









# Discrete Semiconductors Selection Guide 2014

Protection and signal conditioning devices, diodes, bipolar transistors, MOSFETs and thyristors.

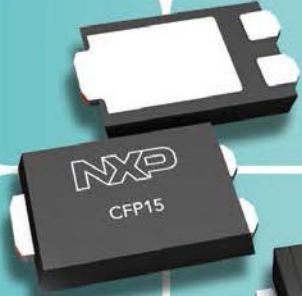
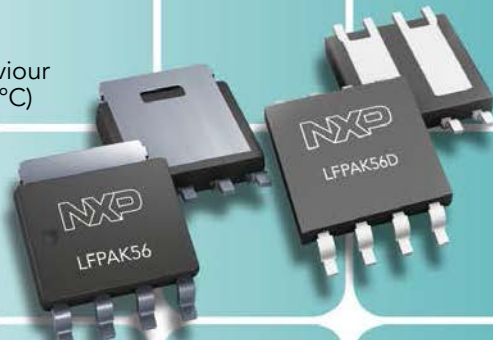


# NXP's next generation of packaging

DFN (Discrete Flat No-lead) packages – high performance on smallest footprint

 <p><b>DFN1006D-2 (SOD882D) / DFN1010D-3 (SOT1215)</b> 100% solderable side pads</p> <ul style="list-style-type: none"> <li>▶ Improved electro-thermal behaviour</li> <li>▶ For visual solder inspection</li> </ul>	 <p><b>DFN2020MD-6 (SOT1220) / DFN1608D-2 (SOD1608)</b> Heat sink at die pad</p> <ul style="list-style-type: none"> <li>▶ For high power on a small footprint</li> <li>▶ Enabling smaller designs</li> </ul>	
 <p><b>DFN1010E-6 (SOT1202) / DFN1006B-3 (SOT883B) DFN1010B-6 (SOT1216)</b> Reduced height</p> <ul style="list-style-type: none"> <li>▶ Down to 0.33 mm</li> <li>▶ For height minimized solutions</li> </ul>		 <p><b>DSN0603 (SOD962)</b> Smallest diode package</p> <ul style="list-style-type: none"> <li>▶ 0.6 x 0.3 mm outline</li> <li>▶ Only 0.3 mm height</li> </ul>

True power packages for smart efficiency – with solid wireless clip design

 <p><b>FlatPower: CFP15 (SOT1289) SOD128 / SOD123W</b> Same performance as SMA/SMB on a much smaller footprint</p>	<p><b>The miniaturization of power</b></p> <ul style="list-style-type: none"> <li>▶ Only 1 mm height</li> <li>▶ Excellent electro-thermal behaviour</li> <li>▶ For high temperature use (175 °C)</li> </ul>	
		<p><b>LFPAK56/56D (SOT669 / SOT1205)</b> Same performance as DPAK, on a much smaller footprint</p>



# Our extensive package range provides maximum flexibility

## Ultra small

## Very small

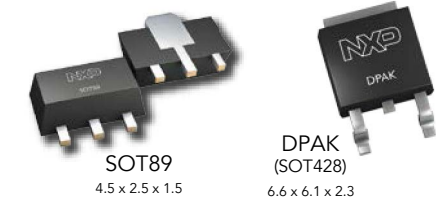
## Small

## Power

2 Pins



3 Pins



4/5 Pins



6 Pins



> 8 Pins



\* The exact position of the balls and package dimensions vary.

## A partner of excellence, experience and innovation for our customers



# Discrete Semiconductors Selection Guide 2014

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conditioning**

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Benefit from interactive features in the online edition of this selection guide: A click on a product type takes you to the corresponding product information page on the NXP website. There you'll find data sheets and other design-support documents. To access the online selection guide, go to [www.nxp.com/discrete\\_selection\\_guide](http://www.nxp.com/discrete_selection_guide)

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# Quality is our top priority

## Zero-Defect Program

- ▶ Ongoing quality improvement process. Goal: Eliminate complaints and incidents in production. Originally established to fulfill the stringent automotive business requirements. Performance measured in CPB (Complaints per Billion).

## Six Sigma Program NXP

- ▶ Structured process-improvement strategy involving the entire organization by identifying and removing defects and minimizing any spillover within the manufacturing process.
- ▶ Strong business processes and internal review process for further improvements.

## Safe-Launch (DfX)

- ▶ Achieve low CPB (Complaints per Billion) at product launch from the beginning.

## Advanced complaint handling

- ▶ Continual process improvement to achieve 'best in class' performance in complaint handling and problem solving.
- ▶ Dedicated safe launch procedure for new product introduction.

## Green products

- ▶ Halogen and lead free, environmental friendly portfolio – Dark Green products are fully RoHS compliant with European Union directive 2002/95/EC.

## Automotive quality mindset

- ▶ Nearly all products are qualified acc. to AEC-Q101 standard.

## Highly qualified design-in and customer support

- ▶ Excellent direct customer support line: Short reaction time and high service level to build and preserve strong customer relationships.

## Certification & Standards

- ▶ All international certification standards of note achieved such as ISO9001, ISO/TS 16949 for automotive sites, ISO14001, OHSAS18001.



Exceeding quality standards is our expectation



# Protection and signal conditioning

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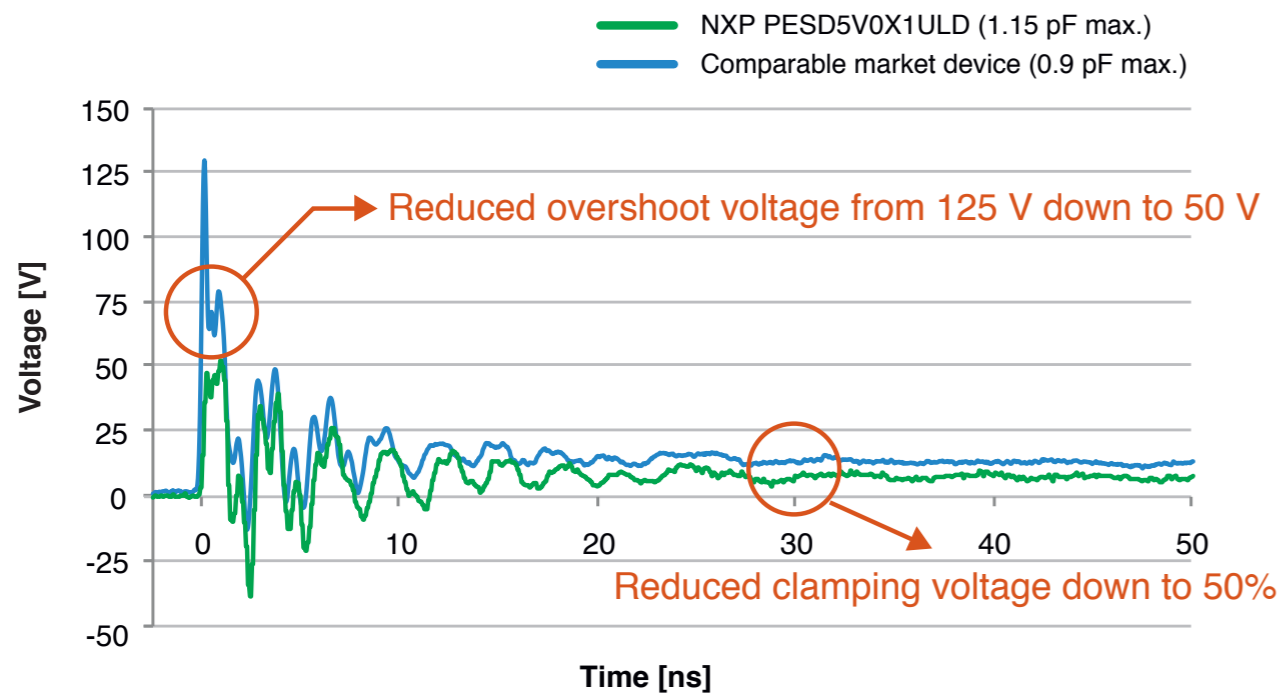
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# Ultra low clamping ESD protection for highly sensitive devices

- ▶ Modern IC process technology nodes feature ultra small structure widths which are highly sensitive to high voltages and currents
- ▶ The excellent clamping performance of the new NXP family reduces dangerous clamping/transient voltages during an ESD strike to a minimum

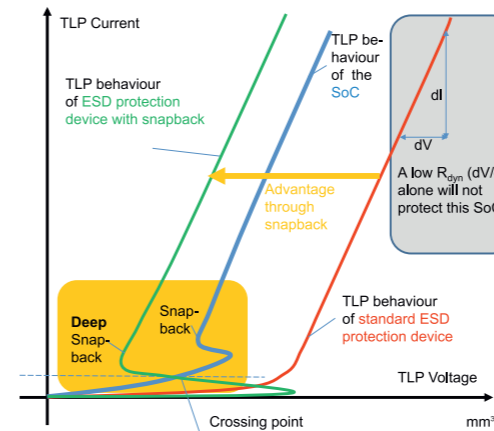
Optimal clamping performance: 8 kV ESD clamping graph



## Electrical specifications

Product	V <sub>RWM</sub>	C <sub>d</sub> typ	C <sub>d</sub> max	ESD rating max	V <sub>CL</sub> @ 8 kV ESD pulse after 30 ns	Package	Configuration
PESD5V0X1UB	5 V	0.95 pF	1.15 pF	8 kV	7.5 V	SOD523 (1.2 x 0.8 x 0.6)	
PESD5V0X1UAB	5 V	1.55 pF	1.75 pF	15 kV	11 V		
PESD5V0X1ULD	5 V	0.95 pF	1.15 pF	8 kV	7.5 V	DFN1006D-2 (SOD882D) (1.0 x 0.6 x 0.37)	
PESD5V0X1UALD	5 V	1.55 pF	1.75 pF	15 kV	11 V		
PESD5V0X1BCL	5 V	0.49 pF	0.6 pF	8 kV	18 V	DFN1006-2 (SOD882) (1.0 x 0.6 x 0.5)	
PESD5V0X1BCAL	5 V	0.85 pF	0.95 pF	15 kV	13.3 V		

# Snap-back ESD protection for ultra-high speed interfaces, protecting sensitive SoCs

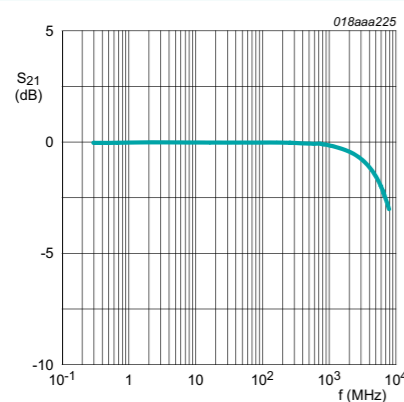


- ▶ Modern, very fast SoCs react very fast to transients such as ESD pulses and Transmission Line Pulse (TLP) measurements
- ▶ Standard ESD protection devices react at higher TLP voltages and do not offer sufficient protection
- ▶ NXP's ESD-protection devices with deep snapback protect even these most sensitive SoCs against ESD pulses according to IEC61000-4-2

Device	Configuration	Description	C <sub>d</sub> typ [pF]	ESD rating [kV IEC 61000-4-2]	Package	Size [mm <sup>3</sup> ]
IP3319CX6	Protects and filters one line pair	Common-mode filter with deep snap-back ESD protection for fast data lines such as USB2.0	1.5	15	WLCSP6	1.34 x 0.95 x 0.57
PUSB2X4Y	Protects four unidirectional lines	Deep snap-back ESD protection for fast data lines (USB2.0,...)	0.8	12	SOT363	2 x 1.25 x 0.95
PUSB2X4D	Protects four unidirectional lines	Deep snap-back ESD protection for fast data lines (USB2.0,...)	0.8	12	SOT457	2.9 x 1.5 x 1.0
IP4285CZ9-TBB	Protects four unidirectional lines	Deep snap-back ESD protection for ultra fast data lines (HDMI,...)	0.8	12	DFN2110-9 (SOT1178)	2.1 x 1.0 x 0.48
IP4292CZ10-TBR	Protects four unidirectional lines	Deep snap-back ESD protection for ultra fast data lines (USB3.0,...)	0.55	8	DFN2510-10 (SOT1176)	2.5 x 1.0 x 0.48
IP4294CZ10-TBR	Protects four unidirectional lines	Deep snap-back ESD protection for ultra fast data lines (USB3.0,...)	0.5	10	DFN2510-10 (SOT1176)	2.5 x 1.0 x 0.48
PUSB3F96	Protects four unidirectional lines or two line pairs	Deep snap-back ESD protection for ultra fast data lines (USB3.0,...)	0.5	10	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48
PCMF2DFN1	Protects and filters two line pairs	Common-mode filter with deep snap-back ESD protection for MIPI D-PHY, HDMI	0.6	15	DFN2520-9 (SOT1333)	2.5 x 2.0 x 0.48
PCMF3DFN1	Protects and filters three line pairs	Common-mode filter with deep snap-back ESD protection for MIPI D-PHY	0.6	15	DFN4020-14 (SOT1334)	2.5 x 2.0 x 0.48
PCMF2DFN2	Protects and filters two line pairs	Common-mode filter with deep snap-back ESD protection for MIPI D-PHY, HDMI	0.4	15	DFN2520-9 (SOT1333)	4.0 x 2.0 x 0.48
PCMF3DFN2	Protects and filters three line pairs	Common-mode filter with deep snap-back ESD protection for MIPI M-PHY	0.4	15	DFN4020-14 (SOT1334)	4.0 x 2.0 x 0.48
PUSB3FB6	Protects six unidirectional lines	6-line ESD protection for USB3/2 combinations and other very fast data lines with extremely low clamping and very low capacitance	0.5	10	DFN2111-7 (SOT1358)	2.1 x 1.1 x 0.48
PUSB3TB6	Protects six bidirectional lines	6-line ESD protection for USB3/2 combinations and other very fast data lines with extremely low clamping and very low capacitance	0.3	10		

# Ultra low capacitance devices for high-speed dataline protection

- ▶ Ultra high-speed interfaces allow only a minimum of additional line capacitance for ESD protection
- ▶ NXP new ultra low capacitance ESD protection diodes offer a line capacitance of only 0.25 pF, thereby increase PCB design flexibility
- ▶ Applications: Ultra high-speed interfaces, USB2.0, USB3.0 and HDMI



### Mixedmode differential insertion loss

A wide differential pass-band allows to pass not only the fundamental frequency, but also higher harmonics of the signal to support signal reconstruction. Shown is the differential pass-band of IP4369CX4, which extends up to 8 GHz, where the attenuation is 3 dB.

### Electrical specifications

types in **bold** represent new products

Product	Configuration	$V_{RWM}$	$C_d$ typ	$C_d$ max	ESD rating max	Package	Configuration
PESD5V0F1BSF	1 x bi	5.5	0.25	0.3	10	DSN0603-2 (SOD962)	
PESD5V0F1USF	1 x uni	5.5	0.6	0.75	10	DSN0603-2 (SOD962)	
PESD5V0F1BLD	1 x bi	5	0.4	0.55	10	DFN1006D-2 (SOD882D)	
<b>PUSB3F96</b>	4 x uni	5.5	0.50	0.60	10	DFN2510A-10 (SOT1176)	
PESD5V0F5UF	5 x uni	5	0.55	0.7	8	DFN1410-6 (SOT886)	

### Available in innovative and ultra-small packages DSN0603-2 and DFN1006D-2

#### The smallest available package for protection diodes

##### Key features and benefits

- ▶ Ultra small package size of 0.6 x 0.3 mm
- ▶ Ultra low package height of only 0.3 mm
- ▶ Up to 30 kV ESD robustness according to IEC61000-4-2
- ▶ Up to 8 A peak current for an 8 / 20  $\mu$ s pulse

#### The innovative, ultra-small package with solderable sidepads

##### Key features and benefits

- ▶ Ultra small package size of 1 x 0.6 mm
- ▶ Low package height of only 0.37 mm / 0.5 mm
- ▶ Up to 30 kV ESD robustness according to IEC61000-4-2
- ▶ Up to 15 A peak current for an 8 / 20  $\mu$ s pulse
- ▶ Ultra low leakage current of 1 nA typical – ideal for battery powered devices

ESD protection for very high-speed interfaces (<2 pF)

### ESD protection for very high-speed interfaces (<2 pF) – Part I

types in **bold** represent new products

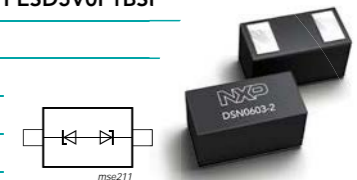
Number of protected lines		$V_{RWM}$ (V)	$C_{line}$ typ (pF)	$C_{line}$ max (pF)	ESD rating <sup>[1]</sup> max (kV)	Configuration	Type	Package	Size (mm)		
Unidirectional	Bidirectional										
1	0	5.5	0.45	0.6	10		<b>PESD5V0F1USF</b>	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3		
		5	0.95	1.15	8		PESD5V0X1ULD	DFN1006D-2 (SOD882D)	1.0 x 0.6 x 0.37		
			1.55	1.75	15		PESD5V0X1UALD	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48		
		16	0.83	0.98	8		PESD16VX1UL	SOD523 (SC-79)	1.2 x 0.8 x 0.6		
		5	0.95	1.15	8		PESD5V0X1UB	SOT323	2.0 x 1.25 x 0.95		
			1.55	1.75	15		PESD5V0X1UAB	SOT23	2.9 x 1.3 x 1.0		
		80	0.6	0.75	30	NUP1301U					
		5.5	1	1.5	8	PRTR5V0U1T					
		0	1	5.5	0.25	0.3	10		<b>PESD5V0F1BSF</b>	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3
				18	0.3	0.45			<b>PESD18VF1BSF</b>		
24	0.3			0.45	<b>PESD24VF1BSF</b>						
5	0.4			0.55	10		PESD5V0F1BLD	DFN1006D-2 (SOD882D)	1.0 x 0.6 x 0.37		
3.3	1.3			1.6	9		PESD3V3X1BL	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48		
5.5	0.4			0.55	10		PESD5V0F1BL				
5	0.49			0.6	8		PESD5V0X1BCL				
	0.85			0.95	15		PESD5V0X1BCAL				
0.9	1.3			9	PESD5V0X1BL						
18	0.35			0.5	10		PESD18VF1BL				
24	0.35	0.5	10	PESD24VF1BL							

<sup>[1]</sup> acc. to IEC 61000-4-2 (contact discharge)

### In the Spotlight

#### Ultra low capacitance ESD protection in DSN0603-2: PESD5V0F1BSF

- Bidirectional protection for one data line in DSN0603-2
- Ultra low line capacitance of 0.25 pF
- Minimized capacitance variation over voltage
- High ESD robustness = 10 kV
- Ultra small package DSN0603-2 (0.6 x 0.3 x 0.3 mm)





ESD protection for very high-speed interfaces (<2 pF) – Part 2

types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	ESD rating <sup>(1)</sup> max (kV)	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional								
2	1	5	0.55	0.7	10		PESD5V0X2UMB	DFN1006B-3 (SOT883B)	1.0 x 0.6 x 0.37
							PESD5V0X2UM	DFN1006-3 (SOT883)	1.0 x 0.6 x 0.48
							PESD5V0X2UAMB	DFN1006B-3 (SOT883B)	1.0 x 0.6 x 0.37
							PESD5V0X2UAM	DFN1006-3 (SOT883)	1.0 x 0.6 x 0.48
	0	5.5	0.9	1.3	9		PESD5V0X1BQ	SOT663	1.6 x 1.2 x 0.55
							PESD5V0X1BT	SOT23	2.9 x 1.3 x 1.0
							PRTR5V0U2X	SOT143B	2.9 x 1.3 x 1.0
							PRTR5V0U2AX		2.9 x 1.3 x 1.0
							PRTR5V0U2F	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48
							IP4234CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
IP4282CZ6	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48							
IP4359CX4/LF	WLCSP4	0.76 x 0.76 x 0.61							
IP4369CX4		0.76 x 0.76 x 0.47							

<sup>(1)</sup> acc. to IEC 61000-4-5 (contact discharge)

**In the Spotlight**

**Lowest capacitance ESD protection in DFN1006D-2: PESD5V0F1BLD**

- Bidirectional protection for one data line
- Ultra low line capacitance of 0.4 pF
- Very low package height of 0.37 mm typ
- High ESD robustness of 10 kV
- Ultra small package DFN1006D-2 with solderable sidepads

ESD protection for very high-speed interfaces (<2 pF) – Part 3

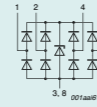
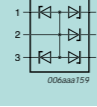
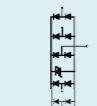
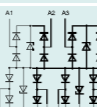
types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	ESD rating <sup>(1)</sup> max (kV)	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional								
4	0	5.5	1	-	8		IP4220CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
							IP4221CZ6-S	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48
							<b>IP4221CZ6-XS</b>	DFN1010-6 (SOT891)	1.0 x 1.0 x 0.48
							<b>IP4233CZ6</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95
							PRTR5V0U4D	SOT457 (SC-74)	2.9 x 1.5 x 1.0
							PRTR5V0U4Y	SOT363 (SC-88)	2.0 x 1.25 x 0.95
							IP4285CZ9-TBB	DFN2110-9 (SOT1178)	2.1 x 1.0 x 0.48
							<b>PUSB2X4D</b>	SOT457 (SC-74)	2.9 x 1.5 x 1.0
							<b>PUSB2X4Y</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95
							IP4280CZ10	SOT552 (1SSOP10)	3.0 x 3.0 x 1.1
							IP4283CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48
							IP4284CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48

<sup>(1)</sup> acc. to IEC 61000-4-5 (contact discharge)

ESD protection for very high-speed interfaces (<2 pF) – Part 4

types in **bold** represent new products

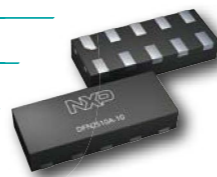
Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	ESD rating <sup>[1]</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
4	0	5.5	0.55	-	8	-		IP4292CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48
								IP4294CZ10-TBR		
								<b>PUSB3F96</b>		
5	4	5	0.5	0.65	8	0.1		PESD5V0F5UF	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48
								PESD5V0F5UW	SOT666	1.6 x 1.2 x 0.55
6	0	5	0.3	-	10	-		PUSB3TB6	DFN2111-7 (SOT1358)	2.1 x 1.1 x 0.48
								PUSB3FB6		
8	0	5.5	1.3	-	15	-		IP4309CX9	WLCSP9	1.16 x 1.16 x 0.61

<sup>[1]</sup> acc. to IEC 61000-4-2 (contact discharge)

In the Spotlight



**PUSB3F96 - ESD protection in very small DFN2510A-10 package for USB3.0**

- Protects four very fast data lines of sensitive system chips
- Deep snap-back and very low dynamic resistance (less than 0.26 Ω / 0.41 Ω)
- Very small DFN2510A-10 package (2.5 x 1.0 x 0.48 mm)
- Differential pass-band >7.5 GHz, capacitance <0.5 pF



Low capacitance ESD protection devices – Part 1

types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
1	0	3.3	34	40	45	30	0.3		PESD3V3L1UL	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48
		5	25	30	42	26	0.1		PESD5V0L1UL		
		5	25	30	42	26	0.1		PESD5V0L1ULD	DFN1006D-2 (SOD882D)	1.0 x 0.6 x 0.37
		3.3	34	40	45	30	0.3		PESD3V3L1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6
		5	25	30	42	26	0.1		PESD5V0L1UB		
		3.3	34	40	45	30	0.3		PESD3V3L1UA	SOD323 (SC-76)	1.7 x 1.25 x 0.95
		5	25	30	42	26	0.1		PESD5V0L1UA		
		5	12	15	10	30	0.1		PESD5V0L1USF	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3
		5	4	5	8	14	0.1		PESD5V0V1USF		
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UL	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48
		5	2	2.6	-	9	0.1		PESD5V0U1UL		
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6
		5	2	2.6	-	9	0.1		PESD5V0U1UB		
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UA	SOD323 (SC-76)	1.7 x 1.25 x 0.95
		5	2	2.6	-	9	0.1		PESD5V0U1UA		
0	1	3.3	101	-	500	30	2		PESD3V3L1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95
		5	75	-	500	30	1		PESD5V0L1BA		
		12	17	25	-	30	0.05		<b>PESD12VV1BSF</b>	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3
		12	19	-	200	30	0.05		PESD12VL1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95
		15	16	-	200	30	0.05		PESD15VL1BA		
		24	11	-	200	23	0.05		PESD24VL1BA	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3
		5.5	12	15.4	35	30	0.1		PESD5V0L1BSF		
		5	11	13	45	30	0.01		PESD5V0V1BL	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48
		5	11	13	45	30	0.01		PESD5V0V1BLD	DFN1006D-2 (SOD882D)	1.0 x 0.6 x 0.37
		5	11	13	45	30	0.01		PESD5V0V1BB	SOD523 (SC-79)	1.2 x 0.8 x 0.6
		5	11	13	45	30	0.01		PESD5V0V1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95
		5	5.3	6	10	20	0.1		PESD5V0V1BCSF	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3
		5	5.3	6	20	25	0.1		PESD5V0V1BDSF		
		5.5	3.5	4.5	8	15	0.1		PESD5V0V1BSF	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48
		12	17	25	290	30	0.01		PESD12VV1BL		
15	8	10	-	15	0.1	IP4302CX2/A	WLCSP2	0.7 x 0.52 x 0.40			

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

Low capacitance ESD protection devices – Part 2

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line typ</sub> (pF)	C <sub>line max</sub> (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)							
Unidirectional	Bidirectional																	
0	1	5	2.9	3.5	-	10	0.1		PESD5V0U1BL	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48							
									PESD5V0U1BLD	DFN1006D-2 (SOD882D)	1.0 x 0.6 x 0.37							
									PESD5V0U1BB	SOD523 (SC-79)	1.2 x 0.8 x 0.6							
									PESD5V0U1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95							
2	1	3.3	22	28	30	15	0.3		PESD3V3L2UM	DFN1006-3 (SOT883)	1.0 x 0.6 x 0.48							
									PESD5V0L2UM	DFN1006B-3 (SOT883B)	1.0 x 0.6 x 0.37							
		5	16	19	-	15	0.025		PESD5V0L2UMB	DFN1006B-3 (SOT883B)	1.0 x 0.6 x 0.37							
									PESD5V0L2UU	SOT323 (SC-70)	2.0 x 1.25 x 0.95							
0	2	3.3	101	-	350	30	2		PESD3V3L2BT	SOT23	2.9 x 1.3 x 1.0							
									PESD5V0L2BT									
									PESD12VL2BT									
									PESD15VL2BT									
									PESD24VL2BT									
									PESD5V0S2BT									
		5	2.9	3.5	-	10	0.1		PESD5V0U2BT	DFN1006-3 (SOT883)	1.0 x 0.6 x 0.48							
									PESD5V0U2BM	DFN1006B-3 (SOT883B)	1.0 x 0.6 x 0.37							
									15	13	15	-	15	0.1		IP4303CX4/P	WLCSP4	0.76 x 0.76 x 0.40

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> acc. to IEC 61000-4-5 (contact discharge)

Low capacitance ESD protection devices – Part 3

types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line typ</sub> (pF)	C <sub>line max</sub> (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)		
Unidirectional	Bidirectional												
0	4	3.3	22	28	30	20	0.3		PESD3V3L4UF	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48		
									PESD5V0L4UF				
									PESD3V3L4UW	SOT665		1.6 x 1.2 x 0.55	
									PESD5V0L4UW				
									PESD3V3L4UG	SOT353 (SC-88A)			2.0 x 1.25 x 0.95
									PESD5V0L4UG				
		5	16	19	30	20	0.025		PESD3V3V4UK	DFN1010-6 (SOT891)	1.0 x 1.0 x 0.48		
									PESD5V0V4UK				
									PESD9V0V4UK				
									PESD3V3V4UF	DFN1410-6 (SOT886)		1.45 x 1.0 x 0.48	
									PESD5V0V4UF				
									PESD3V3V4UW	SOT665			1.6 x 1.2 x 0.55
PESD5V0V4UW													
PESD3V3V4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95											
PESD5V0V4UG													
0	4		5.5	18	20	-	15	0.1		IP4343CX5/LF	WLCSP5	1.06 x 0.76 x 0.61	

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> acc. to IEC 61000-4-5 (contact discharge)

Low capacitance ESD protection devices – Part 4

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line typ</sub> (pF)	C <sub>line max</sub> (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
0	4	5	2.9	3.5	-	10	0.1		PESD5V0U4BF	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48
		5	2.9	3.5	-	10	0.1		PESD5V0U4BW	SOT665	1.6 x 1.2 x 0.55
5	4	3.3	20	24	28	15	2		PESD3V3L5UK	DFN1010-6 (SOT891)	1.0 x 1.0 x 0.48
		5	18.5	22	30	20	0.5		PESD5V0L5UK		
		3.3	22	28	25	20	0.3		PESD3V3L5UF	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48
		5	16	19	25	20	0.025		PESD5V0L5UF		
		3.3	22	28	25	20	0.3		PESD3V3L5UV	SOT666	1.6 x 1.2 x 0.55
		5	16	19	25	20	0.025		PESD5V0L5UV		
		3.3	22	28	25	20	0.3		PESD3V3L5UY	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		5	16	19	25	20	0.025		PESD5V0L5UY		
0	5	5	2.9	3.5	-	10	0.1		PESD5V0U5BF	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48
		5	2.9	3.5	-	10	0.1		PESD5V0U5BV	SOT666	1.6 x 1.2 x 0.55
6	5	5	16	19	35	20	0.025		PESD5V0L6US	SOT96 (SO8)	4.9 x 3.9 x 1.75
0	7	5	8	10	35	10	0.025		PESD5V0L7BS	SOT96 (SO8)	4.9 x 3.9 x 1.75

<sup>[1]</sup> 8/20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> acc. to IEC 61000-4-5 (contact discharge)

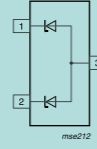
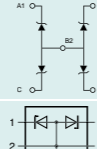
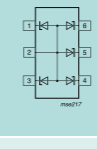

Standard ESD protection devices – Part I

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line typ</sub> (pF)	C <sub>line max</sub> (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
1	0	5	35	42	40	30	0.1		PESD5V0S1USF	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3
		3.3	207	300	150	30	2		PESD3V3S1UL	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48
		5	152	200	150	30	1		PESD5V0S1UL		
		12	38	75	150	30	0.05		PESD12VS1UL		
		15	32	70	150	30	0.05		PESD15VS1UL		
		24	23	50	150	23	0.05		PESD24VS1UL		
		36	18	30	150	30	0.01		PESD36VS1UL		
		5	152	200	150	30	1		PESD5V0S1ULD	DFN1006D-2 (SOD882D)	1.0 x 0.6 x 0.37
		12	38	75	150	30	0.05		PESD12VS1ULD		
		15	32	70	150	30	0.05		PESD15VS1ULD		
		24	23	50	150	23	0.05		PESD24VS1ULD		
		3.3	207	300	330	30	2		PESD3V3S1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6
		5	152	200	260	30	1		PESD5V0S1UB		
		12	38	75	180	30	0.05		PESD12VS1UB	SOD323 (SC-76)	1.7 x 1.25 x 0.95
		15	32	70	160	30	0.05		PESD15VS1UB		
		24	23	50	160	23	0.05		PESD24VS1UB		
		5	480	530	890	30	4		PESD5V0S1UA		
		12	160	180	600	30	0.1		PESD12VS1UA		
		24	23	50	160	23	0.05		PESD24VS1UA		
		5	480	530	890	30	4		PESD5V0S1UJ	SOD323F (SC-90)	1.7 x 1.25 x 0.7
		12	160	180	600	30	0.1		PESD12VS1UJ		
		5	68	75	150	30	1		PESD9X5.0L	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48
		7	62	70	150	30	1		PESD9X7.0L		
		2.5	229	300	260	30	6		PESD5Z2.5	SOD523 (SC-79)	1.2 x 0.8 x 0.6
3.3	172	200	260	30	0.05	PESD5Z3.3					
5	89	150	180	30	0.05	PESD5Z5.0					
6	78	150	180	30	0.01	PESD5Z6.0					
7	69	150	180	30	0.01	PESD5Z7.0					
12	35	75	200	30	0.01	PESD5Z12					
5.5	35	45	100	30	0.1	PESD5V0S1BSF	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3			
5	35	45	130	30	0.1	PESD5V0S1BL	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48			
5	35	45	130	30	0.1	PESD5V0S1BLD	DFN1006D-2 (SOD882D)	1.0 x 0.6 x 0.37			
5	35	45	130	30	0.1	PESD5V0S1BB	SOD523 (SC-79)	1.2 x 0.8 x 0.6			
5	35	45	130	30	0.1	PESD5V0S1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95			

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

## Standard ESD protection devices – Part 2

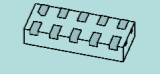
Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line typ</sub> (pF)	C <sub>line max</sub> (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)		
Unidirectional	Bidirectional												
2	1	3.3	200	275	150	23	3		PESD3V3S2UQ	SOT663	1.6 x 1.2 x 0.55		
		5	150	215	150	30	0.3						
		12	38	100	150	30	0.03						
		15	32	70	150	30	0.05						
		24	23	50	150	23	0.05						
		3.3	207	300	330	30	2						
		5.2	152	200	260	30	1						
		12	38	75	180	30	1						
		15	32	70	160	30	1						
		24	23	50	160	23	1						
		36	17	35	160	30	1 (@ 30 V)						
		3.3	207	300	330	30	2						
		5	152	200	260	30	1						
		12	38	75	180	30	0.05						
		15	32	70	160	30	0.05						
		24	23	50	160	23	0.05						
4	3	5.5	45	60	-	15	0.1		IP4342CX5/LF	WLCSP5	1.06 x 0.76 x 0.61		
		5.5	30	40	-	15	0.1						
		3.3	110	300	110	30	1 (@ 3 V)						
		5	85	220	110	30	0.1 (@ 4.3 V)						
		3	107	125	-	8	1						
		4	90	105	-	8	0.5						
		4.3	78	90	-	8	0.1						
		3	200	240	-	8	2						
		3	107	125	-	8	1						
		4	165	200	-	8	0.7						
		4	90	105	-	8	0.5						
		4.3	145	180	-	8	0.2						
		4.3	78	90	-	8	0.1						
		15	37	50	-	8	0.1						
		3	200	240	-	8	2						
		4	165	200	-	15	0.7						
		14	37	48	-	8	0.075						
		15	37	48	-	8	0.1						
		3.3	215	300	200	30	0.8						
		5	165	220	200	30	0.2						
		12	73	100	200	30	0.015						
		15	60	90	200	30	0.015						
		24	40	70	200	23	0.015						
		5	4	3.3	215	300	200	30	0.8		PESD3V3S5UD	SOT457 (SC-74)	2.9 x 1.5 x 1.0
				5	165	220	200	30	0.2				
				12	73	100	200	30	0.015				
				15	60	90	200	30	0.015				
				24	45	70	200	23	0.015				
		0	4	5	45	75	-	15	0.1		BZA408B		

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

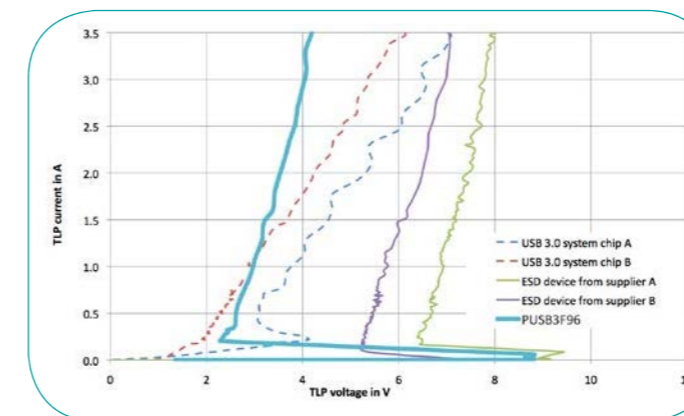
<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

## USB3.0, SATA, LAN

types in **bold** represent new products

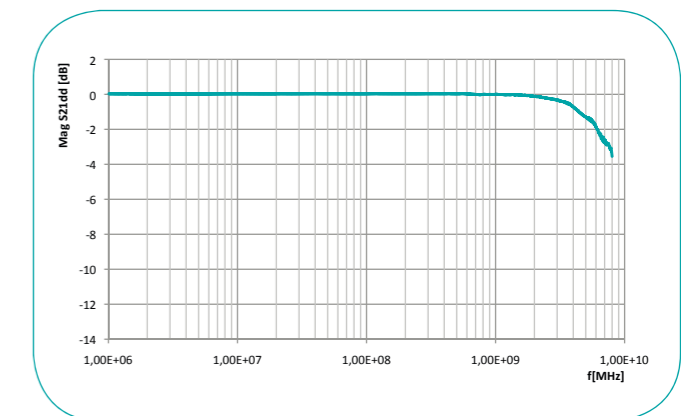
Baseband interface	Number of protected lines	R <sub>line</sub>	C <sub>line</sub> (pF)	Remark	Type	Package	Size (mm)
USB3.0 SuperSpeed USB	4	-	0.5	ESD protection for ultra high-speed interfaces	IP4294CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48
		-	0.55	ESD protection for ultra high-speed interfaces	IP4292CZ10-TBR		
		-	0.5	ESD protection for ultra high-speed interfaces	<b>PUSB3F96</b>		

### Comparative transmission line pulse (TLP) measurements



If the ESD device has a higher TLP voltage for a given TLP current, the USB 3.0 system chip will see the majority of the ESD pulse's energy. The results shown in this diagram have been confirmed with tests that brought complete boards to destruction. When protected by the NXP device, the USB 3.0 system chip survived 10 kV IEC61000-4-2 pulses, but when protected by the ESD device from supplier B, the USB 3.0 system chip failed already at 4 kV.

### A very wide differential mode pass band ensures that even higher harmonics see no attenuation



With a differential pass-band up to 8 GHz, PUSB3F96 allows to pass not only the fundamental frequency, but also higher harmonics of the signal to support signal reconstruction.

### In the Spotlight

#### USB3.0 ESD protection: PUSB3F96

- Extremely low capacitance of 0.5 pF with minimized voltage dependency
- Highest protection for the most sensitive system chips
- RF-optimized DFN2510A-10 (SOT1176) package
- Pass-through routing
- Extremely low crosstalk



## USB2.0, SATA, LAN

types in **bold** represent new products

Baseband interface	Number of protected lines	$R_{line}$	$C_{line}$ (pF)	Remark	Type	Package	Size (mm)	
USB (CSP package)	2	33 Ω / 1.3 kΩ / 17 kΩ / 15 kΩ	27	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4065CX11/LF	WLCSP11	1.47 x 1.97 x 0.65	
	3 + 2	47 Ω / 100 Ω	10	Integrated low capacitance SIM-Card & USB passive filter array with ESD protection	IP4365CX11/P	WLCSP11	1.16 x 1.56 x 0.61	
	2	-	0.8	MHL and USB2.0 high-speed ESD-protection	IP4369CX4	WLCSP4	0.76 x 0.76 x 0.47	
USB2.0 (Plastic package)	2	0.5	2	>15 kV IEC contact ESD protection with pi-filter	IP4234CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0	
			1.0	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2X	SOT143B	2.9 x 1.3 x 1.0	
			1.8	ESD protection for up to 2 ultra high-speed datalines with 12 kV ESD robustness	PRTR5V0U2AX			
			0.7	ESD protection for ultra high-speed interfaces	IP4282CZ6	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48	
				ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2K	DFN1010-6 (SOT891)	1.0 x 1.0 x 0.48	
				ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2F	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48	
	3 + 1	-	1	USB protection for USB OTG with 5.5 V Vbat protection	PUSBM5VX4-TL	DFN1616-6 (SOT1189)		1.6 x 1.6 x 0.48
				USB protection for USB OTG with 12 V Vbat protection	PUSBM12VX4-TL			
				USB protection for USB OTG with 15 V Vbat protection	PUSBM15VX4-TL			
				USB protection for USB OTG with 30 V Vbat protection	PUSBM30VX4-TL			
	4	-	0.8	Very low clamp ESD protection for USB2.0 high-speed with 12 kV IEC ESD protection	<b>PUSB2X4X</b>	SOT363 (SC-88)		2.0 x 1.25 x 0.95
				Very low clamp ESD protection for USB2.0 high-speed with 12 kV IEC ESD protection	<b>PUSB2X4D</b>	SOT457 (SC-74)		2.9 x 1.5 x 1.0
				Dual ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4220CZ6			
				Dual ESD protection for USB2.0 high-speed, SD-card, SIM card	PRTR5V0U4D			
				Dual ESP protection for USB2.0 high-speed, SD-card, SIM card	PRTR5V0U4Y	SOT363 (SC-88)		2.0 x 1.25 x 0.95
				ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4221CZ6-S	DFN1410-6 (SOT886)		1.45 x 1.0 x 0.48
	Dual ESD protection for USB2.0 high-speed, SD-card, SIM-card	IP4221CZ6-XS	DFN1010-6 (SOT891)		1.0 x 1.0 x 0.48			

## Common Mode Filter for USB, SATA, LAN

types in **bold** represent new products


Baseband interface	Number of protected lines	$C_{line}$ (pF)	ESD rating <sup>(1)</sup> max (kV)	Remark	Type	Package	Size (mm)
USB2.0	2	1.5	15	Common Mode filter with ESD protection for high-speed interfaces such as USB 2.0	<b>IP3319CX6</b>	WLCSP6	1.34 x 0.95 x 0.57

<sup>(1)</sup> acc. to IEC 61000-4-2 (contact discharge)

**In the Spotlight**

**IP3319CX6 - Common Mode filter for USB2.0**


- Very wide differential pass band >1 GHz
- Very broadband common-mode attenuation
- Very low clamping ESD protection, excellent SoC protection
- Very small WLCSP6 package (footprint area 1.34 x 0.95 mm<sup>2</sup>)



**In the Spotlight**

**PCMF-series: 2 and 3 line pair Common Mode filters for MIPI, HDMI**

- Very wide differential pass band >2 GHz
- Very broadband common-mode attenuation
- Very low clamping ESD protection, excellent SoC protection
- Very thin DFN plastic package (0.5 mm max.)



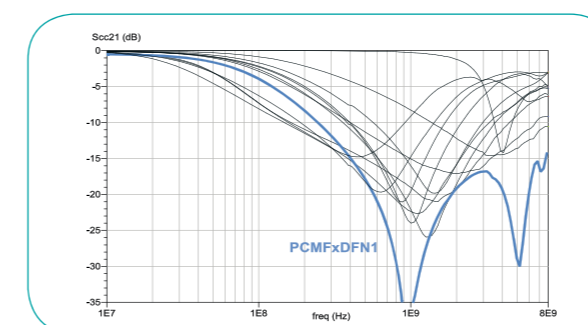
## Common Mode Filter for MIPI CSI, DSI, (D-PHY)

types in **bold** represent new products

Baseband interface	Number of protected line pairs unidirectional	Number of protected line pairs bidirectional	Type	Differential Mode 3 dB frequency (typ.)	Common Mode insertion loss 800 MHz - 2.4 GHz	$C_d$ pF typical	$V_{fwm}$	ESD rating <sup>(1)</sup> max (kV)	Channel series resistance	Package	Size (mm)
MIPI D-PHY	2	0	PCMF2DFN1	>2 GHz	<-24 dB	0.8	5	15	5 Ω	DFN2520-9 (SOT1333)	2.5 x 2.0 x 0.48
	3		PCMF3DFN1	>2 GHz						DFN4020-14 (SOT1334)	4.0 x 2.0 x 0.48
MIPI, HDMI	2	0	PCMF2DFN2	<5 GHz	<-20 dB	0.4	5	15	4 Ω	DFN2520-9 (SOT1333)	2.5 x 2.0 x 0.48
	3		PCMF3DFN2	<-20 dB						DFN4020-14 (SOT1334)	4.0 x 2.0 x 0.48

<sup>(1)</sup> acc. to IEC 61000-4-2 (contact discharge)

### Common Mode suppression performance (for various Ferrite / Ceramic Filters)



PCMFxDFN1 offers the largest bandwidth of Common-Mode suppression. The figure shows a comparison to a field of ferrite/ceramic based filters. This large suppression bandwidth gives customers the security of maximum RF emission and irradiation reduction over all relevant frequencies. It also reduces time-to-market by avoiding the exchange of filters, until a suitable Common-Mode suppression is found.

## LAN

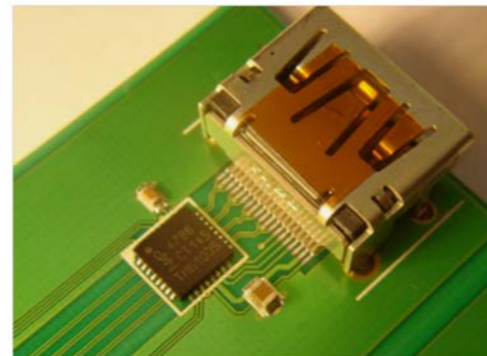
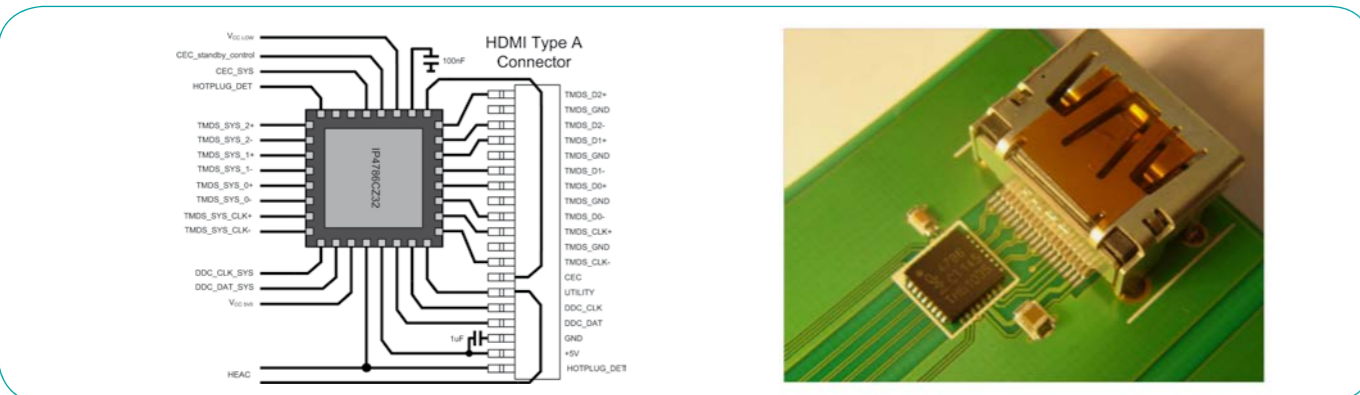
types in **bold** represent new products

Baseband interface	Number of protected lines	$C_{line}$ (pF)	Remark	Type	Package	Size (mm)
LAN	1	0.6	Ethernet ESD protection $V_{RWM} = 3.3$ V	PESD3V3U1UT	SOT23	2.9 x 1.3 x 1.0
		0.6	Ethernet ESD protection $V_{RWM} = 5.0$ V	PESD5V0U1UT		
		0.6	Ethernet ESD protection $V_{RWM} = 12$ V	PESD12VU1UT		
		0.6	Ethernet ESD protection $V_{RWM} = 15$ V	PESD15VU1UT		
		0.6	Ethernet ESD protection $V_{RWM} = 24$ V	PESD24VU1UT		
	4	1	Ethernet line surge ESD protection	<b>IP4233CZ6</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95
	4	1	Ethernet ESD protection	IP4220CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0

Please find more ESD protection diodes for very high-speed interfaces on pages 30 - 34

## Signal conditioning and protection

Interface	Number of protected lines	Buffer	Level shifter	$C_{line}$ (pF)	Resistor (Ohm)	LDO	Remark	Type	Package	Size
HDMI tx	5			-	internal	-	Fully integrated for HDMI control lines including buffer for DDC, CEC and Hot Plug module	IP4791CZ12	DFN2521-12 (SOT1156)	2.5 x 2.1 x 0.48
				10	1.75 k, 100 k		HDMI, DDC, CEC, hot plug ESD protection and biasing	IP4310CX8/P	WLCSP8	1.16 x 1.16 x 0.61
	13	yes	yes	100 $\Omega$ differential impedance	internal	CEC LDO, 5 V LDO	Fully integrated HDMI source solution with current limiter, buffer and level shifter for DDC, CEC and Hot Plug	IP4786CZ32	DFN5050-32 (SOT617)	5.0 x 5.0 x 0.85
							Fully integrated HDMI sink solution with buffer and level shifter for DDC, CEC and Hot Plug			
							Fully integrated HDMI source solution with enhanced ESD protection, current limiter, buffer and level shifter for DDC, CEC and Hot Plug	IP4786CZ32S	DFN4040-32 (SOT1318-1)	4.0 x 4.0 x 0.50
SD 3.0	6				internal	1.8 V LDO	Fully integrated SD 3.0 card level shifter with buffer technology, LDO and EMI filter	IP4855CX25	WLCSP25	2.4 x 2.4 x 0.4
								IP4755CZ24	DFN5535-24 (SOT815)	3.5 x 5.5 x 0.85

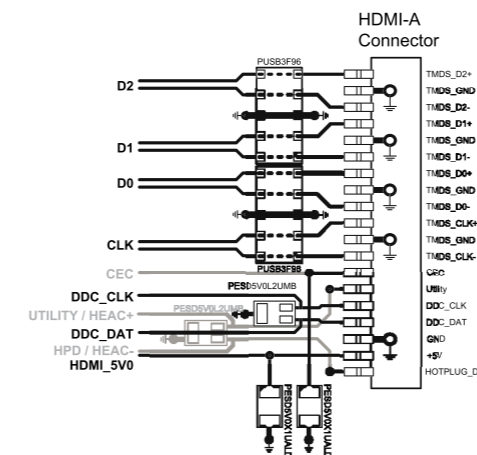


## Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	$C_{line}$ (pF)	Remark	Type	Package	Size (mm)	
Display port	4	0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48	
			ESD protection for ultra high-speed interfaces	IP4283CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
		0.55	ESD protection for ultra high-speed interfaces	IP4292CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48	
			ESD protection for ultra high-speed interfaces	IP4294CZ10-TBR	<b>PUSB3F96</b>		
			ESD protection for ultra high-speed interfaces	IP4285CZ9-TBB	DFN2110-9 (SOT1178)		2.1 x 1.0 x 0.48
HDMI	2	0.7	ESD protection for ultra high-speed interfaces	IP4282CZ6	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48	
			ESD protection for ultra high-speed interfaces	IP4280CZ10	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
	4	0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48	
			ESD protection for ultra high-speed interfaces	IP4283CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
		0.8	ESD protection for ultra high-speed interfaces	IP4285CZ9-TBB	DFN2110-9 (SOT1178)	2.1 x 1.0 x 0.48	
			ESD protection for ultra high-speed interfaces	IP4292CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48	
	4	0.5	ESD protection for ultra high-speed interfaces	<b>PUSB3F96</b>			
			ESD protection for ultra high-speed interfaces	IP4294CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48	
	LVDS	4	0.8	Very low clamp ESD protection with 12 kV IEC ruggedness	<b>PUSB2X4D</b>	SOT457 (SC-74)	2.9 x 1.5 x 1.0
				Very low clamp ESD protection with 12 kV IEC ruggedness	<b>PUSB2X4Y</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95

PUSB3F96 PESD HDMI application schematic



## SATA

types in **bold** represent new products

Baseband interface	Number of protected lines	$C_{line}$ (pF)	Remark	Type	Package	Size (mm)
SATA	2	0.7	ESD protection for ultra high-speed interfaces	IP4282CZ6	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.48
					DFN2510A-10 (SOT1176)	
	4	0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TBR	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48
					SOT552 (TSSOP10)	
					DFN2510A-10 (SOT1176)	
					DFN2510A-10 (SOT1176)	
					DFN2110-9 (SOT1178)	
					DFN2510A-10 (SOT1176)	
					DFN2510A-10 (SOT1176)	
DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.48					
<b>PUSB3F96</b>						

## SD-, SIM-card and MMC

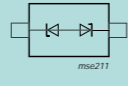
types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		$R_{line}$	$C_{line}$ (pF)					
SIM card	3 + 2	47 $\Omega$ / 100 $\Omega$	10	~20	Integrated low capacitance SIM-card passive filter array & USB ESD protection	IP4365CX11	WLCS11	1.16 x 1.56 x 0.61
						IP4064CX8/LF/P	WLCS8	1.41 x 1.41 x 0.65
	3	47 $\Omega$ / 100 $\Omega$	20	~20	Integrated SIM-card EMI filter and ESD protection	IP4364CX8/LF/P	WLCS8	1.16 x 1.16 x 0.61
						IP4366CX8/P	DFN1714-8 (SOT1166)	1.7 x 1.35 x 0.52
						IP4264CZ8-20-TTL	DFN1410-6 (SOT886)	1.0 x 1.0 x 0.48
4	-	1	~240	Quad channel low capacitance ESD protection	IP4221CZ6-S	DFN1010-6 (SOT891)	1.0 x 1.0 x 0.48	
					IP4221CZ6-XS	DFN1010-6 (SOT891)	1.0 x 1.0 x 0.48	
SD-card / MMC	4	47 $\Omega$ / 13 k $\Omega$ / 56 k $\Omega$	25	~30	MMC ESD protection, pull-up resistors	IP4051CX11/LF	WLCS11	1.44 x 1.96 x 0.65
						IP4252CZ12-6-TTL	DFN2514-12 (SOT1167)	2.5 x 1.35 x 0.53
	6	40 $\Omega$ / 100 $\Omega$	11	-	6-channel Micro-SD memory card interface ESD protection filter	IP4340CX15	WLCS15	1.56 x 1.56 x 0.5
						IP4357CX17	WLCS17	1.1 x 2.4 x 0.61
6 + 2	40 $\Omega$	12	>52	(Mini) SD card/trans flash ESD protection, EMI filter	IP4252CZ16-8-TTL	DFN3314-16 (SOT1168)	3.3 x 1.35 x 0.53	

Please find more ESD protection diodes for very high-speed interfaces on pages 30 - 34

## NFC Antenna Protection

types in **bold** represent new products


Interface	Number of protected lines (Bidirectional)	$V_{RWM}$ [V]	$C_{line}$ typ [pF]	$C_{line}$ max [pF]	ESD rating <sup>(1)</sup> max [kV]	Configuration	Type	Package	Size
NFC Antenna	1	18	0.3	0.45	10		<b>PESD18VF1BSF</b>	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3
			0.35	0.5	10		<b>PESD18VF1BL</b>	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48
		24	0.3	0.45	10		<b>PESD24VF1BSF</b>	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3
			0.35	0.5	10		<b>PESD24VF1BL</b>	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48

<sup>(1)</sup> acc. to IEC 61000-4-2 (contact discharge)

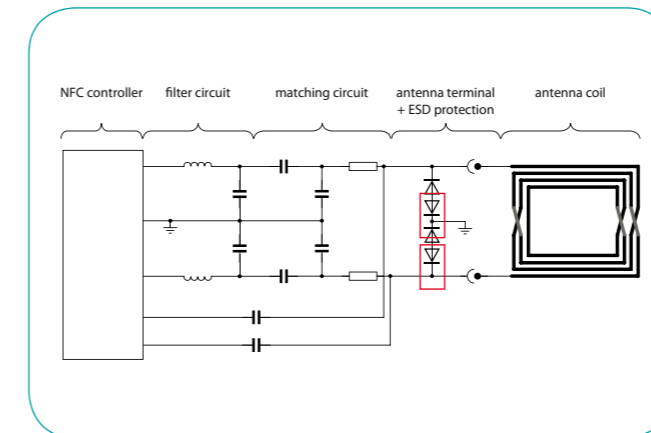
**In the Spotlight**

**PESD18VF1BL – NFC antenna protection**

- High reverse standoff voltage  $V_{RWM} = 18$  V
- Ultra small DFN1006-2 package (1.0 x 0.6 x 0.48 mm)
- Ultra low diode capacitance  $C_d = 0.35$  pF
- Very small voltage dependency of the capacitance



### Circuit diagram

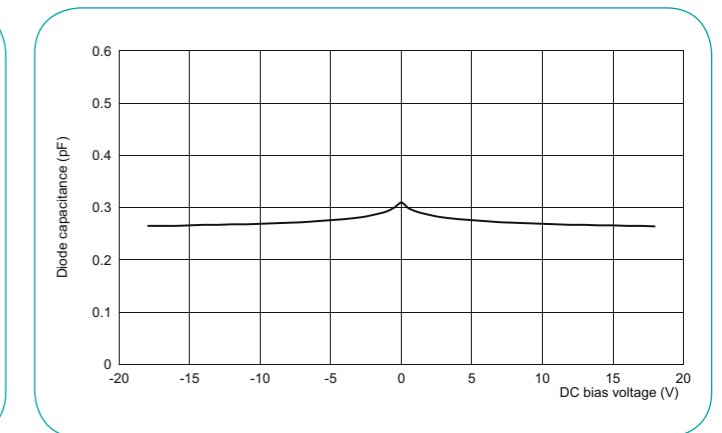


Using tiny packages makes PCB design more flexible.

### Features

- ▶ Bidirectional configuration, allowing operating voltages up to 18 V
- ▶ Very low capacitance, enabling easy design of the antenna matching circuit
- ▶ Very small voltage dependency of the diode capacitance, avoiding intermodulation distortion
- ▶ Small form-factor packages of 1006 (0402 inch) and 0603 (0201 inch) standard size

### Diode capacitance versus bias voltage










The highly linear diode capacitance, with very small variation, minimizes signal degradation.

### Benefits





- ▶ NFC is the breakthrough technology that allows tags in posters, check-in signs, and contactless payment terminals to interact with mobile phones. The NFC antenna is often integrated into the battery cover or the battery itself and is connected to the NFCs via small contacts on the phone- an entry point for ESD strikes which are potentially hazardous to the NFC IC. These new NXP devices are optimized for the requirements of the NFC system and ensure the best-possible protection of the NFC IC.






### Multichannel EMI filters, ESD protection for LCD and camera

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21 ~ -3 dB (MHz)	Type	Package	Size (mm)							
		R <sub>line</sub> (Ω)	C <sub>line</sub> (pF)	L <sub>line</sub> (nH)												
LCD display, camera, keypad	2	45	40	-	~50	145	PEMI2STD/HT		1.6 x 1.2 x 0.5							
			15	-	~125	376	PEMI2STD/HE									
		200	40	-	~40	119	PEMI2STD/WT									
	4	45	19	-	~100	300	PEMI2QFN/HG		1.45 x 1.0 x 0.48							
										15	43	18	~60	175	IP3253CZ8-4-TTL	
											50	18	~50	145	IP3254CZ8-4-TTL	
										40	18	-	~100	300	IP4252CZ8-4-TTL	
											45	-	~40	130	IP4254CZ8-4-TTL	
										100	15	-	~110	330	IP4251CZ8-4-TTL	
	200	45	-	~35	110	IP4253CZ8-4-TTL										
	6	15	50	18	~50	145	IP3254CZ12-6-TTL		2.5 x 1.35 x 0.53							
										40	43	18	~60	175	IP3253CZ12-6-TTL	
											18	-	~100	300	IP4252CZ12-6-TTL	
										100	45	-	~40	130	IP4254CZ12-6-TTL	
	200	15	-	~110	330	IP4251CZ12-6-TTL										
	7	70	25	-	~75	220	IP4337CX18/LF		1.96 x 1.61 x 0.61							
									125	25	60	~60	180	IP3337CX18/LF	2.06 x 1.66 x 0.61	
	8	15	43	18	~60	175	IP3253CZ16-8-TTL		3.3 x 1.35 x 0.53							
										40	50	18	~50	145	IP3254CZ16-8-TTL	
											18	-	~100	300	IP4252CZ16-8-TTL	
										100	45	-	~40	130	IP4254CZ16-8-TTL	
	200	15	-	~110	330	IP4251CZ16-8-TTL										
	10	70	25	-	~75	220	IP4338CX24/LF		1.96 x 2.01 x 0.61							
									125	25	60	~60	180	IP3338CX24/LF	2.11 x 2.11 x 0.61	
															1000	50
									200	50	-	~35	105	IP4041CX25/LF		

### Audio interfaces

Baseband interface	Number of protected lines	Line small-signal equivalents		Remark	Type	Package	Size (mm)
		R <sub>line</sub>	C <sub>line</sub> (pF)				
Audio	2	0.9 Ω	290	Low-ohmic speaker (<-8 Ω)	IP4047CX6/LF		1.56 x 1.01 x 0.65
		10 Ω	200	Low-ohmic speaker (>-8 Ω)	IP4048CX5/LF		0.91 x 1.28 x 0.65
		68 Ω	110	Single-ended or differential microphone	IP4049CX5/LF		
	5	2.9 kΩ, 1 kΩ / 10 Ω	-	5-channel filter interface with integrated RC-filters and biasing network for audio interfaces	IP4327CX15		1.05 x 2.36 x 0.61
	6	40 Ω / 1450 Ω / 10 Ω	50 / 20 / 200	Fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4027CX20/LF		1.91 x 2.52 x 0.65

### Battery and charger protection

Baseband interface	Number of protected lines	C <sub>line</sub> (pF)	Diode voltage	Remark	Type	Package	Size (mm)				
Battery & charger protection	1	180	Breakdown 16 V	Power diode	IP4085CX4		0.91 x 0.91 x 0.65				
							160	Breakdown 16 V	Power diode	IP4386CX4	0.76 x 0.76 x 0.61
		160	V <sub>RWM</sub> = 12 V	Power diode	PESD12VS1UJ	SOD323F (SC-90)	1.7 x 1.25 x 0.7				
						SOD323 (SC-76)					
		160	V <sub>RWM</sub> = 12 V	Power diode	PESD12VS1UA		1.7 x 1.25 x 0.95				
		480	V <sub>RWM</sub> = 5 V	Power diode	PESD5V0S1UJ	SOD323F (SC-90)	1.7 x 1.25 x 0.7				
SOD323 (SC-76)											
480	V <sub>RWM</sub> = 5 V	Power diode	PESD5V0S1UA		1.7 x 1.25 x 0.95						

### Automotive high-speed networks (AEC-Q101 compliant)

Number of protected lines	V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	I <sub>RM</sub> max @3V (μA)	ESD rating <sup>[1]</sup> max (kV)	Configuration	Type	Package	Size (mm)
4	5.5	0.6	1	8		PESD1LVDS	DFN2510-10 (SOT1165)	2.5 x 1.0 x 0.48
	5.5	0.6	1	8		PRTR5V0U4D	SOT457	2.9 x 1.5 x 1.0

<sup>[1]</sup> acc. to IEC 61000-4-2 (contact discharge)

### Automotive LIN/CAN/FlexRay (AEC-Q101 compliant)

Number of protected lines bidirectional	V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	P <sub>PP</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>r</sub> max [μA] @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)
1	15 (diode 1) 24 (diode 2)	13	17	160	23	0.05		PESD1LIN	SOD323 (SC-76)	1.7 x 1.25 x 0.95
2	24	11	17	200	23	0.05		PESD1CAN	SOT23	2.9 x 1.3 x 1.0
		25	30	230	30	0.01		PESD2CAN		
		11	17	200	23	0.05		PESD1FLEX		
		9.3	12	150	23	0.05		PESD1CAN-U	SOT323	2.0 x 1.25 x 0.95

<sup>[1]</sup> 8 / 20 μs surge pulse acc. to IEC 61000-4-5

<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

#### In the Spotlight

##### PESD1CAN-U: CAN bus protection in very small SOT323 package

- Protection for 2 CAN Bus lines
- Very small SOT323 package (2.0 x 1.25 x 0.95 mm)
- AEC-Q101 compliant
- ESD robustness of up to 23 kV (contact)
- Very good capacitance matching



### TVS diodes

### TVS diodes, 24 W / 40 W

Power (W) (10/1000 μs waveform) <sup>[1]</sup>	V <sub>RWM</sub> (V)	V <sub>BR</sub> min (V) @ I <sub>r</sub>	V <sub>BR</sub> typ (V) @ I <sub>r</sub>	V <sub>BR</sub> max (V) @ I <sub>r</sub>	I <sub>r</sub> (mA)	ESD rating <sup>[1]</sup> max (kV)	C <sub>line</sub> typ (pF)	V <sub>CL</sub> max <sup>[1]</sup> (V) @ I <sub>PP</sub>	I <sub>PP</sub> <sup>[1]</sup> (A)	I <sub>RM</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)
24	3	5.32	5.6	5.88	20	30	210	8	3	5		MMBZ5V6AL	SOT23	2.9 x 1.3 x 1.0
	3	5.89	6.2	6.51	1	30	175	8.7	2.76	0.2		MMBZ6V2AL		
	4.5	6.48	6.8	7.14	1	30	150	9.6	2.5	0.3		MMBZ6V8AL		
	6	8.65	9.1	9.56	1	30	155	14	1.7	0.1		MMBZ9V1AL		
	6.5	9.5	10	10.5	1	30	130	14.2	1.7	0.02		MMBZ10VAL		
40	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005		MMBZ12VAL	SOT23	2.9 x 1.3 x 1.0
	12	14.25	15	15.75	1	30	85	21	1.9	0.005		MMBZ15VAL		
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005		MMBZ18VAL		
	17	19	20	21	1	30	65	28	1.4	0.005		MMBZ20VAL		
	22	25.65	27	28.35	1	30	48	40	1	0.005		MMBZ27VAL		
	26	31.35	33	34.65	1	30	45	46	0.87	0.005		MMBZ33VAL		
	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005		MMBZ12VDL		
	12.8	14.3	15	15.8	1	30	85	21.2	1.9	0.005		MMBZ15VDL		
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005		MMBZ18VCL		
	17	19	20	21	1	30	65	28	1.4	0.005		MMBZ20VCL		
	22	25.65	27	28.35	1	30	48	38	1	0.005		MMBZ27VCL		
	26	31.35	33	34.65	1	30	45	46	0.87	0.005		MMBZ33VCL		

<sup>[1]</sup> 10 / 1000 μs according to IEC 61643-321 <sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

#### In the Spotlight

##### PTVSxU1UPA series: 300 W surge protection in DFN2020-3 package

- Series of 6 types from V<sub>RWM</sub> = 7.5 up to 26 V
- Peak pulse power of 300 W for 10 / 1000 μs pulse
- Small package size of 2.0 x 2.0 mm
- Very low package height of 0.62 mm typ
- For charger port protection for mobile devices




### TVS diodes, 300 W

types in **bold** represent new products

Power (W) (10/1000 μs waveform) <sup>[1]</sup>	V <sub>RWM</sub> (V)	V <sub>BR</sub> min (V) @ I <sub>r</sub>	V <sub>BR</sub> typ (V) @ I <sub>r</sub>	V <sub>BR</sub> max (V) @ I <sub>r</sub>	I <sub>r</sub> (mA)	V <sub>CL</sub> max <sup>[1]</sup> (V) @ I <sub>PP</sub>	I <sub>PP</sub> <sup>[1]</sup> (A)	I <sub>RM</sub> typ (μA) @ V <sub>RWM</sub>	I <sub>RM</sub> max (μA) @ V <sub>RWM</sub>	Type	Package	Size (mm)
300	7.5	8.33	8.77	9.21	1	12.9	23.3	0.3	50	<b>PTVS7V5U1UPA</b>	DFN2020-3 (SOT1061)	2.0 x 2.0 x 0.62
	10	11.1	11.7	12.3	1	17	17.6	0.008	2.5	<b>PTVS10VU1UPA</b>		
	12	13.3	14	14.7	1	19.9	15.1	0.005	2.5	<b>PTVS12VU1UPA</b>		
	15	16.7	17.6	18.5	1	24.4	12.3	0.001	0.1	<b>PTVS15VU1UPA</b>		
	18	20	21	22.1	1	29.2	10.3	0.001	0.1	<b>PTVS18VU1UPA</b>		
	26	28.9	30.4	31.9	1	42.1	7	0.001	0.1	<b>PTVS26VU1UPA</b>		

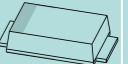
<sup>[1]</sup> 10 / 1000 μs according to IEC 61643-321

## TVS diodes, 400 W

Power (W) (10/1000 µs waveform) <sup>(1)</sup>	V <sub>RWM</sub> (V)	V <sub>BR</sub> min (V) @ I <sub>R</sub>	V <sub>BR</sub> typ (V) @ I <sub>R</sub>	V <sub>BR</sub> max (V) @ I <sub>R</sub>	I <sub>R</sub> (mA)	V <sub>CL</sub> max <sup>(1)</sup> (V) @ I <sub>PP</sub>	I <sub>PP</sub> <sup>(1)</sup> (A)	I <sub>PP</sub> typ (µA) @ V <sub>RWM</sub>	I <sub>PP</sub> max (µA) @ V <sub>RWM</sub>	Type (T <sub>J</sub> max = 150 °C)	Type (T <sub>J</sub> max = 185 °C)	Package	Size (mm)
350	3.5	5.20	5.60	6.00	10	8.0	43.8	5	600	PTVS3V3S1UR	PTVS3V3S1UTR	SOD123W 	2.6 x 1.7 x 1.0
400	5.0	6.40	6.70	7.00	10	9.2	43.5	5	400	PTVS5V0S1UR	PTVS5V0S1UTR		
	6.0	6.67	7.02	7.37	10	10.3	38.8	5	400	PTVS6V0S1UR	PTVS6V0S1UTR		
	6.5	7.22	7.60	7.98	10	11.2	35.7	5	250	PTVS6V5S1UR	PTVS6V5S1UTR		
	7.0	7.78	8.20	8.60	10	12.0	33.3	3	100	PTVS7V0S1UR	PTVS7V0S1UTR		
	7.5	8.33	8.77	9.21	1	12.9	31.0	0.2	50	PTVS7V5S1UR	PTVS7V5S1UTR		
	8.0	8.89	9.36	9.83	1	13.6	29.4	0.03	25	PTVS8V0S1UR	PTVS8V0S1UTR		
	8.5	9.44	9.92	10.40	1	14.4	27.8	0.01	10	PTVS8V5S1UR	PTVS8V5S1UTR		
	9.0	10.00	10.55	11.10	1	15.4	26.0	0.005	5	PTVS9V0S1UR	PTVS9V0S1UTR		
	10	11.10	11.70	12.30	1	17.0	23.5	0.005	2.5	PTVS10VS1UR	PTVS10VS1UTR		
	11	12.20	12.85	13.50	1	18.2	22.0	0.005	2.5	PTVS11VS1UR	PTVS11VS1UTR		
	12	13.30	14.00	14.70	1	19.9	20.1	0.005	2.5	PTVS12VS1UR	PTVS12VS1UTR		
	13	14.40	15.15	15.90	1	21.5	18.6	0.001	0.1	PTVS13VS1UR	PTVS13VS1UTR		
	14	15.60	16.40	17.20	1	23.2	17.2	0.001	0.1	PTVS14VS1UR	PTVS14VS1UTR		
	15	16.70	17.60	18.50	1	24.4	16.4	0.001	0.1	PTVS15VS1UR	PTVS15VS1UTR		
	16	17.80	18.75	19.70	1	26.0	15.4	0.001	0.1	PTVS16VS1UR	PTVS16VS1UTR		
	17	18.90	19.90	20.90	1	27.6	14.5	0.001	0.1	PTVS17VS1UR	PTVS17VS1UTR		
	18	20.00	21.00	22.10	1	29.2	13.7	0.001	0.1	PTVS18VS1UR	PTVS18VS1UTR		
	20	22.20	23.35	24.50	1	32.4	12.3	0.001	0.1	PTVS20VS1UR	PTVS20VS1UTR		
	22	24.40	25.60	26.90	1	35.5	11.3	0.001	0.1	PTVS22VS1UR	PTVS22VS1UTR		
	24	26.70	28.10	29.50	1	38.9	10.3	0.001	0.1	PTVS24VS1UR	PTVS24VS1UTR		
	26	28.90	30.40	31.90	1	42.1	9.5	0.001	0.1	PTVS26VS1UR	PTVS26VS1UTR		
	28	31.10	32.80	34.40	1	45.4	8.8	0.001	0.1	PTVS28VS1UR	PTVS28VS1UTR		
	30	33.30	35.10	36.80	1	48.4	8.3	0.001	0.1	PTVS30VS1UR	PTVS30VS1UTR		
	33	36.70	38.70	40.60	1	53.3	7.5	0.001	0.1	PTVS33VS1UR	PTVS33VS1UTR		
	36	40.00	42.10	44.20	1	58.1	6.9	0.001	0.1	PTVS36VS1UR	PTVS36VS1UTR		
	40	44.40	46.80	49.10	1	64.5	6.2	0.001	0.1	PTVS40VS1UR	PTVS40VS1UTR		
	43	47.80	50.30	52.80	1	69.4	5.8	0.001	0.1	PTVS43VS1UR	PTVS43VS1UTR		
	45	50.00	52.65	55.30	1	72.7	5.5	0.001	0.1	PTVS45VS1UR	PTVS45VS1UTR		
	48	53.30	56.10	58.90	1	77.4	5.2	0.001	0.1	PTVS48VS1UR	PTVS48VS1UTR		
	51	56.70	59.70	62.70	1	82.4	4.9	0.001	0.1	PTVS51VS1UR	PTVS51VS1UTR		
	54	60.00	63.15	66.30	1	87.1	4.6	0.001	0.1	PTVS54VS1UR	PTVS54VS1UTR		
	58	64.40	67.80	71.20	1	93.6	4.3	0.001	0.1	PTVS58VS1UR	PTVS58VS1UTR		
60	66.70	70.20	73.70	1	96.8	4.1	0.001	0.1	PTVS60VS1UR	PTVS60VS1UTR			
64	71.10	74.85	78.60	1	103.0	3.9	0.001	0.1	PTVS64VS1UR	PTVS64VS1UTR			

<sup>(1)</sup> 10 / 1000 µs according to IEC 61643-321

## TVS diodes, 600 W

Power (W) (10/1000 µs waveform) <sup>(1)</sup>	V <sub>RWM</sub> (V)	V <sub>BR</sub> min (V) @ I <sub>R</sub>	V <sub>BR</sub> typ (V) @ I <sub>R</sub>	V <sub>BR</sub> max (V) @ I <sub>R</sub>	I <sub>R</sub> (mA)	V <sub>CL</sub> max <sup>(1)</sup> (V) @ I <sub>PP</sub>	I <sub>PP</sub> <sup>(1)</sup> (A)	I <sub>PP</sub> typ (µA) @ V <sub>RWM</sub>	I <sub>PP</sub> max (µA) @ V <sub>RWM</sub>	Type (T <sub>J</sub> max = 150 °C)	Type (T <sub>J</sub> max = 185 °C)	Package	Size (mm)
600	3.5	5.20	5.60	6.00	10	8	75	5	600	PTVS3V3P1UP	PTVS3V3P1UTP	SOD128 	3.8 x 2.6 x 1.0
	5	6.40	6.70	7.00	10	9.2	65.2	5	400	PTVS5V0P1UP	PTVS5V0P1UTP		
	6	6.67	7.02	7.37	10	10.3	58.3	5	400	PTVS6V0P1UP	PTVS6V0P1UTP		
	6.5	7.22	7.60	7.98	10	11.2	53.6	5	250	PTVS6V5P1UP	PTVS6V5P1UTP		
	7	7.78	8.20	8.60	10	12	50	3	100	PTVS7V0P1UP	PTVS7V0P1UTP		
	7.5	8.33	8.77	9.21	1	12.9	46.5	0.2	50	PTVS7V5P1UP	PTVS7V5P1UTP		
	8	8.89	9.36	9.83	1	13.6	44.1	0.03	25	PTVS8V0P1UP	PTVS8V0P1UTP		
	8.5	9.44	9.92	10.40	1	14.4	41.7	0.01	10	PTVS8V5P1UP	PTVS8V5P1UTP		
	9	10.00	10.55	11.10	1	15.4	39	0.005	5	PTVS9V0P1UP	PTVS9V0P1UTP		
	10	11.10	11.70	12.30	1	17	35.3	0.005	2.5	PTVS10VP1UP	PTVS10VP1UTP		
	11	12.20	12.85	13.50	1	18.2	33	0.005	2.5	PTVS11VP1UP	PTVS11VP1UTP		
	12	13.30	14.00	14.70	1	19.9	30.2	0.005	2.5	PTVS12VP1UP	PTVS12VP1UTP		
	13	14.40	15.15	15.90	1	21.5	27.9	0.001	0.1	PTVS13VP1UP	PTVS13VP1UTP		
	14	15.60	16.40	17.20	1	23.2	25.9	0.001	0.1	PTVS14VP1UP	PTVS14VP1UTP		
	15	16.70	17.60	18.50	1	24.4	24.6	0.001	0.1	PTVS15VP1UP	PTVS15VP1UTP		
	16	17.80	18.75	19.70	1	26	23.1	0.001	0.1	PTVS16VP1UP	PTVS16VP1UTP		
	17	18.90	19.90	20.90	1	27.6	21.7	0.001	0.1	PTVS17VP1UP	PTVS17VP1UTP		
	18	20.00	21.00	22.10	1	29.2	20.5	0.001	0.1	PTVS18VP1UP	PTVS18VP1UTP		
	20	22.20	23.35	24.50	1	32.4	18.5	0.001	0.1	PTVS20VP1UP	PTVS20VP1UTP		
	22	24.40	25.60	26.90	1	35.5	16.9	0.001	0.1	PTVS22VP1UP	PTVS22VP1UTP		
	24	26.70	28.10	29.50	1	38.9	15.4	0.001	0.1	PTVS24VP1UP	PTVS24VP1UTP		
	26	28.90	30.40	31.90	1	42.1	14.2	0.001	0.1	PTVS26VP1UP	PTVS26VP1UTP		
	28	31.10	32.80	34.40	1	45.4	13.2	0.001	0.1	PTVS28VP1UP	PTVS28VP1UTP		
	30	33.30	35.10	36.80	1	48.4	12.4	0.001	0.1	PTVS30VP1UP	PTVS30VP1UTP		
	33	36.70	38.70	40.60	1	53.3	11.3	0.001	0.1	PTVS33VP1UP	PTVS33VP1UTP		
	36	40.00	42.10	44.20	1	58.1	10.3	0.001	0.1	PTVS36VP1UP	PTVS36VP1UTP		
	40	44.40	46.80	49.10	1	64.5	9.3	0.001	0.1	PTVS40VP1UP	PTVS40VP1UTP		
	43	47.80	50.30	52.80	1	69.4	8.6	0.001	0.1	PTVS43VP1UP	PTVS43VP1UTP		
	45	50.00	52.65	55.30	1	72.7	8.3	0.001	0.1	PTVS45VP1UP	PTVS45VP1UTP		
	48	53.30	56.10	58.90	1	77.4	7.8	0.001	0.1	PTVS48VP1UP	PTVS48VP1UTP		
	51	56.70	59.70	62.70	1	82.4	7.3	0.001	0.1	PTVS51VP1UP	PTVS51VP1UTP		
	54	60.00	63.15	66.30	1	87.1	6.9	0.001	0.1	PTVS54VP1UP	PTVS54VP1UTP		
	58	64.40	67.80	71.20	1	93.6	6.4	0.001	0.1	PTVS58VP1UP	PTVS58VP1UTP		
60	66.70	70.20	73.70	1	96.8	6.2	0.001	0.1	PTVS60VP1UP	PTVS60VP1UTP			
64	71.10	74.85	78.60	1	103	5.8	0.001	0.1	PTVS64VP1UP	PTVS64VP1UTP			

<sup>(1)</sup> 10 / 1000 µs according to IEC 61643-321

## In the Spotlight

## High temperature TVS series in FlatPower package

Available in 400 W (PTVSxS1UTR) and 600 W (PTVSxP1UTP) power classes with 35 devices each

Very high maximal junction temperature of 185 °C

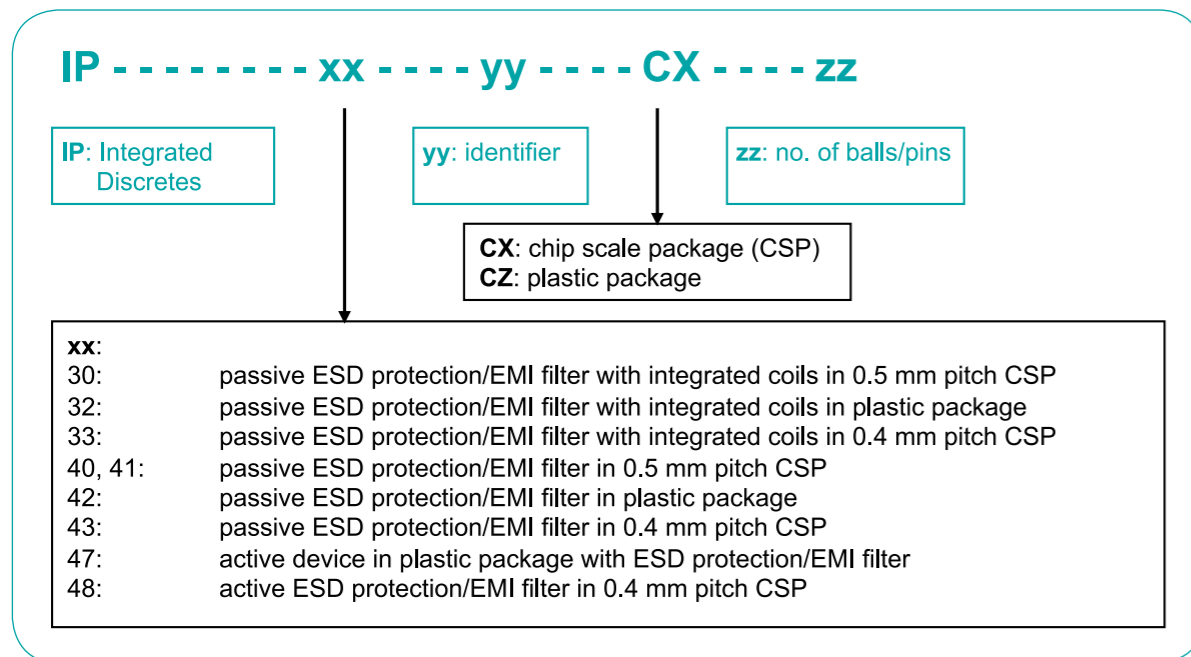
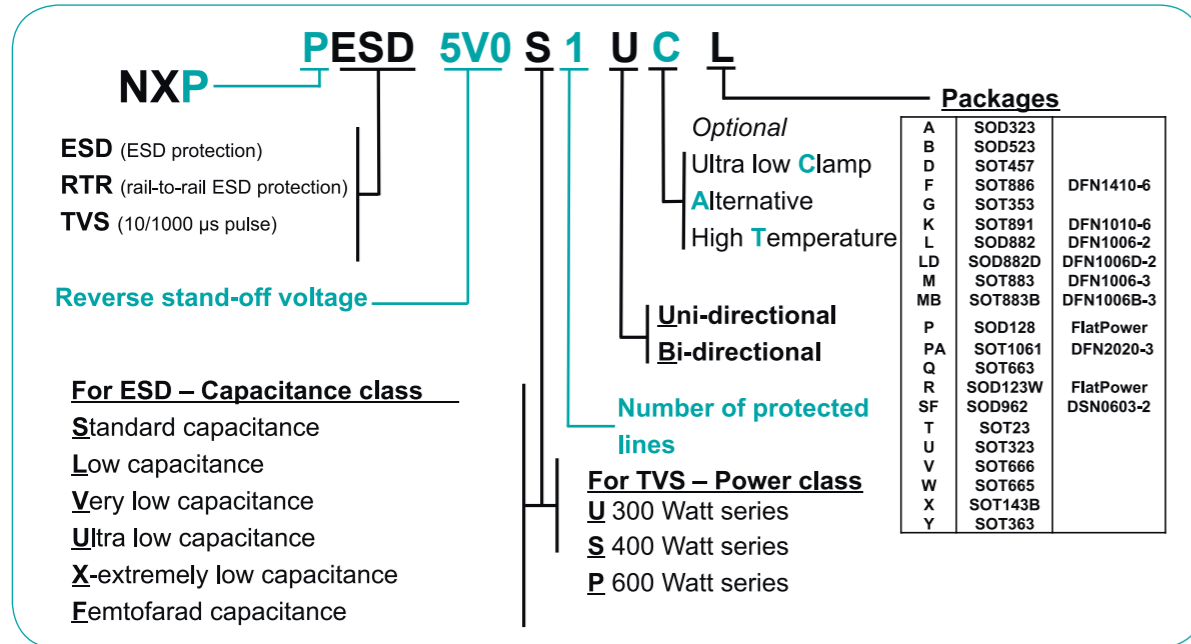
Reverse standoff voltages from 3.3 to 64 V

Low height, high performance - save board space by replacing SMA &amp; SMB packages with low profile SOD123W and SOD128 packages

AEC-Q101 qualified



## Protection and signal conditioning nomenclature



## Diodes

### Schottky barrier diodes and rectifiers

38

Medium power low VF Schottky rectifiers single $\geq 200$ mA	38
Medium power low VF Schottky rectifiers dual $\geq 200$ mA	42
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General purpose Schottky diodes $\leq 250$ mA	44
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### Zener diodes

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### Switching diodes

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General purpose high speed switching diodes $\leq 100$ V	48
General purpose switching diodes $\geq 100$ V	50
PN-rectifier	51
Controlled avalanche switching diodes	52
Low leakage current switching diodes	52

### Power diodes

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# NEW low $V_F$ Schottky rectifiers in our superflat second generation leadless DFN package

A new portfolio of low  $V_F$  MEGA Schottky diodes with outstanding performance in an ultra-small and flat package of 0.37 mm height. The package has tin plated, 100% solderable side pads for easy visual inspection after soldering.



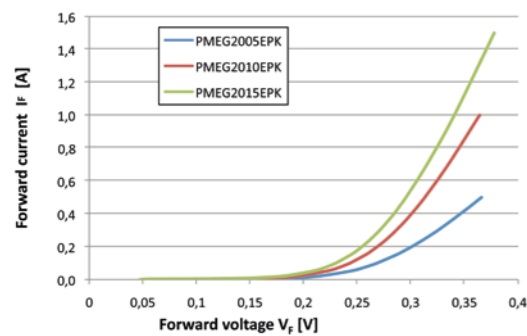
### Features and benefits

- ▶ 33% lower  $V_F$  on same footprint
- ▶ Low profile of 0.37 mm height
- ▶ Solderable side pads
- ▶ Visual solder inspection

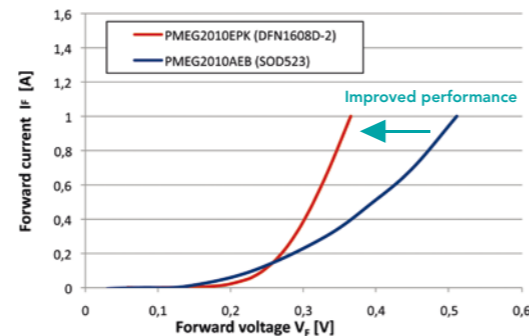
### Applications

- ▶ Handheld equipment
- ▶ Backlighting for smart phone
- ▶ Battery charging
- ▶ Shrunk PCB design

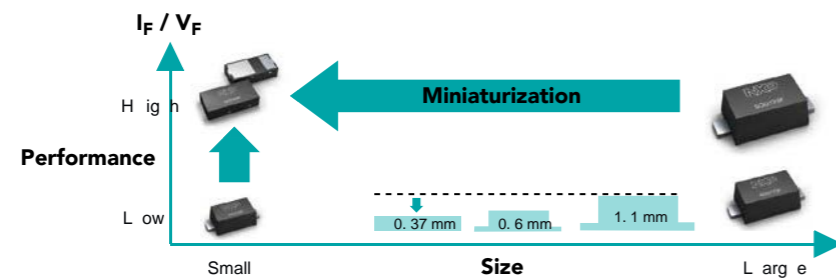
### Differentiated portfolio



### with best performance



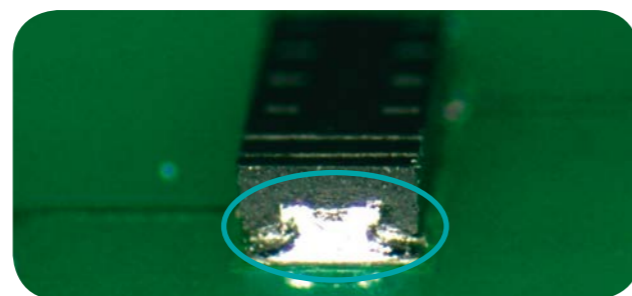
### DFN1608D-2 combines improved performance with reduced size



### Portfolio of 0.5 A – 1.5 A with low $V_F$ and low $I_R$ types

Type	Main parameters		
	Optimization	$V_{Rmax}$ (V)	$I_{F(av)max}$ (A)
PMEG2005EPK	low $V_F$	20	0.5
PMEG2010EPK	low $V_F$	20	1.0
PMEG2015EPK	low $V_F$	20	1.5
PMEG2020EPK	low $V_F$	20	2.0
PMEG4005EPK	low $I_R$	40	0.5
PMEG4010EPK	low $I_R$	40	1.0
PMEG4015EPK	low $I_R$	40	1.5
PMEG4020EPK	low $I_R$	40	2.0

### Soldered products onto pcb

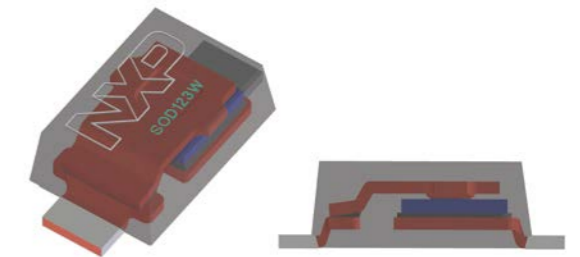


# NXP's medium power solution for shrinking designs FlatPower packages: CFP15, SOD128 and SOD123W



### Small SMD packages in three different versions: SOD123W, SOD128 and CFP15

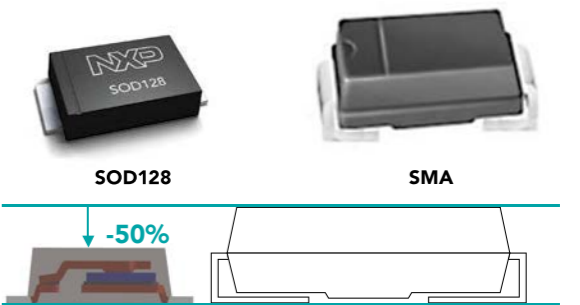
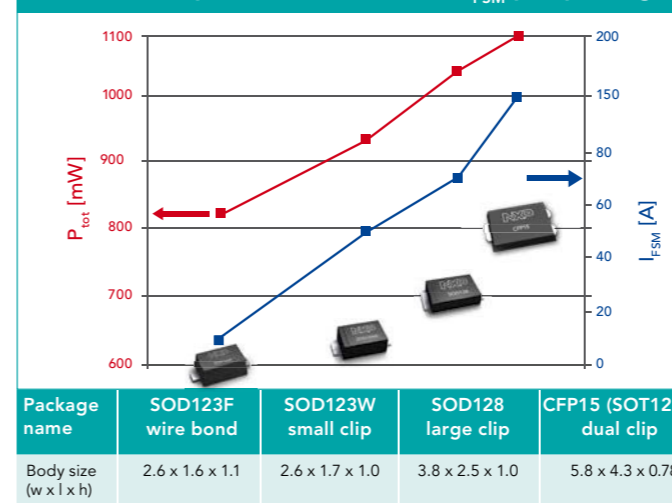
- ▶ Flat geometry, only 1 mm height
- ▶ Halogene free mold compound
- ▶ AEC-Q101 qualified



### Robust design inside SOD123W, SOD128 and CFP15

- ▶ High surge capability due to clip bond technology
- ▶ Excellent electro-thermal behaviour

### Power dissipation (@ 1 cm<sup>2</sup>), and $I_{FSM}$ per package



### Take advantage of 50% height reduction

### Schottky diodes

- Enabling superior high  $P_{tot}$  and  $I_{FSM}$
- ▶ Huge portfolio of Schottky diodes available
- ▶ 20 V – 60 V, 1 A – 10 A, very low  $V_F$
- ▶ Junction temperature up to 175 °C
















### TVS diodes

- Can replace SMA and SMB products
- ▶ Complete TVS series available
- ▶ 3.5 V – 64 V, 400 W and 600 W
- ▶ Junction temperature up to 185 °C

Large supplier of more than 170 products in FlatPower packages for a lot of medium power rectification and surge protection applications.













Medium power low  $V_F$  Schottky rectifiers single  $\geq 200$  mA – Part I

types in **bold** represent new products

$I_F$ max (A)	$V_R$ max (V)	$V_F$ max (mV) @ $I_F$ max	$I_R$ max (mA) @ $V_R$ max	Package	SOD128	SOT457 (SC-74)	SOT23	SOD123W	SOD123F		DFN2020-3 (SOT1061)	SOT323 (SC-70)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	DFN1608D-2 (SOD1608)	SOD523 (SC-79)	DFN1006-2 (SOD882)	DFN1006D-2 (SOD882D)	DSN0603-2 (SOD962)			
																							
					Size (mm)	3.8 x 2.5 x 1.0	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.7 x 1.0	2.6 x 1.6 x 1.1		2.0 x 2.0 x 0.62	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.37	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.48	1.0 x 0.6 x 0.37	0.6 x 0.3 x 0.3		
					$P_{tot}$ (mW) @ 1 cm <sup>2</sup>	1050	540	420	950	830		960	400	830	570	570	780	500	565	660	200		
					Optimization																		
0.2	20	420	0.045	low $V_F$																	PMEG2002AESF		
		490	0.0035	low $I_R$																		<b>PMEG2002ESF</b>	
	30	480	0.05	low $V_F$									PMEG3002EJ					PMEG3002AEB	PMEG3002AEL	PMEG3002AELD			
		480	0.1	low $V_F$																			<b>PMEG3002AESF</b>
	40	550	0.01	low $I_R$																			<b>PMEG3002ESF</b>
		530	0.0095	low $V_F$										PMEG4002EJ					PMEG4002EB	PMEG4002EL	PMEG4002ELD		<b>PMEG4002AESF</b>
60	600	0.01	low $I_R$																		<b>PMEG4002ESF</b>		
0.5	20	390	0.2	low $V_F$			PMEG2005ET		PMEG2005EH				PMEG2005EJ	PMEG2005AEA	PMEG2005AEV							PMEG2005BELD	
		410	0.3	low $V_F$													PMEG2005EPK						
		440	1.5	low $V_F$															PMEG2005AEL	PMEG2005AELD			
		480	0.03	low $I_R$														PMEG2005EB					
		500	0.03	low $I_R$															PMEG2005EL	PMEG2005ELD			
		550	0.045	low $V_F$																			<b>PMEG2005AESF</b>
	30	600	0.0035	low $I_R$																			<b>PMEG2005ESF</b>
		430	0.15	low $V_F$			PMEG3005ET		PMEG3005EH				PMEG3005EJ	PMEG3005AEA	PMEG3005AEV								
	40	500	0.5	low $V_F$															PMEG3005EB	PMEG3005EL	PMEG3005ELD		
		630	0.1	low $V_F$																			<b>PMEG3005AESF</b>
		470	0.1	low $V_F$			PMEG4005ET		PMEG4005EH				PMEG4005EJ	PMEG4005AEA	PMEG4005AEV								
		550	1.1	low $V_F$			BAT720						1P570SB20										
	590	0.01	low $I_R$																			PMEG4005EPK	
1.0	20	340	1	low $V_F$				PMEG2010ER															
		375	1.9	low $V_F$							PMEG2010EPA												
		415	0.6	low $V_F$																PMEG2010EPK			
		430	0.2	low $V_F$			PMEG2010AET		PMEG2010AEH														
		450	0.05	low $I_R$					PMEG2010BER														
		490	0.2	low $V_F$																			PMEG2010BELD
	30	500	0.2	low $V_F$			PMEG2010ET		PMEG2010EH				PMEG2010EJ	PMEG2010BEA	PMEG2010BEV								
		550	0.07	low $I_R$									PMEG2010AEJ	PMEG2010EA BAT760	PMEG2010EV BAT960								
		620	1.5	low $V_F$																PMEG2010AEB			
		450	1	low $V_F$				1P574SB23															
		360	1.5	low $V_F$		PMEG3010EP				PMEG3010ER													
		450	0.05	low $I_R$		PMEG3010BEP				PMEG3010BER													
	40	520	0.1	low $I_R$									PMEG3010CEJ										
		560	0.15	low $V_F$				PMEG3010ET		PMEG3010EH			PMEG3010EJ	PMEG3010BEA	PMEG3010BEV								
		680	0.5	low $V_F$																PMEG3010EB			
		490	0.05	low $V_F$		PMEG4010EP				PMEG4010ER													
	60	490	0.05	low $V_F$		PMEG4010ETP			PMEG4010ETR														
		570	0.05	low $I_R$										PMEG4010CEJ									
600		0.02	low $I_R$																PMEG4010EPK				
640		0.05	low $V_F$				PMEG4010ET		PMEG4010EH				PMEG4010EJ	PMEG4010BEA	PMEG4010BEV								
100	530	0.06	low $V_F$		PMEG6010EP			PMEG6010ER															
	530	0.06	low $V_F$					PMEG6010ETR															
	650	0.35	low $V_F$				PMEG6010AED																
	660	0.05	low $I_R$										PMEG6010CEJ										
	660	0.0003	low $I_R$					PMEG6010ELR															
	770	0.5	low $I_R$					PMEG10010EVR															

Medium power low  $V_F$  Schottky rectifiers single  $\geq 200$  mA – Part 2

types in **bold** represent new products

$I_F$ max (A)	$V_F$ max (V)	$V_F$ max (mV) @ $I_F$ max	$I_R$ max (mA) @ $V_R$ max	Package	CFP15 (SOT1289)	SOD128	SOT457 (SC-74)	SOT23	SOD123W		SOD123F	DFN2020-3 (SOT1061)	SOT323 (SC-70)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	DFN1608D-2 (SOD1608)			
																				
					Size (mm)	5.8 x 4.3 x 0.78	3.8 x 2.5 x 1.0	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.7 x 1.0		2.6 x 1.6 x 1.1	2.0 x 2.0 x 0.62	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.37		
					$P_{tot}$ (mW) @ 1 cm <sup>2</sup>	1200	1050	540	420	950		830	960	400	830	570	570	780		
					Optimization															
1.5	20	420	0.9	low $V_F$														PMEG2015EPK		
		660	0.2	low $I_R$								PMEG2015EH			PMEG2015EJ	PMEG2015EA	PMEG2015EV			
	30	500	1	low $V_F$							PMEG3015EH			PMEG3015EJ		PMEG3015EV				
2.0	10	460	3	low $V_F$														PMEG4015EPK		
		20	420	1.9	low $V_F$															
			450	0.9	low $V_F$								PMEG2020EPA						PMEG2020EPK	
	30	20	525	0.2	low $V_F$										PMEG2020EJ	PMEG2020AEA				
			360	3	low $V_F$		PMEG3020EP													
		420	1.5	low $V_F$		PMEG3020CEP			PMEG3020ER											
		450	0.1	low $I_R$		PMEG3020BEP														
		470	2.5	low $V_F$										PMEG3020EPA						
		520	0.05	low $I_R$		PMEG3020DEP			PMEG3020BER											
	40	30	620	1	low $V_F$										PMEG3020EH					
			490	0.1	low $V_F$		PMEG4020EP			PMEG4020ER										
		40	490	0.1	low $V_F$		PMEG4020ETP			PMEG4020ETR										
			535	0.1	low $V_F$											PMEG4020EPA				
		60	40	660	0.03	low $I_R$														
				530	0.2	low $V_F$		PMEG6020EP			PMEG6020ER									
530	0.2		low $V_F$		PMEG6020ETP			PMEG6020ETR												
575	0.25		low $V_F$											PMEG6020EPA						
60	60	700	0.001	low $I_R$		<b>PMEG6020EVP</b>														
		760	0.0003	low $I_R$					<b>PMEG6020ELR</b>											
	100	770	1	low $V_F$					<b>PMEG10020EVR</b>											
3.0	10	530	3	low $V_F$																
	30	360	5	low $V_F$		PMEG3030EP														
		450	0.15	low $I_R$		PMEG3030BEP														
	40	490	0.2	low $V_F$		PMEG4030EP														
		490	0.2	low $V_F$		PMEG4030ETP														
	60	540	0.1	low $I_R$					PMEG4030ER											
		530	0.2	low $V_F$		PMEG6030EP														
		530	0.2	low $V_F$		PMEG6030ETP														
100	700	0.0015	low $I_R$		<b>PMEG6030EVP</b>															
5.0	30	770	1.5	low $I_R$		<b>PMEG10030EVP</b>														
		360	8	low $V_F$		PMEG3050EP														
	450	0.25	low $I_R$		PMEG3050BEP															
	40	490	0.3	low $V_F$		PMEG4050EP														
10	45	490	3	low $V_F$	<b>PMEG45U10EPD</b>															
		580	2	low $I_R$	<b>PMEG45A10EPD</b>															

In the Spotlight

**New low  $V_F$  Schottky rectifier portfolio in DFN1608D-2 (SOD1608)**

Leadless ultra small and flat SMD package (1.6 x 0.8 x 0.37 mm)

4 low  $V_F$  devices with  $V_R = 20$  V and  $I_F$  up to 2 A

4 low  $I_R$  devices with  $V_R = 40$  V and  $I_F$  up to 2 A

Solderable side pads for visual soldering inspection

AEC-Q101 qualified



In the Spotlight

**New CFP15 (SOT1289) FlatPower package for Schottky rectifier**

Small body size of 5.8 x 4.3 mm<sup>2</sup> for shrinked design

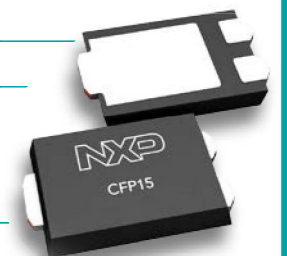
Benchmark low package height of 0.78 mm

High surge current capability due to clip bond technology

Footprint compatible to TO-277A (SMPC) and PowerDi5

First Schottky rectifier **PMEG45A10EPD** and **PMEG45U10EPD**

Both 10 A and 45 V, 'A' with low  $I_R$ , 'U' with low  $V_F$

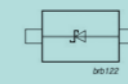


### Medium power low $V_F$ Schottky rectifiers dual $\geq 200$ mA

$I_F$ max (A)	$V_R$ max (V)	$V_F$ max (mV) @ $I_F$ max	$I_R$ max (mA) @ $V_R$ max	Optimization	Package	SOT223 (SC-73)	SOT23	DFN2020-3 (SOT1061)	SOT666
					Size (mm)	6.5 x 3.5 x 1.65	2.9 x 1.3 x 1.0	2.0 x 2.0 x 0.62	1.6 x 1.2 x 0.55
					$P_{tot}$ (mW)	1500	250	1000	300
0.2	30	480	0.03	low $V_F$	dual isolated				PMEG3002TV
	60	600	0.1	low $V_F$					PMEG6002TV
0.5	20	390	0.2	low $V_F$	dual c.c.		PMEG2005CT		
	30	430	0.15	low $V_F$			PMEG3005CT		
	40	470	0.1	low $V_F$			PMEG4005CT		
1.0	25	450	1.0	low $V_F$	dual series	BAT120S			
				low $V_F$	dual c.c.	BAT120C			
				low $V_F$	dual c.a.	BAT120A			
	40	500	0.05	low $V_F$	dual c.c.			PMEG4010CPA	
				low $V_F$	dual c.c.			PMEG6010CPA	
	60	650	0.35	low $V_F$	dual series	BAT160S			
				low $V_F$	dual c.c.	BAT160C			
				low $V_F$	dual c.a.	BAT160A			
				low $V_F$	dual c.c.			PMEG2020CPA	
				low $V_F$	dual c.c.			PMEG3020CPA	
2.0	30	440	2.0	low $V_F$					

### DSN (CSP) low $V_F$ Schottky rectifiers $\geq 200$ mA


types in **bold** represent new products

$I_F$ (A)	$V_R$ (V)	$V_F$ max (at) $I_F$ max (mA)	$I_R$ max (at) $V_R$ max (mA)	Optimization	Package	DSN0603-2
					Size (mm)	0.6 x 0.3 x 0.3
					$P_{tot}$ (mW)	525
0.2	20	420	0.045	low $V_F$		<b>PMEG2002AESF</b>
						<b>PMEG2002ESF</b>
						<b>PMEG3002AESF</b>
						<b>PMEG3002ESF</b>
						<b>PMEG4002AESF</b>
						<b>PMEG4002ESF</b>
						<b>PMEG2005AESF</b>
						<b>PMEG2005ESF</b>
						<b>PMEG3005AESF</b>
						<b>PMEG3005ESF</b>

**In the Spotlight**

**Ultra small Schottky rectifier in DSN0603-2 (SOD962) csp technology**

- PMEG2002ESF and PMEG2002AESF are the first types of a portfolio
- 20 V, 200 mA, low  $I_R$  and low  $V_F$  types
- Benchmark low  $V_F$  characteristic
- High surge current capability, due to csp technology (no wire inside)
- Portfolio will be expanded to 30 V, 40 V and 0.5 A
- Ultra small packages size, 0.6 x 0.3 x 0.3 mm<sup>3</sup>



### Nomenclature of low $V_F$ (MEGA) Schottky rectifiers

**PMEG 40 10 A E T P**

NXP MEGA Schottky rectifier

Max. reverse voltage in V  
e.g. 40 = 40 V

Cont. forward current in A  
e.g. 10 = 1.0 A

Variant number (optional)

Package indicator:

- A = SOD323
- B = SOD523
- D = SOT457
- H = SOD123
- J = SOD323F
- L = DFN1008-2 (SOD882)
- LD = DFN1008D-2 (SOD882D)
- P = SOD128
- PA = DFN2020-3 (SOT1061)
- PD = CFP15 (SOT1289)
- PK = DFN1608D-2 (SOD1608)
- R = SOD123W
- SF = DSN0603-2 (SOD962)
- T = SOT23
- V = SOT666

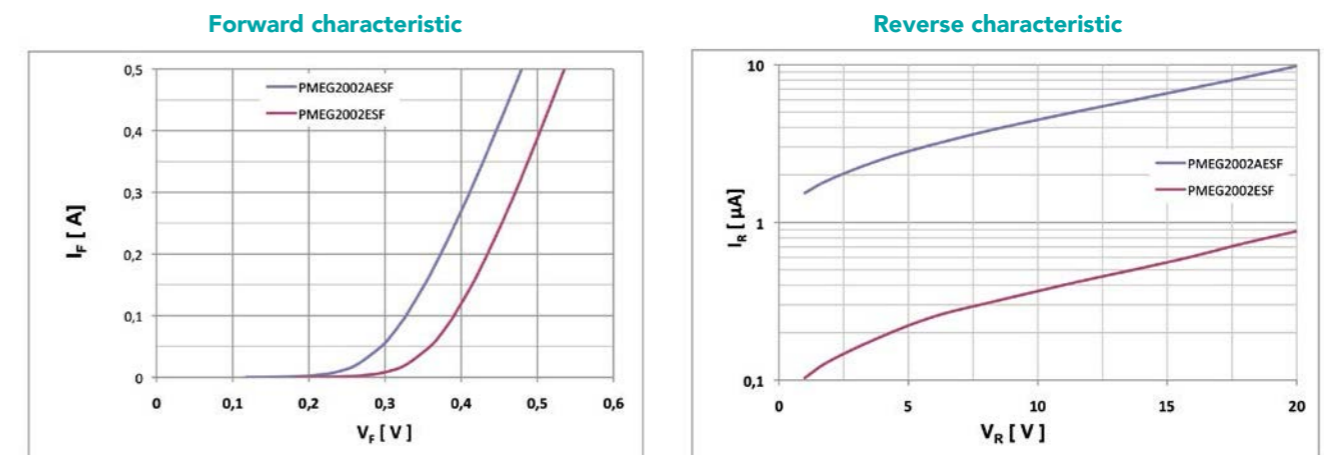
Variant number (optional):

- A = CA
- C = CC
- E = single
- P = double, parallel
- R = tripple, antiparallel
- S = series
- V = tripple
- W = CA and CC
- X = 2 x series
- Y = 2 x CC
- Z = 2 x CA

Internal configuration:

- A = CA
- C = CC
- E = single
- P = double, parallel
- R = tripple, antiparallel
- S = series
- V = tripple
- W = CA and CC
- X = 2 x series
- Y = 2 x CC
- Z = 2 x CA

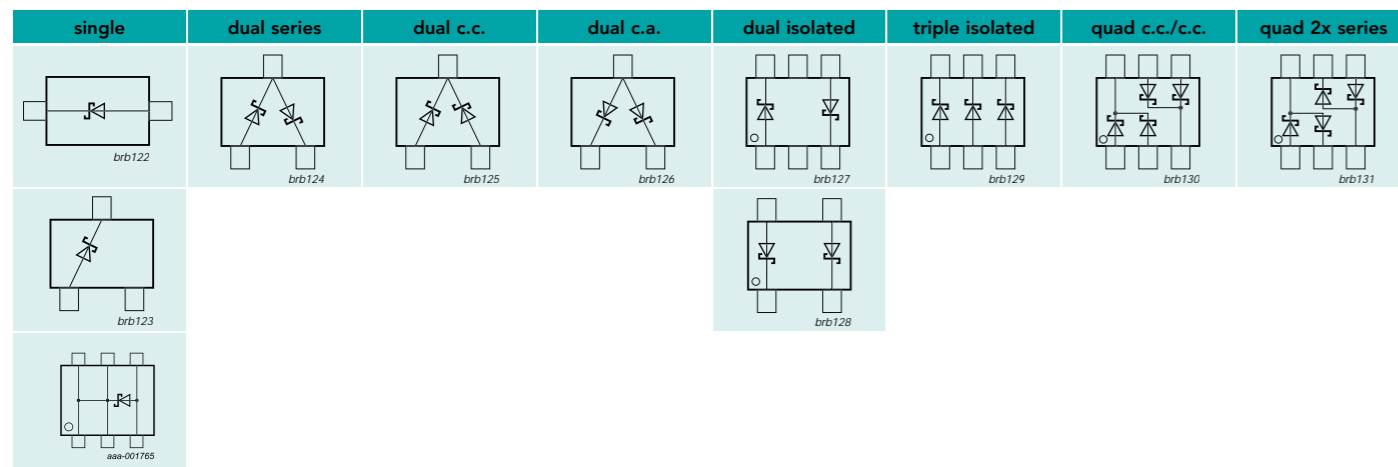
### Parameter survey, typical data: $V_R$ : 20 V, $I_F$ : 0.2 A in DSN0603 package





General purpose Schottky diodes ≤250 mA

I <sub>F</sub> max (mA)	V <sub>R</sub> max (V)	V <sub>F</sub> max (mV)	@ I <sub>F</sub> (mA)	I <sub>R</sub> max (μA)	@ V <sub>R</sub> (V)	Package	SOD80C (MiniMelf)	SOD68 (DO-34)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	SOT416 (SC-75)	SOD523 (SC-79)	DFN1006-2 (SOD882)/ DFN1006-3 (SOT883)						
							Size (mm)	3.5 x 1.5 x 1.5	3.04 x 1.6 x 0.55	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.48					
70	70	750	10	0.1	50	single			BAS70		BAS70H	BAS70W			1PS76SB70				1PS79SB70	BAS70L					
						dual series			BAS70-04			BAS70-04W													
						dual c.c.			BAS70-05			BAS70-05W													
						dual c.a.			BAS70-06			BAS70-06W													
						dual isolated							BAS70-07								BAS70-07V				
						triple isolated															BAS70WV				
120	40	500	10	1	30	quad 2x series																			
						single																			
						single			BAS40		BAS40H	BAS40W							RB751V40				RB751S40	RB751CS40	
						dual series			BAS40-04			BAS40-04W							1PS76SB40				1PS79SB40	BAS40L	
						dual c.c.			BAS40-05			BAS40-05W													
						dual c.a.			BAS40-06			BAS40-06W													
200	30	300	10	30	10	quad c.c./c.c.																			
						quad 2x series																			
						single																		1PS79SB31	
						single			BAT754																
		dual series			BAT754S																				
		dual c.c.			BAT754C																				
		dual c.a.			BAT754A																				
		triple isolated																							
	40	400	10	2	25	single	BAS85	BAT85	BAT54		BAT54H	BAT54W			BAT54J	1PS76SB10			BAT54T	1PS79SB10	BAT54L				
						dual series			BAT54S			BAT54SW													
						dual c.c.			BAT54C			BAT54CW													
						dual c.a.			BAT54A			BAT54AW													
		dual isolated							BAT74																
		triple isolated																							
		quad c.c./c.c.																							
		quad 2x series																							
250	100	850	250	4	75	single																			
						single																			
						single																			
						single																			
						single																			
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						single																			
						single																			
						single																			
						single																			



Low capacitance Schottky diodes

I <sub>F</sub> max (mA)	V <sub>R</sub> max (V)	V <sub>F</sub> max (mV)	@ I <sub>F</sub> (mA)	C <sub>d</sub> max (pF)	@ V <sub>R</sub> = 0 V	Package	SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOT666	SOD523 (SC-79)	DFN1006-2 (SOD882)	
							Size (mm)	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.48
30	4	450	1	1	single	BAT17				1PS76SB17		1PS79SB17		
					triple isolated							1PS66SB17		
					dual series	PMBD353 PMBD354 <sup>1)</sup>								
					single		1PS70SB82							1PS10SB82
					triple isolated			1PS88SB82				1PS66SB82		
					dual series				1PS70SB84					
15	340	340	1	1	dual c.c.				1PS70SB85					
					dual c.a.				1PS70SB86					
					dual c.c.									
					dual c.a.									

<sup>1)</sup> Diodes have matched capacitance

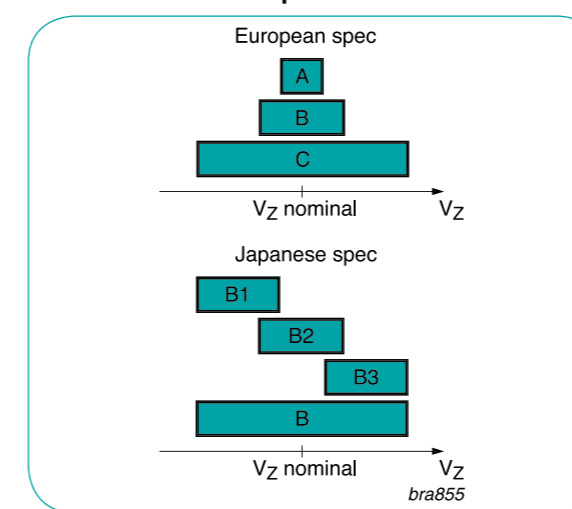
## General purpose Zener diodes

$I_f$ max (mA)	$P_{ZSM}$ (W)	$V_Z$ nom (V)	$V_Z$ tolerance	Note	Configuration	Series	Package	Size (mm)	$P_{tot}$ (mW)
500	-	3.3~24	C	Eur	single	1N47xxA series	SOD66 (DO-41)	4.8 x 2.6 x 0.81	1000
	60	3.6~75				BZX85 series	SOD66 (DO-41)		
250	-	2.1~36	about 2%	special	single	NZX series	SOD27 (DO-35)	4.25 x 1.85 x 0.56	400
	40	2.4~75	B, C	Eur		BZX79 series	SOD27 (DO-35)		
400	40	2.4~75	C	Eur	single	BZX90 series	SOT223 (SC-73)	6.5 x 3.5 x 1.65	1500
250	40	2.4~75	C	Eur	single	BZX49 series	SOT89 (SC-62)	4.5 x 2.5 x 1.5	1000
250	40	2.4~75	B, C	Eur	single	BZX55 series	SOD80C (MiniMelf)	3.5 x 1.5 x 1.5	400
200	40	2.4~75	B, C	Eur	dual c.a.	BZB84 series	SOT23	2.9 x 1.3 x 1.0	250
			A, B, C		BZX84 series				
250	30	5~6.8	0.2 V	Ave	single	PLVA600A series	SOT23	2.9 x 1.3 x 1.0	250
			0.2 V		dual c.a.	PLVA2600A series			
250	-	3.0~30	about 2.5%	special	single	NZH series	SOD123F	2.6 x 1.6 x 1.1	830
	40	2.4~75	B, C	Eur		BZT52H series	SOD123F		
200	40	2.7~24	B2	Jap	dual isolated	PZUxDB2 series	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	300
200	40	2.4~15	C	Eur	dual c.a.	BZB784 series	SOT323 (SC-70)	2.0 x 1.25 x 0.95	350
200	30	100	C	Eur	back-to-back	BZB100A	SOD323 (SC-76)	1.7 x 1.25 x 0.95	300
			B2			PDZ-B series			
250	40	2.4~75	B, C	Eur	single	BZX384 series	SOD323 (SC-76)	1.7 x 1.25 x 0.95	300
200	40	2.4~36	B, B1, B2, B3	Jap	PZUxBA series	SOD323 (SC-76)			
200	60	100	C	Eur	single	BZX100A	SOD323F (SC-90)	1.7 x 1.25 x 0.7	550
200	40	2.4~36	B, B1, B2, B3	Jap	PZUxB series	SOD323F (SC-90)			
250	40	2.4~75	B, C	Eur	single	BZX84J series	SOD323F (SC-90)	1.7 x 1.25 x 0.7	550
200	40	2.4~15	C	Eur	dual c.a.	BZB984 series	SOT663		
200	40	2.4~75	B, C	Eur	single	BZX585 series	SOD523 (SC-79)	1.2 x 0.8 x 0.6	300
			B, B2			BZX884 series	DFN1006-2 (SOD882)		
200	40	2.4~75	B, C	Eur	single	BZX884 series	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.48	250
		2.4~36	B, B2			Jap			
250	40	2.4~30	B	Eur	single	TDZxJ series	SOD323F	1.7 x 1.25 x 0.7	500

Notes:  
 Jap: B selection: app. 5%  $V_Z$  tolerance, B1, B2, B3 selections: app. 2%  $V_Z$  tolerance in sequential intervals  
 Eur: A selection: app. 1%  $V_Z$  tolerance, B selection: app. 2%  $V_Z$  tolerance, C selection: app. 5%  $V_Z$  tolerance; the selections are in overlapping intervals  
 Ave: low voltage avalanche regulator diodes  
 dual c.a.: dual common anode

## Zener diodes specifications

### Differences in Zener specifications



### Japanese spec (PZU, PDZ)

$\gamma =$	B-series	B1-series	B2-series	B3-series
	$\pm 5\%$	$\pm 2\%$	$\pm 2\%$	$\pm 2\%$
	$V_Z$ (V)	$V_Z$ (V)	$V_Z$ (V)	$V_Z$ (V)
PZU2.4y	2.3 - 2.6	-	-	-
PZU2.7y	2.5 - 2.9	2.5 - 2.75	2.65 - 2.9	-
PZU3.0y	2.8 - 3.2	2.8 - 3.05	2.95 - 3.2	-
PZU3.3y	3.1 - 3.5	3.1 - 3.35	3.25 - 3.5	-
PZU3.6y	3.4 - 3.8	3.4 - 3.65	3.55 - 3.8	-
PZU3.9y	3.7 - 4.1	3.7 - 3.97	3.87 - 4.1	-
PZU4.3y	4.01 - 4.48	4.01 - 4.21	4.15 - 4.34	4.28 - 4.48
PZU4.7y	4.42 - 4.9	4.42 - 4.61	4.55 - 4.75	4.69 - 4.9
PZU5.1y	4.84 - 5.37	4.84 - 5.04	4.98 - 5.2	5.14 - 5.37
PZU5.6y	5.31 - 5.92	5.31 - 5.55	5.49 - 5.73	5.67 - 5.92
PZU6.2y	5.86 - 6.53	5.86 - 6.12	6.06 - 6.33	6.26 - 6.53
PZU6.8y	6.47 - 7.14	6.47 - 6.73	6.65 - 6.93	6.86 - 7.14
PZU7.5y	7.06 - 7.84	7.06 - 7.36	7.28 - 7.6	7.52 - 7.84
PZU8.2y	7.76 - 8.64	7.76 - 8.1	8.02 - 8.36	8.28 - 8.64
PZU9.1y	8.56 - 9.55	8.56 - 8.93	8.85 - 9.23	9.15 - 9.55
PZU10y	9.45 - 10.55	9.45 - 9.87	9.77 - 10.21	10.11 - 10.55
PZU11y	10.44 - 11.56	10.44 - 10.88	10.76 - 11.22	11.1 - 11.56
PZU12y	11.42 - 12.6	11.42 - 11.9	11.74 - 12.24	12.08 - 12.6
PZU13y	12.47 - 13.96	12.47 - 13.03	12.91 - 13.49	13.37 - 13.96
PZU14y	-	-	13.7 - 14.3	-
PZU15y	13.84 - 15.52	13.84 - 14.46	14.34 - 14.98	14.85 - 15.52
PZU16y	15.37 - 17.09	15.37 - 16.01	15.85 - 16.51	16.35 - 17.09
PZU18y	16.94 - 19.03	16.94 - 17.7	17.56 - 18.35	18.21 - 19.03
PZU20y	18.86 - 21.08	18.86 - 19.7	19.52 - 20.39	20.21 - 21.08
PZU22y	20.88 - 23.17	20.88 - 21.77	21.54 - 22.47	22.23 - 23.17
PZU24y	22.93 - 25.57	22.93 - 23.96	23.72 - 24.78	24.54 - 25.57
PZU27y	25.1 - 28.9	-	-	-
PZU30y	28 - 32	-	-	-
PZU33y	31 - 35	-	-	-
PZU36y	34 - 38	-	-	-

### European spec (BZX, BZx, BZB, 1N47)

$\gamma =$	C-series	B-series	A-series
	$\pm 5\%$	$\pm 2\%$	$\pm 1\%$
	$V_Z$ (V)	$V_Z$ (V)	$V_Z$ (V)
BZX84-y2V4	2.2 - 2.6	2.35 - 2.45	2.37 - 2.43
BZX84-y2V7	2.5 - 2.9	2.65 - 2.75	2.67 - 2.73
BZX84-y3V0	2.8 - 3.2	2.94 - 3.06	2.97 - 3.03
BZX84-y3V3	3.1 - 3.5	3.23 - 3.37	3.26 - 3.34
BZX84-y3V6	3.4 - 3.8	3.53 - 3.67	3.56 - 3.64
BZX84-y3V9	3.7 - 4.1	3.82 - 3.98	3.86 - 3.94
BZX84-y4V3	4 - 4.6	4.21 - 4.39	4.25 - 4.35
BZX84-y4V7	4.4 - 5	4.61 - 4.79	4.65 - 4.75
BZX84-y5V1	4.8 - 5.4	5 - 5.2	5.04 - 5.16
BZX84-y5V6	5.2 - 6	5.49 - 5.71	5.54 - 5.66
BZX84-y6V2	5.8 - 6.6	6.08 - 6.32	6.13 - 6.27
BZX84-y6V8	6.4 - 7.2	6.66 - 6.94	6.73 - 6.87
BZX84-y7V5	7 - 7.9	7.35 - 7.65	7.42 - 7.58
BZX84-y8V2	7.7 - 8.7	8.04 - 8.36	8.11 - 8.29
BZX84-y9V1	8.5 - 9.6	8.92 - 9.28	9 - 9.2
BZX84-y10	9.4 - 10.6	9.8 - 10.2	9.9 - 10.1
BZX84-y11	10.4 - 11.6	10.8 - 11.2	10.8 - 11.11
BZX84-y12	11.4 - 12.7	11.8 - 12.2	11.88 - 12.12
BZX84-y13	12.4 - 14.1	12.7 - 13.3	12.87 - 13.13
BZX84-y15	13.8 - 15.6	14.7 - 15.3	14.85 - 15.15
BZX84-y16	15.3 - 17.1	15.7 - 16.3	15.84 - 16.16
BZX84-y18	16.8 - 19.1	17.6 - 18.4	17.82 - 18.18
BZX84-y20	18.8 - 21.2	19.6 - 20.4	19.8 - 20.2
BZX84-y22	20.8 - 23.3	21.6 - 22.4	21.78 - 22.22
BZX84-y24	22.8 - 25.6	23.5 - 24.5	23.76 - 24.24
BZX84-y27	25.1 - 28.9	26.5 - 27.5	26.73 - 27.27
BZX84-y30	28 - 32	29.4 - 30.6	29.70 - 30.30
BZX84-y33	31 - 35	32.3 - 33.7	32.67 - 33.33
BZX84-y36	34 - 38	35.3 - 36.7	35.64 - 36.36
BZX84-y39	37 - 41	38.2 - 39.8	38.61 - 39.39
BZX84-y43	40 - 46	42.1 - 43.9	42.57 - 43.43
BZX84-y47	44 - 50	46.1 - 47.9	-
BZX84-y51	48 - 54	50 - 52	50.49 - 51.51
BZX84-y56	52 - 60	54.9 - 57.1	-
BZX84-y62	58 - 66	60.8 - 63.2	-
BZX84-y68	64 - 72	66.6 - 69.4	-
BZX84-y75	70 - 79	73.5 - 76.5	74.25 - 75.75

### NZX-series in SOD27

	$V_Z$ (V)	$V_Z$ (V)	$V_Z$ (V)
NZX2V1B	2.0 - 2.2	NZX6V2D	6.1 - 6.4
NZX2V4A	2.3 - 2.5	NZX6V2E	6.3 - 6.6
NZX2V4B	2.4 - 2.6	NZX6V8A	6.4 - 6.7
NZX2V7A	2.5 - 2.7	NZX6V8B	6.6 - 6.9
NZX2V7B	2.6 - 2.8	NZX6V8C	6.7 - 7
NZX2V7C	2.7 - 2.9	NZX6V8D	6.9 - 7.2
NZX3V0A	2.8 - 3	NZX7V5A	7 - 7.3
NZX3V0B	2.9 - 3.1	NZX7V5B	7.2 - 7.6
NZX3V0C	3 - 3.2	NZX7V5C	7.3 - 7.7
NZX3V3A	3.1 - 3.3	NZX7V5D	7.5 - 7.9
NZX3V3B	3.2 - 3.4	NZX7V5X	7.07 - 7.45
NZX3V3C	3.3 - 3.5	NZX8V2A	7.7 - 8.1
NZX3V6A	3.4 - 3.6	NZX8V2B	7.9 - 8.3
NZX3V6B	3.5 - 3.7	NZX8V2C	8.1 - 8.5
NZX3V6C	3.6 - 3.8	NZX8V2D	8.3 - 8.7
NZX3V9A	3.7 - 3.9	NZX9V1A	8.5 - 8.9
NZX3V9B	3.8 - 4	NZX9V1B	8.7 - 9.1
NZX3V9C	3.9 - 4.1	NZX9V1C	8.9 - 9.3
NZX4V3A	4 - 4.2	NZX9V1D	9.1 - 9.5
NZX4V3B	4.1 - 4.3	NZX9V1E	9.3 - 9.7
NZX4V3C	4.2 - 4.4	NZX10A	9.5 - 9.9
NZX4V3D	4.3 - 4.5	NZX10B	9.7 - 10.1
NZX4V7A	4.4 - 4.6	NZX10C	9.9 - 10.3
NZX4V7B	4.5 - 4.7	NZX10D	10.2 - 10.6
NZX4V7C	4.6 - 4.8	NZX11A	10.4 - 10.8
NZX4V7D	4.7 - 4.9	NZX11B	10.7 - 11.1
NZX5V1A	4.8 - 5	NZX11C	10.9 - 11.3
NZX5V1B	4.9 - 5.1	NZX11D	11.1 - 11.6
NZX5V1C	5 - 5.2	NZX12A	11.4 - 11.9
NZX5V1D	5.1 - 5.3	NZX12B	11.6 - 12.1
NZX5V6A	5.2 - 5.5	NZX12C	11.9 - 12.4
NZX5V6B	5.3 - 5.6	NZX12D	12.2 - 12.7
NZX5V6C	5.4 - 5.7	NZX12X	11.44 - 12.03
NZX5V6D	5.5 - 5.8	NZX13A	12.4 - 12.9
NZX5V6E	5.6 - 5.9	NZX13B	12.6 - 13.1
NZX6V2A	5.7 - 6	NZX13C	12.9 - 13.4
NZX6V2B	5.8 - 6.1	NZX14A	13.2 - 13.7
NZX6V2C	6 - 6.3	NZX14B	13.5 - 14

General purpose high speed switching diodes  $\leq 100V$

$V_R$ max (V)	$V_F$ max (V)	@ $I_F$ (mA)	$I_R$ max (nA)	@ $V_R$ (V)	$t_{rr}$ max (ns)	Package	SOD27 (DO-35)	SOD68 (DO-34)	SOD80C (MiniMelf)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)		SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOT666	SOT416 (SC-75)	SOD523 (SC-79)	DFN1006-2 (SOD882)	DFN1006-3 (SOT883)	DFN1006D-2 (SOD882D)							
						Size (mm)	4.25 x 1.85 x 0.56	3.04 x 1.6 x 0.55	3.5 x 1.5 x 1.5	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95		2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.48	1.0 x 0.6 x 0.48	1.0 x 0.6 x 0.37							
						$P_{tot}$ (mW)	500	500	500	250	250	830	200		300	400	550	180	170	500	250	250	250							
50	1	50	100	50	4					BAL74																				
										BAV74																				
70	1	50	1000	70	4					BAL99																				
75	1	10	25	20	4			1N4531																						
		50	1000	75	4					BAS28																				
		100	5000	75	4		BAW62		BAS32L																					
80	1	50	500	80	4								1PS300																	
														1PS301																
															1PS302															
90	1	50	500	80	4					BAW56			BAW56W							BAW56T				BAW56M						
															BAW56S															
															BAV756S															
100	1	10	25	20	4		1N4148																							
												BAS16H				BAS316	BAS16J			BAS516	BAS16L		BAS16LD							
		50	500	80	4					BAS16				BAS16W							BAS16T									
															BAS16VY			BAS16VV												
													BAV70				BAV70W						BAV70T					BAV70M		
																			BAV70S											
														BAV99				BAV99W												

General purpose switching diodes  $\geq 100V$

$V_R$ max (V)	$V_F$ max (V)	$I_F$ (mA)	$I_R$ max (mA)	$t_{rr}$ max (ns)	Package	SOD27 (DO-35)	SOD80C (MiniMelf)	SOT457 (SC-74)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOD523 (SC-79)							
						Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)						
100	1	100	100	50					BAS19														
150	1	100	100	50		BAV20	BAV102																
$\geq 200$	1	100	100	50		BAV21	BAV103				BAS21H			BAS321									
									BAS21		BAS21W												
												BAV23											
																		BAS21AW					
300	1.1	100	150	250												BAS21J	BAS521						

PN-rectifier

$V_R$ max (V)	$V_F$ max (V)	$I_F$ (A)	$I_R$ max (mA)	$t_{rr}$ max (ns)	Package	SOD123W	SOD128
						Size (mm)	Size (mm)
200	1.15	1	2	200			
	1	1	2	200		2.6 x 1.7 x 1.0	3.8 x 2.6 x 1.0
	1.15	2	2	200		950	1050
	0.95	2	2	200		PNE20009ER	
	1	3	2	200		PNE20010ER	
400	1.1	1	1	1800		PNE20020ER	
							PNE20020EP
						PNE20030EP	
						PNS40010ER	

**In the Spotlight**

**Hyperfast pn-rectifier in FlatPower package**

200 V hyperfast pn-rectifier portfolio consist of 5 types with 1 A - 3 A

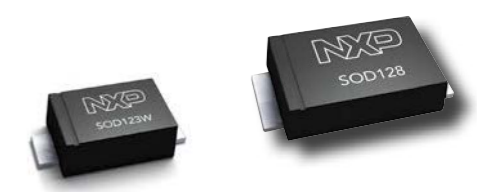
**PNE20010ER:** 1 A, SOD123W up to **PNE20030EP:** 3A, SOD128

Hyperfast switching speed of  $t_{rr}$  max = 25 ns

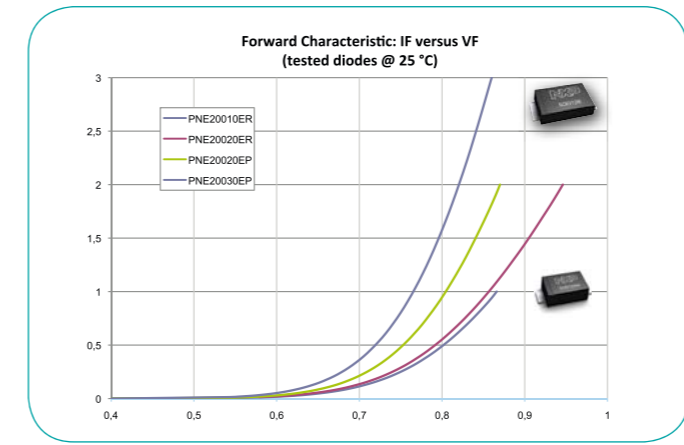
High surge current capability due to clip bond technology

Suitable for high temperature application,  $T_j$  max = 175 °C

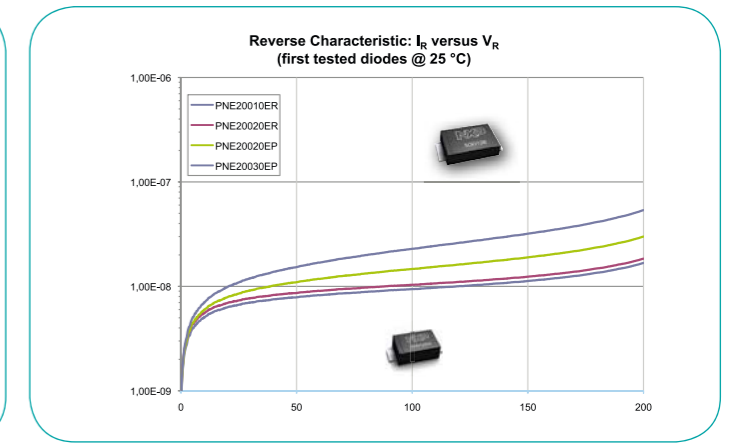
AEC-Q101 qualified



Forward characteristic



Reverse characteristic



### Controlled avalanche switching diodes

$V_R$ max (V)	$V_F$ max (V)	@ $I_F$ (mA)	$I_R$ max (nA) @ $V_R$ max	$I_{FSM}$ max (A)	$I_{FRM}$ max (mA)	$C_d$ max (pF)	$t_{rr}$ max (ns)	Package	SOT23	SOT143B
								Size (mm)	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0
								$P_{tot}$ (mW)	250	250
60	1	200	100	9	600	2.5	6			BAS56
90	1	200	100	10	600	35	50		BAS29	
									BAS31	
									BAS35	

### Low leakage current switching diodes

$V_R$ max (V)	$V_F$ max (V)	@ $I_F$ (mA)	$I_R$ max (nA) @ $V_R$ max	$t_{rr}$ max (μs)	Package	SOD80C (MiniMelf)	SOD68 (DO-34)	SOT23	SOD123F	SOT323 (SC-70)	SOD323 (SC-76)	SOT416 (SC-75)	SOD523 (SC-79)
					Size (mm)	3.5 x 1.5 x 1.5	3.04 x 1.6 x 0.55	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6
					$P_{tot}$ (mW)	300	500	250	830	250	400	170	500
75	1	10	5	3					BAS116H		BAS416		BAS716
								BAS116			BAS116T		
								BAV199			BAV199W		
								BAW156					
								BAV170					
						BAS45AL	BAS45A						
125	1	100	1	1.5 typ		BAS45AL	BAS45A						

### Hyperfast Power Diodes

types in **bold** represent new products


	$V_{RRM}$ (V)	$I_{FAV}$ (A)	$V_F$ (typ) @ 150C (V)	@ $I_F$ (A)	$t_{rr}$ (typ) @ 25C (ms)	SOD59 (TO220AC)	SOD113 (2-pin SOT186A)	SOD142 (2-pin TO247)	SOT429 (3-pin TO247)	SOT78 (TO220AB)	SOT404 (D <sup>2</sup> PAK)		
Power Diodes for Continuous Current Mode PFC	500	5	1.15	5	16	BYC5D-500	BYC5DX-500						
						BYC5-600	BYC5X-600				BYC5B-600		
						BYC8-600P	BYC8X-600P				BYC8B-600P		
						<b>BYC10-600P</b>	<b>BYC10X-600P</b>						
						2 x 5	1.4	5	19			BYC10-600CT	
						15	1.4	15	22	<b>BYC15-600P</b>	<b>BYC15X-600P</b>		
						20	1.2	20	26	<b>BYC20D-600P</b>	<b>BYC20DX-600P</b>		
						30	1.4	30	29		BYC30X-600P	<b>BYC30W-600P</b>	<b>BYC30WT-600P</b>

**In the Spotlight**

**Hyperfast recovery power diodes**

- Comprehensive package offerings
- Low leakage current (platinum doped series)
- Low reverse recovery current
- Low thermal resistance

Reduces switching losses in associated MOSFET or IGBT



### Power Schottky Diodes

types in **bold** represent new products

	$V_{RRM}$ (V)	$I_{FAV}$ (A)	$V_F$ (typ) @ 125C (V)	@ $I_F$ (A)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)
Power Schottky diodes for SMPS output rectification	100	2 x 10	0.59	10	NXPS20H100C	NXPS20H100CX
			<b>0.66</b>	10	<b>NXPS20S100C</b>	<b>NXPS20S100CX</b>
			0.59	10	NXPS20H110C	


### Casco Diodes

	$V_{RRM}$ (V)	$I_{FAV}$ (A)	$V_F$ (typ) @ 150C (V)	@ $I_F$ (A)	$t_{rr}$ (typ) @ 25C (ms)	SOD113 (2-pin SOT186A)
Casco Diodes for Continuous Current Mode PFC	600	8	2	8	12.5	BYC58X-600

**In the Spotlight**

**Power Schottky Diodes**

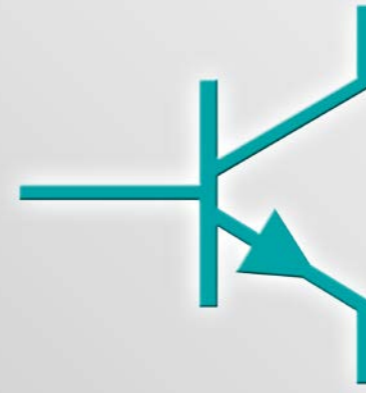
- Negligible switching losses
- High junction temperature capability
- Low leakage current
- Optimized design to give low  $V_F$  and high  $T_{jmax}$
- Integrated guard ring for voltage stress protection



## Ultrafast Power Diodes

types in **bold** represent new products

V <sub>RRM</sub> (V)	I <sub>MAV</sub> (A)	V <sub>F</sub> (typ) @ 150C (V)	t <sub>r</sub> (typ) @ 25C (ns)	SOD59 (TO220AC)	SOD113 (2-pin SOT186A)	SOD141 (DO201AD)	SOD142 (2-pin TO247)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT223	SOT226 (I <sup>2</sup> PAK)	SOT404 (D <sup>2</sup> PAK)	SOT428 (DPAK)	SOD132 (SMB)	SOT429 (TO247)
				BYW29E-100				BYV32E-100				BYV40E-150			
100	8	0.8	8	20	BYW29E-100										
	2x10	0.72	8	20											
	2x0.75	0.5	0.5	10											
	8	0.8	8	20	BYW29E-150										
150	2x10	0.72	8	20											
	2x15	0.78	15	20											
	8	0.8	8	20	BYW29E-200	BYW29EX-200									
	2x5	0.8	5	15											
200	14	0.83	14	20	BYV79E-200										
	2x8	0.84	8	20											
	2x10	0.72	8	20											
	2x15	0.78	15	20											
300	2x5	0.95	5	50											
	9	0.9	8	50	BYV29-400										
	2x10	0.87	10	50											
	2x15	0.95	15	35											
400	9	0.9	8	50	BYV29-500	BYV29X-500									
	2x5	0.95	5	50											
	15	0.9	15	50	BYT79-500										
	2x10	0.87	10	50											
500	2x15	0.95	15	50											
	3	0.82	3	35											
	4	0.82	3	35											
	5	0.97	5	50											
600	8	1.07	8	60	BYR29-600	BYR29X-600									
	9	0.97	8	50	BYV29-600	BYV29X-600									
	15	1	15	50	BYT79-600	BYT79X-600									
	2x10	0.92	10	50											
Enhanced Ultrafast diodes for Interleaved PFC and dual mode DCM/CCM	5	1.1	5	17.5	BYV25F-600	BYV25FX-600									
	9	1.25	8	17.5	BYV29F-600	BYV29FX-600									
	10	1.25	10	20	<b>BYV10-600P</b>	<b>BYV10X-600P</b>									
	2x10	1.3	10	20											
800	8	1.07	8	60	BYR29-800	BYR29X-800									
	1200	16	1.65	16	50										



## Bipolar transistors

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### Low V<sub>CEsat</sub> (BISS) transistors 58

- Low V<sub>CEsat</sub> (BISS) double transistors 58
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### High voltage power bipolar transistors 75

- High voltage power bipolar transistors 75

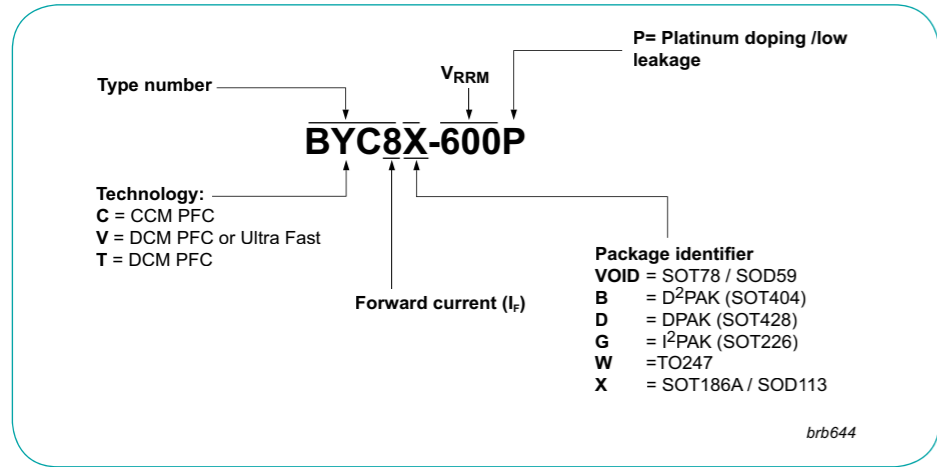
### In the Spotlight

#### Ultrafast recovery power diodes

- Fast switching
- High voltage capability
- Low forward voltage drop
- Low leakage current (platinum doped series)
- Low thermal resistance
- Soft recovery characteristic

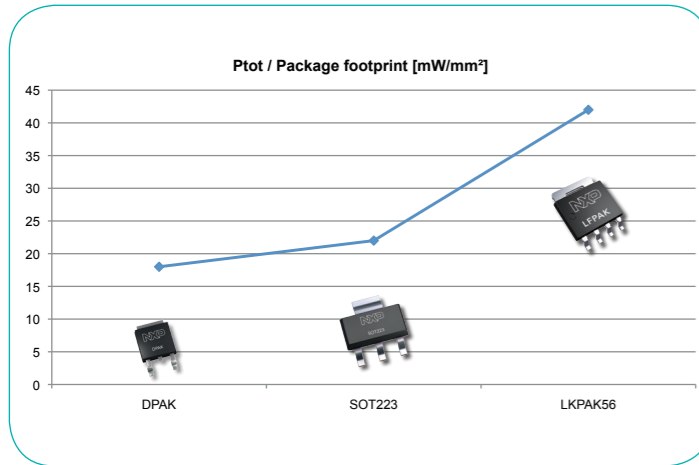


### Power Diode part numbering



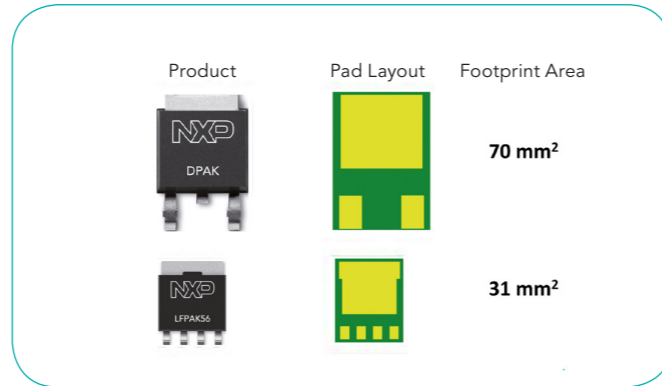
# First bipolar transistors in power package LFAK56

## Same power dissipation but half the size - compared to DPAK



Reduced PCB area requirements compared to SOT223 and DPAK

55% saving for all applications where size makes a difference



Tremendous package size reduction while retaining the same power performance.

### Features and benefits

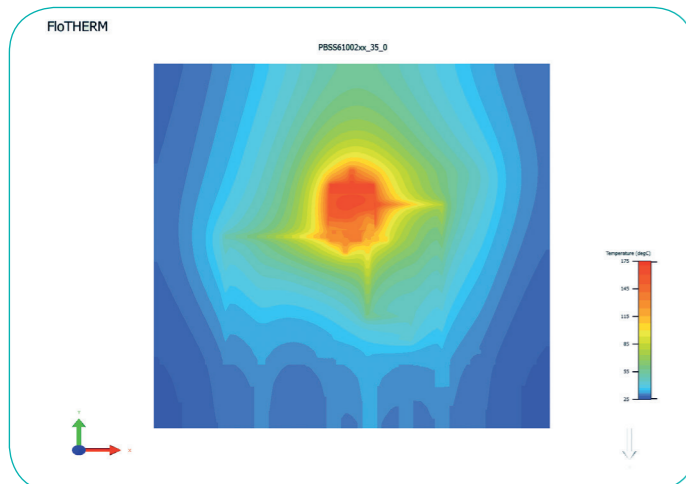
- ▶ High thermal power dissipation capability
- ▶ Designed for reliability, solid copper clip, wire-free
- ▶ Suitable for high temperature applications (175 °C)
- ▶ Reduced Printed-Circuit Board (PCB) area requirements comparing to transistors in DPAK
- ▶ High energy efficiency due to less heat generation
- ▶ AECQ-101 qualified
- ▶ Ultra thin package of only 1 mm height

### Applications

- ▶ Power management
- ▶ Loadswitch
- ▶ Linear mode voltage regulator
- ▶ Backlighting applications
- ▶ Motor drive
- ▶ LED light

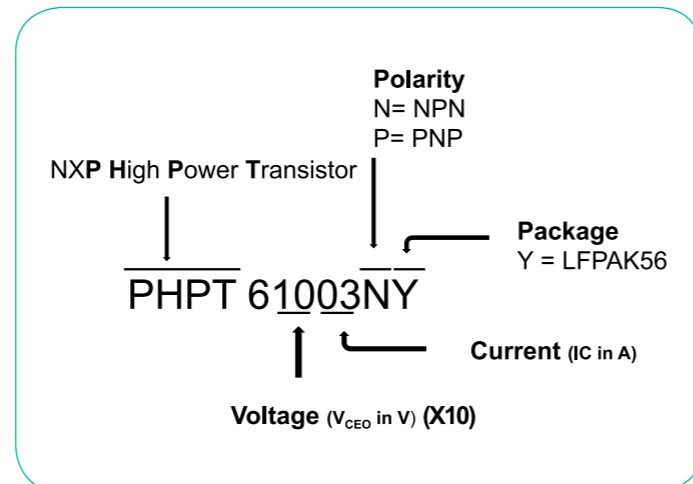


### The thermal performance of LFAK56



Suitable for high temperature applications up to 175 °C

### High power transistors nomenclature:



### High power transistors

In the Spotlight

#### First bipolar transistors in LFAK56 (Power-SO8, SOT669) power package

- High thermal power dissipation up to 3 W
- V<sub>ce0</sub> up to 100 V
- 4 types AECQ 101 qualified (I<sub>c</sub> = 3A)
- Reduced Printed-Circuit Board (PCB) size requirements
- High temperature applications up to 175 °C
- For LED lighting, motor drive, linear regulators, backlight units, PowerMOS and IGBT drive
- Types up to 15 A in development**



### High power transistors single

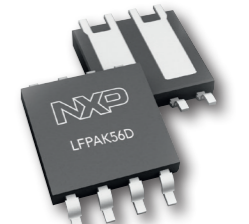
Package													LFAK Power SO8 (SOT669)
Size (mm)													4.8 x 6 x 1.1
V <sub>CE0</sub> (V)	I <sub>C</sub> (A)	I <sub>CM</sub> (A)	h <sub>FE</sub> typ	@ I <sub>C</sub> (A)	@ V <sub>CE</sub> (V)	R <sub>CEsat</sub> typ. @ I <sub>C</sub> /I <sub>B</sub> =10	V <sub>CEsat</sub> typ (mV); I <sub>C</sub> = 0.5 A; I <sub>B</sub> = 0.05 A	V <sub>CEsat</sub> max (mV)	@ I <sub>C</sub> (A)	@ I <sub>B</sub> (A)	Polarity		
60	3	8	200 / 400	0.5	2	60	50	270	3	0.3	NPN	PHPT60603NY	
			200 / 400	0.5	2	80	70	360	3	0.3	PNP	PHPT60603PY	
100	3	8	150 / 250	0.5	10	75	50	330	3	0.3	NPN	PHPT61003NY	
			150 / 220	0.5	10	110	70	360	2	0.2	PNP	PHPT61003PY	
	2	6	150 / 250	0.5	10	80	50	300	2	0.2	NPN	PHPT61002NYC	
			150 / 220	0.5	10	125	70	400	2	0.2	PNP	PHPT61002PYC	

Bipolar transistors

In the Spotlight

#### First bipolar transistors in LFAK56D (SOT1205) power package

- High thermal power dissipation up to 3 W
- V<sub>ce0</sub> up to 100 V
- All types AECQ 101 qualified (I<sub>c</sub> = 2A)
- 2 types with current gain matching of 5%
- Reduced Printed-Circuit Board (PCB)
- High temperature applications up to 175 °C
- For LED lighting, motor drive, linear regulators, backlight units, PowerMOS and IGBT drive



### High power transistors double

Package														LFAK56D (SOT1205)
Size (mm)														4.8 x 6 x 1.1
V <sub>CE0</sub> (V)	I <sub>C</sub> (A)	I <sub>CM</sub> (A)	h <sub>FE</sub> typ	@ I <sub>C</sub> (A)	@ V <sub>CE</sub> (V)	R <sub>CEsat</sub> typ. @ I <sub>C</sub> /I <sub>B</sub> =10	V <sub>CEsat</sub> typ (mV); I <sub>C</sub> = 0.5 A; I <sub>B</sub> = 0.05 A	V <sub>CEsat</sub> max (mV)	@ I <sub>C</sub> (A)	@ I <sub>B</sub> (A)	Polarity	h <sub>FE1</sub> /h <sub>FE2</sub>		
100	2	6	150	0.5	10	80	50	300	2	0.2	2XNPN	-	PHPT610020NK	
						125	70	400	2	0.2	2XPNP	-	PHPT610020PK	
						80 / 125	50 / 70	300 / 400	2	0.2	NPN/PNP	-	PHPT61002NPK	
						80	50	300	2	0.2	2XNPN	0.95	PHPT610025NK	
						125	70	400	2	0.2	2XPNP	0.95	PHPT610025PK	

Low  $V_{CEsat}$  (BISS) double transistors

Low  $V_{CEsat}$  (BISS) transistors

Industry's first combination of reduced switching times (down to 125 ns) with minimized saturation voltage (below 50 mV)

Voltage range from 12 to 100 V

Flexible package options, from standard SMD to brand new ultra small leadless package DFN1010B-3 (SOT883B) (1.0 x 0.6 x 0.37 mm)

Provides benchmark reduced on-state-resistance

New double BISS transistors in DFN2020 (SOT1118) and LFPK56D (SOT1205)

New 2 A BISS transistors in SOT89 and SOT223 available: PBSS4240X, PBSS5240X, PBSS4240Z, and PBSS5240Z



In the Spotlight

Package		SOT96 (SO8)	SOT457 (SC-74)	SOT363 (SC-88)	SOT666	DFN2020-6 (SOT1118)				
Size (mm)		4.9 x 3.9 x 1.75	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	2.0 x 2.0 x 0.652				
$P_{tot}$ (mW)		2000 <sup>2)</sup>	750	430	500	1300				
$V_{CE0}$ (V)	$I_C$ (A)	Polarity	$h_{FE}$ min	@ $I_C$ (A)	@ $V_{CE}$ (V)	$V_{CEsat}$ typ (mV); $I_C = 0.5$ A; $I_B = 0.05$ A	$V_{CEsat}$ max (mV)	@ $I_C$ (A)	@ $I_B$ (A)	
15	0.5	2 x NPN	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05	PBSS2515VS
		2 x PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05	PBSS3515VS
		NPN / PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05	PBSS2515VPN
		NPN / PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05	PBSS2515YPN
20	7.5	NPN / PNP	300	0.5	2	15	150	4	0.2	PBSS4021SN
	6.3	PNP / PNP	250	0.5	2	24	225	4	0.2	PBSS4021SP
	7.5 / 6.3	NPN / PNP	300 / 250	0.5	2	15 / 24	150 / 225	4	0.2	PBSS4021SPN
30	1	NPN / NPN	210	0.5	2	75	100	0.5	0.05	PBSS4130PAN
		PNP / PNP	170	0.5	2	85	140	0.5	0.05	PBSS5130PAP
		NPN / PNP	210 / 170	0.5	2	75 / 85	100 / 140	0.5	0.05	PBSS4130PANP
	2	NPN / NPN	230	0.5	2	60	80	0.5	0.05	PBSS4230PAN
		PNP / PNP	210	0.5	2	75	110	0.5	0.05	PBSS5230PAP
40	5.7	NPN / NPN	300	0.5	2	60 / 75	80 / 100	0.5	0.05	PBSS4230PANP
		NPN / NPN	300	0.5	2	57	250	4	0.4	PBSS4032SN <sup>3)</sup>
	4.8	PNP / PNP	200	0.5	2	70	390	4	0.4	PBSS4032SP <sup>3)</sup>
		NPN / PNP	300 / 200	0.5	2	57 / 70	250 / 390	4	0.4	PBSS4032SPN <sup>3)</sup>
50	2.7	NPN / PNP	300 / 250	0.5	5	130 / 150	500	1	0.1	PBSS4140DPN
		2 x NPN	300	0.5	2	50	340	2.7	0.27	PBSS4350SS
		2 x PNP	200	0.5	2	60	370	2.7	0.27	PBSS5350SS
60	1.0	NPN / PNP	300 / 200	0.5	2	50 / 60	340 / 370	2.7	0.27	PBSS4350SPN
		2 x NPN	200	0.5	5	115	250	1	0.1	PBSS4160DS
		2 x PNP	150	0.5	5	120	330	1	0.1	PBSS5160DS
	1	NPN / PNP	200 / 150	0.5	5	115 / 120	250 / 330	1	0.1	PBSS4160DPN
		NPN / NPN	150	0.5	2	90	120	0.5	0.05	PBSS4160PAN
		PNP / PNP	120	0.5	2	125	180	0.5	0.05	PBSS5160PAP
	2	NPN / PNP	150 / 120	0.5	2	90 / 125	120 / 180	0.5	0.05	PBSS4160PANP
		NPN / NPN	210	0.5	2	70	90	0.5	0.05	PBSS4260PAN
		PNP / PNP	140	0.5	2	100	140	0.5	0.05	PBSS5260PAP
	6.7	NPN / NPN	210 / 140	0.5	2	70 / 100	90 / 140	0.5	0.05	PBSS4260PANP
		NPN / NPN	300	0.5	2	20	190	4	0.2	PBSS4041SN
		PNP / PNP	200	0.5	2	35	330	4	0.2	PBSS4041SP
120	1	NPN / PNP	300 / 200	0.5	2	20 / 35	190 / 330	4	0.2	PBSS4041SPN
		NPN / NPN	240	0.1	2	90	120	0.5	0.05	PBSS4112PAN
1	PNP / PNP	190	0.1	2	150	220	0.5	0.05	PBSS5112PAP	
	NPN / PNP	240 / 190	0.1	2	90 / 150	120 / 220	0.5	0.05	PBSS4112PANP	

<sup>1)</sup>  $I_C / I_B = 20$  <sup>2)</sup> Device mounted on a ceramic PCB, Al2O3, standard footprint. <sup>3)</sup> Optimized for high speed switching

Low  $V_{CEsat}$  (BISS) transistors single NPN

New Low  $V_{CEsat}$  transistors up to 2 A in DFN1010D-3: 2 A on 1.1 mm<sup>2</sup> footprint

High  $I_C$  performance on ultra small footprint

$V_{CE}$  30 V and 60 V

Leadless DFN1010D-3 (SOT1215) SMD package with solderable sidepads (1.1 x 1.0 x 0.37)

AEC-Q101 qualified



In the Spotlight

types in **bold** represent new products

Package		SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)	DFN1010D-3 (SOT1215)					
Size (mm)		2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.48	1.0 x 0.6 x 0.37	1.1 x 1.0 x 0.37					
$P_{tot}$ (mW)		480	350	430	250	250	250	750					
$V_{CE0}$ (V)	$I_C$ (A)	$I_{CM}$ (A)	$h_{FE}$ min/typ	@ $I_C$ (A)	@ $V_{CE}$ (V)	$R_{CEsat}$ typ (m $\Omega$ ); $I_C / I_B = 10$	$V_{CEsat}$ typ (mV); $I_C = 0.5$ A; $I_B = 0.05$ A	$V_{CEsat}$ max (mV)	@ $I_C$ (A)	@ $I_B$ (A)			
15	0.5	1	200 / 325	0.01	2	360	-	250	0.5	0.05	PBSS2515M	PBSS2515MB	
			200 / 425	0.01	2	300	200	250	0.5	0.05		PBSS2515E	
20	1	3	350 / 470	0.1	2	220	110 <sup>2)</sup>	250	1	0.05	PBSS4120T		
			220 / 330	0.1	2	80	45	310	3	0.3	PBSS4320T		
			300 / 550	0.5	2	36	21	220	4	0.2	PBSS4021NT		
30	1.5	3	230 / 380	0.5	2	175	90	235	1	0.1		<b>PBSS4130QA</b>	
			300 / 450	0.5	2	240	120 <sup>2)</sup>	270	1	0.05	PBSS4130T		
	2	3	300 / 450	0.5	2	120	70	320	2	0.2	PBSS4230T		
			230 / 380	0.5	2	135	75	350	2	0.2		<b>PBSS4230QA</b>	
40	2.6	5	300 / 500	0.5	2	76	80	320	3	0.3	PBSS4032NT <sup>3)</sup>		
			200 / 550	0.01	2	380	200 <sup>2)</sup>	250	0.5	0.05		PBSS2540M	PBSS2540MB
			200 / 350	0.01	2	380	190	250	0.5	0.05		PBSS2540E	
	2.0	3	300 / 440	0.5	5	240	130	500	1	0.1	PBSS4140U		
			300 / 510	0.5	5	230	120	500	1	0.1	PMMT491A		
			300 / 420	0.5	5	150	130	500	1	0.1	PBSS4140T		
3.0	3	300 / -	0.5	5	280	140	510	2	0.2				
		350 / 470	0.1	2	120	70	320	2	0.2		PBSS4240Y		
50	2	5	300 / 495	0.5	2	100	60	260	2	0.2	PBSS4240T		
			300 / 450	0.5	2	120	70	320	2	0.2	PBSS4350T		
60	1.5	3	150 / 240	0.5	2	170	90	235	1	0.1		<b>PBSS4160QA</b>	
			200 / 420	0.5	5	230	120	280	1	0.1		PBSS4160U	
	2	3	200 / 350	0.5	5	200	110	250	1	0.1	PBSS4160T		
			150 / 240	0.5	2	125	75	350	2	0.2		<b>PBSS4260QA</b>	
100	1.0	3.0	300 / 500	0.5	2	46	29	200	3	0.3	PBSS4041NT		
			150 / 400	0.25	10	160	80	200	1	0.1		PBSS8110Y	
1.0	3.0	150 / 300	0.25	10	165	70	200	1	0.1	PBSS8110T			

<sup>1)</sup>  $I_C / I_B = 20$  <sup>2)</sup>  $V_{CEsat}$  (max) <sup>3)</sup> optimized for high speed switching

Bipolar transistors



## Low $V_{CEsat}$ (BISS) transistors single PNP

In the Spotlight

New Low  $V_{CEsat}$  transistors up to 2 A in DFN1010D-3: 2 A on 1.1 mm<sup>2</sup> footprint

High  $I_C$  performance on ultra small footprint

$V_{CE}$  30 V and 60 V

Leadless DFN1010D-3 (SOT1215) SMD package with solderable sidepads (1.1 x 1.0 x 0.37)

AEC-Q101 qualified



types in **bold** represent new products

Package		SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)	DFN1010D-3 (SOT1215)					
Size (mm)		2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.48	1.0 x 0.6 x 0.37	1.1 x 1.0 x 0.37					
$P_{tot}$ (mW)		480	350	430	250	250	250	750					
$V_{CEO}$ (V)	$I_C$ (A)	$I_{CM}$ (A)	$h_{FE}$ min/typ	@ $I_C$ (A)	@ $V_{CE}$ (V)	$R_{CEsat}$ typ (m $\Omega$ ); $I_C/I_B = 10$	$V_{CEsat}$ typ (mV); $I_C = 0.5$ A; $I_B = 0.05$ A	$V_{CEsat}$ max (mV)	@ $I_C$ (A)	@ $I_B$ (A)			
15	0.5	1	200 / 260	0.01	2	300	150	250	0.5	0.05			
			200 / 325	0.01	2	300	150	250	0.5	0.05			
20	2.0	3	300 / 450	0.1	2	250	125 2)	250	1	0.05	PBSS5120T		
			225 / -	0.5	2	115	80 2)	225	2	0.2	PBSS5220T		
			220 / 420	0.5	2	75	50	210	3	0.2	PBSS5320T		
30	1.5	1	180 / 295	0.5	2	160	85	240	1	0.1		<b>PBSS5130QA</b>	
			260 / 350	0.5	2	220	110	225	1	0.05	PBSS5130T		
40	1.0	2	300 / 450	0.1	2	160	70	350	2	0.2	PBSS5230T		
			180 / 295	0.5	2	125	70	330	2	0.2		<b>PBSS5230QA</b>	
			200 / 320	0.5	2	110	95	330	2	0.2	PBSS4032PT <sup>3)</sup>		
50	2.0	3	200 / 380	0.01	2	440	220	350	0.5	0.05		PBSS3540M	PBSS3540MB
			200 / 380	0.01	2	440	230	350	0.5	0.05			PBSS3540E
			300 / 520	0.1	5	230	130	500	1	0.1		PBSS5140U	
			300 / 800	0.1	5	250	130	500	1	0.1	PMMT591A		
			300 / 510	0.1	5	230	130	500	1	0.1	PBSS5140T		
60	1.0	2	300 / -	0.1	2	200	110 2)	350	2	0.2			PBSS5240Y
			300 / 450	0.1	2	150	70	350	2	0.2	PBSS5240T		
			200 / -	0.5	2	150	90 2)	300	2	0.1	PBSS5250T		
			200 / 360	0.5	2	90	55	270	2	0.2	PBSS5350T		
100	1.0	3.0	120 / 185	0.5	2	225	125	330	1	0.1			<b>PBSS5160QA</b>
			150 / 250	0.5	5	255	135	340	1	0.1		PBSS5160U	
			150 / 250	0.5	5	220	120	330	1	0.1	PBSS5160T		
100	1.0	3.0	120 / 185	0.5	2	205	105	500	1-Jul	0.17			<b>PBSS5260QA</b>
			200 / 300	0.5	2	80	49	360	3	0.3	PBSS4041PT		
100	1.0	3.0	150 / -	0.25	5	170	93	320	1	0.1			PBSS9110Y
			150 / 350	0.5	5	170	95	320	1	0.1	PBSS9110T		

<sup>1)</sup>  $I_C / I_B = 20$  <sup>2)</sup>  $V_{CEsat}$  (max) <sup>3)</sup> optimized for high speed switching

## Medium power low $V_{CEsat}$ (BISS) transistors single NPN

Package		SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)	DFN2020-3 (SOT1061)									
Size (mm)		6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.0 x 2.0 x 0.62									
$P_{tot}$ (mW)		1700	1650	750	1400									
$V_{CEO}$ (V)	$I_C$ (A)	$I_{CM}$ (A)	$h_{FE}$ min/typ	@ $I_C$ (A)	@ $V_{CE}$ (V)	$R_{CEsat}$ typ (m $\Omega$ ); $I_C/I_B = 10$	$V_{CEsat}$ typ (mV); $I_C = 0.5$ A; $I_B = 0.05$ A	$V_{CEsat}$ max (mV)	@ $I_C$ (A)	@ $I_B$ (A)				
12	5.3	10.6	300 / 530	0.5	2	27 <sup>1)</sup>	18	200	5.3	0.265		PBSS301NX		
			5.8	11.6	300 / 530	0.5	2	29 <sup>1)</sup>	18	235	5.8	0.29	PBSS301NZ	
20	6	7	280 / 440	0.5	2	33 <sup>1)</sup>	20	275	6	0.3		PBSS4612PA		
			3	5	220 / 390	0.5	2	85	40	310	3	0.3		PBSS4320X
			4	15	300 / 450	0.5	2	50	30	280	4	0.4		PBSS301ND
			5	10	300 / 450	0.5	2	32	35	220	5	0.5		PBSS4520X
			5.3	10.6	300 / 570	0.5	2	27 <sup>1)</sup>	20	200	5.3	0.265		PBSS302NX
			5.8	10.2	300 / 570	0.5	2	30 <sup>1)</sup>	20	250	5.8	0.29	PBSS302NZ	
			6	7	280 / 440	0.5	2	33 <sup>1)</sup>	20	275	6	0.3		PBSS4620PA
			7	15	300 / 550	0.5	2	19	12	210	7	0.35		PBSS4021NX
30	8	20	300 / 550	0.5	2	14	9	170	8	0.4	PBSS4021NZ			
			3	5	300 / 490	0.5	2	80	45	300	3	0.3		PBSS4330X
			3	5	300 / 465	0.5	2	75	40	300	3	0.3		PBSS4330PA
			3.5	6	300 / 500	0.5	2	50	70	300	4	0.4		PBSS4032ND <sup>3)</sup>
			4.7	10	300 / 500	0.5	2	45	57	250	4	0.4		PBSS4032NX <sup>3)</sup>
			5.1	10.2	300 / 480	0.5	2	30 <sup>1)</sup>	20	220	5.1	0.255		PBSS303NX
40	5.4	10	300 / 500	0.5	2	45	57	340	4.9	0.27	PBSS4032NZ <sup>3)</sup>			
			5.5	11	300 / 480	0.5	2	31 <sup>1)</sup>	20	240	5.5	0.275	PBSS303NZ	
			6	7	280 / 450	0.5	2	35 <sup>1)</sup>	21	275	6	0.3		PBSS4630PA
			2.0	3.0	300 / -	0.5	5	280	140	510	2	0.2		PBSS4240X
50	4	10	300 / 520	0.5	2	55	35	300	4	0.4		PBSS302ND		
			300 / 500	0.5	2	40	21	355	5	0.5		PBSS4540X		
			300 / 500	0.5	2	42	25	355	5	0.5	PBSS4540Z			
60	2	5	300 / -	0.5	2	160	90 <sup>2)</sup>	320	2	0.2		PBSS4250X		
			200 / 280	0.5	2	110	65	290	2	0.2		PBSS4350D		
			300 / 460	0.5	2	75	50	370	3	0.3		PBSS4350X		
80	3.0	5.0	200 / 280	0.5	2	110	60 <sup>1)</sup>	290	2	0.2	PBSS4350Z			
			3	6	345 / 570	0.5	2	65	40	260	3	0.3		PBSS303ND
			4.7	9.4	300 / 520	0.5	2	37 <sup>1)</sup>	25	245	4.7	0.235		PBSS304NX
			5.2	10.4	300 / 520	0.5	2	39 <sup>1)</sup>	25	280	5.2	0.26	PBSS304NZ	
			6	7	280 / 440	0.5	2	34 <sup>1)</sup>	22	290	6	0.3		PBSS4560PA
100	6.2	15	300 / 500	0.5	2	25	17	230	6	0.3		PBSS4041NX		
			7	15	300 / 500	0.5	2	17.5	13	195	7	0.35	PBSS4041NZ	
			3	6	240 / 360	0.5	2	67	40	255	3	0.3		PBSS304ND
			4	10	250 / 400	0.5	2	43 <sup>1)</sup>	25	230	4	0.2		PBSS4480X
100	4.6	9.2	300 / 470	0.5	2	37 <sup>1)</sup>	25	240	4.6	0.23		PBSS305NX		
			5.1	10.2	300 / 470	0.5	2	38 <sup>1)</sup>	25	270	5.1	0.255	PBSS305NZ	
			5.6	7	270 / 425	0.5	2	40 <sup>1)</sup>	25	320	5.6	0.28		PBSS4580PA
100	150	290	150 / 290	0.25	10	160	75	200	1	0.1		PBSS8110D		
			150 / 290	0.25	10	165	73	200	1	0.1		PBSS8110X		
			150 / 290	0.25	10	160	73	200	1	0.1	PBSS8110Z			
			3	4	170 / 275	0.5	2	72	45	360	4	0.4		PBSS305ND
			4.5	9	200 / 330	0.5	2	38 <sup>1)</sup>	27	245	4.5	0.225		PBSS306NX
			5.1	10.2	200 / 330	0.5	2	43 <sup>1)</sup>	27	300	5.1	0.255	PBSS306NZ	
100	5.2	6	180 / 285	0.5	2	48 <sup>1)</sup>	30	340	5.2	0.26		PBSS8510PA		

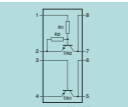
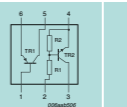
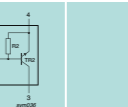
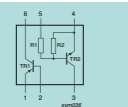
<sup>1)</sup>  $I_C / I_B = 20$  <sup>2)</sup>  $V_{CEsat}$  (max) <sup>3)</sup> optimized for high speed switching

Medium power low  $V_{CEsat}$  (BISS) transistors single PNP

Package											SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)	DFN2020-3 (SOT1061)
Size (mm)											6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.0 x 2.0 x 0.62
$P_{tot}$ (mW)											1700	1650	750	1400
$V_{CEO}$ (V)	$I_C$ (A)	$I_{CM}$ (A)	$h_{FE}$ min/typ	@ $I_C$ (A)	@ $V_{CE}$ (V)	$R_{CEsat}$ typ (m $\Omega$ ); $I_C/I_B = 10$	$V_{CEsat}$ typ (mV); $I_C = 0.5$ A; $I_B = 0.05$ A	$V_{CEsat}$ max (mV)	@ $I_C$ (A)	@ $I_B$ (A)				
12	5.3	10.6	250 / 400	0.5	2	28 <sup>1)</sup>	20	210	5.3	0.265		PBSS301PX		
	5.7	11.4	250 / 400	0.5	2	30 <sup>1)</sup>	20	245	5.7	0.285	PBSS301PZ			
	6	7	220 / 335	0.5	2	33 <sup>1)</sup>	20	300	6	0.3			PBSS5612PA	
20	3	5	200 / -	0.5	2	85	80 <sup>2)</sup>	400	3	0.3		PBSS5320D		
			220 / 450	0.5	2	90	50	300	3	0.3		PBSS5320X		
	3.5	8	250 / 400	0.5	2	55	35	375	4	0.2				
	4	15	250 / 400	0.5	2	50	35	280	4	0.4		PBSS301PD		
	5	10	300 / 430	0.5	2	34	45	270	5	0.5		PBSS5520X		
	5.1	10.2	250 / 370	0.5	2	32 <sup>1)</sup>	25	230	5.1	0.255		PBSS302PX		
	5.5	11	250 / 370	0.5	2	34 <sup>1)</sup>	25	265	5.5	0.275	PBSS302PZ			
	6	7	230 / 345	0.5	2	39 <sup>1)</sup>	25	350	6	0.3			PBSS5620PA	
30	6.2	15	250 / 400	0.5	2	23	18	240	6	0.3		PBSS4021PX		
	6.6	20	250 / 400	0.5	2	22	16	240	7	0.35	PBSS4021PZ			
	2.7	5	200 / 350	0.5	2	88	87	395	3	0.3		PBSS4032PD <sup>3)</sup>		
			200 / 380	0.5	2	80	50	320	3	0.3		PBSS5330X		
			200 / 320	0.5	2	75	45	320	3	0.3			PBSS5330PA	
	4.2	10	200 / 350	0.5	2	58	70	345	4	0.4		PBSS4032PX <sup>3)</sup>		
	4.4	10	200 / 350	0.5	2	58	70	400	4	0.2	PBSS4032PZ <sup>3)</sup>			
	5.1	10.2	250 / 400	0.5	2	32 <sup>1)</sup>	25	230	5.1	0.255		PBSS303PX		
40	5.3	10.6	250 / 400	0.5	2	35 <sup>1)</sup>	25	265	5.3	0.265	PBSS303PZ			
	6	7	200 / 335	0.5	2	39 <sup>1)</sup>	25	350	6	0.3			PBSS5630PA	
	2.0	3.0	215 / -	0.5	5	340	170	500	2	0.2		PBSS5240X		
	4	15	200 / 310	0.5	2	55	46	300	4	0.4		PBSS302PD		
50	5	10	250 / 370	0.5	2	45	33	375	5	0.5		PBSS5540X		
	5	10	250 / 350	0.5	2	55	40 <sup>1)</sup>	160	2	0.2	PBSS5540Z			
	2.0	5	200 / -	0.5	2	160	90 <sup>2)</sup>	320	2	0.2		PBSS5250X		
60	3.0	5.0	200 / 300	0.5	2	120	70	300	2	0.2			PBSS5350D	
			200 / 375	0.5	2	120	70	390	3	0.3		PBSS5350X		
			200 / 300	0.5	2	120	70	300	2	0.2	PBSS5350Z			
	3	6	180 / 265	0.5	2	70	55	290	3	0.3			PBSS303PD	
	4.2	8.4	200 / 295	0.5	2	53 <sup>1)</sup>	35	310	4.2	0.21		PBSS304PX		
80	4.5	9	200 / 295	0.5	2	59 <sup>1)</sup>	35	375	4.5	0.225	PBSS304PZ			
	5	6	170 / 260	0.5	2	35 <sup>1)</sup>	35	450	5	0.25			PBSS560PA	
	5	15	200 / 300	0.5	2	40	30	300	5	0.5		PBSS4041PX		
	5.7	15	200 / 300	0.5	2	29	22	285	6	0.3	PBSS4041PZ			
100	3	5	155 / 225	0.5	2	71	55	290	3	0.3			PBSS304PD	
			180 / 265	0.5	2	65 <sup>1)</sup>	40	420	4	0.2			PBSS5580PA	
	4.0	10	200 / 300	0.5	2	50	35	380	5	0.5		PBSS5480X		
		8	200 / 280	0.5	2	43	36	240	4	0.4		PBSS305PX		
	4.5	9	200 / 280	0.5	2	69 <sup>1)</sup>	36	450	4.5	0.225	PBSS305PZ			
100	1.0	3.0	150 / 350	0.5	5	170	100	320	1	0.1			PBSS9110D	
			150 / 350	0.5	5	170	90	320	1	0.1			PBSS9110X	
			150 / -	0.5	5	170	90	320	1	0.1			PBSS9110Z	
	2	3	175 / 275	0.5	2	88	65	250	2	0.2			PBSS305PD	
	2.7	4	180 / 295	0.5	2	110 <sup>1)</sup>	45	450	2.7	0.135			PBSS9410PA	
	3.7	7.4	200 / 300	0.5	2	52	45	300	4	0.4		PBSS306PX		
4.1	8.2	200 / 300	0.5	5	57	45	325	4.1	0.41	PBSS306PZ				

<sup>1)</sup>  $I_C / I_B = 20$  <sup>2)</sup>  $V_{CEsat}$  (max) <sup>3)</sup> optimized for high speed switching

Low  $V_{CEsat}$  (BISS) load switches

Package				SOT96 (SO8)	SOT457 (SC-74)	SOT363 (SC-88)	SOT666
Size (mm)				4.9 x 3.9 x 1.75	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55
$P_{tot}$ (mW)				1500 <sup>1)</sup>	750 <sup>1)</sup>	600 <sup>1)</sup>	300 <sup>2)</sup>
$V_{CEO}$ (V)	$I_C$ (A)	$V_{CEsat}$ max (mV); $I_C = 0.5$ A; $I_B = 0.05$ A	R1, R2 (k $\Omega$ )				
15	0.5	250	2.2				PBLS1501Y
			4.7				PBLS1502Y
			10				PBLS1503Y
20	1	150	2.2				PBLS2001D
			4.7				PBLS2002D
			10				PBLS2003D
			22				PBLS2004D
20	1.8	70	2.2				PBLS2021D
			4.7				PBLS2022D
			10				PBLS2023D
			22				PBLS2024D
			2.2	PBLS2001S			
40	0.5	350	2.2				PBLS4001Y
			4.7				PBLS4002Y
			10				PBLS4003Y
			22				PBLS4004Y
40	1	170	2.2				PBLS4001D
			4.7				PBLS4002D
			10				PBLS4003D
			22				PBLS4004D
			47				PBLS4005D
			47				PBLS4005D
60	1	180	2.2				PBLS6001D
			4.7				PBLS6002D
			10				PBLS6003D
			22				PBLS6004D
			47				PBLS6005D
60	1.5	100	2.2				PBLS6021D
			4.7				PBLS6022D
			10				PBLS6023D
			22				PBLS6024D

<sup>1)</sup> Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

<sup>2)</sup> Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint

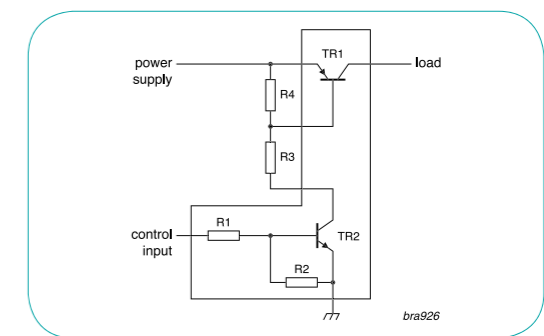
Key features and benefits

- ▶ Very small input current drives high load current
- ▶ High efficiency and low voltage drop due to low  $V_{CEsat}$  (BISS) pass transistor
- ▶ Replaces expensive P-MOSFETs
- ▶ Inherent reverse current blocking
- ▶ Automotive qualified according to AEC-Q101

Key applications

- ▶ Fan driver
- ▶ Battery charge switch
- ▶ Supply line switch
- ▶ High side load

Low  $V_{CEsat}$  (BISS) load switch – the optimal choice for supply-line and high-side switches



### High voltage low $V_{CEsat}$ (BISS) transistors

types in **bold** represent new products

				SOT223 (SC-73)	SOT89 (SC-62)	SOT23
Package						
Size (mm)				6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0
$P_{tot}$ (mW)				1700	1300	250
Polarity	$V_{CESM}^{1)}$	$V_{CEO}$ (V)	$I_C$ (A)			
NPN	-	150	1	PBHV8115Z	<b>PBHV8115X</b>	PBHV8115T
		180	2	PBHV8215Z		
		600	1			PB-M818T
	500	400	0.5	<b>PBHV8560Z</b>		
		400	0.5	PBHV8540Z	<b>PBHV8540X</b>	PBHV8540T
		500	1	PBHV8140Z		
PNP	-	140	4	<b>PBHV9414Z</b>		
		150	1	PBHV9115Z	PBHV9115X	PBHV9115T
		150	2	PBHV9215Z		
	500	600	0.5	<b>PBHV9560Z</b>		
		400	0.25	PBHV9040Z	<b>PBHV9040X</b>	PBHV9040T
		500	0.15	PBHV9540Z		
		500	0.15			PBHV9050T
		500	0.25	PBHV9050Z		

<sup>1)</sup> Collector-emitter peak voltage

In the Spotlight

#### High voltage low $V_{CEsat}$ (BISS) transistors in SOT223, SOT23 & SOT89

Voltage  $V_{CEO}$  up to 600 V

Current  $I_C$  up to 4 A (continuous), 10 A (peak)

$V_{CEsat}$  down to 33 mV

AEC-Q101 qualified

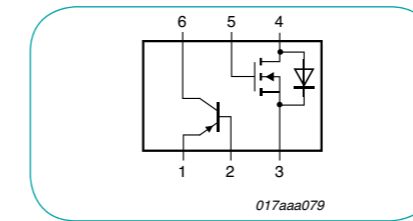


### Low $V_{CEsat}$ (BISS) RETs

					SOT23	
Package						
Size (mm)					2.9 x 1.3 x 1.0	
$P_{tot}$ (mW)					250	
$V_{CEO}$ (V)	$I_C$ (mA)		R1 (k $\Omega$ )	R2 (k $\Omega$ )	NPN	PNP
40	600	R1 = R2	1	1	PBRN113ET	PBRP113ET
			2.2	2.2	PBRN123ET	PBRP123ET
		R1 $\neq$ R2	1	10	PBRN113ZT	PBRP113ZT
			2.2	10	PBRN123YT	PBRP123YT

### Low $V_{CEsat}$ (BISS) transistor PNP – N-channel MOSFET combination

											DFN2020-6 (SOT1118)
Package											
Size (mm)											2.0 x 2.0 x 0.62
$P_{tot}$ (mW)											1300
$V_{CEO}$ (V)	$I_C$ (A)	$h_{FE}$ min	$h_{FE}$ max	@ $I_C$ (mA)	@ $V_{CE}$ (V)	$R_{CEsat}$ typ (m $\Omega$ )	$V_{DS}$ (V)	$V_{GS}$ (V)	$I_D$ (A)	$R_{Dson}$ typ (m $\Omega$ )	
40	2	300	800	100	5	240	30	0.7	0.66	390	PBSM5240PF
		100	-	100	5	240	30	0.7	0.66	390	PBSM5240PFH



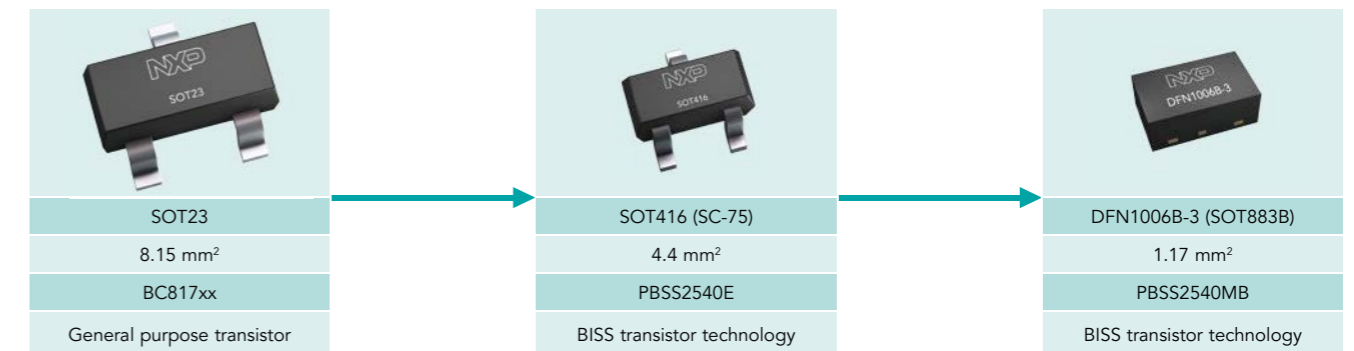
Combination of Low  $V_{CEsat}$  transistor with N-channel MOSFET in the very small and ultra thin leadless package DFN2020-6 (SOT1118)

### Advantages of low $V_{CEsat}$ (BISS) technology

Our BISS (Breakthrough In Small-Signal) transistors show lowest  $V_{CEsat}$  values due to an innovative mesh-emitter technology and further technology improvement. Benefit from:

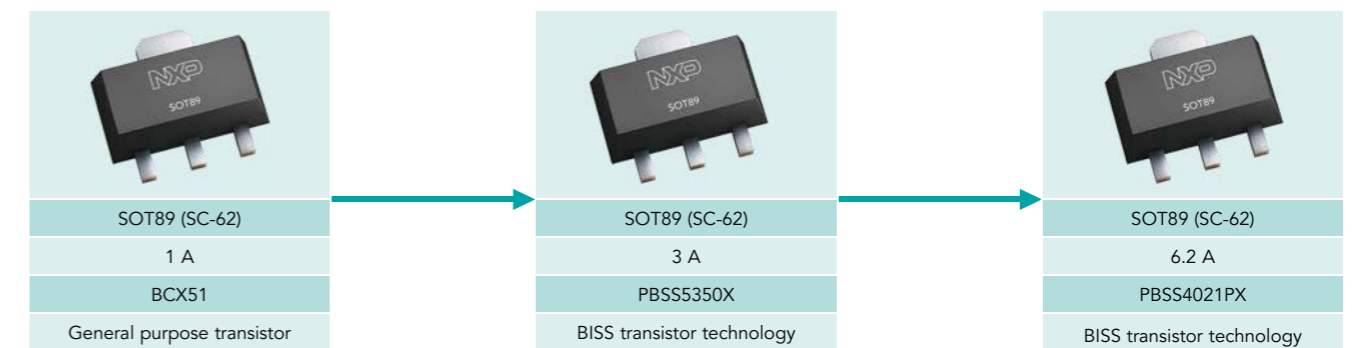
#### Reduction in board space

▶ Stable performance at smaller footprint ▶  $I_C = 0.5$  A;  $V_{CEO} = 40 - 45$  V



#### Improved collector current capabilities

▶ 17.87 mm² footprint



RETs 100 mA single - Part 1

Package				SOT23		SOT323 (SC-70)				
Size (mm)				2.9 x 1.3 x 1.0		2.0 x 1.25 x 0.95				
P <sub>tot</sub> (mW)				250		200				
V <sub>CE0</sub> (V)	I <sub>c</sub> (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	NPN	PNP	NPN	PNP		
50	100		1	1		PDTA113ET		PDTA113EU		
			2.2	2.2	PDTC123ET	PDTA123ET	PDTC123EU	PDTA123EU		
			4.7	4.7	PDTC143ET	PDTA143ET	PDTC143EU	PDTA143EU		
			10	10	PDTC114ET	PDTA114ET	PDTC114EU	PDTA114EU		
			22	22	PDTC124ET	PDTA124ET	PDTC124EU	PDTA124EU		
			47	47	PDTC144ET	PDTA144ET	PDTC144EU	PDTA144EU		
			100	100	PDTC115ET	PDTA115ET	PDTC115EU	PDTA115EU		
			1	10		PDTA113ZT		PDTA113ZU		
			2.2	10	PDTC123YT	PDTA123YT	PDTC123YU	PDTA123YU		
			2.2	47	PDTC123JT	PDTA123JT	PDTC123JU	PDTA123JU		
			4.7	10	PDTC143XT	PDTA143XT	PDTC143XU	PDTA143XU		
			4.7	47	PDTC143ZT	PDTA143ZT	PDTC143ZU	PDTA143ZU		
		10	47	PDTC114YT	PDTA114YT	PDTC114YU	PDTA114YU			
		22	47	PDTC124XT	PDTA124XT	PDTC124XU	PDTA124XU			
		47	10	PDTC144VT	PDTA144VT	PDTC144VU	PDTA144VU			
		47	22	PDTC144WT	PDTA144WT	PDTC144WU	PDTA144WU			
		2.2	-	PDTC123TT	PDTA123TT	PDTC123TU	PDTA123TU			
		4.7	-	PDTC143TT	PDTA143TT	PDTC143TU	PDTA143TU			
		10	-	PDTC114TT	PDTA114TT	PDTC114TU	PDTA114TU			
		22	-	PDTC124TT	PDTA124TT	PDTC124TU	PDTA124TU			
		47	-	PDTC144TT	PDTA144TT	PDTC144TU	PDTA144TU			
		100	-	PDTC115TT	PDTA115TT	PDTC115TU	PDTA115TU			
					2.2	10		PDTA113ZT		PDTA113ZU
		2.2	10		PDTC123YT	PDTA123YT	PDTC123YU	PDTA123YU		
2.2	47	PDTC123JT	PDTA123JT		PDTC123JU	PDTA123JU				
4.7	10	PDTC143XT	PDTA143XT		PDTC143XU	PDTA143XU				
4.7	47	PDTC143ZT	PDTA143ZT		PDTC143ZU	PDTA143ZU				
10	47	PDTC114YT	PDTA114YT		PDTC114YU	PDTA114YU				
22	47	PDTC124XT	PDTA124XT		PDTC124XU	PDTA124XU				
47	10	PDTC144VT	PDTA144VT		PDTC144VU	PDTA144VU				
47	22	PDTC144WT	PDTA144WT		PDTC144WU	PDTA144WU				
2.2	-	PDTC123TT	PDTA123TT		PDTC123TU	PDTA123TU				
4.7	-	PDTC143TT	PDTA143TT		PDTC143TU	PDTA143TU				
10	-	PDTC114TT	PDTA114TT		PDTC114TU	PDTA114TU				
22	-	PDTC124TT	PDTA124TT	PDTC124TU	PDTA124TU					
47	-	PDTC144TT	PDTA144TT	PDTC144TU	PDTA144TU					
100	-	PDTC115TT	PDTA115TT	PDTC115TU	PDTA115TU					

RETs 100 mA single - Part 2

Package				SOT416 (SC-75)		DFN1006-3 (SOT883)		DFN1006B-3 (SOT883B)				
Size (mm)				1.6 x 0.8 x 0.77		1.0 x 0.6 x 0.48		1.0 x 0.6 x 0.37				
P <sub>tot</sub> (mW)				150		250		250				
V <sub>CE0</sub> (V)	I <sub>c</sub> (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	NPN	PNP	NPN	PNP	NPN	PNP		
50	100		1	1		PDTA113EE		PDTA113EM		PDTA113EMB		
			2.2	2.2	PDTC123EE	PDTA123EE	PDTC123EM	PDTA123EM	PDTC123EMB	PDTA123EMB		
			4.7	4.7	PDTC143EE	PDTA143EE	PDTC143EM	PDTA143EM	PDTC143EMB	PDTA143EMB		
			10	10	PDTC114EE	PDTA114EE	PDTC114EM	PDTA114EM	PDTC114EMB	PDTA114EMB		
			22	22	PDTC124EE	PDTA124EE	PDTC124EM	PDTA124EM	PDTC124EMB	PDTA124EMB		
			47	47	PDTC144EE	PDTA144EE	PDTC144EM	PDTA144EM	PDTC144EMB	PDTA144EMB		
			100	100	PDTC115EE	PDTA115EE	PDTC115EM	PDTA115EM	PDTC115EMB	PDTA115EMB		
			1	10		PDTA113ZE		PDTA113ZM		PDTA113ZMB		
			2.2	10	PDTC123YE	PDTA123YE	PDTC123YM	PDTA123YM	PDTC123YMB	PDTA123YMB		
			2.2	47	PDTC123JE	PDTA123JE	PDTC123JM	PDTA123JM	PDTC123JMB	PDTA123JMB		
			4.7	10	PDTC143XE	PDTA143XE	PDTC143XM	PDTA143XM	PDTC143XMB	PDTA143XMB		
			4.7	47	PDTC143ZE	PDTA143ZE	PDTC143ZM	PDTA143ZM	PDTC143ZMB	PDTA143ZMB		
			10	47	PDTC114YE	PDTA114YE	PDTC114YM	PDTA114YM	PDTC114YMB	PDTA114YMB		
			22	47	PDTC124XE	PDTA124XE	PDTC124XM	PDTA124XM	PDTC124XMB	PDTA124XMB		
			47	10	PDTC144VE	PDTA144VE	PDTC144VM	PDTA144VM	PDTC144VMB	PDTA144VMB		
			47	22	PDTC144WE	PDTA144WE	PDTC144WM	PDTA144WM	PDTC144WMB	PDTA144WMB		
			2.2	-	PDTC123TE	PDTA123TE	PDTC123TM	PDTA123TM	PDTC123TMB	PDTA123TMB		
			4.7	-	PDTC143TE	PDTA143TE	PDTC143TM	PDTA143TM	PDTC143TMB	PDTA143TMB		
		10	-	PDTC114TE	PDTA114TE	PDTC114TM	PDTA114TM	PDTC114TMB	PDTA114TMB			
		22	-	PDTC124TE	PDTA124TE	PDTC124TM	PDTA124TM	PDTC124TMB	PDTA124TMB			
		47	-	PDTC144TE	PDTA144TE	PDTC144TM	PDTA144TM	PDTC144TMB	PDTA144TMB			
		100	-	PDTC115TE	PDTA115TE	PDTC115TM	PDTA115TM	PDTC115TMB	PDTA115TMB			
					2.2	10		PDTA113ZE		PDTA113ZM		PDTA113ZMB
		2.2	10		PDTC123YE	PDTA123YE	PDTC123YM	PDTA123YM	PDTC123YMB	PDTA123YMB		
		2.2	47		PDTC123JE	PDTA123JE	PDTC123JM	PDTA123JM	PDTC123JMB	PDTA123JMB		
		4.7	10		PDTC143XE	PDTA143XE	PDTC143XM	PDTA143XM	PDTC143XMB	PDTA143XMB		
		4.7	47		PDTC143ZE	PDTA143ZE	PDTC143ZM	PDTA143ZM	PDTC143ZMB	PDTA143ZMB		
		10	47		PDTC114YE	PDTA114YE	PDTC114YM	PDTA114YM	PDTC114YMB	PDTA114YMB		
		22	47		PDTC124XE	PDTA124XE	PDTC124XM	PDTA124XM	PDTC124XMB	PDTA124XMB		
		47	10		PDTC144VE	PDTA144VE	PDTC144VM	PDTA144VM	PDTC144VMB	PDTA144VMB		
		47	22		PDTC144WE	PDTA144WE	PDTC144WM	PDTA144WM	PDTC144WMB	PDTA144WMB		
		2.2	-		PDTC123TE	PDTA123TE	PDTC123TM	PDTA123TM	PDTC123TMB	PDTA123TMB		
		4.7	-		PDTC143TE	PDTA143TE	PDTC143TM	PDTA143TM	PDTC143TMB	PDTA143TMB		
		10	-		PDTC114TE	PDTA114TE	PDTC114TM	PDTA114TM	PDTC114TMB	PDTA114TMB		
		22	-		PDTC124TE	PDTA124TE	PDTC124TM	PDTA124TM	PDTC124TMB	PDTA124TMB		
		47	-		PDTC144TE	PDTA144TE	PDTC144TM	PDTA144TM	PDTC144TMB	PDTA144TMB		
100	-	PDTC115TE	PDTA115TE		PDTC115TM	PDTA115TM	PDTC115TMB	PDTA115TMB				

RETs 100 mA double

Package					SOT457 (SC-74)		SOT363 (SC-88)			SOT666					
Size (mm)					2.9 x 1.5 x 1.0		2.0 x 1.25 x 0.95			1.6 x 1.2 x 0.55					
P <sub>tot</sub> (mW)					750		300			300					
V <sub>CE0</sub> (V)	I <sub>c</sub> (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	NPN / NPN	NPN / PNP	NPN / NPN	NPN / PNP	PNP / PNP	NPN / NPN	NPN / PNP	PNP / PNP			
50	100	R1 = R2	2.2	2.2				PUMH20	PUMD20	PUMB20	PEMH20	PEMD20	PEMB20		
			4.7	4.7					PUMH15	PUMD15	PUMB15	PEMH15	PEMD15	PEMB15	
			10	10			PIMD3		PUMH11	PUMD3	PUMB11	PEMH11	PEMD3	PEMB11	
			22	22			PIMD2		PUMH1	PUMD2	PUMB1	PEMH1	PEMD2	PEMB1	
			47	47					PUMH2	PUMD12	PUMB2	PEMH2	PEMD12	PEMB2	
			100	100					PUMH24	PUMD24	PUMB24	PEMH24	PEMD24	PEMB24	
			2.2	47					PUMH10	PUMD10	PUMB10	PEMH10	PEMD10	PEMB10	
			4.7	10					PUMH18	PUMD18	PUMB18	PEMH18	PEMD18	PEMB18	
			4.7	47					PUMH13	PUMD13	PUMB13	PEMH13	PEMD13	PEMB13	
			10	47			PIMH9		PUMH9	PUMD9	PUMB9	PEMH9	PEMD9	PEMB9	
			22	47					PUMH16	PUMD16	PUMB16	PEMH16	PEMD16	PEMB16	
			47	22					PUMH17	PUMD17	PUMB17	PEMH17	PEMD17	PEMB17	
		47 / 2.2	47 / 47						PUMD48			PEMD48			
		2.2	-						PUMH30	PUMD30	PUMB30	PEMH30	PEMD30	PEMB30	
		4.7	-						PUMH7	PUMD6	PUMB3	PEMH7	PEMD6	PEMB3	
		10	-						PUMH4	PUMD4	PUMB4	PEMH4	PEMD4	PEMB4	
		22	-						PUMH19	PUMD19	PUMB19	PEMH19	PEMD19	PEMB19	
		47	-						PUMH14	PUMD14	PUMB14	PEMH14	PEMD14	PEMB14	
				R1 ≠ R2	2.2	10				PUMH10	PUMD10	PUMB10	PEMH10	PEMD10	PEMB10
		4.7	10							PUMH18	PUMD18	PUMB18	PEMH18	PEMD18	PEMB18
		4.7	47							PUMH13	PUMD13	PUMB13	PEMH13	PEMD13	PEMB13
		10	47				PIMH9			PUMH9	PUMD9	PUMB9	PEMH9	PEMD9	PEMB9
		22	47							PUMH16	PUMD16	PUMB16	PEMH16	PEMD16	PEMB16
		47	22							PUMH17	PUMD17	PUMB17	PEMH17	PEMD17	PEMB17
47 / 2.2	47 / 47							PUMD48			PEMD48				
2.2	-							PUMH30	PUMD30	PUMB30	PEMH30	PEMD30	PEMB30		
4.7	-							PUMH7	PUMD6	PUMB3	PEMH7	PEMD6	PEMB3		
10	-							PUMH4	PUMD4	PUMB4	PEMH4	PEMD4	PEMB4		
22	-							PUMH19	PUMD19	PUMB19	PEMH19	PEMD19	PEMB19		
47	-							PUMH14	PUMD14	PUMB14	PEMH14	PEMD14	PEMB14		

RETs 500 mA

types in **bold** represent new products

Package					SOT457 (SC-74)		SOT23		SOT323 (SC-70)			
Size (mm)					2.9 x 1.5 x 1.0		2.9 x 1.3 x 1.0		2.0 x 1.25 x 0.95			
P <sub>tot</sub> (mW)					750		250		200			
V <sub>CE0</sub> (V)	I <sub>c</sub> (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	NPN / NPN	NPN / PNP	NPN	PNP	NPN	PNP		
50	500	R1 = R2	1	1				PDTD113ET	PDTB113ET	<b>PDTD113EU</b>	<b>PDTB113EU</b>	
			2.2	2.2					PDTD123ET	PDTB123ET	<b>PDTD123EU</b>	<b>PDTB123EU</b>
			4.7	4.7					<b>PDTD143ET</b>	<b>PDTB143ET</b>	<b>PDTD143EU</b>	<b>PDTB143EU</b>
			10	10					<b>PDTD114ET</b>	<b>PDTB114ET</b>	<b>PDTD114EU</b>	<b>PDTB114EU</b>
			1	10			PIMN31	PIMC31	PDTD113ZT	PDTB113ZT	<b>PDTD113ZU</b>	<b>PDTB113ZU</b>
			2.2	10					PDTD123YT	PDTB123YT	<b>PDTD123YU</b>	<b>PDTB123YU</b>
		4.7	10					<b>PDTD143XT</b>	<b>PDTB143XT</b>	<b>PDTD143XU</b>	<b>PDTB143XU</b>	
		2.2	-					PDTD123TT	PDTB123TT			
				R1 ≠ R2	2.2	10						
		4.7	10									
		10	10									
		2.2	10									
4.7	10											
2.2	-											

Single transistors NPN

Package						SOT23	SOT323 (SC-70)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
Size (mm)						2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.48	1.0 x 0.6 x 0.37
P <sub>tot</sub> (mW)						250	200	150	250	250
V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)						
25	100	450	1200	100						
30	100	110 - 200	450 - 800	100	BC848B		PMST5089			BC848W
		350	900	100			PMST5088			
32	100	110 - 420	220 - 800	100	BCW31 / 32 / 33					
		180 - 380	310 - 630	250	BCW60B / C / D					
45	100	110 - 420	220 - 800	100	BC847 / A / B / C	BC847W / AW / BW / CW	BC847T / AT / BT / CT	BC847AM / BM / CM	BC847AMB / BMB / CMB	
		120 - 380	220 - 630	100	BCX70G / H / J / K					
		110 - 200	220 - 450	100	BCW71 / 72					
50	100	210 - 290	340 - 460	100 - 150	PMBT6429	PMST6429				
		250	650	100	2PD601ART	2PD601ARW / SW				
		290	460	100	2PD601ARL					
60	100	110 - 200	220 - 450	100	BCV71 / 72					
65	100	110 - 200	220 - 450	100	BC846 / A / B	BC846W / AW / BW	BC846T / AT / BT		BC846BMB	
80	100	20	80	60	BSS64					
50	150	120 - 200	240 - 400	80	NXP3875Y / G					
		120 - 270	270 - 560	100		2PC4081Q / R / S	2PC4617Q / R	2PC4617QM / RM	2PC4617QMB / RMB	
		210	340	100	2PD601BRL					
45	500	100 - 250	250 - 600	100	BC817 / -16 / -25 / -40	BC817W / -16W / -25W / -40W				
		100	600	100	BCX19					
50	500	85 - 170	170 - 340	140 - 180	2PD602AQL	2PD1820AR / S				
60	500	50	-	100	2PD602ARL					
80	500	100	-	50	2PD602ASL					
					PMSTA05					
					PMBTA06	PMSTA06				

Single transistors PNP

Package						SOT23	SOT323 (SC-70)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
Size (mm)						2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.48	1.0 x 0.6 x 0.37
P <sub>tot</sub> (mW)						250	200	150	250	250
V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)						
30	100	125 - 220	500 - 800	100	BC858B	BC858W				
32	100	120 - 215	260 - 500	100	BCW29 / 30					
		180 - 380	310 - 630	100	BCW61B / C / D					
45	100	210 - 290	340 - 460	70 - 80	2PB709ART	2PB709ARW / SW				
		180 - 380	310 - 630	100	2PB709ARL					
		120 - 215	260 - 500	100	2PB709ASL					
		180 - 380	310 - 630	100	BCX71H / J / K					
60	100	125 - 420	250 - 800	100	BCW69 / 70					
65	100	125 - 200	250 - 475	100	BC857 / A / B / C	BC857W / AW / BW / CW	BC857T / AT / BT / CT	BC857AM / BM / CM	BC857AMB / BMB / CMB	
100	100	30	-	50	BCW89					
50	150	120 - 270	270 - 560	100	BSS63	2PA1576Q / R / S	2PA1774Q / R / S	2PA1774QM / RM / SM	2PA1774QMB / RMB / SMB	
		210	340	100	2PB709BRL					
		290	460	100	2PB709BSL					
25	500	100	600	80	BCX18					
45	500	100 - 250	250 - 600	80	BC807 / -16 / -25 / -40	BC807W / -16W / -25W / -40W				
		100	600	80	BCX17					
50	500	85 - 170	170 - 340	100 - 140	2PB710ARL	2PB1219AQ / R / S				
60	500	100	-	50	2PB710ASL					
80	500	100	-	50	PMSTA55					
					PMBTA56	PMSTA56				

Double transistors

types in bold represent new products

Package						SOT457 (SC-74)	SOT363 (SC-88)	SOT666	DFN1010B-6 (SOT1216)	
Size (mm)						2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.0 x 1.0 x 0.33	
P <sub>tot</sub> (mW)						750	300	300	350	
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)					
NPN	40	100	120	450	100			PUMX1		
	45	100	200	450	100	BC847DS	BC847BS	BC847BV	<b>BC847QAS</b>	
	65	100	110	-	100			BC846S		
			200	450	100	BC846DS	BC846BS			
PNP	50	150	120	560	100			PUMX2		
	45	500	160	400	80	BC817DS				
	40	100	120	450	100	PIMT1	PUMT1	PEMT1		
	45	100	200	450	100		BC857BS	BCC857BV	<b>BC857QAS</b>	
NPN / PNP	65	100	110	-	100		BC856S			
			200	450	100		BC856BS			
	45	500	160	400	80	BC807DS				
	40	100	120	450	100		PUMZ1	PEMZ1		
NPN / PNP	45	100	200	450	100		BC847BPN	BC847BVN	<b>BC847QAPN</b>	
			50	100	120	560	100	PIMZ2	PUMZ2	
	65	100	200	450	100		BC846BPN			
	12	500	200	-	250 / 100			PEMZ7		
45	500	160	160	100 / 800		BC817DPN				

Single and double switching transistors

Package							SOT223 (SC-73)	SOT89 (SC-62)	SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOT666	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)			
Size (mm)							6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.48	1.0 x 0.6 x 0.37			
P <sub>tot</sub> (mW)							1700	1300	250	200	300	300	250	250			
Configuration							single	single	single	single	double	double	single	single			
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)	t <sub>off</sub> (ns)											
NPN	12	100	40	120	400	20			BSV52								
	40	200	100	300	180	1200			PMBS3904	PMSS3904							
			300	250													
	15	600	40	120	500	20			PMBT2369	PMST2369							
			40	200	100	300	300	250			MMBT3904						
	40	600	100	300	250	250	250			PMBT3904	PMST3904	PMBT3904YS	PMBT3904VS	PMBT3904M	PMBT3904MB		
										PMBT2222	PMST2222						
			40	600	100	300	300	250	250	PZT4401	PXT4401	PMBT4401	PMST4401				
											MMBT2222A	PMST2222A					
PNP	40	800	100	300	300	250			PZT2222A	PXT2222A	PMBT2222A	PMST2222A					
	40	100	100	300	150	700			BSR14								
									PMBS3906	PMSS3906							
	40	200	100	300	250	300	300			MMBT3906							
										PMBT3906	PMST3906	PMBT3906YS	PMBT3906VS	PMBT3906M	PMBT3906MB		
	40	600	100	300	200	350	365	PZT4403	PXT4403	PMBT4403	PMST4403						
								300	300	200	365	300			PMBT2907		
																	PMST2907A
60	600	100	300	200	365			BSR16									
NPN / PNP	40	200	100	300	300 / 250	250 / 300	PZT2907A	PXT2907A	PMBT2907A								
											PMBT3946YPN	PMBT3946VFN					

### Medium power general purpose transistors

Package						SOT223 (SC-73)	SOT89 (SC-62)	DFN2020-3 (SOT1061)
Size (mm)						6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.0 x 2.0 x 0.62
P <sub>tot</sub> (mW)						1700	1300	1100
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)			
NPN	20	2	85 - 160	375	40	BCP68 / -25	BC868 / -25	BC68PA / BC68-25PA
	45	1	63 - 100	160 - 250	100	BCP54 / -10 / -16	BCX54 / -10 / -16	BC54PA / BC54-10PA / BC54-16PA
	60	1	63 - 100	160 - 250	100	BCP55 / -10 / -16	BCX55 / -10 / -16	BC55PA / BC55-10PA / BC55-16PA
			100	300	100	BSP41	BSR41	
80	1	63 - 100	160 - 250	100	BCP56 / -10 / -16	BCX56 / -10 / -16	BC56PA / BC56-10PA / BC56-16PA	
PNP	20	2	85 - 160	250 - 375	40	BCP69 / -16 / -25	BC869 / -16 / -25	BC69PA / BC69-16PA / BC69-25PA
	45	1	63 - 100	160 - 250	115 <sup>1)</sup> - 145 <sup>1)</sup>	BCP51 / -10 / -16	BCX51 / -10 / -16	BC51PA / BC51-10PA / BC51-16PA
	60	1	63 - 100	160 - 250	100	BCP52 / -10 / -16	BCX52 / -10 / -16	BC52PA / BC52-10PA / BC52-16PA
			40 - 100	120 - 300	100	BSP31	BSR30 / 31	
	80	1	63 - 100	160 - 250	115 <sup>1)</sup> - 145 <sup>1)</sup>	BCP53 / -10 / -16	BCX53 / -10 / -16	BC53PA / BC53-10PA / BC53-16PA
			40 - 100	120 - 300	100	BSP32 / 33	BSR33	

<sup>1)</sup> Typical value

In the Spotlight

#### Medium power transistors in DFN2020-3

- Excellent electrical performance on a small 2 x 2 mm footprint
- 80% board space reduction (DFN2020-3 vs. SOT89)
- V<sub>CEO</sub> ranging from 20 to 80 V
- High collector current capability I<sub>C</sub> up to 2 A
- AEC-Q101 qualified



### High voltage transistors

Package						SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)	SOT23	SOT323 (SC-70)	
Size (mm)						6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	
P <sub>tot</sub> (mW)						1700	1300	750	250	200	
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)						
NPN	80	100	20	-	60				BSS64		
	140	300	60	250	100				PMBT5550	PMST5550	
	160	300	80	250	100				PMBT5551/BSR19A	PMST5551	
	250	100	50	-	60		BF722	BF622		BF822	
			50	-	60		BF720	BF620		BF820	BF820W
	300	100	40	-	50		PZTA42	PXTA42		PMBTA42	PMSTA42
350	100	40	-	70		BSP19	BST39				
PNP	400	300	50	200	20		PZTA44			PMBTA44	
	100	100	30	-	50					BSS63	
	250	100	50	-	60		BF723				
			50	-	60			BF623			BF823
	300	100	50	-	60			BF621		BF821	
2 x NPN	300	100	40	-	50		PZTA92	PXTA92		PMBTA92	PMSTA92
										PMBTA42DS	

For high voltage transistors with increased performance please refer to our high voltage low V<sub>CEsat</sub> (BISS) transistor portfolio on page 64.

### LED driver

types in bold represent new products

Package		SOT457
Size (mm)		2.9 x 1.5 x 1.0
P <sub>tot</sub> (mW)		750
Vs Supply voltage [V]		LED drive current [mA] @ Vs=10V
40		10
		20
		50
		<b>NCR401U</b>
		<b>NCR402U</b>
		<b>NCR405U</b>

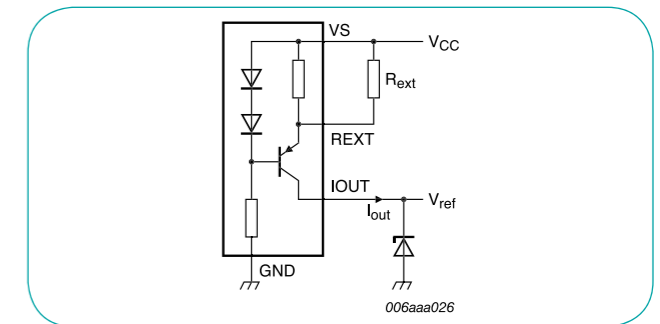
#### Key features and benefits

- Single-chip constant current source with reduced component count
- Very small footprint package for smaller designs

#### Key applications

- Constant current LED driver
- Generic constant current source
- Active bias control for audio amplifiers

#### Voltage reference



### Constant current source

SOT353 (SC-88A)							
Package							
Size (mm)	2.0 x 1.25 x 0.95						
P <sub>tot</sub> (mW)	335						
Type	PSSI2021SAY						
Description	maximum supply voltage	maximum supply current	typical stabilized output current	minimum stabilized output current	maximum stabilized output current	typical load stability of stabilized output current	typical output current change over ambient temperature
Parameter	V <sub>S</sub> max (V)	I <sub>S</sub> max (mA)	I <sub>out</sub> typ (μA)	I <sub>out</sub> min (mA)	I <sub>out</sub> max (mA)	ΔI <sub>out</sub> /I <sub>out</sub> typ (%)	ΔI <sub>out</sub> /I <sub>out</sub> typ (%/K)
Value	75	2.2	15	0.015	50	0.5	0.15

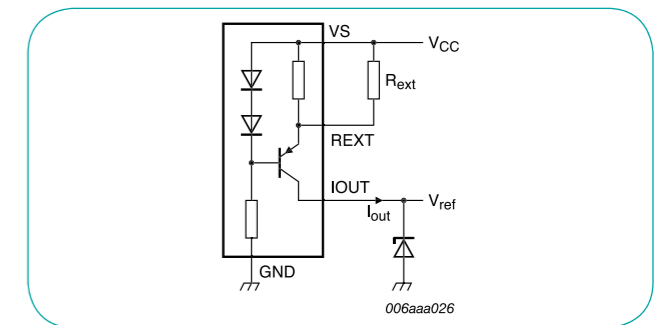
#### Key features and benefits

- Single-chip constant current source with reduced component count
- Output current set by an external resistor
- Very small footprint package for smaller designs

#### Key applications

- Constant current LED driver
- Generic constant current source
- Active bias control for audio amplifiers

#### Voltage reference



### Darlington transistors

Package					SOT223 (SC-73)	SOT89 (SC-62)	SOT23		
Size (mm)					6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0		
P <sub>tot</sub> (mW)					1700	1300	250		
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	f <sub>r</sub> min (MHz)					
NPN	30	500	10000	125			PMBTA13		
			20000	220	PZTA14	PXTA14	PMBTA14		
	45	1000	2000	200				BCV29	
			10000	220	BSP50	BST50	BCV49		
	60	500	2000	200				BCV47	
			10000	220	BSP51	BST51			
80	1000	2000	200				BSP52	BST52	
PNP	30	500	20000	125			PMBTA64		
			2000	200				BCV28	
	45	1000	2000	200				BSP60	BST60
			10000	220				BCV48	
	60	500	2000	200				BCV46	
			10000	220	BSP61	BST61			
80	1000	2000	200				BSP62	BST62	















### Schmitt trigger

Package							SOT143B
Size (mm)							2.9 x 1.3 x 1.0
P <sub>tot</sub> (mW)							250
Polarity	V <sub>CEO</sub> (V) TR1	V <sub>CEO</sub> (V) TR2	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	V <sub>CEsat</sub> typ (mV)	
NPN	30	6	100	110	800	250	BCV63 / B
PNP	30	6	100	220	475	250	BCV64B

### Low noise transistors

Package							SOT23	SOT323 (SC-70)
Size (mm)							2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95
P <sub>tot</sub> (mW)							250	200
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	Noise figure max (dB)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>r</sub> min (MHz)		
NPN	30	100	4	200	450	100	BC849B	BC849BW
				420	800	100	BC849C	BC849CW
	45	100	4	200	450	100	BC850B	BC850BW
				420	800	100	BC850C	BC850CW
PNP	30	100	4	220	475	100	BC859B	BC859BW
				420	800	100	BC859C	BC859CW
	45	100	4	220	475	100	BC860B	BC860BW
				420	800	100	BC860C	BC860CW

### Matched pair transistors

Package								SOT143B	SOT457 (SC-74)	SOT353 (SC-88A)	SOT363 (SC-88)	SOT666	LFAK56D (SOT1205)	
Size (mm)								2.9 x 1.3 x 1.0	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	4.9 x 4.45 x 1.0	
P <sub>tot</sub> (mW)								250	750	300	300	300	1250	
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	h <sub>FE1</sub> /h <sub>FE2</sub>	V <sub>BE1</sub> - V <sub>BE2</sub> (mV)								
NPN	30	100	110	800	0.7 <sup>1)</sup>	n.a.	BCV61/A/B/C <sup>1)</sup>							
							BCM61B <sup>1)</sup>							
	45	100	200	450	0.9 <sup>1)</sup>	2		BCM847DS		BCM847BS		BCM847BV		
									PMP4501G	PMP4501Y	PMP4501V			
	100	2000	150	400	0.98	2			PMP4201G	PMP4201Y	PMP4201V			
Configuration														
PNP	30	100	100	800	0.7 <sup>1)</sup>	n.a.	BCV62/A/B/C <sup>1)</sup>							
							BCM62B <sup>1)</sup>							
	45	100	200	450	0.95	2		BCM857DS		BCM857BS		BCM857BV		
									PMP5501G	PMP5501Y	PMP5501V			
	65	100	200	450	0.9	2			PMP5201G	PMP5201Y	PMP5201V			
100	2000	150	220	0.95	n.a.		BCM856DS		BCM856BS					
Configuration														

<sup>1)</sup> I<sub>C1</sub> / I<sub>E2</sub>

### In the Spotlight

#### New transistors in LFAK56D (SOT1205) power package

- High thermal power dissipation up to 3 W
- V<sub>ceo</sub> up to 100 V
- All types AECQ 101 qualified (I<sub>c</sub> = 2 A)
- 2 types with current gain matching of 5%**
- Reduced Printed-Circuit Board (PCB) size requirements
- High temperature applications up to 175 °C
- For LED lighting, motor drive, linear regulators, backlight units, PowerMOS and IGBT drive



#### Key features

- Current gain matching to 10%, 5% or 2%
- Base-emitter voltage matching to 2 mV
- Choice of standard double transistor pinout or application-optimized pinout
- Common-emitter configuration for 5-pin type
- Range of small, very small and ultra small packages

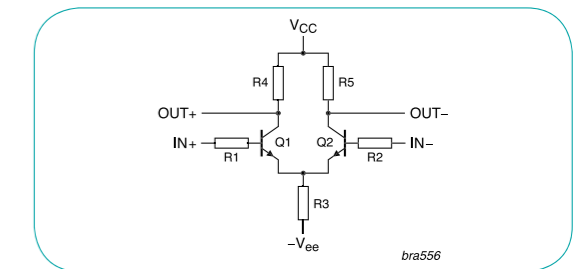
#### Key benefits

- Improved performance of current mirror and differential amplifier circuits
- Drop-in replacement for standard double transistors (BCM series)
- Simplified board layout (PMP series)
- Eliminates the need for costly additional trimming

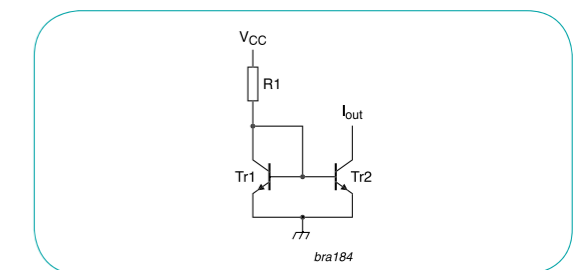
#### Key applications

- Current mirrors
- Differential and instrumentation amplifiers
- Logarithmic amplifiers
- Comparators

#### Differential amplifier



#### Current mirror



### MOSFET driver

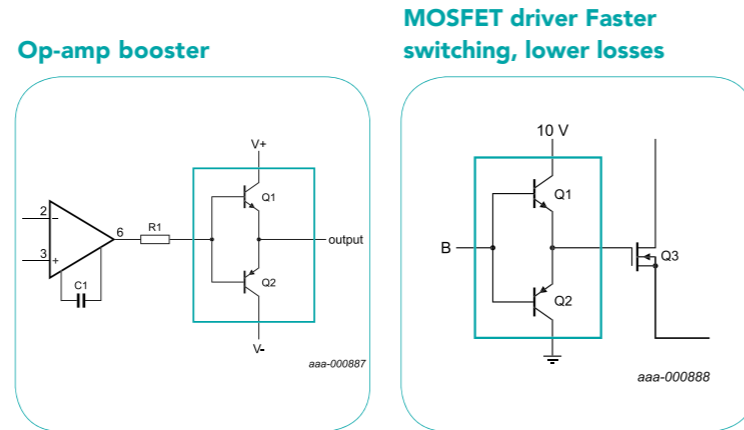
V <sub>CE0</sub> (V)	I <sub>C</sub> (mA)	I <sub>cm</sub> [A]	Type	Package	Remark	Configuration
30	0.1	0.2	BCV65	SOT143B	General purpose transistors	
40	0.6	1	PMD2001D	SOT457	Switching transistors with reduced storage time	
	1	2	PMD3001D		Low V <sub>CEsat</sub>	

#### Key features and benefits

- ▶ Three different configurations
- ▶ Types available with standard, switching, and low V<sub>CEsat</sub> (BISS) transistors
- ▶ Small footprint

#### Key applications

- ▶ Power management
  - (Half) bridge push-pull driver
  - Isolated DC/DC converters
  - Secondary synchronous rectification
- ▶ Peripheral driver
  - (Half) bridge push-pull driver
  - Motor driver
  - Brushless DC motor driver
  - Operational amplifier (Op-amp) output current booster



### Medium frequency transistors

Package						SOT23	SOT323 (SC-70)
Size (mm)						2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95
P <sub>tot</sub> (mW)						250	200
Polarity	V <sub>CE0</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>t</sub> typ (MHz)		
NPN	15	100	40	-	500	BF570	
	20	25		85	>275		BFS20
	40	30	65	225	260	BFS19	
PNP	40	25	67	220	380	BF840	
	30	25	25	50	250	BF824	BF824W
	40		50	-	>325	BF550	

### High voltage power bipolar transistors (for lighting, self oscillating power supplies and industrial applications)

V <sub>CESM</sub> (V)	I <sub>C(DC)</sub> (max) (A)	25 °C ind. t <sub>r</sub> (typ) (ns)	@ I <sub>C</sub> (A)	h <sub>FE</sub> (typ)	@ I <sub>C</sub> (A)	SOT54 (TO92)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT404 (D <sup>2</sup> PAK)	SOT428 (DPAK)	
700	1	80	1	7.5	0.8	BUJ100LR					
		50	1	14	0.75	PHE13003A					
	1.5	100	0.5	9	1	PHE13003C					
						PHD13003C*					
	4	30	2	12.5	3		BUJ103A	BUJ103AX		BUJ103AD	
									BUJD103AD*		
		100	2	17	2	2		PHE13005	PHE13005X		
								PHD13005*			
								BUJ105A		BUJ105AB	BUJ105AD
											BUJD105AD*
	8	20	5	11	4						
		40	5	9	5		PHE13007				
10	20	5	11	6		BUJ106A					
	12	100	5	7	8		PHE13009				
850	4	30	2	12.5	3		BUJD203A*	BUJD203AX*		BUJD203AD*	
1000	5	145	2.5	12	3		BUJ303A	BUJ303AX		BUJ303AD	
1050	4	370	2.5	17.5	2		BUJ302A	BUJ302AX		BUJ302AD	
							BUJ303B				
5	200	2.5	10.5	3						BUJ303CD	
1200	6	170	2.5	15.5	3		BUJ403A	BUT11APX-1200			

\* Integrated freewheeling diode

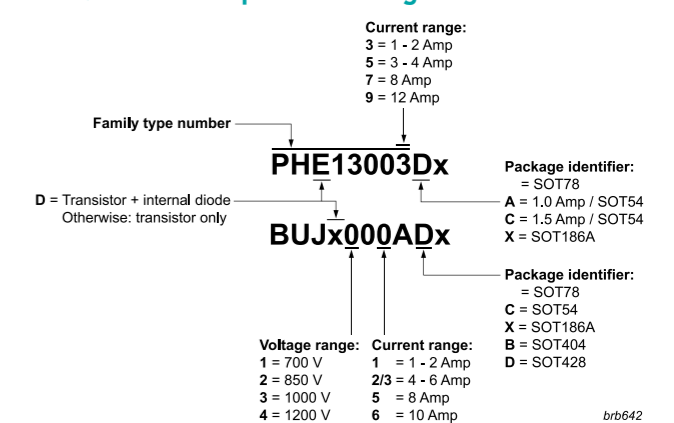
#### Key features and benefits

- ▶ Planar technology for voltage blocking stability and long-term reliability at elevated temperature
- ▶ Fast and smooth turn-off performance for low switching losses and improved efficiency
- ▶ Low saturation voltage for low conduction losses and improved efficiency
- ▶ Lowest overall power dissipation for lowest temperature rise and improved reliability
- ▶ Tightly-controlled manufacturing process for narrower gain (h<sub>FE</sub>) spread and easier circuit optimization
- ▶ Flat gain (h<sub>FE</sub>) vs current characteristic for correct circuit operation under all conditions
- ▶ Transistor design possesses inherent avalanche ruggedness

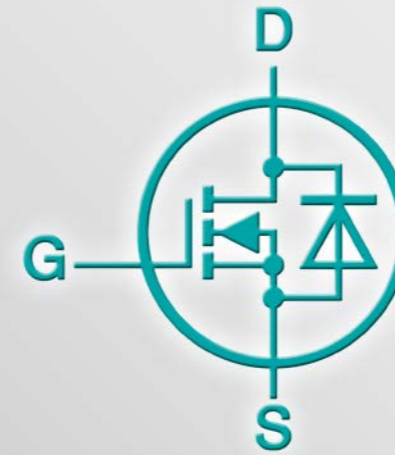
#### Key applications

- ▶ Compact Fluorescent Lamps
- ▶ Electronic ballasts for fluorescent lamps
- ▶ Electronic transformers for Low Voltage Tungsten Halogen lighting
- ▶ Power supplies and chargers – e.g. for mobile phones

#### PHx / BUJx series part numbering







# MOSFETs

## Small-signal MOSFETs

77

Small-signal MOSFETs in ultra-small DFN1006B package	81
Small-signal MOSFETs in DFN1010D-3 single and DFN1010B-3 dual package	83
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## Power MOSFETs

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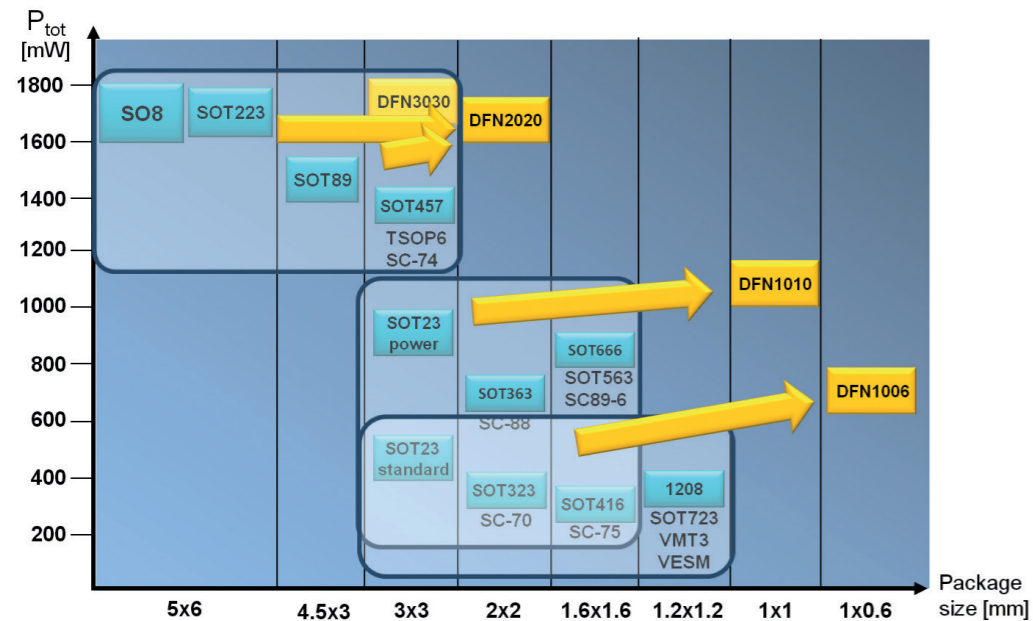
## Automotive MOSFETs

106

Small-signal Automotive MOSFETs	106
30 V N-channel Automotive TrenchMOS	108
40 V N-channel Automotive TrenchMOS	109
55 V - 60 V N-channel Automotive TrenchMOS	111
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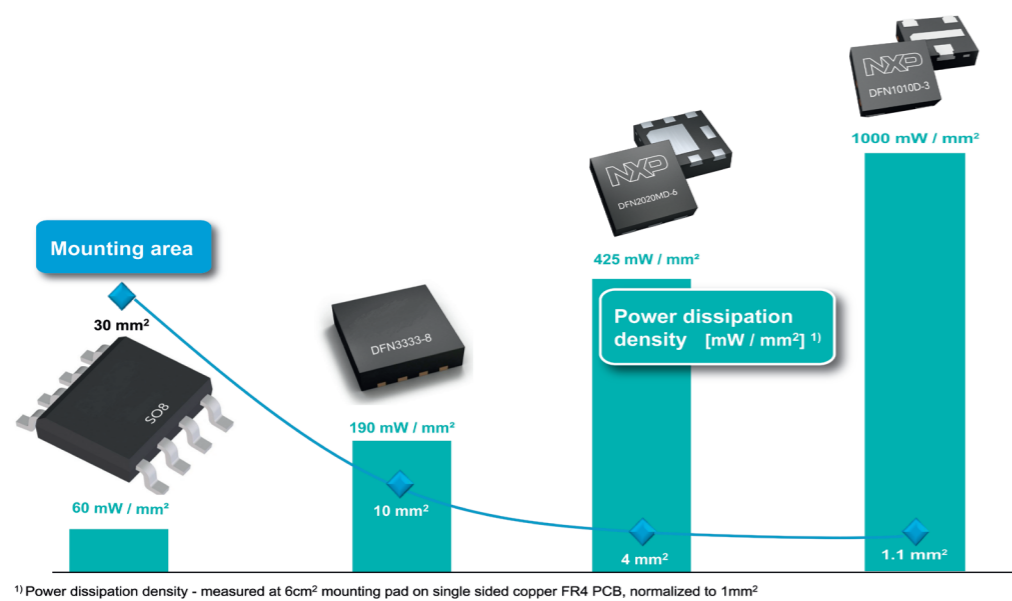
# DFN – Next generation packages for small, low $R_{DSon}$ MOSFETs

## From leaded to leadless packages



Replacement options for a dedicated  $R_{DSon}$  range of  $>10\text{ m}\Omega$  with improved power dissipation performance

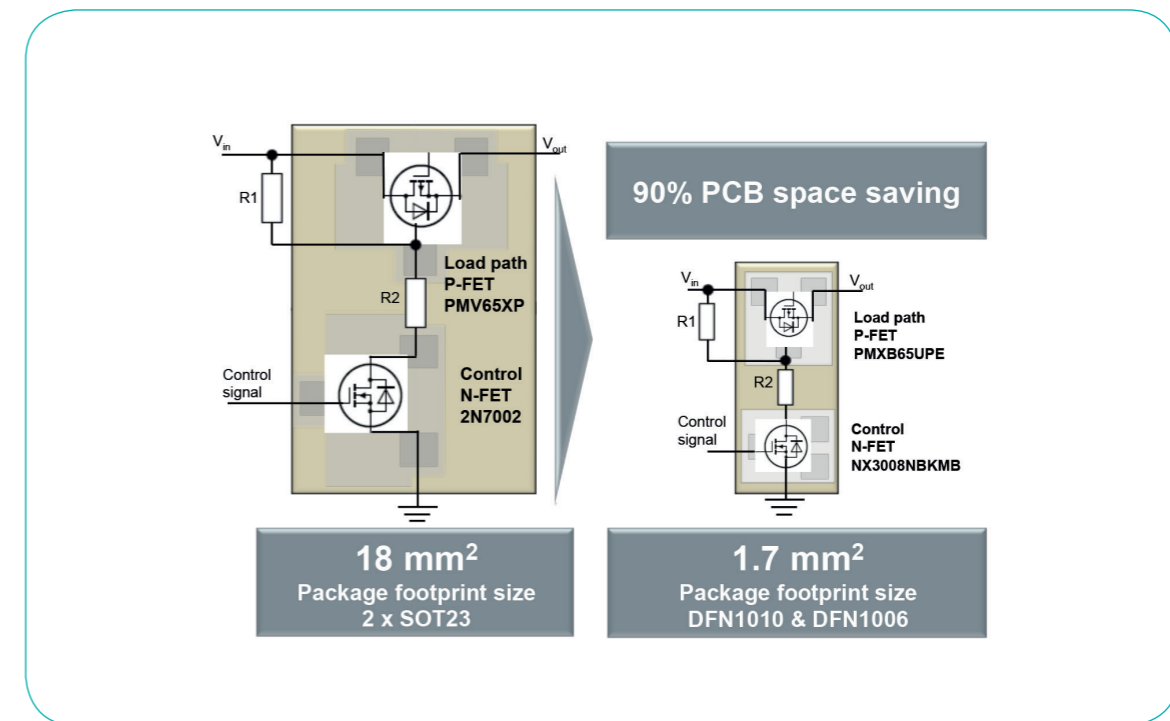
## Mounting area / power density comparison



<sup>1)</sup> Power dissipation density - measured at 6cm<sup>2</sup> mounting pad on single sided copper FR4 PCB, normalized to 1mm<sup>2</sup>

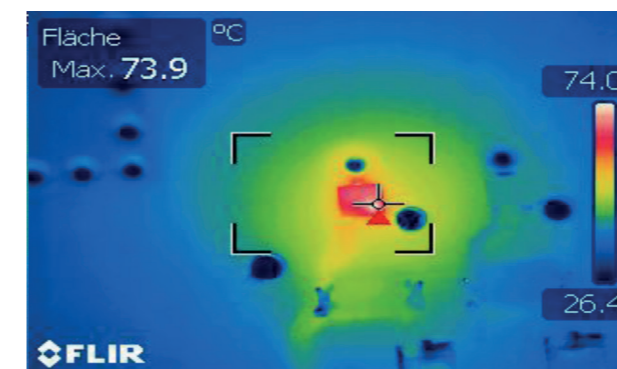
With a power dissipation density rating of 1000 mW per mm<sup>2</sup>, the DFN1010 package exceeds the performance of leaded packages like the SO8 by a factor of 16. The result is comparable thermal performance on a smaller mounting area, for smaller designs.

## PCB space saving potential of DFN packages



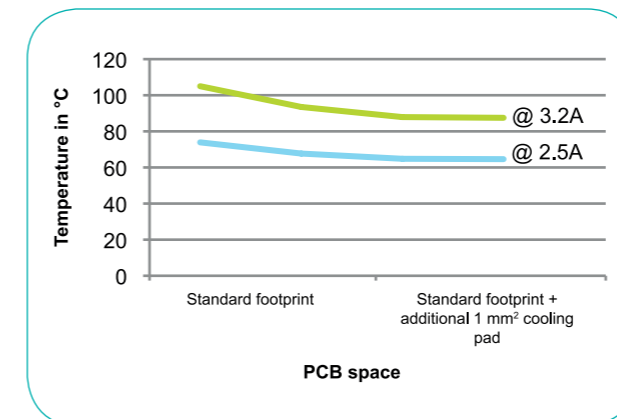
SOT23 based loadswitch realisation vs DFN based solution

## Thermal performance of DFN1010



$I_D$  of 2.5 A on 0.3 mm<sup>2</sup> footprint

- ▶ Only 74 °C device surface temperature at 2.5 A continuous drain current on standard footprint of 1 mm<sup>2</sup>
- ▶ The PCB cooling pad only consists of an area of 0.3 mm<sup>2</sup> originating from the device leads



- ▶ An increase of the cooling pad area results in a temperature decrease of 7 - 10 °C
- ▶ At a drain current of 3.2 A the surface temperature of the device reaches only 105 °C and stays within the specified operating temperature range

# DFN1006 – The new SOT23 for portables

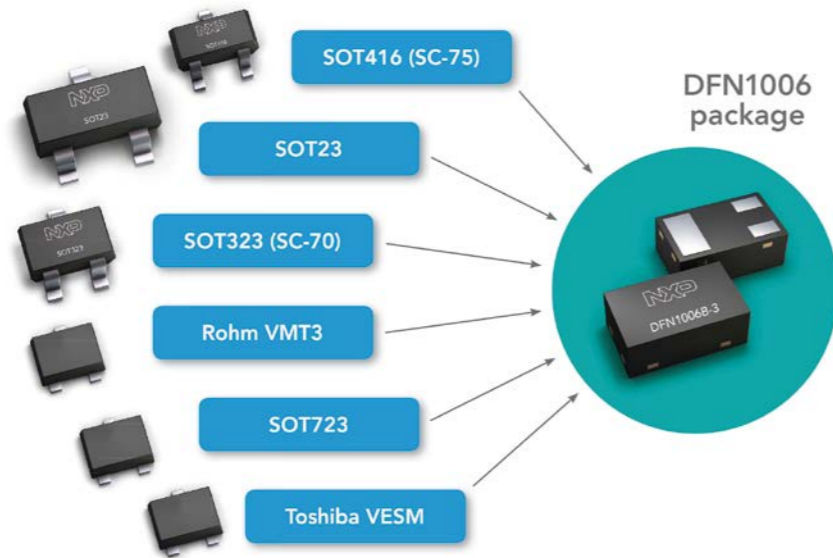


## The DFN1006 is the new standard package for portables

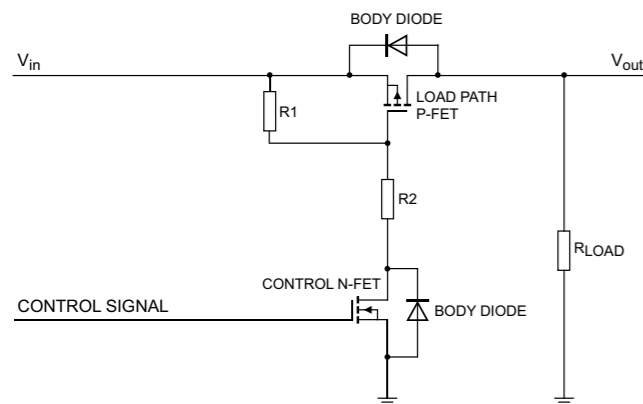
- ▶ SOT23 is the standard in computing and consumer
- ▶ DFN1006 is on the edge of becoming the same standard package for portables
- ▶ About a factor 7 smaller than a SOT23, but delivers the same power dissipation (360 mW)
- ▶ DFN1006 replaces larger packages in the same  $R_{DSon}$  range of >250 mΩ

## Choose the next generation – DFN1006

Replace larger package types with  $R_{DSon}$  values >250 mΩ



## Load switch application



The DFN1006 package is widely used for load switches in power management units of portable devices. It is used in any kind of power conversion and switching applications in small, thin, and battery driven electronic devices.

## Small-signal MOSFETs

## Small-signal MOSFETs in ultra-small DFN1006 and DFN1006B package

types in **bold** represent new products

Package		DFN1006-3 (SOT883)	DFN1006B (SOT883B)												
Size (mm)		1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37												
$P_{tot}$ (mW)		250	250												
Polarity	$V_{DS}$ (V)	$V_{GS}$ (V)	$I_D$ (A)	$V_{GS(th) min}$ (V)	$V_{GS(th) max}$ (V)	$t_{on typ}$ (ns)	$t_{off typ}$ (ns)	$Q_g typ$ (nC)	ESD Protection (kV)	$R_{DSon typ}$ (mΩ) @ $V_{GS} =$					
										10 V	4.5 V	2.5 V	1.8 V		
N-channel	20	8	2.28	0.45	0.95	4.5	18.5	0.89	2		250	320	420	PMZ250UN	
			<b>1</b>	0.45	0.95	4.5	18.5	0.89			290	360	460	<b>PMZ290UN</b>	PMZB290UN
			1	0.5	0.95	6	86	0.45			290	420	600		PMZB290UNE
		12	2.15	0.5	1.5	5	11	0.72			270	440		PMZ270XN	
			1	0.5	1.5	5	11	0.72			300	470			PMZB300XN
			0.48	0.45	0.95	4	18	0.89			1000	1100	1400	PMZ1000UN	
	30	8	1.78	0.45	0.95	4	18	0.89		390	460	550	PMZ390UN		
			<b>0.53</b>	0.6	1.1	15	69	0.52	2	1000	1400	2000		<b>NX3008NBKMB</b>	
			0.9	0.5	1.05	11	54	0.77	2	370	470	630		PMZB370UNE	
		12	0.9	0.45	0.95	4	18	0.75		420	490	580		PMZB420UN	
			1.87	0.5	1.5	6.5	14	0.65		350	520		PMZ350XN		
			<b>0.93</b>	0.5	1.5	6.5	14	0.65		380	550			<b>PMZB380XN</b>	
60	20	0.45	1.1	2.1	5	12	0.5	2	1000	1300			2N7002BKM		
		1.22	1	3	2	5	1.05		760	1100			PMZ760SN		
		0.45	1.1	2.1	5	12	0.5	2	1000	1300			2N7002BKMB		
	30	0.65	1	3	2	5	1.05		790	1130			<b>PMZB790SN</b>		
		1.4	0.45	0.95	4	26	1.3	1.8		330	420	520		PMZB350UPE	
		<b>0.68</b>	0.5	1.3	18	80	0.76	2		670	1200	1800		<b>PMZB670UPE</b>	
P-channel	20	8	0.3	0.6	1.1	19	65	0.55	2		2800	5300			<b>NX3008PBKMB</b>
			0.23	1.1	2.1	13	48	0.26	1	4500	5700			<b>BSS84AKM</b>	
	30	8	0.3	0.6	1.1	19	65	0.55	2		2800	5300			<b>BSS84AKM</b>

## In the Spotlight

### PMZB350UPE - smallest low $R_{DSon}$ P-ch load switch in DFN1006

20 V P-ch with  $R_{DSon}$  of typ. 330 mΩ @ 4.5 V

$I_D$  max of 1.4 A for medium current load switch

Ultra small footprint (1.0 x 0.6 mm) and low height (0.37 mm)

Low voltage gate drive with  $V_{GS(th)}$  typ. at 0.7 V

$R_{DSon}$  specified down to 1.8 V for low drive voltages



## Key features

- ▶ N-channel and P-channel
- ▶ Low  $R_{DSon}$  down to 250 mΩ
- ▶  $I_D$  up to 2.28 A
- ▶ Low voltage drive ( $V_{GS(th)} = 0.65$  V typ.)
- ▶ Voltage range of 20 to 60 V
- ▶ ESD protection of more than 3 kV

## Package

- ▶ 1.0 x 0.6 mm footprint
- ▶ Single package with different heights:
  - 0.5 mm for DFN1006 (SOT883)
  - 0.37 mm for DFN1006B (SOT883B)
- ▶ Power dissipation ( $P_{tot}$ ) of 360 mW

# DFN1010 – First 3 A MOSFETs on 1.1 mm<sup>2</sup> footprint

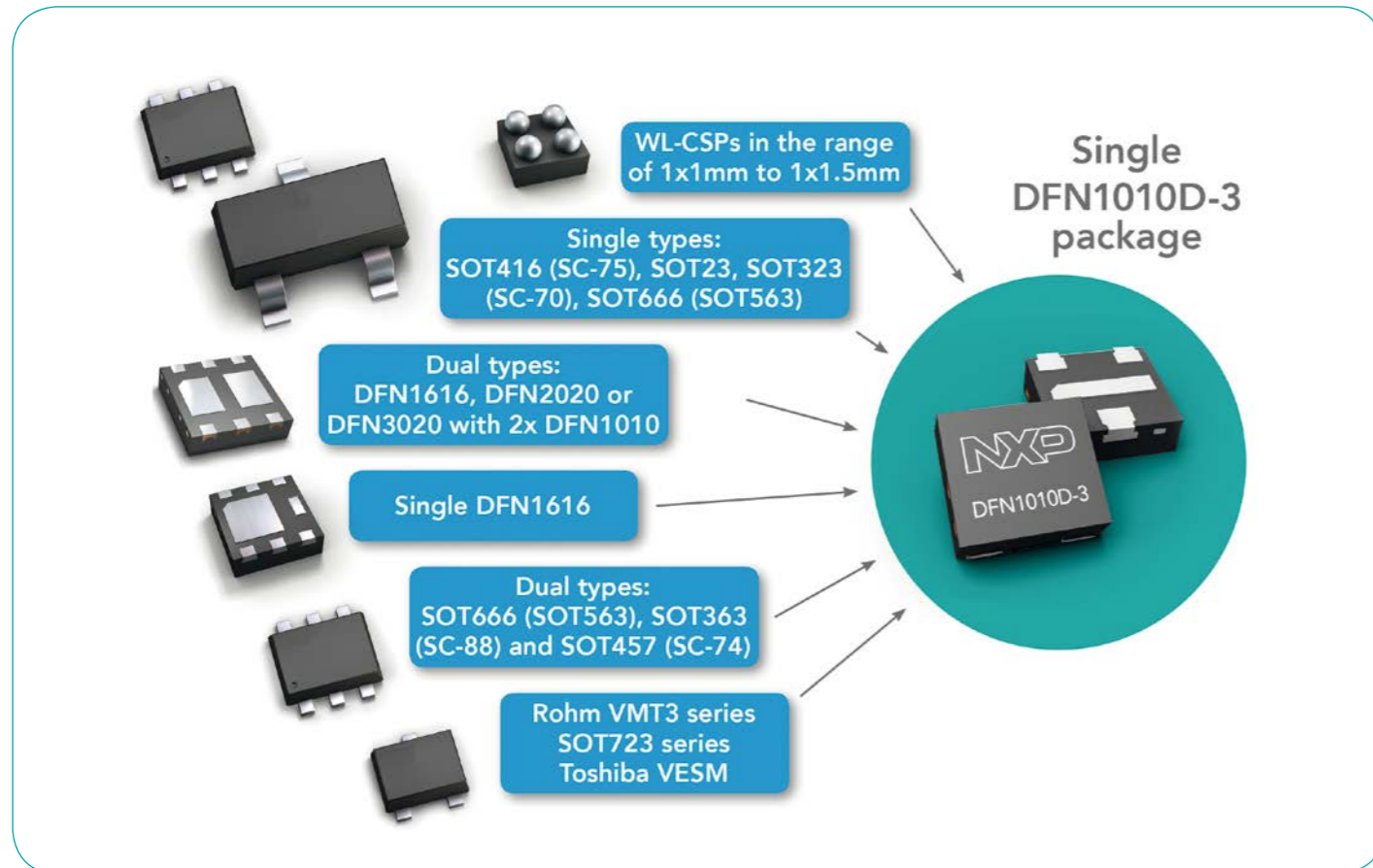
## Small & powerful – High performance on a small footprint

The DFN1010 package features high currents of up to 3.2 A and a high power dissipation of 1000 mW on a small footprint of only 1.1 mm<sup>2</sup>.



This new product series is housed in tiny leadless packages ideal for use in tight-footprint power management and load switches. Featuring small yet powerful high- $P_{tot}$  MOSFETs with benchmark values for  $R_{DSon}$ .

## The next generation of small packaging - featuring currents up to 3 A on a 1.1 mm<sup>2</sup> footprint



The DFN1010 can be used for new designs in space constrained application and replace larger packages in the same  $R_{DSon}$  range

## Small-signal MOSFETs

### Small-signal MOSFETs in DFN1010D-3 single and DFN1010B-6 dual package types in bold represent new products

Package		DFN1010D-3 (SOT1215)		DFN1010B-6 (SOT1216)														
Size (mm)		1.1 x 1.0 x 0.37		1.1 x 1.0 x 0.37														
$P_{tot}$ (mW)		1000		350														
Configuration	Polarity	$V_{DS}$ (V)	$V_{GS}$ (V)	$I_D$ (A)	$V_{GS(th) min}$ (V)	$V_{GS(th) max}$ (V)	$t_{on} typ$ (ns)	$t_{off} typ$ (ns)	$Q_G typ$ (nC)	ESD Protection (kV)	$R_{DSon} typ$ (m $\Omega$ ) @ $V_{GS} =$							
											10 V	4.5 V	2.5 V	1.8 V	1.5 V	1.2 V		
Single	N	12	8	1.1	0.4	0.9	6	18	6.6	1	34	39	46	50	121	<b>PMXB40UNE</b>		
		20	8	3.2	0.5	0.9	6	17	5.7	1	42	48	56	64		<b>PMXB43UNE</b>		
		30	20	3.2	1	2	3	11	3.6		49	56				<b>PMXB56EN</b>		
		80	20	3.2	1	2.5	3	11	6	1	44	56				<b>PMXB65ENE</b>		
	P	12	8	2.0	0.4	0.9				1.5	60	80	120	200		<b>PMXB65UPE</b>		
		20	8	1.8	0.4	0.9				1	70	87	130	200		<b>PMXB75UPE</b>		
		30	8	1.2	0.45	0.95	3	18	1.25	1.5	350	450	600	760	1200	<b>PMXB350UPE</b>		
		80	20	2.4	1	2.5	4	16	6.2	1	100	125				<b>PMXB120EPE</b>		
Dual	N	20	8	0.6	0.45	0.95	5.6	19	0.4	1	470	620	845	1125	2210		<b>PMDXB600UNE</b>	
	P	20	8	0.5	0.45	0.95	2.3	13.5	1.19	1	1020	1270	1700	2300	3500		<b>PMDXB950UPE</b>	
Complementary	N	20	8	0.6	0.45	0.95	5.6	19	0.4	1	470	620	845	1125	2210		<b>PMXCB900UE</b>	
	P	20	8	0.5	0.45	0.95	2.3	13.5	1.19	1	1020	1270	1700	2300	3500		<b>PMXCB900UE</b>	

### Key features

- ▶N-channel and P-channel
- ▶Low  $R_{DSon}$  down to 34 m $\Omega$
- ▶ $I_D$  up to 3.2 A
- ▶Low voltage drive ( $V_{GS(th)} = 0.65$  V typ.)
- ▶Voltage range of 12 to 80 V
- ▶ESD protection of more than 1 kV

### Package

- ▶1.1 x 1.0 x 0.37 mm package size
- ▶Single and dual package
- ▶High power dissipation ( $P_{tot}$ ) of 1000 mW single and 350 mW for dual package
- ▶Single package with tin-plated, solderable side pads for improved mounting and automotive conformity

**In the Spotlight**

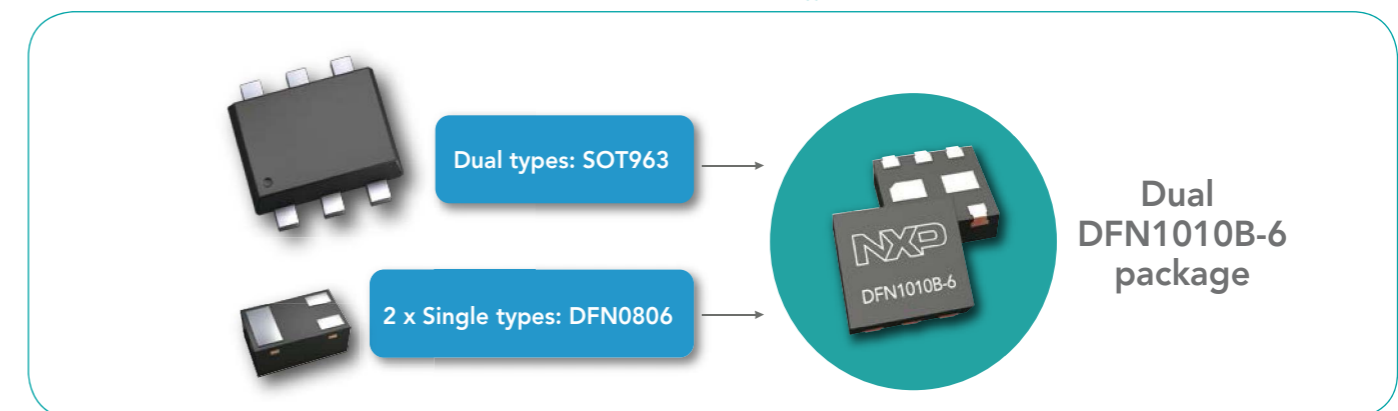
**PMXB40UNE – Low  $R_{DSon}$  of only 34 m $\Omega$**

Small and leadless ultra-thin SMD package: 1.1 x 1.0 x 0.37 mm

20 V N-ch with  $R_{DSon}$  of typ. 34 m $\Omega$  @  $V_{GS} = 4.5$  V

Tin-plated 100% solderable side pads for optical solder inspection

### Dual DFN1010 types - Replace larger packages with comparables $R_{DSon}$ values

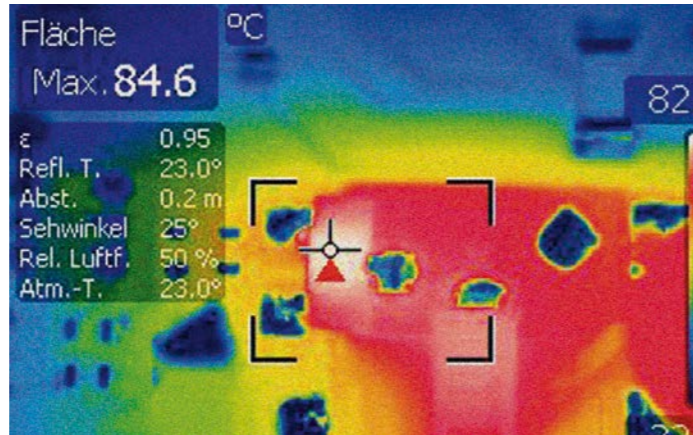


# DFN2020 – Switching performance and low $R_{DSon}$ MOSFETs

## MOSFETs in DFN package for DC-DC converter



Demo-PCB DC-DC down-conversion with 2 PMPBEN MOSFETs  
Condition:  $V_{in} = 10\text{ V}$ ;  $V_{out} = 1.5\text{ V @ } 6\text{ A}$ ;  $f_{sw} = 490\text{ kHz}$



The cursor points to the hot spot in the photo area (max. temperature value in degree Celsius)  $T_a = 25\text{ °C}$

## Small-signal MOSFETs

### Small-signal MOSFETs in DFN2020MD-6 single and DFN2020-6 dual package types in bold represent new products

Package		DFN2020MD-6 (SOT1220)		DFN2020-6 (SOT1118)											
Size (mm)		2.0 x 2.0 x 0.65		2.0 x 2.0 x 0.65											
$P_{tot}$ (mW)		1250		1250											
Configuration	Polarity	$V_{DS}$ (V)	$V_{GS}$ (V)	$I_D$ (A)	$V_{GS(th) min}$ (V)	$V_{GS(th) max}$ (V)	$t_{on typ}$ (ns)	$t_{off typ}$ (ns)	$Q_g typ$ (nC)	ESD Protection (kV)	$R_{DSon typ}$ (mΩ) @ $V_{GS} =$				
											10 V	4.5 V	2.5 V	1.8 V	
Single	N-channel	20	8	11.3	0.4	1	9	26	8.8		14	17	21	PMPB12UN	
				9.4	0.4	1	7	17	4.7		19	25	36	PMPB20UN	
		12	12.9	0.4	0.9	13	54	23		2.2	10	12	16	PMPB10XNE	
			10.4	0.4	0.9	9	31	13.4		2.1	19	23	31	PMPB15XN	
		30	12	11.3	0.4	0.9	12	54	24		2.2	13	14	17	PMPB13XNE
				10.3	0.5	1.5	9	20	7.2		2.1	16	22		PMPB16XN
			20	5	0.4	0.9	8	33	12.4		2.1	28	32	37	PMPB29XNE
				5.5	0.45	1.2	6	21	5.1			37	55		PMPB33XN
		60	20	13	1	2	9	17	13.7			12	14		PMPB11EN
				10.4	1	2	9	9	7.2			16.5	20.5		PMPB20EN
	80		12.9	1	3	9	12	12.1			34	40		PMPB40SNA	
			3	1.3	2.7	4	10.5	6.2		2.7	72	85		<b>PMPB85NEA</b>	
	100		1.9	1.3	2.7	3.5	9.5	4.8		2	175	195		<b>PMPB215NEA</b>	
			2.8	1.3	2.7	5	15	9.9		2.8	80	92		<b>PMPB95NEA</b>	
	P-channel	12	12	11.8	0.47	0.9	18	85	67			15	17	21	PMPB15XP
				10.3	0.47	0.9	16	43	28.8			19	21	27	PMPB19XP
		20	12	10.3	0.47	0.9	13	92	30		2.4	19	22	28	PMPB20XPE
				5	0.47	0.9	12	91	30		2.3	28	31	36	PMPB29XPE
			30	7.9	0.47	0.9	12	62	15		-	30	35	45	PMPB33XP
				5	0.47	0.9	9	57	15.6		2.3	39	45	56	PMPB43XPE
20		5	0.47	0.9	15	28	14			47	54	74	PMPB47XP		
		8.8	1	2.5	10	28	30			24	32		PMPB27EP		
30		6.8	1	2.5	7.4	27	17			40	55		PMPB48EP		
		N-channel	20	8	5.8	0.4	1	6	13	3.1			30	39	56
5	0.4			1	6	13	2.9		1.6		38	52	65	PMDPB38UNE	
12	5.1		0.4	1	6	20	2				40	53	82	PMDPB42UN	
	5.3		0.4	0.9	4	40	14.4				32	40	60	PMDPB30XN	
30	4		0.5	1.5	8	12	1.9				55	86		PMDPB56XN	
	3.1		0.5	1.5	6	18	1.65		1.8		95	130		PMDPB95XNE	
100	4.5	1	2.5	3	15	3				46	67		PMDPB70EN		
	20	0.9	1.3	2.5	3	8	2.4			670	715		<b>PMDPB760EN</b>		
P-channel	20	8	4.5	0.45	0.95	7	41	6.3		2	58	74	97	PMDPB58UPE	
			3.7	0.45	0.95	6	47	5.4		2	82	107	142	PMDPB85UPE	
	12	4.5	0.47	0.9	4	135	16.5				55	75	110	PMDPB55XP	
		4.2	0.75	1.25	7	33	5		2		66	98		PMDPB70XPE	
	30	3.7	0.4	1	6	120	5.7				80	95	120	PMDPB80XP	
		3.8	0.45	1	3	112	5.2				70	89		PMDPB70XP	
MOSFET-Schottky	P-channel	20	12	3.7	0.4	1	6	120	5.7			80	95	120	PMFPB8032XP
				3.7	0.4	1	6	120	5.7				80	95	120
Pre-biased NPN	P	30	12	3.4	0.45	1	3	112	5.2			85	105		PMCB85XP
				5.3	0.4	0.9	4	40	14.4			26	33	50	
Complementary	P	20	12	4.5	0.4	0.9	4	40	8.1			55	75	110	

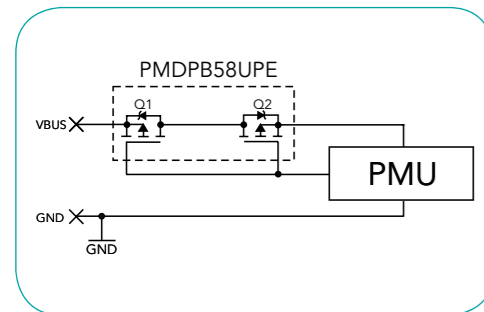
### Key features

- ▶ N-channel and P-channel
- ▶ Low  $R_{DSon}$  down to 10 mΩ
- ▶  $I_D$  up to 13 A
- ▶ Low voltage drive ( $V_{GS(th)} = 0.65\text{ V typ.}$ )
- ▶ Voltage range of 12 to 100 V
- ▶ ESD protection of up to 3 kV

### Package

- ▶ 2.0 x 2.0 x 0.65 mm package size
- ▶ Single and dual package
- ▶ High power dissipation ( $P_{tot}$ ) of 1250 mW for single and dual package
- ▶ Single package with tin-plated, solderable side pads for improved mounting and automotive conformity

### Low $R_{DSon}$ types for USB OTG Vbus protection



### In the Spotlight









#### Dual P-channel ESD protected MOSFET in small 0.65 mm flat, 2 x 2 mm leadless package (PMDPB58UPE)

- ESD protected MOSFET of >1 kV HBM
- Very low  $R_{DSon}$  of <70 mΩ at  $V_{GS} = 4.5\text{ V}$
- 1.8 V  $R_{DSon}$  rating for operation at low voltage gate drive levels
- Best-in-class thermal performance due to extra heatsink
- Smallest 2 x 2 mm leadless package dual P-channel; 0.65 mm package height



Automotive compliant MOSFETs

types in **bold** represent new products

															SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	SOT666	DFN2020MD-6 (SOT1220)	DFN1010D-3 (SOT1215)	DFN1006 (SOT883)
Package																						
Size (mm)															2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.6 x 1.2 x 0.55	2.0 x 2.0 x 0.65	1.1 x 1.0 x 0.37	1.0 x 0.6 x 0.5
P <sub>tot</sub> (mW)															250	300	200	150	300	1250	1000	250
Polarity	Configuration	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th)</sub> min (V)	V <sub>GS(th)</sub> max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection (kV)	R <sub>DS(on)</sub> typ (mΩ) @ V <sub>GS</sub> =											
											10 V	4.5 V	2.5 V	1.8 V								
N-channel	single	20	8	0.7	0.5	0.95	10	117	0.45	2	-	380	620	1100					PMR290UNE			
											-	1000	1400	2000								
		30	8	0.4	0.6	1.1	26	88	0.52	2	-	1000	1400	2000								
		40	20	1.8	1	2.5	10	40	4.7	1	180	220	-	-								
		60	20	12.9	1	3	9	12	12.1	-	34	40	-	-						PMPB40SNA		
											900	1000	-	-								
											1000	1100	1400	-								
											1000	1300	-	-								
	1100										1300	-	-									
	80	20	1.9	1.3	2.7	3.5	9.5	4.8	2	175	195	-	-						PMPB85ENEA			
										80	92	-	-									
										345	390	-	-									
dual	20	8	0.8	0.5	0.95	10	117	0.45	2	-	380	620	1100						PMDT290UNE			
	30	8	0.4	0.6	1.1	26	88	0.52	2	-	1000	1400	2000									
	60	20	0.3	1	2.5	11	19	0.5	2	1000	1300	-	-									
										1000	1100	1400	-									
										900	1000	-	-									
P-channel	single	20	8	2	0.5	1.1	7	50	6	-	-	100	-	-								
30		8	0.48	0.5	1.3	48	152	0.76	2	-	670	1200	1800									
50	20	0.2	1.1	2.1	24	73	0.26	1	5300	6000	-	-										
dual	20	8	0.55	0.5	1.3	48	152	0.76	2	-	670	1200	1800							PMDT670UPE		
	30	8	0.2	0.6	1.1	49	103	0.55	2	-	2800	5300	-									
	50	20	0.16	1.1	2.1	24	73	0.26	1	5300	6000	-	-									

MOSFETs

**NXP package**  
100% solderable side pads



**100% solder wetting solution**  
with new 2 x 2 mm leadless package DFN2020MD-6

- ▶ Optimal visual solder inspection
- ▶ High-quality solder connections

**Packages from other suppliers**



- ▶ No complete wetting on side pad
- ▶ Quality of solder connection difficult to determine
- ▶ Very limited options for optical solder inspection

Automotive MOSFET in DFN2020 with wettable flanks

In the Spotlight

**PMPB40SNA - Automotive compliant 60 V N-ch MOSFET with I<sub>D</sub> max of 12.9 A**

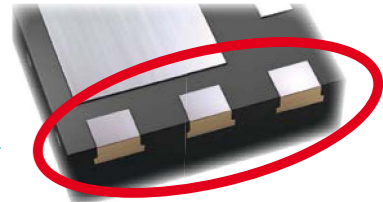
60 V N-ch with R<sub>DS(on)</sub> of typ. 40 mΩ @ 4.5 V

Only 15% of the size of a standard SO8 package with same power dissipation level

Small and leadless ultra thin SMD plastic package: 2 x 2 x 0.65 mm

Exposed drain pad for excellent thermal conduction

Tin-plated 100% solderable side pads for optical solder inspection



Small-signal MOSFETs single (N-channel)

types in **bold** represent new products

Package													SOT223 (SC-73)		SOT89 (SC-62)	SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)		
Size (mm)													6.5 x 3.5 x 1.65		4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37		
P <sub>tot</sub> (mW)													1700		1300	600	250	300	200	150	250	250		
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th)</sub> min (V)	V <sub>GS(th)</sub> max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection (kV)	R <sub>Dson</sub> typ (mΩ) @ V <sub>GS</sub> =															
									10 V	4.5 V	2.5 V	1.8 V												
20	8	5.8	0.4	1	55	255	7.4	-	-	15	18	25	-											
		3.3	0.4	1	34	186	5.8	-	-	25	30	39	-											
		2.8	0.4	1	38	56	2.2	-	-	45	58	85	-											
		2.3	0.4	1	26	83	2.4	-	-	64	78	110	-											
		1.9	0.4	1	35	48	2.2	-	-	63	77	114	-											
		2.28	0.45	0.95	14.5	23.5	0.89	-	-	250	-	420	-											
		1	0.45	0.95	14.5	23.5	0.89	-	-	290	360	460	-											
	1	0.45	1	14.5	23.5	0.89	-	-	280	-	460	-												
	0.7	0.5	0.95	10	117	0.45	2	-	380	620	1100	-												
	1	0.5	0.95	10	117	0.45	2	-	290	420	600	-												
	5.7	0.5	1.5	39	196	6.4	-	-	27	37	-	-												
	3.2	0.5	1.5	39	144	4.9	-	-	28	39	-	-												
	2.15	0.5	1.5	16	17	0.72	-	-	270	440	-	-												
	0.9	0.5	1.05	20	81	0.77	2	-	370	470	630	-												
1.78	0.45	0.95	11.5	22.5	0.89	-	-	390	-	550	-													
0.85	0.4	-	6	27	-	-	-	400	-	600	-													
0.45	0.45	0.95	11.5	22.5	0.89	-	-	1000	1100	1400	-													
0.4	0.6	1.1	26	88	0.52	2	-	1000	1400	2000	-													
4.8	0.5	1.5	39	176	6.4	-	-	19	26	-	-													
1.63	0.5	1.5	27	38	1.9	-	-	77	104	-	-													
0.9	0.5	1.5	23	19	0.74	-	-	234	324	-	-													
1.87	0.5	1.5	16	19.5	0.65	-	-	350	520	-	-													
5.2	1	2.5	19	140	8.6	-	-	17	22	-	-													
7.4	1	2.5	33	249	12.5	-	-	21	26	-	-													
10	1	2.8	18	44	24	-	-	20	30	-	-													
6	1	2.5	33	134	9.6	-	-	29	36	-	-													
3.1	1	2.5	18	78	6.5	-	-	28	37	-	-													
2.1	1	2.5	11	20	2.6	-	-	70	90	-	-													
1.9	1	2.5	17	21	3.1	-	-	67	87	-	-													
6	1	2.8	14	36	-	-	-	80	120	-	-													
0.18	0.8	1.5	10	51	0.34	-	-	2700	3000	4000	-													
2.5	1	2.5	14	14	2.4	1	-	95	120	-	-													
50	20	0.1	0.4	1.8	2	5	-	2800	3800	-	-													
55	8	0.3	0.4	1.3	4	11	1	-	2300	2400	3100	-												
		0.335	0.4	1.3	4	11	1	-	2300	2400	3100	-												
	13	2.5	2	4	-	-	-	2	120	-	-	-												
		3.5	1	2	-	-	-	2	65	-	-	-												
		2.5	1	2	-	-	-	2	120	-	-	-												
		1.22	1	3	6	7.2	1.05	-	-	760	1100	-	-											
0.36	0.9	1.5	5	13	0.72	-	-	900	1000	-	-													
0.36	0.48	1.6	10	58	0.6	1.5	-	1000	1100	1400	-													
0.3	1	2.5	11	19	0.5	2	-	1000	1300	-	-													
0.19	1.1	2.1	12	34	0.33	yes	-	3000	3700	-	-													
0.35	0.45	0.95	-	-	-	2	-	3200	3700	-	-													
60	20	0.3	1	2.5	2.5	11	-	2800	3800	-	-													
		3	2	4	-	-	-	2	57	-	-	-												
		3.3	1.3	2.5	9	14	7.4	-	190	200	-	-												
		0.85	2	4	19	13	4.6	-	400	-	-	-												
		1.3	1.3	2.5	6	11	2.4	-	760	800	-	-												
	0.15	1	2.8	3	12	-	-	-	3500	-	-	-												
	0.19	1	-	3	12	-	-	-	5000	-	-	-												
0.52	1	-	3	12	-	-	-	5000	-	-	-													
1.9	2	4	10.5	12.5	7	-	-	213	-	-	-													
200	20	0.4	0.8	2.8	6	49	-	1600	-	-	-													
		0.55	0.4	2	10	45	-	1700	-	3000	-	-												
240	20	0.375	0.8	2	6	47	-	2800	-	7500	-													
250	20	0.35	0.8	2	6	47	-	2800	-	-	-													
300	20	0.35	0.8	2	6	46	-	3700	-	4800	-													

<sup>1)</sup> enhanced thermal capability

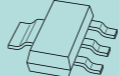



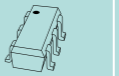




**In the Spotlight**

**2N7002BKx - 2N7002 ESD-protected 60 V N-channel MOSFET-series in several SMD packages**

- ESD protection up to 2 kV in several SMD packages
- Available in single and dual configuration
- Very fast switching
- TrenchMOS technology
- AEC-Q101 qualified


Small-signal MOSFETs single (P-channel)

types in **bold** represent new products

														SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
Package																						
Size (mm)														6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.48	1.0 x 0.6 x 0.37
P <sub>tot</sub> (mW)														1700	1300	600	250	300	200	150	250	250
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th) min</sub> (V)	V <sub>GS(th) max</sub> (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection (kV)	R <sub>Dson</sub> typ (mΩ) @ V <sub>GS</sub> =													
									10 V	4.5 V	2.5 V	1.8 V										
12	8	0.75	0.4	-	6.5	65	-	-	-	180	-	420							BSH205 <sup>1)</sup>			
20	8	5.7	0.45	0.95	39	122	21	-	-	27	36	57							PMN27UP			
		5.3	0.45	0.95	41	122	14.7	2	-	30	38	51							PMV33UPE <sup>1)</sup>			
		5.4	0.45	0.95	34	128	15.5	-	-	34	42	57							PMN34UP			
		6	0.45	0.95	29	84	15.6	4	-	37	45	59							PMN40UPE			
		4	0.47	0.9	-	-	10.5	3	-	50	57	70							PMN50UPE			
		1.2	0.45	0.95	33	52	3.3	-	-	170	210	280							PMV160UP			
		1.4	0.45	0.95	9	35	1.3	1.8	-	330	420	520										
	0.48	0.5	1.3	48	152	0.76	2	-	670	1200	1800								PMR670UPE			
	2	0.5	1.1	7	50	6	-	-	100	-	-											
	12	5.7	0.75	1.25	37	66	15	2	-	27	39	-								PMN27XPE		
		5.7	0.75	1.25	44	60	11.5	2	-	41	56	-								PMN42XPE		
		4.1 / 3.5	0.75	1.25	24	84	8.5	-	-	48	71	-								PMN48XP		
		3.9	0.55	0.95	28	101	7.6	-	-	65	90	-								PMV48XP <sup>1)</sup>		
		4.1	0.75	1.25	20	57	5.2	2	-	70	101	-								PMN70XPE		
3.2		0.45	1	20	170	5	-	-	80	95	120								PMN80XP			
2		0.65	1.15	48	64	4.8	-	-	90	125	-								PMG85XP			
30	8	1	0.65	1.15	26	44	2.6	-	-	175	240	-							PMF170XP			
		0.23	0.6	1.1	49	103	0.55	2	-	2800	5300	-						NX3008PBKW				
	0.47	0.4	-	6.5	65	-	-	-	660	-	1100							NX3008PBKT				
20	3	1	2.8	20	50	-	-	220	330	-	-								NX3008PBKMB			
	0.52	1	-	6.5	65	-	-	630	890	-	-											
40	20	1.8	1	2.5	10	40	4.7	1	180	220	-	-							PMV250EPEA <sup>1)</sup>			
50	20	0.2	1.1	2.1	24	73	0.26	1	5300	6000	-	-							BSS84AK			
60	20	0.3	1	-	6.5	65	-	-	2100	-	2700	-							BSS84AKW			
200	20	0.225	0.8	2.8	5	20	-	-	10000	-	-	-							BSS84AKT			
240	20	0.2	0.8	2.8	5	20	-	-	10000	-	-	-							BSS84AKM			
250	20	0.225	0.8	2.8	5	10	-	-	10000	-	-	-							BSS84AKMB			
300	20	0.21	1.95	2.8	5	15	-	-	17000 <sup>2)</sup>	-	-	-										

<sup>1)</sup> SOT23 with enhanced thermal performance


Small-signal MOSFET – Schottky combination

														DFN2020-6 (SOT1118)		
Package																
Size (mm)														2.0 x 2.0 x 0.62		
P <sub>tot</sub> (mW)														>500		
Configuration	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th) min</sub> (V)	V <sub>GS(th) max</sub> (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	I <sub>F</sub> (A)	V <sub>R</sub> (V)	V <sub>F</sub> typ. (mV)	R <sub>Dson</sub> typ (mΩ) @ V <sub>GS</sub> =				
												4.5 V	2.5 V	1.8 V		
Single + schottky	20	8	3.7	0.4	1	20	170	5.7	2	30	455	80	95	120	PMFPB8040XP	
			3.7	0.4	1	20	170	5.7	2.2	30	325	80	95	120	PMFPB8032XP	

**In the Spotlight**

**20 V, 100 mΩ P-channel enhancement mode Field-Effect Transistor (FET) – NX2301P**




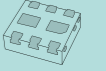
- Housed in a small SMD plastic package SOT23
- Very fast switching
- TrenchMOS technology
- AEC-Q101 qualified
- 1.8 V R<sub>Dson</sub> rated for Low Voltage Gate Drive








Small-signal MOSFETs dual

types in **bold** represent new products

											SOT363 (SC-88)	SOT666	DFN2020-6 (SOT118)	DFN1010B-6 (SOT1216)						
Package																				
Size (mm)											2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	2.0 x 2.0 x 0.65	1.0 x 1.0 x 0.37						
P <sub>tot</sub> (mW)											300	300	1250	350						
Polarity	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th)</sub> min (V)	V <sub>GS(th)</sub> max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection (kV)		R <sub>DS(on)</sub> typ (mΩ) @ V <sub>GS</sub> =									
											10 V	4.5 V	2.5 V	1.8 V						
N-channel dual	20	8	0.87	0.45	1	14.5	23.5	0	-		-	280	-	460	PMGD280UN					
			0.8	0.5	0.95	10	117	0.45	2	-		-	290	420	600		PMDT290UNE			
			5.8	0.4	1	6	13	3.1	-	-		-	30	39	56			PMDPB28UN		
			5	0.4	1	6	13	2.9	1.6	-		-	38	52	65			PMDPB38UNE		
			0.6	0.45	0.95	5.6	19	0.4	1	-		-	470	620	845				<b>PMDXB600UNE</b>	
			5.1	0.4	1	6	20	2	-	-		-	40	53	82			PMDPB42UN		
	30	12	0.86	0.5	1.5	16	17	0.72	-		-	290	460	-	PMGD290XN					
			5.3	0.4	0.9	4	40	14.4	-	-		-	32	40	60			PMDPB30XN		
		8	0.35	0.6	1.1	26	88	0.52	2	-		1000	1400	2000	NX3008NBKS	NX3008NBKV				
		12	4	0.5	1.5	8	12	1.9	-	-		-	55	86	-			PMDPB56XN		
			3.1	0.5	1.5	6	18	1.65	1.8	-		-	95	130	-			PMDPB95XNE		
		20	0.18	0.8	1.5	10	51	0.34	yes	-		2700	3000	4000	-	NX3020NAKS	NX3020NAKV			
	4.5		1	2.5	3	15	3	-	-		46	67	-	-			PMDPB70EN			
	60	20	0.36	0.9	1.5	5	13	0.72	-		900	1000	-	-	BSS138PS					
			0.32	0.48	1.6	10	58	0.6	1.5	-		1000	1100	1400	-	BSS138BKS				
		0.3	1	2.5	11	19	0.5	2	-		1000	1300	-	-		2N7002BKV				
0.17		1.1	2.1	12	34	0.33	yes	-		3000	3700	-	-	NX7002AKS						
P-channel dual	100	20	0.9	1.3	2.5	3	8	2.4	-		670	715	-	-			<b>PMDPB760EN</b>			
	20	8	0.55	0.5	1.3	48	152	0.76	2	-	-	670	1200	1800		PMDT670UPE				
			4.5	0.45	0.95	7	41	6.3	2	-		-	58	74	97			PMDPB58UPE		
		0.5	0.45	0.95	2.3	13.5	1.19	1	-		-	1020	1270	1700				<b>PMDXB950UPE</b>		
		3.7	0.45	0.95	6	47	5.4	2	-		-	82	107	142			PMDPB85UPE			
	12	4.5	0.47	0.9	4	135	16.5	-	-		-	55	75	110			PMDPB55XP			
		4.2	0.75	1	7	33	5	2	-		-	66	98	-			PMDPB70XPE			
	3.7	0.4	1	6	120	5.7	-	-		-	80	95	120			PMDPB80XP				
	30	8	0.2	0.6	1.1	49	103	0.55	2	-		-	2800	5300	-	NX3008PBKS	NX3008PBKV			
		12	3.8	0.45	1	3	112	5.2	-		-	70	89	-			PMDPB70XP			
50	20	0.16	1.1	2.1	24	73	0.26	1	-		4500	5700	-	-	BSS84AKS	BSS84AKV				

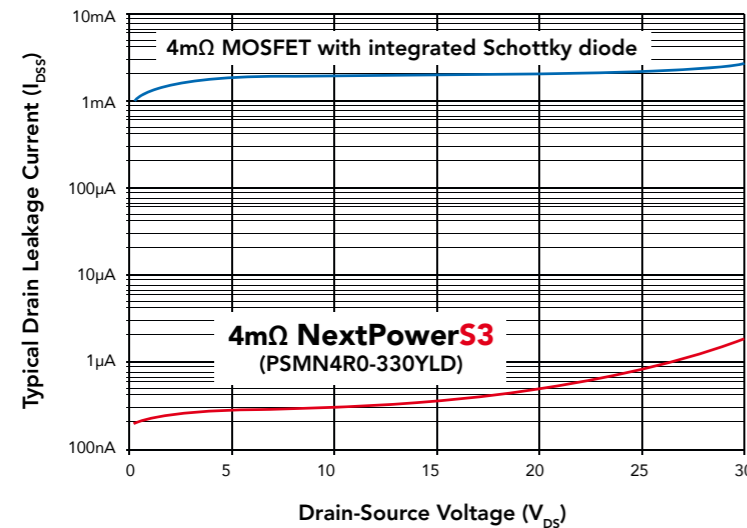
Small-signal MOSFETs complementary

types in **bold** represent new products

Package	Type	Polarity	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	ESD protection	I <sub>D</sub> (A)	V <sub>GS(th)</sub> min (V)	V <sub>GS(th)</sub> max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	R <sub>DS(on)</sub> typ (mΩ) @ V <sub>GS</sub> =					
												10 V	4.5 V	2.5 V	1.8 V	1.5 V	1.2 V
SOT666 	NX1029X	N	60	20	2	0.33	1.1	2.1	11	19	0.5	1000	1300	-	-	-	-
		P	50	20	1	0.17	1.1	2.1	24	73	0.26	4500	5100	-	-	-	-
	NX3008CBKV	N	30	8	2	0.4	0.6	1.1	26	88	0.52	-	1000	1400	2000	-	-
		P	30	8	2	0.22	0.6	1.1	49	103	0.55	-	2800	5300	-	-	-
PMDT290UCE	N	20	8	2	0.8	0.5	0.95	10	117	0.45	-	290	420	600	-	-	
	P	20	8	2	0.55	0.5	1.3	48	152	0.76	-	670	1200	1800	-	-	
SOT363 	NX3008CBKS	N	30	8	2	0.35	0.6	1.1	26	88	0.52	-	1000	1400	2000	-	-
		P	30	8	2	0.2	0.6	1.1	49	103	0.55	-	2800	5300	-	-	
	PMGD290UCEA	N	20	8	2	0.73	0.5	0.95	10	117	0.45	-	290	420	600	-	-
DFN1010B-6 (SOT1216) 	<b>PMCPB5530X</b>	N	20	12	-	5.3	0.4	0.9	19	56	14.4	-	26	33	50	-	-
		P	20	12	-	4.5	0.47	0.9	18	56	16.5	-	55	75	110	-	-

# Featured Product: NextPower S3

## NextPowerS3: Integrated Schottky performance with low leakage current



## NextPowerS3 first to deliver integrated Schottky performance with low leakage current

Welcome to NextPowerS3, a new high-performance 30 V MOSFET platform incorporating NXP's unique "SchottkyPlus" technology. NextPowerS3 is the industry's first MOSFET to deliver the high frequency, low spiking performance usually associated with MOSFETs with an integrated Schottky or Schottky-like diode but without problematic high leakage current.

The trend in recent years has been to create faster and faster switching MOSFETs in an effort to reduce switching losses and increase the efficiency of switch mode power supply (SMPS) designs. However, faster switching on its own can generate problems in terms of switch node voltage spikes, coupled gate glitches and the potential for shoot-through, raising EMI and reliability concerns. One popular solution has been to integrate Schottky and Schottky-like diodes into MOSFET structures in order to minimize reverse-recovery losses.

However, Schottky diodes introduce high leakage currents, especially at elevated temperatures, which impact efficiency, battery life and the ability to screen for defects in the manufacturing process. Combining superfast switching with soft recovery, NXP's NextPowerS3 range addresses each of these concerns, delivering increased efficiency and higher power density, while keeping voltage spikes under control and limiting leakage current to less than 1 µA.

NextPowerS3 30 V is suitable for a variety of applications, including high efficiency power supplies for telecoms and cloud computing, high performance portable computing and battery-powered motor control, such as rechargeable power tools.

## Features and benefits

- ▶ High system efficiency through ultra low  $Q_G$ ,  $Q_{GD}$  and  $Q_{OSS}$
- ▶ Reduced switch-node voltage spikes; EMI friendly
- ▶ Unique SchottkyPlus technology; integrated Schottky performance without high leakage current
- ▶ No wire bonds, no glue; qualified to 175 °C

### Products

- ▶ PSMN4R0-30YLD [http://www.nxp.com/products/mosfets/standard\\_mosfets/PSMN4R0-30YLD.html](http://www.nxp.com/products/mosfets/standard_mosfets/PSMN4R0-30YLD.html)
- ▶ PSMN2R4-30MLD [http://www.nxp.com/products/mosfets/standard\\_mosfets/PSMN2R4-30MLD.html](http://www.nxp.com/products/mosfets/standard_mosfets/PSMN2R4-30MLD.html)
- ▶ PSMN4R2-30MLD [http://www.nxp.com/products/mosfets/standard\\_mosfets/PSMN4R2-30MLD.html](http://www.nxp.com/products/mosfets/standard_mosfets/PSMN4R2-30MLD.html)

### Video






- ▶ MOSFETs for DC:DC Buck Regulators



- ▶ Reverse Recovery & Diode Leakage in SMPS







Power MOSFETs 20 - 25 V

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>b</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404) 	PHB66NQ03LT	25	10.5	-	66	12
DPAK (SOT428) 	PHD38N02LT	20	-	-	44.7	15.1
	PHD97NQ03LT	25	6.3	10.6	75	11.7
LFPAK33 (SOT1210) 	PSMN2R8-25MLC	25	2.8	3.75	70	16.3
	PSMN3R9-25MLC	25	4.15	5.55	70	9.7
	PSMN9R0-25MLC	25	8.65	11.3	55	5.4
Power-SO8 (LFPAK56) 	PH3120L	20	2.65	3.7	100	48.5
	PH2520U	20	-	2.7	100	78
	PSMN0R9-25YLC	25	0.99	1.25	100	51
	PSMN1R1-25YLC	25	1.15	1.5	100	39
	PSMN1R2-25YL	25	1.2	1.85	100	50.6
	PSMN1R2-25YLC	25	1.3	1.7	100	31
	PSMN1R5-25YL	25	1.5	2.2	100	36
	PSMN1R7-25YLC	25	1.9	2.5	100	28
	PSMN1R9-25YLC	25	2.05	2.7	100	27
	PSMN2R2-25YLC	25	2.4	3.15	100	18
	PSMN2R9-25YLC	25	3.15	4.1	100	16
	PSMN3R2-25YLC	25	3.4	4.45	100	14
	PSMN3R7-25YLC	25	3.9	5.1	97	10.1
	PSMN4R0-25YLC	25	4.5	5.8	84	10.9
	PSMN6R0-25YLB	25	6.1	7.9	73	9
	PSMN6R5-25YLC	25	6.5	8.5	64	8.4
	PSMN7R5-25YLC	25	7.4	9.8	56	7
	PSMN9R0-25YLC	25	9.1	12.3	46	5.6
	PSMN10-25YLC	25	10.6	14	39	5
	PSMN12-25YLC	25	12.6	16.6	33	3.8
PH2925U	25	-	3	100	92	
SO8 (SOT96-1) 	FSMN006-20K	20	-	5	32	32

For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

Power MOSFETs 30 V – Part I

types in **bold** represent new products

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>b</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404) 	PSMNR90-30BL	30	1	1.3	120	118
	PSMN1R5-30BLE	30	1.5	1.85	120	228
	PSMN1R8-30BL	30	1.8	2.1	100	83
	PSMN1R6-30BL	30	1.9	2.2	100	101
	PSMN2R0-30BL	30	2.1	2.9	100	55
	PSMN2R7-30BL	30	3	3.7	100	32
	PSMN3R4-30BL	30	3.3	3.8	100	31
	PSMN3R4-30BLE	30	3.4	5	120	81
	PSMN4R3-30BL	30	4.1	5.2	100	19
	PSMN017-30BL	30	17	23.3	32	5.1
PSMN022-30BL	30	22.6	29.6	30	4.4	
DPAK (SOT428) 	PHD101NQ03LT	30	5.5	-	75	23
	PHD71NQ03LT	30	10	-	75	13.2
LFPAK (SOT226) 	PSMN1R1-30EL	30	1.3	1.4	120	118
	PSMN017-30EL	30	17	23.4	32	5.1
LFPAK33 (SOT1210) 	<b>PSMN2R4-30MLD</b>	30	2.4	3.2	70	16
	PSMN2R9-30MLC	30	2.95	3.8	70	16.7
	PSMN3R0-30MLC	30	3.15	4.05	70	16.1
	<b>PSMN4R2-30MLD</b>	30	4.3	5.7	70	
	PSMN4R4-30MLC	30	4.65	6	70	10.6
	PSMN7R0-30MLC	30	7	9	67	8.2
	PSMN9R8-30MLC	30	9.8	12.4	50	5
	PSMN013-30MLC	30	13.6	16.9	39	3.7
	PSMN020-30MLC	30	18.1	27	31.8	4.6
	PSMN1R0-30YLC	30	1.15	1.4	100	50
PSMN1R2-30YLC	30	1.25	1.65	100	38	
PSMN1R3-30YL	30	1.3	1.95	100	46.6	
PSMN1R5-30YL	30	1.5	1.9	100	36.2	
PSMN1R5-30YLC	30	1.55	2.05	100	30	
PSMN1R7-30YL	30	1.7	2.1	100	36.2	
PSMN2R0-30YL	30	2	2.63	100	30	
<b>PSMN2R0-30YLD</b>	30	2	2.5	100	21.8	
PSMN2R0-30YLE	30	2	3.5	100	87	
PSMN2R2-30YLC	30	2.15	2.8	100	26	
<b>PSMN2R4-30YLD</b>	30	2.4	3.1	100	16.2	
PSMN2R5-30YL	30	2.4	3.16	100	27	
PSMN2R6-30YLC	30	2.8	3.65	100	18	
PSMN3R0-30YL	30	3	4.04	100	21	
<b>PSMN3R0-30YLD</b>	30	3.1	4	100	14.5	
PSMN3R2-30YLC	30	3.5	4.55	100	14.2	

Power MOSFETs 30V – Part 2

types in **bold** represent new products

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
Power-SO8 (LFPAK56)	PSMN3R5-30YL	30	3.5	4.61	100	19
	PSMN3R7-30YLC	30	3.95	5.15	100	14
	PSMN4R0-30YL	30	4	5.25	100	17.6
	<b>PSMN4R0-30YLD</b>	30	4	5.5	95	9.1
	PSMN4R1-30YLC	30	4.35	5.7	92	11
	PSMN4R5-30YLC	30	4.8	6.1	84	9.6
	PSMN5R0-30YL	30	5	6.7	91	14.1
	PSMN6R0-30YL	30	6	7.87	79	11
	PSMN5R9-30YL	30	6.1	9	78	10.5
	PSMN6R0-30YLB	30	6.5	8.1	71	9
	PSMN7R0-30YL	30	7	9.1	76	10
	PSMN7R0-30YLC	30	7.1	8.9	61	7.9
	PSMN8R0-30YLC	30	7.9	10	54	7
	PSMN9R0-30YL	30	8	11.03	61	8.7
	PSMN8R0-30YL	30	8.3	12.2	62	9
	PSMN9R1-30YL	30	9.1	13.6	57	8.4
	PSMN9R5-30YLC	30	9.8	12.1	44	5
	PSMN011-30YL	30	10.7	16.1	51	7.3
	PSMN011-30YLC	30	11.6	14.5	37	4.9
	PSMN013-30YLC	30	13.6	16.9	32	4

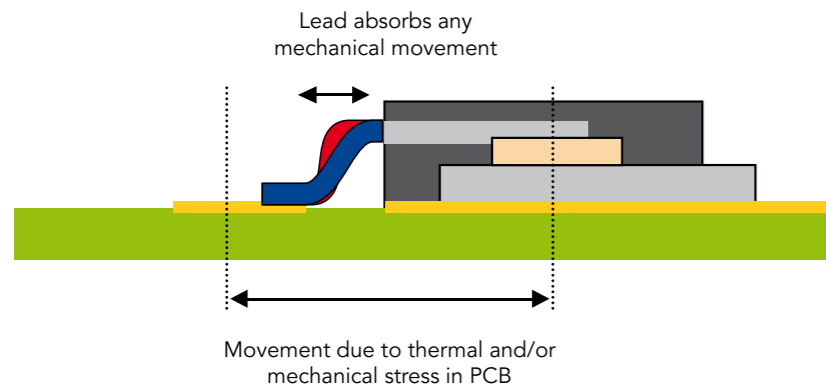
Power MOSFETs 30V – Part 3

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
SO8 (SOT96-1)	PHK31NQ03LT	30	4.4	5.6	30.4	33
	PSMN005-30K	30	5.5	8		34
	PHK28NQ03LT	30	6.5	7.7	23.7	30.3
	PHK18NQ03LT	30	8.9	12.5	20.3	10.6
	PHK13NQ03LT	30	20	26	13.8	10.7
	PHK12NQ03LT	30	-	14	11.8	-
	TO-220AB (SOT78)	PSMN1R1-30PL	30	1.3	1.4	120
PSMN1R6-30PL		30	1.7	2.1	100	101
PSMN1R8-30PL		30	1.8	2.3	100	83
PSMN2R0-30PL		30	2.1	2.8	100	55
PSMN2R7-30PL		30	2.7	3.6	100	32
PSMN3R4-30PL		30	3.4	4.1	100	31
PSMN4R3-30PL		30	4.3	6.2	100	19
PHP36N03LT		30	17	22	43.4	18.5
PSMN017-30PL		30	17	23.4	32	5.1
PSMN022-30PL		30	22	34	30	4.4

For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

LFPAK for mechanical & thermal ruggedness

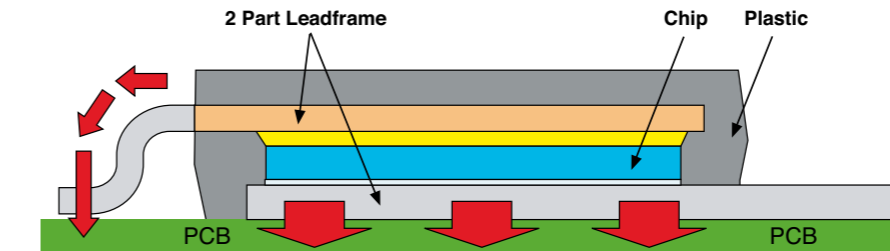
**NXP LFPAK**



LFPAK pins provide compliance and allow for thermal expansion due to temperature difference between the MOSFET & PCB and also mechanical strain due to PCB bending & flexing

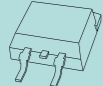
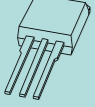


Power-SO8 (LFPAK) Design

- ▶ Low Thermal resistance
- ▶ Low Electrical resistance
- ▶ Low Inductance




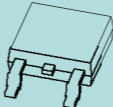
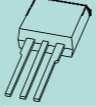

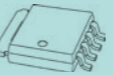


Power MOSFETs 40 - 50V

types in **bold** represent new products

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404) 	PSMN1R1-40BS	40	1.3	120	136
	PSMN2R2-40BS	40	2.2	100	130
	PSMN2R8-40BS	40	2.9	100	71
	PSMN4R5-40BS	40	4.5	100	35
	PSMN8R0-40BS	40	7.6	77	21
I <sup>2</sup> PAK (SOT226) 	PSMN1R5-40ES	40	1.6	120	136
Power-SO8 (LFPAK56) 	<b>PSMN1R0-40YLD</b>	40	1.2	100	54
	PSMN1R6-40YLC	40	1.55	100	59
	PSMN1R8-40YLC	40	1.8	100	45
	PSMN2R6-40YS	40	2.8	100	63
	PSMN3R3-40YS	40	3.3	100	49
	PH4840S	40	4.1	94.5	67
	PSMN4R0-40YS	40	4.2	100	38
	PSMN5R8-40YS	40	5.7	90	28.8
	PSMN8R3-40YS	40	8.6	70	20
	PSMN014-40YS	40	14	46	12
	PSMN023-40YLC	40	23	24	4.3
TO-220AB (SOT78A) 	PSMN1R5-40PS	40	1.6	150	136
	PSMN1R9-40PL	40	1.7	150	230
	PSMN2R2-40PS	40	2.1	100	110
	PSMN2R1-40PL	40	2.2	150	168.9
	PSMN2R8-40PS	40	2.8	100	71
	PSMN4R5-40PS	40	4.6	100	35
	PSMN8R0-40PS	40	7.6	77	17

For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

Power MOSFETs 55 - 60V

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404) 	PHB191NQ06LT	55	3.7	75	95.6
	PHB21N06LT	55	70	19	-
	PHB20N06T	55	75	20.3	11
	PSMN1R7-60BS	-	2	120	137
	PSMN3R0-60BS	60	3.2	100	130
	PSMN004-60B	60	3.6	75	168
	PSMN4R6-60BS	60	4.4	100	70.8
	PSMN7R6-60BS	60	7.8	92	38.7
	PSMN015-60BS	60	14.8	50	20.9
	PHB32N06LT	60	37	34	17
DPAK (SOT428) 	PHD20N06T	55	77	18	11
I <sup>2</sup> PAK (SOT226) 	PSMN2R0-60ES	60	2.2	120	137
	PSMN3R0-60ES	60	3	100	130
LFPAK33 (SOT1210) 	PSMN011-60ML	60	11.3	61	37.2
	PSMN011-60MS	60	11.3	61	23
Power-SO8 (LFPAK56) 	PH955L	55	8.3	62.5	42
	PSMN5R5-60YS	60	5.2	100	56
	PSMN7R0-60YS	60	6.4	89	45
	PSMN8R5-60YS	60	8	76	39
	PSMN012-60YS	60	11.1	59	28.4
	PSMN017-60YS	60	15.7	44	20
	PSMN030-60YS	60	24.7	29	13
TO-220AB (SOT78A) 	PHP191NQ06LT	55	3.7	75	95.6
	PHP20N06T	55	75	20.3	11
	PSMN2R0-60PS	60	2.2	120	137
	PSMN2R5-60PL	60	2.6	150	223
	PSMN2R6-60PS	60	2.6	150	140
	PSMN3R0-60PS	60	3	100	130
	PSMN3R3-60PL	60	3.4	130	175
	PSMN3R9-60PS	60	3.9	130	103
	PSMN4R2-60PL	60	3.9	130	151
	PSMN4R6-60PS	60	4.6	100	70.8
	PSMN7R6-60PS	60	7.8	92	38.7
	PSMN015-60PS	60	14.8	50	20.9
	TO-220F (SOT186A) 	PSMN3R9-60XS	60	4	75

For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

Power MOSFETs 75 - 80V

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404)	PSMN005-75B	75	5	75	165
	PSMN008-75B	75	8.5	75	122.8
	PHB110NQ08T	75	9	75	113.1
	PHB29N08T	75	-	27	19
	PSMN2R8-80BS	80	3	120	139
	PSMN3R3-80BS	80	3.5	120	111
	PSMN4R4-80BS	80	4.5	100	125
	PSMN5R0-80BS	80	5.1	100	101
	PSMN6R5-80BS	80	6.9	100	71
	PSMN8R7-80BS	80	8.7	90	52
	PSMN012-80BS	80	11	74	36
	PSMN017-80BS	80	17	50	26
	PSMN050-80BS	80	46	22	11
	I <sup>2</sup> PAK (SOT226)	PSMN3R3-80ES	80	3.3	120
PSMN3R5-80ES		80	3.5	120	139
PSMN4R3-80ES		80	4.3	120	111
Power-SO8 (LFPAK56)	PSMN8R2-80YS	80	8.5	82	55
	PSMN011-80YS	80	11	67	45
	PSMN013-80YS	80	12.9	60	37
	PSMN018-80YS	80	18	45	26
	PSMN026-80YS	80	27.5	34	20
	PSMN041-80YL	80	41	25	21.9
	PSMN045-80YS	80	45	24	12.5
TO-220AB (SOT78)	PSMN005-75P	75	5	75	165
	PHP79NQ08LT	75	16	73	30
	PHP29N08T	75	-	27	19
	PSMN3R3-80PS	80	3.3	120	139
	PSMN3R5-80PS	80	3.5	120	139
	PSMN4R4-80PS	80	4.1	100	112
	PSMN4R3-80PS	80	4.3	120	111
	PSMN5R0-80PS	80	4.7	100	87
	PSMN6R5-80PS	80	6.9	100	71
	PSMN8R7-80PS	80	8.7	90	52
	PSMN012-80PS	80	11	74	36
	PSMN017-80PS	80	17	50	26
	PSMN050-80PS	80	46	22	9

For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

Power MOSFETs 100V

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)	
D <sup>2</sup> PAK (SOT404)	PSMN3R8-100BS	100	3.9	120	170	
	PSMN4R8-100BSE	100	4.8	120	196	
	PSMN5R6-100BS	100	5.6	100	141	
	PSMN7R0-100BS	100	6.8	100	125	
	PSMN7R6-100BSE	100	7.6	75	128	
	PSMN009-100B	100	8.8	75	156	
	PSMN9R5-100BS	100	9.6	89	82	
	PSMN013-100BS	100	13.9	68	59	
	PSMN015-100B	100	15	75	90	
	PSMN016-100BS	100	16	57	49	
	PHB45NQ10T	100	25	47	61	
	PSMN027-100BS	100	26.8	37	30	
	PHB47NQ10T	100	28	47	66	
	PSMN034-100BS	100	34.5	32	23.8	
	PHB27NQ10T	100	50	28	30	
	PHB18NQ10T	100	90	18	21	
	DPAK (SOT428)	PSMN025-100D	100	25	47	61
I <sup>2</sup> PAK (SOT226)	PSMN4R3-100ES	100	4.3	120	170	
	PSMN5R0-100ES	100	5	120	170	
	PSMN7R0-100ES	100	6.8	100	125	
	PSMN8R5-100ES	100	8.5	100	111	
LFPAK33 (SOT1210)	PSMN040-100MSE	100	36.6	30	30	
	PSMN075-100MSE	100	71	18	16.4	
Power-SO8 (LFPAK56)	PSMN012-100YS	100	12	60	64	
	PSMN013-100YSE	100	13	82	75	
	PSMN016-100YS	100	16.3	51	54	
	PSMN020-100YS	100	20.5	43	41	
	PH20100S	100	23	34.3	39	
	PSMN028-100YS	100	27.5	42	33	
	PSMN038-100YL	100	37.5	30	21.6	
	PSMN039-100YS	100	39.5	28.1	23	
SO8 (SOT96-1)	PSMN069-100YS	100	72.4	17	14	
	PHK12NQ10T	100	28	11.6	35	
TO-220AB (SOT78)	PSMN038-100K	100	38	-	43	
	PSMN4R3-100PS	100	4.3	120	170	
	PSMN5R0-100PS	100	5	120	170	
	PSMN5R6-100PS	100	5.6	100	141	
	PSMN7R0-100PS	100	6.8	100	125	
	PSMN8R5-100PS	100	8.5	100	111	
	PSMN009-100P	100	8.8	75	156	
	PSMN9R5-100PS	100	9.6	89	82	
	PSMN013-100PS	100	13.9	68	59	
	PSMN015-100P	100	15	75	90	
	PSMN016-100PS	100	16	57	49	
	PHP45NQ10T	100	25	47	61	
	PSMN027-100PS	100	26.8	37	30	
	PSMN034-100PS	100	34.5	32	23.8	
	PHP18NQ10T	100	90	18	21	
	TO-220F (SOT186A)	PSMN4R6-100XS	100	4.6	70.4	153
		PSMN5R0-100XS	100	5	67.5	153
PSMN5R6-100XS		100	5.6	61.8	145	
PSMN7R0-100XS		100	6.8	55	121	
PSMN8R5-100XS		100	8.5	49	100	
PSMN9R5-100XS		100	9.6	44.2	81.5	
PSMN013-100XS		100	13.9	35.2	57.5	
PSMN016-100XS		100	16	32.1	46.2	
PSMN027-100XS		100	26.8	23.4	30	

For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

### Power MOSFETs 105 - 150 V

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404)	PSMN030-150B	150	30	55.5	98
	PSMN035-150B	150	35	50	79
	PHB45NQ15T	150	42	45.1	32
	PSMN063-150D	150	63	29	55
I <sup>2</sup> PAK (SOT226)	PSMN8R5-108ES	108	8.5	100	111
	PSMN6R3-120ES	120	6.7	70	207.1
	PSMN7R8-120ES	120	7.9	70	167
Power-SO8 (LFPAK56)	PSMN059-150Y	150	59	43	27.9
SO8 (SOT96-1)	PHK5NQ15T	150	75	5	29
	PSMN085-150K	150	85	-	40
TO-220AB (SOT78)	PHP45NQ11T	105	25	47	60
	PSMN015-110P	110	15	75	90
	PHP27NQ11T	110	50	27.6	30
	PHP23NQ11T	110	70	23	22
	PHP18NQ11T	110	90	18	21
	PSMN6R3-120PS	120	6.7	70	207.1
	PSMN7R8-120PS	120	7.9	70	167
	PSMN030-150P	150	30	55.5	98
	PSMN035-150P	150	35	50	79
	PHP30NQ15T	150	63	29	55
	PHP28NQ15T	150	65	28.5	24

For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

### P channel

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
SO8 (SOT96-1)	PMK30EP	-30	19	30	-14.9	50
	PMK35EP	-30	19	35	-14.9	42
	PHP225	-30	250	400	-	10
	PMK50XP	-20	-	50	-7.9	10
	PHK04P02T	-16	-	120	-4.66	7.2

For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

### Multi-chip

Package	Typenumber	Channel type	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
SO8 (SOT96-1)	PHP225	P	-30	250	-	10
	PHKD6N02LT	N	20	-	10.9	15.3
	PHKD13N03LT	N	30	20	10.4	10.7
	PHN203	N	30	30	6.3	14.6
	PHN210T	N	30	100	3.4	6
	PHC21025	N/P	30	250	-	10
	PHKD3NQ10T	N	100	90	3	21
	PHC2300	N/P	300	6000	-	6.24

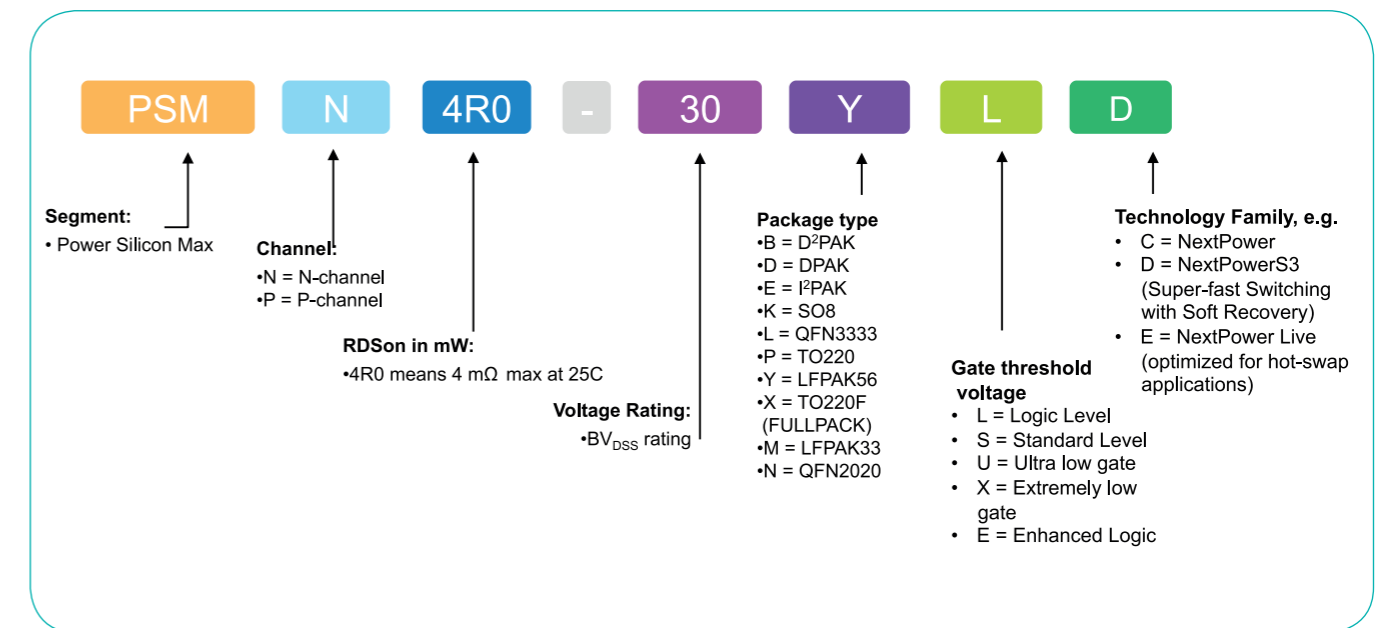
For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

### Power MOSFETs 200 - 300 V

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>G(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404)	PSMN057-200B	200	57	39	96
	PSMN070-200B	200	70	35	77
	PHB33NQ20T	200	77	32.7	32.2
	PHB20NQ20T	200	130	20	65
DPAK (SOT428)	PSMN130-200D	200	130	20	65
	PHD9NQ20T	200	400	8.7	24
Power-SO8 (LFPAK56)	PSMN102-200Y	200	102	21.5	30.7
SO8 (SOT96-1)	PSMN165-200K	200	165	-	40
		200	165	-	40
TO-220AB (SOT78)	PSMN057-200P	200	57	39	96
	PSMN070-200P	200	70	35	77
	PHP33NQ20T	200	77	32.7	32.2
	PHP20NQ20T	200	130	20	65
	PHP9NQ20T	200	400	8.7	24

For the most up to date product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

### PSMN Part Numbering



Small-signal Automotive MOSFETS

types in **bold** represent new products

											SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	SOT666	DFN2020MD-6 (SOT1220)	DFN1010D-3 (SOT1215)	DFN1006 (SOT883)		
Package											2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.6 x 1.2 x 0.55	2.0 x 2.0 x 0.65	1.1 x 1.0 x 0.37	1.0 x 0.6 x 0.5		
Size (mm)											250	300	200	150	300	1250	1000	250		
P <sub>tot</sub> (mW)																				
Polarity	Configuration	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th)</sub> min (V)	V <sub>GS(th)</sub> max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection (kV)	R <sub>DS(on)</sub> typ (mΩ) @ V <sub>GS</sub> =									
											10 V	4.5 V	2.5 V	1.8 V						
N-channel	single	20	8	0.7	0.5	0.95	10	117	0.45	2	-	380	620	1100				PMR290UNE		
		30	8	0.4	0.6	1.1	26	88	0.52	2	-	1000	1400	2000				NX3008NBK		
		40	20	1.8	1	2.5	10	40	4.7	1	180	220	-	-				PMV250EPEA		
		60	20	12.9	1	3	9	12	12.1	-	34	40	-	-					PMPB40SNA	
				0.36	0.9	1.5	5	13	0.72	-	900	1000	-	-					BSS138P	
				0.36	0.48	1.6	10	58	0.6	1.5	1000	1100	1400	-	-					BSS138BK
				0.3	1	2.5	11	19	0.5	2	1000	1300	-	-						2N7002BK
				0.3	1	2.5	16	60	1.09	3	1100	1300	-	-						2N7002CK
		80	20	3	1.3	2.7	4	10.5	6.2	2.7	72	85	-	-						PMPB85ENEAE
	1.9			1.3	2.7	3.5	9.5	4.8	2	175	195	-	-						PMPB215ENEAE	
	2.8			1.3	2.7	5	15	9.9	2.8	80	92	-	-						PMPB95ENEAE	
	1.1			1.3	2.7	2	9	3	2	345	390	-	-						<b>PMXB360ENEAE</b>	
	dual	20	8	0.8	0.5	0.95	10	117	0.45	2	-	380	620	1100					PMDT290UNE	
		30	8	0.4	0.6	1.1	26	88	0.52	2	-	1000	1400	2000					NX3008NBKS	
		60	20	0.3	1	2.5	11	19	0.5	2	1000	1300	-	-						2N7002BKS
0.36				0.48	1.6	10	58	0.6	1.5	1000	1100	1400	-	-					BSS138BKS	
0.36				0.9	1.5	5	13	0.72	-	900	1000	-	-						BSS138PS	
P-channel	single	20	8	2	0.5	1.1	7	50	6	-	-	100	-	-				NX2301P		
				0.48	0.5	1.3	48	152	0.76	2	-	670	1200	1800					PMR670UPE	
		30	8	0.23	0.6	1.1	49	103	0.55	2	-	2800	5300	-					NX3008PBK	
	dual	50	20	0.2	1.1	2.1	24	73	0.26	1	5300	6000	-	-					BSS84AK	
		20	8	0.55	0.5	1.3	48	152	0.76	2	-	670	1200	1800						PMDT670UPE
		30	8	0.2	0.6	1.1	49	103	0.55	2	-	2800	5300	-						NX3008PBKS
		50	20	0.16	1.1	2.1	24	73	0.26	1	5300	6000	-	-						BSS84AKS

MOSFETS

**NXP package**  
100% solderable side pads



**100% solder wetting solution**  
with new 2 x 2 mm leadless package DFN2020MD-6

- ▶ Optimal visual solder inspection
- ▶ High-quality solder connections

**Packages from other suppliers**



- ▶ No complete wetting on side pad
- ▶ Quality of solder connection difficult to determine
- ▶ Very limited options for optical solder inspection

Automotive MOSFET in DFN2020 with wettable flanks

In the Spotlight

**PMPB40SNA - Automotive compliant 60 V N-ch MOSFET with I<sub>D</sub> max of 12.9 A**

60 V N-ch with R<sub>DS(on)</sub> of typ. 40 mΩ @ 4.5 V

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Only 15% of the size of a standard SO8 package with same power dissipation level

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Small and leadless ultra thin SMD plastic package: 2 x 2 x 0.65 mm

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Exposed drain pad for excellent thermal conduction

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Tin-plated 100% solderable side pads for optical solder inspection



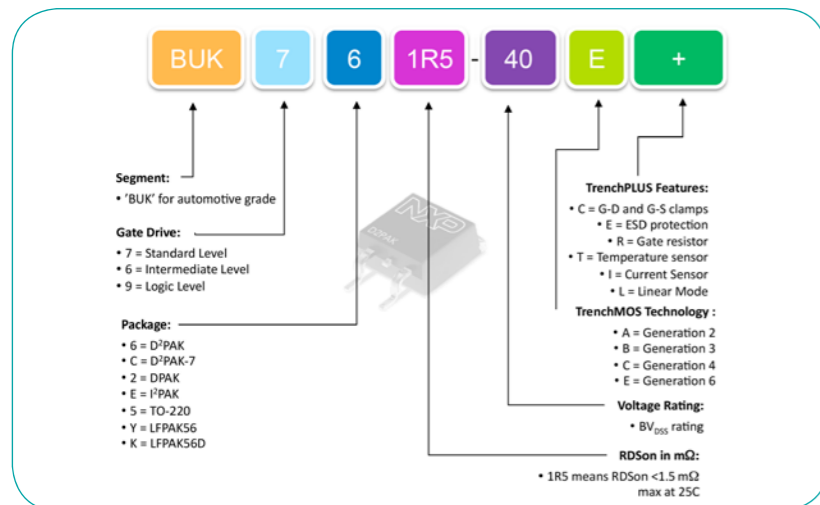


### 30 V N-channel Automotive TrenchMOS

types in **bold** represent new products

Package name	Type number	V <sub>DS</sub> [max] [V]	R <sub>DSon</sub> [max] @ 10 V [mΩ]	R <sub>DSon</sub> [max] @ 5 V [mΩ]	I <sub>D</sub> [max] @ 25 °C [A]	R <sub>th(j-mb)</sub> [K/W]	
Power-SO8 (LFPK56)	BUK9Y07-30B	30	6	7	75	1.4	
	BUK7Y07-30B	30	7		75	1.4	
	BUK9Y11-30B	30	9	11	59	2.0	
	BUK7Y10-30B	30	10		67	1.8	
	BUK9Y22-30B	30	19	22	38	2.5	
LFPK56D (SOT1205)	BUK7Y20-30B	30	20		40	2.5	
	<b>BUK9K5R1-30E</b>	30	4.2	5.0	40	2.2	
	<b>BUK9K5R6-30E</b>	30	4.6	5.5	40	2.4	
	<b>BUK7K5R1-30E</b>	30	5.1		40	2.2	
D <sup>2</sup> PAK (SOT404)	<b>BUK7K5R6-30E</b>	30	5.6		40	2.4	
	<b>BUK961R4-30E</b>	30	1.2	1.4	120	0.42	
	<b>BUK761R3-30E</b>	30	1.3		120	0.43	
	<b>BUK761R4-30E</b>	30	1.4		120	0.46	
	BUK962R8-30B	30	2.4	2.8	75	0.50	
	BUK762R7-30B	30	2.7		75	0.50	
	BUK763R4-30B	30	3.4		75	0.59	
	BUK9605-30A	30	4.6	5.0	75	0.65	
	BUK9607-30B	30	5.0	7.0	75	0.95	
	BUK7607-30B	30	7.0		75	0.95	
	<b>BUK961R5-30E</b>	30	13	1.5	120	0.46	
	DPAK (SOT428)	BUK624R5-30C	30	4.5	6.0	90	0.95
		BUK724R5-30C	30	4.5		75	0.95
		BUK9207-30B	30	5.0	7.0	75	0.95
BUK625R2-30C		30	5.2	7.5	90	1.17	
BUK7207-30B		30	7.0		75	0.95	
BUK6209-30C		30	9.8	15	50	1.87	
BUK9213-30A		30	11	13	75	1	
BUK9214-30A		30	12	14	63	1.4	
BUK6213-30A		30	13		55	1.4	
BUK6213-30C		30	14	22	47	2.52	
TO-220AB (SOT78)	<b>BUK951R6-30E</b>	30	1.4	1.6	120	0.43	
	<b>BUK751R6-30E</b>	30	1.6		120	0.43	
	BUK952R8-30B	30	2.4	2.8	75	0.5	
	BUK752R7-30B	30	2.7		75	0.5	
	BUK9507-30B	30	5.0	7.0	75	0.95	
I <sup>2</sup> PAK (SOT226)	BUK7507-30B	30	7.0		75	0.95	
	<b>BUK9E1R6-30E</b>	30	1.4	1.6	120	0.43	
	<b>BUK7E1R6-30E</b>	30	1.6		120	0.43	
	BUK7E2R7-30B	30	2.7		75	0.5	
	BUK9E04-30B	30	3.0	4.0	75	0.59	

#### Automotive TrenchMOS Part Numbering








### 40 V N-channel Automotive TrenchMOS – Part I

types in **bold** represent new products

Package name	Type number	V <sub>DS</sub> [max] [V]	R <sub>DSon</sub> [max] @ 10 V [mΩ]	R <sub>DSon</sub> [max] @ 5 V [mΩ]	I <sub>D</sub> [max] @ 25 °C [A]	R <sub>th(j-mb)</sub> [K/W]	
Power-SO8 (LFPK56)	BUK9Y3R0-40E	40	2.4	3.0	100	0.8	
	BUK9Y3R5-40E	40	2.9	3.5	100	0.9	
	BUK7Y3R0-40E	40	3.0		100	0.8	
	BUK7Y3R5-40E	40	3.5		100	0.9	
	BUK9Y4R4-40E	40	3.7	4.4	100	1.0	
	BUK7Y4R4-40E	40	4.4		100	1.0	
	BUK9Y7R6-40E	40	6.2	7.6	79	1.6	
	BUK7Y7R6-40E	40	7.6		79	1.6	
	BUK9Y12-40E	40	9.9	12	50	2.5	
	BUK7Y12-40E	40	12		50	2.5	
	BUK9Y21-40E	40	17	21	31	3.7	
	BUK7Y21-40E	40	21		31	3.7	
	BUK9Y29-40E	40	24	29	23	4.7	
	BUK7Y29-40E	40	29		24	4.7	
	LFPK56D (SOT1205)	BUK7K6R2-40E	40	5.9		40	2.2
		BUK9K6R2-40E	40	6	6.2	40	2.2
		BUK9K6R8-40E	40	6.1	6.9	40	2.4
		BUK7K6R8-40E	40	6.8			2.4
BUK9K8R7-40E		40	7.8	8.9	30	2.8	
BUK7K8R7-40E		40	8.5		30	2.8	
BUK9K18-40E		40	16	19.5	30	4.0	
BUK7K18-40E		40	17		30	4.0	
BUK9K25-40E		40	23	27	24	4.7	
BUK7K25-40E		40	25			4.7	
D <sup>2</sup> PAK (SOT404)	BUK961R6-40E	40	1.4	1.6	120	0.43	
	BUK961R7-40E	40	1.5	1.7	120	0.46	
	BUK761R5-40E	40	1.51		120	0.43	
	BUK761R6-40E	40	1.57		120	0.43	
	BUK761R7-40E	40	1.60		120	0.46	
	BUK962R1-40E	40	1.8	2.1	120	0.51	
	BUK762R0-40E	40	2.0		120	0.51	
	BUK962R6-40E	40	2.4	2.8	100	0.57	
	BUK762R6-40E	40	2.6		100	0.57	
	BUK963R1-40E	40	2.7	3.1	100	0.64	
	BUK963R2-40B	40	2.8	3.2	100	0.5	
	BUK762R9-40E	40	2.9		100	0.64	
	BUK763R1-40B	40	3.1		75	0.5	
	<b>BUK964R1-40E</b>	40	3.5	4.1	75	0.82	
	BUK9604-40A	40	4.0	4.4	75	0.5	
	BUK964R4-40B	40	4.0	4.4	75	0.59	
	<b>BUK764R0-40E</b>	40	4.0		75	0.82	
	BUK764R3-40B	40	4.3		75	0.59	
	<b>BUK965R4-40E</b>	40	4.4	5.4	75	1.09	




## 40 V N-channel Automotive TrenchMOS – Part 2

types in **bold** represent new products

Package name	Type number	V <sub>DS</sub> [max] [V]	R <sub>DSon</sub> [max] @ 10 V [mΩ]	R <sub>DSon</sub> [max] @ 5 V [mΩ]	I <sub>b</sub> [max] @ 25 °C [A]	R <sub>th(j-mb)</sub> [max] [K/W]	
D <sup>2</sup> PAK (SOT404) 	BUK765R3-40E	40	4.9		75	1.09	
	BUK9606-40B	40	5.0	6.4	75	0.74	
	BUK765R2-40B	40	5.2		75	0.74	
	<b>BUK968R3-40E</b>	40	6.4	7.9	75	1.56	
	BUK9609-40B	40	7.0	9.0	75	0.95	
	<b>BUK768R1-40E</b>	40	7.2		75	1.56	
	BUK7608-40B	40	8.0		75	0.95	
D <sup>2</sup> PAK-7 (SOT427) 	<b>BUK9C1R3-40E</b>	40	1.1	1.3	190	0.43	
	<b>BUK7C1R2-40E</b>	40	1.2		190	0.43	
	<b>BUK7C1R4-40E</b>	40	1.4		190	0.47	
DPAK (SOT428) 	BUK625R0-40C	40	5.0	6.9	90	0.95	
	BUK725R0-40C	40	5.0		75	0.95	
	BUK626R2-40C	40	6.2	8.8	90	1.17	
	BUK9209-40B	40	7.0	9.0	75	0.95	
	BUK7208-40B	40	8.0		75	0.95	
	BUK6212-40C	40	11	16	50	1.87	
	BUK6218-40C	40	16		42	2.52	
TO-220AB (SOT78) 	<b>BUK951R9-40E</b>	40	1.7	1.8	120	0.43	
	<b>BUK751R8-40E</b>	40	1.8		120	0.43	
	<b>BUK952R3-40E</b>	40	2.2	2.5	120	0.51	
	<b>BUK752R3-40E</b>	40	2.3		120	0.51	
	<b>BUK953R2-40E</b>	40	2.8	3.2	100	0.64	
	BUK953R2-40B	40	2.8	3.2	100	0.5	
	BUK753R1-40E	40	3.1		100	0.64	
	<b>BUK753R1-40B</b>	40	3.1		75	0.5	
	BUK9504-40A	40	4.0	4.4	75	0.5	
	BUK954R4-40B	40	4.0	4.4	75	0.59	
	BUK754R3-40B	40	4.3		75	0.59	
	BUK9506-40B	40	5.0	6.4	75	0.74	
	BUK755R2-40B	40	5.2		75	0.74	
	<b>BUK958R5-40E</b>	40	6.6	8.1	75	1.56	
	BUK9509-40B	40	7.0	9.0	75	0.95	
	<b>BUK758R3-40E</b>	40	7.4		75	1.56	
	BUK7508-40B	40	8.0		75	0.95	
	IPAK (SOT226) 	<b>BUK9E1R9-40E</b>	40	1.7	1.9	120	0.43
		<b>BUK7E1R8-40E</b>	40	1.8		120	0.43
<b>BUK7E1R9-40E</b>		40	1.9		120	0.46	
<b>BUK9E2R3-40E</b>		40	2.2	2.5	120	0.51	
<b>BUK7E2R3-40E</b>		40	2.3		120	0.51	
<b>BUK9E3R2-40E</b>		40	2.8	3.2	100	0.64	
<b>BUK7E3R1-40E</b>		40	3.1		100	0.64	
<b>BUK9E8R5-40E</b>		40	6.6	8.1	75	1.56	
<b>BUK7E8R3-40E</b>		40	7.4		75	1.56	



## 55 V - 60 V N-channel Automotive TrenchMOS – Part I

types in **bold** represent new products

Package name	Type number	V <sub>DS</sub> [max] [V]	R <sub>DSon</sub> [max] @ 10 V [mΩ]	R <sub>DSon</sub> [max] @ 5 V [mΩ]	I <sub>b</sub> [max] @ 25 °C [A]	R <sub>th(j-mb)</sub> [max] [K/W]	
Power-SO8 (LFPAK56) 	BUK9Y4R8-60E	60	4.1	4.8	100	0.6	
	BUK7Y4R8-60E	60	4.8		100	0.6	
	<b>BUK9Y6R0-60E</b>	60	5.2	6.0	100	0.7	
	<b>BUK7Y6R0-60E</b>	60	6.0		100	0.7	
	<b>BUK9Y7R2-60E</b>	60	6.2	7.2	100	0.8	
	<b>BUK7Y7R2-60E</b>	60	7.2		100	0.8	
	<b>BUK9Y8R7-60E</b>	60	7.5	8.7	89	1.0	
	<b>BUK7Y8R7-60E</b>	60	8.7		89	1.0	
	BUK9Y15-60E	60	13	15	53	1.6	
	<b>BUK7Y15-60E</b>	60	15		53	1.6	
	<b>BUK9Y25-60E</b>	60	22	25	33	2.5	
	<b>BUK7Y25-60E</b>	60	25		33	2.5	
	<b>BUK9Y43-60E</b>	60	37	43	20	3.7	
	<b>BUK7Y43-60E</b>	60	43		20	3.7	
	<b>BUK9Y59-60E</b>	60	51	59	15	4.7	
	<b>BUK7Y59-60E</b>	60	59		16	4.7	
	LFPAK56D (SOT1205) 	BUK9K12-60E	60	11	12	40	2.2
		<b>BUK7K12-60E</b>	60	11		40	2.2
		BUK9K13-60E	60	12	13	40	2.4
BUK7K13-60E		60	13		40	2.4	
<b>BUK9K17-60E</b>		60	16	17	30	2.8	
<b>BUK7K17-60E</b>		60	17		30	2.8	
<b>BUK9K35-60E</b>		60	32	35	22	4.0	
<b>BUK7K35-60E</b>		60	35		22	4.0	
<b>BUK9K52-60E</b>		60	49	55	17	4.7	
<b>BUK7K52-60E</b>		60	52		17	4.7	
D <sup>2</sup> PAK (SOT404) 	<b>BUK962R5-60E</b>	60	2.3	2.5	120	0.43	
	<b>BUK762R4-60E</b>	60	2.4		120	0.43	
	<b>BUK962R8-60E</b>	60	2.5	2.8	120	0.46	
	<b>BUK762R6-60E</b>	60	2.6		120	0.46	
	<b>BUK963R3-60E</b>	60	3.0	3.3	120	0.51	
	<b>BUK763R1-60E</b>	60	3.1		120	0.51	
	BUK964R2-55B	55	3.7	4.2	75	0.5	
	<b>BUK763R9-60E</b>	60	3.9		100	0.57	
	<b>BUK964R2-60E</b>	60	3.9	4.2	100	0.57	
	BUK764R0-55B	55	4.0		75	0.5	
	<b>BUK964R8-60E</b>	60	4.4	4.8	100	0.64	
	<b>BUK764R4-60E</b>	60	4.5		100	0.64	
	BUK9606-55B	55	5.4	6.0	75	0.58	
	<b>BUK966R5-60E</b>	60	5.9	6.5	75	0.82	
	BUK7606-55B	55	6.0		75	0.59	
	<b>BUK766R0-60E</b>	60	6.0		75	0.82	
	BUK9608-55B	55	7.0	8.4	75	0.74	



### 55 - 60 V N-channel Automotive TrenchMOS – Part 2

types in **bold** represent new products

Package name	Type number	V <sub>DS</sub> [max] [V]	R <sub>DSon</sub> [max] @ 10 V [mΩ]	R <sub>DSon</sub> [max] @ 5 V [mΩ]	I <sub>b</sub> [max] @ 25 °C [A]	R <sub>th(j-mb)</sub> [K/W]
D <sup>2</sup> PAK (SOT404) 	BUK7607-55B	55	7.1		75	0.74
	<b>BUK969R0-60E</b>	60	8.0	9.0	75	1.09
	<b>BUK768R3-60E</b>	60	8.3		75	1.09
	BUK9610-55A	55	9.0	10	75	0.75
	BUK7610-55AL	55	10		75	0.5
	BUK9611-55A	55	10	11	75	0.9
	BUK9612-55B	55	10	12	75	0.95
	BUK7611-55A	55	11		75	0.9
	BUK7611-55B	55	11		75	0.95
	<b>BUK9614-60E</b>	60	13	14	56	1.56
	<b>BUK7613-60E</b>	60	13		58	1.56
	BUK9616-55A	55	15	16	66	1.1
	BUK9618-55A	55	16	18	61	1.1
	BUK9620-55A	55	18	20	54	1.2
	BUK7620-55A	55	20		54	1.2
	BUK9624-55A	55	22	24	46	1.4
	BUK7624-55A	55	24		47	1.4
	BUK9628-55A	55	25	28	42	1.5
	BUK7628-55A	55	28		42	1.5
	BUK9635-55A	55	32	35	34	1.8
	BUK7635-55A	55	35		35	1.7
	BUK9675-55A	55	68	75	20	2.4
	BUK7675-55A	55	75		20	2.4
	DPAK (SOT428) 	BUK6207-55C	55	7.8	10	90
BUK6210-55C		55	9.6	13	78	1.17
BUK7210-55B		55	10		75	0.95
BUK9212-55B		55	10	12	75	0.95
BUK7212-55B		55	12		75	0.95
BUK9215-55A		55	14	15	62	1.3
BUK7215-55A		55	15		62	1.3
BUK9219-55A		55	18	19	55	1.3
BUK6217-55C		55	19	25	44	1.87
BUK7219-55A		55	19		55	1.3
BUK9222-55A		55	20	22	48	1.5
BUK7222-55A		55	22		48	1.5
BUK9225-55A		55	22	25	43	1.6




### 55 - 60 V N-channel Automotive TrenchMOS – Part 3

types in **bold** represent new products

Package name	Type number	V <sub>DS</sub> [max] [V]	R <sub>DSon</sub> [max] @ 10 V [mΩ]	R <sub>DSon</sub> [max] @ 5 V [mΩ]	I <sub>b</sub> [max] @ 25 °C [A]	R <sub>th(j-mb)</sub> [K/W]
DPAK (SOT428) 	BUK7225-55A	55	25		43	1.6
	BUK9230-55A	55	27	30	38	1.7
	BUK6228-55C	55	29	38	31	2.52
	BUK7230-55A	55	30		38	1.7
	BUK9237-55A	55	33	37	32	1.94
	BUK7237-55A	55	37		32	1.9
	BUK9245-55A	55	40	45	28	2.1
	BUK9277-55A	55	69	77	18	2.93
	BUK7277-55A	55	77		18	2.9
	BUK92150-55A	55	125	140	11	4.1
	BUK72150-55A	55	150		11	4.1
	BUK954R2-55B	55	3.7	4.2	75	0.5
	BUK754R0-55B	55	4.0		75	0.5
	<b>BUK752R7-60E</b>	60	2.6		120	0.43
	BUK9508-55B	55	7.0	8.4	75	0.74
	BUK7507-55B	55	7.1		75	0.74
	<b>BUK952R8-60E</b>	60	2.6	2.8	120	0.43
	<b>BUK953R5-60E</b>	60	3.4	3.7	120	0.51
	BUK7510-55AL	55	10		75	0.5
	<b>BUK753R5-60E</b>	60	3.5		120	0.51
	BUK9512-55B	55	10	12	75	0.95
	BUK7511-55B	55	11		75	0.95
	<b>BUK954R8-60E</b>	60	4.5	4.9	100	0.64
	<b>BUK754R7-60E</b>	60	4.6		100	0.64
BUK7506-55A	55	6.3		75	0.5	
BUK7508-55A	55	8.0		75	0.59	
BUK7509-55A	55	9.0		75	0.71	
BUK9511-55A	55	10	11	75	0.9	
<b>BUK7514-60E</b>	60	13		58	1.56	
<b>BUK9515-60E</b>	60	13	15	54	1.56	
BUK9516-55A	55	15	16	66	1.1	
BUK7516-55A	55	16		66	1.1	
BUK9518-55A	55	16	18	61	1.1	
BUK7520-55A	55	20		54	1.2	
BUK9524-55A	55	22	24	46	1.4	
BUK7528-55A	55	28		42	1.5	
TO-220AB (SOT78A) 	BUK7505-55A	55	10		75	0.95
	BUK7506-55A	55	10		75	0.95
	BUK7507-55A	55	10		75	0.95
	BUK7508-55A	55	10		75	0.95
	BUK7509-55A	55	10		75	0.95
	BUK7510-55A	55	10		75	0.95
	BUK7511-55A	55	10		75	0.95
	BUK7512-55A	55	10		75	0.95
	BUK7513-55A	55	10		75	0.95
	BUK7514-55A	55	10		75	0.95
	BUK7515-55A	55	10		75	0.95
	BUK7516-55A	55	10		75	0.95
	BUK7517-55A	55	10		75	0.95
	BUK7518-55A	55	10		75	0.95




## 55 - 60 V N-channel Automotive TrenchMOS – Part 4

types in **bold** represent new products

Package name	Type number	$V_{DS}$ [max] [V]	$R_{DSon}$ [max] @ 10 V [mΩ]	$R_{DSon}$ [max] @ 5 V [mΩ]	$I_D$ [max] @ 25 °C [A]	$R_{th(j-mb)}$ [max] [K/W]	
TO-220AB (SOT78A) 	BUK9535-55A	55	32	35	34	1.8	
	BUK7535-55A	55	35		35	1.7	
	BUK9575-55A	55	68	75	20	2.4	
	BUK7575-55A	55	75		20	2.4	
IPPAK (SOT226) 	<b>BUK7E2R6-60E</b>	60	2.6		120	0.43	
	<b>BUK9E2R8-60E</b>	60	2.6	2.8	120	0.43	
	<b>BUK9E3R7-60E</b>	60	3.4	3.7	120	0.51	
	<b>BUK7E3R5-60E</b>	60	3.5		120	0.51	
	<b>BUK9E4R9-60E</b>	60	4.5	4.9	100	0.64	
	<b>BUK7E4R6-60E</b>	60	4.6		100	0.64	
	BUK9E06-55B	55	5.4	6.0	75	0.58	
	BUK9E06-55A	55	5.8	6.3	75	0.5	
	BUK9E08-55B	55	7.0	8.4	75	0.74	
	BUK7E07-55B	55	7.1		75	0.74	
	BUK7E11-55B	55	11		75	0.95	
	<b>BUK7E13-60E</b>	60	13		58	1.56	
	<b>BUK9E15-60E</b>	60	13	15	54	1.56	
	SC-73 (SOT223) 	BUK9832-55A	55	29	32	12	15
		BUK9880-55A	55	73	80	7	15
BUK7880-55A		55	80		7	15	
BUK98150-55A		55	137	150	5.5	15	
BUK78150-55A		55	150		5.5	15	

## 75 - 80 V N-channel Automotive TrenchMOS – Part I

types in **bold** represent new products

Package name	Type number	$V_{DS}$ [max] [V]	$R_{DSon}$ [max] @ 10 V [mΩ]	$R_{DSon}$ [max] @ 5 V [mΩ]	$I_D$ [max] @ 25 °C [A]	$R_{th(j-mb)}$ [max] [K/W]	
Power-SO8 (LFPAK56) 	<b>BUK9Y8R5-80E</b>	80	7.4	8.5	100	0.6	
	<b>BUK7Y7R8-80E</b>	80	7.8		100	0.6	
	<b>BUK9Y11-80E</b>	80	9.4	11.0	93	0.7	
	<b>BUK7Y9R9-80E</b>	80	9.9		93	0.7	
	BUK9Y12-80E	80	11	11.9	77	0.8	
	BUK7Y12-80E	80	12		77	0.8	
	<b>BUK9Y14-80E</b>	80	13	14.2	66	1.0	
	<b>BUK7Y14-80E</b>	80	14		66	1.0	
	<b>BUK9Y25-80E</b>	80	23	25	39	1.6	
	<b>BUK7Y25-80E</b>	80	25		39	1.6	
	<b>BUK9Y41-80E</b>	80	38	41	24	2.5	
	<b>BUK7Y41-80E</b>	80	41		24	2.5	
	<b>BUK9Y72-80E</b>	80	66	72	15	3.7	
	<b>BUK7Y72-80E</b>	80	72		15	3.7	
	<b>BUK9Y107-80E</b>	80	93	107	11	4.7	
	<b>BUK7Y98-80E</b>	80	98		11	4.7	
	LFPAK56D (SOT1205) 	BUK9K19-80E	80	18	19	38	2.2
		BUK7K19-80E	80	18		39	2.2
BUK9K21-80E		80	20	21	35	2.4	
BUK7K21-80E		80	20		35	2.4	
BUK9K29-80E		80	27	29	27	2.8	
BUK7K29-80E		80	28		27	2.8	
BUK9K57-80E		80	56	59	16	4.0	
BUK7K57-80E		80	57		16	4.0	
BUK9K85-80E		80	84	89	12	4.7	
BUK7K85-80E		80	86		12	4.7	
D <sup>2</sup> PAK (SOT404) 	<b>BUK763R8-80E</b>	80	3.8		120	0.43	
	<b>BUK964R2-80E</b>	80	4.0	4.2	120	0.43	
	<b>BUK764R2-80E</b>	80	4.2		120	0.46	
	<b>BUK964R7-80E</b>	80	4.5	4.7	120	0.46	
	BUK9606-75B	75	5.5	6.1	75	0.5	
	BUK7606-75B	75	5.6		75	0.5	
	BUK9609-75A	75	8.5	9.0	75	0.65	
	<b>BUK769R6-80E</b>	80	9.6		75	0.82	
	<b>BUK9611-80E</b>	80	10	11	75	0.82	
	BUK7613-75B	75	13		75	0.95	
	BUK9616-75B	75	14	16	67	0.95	
	BUK9623-75A	75	22	23	53	1.1	
	BUK7623-75A	75	23		53	1.1	




### 75 - 80 V N-channel Automotive TrenchMOS – Part 2

types in **bold** represent new products

Package name	Type number	V <sub>DS</sub> [max] [V]	R <sub>DSon</sub> [max] @ 10 V [mΩ]	R <sub>DSon</sub> [max] @ 5 V [mΩ]	I <sub>D</sub> [max] @ 25 °C [A]	R <sub>th(j-mb)</sub> [max] [K/W]
DPAK (SOT428) 	BUK6211-75C	75	11	13.2	74	0.95
	BUK7214-75B	75	14		70	0.95
	BUK6215-75C	75	15	18	57	1.17
	BUK9217-75B	75	15	17	64	0.95
	BUK9226-75A	75	25	26	45	1.3
	BUK7226-75A	75	26		45	1
	BUK6226-75C	75	29	35	33	1.87
	BUK6246-75C	75	46	56	22	2.52
TO-220AB (SOT78A) 	<b>BUK753R8-80E</b>	80	4.0		120	0.43
	<b>BUK954R4-80E</b>	80	4.2	4.4	120	0.43
	BUK9506-75B	75	5.5	6.1	75	0.5
	BUK7506-75B	75	5.6		75	0.5
	BUK7509-75A	75	9.0		75	0.65
	BUK7513-75B	75	13		75	0.95
	BUK9516-75B	75	14	16.4	67	0.95
I <sup>2</sup> PAK (SOT226) 	<b>BUK7E4R0-80E</b>	80	4.0		120	0.43
	<b>BUK9E4R4-80E</b>	80	4.2	4.4	120	0.43

### 100 V N-channel Automotive TrenchMOS – Part 1

types in **bold** represent new products

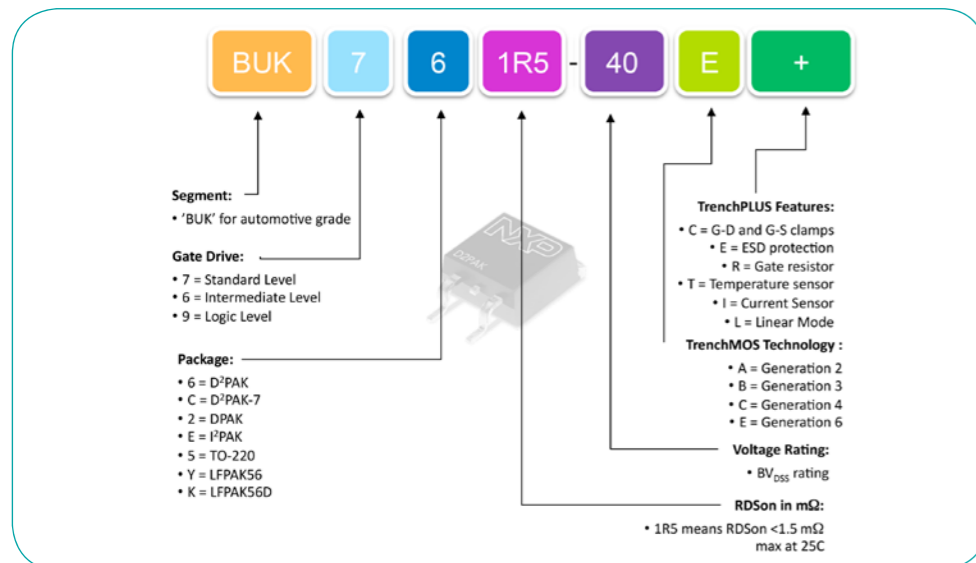
Package name	V <sub>DS</sub> [max] [V]	R <sub>DSon</sub> [max] @ 10 V	R <sub>DSon</sub> [max] @ 10 V [mΩ]	R <sub>DSon</sub> [max] @ 5 V [mΩ]	I <sub>D</sub> [max] @ 25 °C [A]	R <sub>th(j-mb)</sub> [max] [K/W]
Power-SO8 (LFPAK56) 	BUK9Y12-100E	100	12	12	90	0.6
	BUK7Y12-100E	100	12		90	0.6
	BUK9Y15-100E	100	15	15	71	0.7
	BUK7Y15-100E	100	16		71	0.7
	BUK9Y19-100E	100	18	19	59	0.8
	BUK7Y19-100E	100	19		59	0.8
	BUK9Y22-100E	100	22	22	51	1.0
	BUK7Y22-100E	100	22		51	1.0
	BUK9Y38-100E	100	38	38	30	1.6
	BUK7Y38-100E	100	38		30	1.6
	BUK9Y65-100E	100	63	65	18	2.5
	BUK7Y65-100E	100	65		18	2.5
	BUK9Y113-100E	100	110	113	11	3.7
	BUK7Y113-100E	100	113		11	3.7
	BUK9Y153-100E	100	149	153	9	4.7
	BUK7Y153-100E	100	153		9	4.7
LFPAK56D (SOT1205) 	BUK9K29-100E	100	27	29	30	2.2
	BUK7K29-100E	100	28		30	2.2
	BUK7K32-100E	100	31		27	2.4
	BUK9K32-100E	100	31	33	27	2.4
	BUK9K45-100E	100	42	45	21	2.8
	BUK7K45-100E	100	44		21	2.8
	BUK9K89-100E	100	85	89	13	4.0
	BUK7K89-100E	100	88		12	4.0
	BUK7K134-100E	100	134		9	4.7
	BUK9K134-100E	100	154	159	9	4.7
D <sup>2</sup> PAK (SOT404) 	BUK765R0-100E	100	5.0		120	0.43
	BUK965R8-100E	100	5.6	5.8	120	0.43
	BUK768R1-100E	100	8.1		100	0.57
	BUK969R3-100E	100	8.9	9.3	100	0.57
	BUK7613-100E	100	13		72	0.82
	BUK9615-100E	100	14	15	66	0.82
	BUK9620-100B	100	19	20	63	0.75
	BUK7619-100B	100	19		64	0.74
	BUK7620-100A	100	20		63	0.75
	BUK7626-100B	100	26		49	0.95
	BUK9628-100A	100	27	28	49	0.9
	BUK9629-100B	100	27	29	46	0.95
	BUK7628-100A	100	28		47	0.9
	<b>BUK7631-100E</b>	100	31		34	1.56
	<b>BUK9637-100E</b>	100	36	37	31	1.56
	BUK9660-100A	100	58	60	26	1.4
	BUK7660-100A	100	60		26	1.4
	BUK9675-100A	100	72	75	23	1.5
	BUK7675-100A	100	75		23	1.5
	BUK96180-100A	100	173	180	11	2.8

### 100V N-channel Automotive TrenchMOS – Part 2

types in **bold** represent new products

Package name	$V_{DS}$ [max] [V]	$R_{DSon}$ [max] @ 10 V [mΩ]	$R_{DSon}$ [max] @ 10 V [mΩ]	$R_{DSon}$ [max] @ 5 V [mΩ]	$I_D$ [max] @ 25 °C [A]	$R_{th(j-mb)}$ [K/W]	
DPAK (SOT428)	BUK7227-100B	100	27		48	0.95	
	BUK9230-100B	100	28	30	47	0.95	
	BUK9240-100A	100	39	40	33	1.3	
	BUK7240-100A	100	40		34	1.3	
	BUK9275-100A	100	72	75	22	1.7	
TO-220AB (SOT78A)	BUK7275-100A	100	75		22	1.7	
	<b>BUK755R4-100E</b>	100	5.2		120	0.43	
	<b>BUK956R1-100E</b>	100	5.9	6.1	120	0.43	
	BUK9510-100B	100	10	10	75	0.5	
	BUK7510-100B	100	10		75	0.5	
	BUK9515-100A	100	14	15	75	0.65	
	BUK7515-100A	100	15		75	0.5	
	BUK9520-100B	100	19	20	63	0.75	
	BUK9520-100A	100	19	20	63	0.75	
	BUK7520-100A	100	20		63	0.75	
	BUK7526-100B	100	26		49	0.95	
	BUK9529-100B	100	27	29	46	0.95	
	BUK7528-100A	100	28		47	0.9	
	BUK9535-100A	100	34	35	41	1	
	BUK7535-100A	100	35		41	1	
	BUK7540-100A	100	40		37	1.1	
	BUK9575-100A	100	72	75	23	1.5	
	BUK7575-100A	100	75		23	1.5	
	IPPAK (SOT226)	<b>BUK7E5R2-100E</b>	100	5.2		120	0.43
		<b>BUK9E6R1-100E</b>	100	5.9	6.1	120	0.43
SC-73 (SOT223)	BUK9875-100A	100	72	75	7	15	
	BUK98180-100A	100	173	180	4.6	15	

#### Automotive TrenchMOS Part Numbering

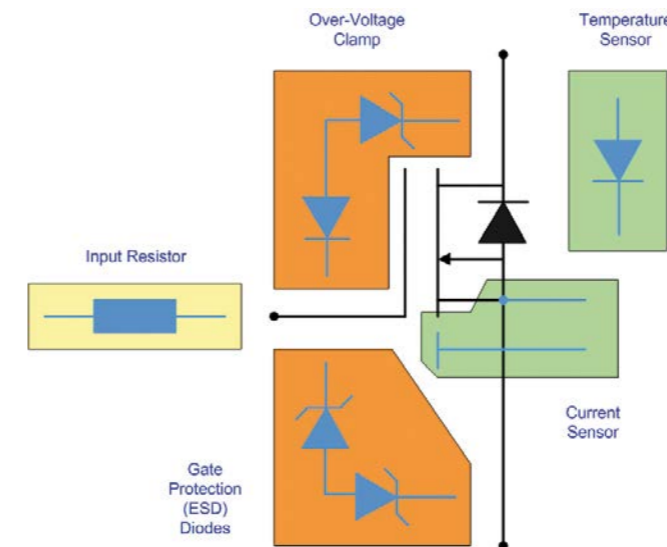


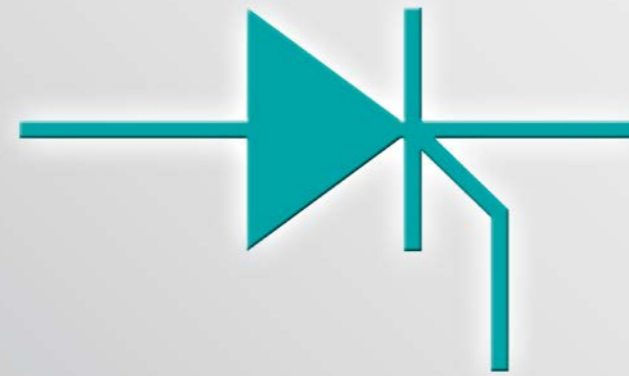
### TrenchPLUS MOSFETs

TrenchPLUS is a range of standard MOSFETs with additional protection features, such as current and temperature sensing components, overvoltage clamps, and gate protection (ESD) diodes. The system microcontroller can use data gathered from

these sensors to implement cost-effective protection features, thus eliminating the need to design with protected power devices. All the standard products listed below offer one or more "PLUS" features. Custom versions can be developed for high-volume applications.

$V_{DS}$ (V)	$R_{DSon}$ (max) @ 10 V (mΩ)	$R_{DSon}$ (max) @ 5 V (mΩ)	$I_D$ (max) @ 25 °C (A)	Temperature Sense	Current Sensing	Gate Source Clamps	Gate Drain Clamps	Gate Resistor	7-pin D <sup>2</sup> PAK (SOT427)	5-pin D <sup>2</sup> PAK (SOT426)	TO220AB (SOT78C)	5-pin TO220 (SOT263B-01)
34	6		75			✓	✓	✓			BUK7L06-34ARC	
34	11		75			✓	✓	✓			BUK7L11-34ARC	
40	4.1		75	✓						BUK714R1-40BT		BUK794R1-40BT
40	5		75		✓	✓				BUK7105-40AIE		BUK7905-40AIE
40	5		75	✓		✓				BUK7105-40ATE		BUK7905-40ATE
40	5		75									BUK7905-40AI
40	6		75	✓	✓	✓			BUK7C06-40AITE			
40	6.6	7	75	✓		✓	✓			BUK9107-40ATC		BUK9907-40ATC
40	8		75	✓		✓	✓			BUK7107-40ATC		BUK7907-40ATC
40	8		75		✓	✓				BUK7108-40AIE		BUK7908-40AIE
55	6.6	7	75	✓		✓				BUK9107-55ATE		BUK9907-55ATE
55	7		75		✓	✓				BUK7107-55AIE		BUK7907-55AIE
55	7		75	✓		✓				BUK7107-55ATE		BUK7907-55ATE
55	8		75	✓	✓	✓			BUK7C08-55AITE			
55	9	10	75	✓	✓				BUK9C10-55BIT			
75	9		75		✓	✓				BUK7109-75AIE		BUK7909-75AIE
75	9		75	✓		✓				BUK7109-75ATE		BUK7909-75ATE
75	10		75	✓	✓	✓			BUK7C10-75AITE			





## Thyristors

AC Thyristor Triacs / AC Thyristors

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AC Thyristors Triacs

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AC Thyristors

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3-quadrant triacs

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4-quadrant triacs

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Silicon Controlled Rectifiers

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### AC Thyristor Triacs

(3Q triacs with overvoltage guarantee)

types in **bold** represent new products


$I_{T(RMS)}$ (A)	$V_{DRM}$ (V)	$I_{GT}$ (max) (mA)	$T_{jmax}$ (°C)	SOT78 (TO220AB)	SOT186A	SOT226 (I <sup>2</sup> PAK)	SOT404 (D <sup>2</sup> PAK)	SOT428 (DPAK)
2	800	E	125					ACTT2S
4	800	C/E	125		ACTT4X			ACTT4S
6	800	E	125	ACTT6	ACTT6X	ACTT6G	ACTT6B	
8	800	C0	125	<b>ACTT8</b>	<b>ACTT8X</b>		<b>ACTT8B</b>	
	800	C0T	150	<b>ACTT8</b>	<b>ACTT8X</b>		<b>ACTT8B</b>	
10	800	C/E	125	<b>ACTT10</b>	<b>ACTT10X</b>			
	800	CT/ET	150	<b>ACTT10</b>	<b>ACTT10X</b>			
12	800	C/E	125	<b>ACTT12</b>	<b>ACTT12X</b>		<b>ACTT12B</b>	
	800	CT/ET	150	<b>ACTT12</b>	<b>ACTT12X</b>		<b>ACTT12B</b>	

$I_{GT}$  key: C = 35 mA; C0 = 5-30 mA; E = 10 mA  
T: high  $T_{jmax}$  150 °C

**In the spotlight**

**AC Thyristor Triac ACTT10 series, ACTT12 series**

- Planar passivated with overvoltage clamping function
- High energy surge handling
- Very high dVD/dt for maximum immunity to false triggering
- High  $T_{j(max)}$  to 150 °C



### AC Thyristors

(Negative gate triggering only, 'Common' mounting base, overvoltage guarantee)

types in **bold** represent new products


$I_{T(RMS)}$ (A)	$V_{DRM}$ (V)	$I_{GT}$ (max) (mA)	$T_{jmax}$ (°C)	SOT54 (TO92)	SOT223	SO8
0.2	600	D	125			ACT102H
0.8	600	D/E	125	ACT108	ACT108W	
	800		125	<b>ACT108</b>		

$I_{GT}$  key: D = 5 mA; E = 10 mA

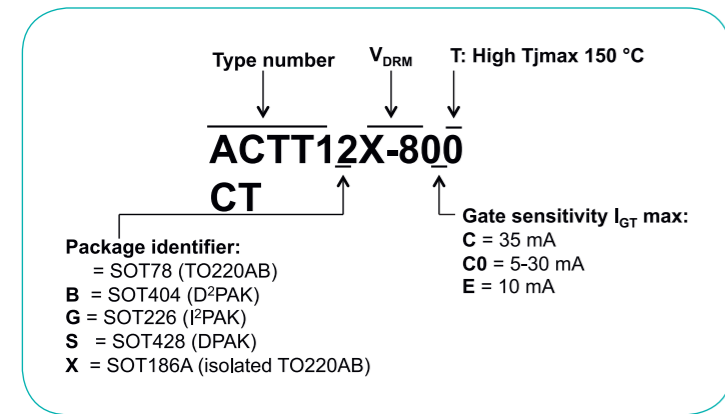
**In the spotlight**

**AC Thyristor ACT108-800E**

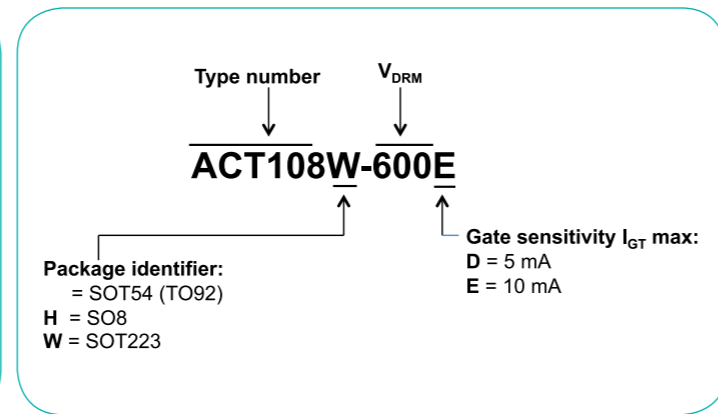
- Planar passivated with overvoltage clamping function
- Enhanced working voltage increased to 800 V
- Enhanced overvoltage clamping capability
- High false trigger immunity



#### AC Thyristor Triacs part numbering



#### AC Thyristors part numbering



### 3-quadrant triacs

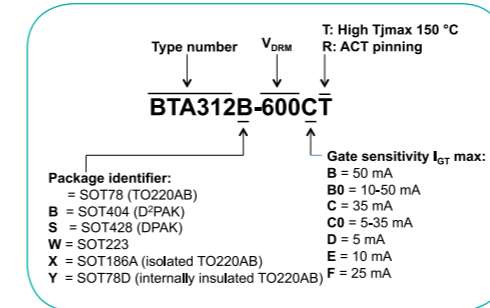
### 3-quadrant triacs

types in **bold** represent new products

$I_{T(RMS)}$ (A)	$V_{DRM}$ (V)	I (max) (mA)	$T_{jmax}$ (°C)	SOT54 (TO92)	SOT78 (TO220AB)	SOT78D (internally insulated TO220AB)	SOT186A (isolated TO220AB)	SOT223	SOT404 (D <sup>2</sup> PAK)	SOT428 (DPAK)
0.8	600 / 800	D	125					<b>BTA2008W</b>		
	600 / 800	D/E	125	BTA2008						
1	1000	D	125	<b>BTA2008</b>						
	600 / 800	B/E/ER	125	BTA201						
	600 / 800	E	125					BTA201W		
	600	B/C/D/E/F	125					BTA204W*		
2	600 / 800	C/E	125					BTA204W*		
	600 / 800	D/E	125				BTA202X			
4	600	B/C/D/E/F	125		BTA204		BTA204X			BTA204S
	800	B/C/E	125		BTA204		BTA204X			BTA204S
	1000	C	125				BTA204X			BTA204S
6	800	C/E	150		BTA206		BTA206X			
	600	B/D/E/F	125		BTA208		BTA208X			BTA208S
	800	B/E/F	125		BTA208		BTA208X			BTA208S
	1000	B	125				BTA208X			
8	1000	C	125				BTA208X			
	1000	C0	125				<b>BTA208X</b>			BTA208B
	600 / 800	C/D/E	125		BTA310		BTA310X			
	600 / 800	B/C/E	150		BTA410*	BTA410Y*	BTA410X*			
12	600	C	150		BTA312					BTA312B
	600	D	125		BTA312					BTA312B
	600 / 800	B/C/E	125		BTA312		BTA312X			BTA312B
	600 / 800	C	125				BTA312X			
	600 / 800	B/C	150				BTA312Y			
	800	C	150				BTA412Y*			
16	800	E	150		BTA312					BTA312B
	600	BT	150		BTA316					BTA316B
	600	B0	125		<b>BTA316</b>					<b>BTA316B</b>
	600	D	125		BTA316					
	600 / 800	B/C/E	125		BTA316		BTA316X			BTA316B
	600 / 800	ET	150		BTA316					
20	600 / 800	B/C	150				BTA416Y*			
	800	B0	125		<b>BTA316</b>		<b>BTA316X</b>			
	800	BT/CT	150		<b>BTA420*</b>	<b>BTA420Y*</b>	<b>BTA420X*</b>			
25	600	B	150		BTA225					
	600 / 800	B	125		BTA225					
	800	BT/CT	150				BTA425Y			

\* Large chip / high surge  $I_{TSM}$   
 $I_{GT}$  key: B = 50 mA, B0 = 10-50 mA, C = 35 mA, C0 = 5-35 mA, D = 5 mA, E = 10 mA, F = 25 mA  
 T: high  $T_{j(max)}$  150 °C  
 R: Reverse pinning

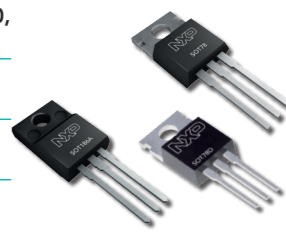
#### 3-quadrant triacs part numbering



**In the spotlight**

**3-quadrant Hi-Com triac BTA316-600B0, BTA316B-600B0**

- Planar passivated for voltage ruggedness and reliability
- Minimum IGT spec of 10 mA for high noise immunity guarantee
- High commutation, high dVD/dt for maximum immunity to false triggering





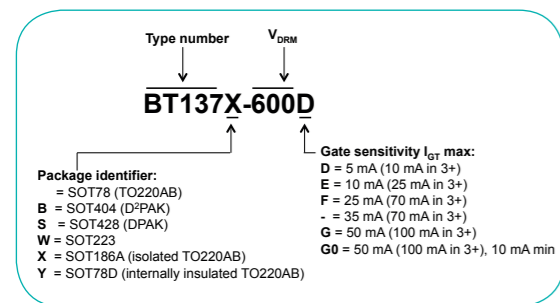
### 4-quadrant triacs

types in **bold** represent new products

I <sub>TRMS</sub> (A)	V <sub>DRM</sub> (V)	I <sub>GT</sub> (max) (mA)	T <sub>jmax</sub> (°C)	SOT54 (TO92)	SOT78 (TO220AB)	SOT78D (internally insulated TO220AB)	SOT82	SOT186A (isolated TO220AB)	SOT223	SOT404 (D <sup>2</sup> PAK)	SOT428 (DPAK)	
0.6	400	5/5/5/7	125	MAC97A6								
	600	5/5/5/7	125	MAC97A8								
1	600	3/3/3/7	125						BT131W			
	600 / 800	3/3/3/7	125	BT131								
	600 / 800	5/5/5/7	125	BT131-D								
	600 / 800	10/10/10/10	125	BT131-E								
	600 / 800	3/3/3/5	125	Z0103MA/NA					Z0103MN/NN			
	600 / 800	5/5/5/7	125	Z0107MA/NA					Z0107MN/NN			
	600 / 800	10/10/10/10	125	Z0109MA/NA					Z0109MN/NN			
	600 / 800	3/3/3/5	125	<b>Z0103MA0/NA0**</b>					<b>Z0103MN0/NN0**</b>			
	600 / 800	5/5/5/7	125	<b>Z0107MA0/NA0**</b>					<b>Z0107MN0/NN0**</b>			
	600 / 800	10/10/10/10	125	<b>Z0109MA0/NA0**</b>					<b>Z0109MN0/NN0**</b>			
	600	D	125	BT132*								
	4	600	D/E/-	125							BT134W*	
800		-	125							BT134W*		
600		D/E/-/G	125				BT134					
800		E/-	125				BT134					
600 / 800		D/E	125		BT234*			BT234X*				
600		D/-	125		BT136			BT136X			BT136S	
600		F	125					BT136X			BT136S	
600 / 800		E	125		BT136			BT136X		BT136B		
800		F	125								BT136S	
800		-	125					BT136X			BT136S	
6		600	F/-/G	125					BT236X			
		800	-/G	125					BT236X			
	600	D/-/G	125		BT137			BT137X			BT137S	
	600	E	125		BT137			BT137X		BT137B	BT137S	
	600	F	125					BT137X		BT137B	BT137S	
	600 / 800	G0	125		<b>BT137</b>							
	800	E	125		BT137			BT137X			BT137S	
	800	F	125							BT137B	BT137S	
	800	-	125		BT137			BT137X		BT137B	BT137S	
	800	G	125							BT137B	BT137S	
	12	600	D	125		BT138			BT138X			
		600	-/G	125		BT138			BT138X		BT138B	
600		F	125					BT138X		BT138B		
600 / 800		E	125		BT138	BT138Y		BT138X		BT138B		
800		F	125					BT138X				
800		-	125		BT138			BT138X				
800		G	125		BT138							
800		G	125		BT138							
800		E/-	125		BT139			BT139X		BT139B		
600		F/G	125					BT139X		BT139B		
800		E	125		BT139					BT139B		
800		F	125							BT139B		
800	-	125		BT139			BT139X		BT139B			
800	G	125		BT139					BT139B			
20	600	50/50/50/75	125					MAC223A8X				
25	400	50/50/50/75	125		MAC223A6							
25	600 / 800	-	125		BTA140							

I<sub>GT</sub> key: D 5 mA (10 mA in 3+) E 10 mA (25 mA in 3+) F 25 mA (70 mA in 3+) - 25 mA (70 mA in 3+) G 50 mA (100 mA in 3+) G0 50 mA (100 mA in 3+), 10 mA min

#### 4Q triacs part numbering



**In the spotlight**

**4-quadrant triac Z010\*\*\*0 series**

Planar passivated for voltage ruggedness and reliability

Improved dynamic performance over Z010\*\*\* series

Best false trigger immunity for sensitive 4-quadrant triacs

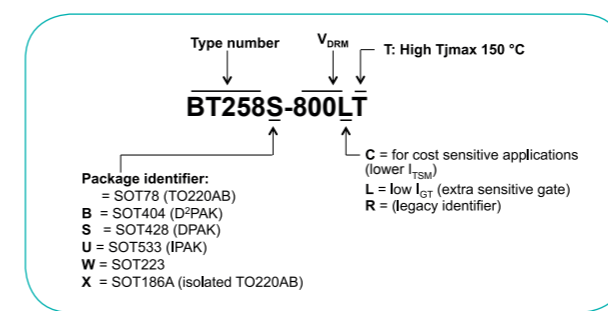
### Silicon Controlled Rectifiers

types in **bold** represent new products

I <sub>TRMS</sub> (A)	V <sub>DRM</sub> & V <sub>RRM</sub> (V)	I <sub>GT</sub> (max) (mA)	T <sub>jmax</sub> (°C)	SOT54 (TO92)	SOT78 (TO220AB)	SOT82	SOT186A (isolated TO220AB)	SOT223	SOT404 (D <sup>2</sup> PAK)	SOT428 (DPAK)	SOT533 (IPAK)
0.6	600	0.5 μA min - 7 μA max	125	N0118GA							
	400	0.012	125	EC103D1				<b>EC103D1W</b>			
	200 / 400 / 600	0.2	125	BT149B/D/G							
	200 / 400 / 600	0.2	125	BT169B/D/G							
	400	0.015 min - 0.05 max	125	BT169D-L							
	600	0.015 min - 0.05 max	125	BT169G-L							
0.8	800	0.1	125	BT169H							
	500 / 600	0.02 min - 0.2 max	125	BT168E/G							
	200	0.2	125					MCR08BT1			
	600	0.02 min - 0.2 max	125					BT168GW			
	600	0.07 min - 0.45 max	125					<b>BT168GWF**</b>			
	600	0.2	125					BT148W-R*			
4	400 / 500 / 600	0.2	125					BT148-R			
	600	0.2	125							BT150S-R	
	500	0.2	125		BT150-R						
8	800	0.05	150							BT258S-LT	
	500 / 600 / 800	0.2	125		BT258-R		BT258X-R				
	600	0.2	125								BT258U-R
	800	0.2	125								BT258S-R
	600	5	125								BT300S-R
	500 / 650	5	125						BT151-L*		BT151S-L*
12	500 / 650 / 800	15	125						BT151-R*		BT151S-R*
	650	15	125								BTH151S-R*
	500 / 650 / 800	15	125						BT151-C		BT151X-C
	500 / 1000	15	150						BT151-RT*		BT151U-C
	600	15	150						<b>TYN16-CT</b>		<b>TYN16X-CT</b>
	600 / 800	25	150						<b>TYN16-RT*</b>		<b>TYN16X-RT*</b>
20	400 / 600 / 800	32	125						BT152-R		BT152X-R
	500	32	150						BT152-RT		
	600	32	150								TYN20B-T
	800	32	150						<b>TYN20-T</b>		<b>TYN20B-T</b>
25	800	35	125					BT145-R			

\* Large chip / high I<sub>TSM</sub> \*\* Hi-Com / fast turn-off T: high T<sub>jmax</sub> 150 °C

#### Silicon Controlled Rectifiers part numbering



**In the spotlight**

**Silicon Controlled Rectifiers TYN16 series, TYN20 series**

Planar passivated for voltage ruggedness and reliability

High T<sub>j(max)</sub> of 150 °C

High thermal cycling capability

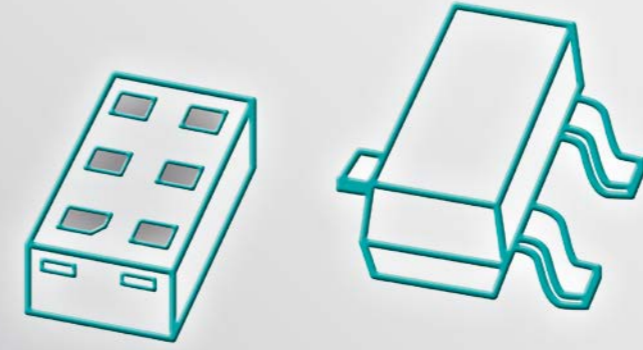


# Our extensive package range provides maximum flexibility

	Ultra small	Very small	Small	Power
<b>2 Pins</b>	DSN0603-2 (SOD962) 0.6 x 0.3 x 0.3 DFN1006D-2 (SOD882D) 1.0 x 0.6 x 0.37 DFN1006-2 (SOD882) 1.2 x 0.8 x 0.6 DFN1608D-2 (SOD1608) 1.6 x 0.8 x 0.77	SOD323 1.7 x 1.25 x 0.95 SOD323F 1.7 x 1.25 x 0.7	SOD123F 2.6 x 1.6 x 1.1	SOD123W 2.6 x 1.7 x 1.0 SOD128 3.8 x 2.6 x 1.0 CFP15 (SOT1289) 5.8 x 4.3 x 0.78
<b>3 Pins</b>	DFN1006B-3 (SOT883B) 1.0 x 0.6 x 0.37 DFN1006-3 (SOT883) 1.0 x 0.6 x 0.48 DFN1010D-3 (SOT1215) 1.1 x 1.0 x 0.37 SOT416 1.6 x 0.8 x 0.77	SOT323 2.0 x 1.25 x 0.95 DFN2020-3 (SOT1061) 2.0 x 2.0 x 0.62	SOT723 2.9 x 1.3 x 1.0	SOT89 4.5 x 2.5 x 1.5 DPAK (SOT1428) 6.6 x 6.1 x 2.3
<b>4/5 Pins</b>	WLCSP4* 0.76 x 0.76 x 0.61 WLCSP5* 1.51 x 1.14 x 0.65 SOT665 1.6 x 1.2 x 0.55	SOT353 2.0 x 1.25 x 0.95	SOT143B 2.9 x 1.3 x 1.0	LFPAK33 3.3 x 3.3 x 0.85 LFPAK56 (SOT669) 4.9 x 4.45 x 1.0 SOT223 6.5 x 3.5 x 1.65
<b>6 Pins</b>	DFN1010E-6 (SOT1202) 1.0 x 1.0 x 0.33 DFN1010-6 (SOT1891) 1.0 x 1.0 x 0.48 DFN1010B-6 (SOT1216) 1.1 x 1.0 x 0.37 DFN1410-6 (SOT1886) 1.45 x 1.0 x 0.48 WLCSP6* 1.6 x 1.15 x 0.65 SOT666 1.6 x 1.2 x 0.55	SOT363 2.0 x 1.25 x 0.95 DFN2020MD-6 (SOT1220) 2.0 x 2.0 x 0.62 DFN2020-6 (SOT1118) 2.0 x 2.0 x 0.42	SOT457 2.9 x 1.5 x 1.0	LFPAK56D (SOT1205) 4.9 x 4.45 x 1.0
<b>&gt; 8 Pins</b>	WLCSP9* 1.16 x 1.16 x 0.61 DFN1712-8 (SOT1157) 1.7 x 1.2 x 0.48 DFN1714LU-8 (SOT983) 1.7 x 1.35 x 0.5	WLCSP16* 1.9 x 1.97 x 0.65 DFN2110-9 (SOT1170) 2.1 x 1.0 x 0.48 WLCSP24* 2.45 x 2.4 x 0.65	DFN2510A-10 (SOT1170) 2.5 x 1.0 x 0.48 DFN2520-9 (SOT1333) 2.5 x 2.0 x 0.68 DFN2512-12 (SOT1158) 2.5 x 2.1 x 0.68	SOT505 3.0 x 3.0 x 1.1 SOT552 3.0 x 3.0 x 1.1 DFN4020-14 (SOT1330) 4.0 x 2.0 x 0.48

\* The exact position of the balls and package dimensions vary.

## A partner of excellence, experience and innovation for our customers



# Packages

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### Package details and packing methods WLCSP – Part 2

Basic Type	Length x width x height	# of balls	Pitch	Package	Package name
IP4364CX8	1.41 x 1.41 x 0.65	8	0.4		WLCSP8
IP4365CX11	1.56 x 1.16 x 0.61	11	0.4		WLCSP11
IP4366CX8	1.41 x 1.41 x 0.65	8	0.4		WLCSP8
IP4369CX4	0.76 x 0.76 x 0.5	4	0.4		WLCSP4
IP4386CX4	0.91 x 0.91 x 0.65	4	0.4		WLCSP4
IP4387CX4	0.91 x 0.91 x 0.65	4	0.4		WLCSP4
PEMI4CSP-RT	1.56 x 1.05 x 0.61	10	0.4		WLCSP10
PEMI4CSP-RW	1.56 x 1.05 x 0.61	10	0.4		WLCSP10
PEMI6CSP-RT	2.36 x 1.05 x 0.61	15	0.4		WLCSP15
PEMI6CSP-RW	2.36 x 1.05 x 0.61	15	0.4		WLCSP15
PEMI8CSP-RT-P	3.16 x 1.05 x 0.61	20	0.4		WLCSP20
PEMI8CSP-RW-P	3.16 x 1.05 x 0.61	20	0.4		WLCSP20

### Packing details glass diodes, single ended and through hole packages

Pins / leads	Package	Packing method and tape/reel/tube dimensions	Package	Ordering code (12 NC ending)	Packing quantity
2	SOD27	26 mm tape ammo pack, axial		-143	5000 pcs
		52 mm tape ammo pack, axial		-133	10000 pcs
		52 mm reel pack, axial		-113	10000 pcs
	SOD59	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs
	SOD66	52 mm tape ammo pack, axial		-133	10000 pcs
		52 mm reel pack, axial		-113	10000 pcs
	SOD68	26 mm tape ammo pack, axial		-143	5000 pcs
		52 mm reel pack, axial		-113	10000 pcs
	52 mm tape ammo pack, axial		-133	10000 pcs	
SOD113	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs	
SOD141	52 mm tape ammo pack, axial		-133	12000 pcs	
	Bulk pack, 500 pcs. per carrier		-112	20 carriers x 500 pcs	
SOT54		Bulk pack, 1000 pcs/carrier	-112	5 carriers x 1000 pcs	
		55 mm reel packing, 2000 pcs/reel, reel dimensions = 380 x 55 mm	-116	5 reels x 2000 pcs	
		Ammo packing, 18 mm tape, 2000 pcs/carrier, reel dimensions = 350 x 55 mm	-126	5 carriers x 2000 pcs	
		Bulk pack, 1000 pcs/carrier	-412	5 carriers x 1000 pcs	
SOT78	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs	
SOT78D	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs	
SOT82	Rail packing, 50 pcs/tube, tube length = 390 mm		-127	20 tubes x 50 pcs	
SOT186A	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs	
SOT226	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs	
SOT533	Rail packing		-127	75 tubes x 50 pcs	
5	SOT263B-1	Rail packing		-127	20 tubes x 50 pcs

### Package cross reference list – Part I

Type	Competitor	NXP	Pins / Leads	Type	Competitor	NXP	Pins / Leads
μQFN-10L	ST	DFN2510A-10 (SOT1176)	10	Micro 6	Int. Rectifier	SOT457	6
μQFN-10L	ST	DFN2520-9 (SOT1333)	9	MICRO FOOT 0.8 x 0.8*	Vishay	DFN1010D-3 (SOT1215)	3
μQFN-2L	ST	DFN1006-2 (SOD882)	2	MICRO FOOT 1.6 x 1.6*	Vishay	DFN2020MD-6 (SOT1220)	6
6 Lead DFN	ON Semi	DFN2020-6 (SOT1118)	6	MICRO FOOT 1 x 1*	Vishay	DFN1010D-3 (SOT1215)	3
CLP0603	Vishay	DSN0603-2 (SOD962)	2	MICRO FOOT 1 x 1.2*	Vishay	DFN1010D-3 (SOT1215)	3
CMAK/ CMAK	Renesas	SOT323	3	MICRO FOOT 1 x 1.5*	Vishay	DFN1010D-3 (SOT1215)	3
CMPAK/ CMAK	Renesas	SOT323	3	MICRO FOOT*	Vishay	DFN2020MD-6 (SOT1220)	6
CMPAK-5(T)	Renesas	SOT353	5	Micro10	ON Semi	SOT552	10
CMPAK-6	Renesas	SOT363	6	MicroFET	Fairchild	DFN2020MD-6 (SOT1220)	6
CP4	Toshiba	SOT143B	4	MicroFET 1.6 x 1.6*	Fairchild	DFN2020MD-6 (SOT1220)	6
CS6	Toshiba	DFN1010-6 (SOT891)	6	MiniMelf	Diodes Inc.	SOD80C	2
CST3	Toshiba	DFN1006-3 (SOT883)	3	MiniMelf	ST	SOD80C	2
CST3	Toshiba	DFN1006B-3 (SOT883B)	3	MiniMelf	Vishay	SOD80C	2
CTS2 (fsc)	Toshiba	DFN1006-2 (SOD882)	2	MP6	Renesas	DSN0603-2 (SOD962)	2
CTS2 (fsc)	Toshiba	DFN1006D-2 (SOD882D)	2	MPAK	Renesas	SOT23	3
D <sup>2</sup> PAK	ON Semi	D <sup>2</sup> PAK (SOT404)	3	MPAK	Renesas	SOT23	3
D <sup>2</sup> PAK	Vishay	D <sup>2</sup> PAK (SOT404)	3	MPAK-4R	Renesas	SOT143B	4
D <sup>2</sup> PAK 3	ON Semi	D <sup>2</sup> PAK (SOT404)	3	MPT3	Rohm	SOT89	3
D <sup>2</sup> PAK*	Diodes Inc.	D <sup>2</sup> PAK (SOT404)	3	MSOP-10L	Semtech	SOT552	10
DFN1006-3	Diodes Inc.	DFN1006-3 (SOT883)	3	PG-TDSON-8	Infineon	LFPK (SOT669)	5
DFN1006H4-3	Diodes Inc.	DFN1006-3 (SOT883)	3	PMDT	Rohm	SOD128	2
DFN1411*	Diodes Inc.	DFN1010D-3 (SOT1215)	3	PMDU	Rohm	SOD123W	2
DFN2	ST	DSN0603-2 (SOD962)	2	PowerDI123	Diodes Inc.	SOD123F	2
DPK	ON Semi	DPK (SOT428)	3	PowerDI123	Diodes Inc.	SOD123W	2
DSN2	ON Semi	DSN0603-2 (SOD962)	2	PowerDI323	Diodes Inc.	SOD323F	2
DSN2, 1.0 x 0.6	ON Semi	DFN1006D-2 (SOD882D)	2	PowerDi5	Diodes Inc.	CFP15 (SOT1289)	3
DSN2, 1.6 x 0.8	ON Semi	DFN1608D-2 (SOD1608)	2	PowerFLAT (6 x 5)	ST	LFPK (SOT669)	5
DSO14	Infineon	SOT108	14	PowerFLAT (6 x 5)	ST	LFPK56D (SOT1205)	6
EMD2	Rohm	SOD523	2	PowerPAK SC-70	Vishay	DFN2020-6 (SOT1118)	6
EMD3 /EMT3	Rohm	SOT416	3	PowerPAK SC-70	Vishay	DFN2020MD-6 (SOT1220)	6
EMD5/ EMT5	Rohm	SOT665	5	PowerPAK SC-70	Vishay	DFN2020MD-6 (SOT1220)	6
EMD6/ EMT6/ WEMT6	Rohm	SOT666	6	PowerPAK SC706L	Vishay	DFN2020-3 (SOT1061)	3
EMT3	Rohm	SOT416	3	PowerPak SC-70-6L	Vishay	DFN2020-6 (SOT1118)	6
EMT3 /EMD3	Rohm	SOT416	3	PowerPak SC-75*	Vishay	DFN2020MD-6 (SOT1220)	6
EMT3F*	Rohm	SOT416	3	PowerPak SC-75-6L*	Vishay	DFN2020MD-6 (SOT1220)	6
EMT5*	Rohm	SOT666	6	PowerPAK SO-8	Vishay	LFPK (SOT669)	5
EMT5/ EMD5	Rohm	SOT665	5	PW-Mini	Toshiba	SOT89	3
EMT6	Rohm	SOT666	6	SC2	Toshiba	DSN0603-2 (SOD962)	2
EMT6/ EMD6/ WEMT6	Rohm	SOT666	6	SC59	Diodes Inc.	SOT23	3
ES6	Toshiba	SOT666	6	SC70	ON Semi	SOT323	3
ES6 ESV	Toshiba	SOT666	6	SC-70	ON Semi	SOT323	3
ESC/TESC	Toshiba	SOD523	2	SC-70, 3 leads	Vishay	SOT323	3
ESM	Toshiba	SOT416	3	SC70-3	Vishay	SOT323	3
ESV	Toshiba	SOT665	5	SC70-3	AOS	SOT323	3
ESV	Toshiba	SOT666	6	SC70-5L	Semtech	SOT353	5
FM8	Toshiba	SOT96	8	SC70-6	Vishay	SOT363	6
FS6*	Toshiba	DFN1010B-6 (SOT1216)	6	SC70-6	AOS	SOT363	6
GMD2	Rohm	DSN0603-2 (SOD962)	2	SC70-6	Fairchild	SOT363	6
HUML2020L8 (Dual)	Rohm	DFN2020-6 (SOT1118)	6	SC70-6L	Semtech	SOT363	6
HUML2020L8 (Single)	Rohm	DFN2020MD-6 (SOT1220)	6	SC-74 TSOP-6	ON Semi	SOT457	6
KMD2	Rohm	DFN1608D-2 (SOD1608)	2	SC74 TSOP6	Infineon	SOT457	6
LDPK(S)-1)	Renesas	D <sup>2</sup> PAK (SOT404)	3	SC75	Infineon	SOT416	3
LFPK	Renesas	LFPK (SOT669)	5	SC75	ON Semi	SOT416	3
LGA 1.0 x 0.6mm	Texas Instruments	DFN1006B-3 (SOT883B)	3	SC-75	ON Semi	SOT416	3
LLD	Renesas	SOD80C	2	SC-75	Semtech	SOT416	3
LLDS	Rohm	SOD80C	2	SC75A	Vishay	SOT416	3
LLP1006-2L	Vishay	DFN1006-2 (SOD882)	2	SC-75A	Vishay	SOT416	3
LLP1006-2L	Vishay	DFN1006D-2 (SOD882D)	2	SC79	Infineon	SOD523	2
LLP1006-2M	Vishay	DFN1006-2 (SOD882)	2	SC-88	ON Semi	SOT363	6
LLP1006-2M	Vishay	DFN1006D-2 (SOD882D)	2	SC88/SC70-6/SOT363 6 LEAD	ON Semi	SOT363	6
LLP75-7L	Vishay	DFN1616-6 (SOT1189)	6	SC-88A	ON Semi	SOT353	5
LPDS/LPTS	Rohm	D <sup>2</sup> PAK (SOT404)	3	SC89	Fairchild	SOT666	6
LPTS/LPDS	Rohm	D <sup>2</sup> PAK (SOT404)	3	SC-89	Semtech	SOT666	6
M-Flat	Toshiba	SOD128	2	SC89-3	Vishay	SOT416	3
Micro 3	Int. Rectifier	SOT23	3				

Types with \* show footprint compability only

Package cross reference list – Part 2

Type	Competitor	NXP	Pins / Leads	Type	Competitor	NXP	Pins / Leads
SC89-3	ON Semi	SOT416	3	SOT143	Infineon	SOT143B	4
SC89-3	Fairchild	SOT416	3	SOT-143	Semtech	SOT143B	4
SC89-6	Vishay	SOT666	6	SOT-143	Diodes Inc.	SOT143B	4
SC89-6	AOS	SOT666	6	SOT223	Vishay	SOT223	4
SC89-6	Fairchild	SOT666	6	SOT223	Infineon	SOT223	4
SC89-6lead	Vishay	SOT666	6	SOT223	Fairchild	SOT223	4
S-Flat	Toshiba	SOD123F	2	SOT223	ON Semi	SOT223	4
S-Flat	Toshiba	SOD123W	2	SOT223	Diodes Inc.	SOT223	4
SLP1006P2	Semtech	DFN1006-2 (SOD882)	2	SOT-223	ON Semi	SOT223	4
SLP1006P2T	Semtech	DFN1006D-2 (SOD882D)	2	SOT-223	Diodes Inc.	SOT223	4
SLP1006P3	Semtech	DFN1006-3 (SOT883)	3	SOT23	Infineon	SOT23	3
SLP1006P3T	Semtech	DFN1006B-3 (SOT883B)	3	SOT23	ST	SOT23	3
SLP1510N6	Semtech	DFN1410-6 (SOT886)	6	SOT23	Vishay	SOT23	3
SLP1610P4	Semtech	DFN2510A-10 (SOT1176)	10	SOT23	Semtech	SOT23	3
SLP1610P4	Semtech	DFN2520-9 (SOT1333)	9	SOT23	Diodes Inc.	SOT23	3
SLP1616P6	Semtech	DFN1616-6 (SOT1189)	6	SOT23	AOS	SOT23	3
SLP1713P8	Semtech	DFN1714-8 (SOT1166)	8	SOT23	ON Semi	SOT23	3
SLP1713P8	Semtech	DFN1714U-8 (SOT983)	8	SOT-23	ON Semi	SOT23	3
SLP2010P8T	Semtech	DFN2110-9 (SOT1178)	9	SOT-23	Diodes Inc.	SOT23	3
SLP2513P12	Semtech	DFN2512-12 (SOT1158)	12	SOT23-3	Diodes Inc.	SOT23	3
SLP2513P12	Semtech	DFN2514-12 (SOT1167)	12	SOT23-3	AOS	SOT23	3
SLP2513P12	Semtech	DFN2514U-12 (SOT984)	12	SOT23-3	ON Semi	SOT23	3
SLP2626P10	Semtech	DFN2626-10 (SOT1197)	10	SOT23-5	AOS	SOT457	6
SLP3313P16	Semtech	DFN3314-16 (SOT1168)	16	SOT23-5	Diodes Inc.	SOT457	6
SLP3313P16	Semtech	DFN3314U-16 (SOT985)	16	SOT23-6	Diodes Inc.	SOT457	6
SM6 VS-6	Toshiba	SOT457	6	SOT23-6	ST	SOT457	6
SMA flat	ST	SOD128	2	SOT23-6	Diodes Inc.	SOT457	6
SMD TO-263	Renesas	D <sup>2</sup> PAK (SOT404)	3	SOT23-6L	Semtech	SOT457	6
SMD6/ SMT6	Rohm	SOT457	6	SOT23F	Toshiba	SOT23	3
SMD6/ SMZ6	Rohm	SOT457	6	SOT23F	Diodes Inc.	SOT23	3
SMFPAK-6	Renesas	SOT666	6	SOT26	Diodes Inc.	SOT457	6
S-Mini	Toshiba	SOT23	3	SOT323	Infineon	SOT323	3
S-Mini TSM	Toshiba	SOT23	3	SOT323	Diodes Inc.	SOT323	3
SMPAK	Renesas	SOT416	3	SOT323	Fairchild	SOT323	3
SMPC TO-277A	Vishay	CFP15 (SOT1289)	3	SOT-323	Diodes Inc.	SOT323	3
SMT3	Rohm	SOT23	3	SOT-323	ST	SOT323	3
SMT5*	Rohm	SOT457	6	SOT-323	Diodes Inc.	SOT323	3
SMT6	Rohm	SOT457	6	SOT353	Diodes Inc.	SOT353	5
SMZ6/ SMD6	Rohm	SOT457	6	SOT353	Vishay	SOT353	5
SO8	Vishay	SOT96	8	SOT353	Diodes Inc.	SOT363	6
SO-8 FL	ON Semi	LFPK (SOT669)	5	SOT363	Infineon	SOT363	6
SOD-123	ST	SOD123F	2	SOT363	Diodes Inc.	SOT363	6
SOD-123-FL	ON Semi	SOD123F	2	SOT-363	Diodes Inc.	SOT363	6
SOD-123-FL	ON Semi	SOD123W	2	SOT523	Diodes Inc.	SOT416	3
SOD323	Infineon	SOD323	2	SOT523F	Fairchild	SOT416	3
SOD323	Vishay	SOD323	2	SOT-553	ON Semi	SOT665	5
SOD323	Semtech	SOD323	2	SOT563	Diodes Inc.	SOT666	6
SOD-323	ON Semi	SOD323	2	SOT-563	ON Semi	SOT666	6
SOD-323	Diodes Inc.	SOD323	2	SOT563-6	ON Semi	SOT666	6
SOD-323	ST	SOD323	2	SOT563F	Fairchild	SOT666	6
SOD523	Diodes Inc.	SOD523	2	SOT666	Infineon	SOT666	6
SOD523	Vishay	SOD523	2	SOT723*	ON Semi	DFN1010D-3 (SOT1215)	3
SOD523	Semtech	SOD523	2	SOT723-3*	ON Semi	DFN1010D-3 (SOT1215)	3
SOD-523	ON Semi	SOD523	2	SOT89	Infineon	SOT89	3
SOD-523	ST	SOD523	2	SOT89	Diodes Inc.	SOT89	3
SOD882	ST	DFN1006-2 (SOD882)	2	SOT-89	ON Semi	SOT89	3
SOD882T	ST	DFN1006D-2 (SOD882D)	2	SOT89-3L	Diodes Inc.	SOT89	3
SOD923-2*	ON Semi	DFN1006-2 (SOD882)	2	SOT963	ON Semi	DFN1010-6 (SOT891)	6
SOIC-8 NB	ON Semi	SOT96	8	SOT963*	Diodes Inc.	DFN1010B-6 (SOT1216)	6
SON2x2	Texas Instruments	DFN2020MD-6 (SOT1220)	6	SOT963*	ON Semi	DFN1010E-6 (SOT1202)	6
SON3x3*	Texas Instruments	DFN2020MD-6 (SOT1220)	6	SRP-F	Renesas	SOD123W	2
SOP14	Rohm	SOT108	14	SS CSP2	Toshiba	DFN1006-3 (SOT883)	3
SOP8	Rohm	SOT96	8	SSD3/ SST3	Rohm	SOT23	3
SOP-8	Renesas	SOT96	8	SSM	Toshiba	SOT416	3
SOT063*	ON Semi	DFN1010B-6 (SOT1216)	6	SSOT3	Fairchild	SOT23	3
				SSOT6	Fairchild	SOT457	6

Types with \* show footprint compatibility only

Package cross reference list – Part 3

Type	Competitor	NXP	Pins / Leads	Type	Competitor	NXP	Pins / Leads
SSOT6 FLMP	Fairchild	SOT457	6	UDFN6B	Toshiba	DFN2020MD-6 (SOT1220)	6
SST3	Rohm	SOT23	3	UDFN8, 1.8 x 1.2, 0.4P	ON Semi	DFN1712-8 (SOT1157)	8
SST3/ SSD3	Rohm	SOT23	3	UDRN 16 4 x 2	ON Semi	DFN4020-14 (SOT1334)	14
Stmite flat	ST	SOD123W	2	UF6	Toshiba	SOT363	6
Thin PowerPAK SC-70	Vishay	DFN2020-6 (SOT1118)	6	UF6/ USV/ US6	Toshiba	SOT363	6
Thin PowerPAK SC70	Vishay	DFN2020MD-6 (SOT1220)	6	UFP	Renesas	SOD523	2
Thin PowerPAK SC-70	Vishay	DFN2020MD-6 (SOT1220)	6	UMD2	Rohm	SOD323F	2
Thin PowerPAK SC75*	Vishay	DFN2020MD-6 (SOT1220)	6	UMD3/UMT3	Rohm	SOT323	3
TLSP-6-1	Infineon	DFN1010E-6 (SOT1202)	6	UMD5/UMT5	Rohm	SOT353	5
TO-220S	Renesas	D <sup>2</sup> PAK (SOT404)	3	UMD6/ UMT6	Rohm	SOT363	6
TO-220SM	Toshiba	D <sup>2</sup> PAK (SOT404)	3	UMLP 1.6 x 1.6*	Fairchild	DFN2020MD-6 (SOT1220)	6
TO-252 reverse, TO-252	Vishay	DKPAK (SOT428)	3	UMT3	Rohm	SOT323	3
TO-252 (MP-3ZK)	Renesas	DKPAK (SOT428)	3	UMT3F*	Rohm	SOT323	3
TO-252, TO-252 reverse	Vishay	DKPAK (SOT428)	3	UMT5/ UMD5	Rohm	SOT353	5
TO-252-3/-3-23	Infineon	DKPAK (SOT428)	3	UMT6	Rohm	SOT363	6
TO263	Diodes Inc.	D <sup>2</sup> PAK(SOT404)	3	UMT6/ UMD6	Rohm	SOT363	6
TO-263 3-lead	Vishay	D <sup>2</sup> PAK (SOT404)	3	UPAK (SOT89)	Renesas	SOT89	3
TO263-3	Infineon	D <sup>2</sup> PAK (SOT404)	3	URP	Renesas	SOD323	2
TO-263AB	Vishay	D <sup>2</sup> PAK (SOT404)	3	US6	Toshiba	SOT363	6
TSLP-2-1	Infineon	DFN1006-2 (SOD882)	2	US6/ UF6/ USV	Toshiba	SOT363	6
TSLP-2-7/-17	Infineon	DFN1006D-2 (SOD882D)	2	USC	Toshiba	SOD323	2
TSLP-3-1, -15	Infineon	DFN1006B-3 (SOT883B)	3	US-Flat	Toshiba	SOD323F	2
TSLP-3-4	Infineon	DFN1006-3 (SOT883)	3	USM	Toshiba	SOT323	3
TSLP-9-1	Infineon	DFN2510A-10 (SOT1176)	10	USV	Toshiba	SOT353	5
TSLP-9-1	Infineon	DFN2520-9 (SOT1333)	9	USV	Toshiba	SOT363	6
TSMT5*	Rohm	SOT457	6	USV/ US6/ UF6/	Toshiba	SOT363	6
TSMT6	Rohm	SOT457	6	VESM*	Toshiba	DFN1010D-3 (SOT1215)	3
TSOP Advance	Toshiba	DFN3333-8 (SOT873-1)	8	VML0806*	Rohm	DFN1006B-3 (SOT883B)	3
TSOP6	Vishay	SOT457	6	VMN2*	Rohm	DFN1006-2 (SOD882)	2
TSOP6	AOS	SOT457	6	VMN2*	Rohm	DFN1006D-2 (SOD882D)	2
TSOP6	ON Semi	SOT457	6	VMN3*	Rohm	DFN1006-3 (SOT883)	3
TSOP-6	Renesas	SOT457	6	VMT3*	Rohm	DFN1010D-3 (SOT1215)	3
TSOP-6/ TSOP6	Vishay	SOT457	6	VMT6*	Rohm	DFN1010B-6 (SOT1216)	6
TSSLP-2-1	Infineon	DSN0603-2 (SOD962)	2	VS6	Toshiba	SOT457	6
TSSOP10	Infineon	SOT552	10	VSON-5	Renesas	SOT665	5
TSSOP20	Toshiba	SOT360	20	WDFN 10 2.5 x 2	ON Semi	DFN2520-9 (SOT1333)	9
TSSOP20	Renesas	SOT360	20	WDFN 16 4 x 2	ON Semi	DFN4020-14 (SOT1334)	14
TSSOP38	Infineon	SOT510	38	WDFN3	ON Semi	DFN2020-3 (SOT1061)	3
TSSOP-8	ON Semi	SOT505	8	W-DFN3020-8*	Diodes Inc.	DFN2020-6 (SOT1118)	6
TSST8*	Rohm	DFN2020MD-6 (SOT1220)	6	WDFN6	ON Semi	DFN2020-6 (SOT1118)	6
TUMT3	Rohm	SOT323	3	WDFN6	ON Semi	DFN2020MD-6 (SOT1220)	6
TUMT5*	Rohm	DFN2020-6 (SOT1118)	6	WEMT6	Rohm	SOT666	6
TUMT6*	Rohm	DFN2020-6 (SOT1118)	6	WEMT6/ EMT6/ EMD6	Rohm	SOT666	6
UDFN 1.6 x 1.6	ON Semi	DFN1616-6 (SOT1189)	6	WLCSP 1 x 1*	Fairchild	DFN1010D-3 (SOT1215)	3
UDFN 1.7 x 1.35, 0.4P	ON Semi	DFN1714U-8 (SOT983)	8	WLCSP1.6 x 1.6*	AOS	DFN2020MD-6 (SOT1220)	6
UDFN 10 2.5 x 1, 0.5P	ON Semi	DFN2520-9 (SOT1333)	9	WLCSP2	ON Semi	DSN0603-2 (SOD962)	2
UDFN 10 2.5 x 2	ON Semi	DFN2520-9 (SOT1333)	9	WLCSP-4*	Fairchild	DFN1010D-3 (SOT1215)	3
UDFN10 2.5 x 1, 0.5P	ON Semi	DFN2510A-10 (SOT1176)	10	WLCSP-4*	ON Semi	DFN1010D-3 (SOT1215)	3
UDFN10 2.6 x 2.6, 0.5P	ON Semi	DFN2626-10 (SOT1197)	10	WLP1.0 x 1.0*	Texas Instruments	DFN1010D-3 (SOT1215)	3
UDFN12, 2.5 x 1.2, 0.4P	ON Semi	DFN2512-12 (SOT1158)	12	WLP1.0 x 1.5*	Texas Instruments	DFN2020MD-6 (SOT1220)	6
UDFN12, 2.5 x 1.35, 0.4P	ON Semi	DFN2512-12 (SOT1158)	12	WLP1.5 x 1.5*	Texas Instruments	DFN2020MD-6 (SOT1220)	6
UDFN12, 2.5 x 1.35, 0.4P	ON Semi	DFN2514-12 (SOT1167)	12	X1-DFN1006-3	Diodes Inc.	DFN1006-3 (SOT883)	3
UDFN16, 3.3 x 1.35, 0.4P	Toshiba	DFN3314U-16 (SOT985)	16	X1-DFN1212-3*	Diodes Inc.	DFN1010D-3 (SOT1215)	3
UDFN16, 3.5 x 1.2, 0.4P	ON Semi	DFN3312-16 (SOT1159)	16	X1-DFN1616-6*	Diodes Inc.	DFN2020MD-6 (SOT1220)	6
U-DFN2020-3 Type B 2.0 x 2.0 x 0.6	Diodes Inc.	DFN2020-3 (SOT1061)	3	X2-DFN0806-3	Diodes Inc.	DFN1006-3 (SOT883)	3
U-DFN2020-6	Diodes Inc.	DFN2020MD-6 (SOT1220)	6	X2-DFN1006-2	Diodes Inc.	DFN1006D-2 (SOD882D)	2
UDFN2020-6 Type B	Diodes Inc.	DFN2020-6 (SOT1118)	6	X2-DFN1006-3	Diodes Inc.	DFN1006B-3 (SOT883B)	3
UDFN2020-6 Type E	Diodes Inc.	DFN2020MD-6 (SOT1220)	6	X2-DFN1310-6*	Diodes Inc.	DFN1010B-6 (SOT1216)	6
U-DFN2523-6*	Diodes Inc.	DFN2020MD-6 (SOT1220)	6	X2-DFN2015-3*	Diodes Inc.	DFN2020MD-6 (SOT1220)	6
UDFN6	Toshiba	DFN2020-6 (SOT1118)	6	X2-DFN2020-6	Diodes Inc.	DFN2020MD-6 (SOT1220)	6
UDFN6	ON Semi	DFN2020MD-6 (SOT1220)	6	X3-DFN0603-2	Diodes Inc.	DSN0603-2 (SOD962)	2
UDFN-6 WDFN6	ON Semi	DFN2020MD-6 (SOT1220)	6	X3DFN-2	ON Semi	DSN0603-2 (SOD962)	2
				XI-DFN1006-2	Diodes Inc.	DFN1006-2 (SOD882)	2

Types with \* show footprint compatibility only

Package cross reference matrix – Part 1

Pins / leads	NXP	Industry standard names	Size (l x w x h) (mm)	P <sub>tot</sub> (mW)	Package	Competitor synonyms								
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	ST	Vishay	Semtech
2	DFN1006-2 (SOD882)	-	1.0 x 0.6 x 0.48	250		(VMN2)	CTS2 (fSC)	(SOD923-2)		TSLP-2-1	XI-DFN1006-2	SOD882 μQFN-2L	LLP1006-2M LLP1006-2L	SLP1006P2
	DFN1006D-2 (SOD882D)	-	1.0 x 0.6 x 0.37	250		(VMN2)	CTS2 (fSC)	DSN2, 1.0 x 0.6		TSLP-2-7/-17	X2-DFN1006-2	SOD882T	LLP1006-2L LLP1006-2M	SLP1006P2T
	DFN1608D-2 (SOD1608)	-	1.6 x 0.8 x 0.37	780		KMD2		DSN2 1.6 x 0.8						
	DSN0603-2 (SOD962)	-	0.6 x 0.3 x 0.3	525		GMD2	SC2	DSN2, X3DFN-2 WLCSP2	MP6	TSSLP-2-1	X3-DFN0603-2	DFN2	CLP0603	SLP0603P2X3
	SOD80C	Mini-Melf	3.5 x 1.5 x 1.5	300		LLDS			LLD		MiniMelf	MiniMelf	MiniMelf	
	SOD123F	-	2.6 x 1.6 x 1.1	830			S-Flat	SOD-123-FL			PowerDI123	SOD-123		
	SOD123W	-	2.6 x 1.7 x 1.0	900		PMDU	S-Flat	SOD-123-FL	SRP-F		PowerDI123	Strmite flat		
	SOD128	-	3.8 x 2.5 x 1.0	1000		PMDT	M-Flat					SMA flat		
	SOD323	SC-76	1.7 x 1.25 x 0.95	400			USC	SOD-323	URP	SOD323	SOD-323	SOD-323	SOD323	SOD323
	SOD323F	SC-90	1.7 x 1.25 x 0.7	830		UMD2	US-Flat				PowerDI323			
	SOD523	SC-79	1.2 x 0.8 x 0.6	500		EMD2	ESC/TESC	SOD-523	UFP	SC79	SOD523	SOD-523	SOD523	SOD523
	3	CFP15 (SOT1289)	-	5.8 x 4.3 x 0.78	1200						PowerDi5		SMPC TO-277A	
DFN1006-3 (SOT883)		SC-101	1.0 x 0.6 x 0.48	250			SS CSP2			TSLP-3-4	X1-DFN1006-3		SLP1006P3	
DFN1006B-3 (SOT883B)		-	1.0 x 0.6 x 0.37	250			CST3			TSLP-3-1,-15	X2-DFN1006-3		SLP1006P3T	
DFN1010D-3 (SOT1215)		-	1.1 x 1.0 x 0.37	325		(VMT3)	(VESM)	(SOT723)				(DFN1411)		
DFN2020-3 (SOT1061)		HU-SON3	2.0 x 2.0 x 0.62	1300				WDFN3			U-DFN2020-3 Type B 2.0 x 2.0 x 0.6		PowerPAK SC706L	
DPAK (SOT428)		-	6.6 x 6.1 x 2.3	-				DPAK	TO-252 (MP-3ZK)	TO-252-3/-3-23			TO-252, TO-252 reverse	
D <sup>2</sup> PAK (SOT404)		-	11.0 x 11.0 x 4.3	-		LPDS/ LPT5	TO-220SM	D <sup>2</sup> PAK D <sup>2</sup> PAK 3	TO-220S / SMD TO-263 LDKPAK(S)-(1)	TO263-3	TO263 (D <sup>2</sup> PAK)		TO-263 3-lead TO-263AB / D <sup>2</sup> PAK	
SOT23		-	2.9 x 1.3 x 1.0	250		SSD3/ SST3	S-Mini TSM	SOT-23	MPAK	SOT23	SOT-23	SOT23	SOT23	SOT23
SOT89		SC-62	4.5 x 2.5 x 1.5	1300		MPT3	PW-Mini	SOT-89	UPAK (SOT89)	SOT89	SOT89			
SOT323		SC-70	2.0 x 1.25 x 0.95	200		UMD3/ UMT3 TUMT3	USM	SC-70	CMAK/ CMPAK	SOT323	SOT-323	SOT-323	SC-70 3 leads	
4	SOT143B	-	2.9 x 1.3 x 1.0	250			CP4		MPAK-4R	SOT143	SOT-143		SOT-143	
	SOT223	SC-73	6.5 x 3.5 x 1.65	1700						SOT223	SOT-223		SOT223	
	LFPK56 (SOT669)	Power-SOB	4.9 x 4.45 x 1.0	3000				SO-8 FL	LFPK	PG-TD-SON-8	PowerDi5060-8	PowerFLAT (6 x 5)	PowerPAK SO-8	
	SOT753	?	2.9 x 1.5 x 1.0	?										
5	SOT353	SC-88A	2.0 x 1.25 x 0.95	300		UMD5/ UMT5	USV	SC-88A	CMPAK-5(T)		SOT353		SOT353 SC70-5L	
	SOT665	-	1.6 x 1.2 x 0.55	300		EMD5/ EMT5	ESV	SOT-553	VSON-5					

Types in brackets (...) show footprint compatibility only

Package cross reference matrix – Part 2

Pins / leads	NXP	Industry standard names	Size (l x w x h) (mm)	P <sub>tot</sub> (mW)	Package	Competitor synonyms								
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	ST	Vishay	Semtech
6	DFN1010-6 (SOT891)	XSON6	1.0 x 1.0 x 0.48	-			CS6	SOT963						
	DFN1010B-6 (SOT1216)	-	1.1 x 1.0 x 0.37	350		(VMT6)	(FS6)	(SOT063)				(SOT963)		
	DFN1010E-6 (SOT1202)	-	1.0 x 1.0 x 0.33	-				(SOT963)				TLSP-6-1		
	DFN1410-6 (SOT886)	XSON6	1.45 x 1.0 x 0.48	250										SLP1510N6
	DFN1616-6 (SOT1189)	HXSON6	1.6 x 1.6 x 0.48	-								UDFN 1.6 x 1.6		LLP75-/L SLP1616P6
	DFN2020-6 (SOT1118)	-	2.0 x 2.0 x 0.62	1300		HU-ML2020L8 (Dual)	UDFN6	6 Lead DFN WDFN6				UDFN2020-6 Type B		PowerPAK SC-70 Thin PowerPAK SC-70
	DFN2020MD-6 (SOT1220)	-	2.0 x 2.0 x 0.62	1250		HU-ML2020L8 (Single)	UDFN6B	UDFN-6 WDFN6				UDFN2020-6 Type E		PowerPAK SC-70 Thin PowerPAK SC-70
	LFPK56D (SOT1205)	-	4.9 x 4.45 x 1.0	3000										PowerFLAT (6x5)
	SOT363	SC-88	2.0 x 1.25 x 0.95	300		UMD6/ UMT6	US6 UF6 USV	SC-88	CMPAK-6	SOT363	SOT-363			SC70-6 SC70-6L
	SOT457	SC-74	2.9 x 1.5 x 1.0	750		SMD6/ SMT6	SM6 VS-6	SC-74 TSOP-6	TSOP-6	SC74 TSOP6	SOT23-6 SOT26			TSOP6 TSOP-6 SOT23-6L
	SOT666	-	1.6 x 1.2 x 0.55	300		EMD6/ EMT6 WEMT6	ES6 ESV	SOT-563	SMFPAK-6	SOT666	SOT563			SC89-6lead SC-89
	8	SOT96	SO8	4.9 x 3.9 x 1.75	1500		SOP8	FM8	SOIC-8 NB	SOP-8				
SOT505		TSSOP8	3.0 x 3.0 x 1.1	-								TSSOP-8		
DFN1712-8 (SOT1157)		HXSON8	1.7 x 1.2 x 0.48	-								UDFN8, 1.8 x 1.2, 0.4P		
DFN1714-8 (SOT1166)		HUSON8	1.7 x 1.35 x 0.52	-										SLP1713P8
DFN1714U-8 (SOT983)		HXSON8	1.7 x 1.35 x 0.48	-								UDFN 1.7 x 1.35, 0.4P		SLP1713P8
DFN2110-9 (SOT1178)		XSON9	2.1 x 1.0 x 0.48	-										SLP2010P8T
DFN2520-9 (SOT1333)		-	2.5 x 2.0 x 0.48	-								WDFN 10 2.5 x 2 UDFN 10 2.5 x 2		
DFN2510-10 (SOT1165)		XSON10	2.5 x 1.0 x 0.48	-								UDFN10 2.5 x 1, 0.5P	TLSP-9-1	μQFN-10L SLP1610P4
10	DFN2510A-10 (SOT1176)	XSON10	2.5 x 1.0 x 0.48	-								UDFN10 2.5 x 1, 0.5P	TLSP-9-1	μQFN-10L SLP1610P4
	SOT552	TSSOP10	3.0 x 3.0 x 1.1	-								Micro10	TSSOP10	MSOP-10L
	DFN2626-10 (SOT1197)	-	2.6 x 2.6 x 0.48	-								UDFN10 2.6x2.6, 0.5P		SLP2626P10
12	DFN2512-12 (SOT1158)	HX-SON12	2.5 x 1.2 x 0.48	-								UDFN12, 2.5 x 1.2, 0.4P		
	DFN2514-12 (SOT1167)	HU-SON12	2.5 x 1.35 x 0.53	-								UDFN12, 2.5 x 1.35, 0.4P		SLP2513P12
	DFN2514U-12 (SOT984)	HX-SON12	2.5 x 1.35 x 0.48	-										SLP2513P12

### Package cross reference matrix – Part 3

Pins / leads	NXP	Industry standard names	Size (l x w x h) (mm)	P <sub>tot</sub> (mW)	Package	Competitor synonyms								
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	ST	Vishay	Semtech
14	DFN4020-14 (SOT1334)	-	4.0 x 2.0 x 0.48	-				WDFN 16 4 x 2 UDRN 16 4 x 2						
	SOT108	SO14	8.65 x 3.9 x 1.75	-		SOP14				DSO14				
16	DFN3312-16 (SOT1159)	HX-SON16	3.3 x 1.2 x 0.48	-				UDFN16, 3.5 x 1.2, 0.4P						
	DFN3314-16 (SOT1168)	HU-SON16	3.3 x 1.35 x 0.53	-									SLP3313P16	
	DFN3314U-16 (SOT985)	HX-SON16	3.3 x 1.35 x 0.48	-				UDFN16, 3.3 x 1.35, 0.4P					SLP3313P16	
20	SOT360	TSSOP20	6.5 x 4.4 x 1.1	-				TSSOP20	TSSOP20					
38	SOT510	TSSOP38	9.7 x 4.4 x 1.1	-					TSSOP38					

Types in brackets (...) show footprint compatibility only

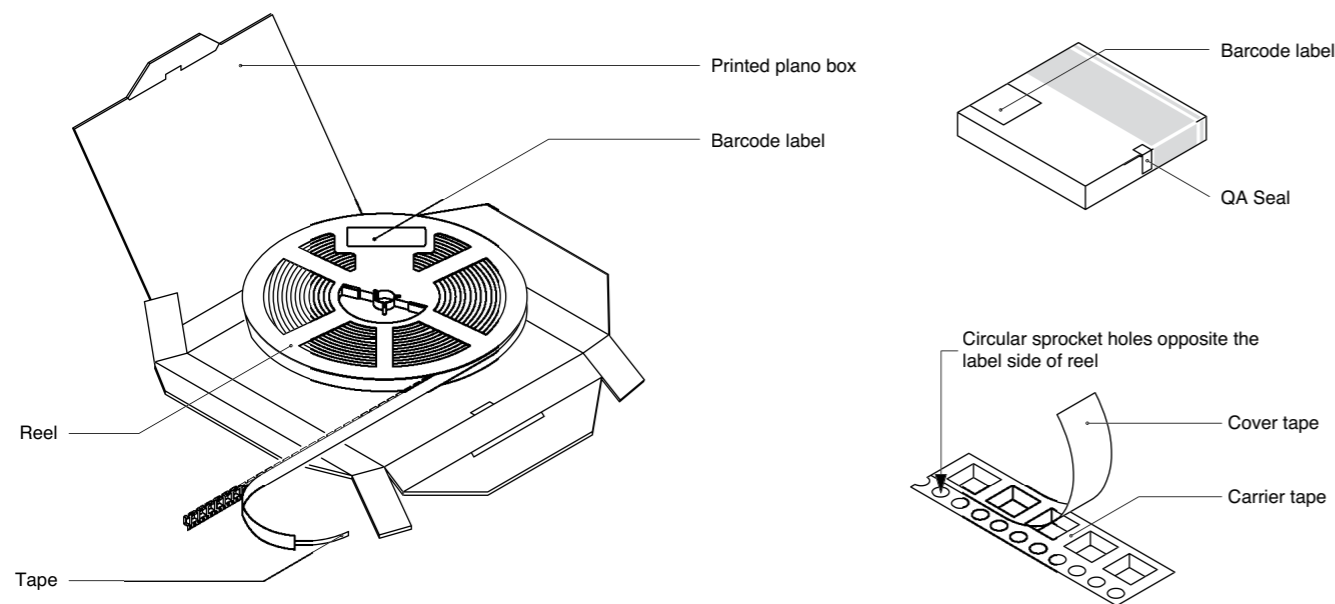
### Product orientation (tape and reel pack)

Orientation in tape	Package	Packing 12NC ending

Orientation in tape	Package	Packing 12NC ending
	DFN1006-3 (SOT883) DFN1006B-3 (SOT883B) SOT23 SOT89 SOT323 SOT416	315 315 185, 215, 235 147 115, 135 115, 135

Orientation in tape	Package	Packing 12NC ending
	DFN1010D-3 (SOT1215) DFN2020-3 (SOT1061) SOT89 SOT663 CFP15 (SOT1289) DPAK (SOT428) D2PAK (SOT404)	147 115, 135 146 115 139, 145 118 118
	SOT89	115, 135

### Tape and reel pack for SMD and WLCSP packages



Orientation in tape	Package	Packing 12NC ending
	SOT143B SOT223 DFN1010-4 (SOT1194)	215, 235 115, 135 115

Orientation in tape	Package	Packing 12NC ending

Orientation in tape	Package	Packing 12NC ending
	LPAK (SOT669)	115
	SOT753	125

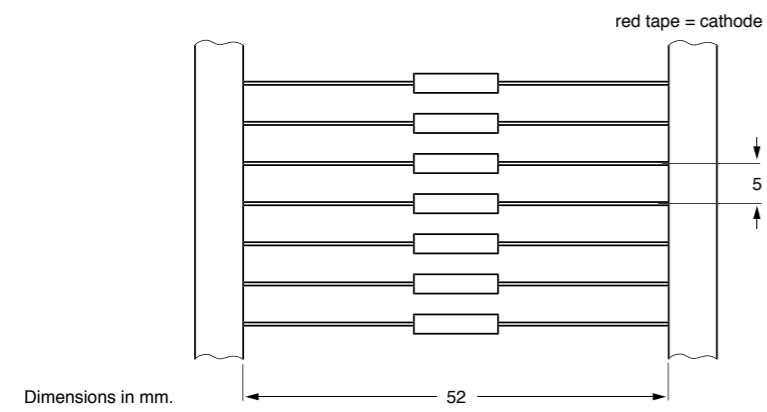
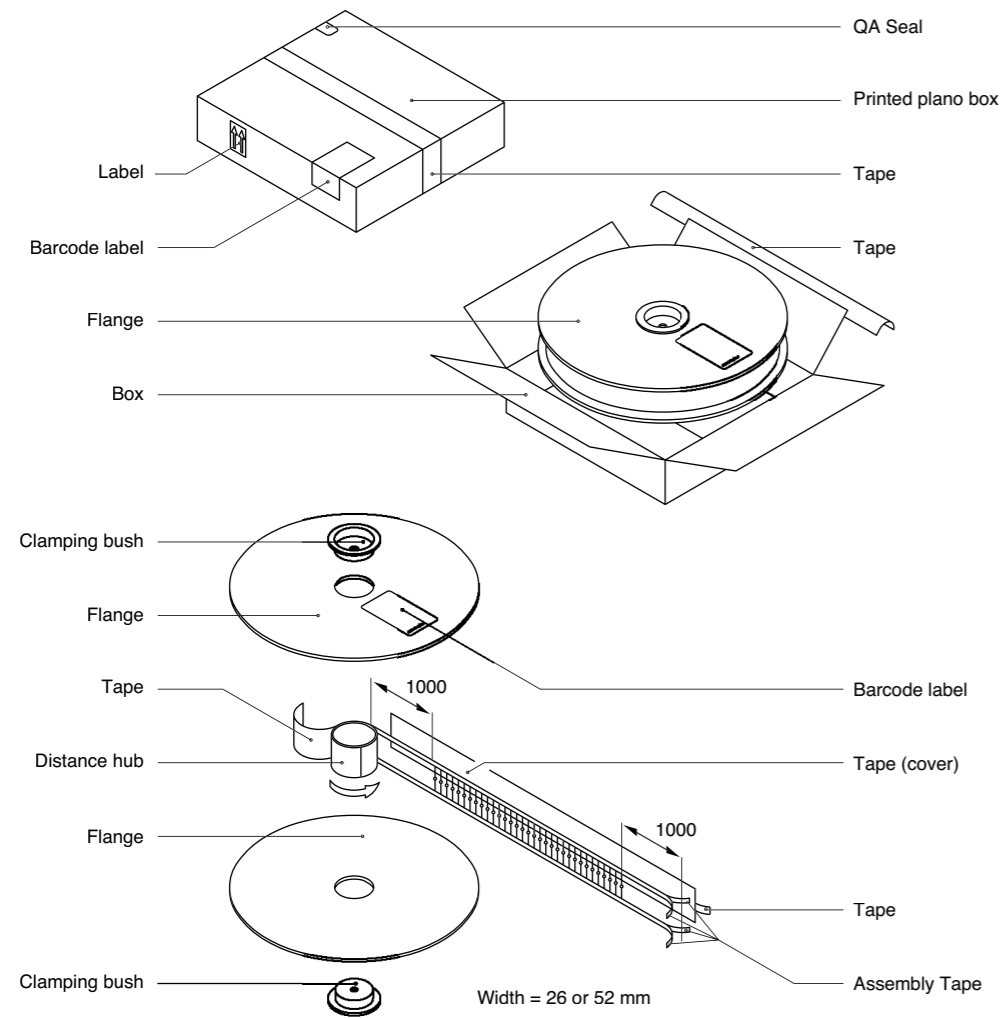
Orientation in tape	Package	Packing 12NC ending
	SOT353 SOT665	115, 135 115

Orientation in tape	Package	Packing 12NC ending
	DFN1410-6 (SOT886) DFN1616-6 (SOT1189) DFN2020MD-6 (SOT1220) LPAK56D (SOT1205)	115 115 184 115
	DFN1010-6 (SOT891) DFN1010E-6 (SOT1202) DFN1410-6 (SOT886) DFN2020MD-6 (SOT1220) SOT363 SOT457	132 132 132 125 125, 165 125, 165

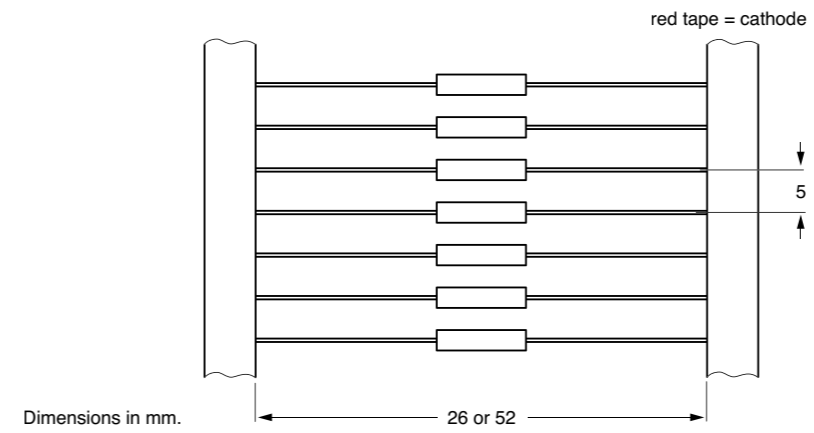
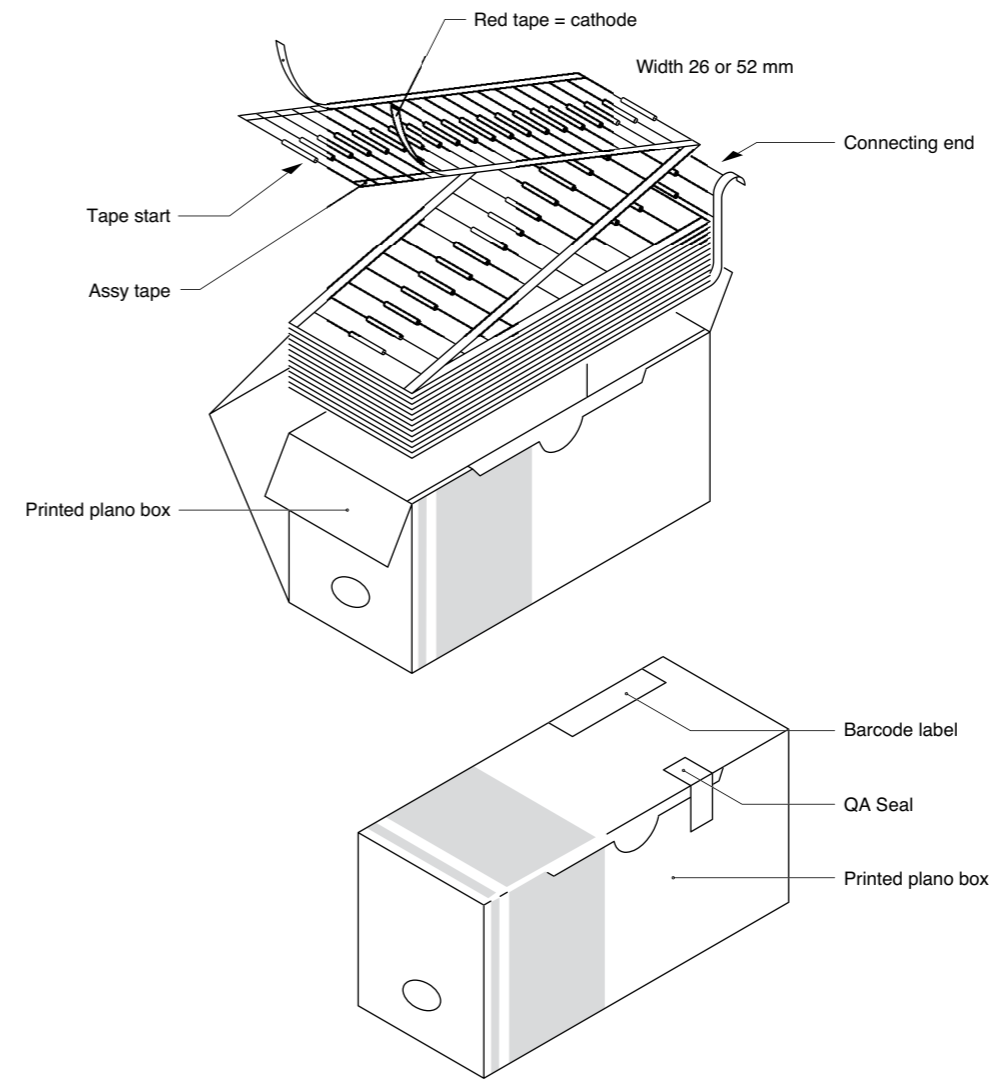
Orientation in tape	Package	Packing 12NC ending
	DFN2020-6 (SOT1118) DFN2020MD-6 (SOT1220) SOT363 SOT457 SOT666	115 115 115, 135 115, 135 115, 315



### Reel pack axial tape for glass diodes



### Ammo pack axial tape for glass diodes



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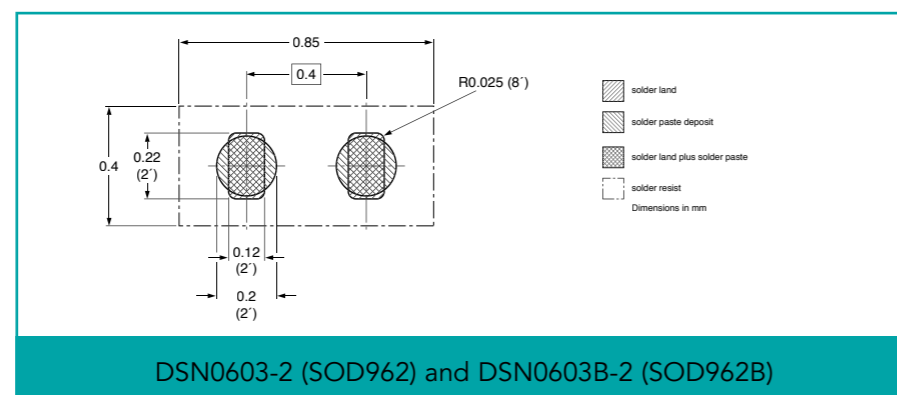
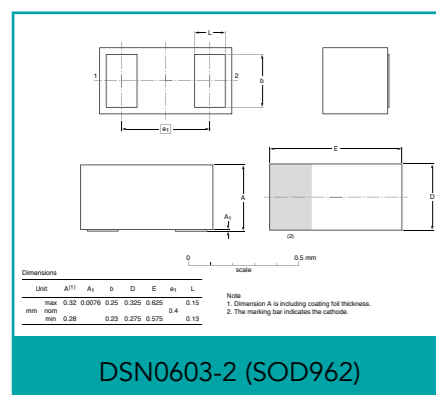
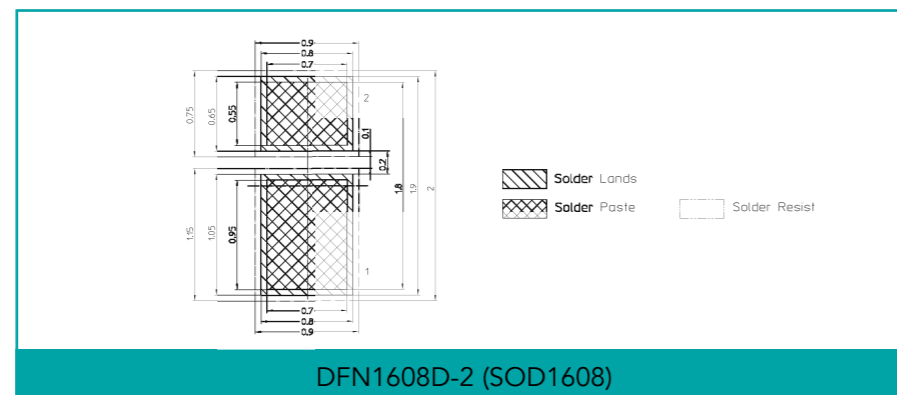
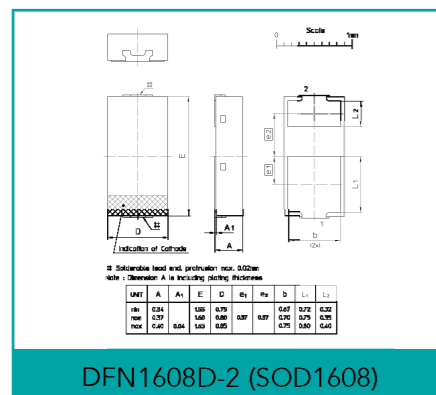
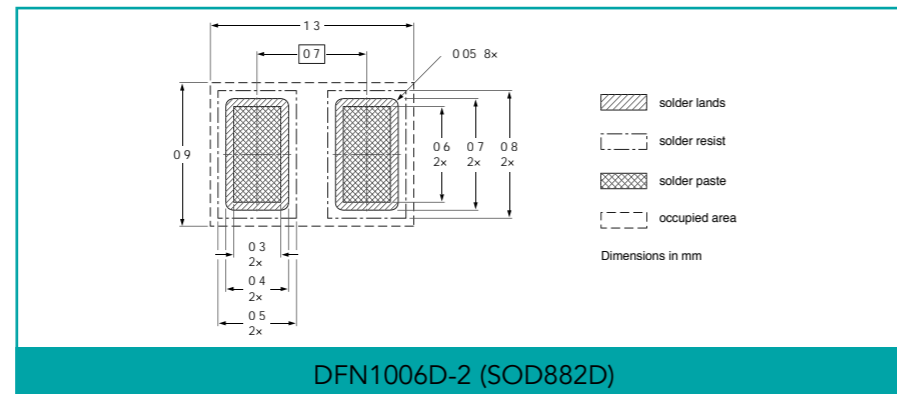
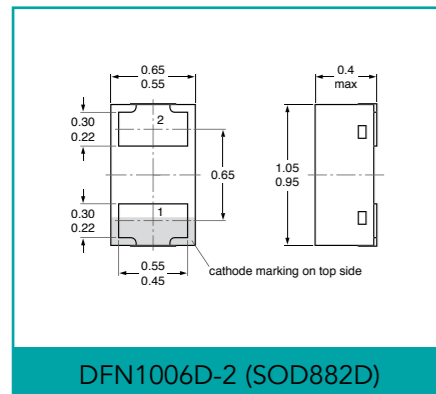
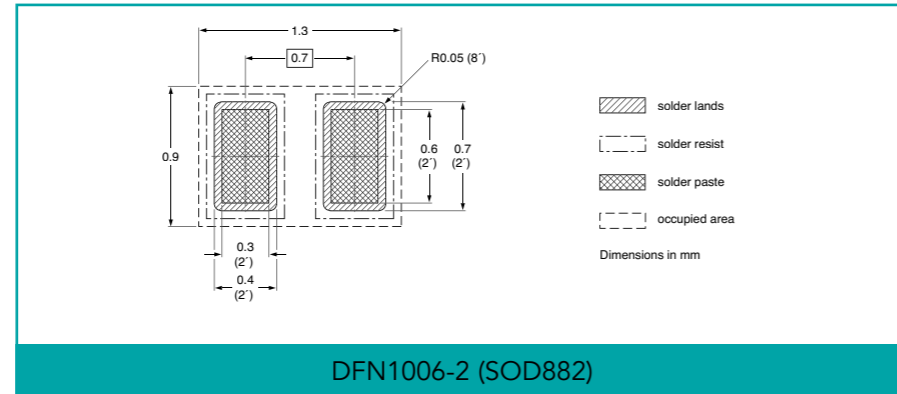
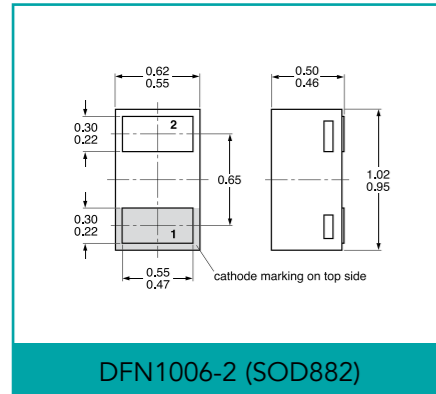
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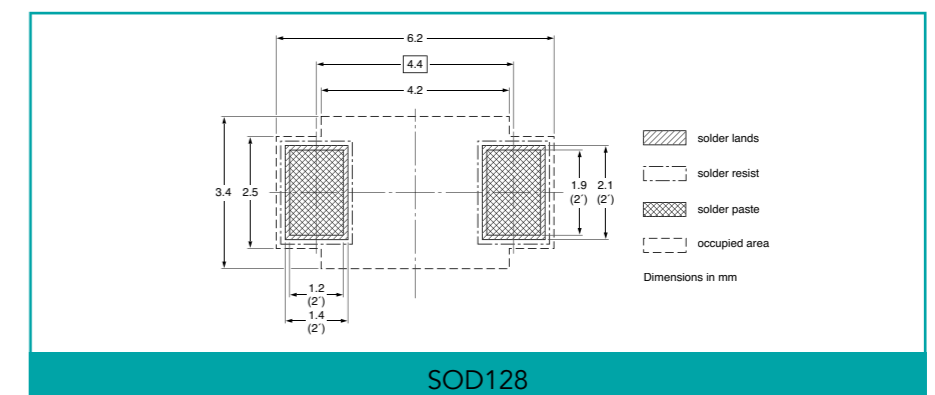
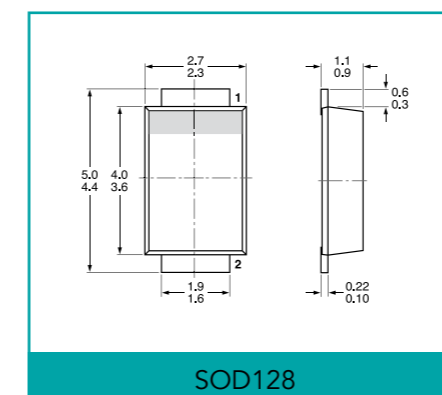
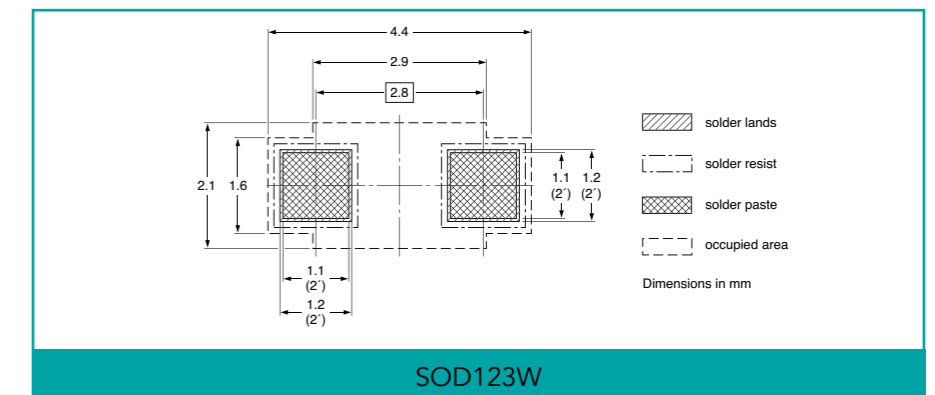
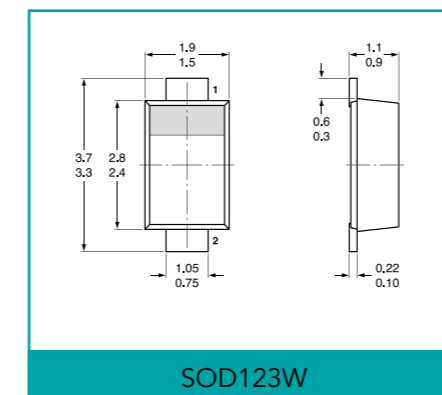
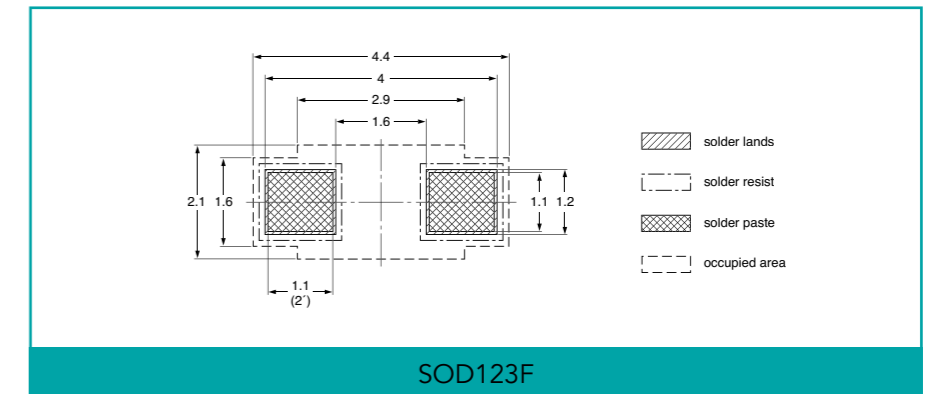
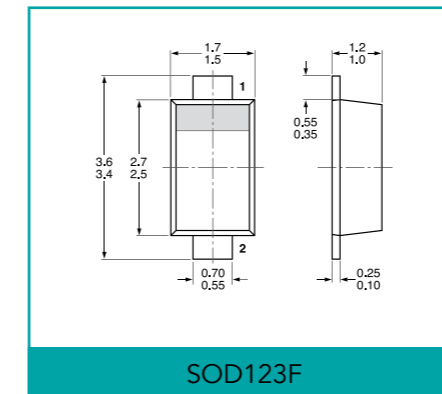
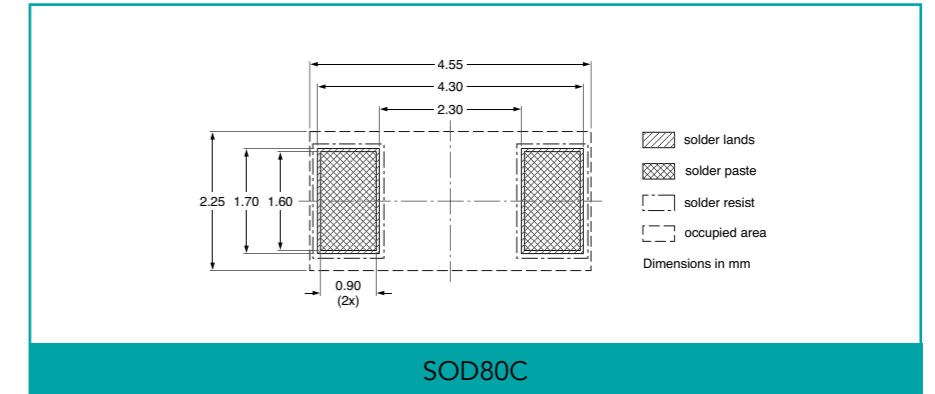
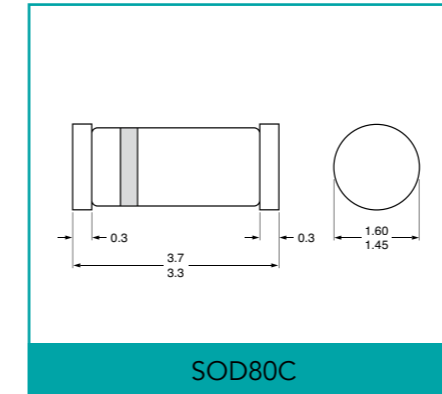
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## 2-Pin SMD Packages

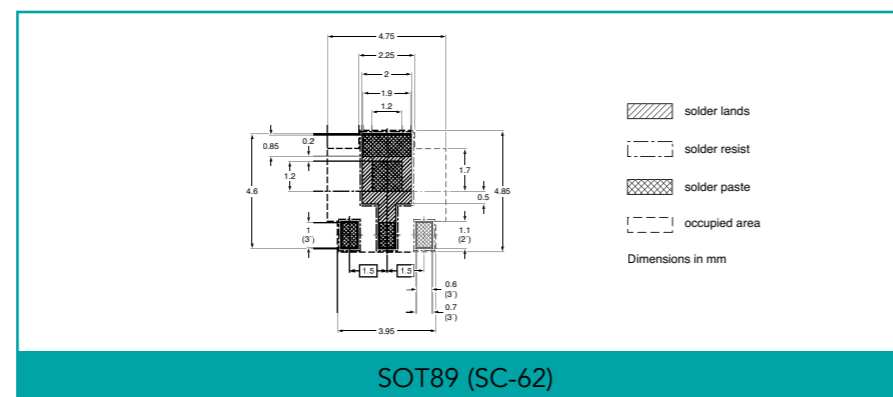
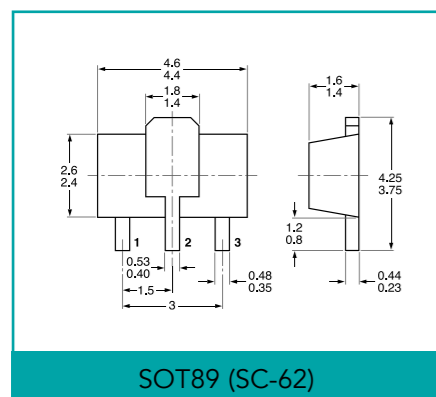
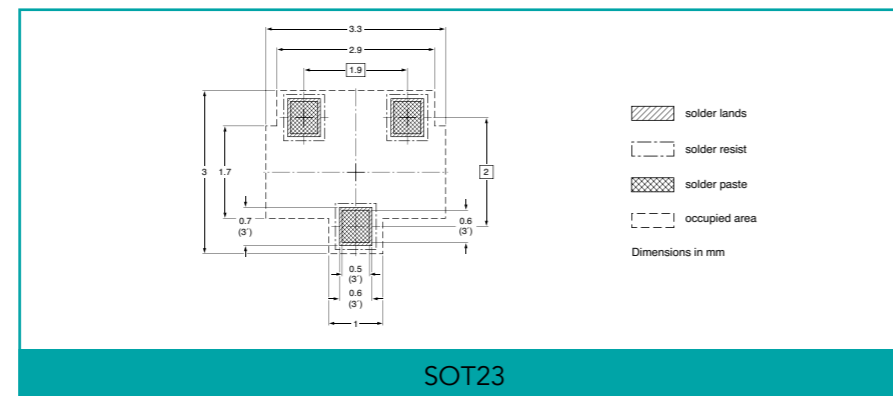
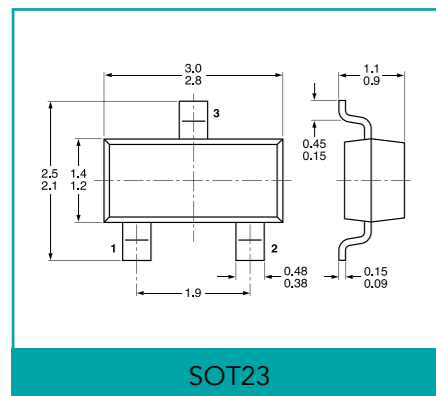
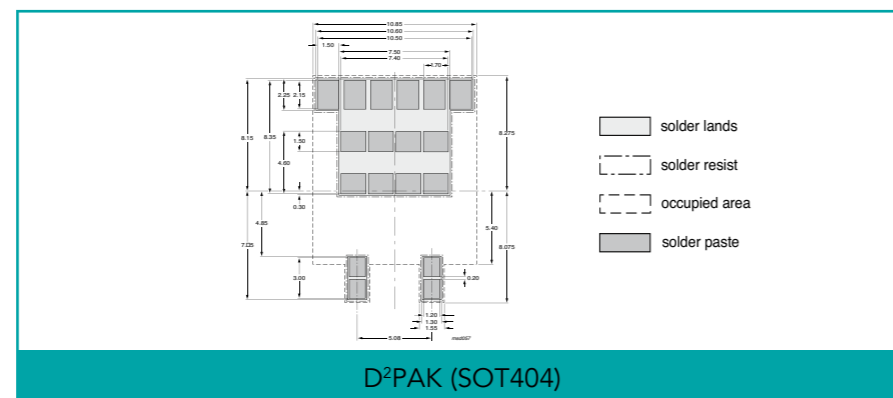
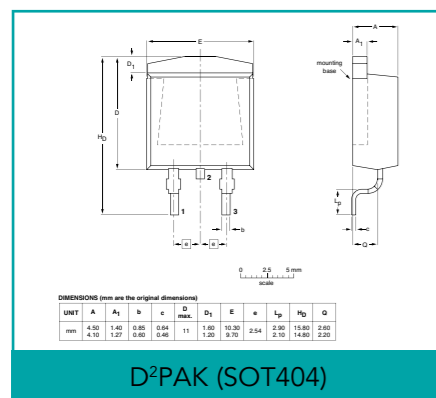
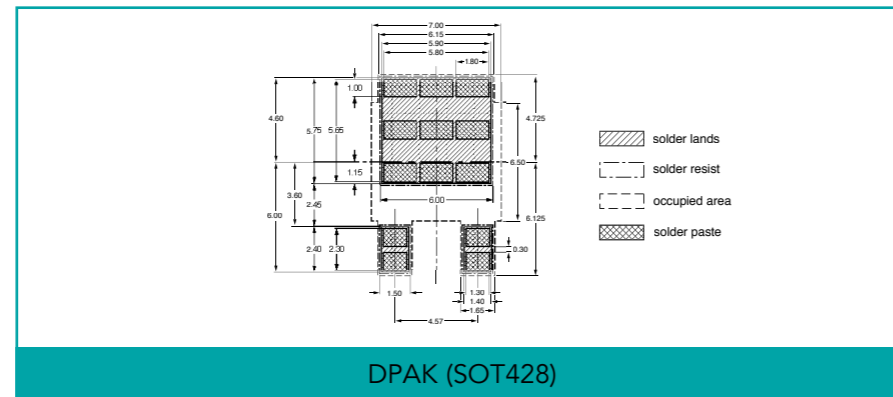
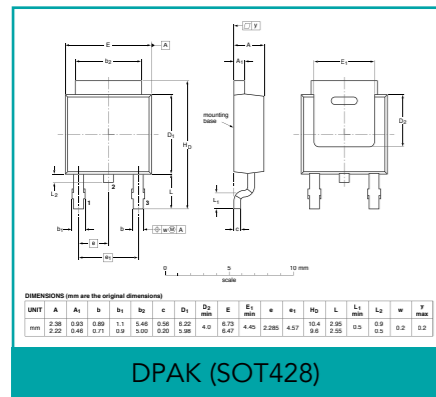


## 2-Pin SMD Packages



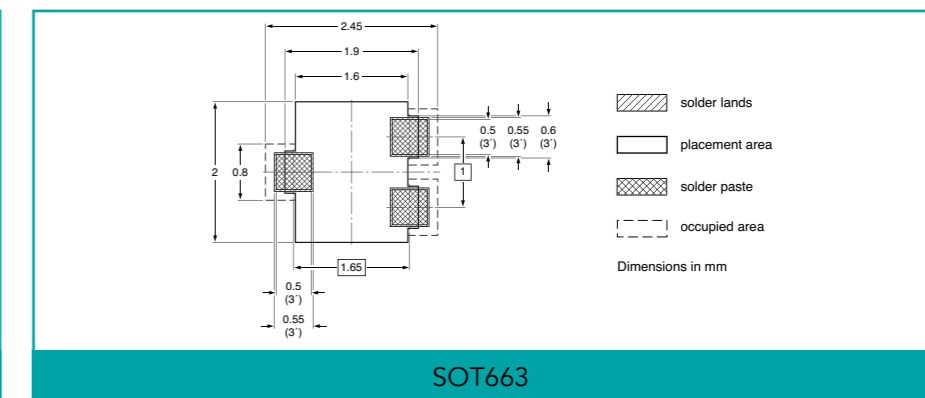
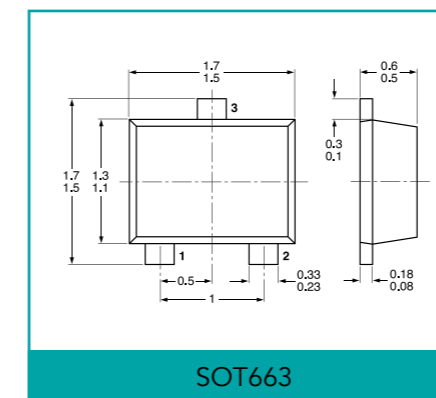
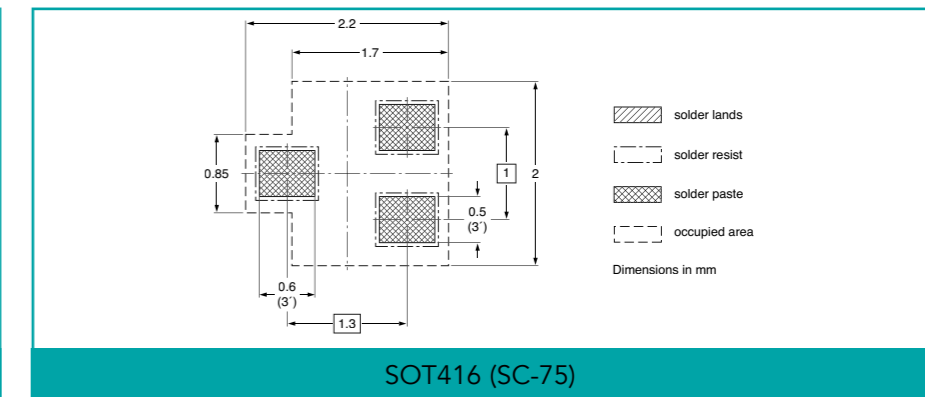
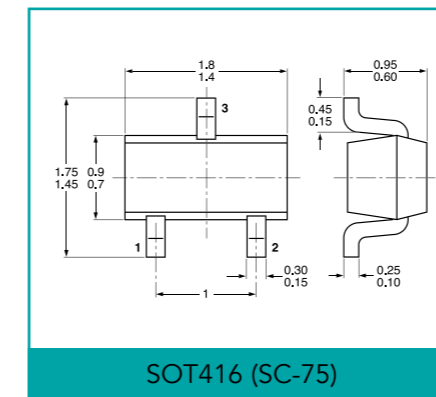
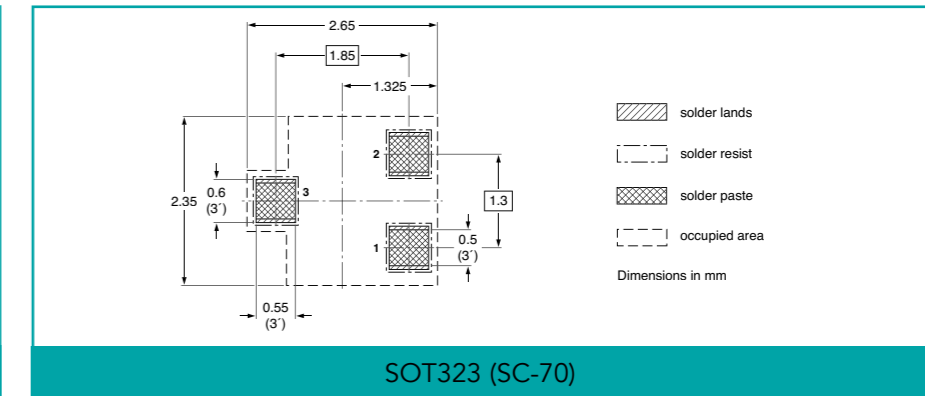
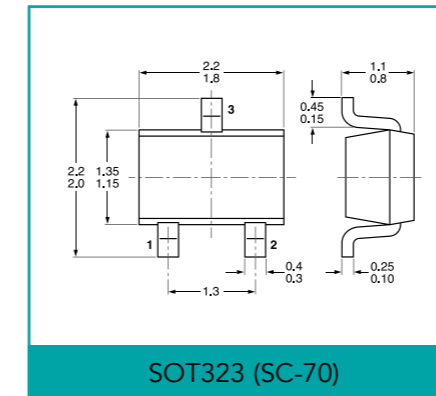


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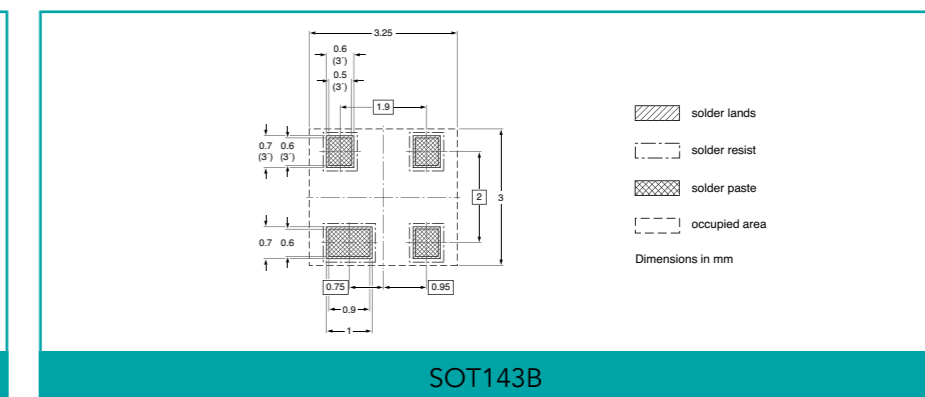
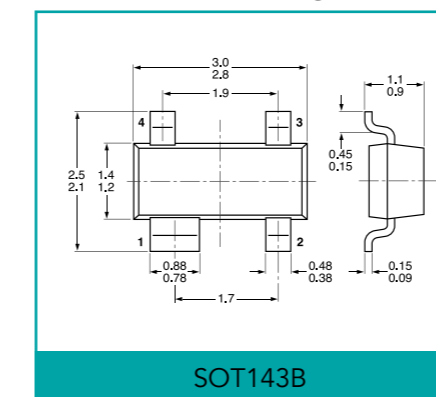


Dimensions in mm

### 3-Pin SMD Packages

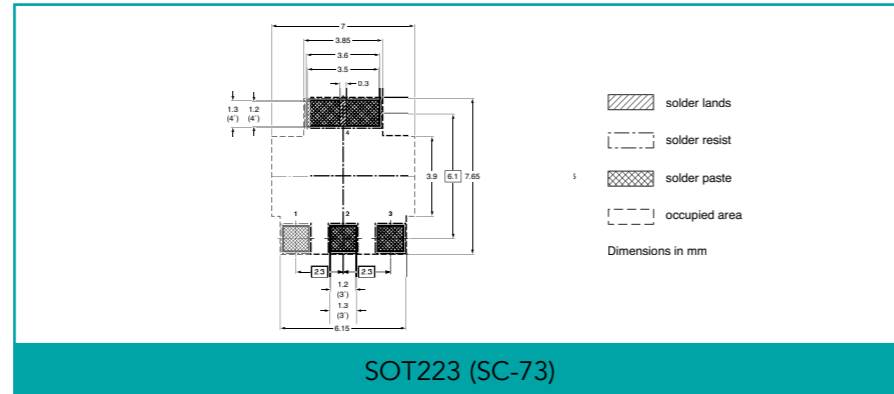
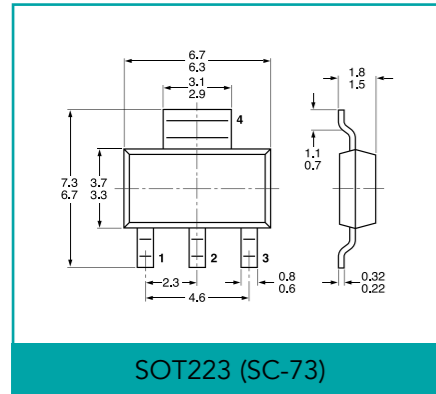


### 4-Pin SMD Packages

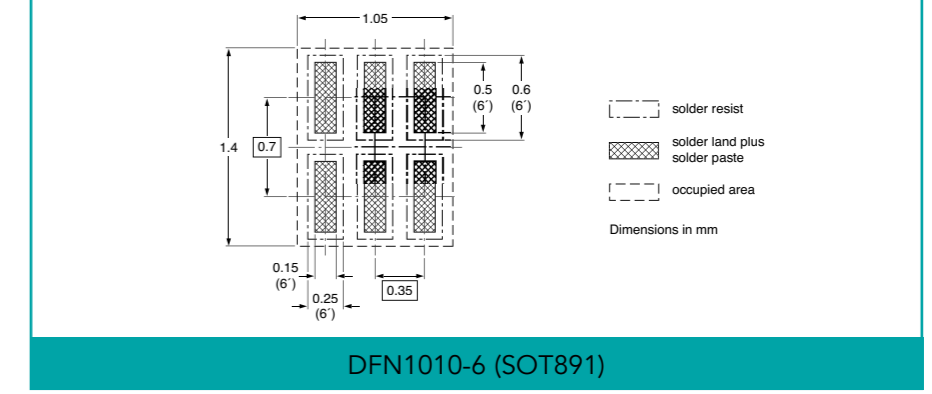
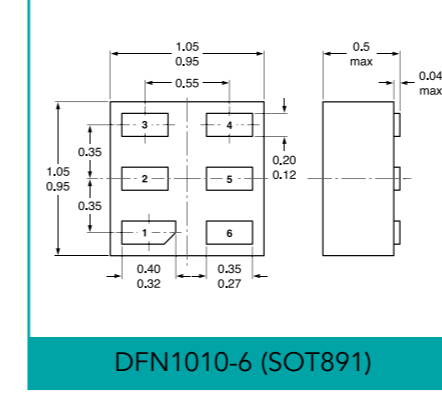


Dimensions in mm

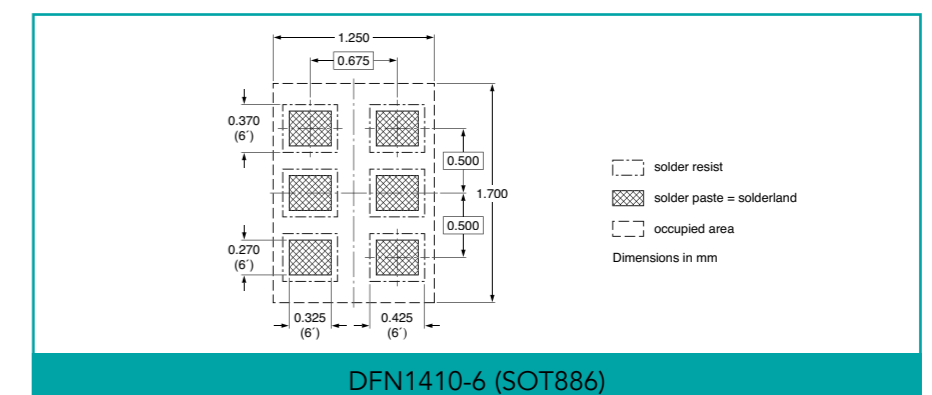
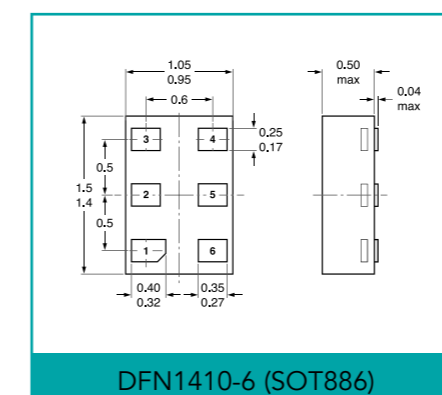
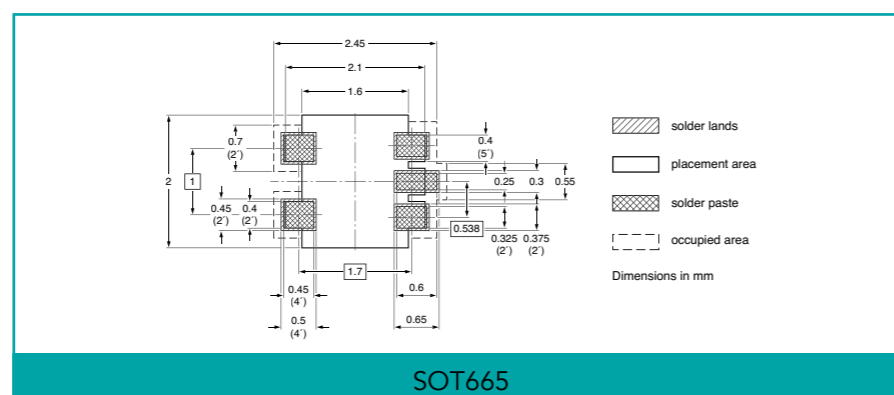
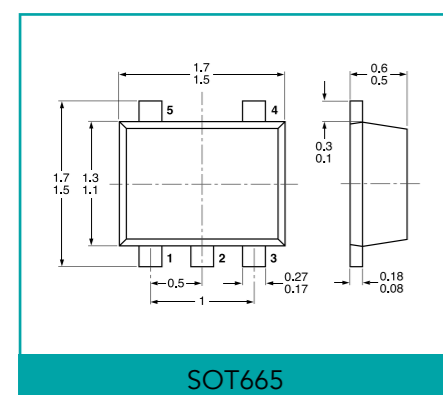
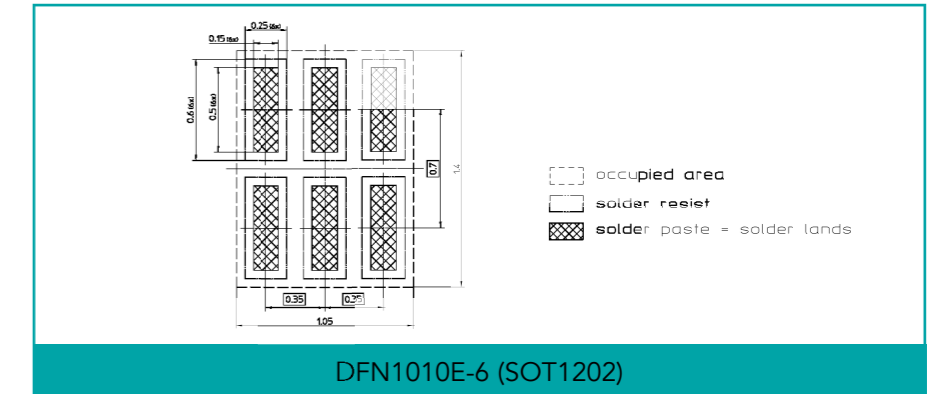
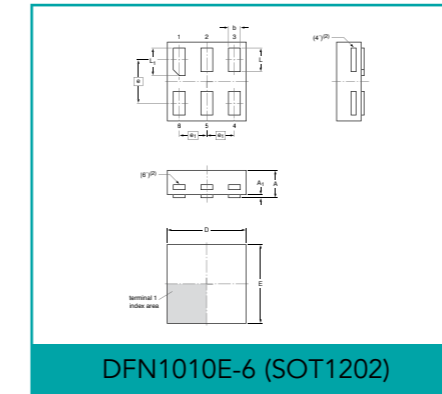
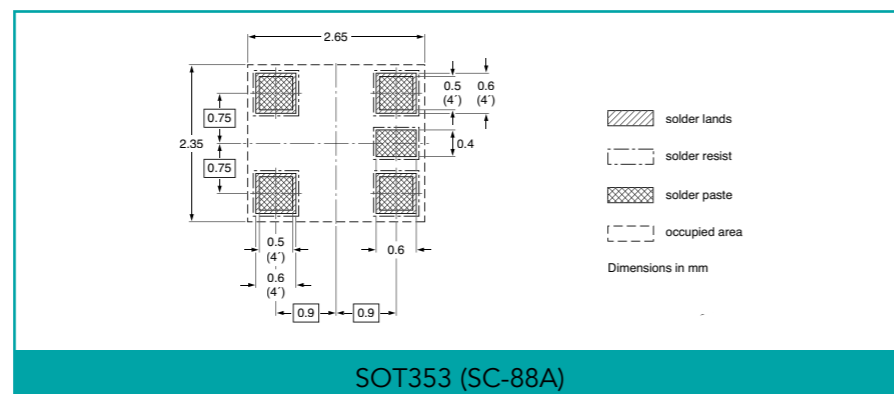
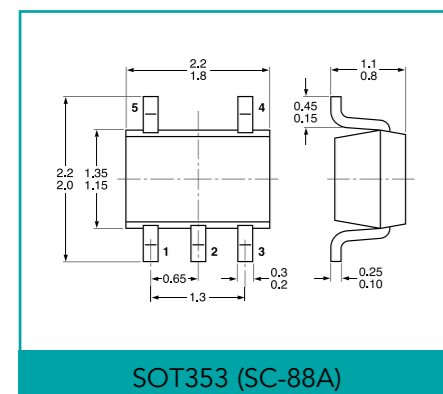
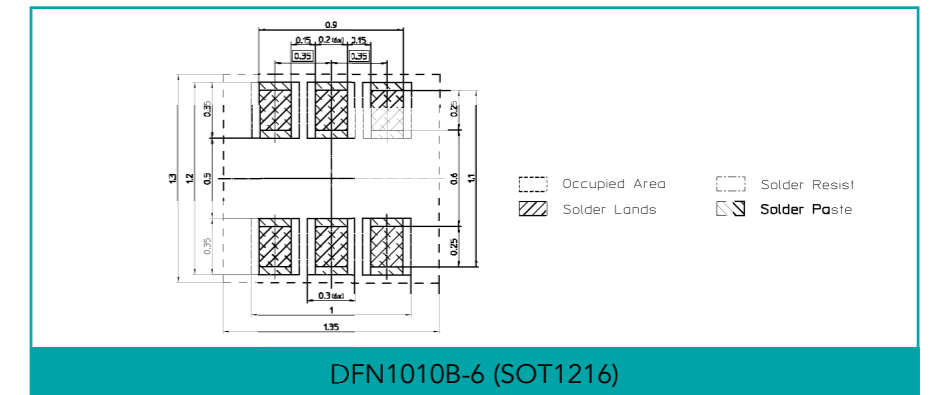
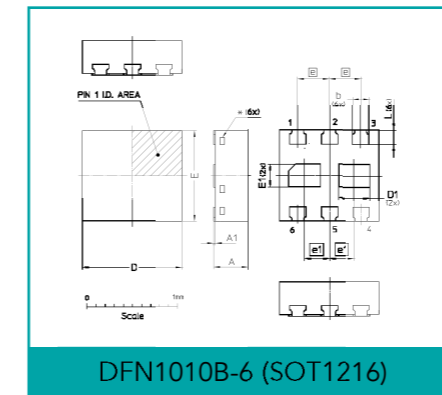
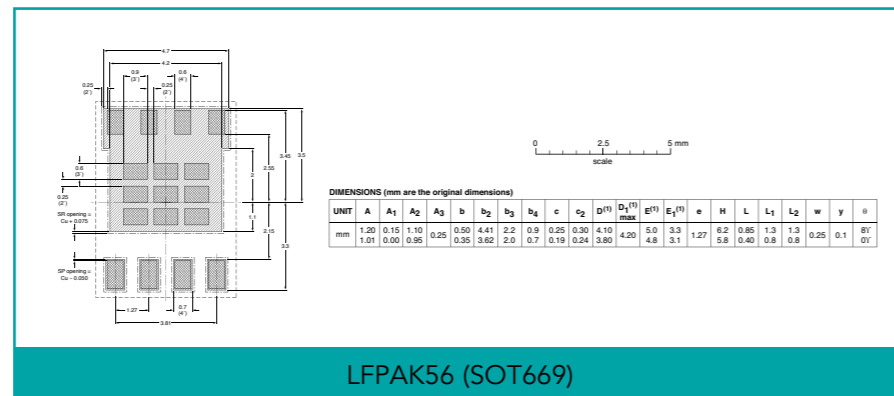
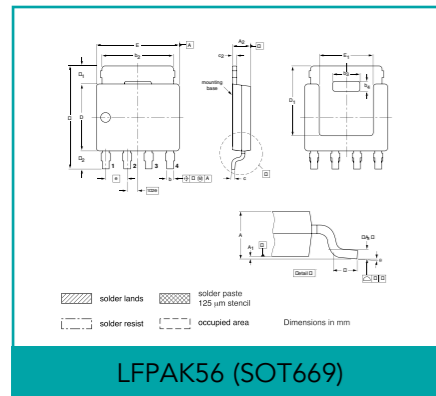
### 4-Pin SMD Packages



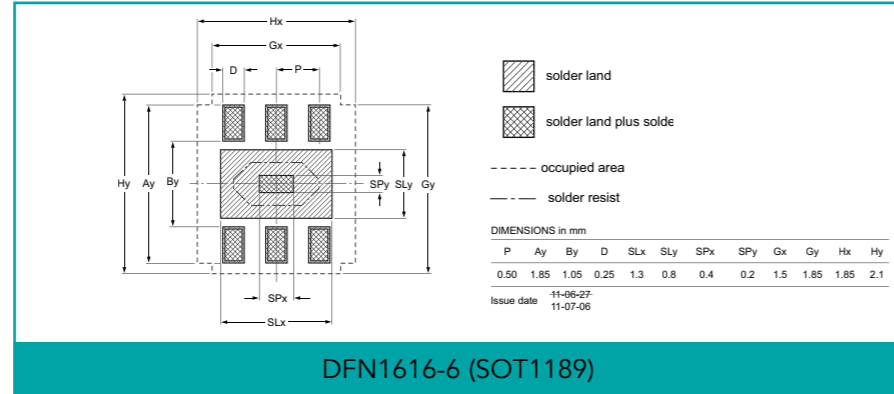
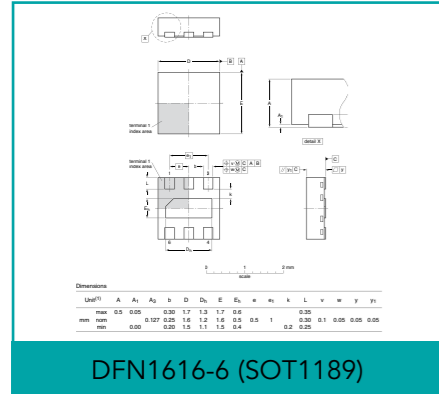
### 6-Pin SMD Packages



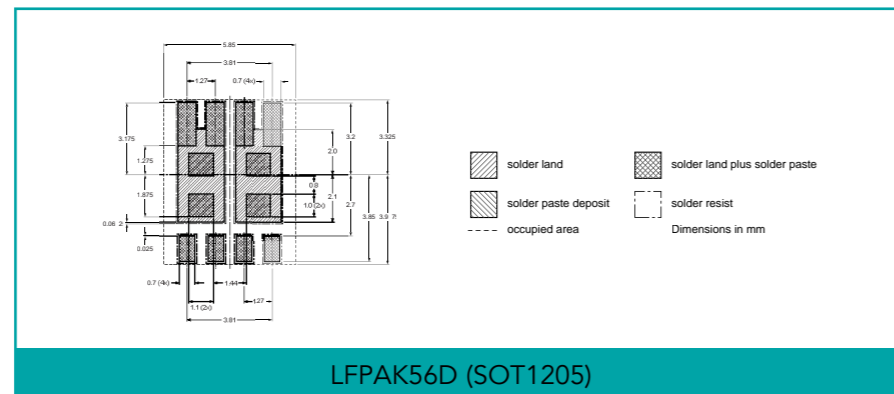
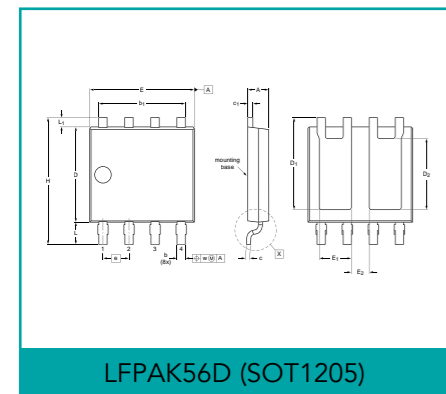
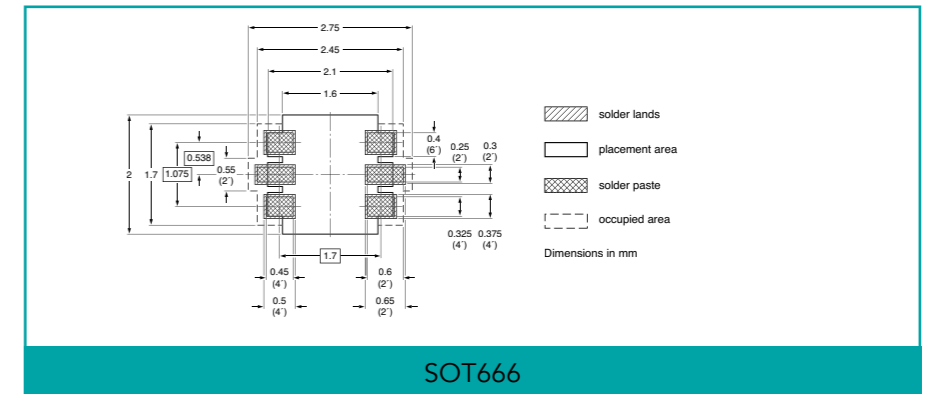
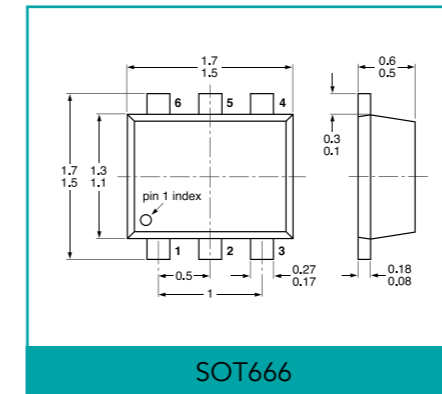
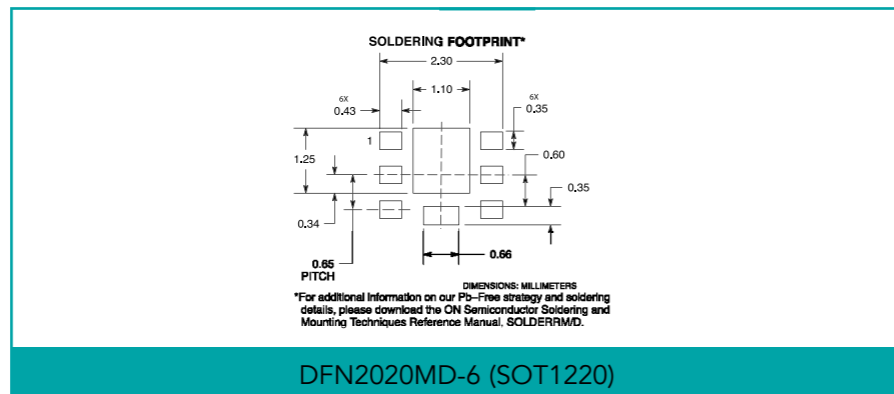
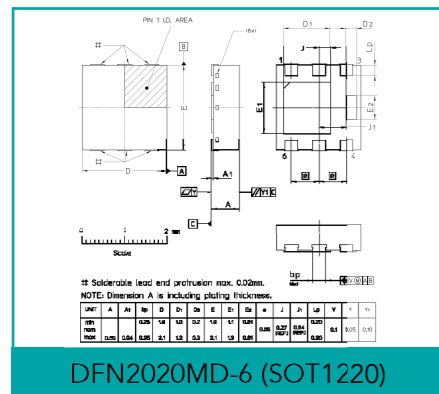
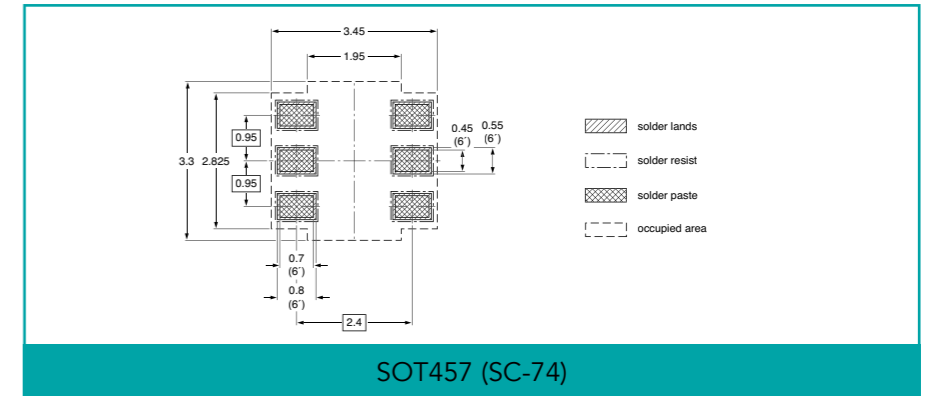
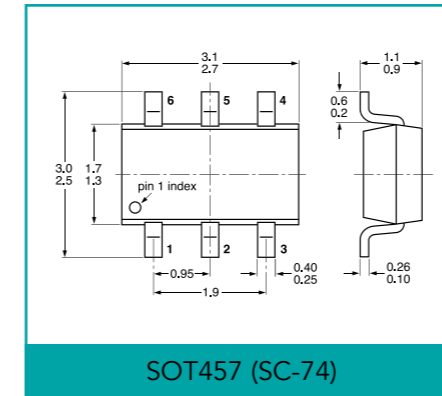
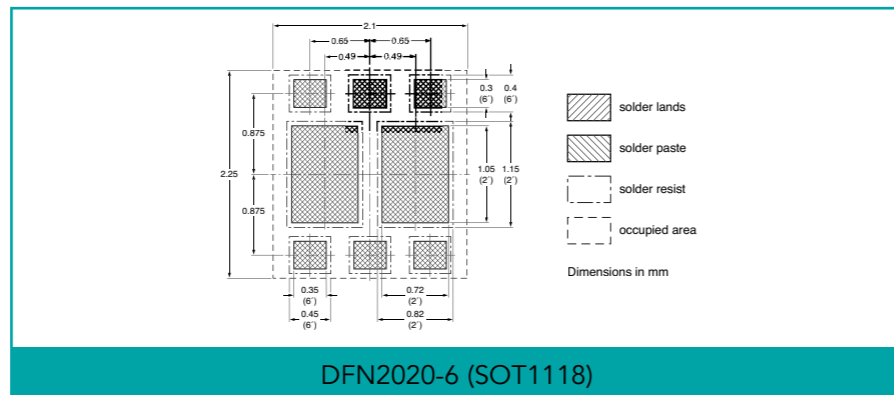
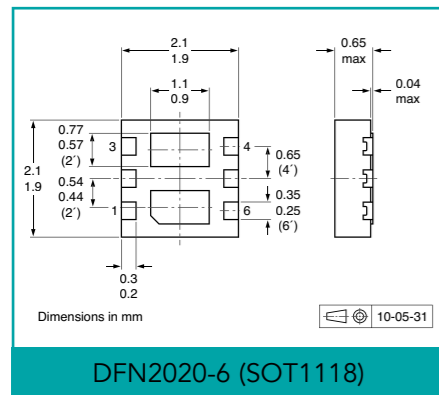
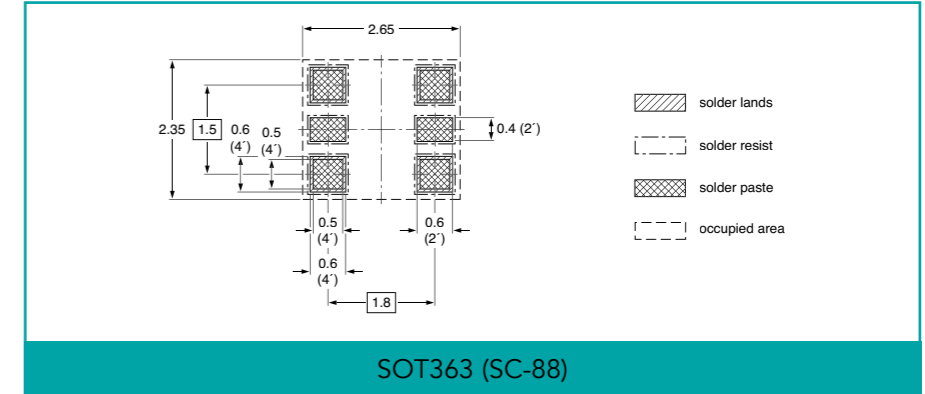
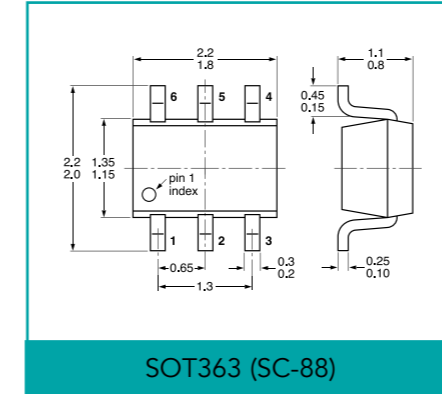
### 5-Pin SMD Packages



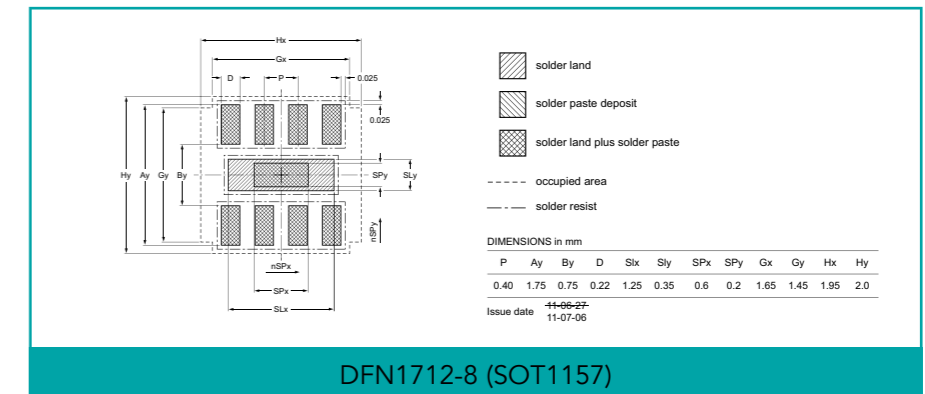
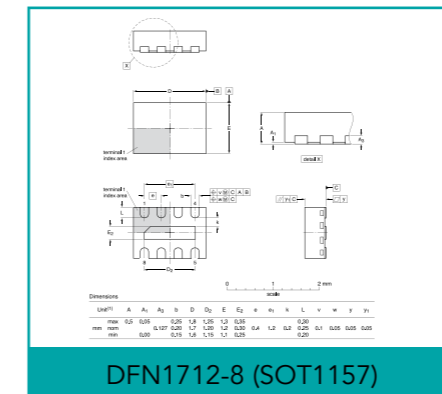
### 6-Pin SMD Packages



### 6-Pin SMD Packages

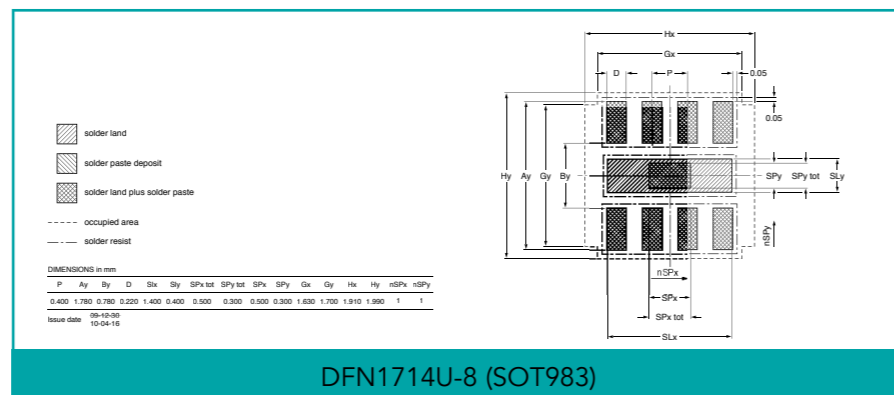
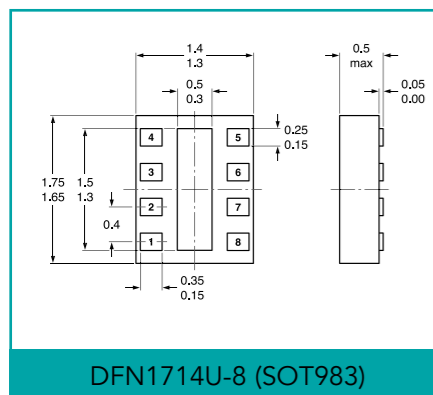
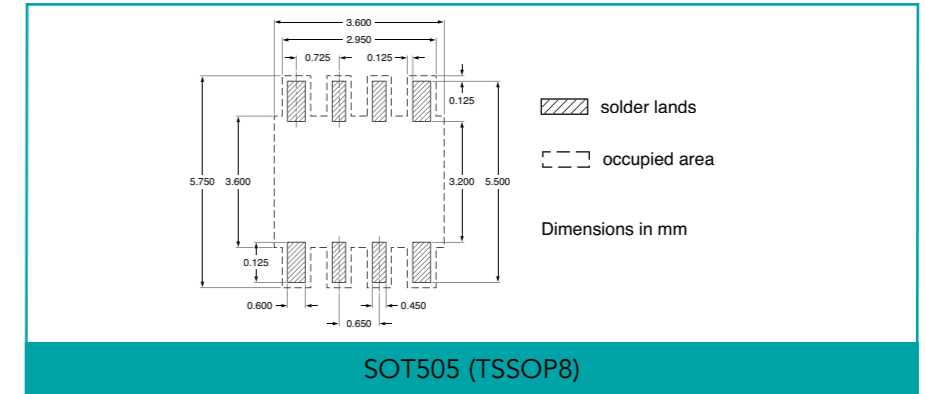
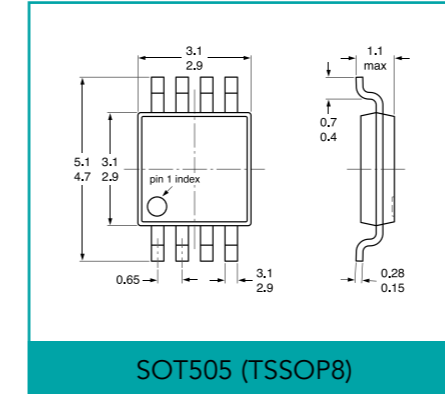
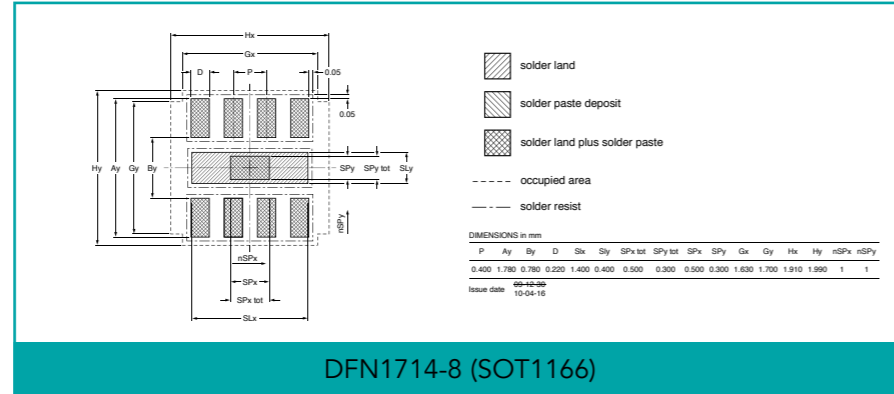
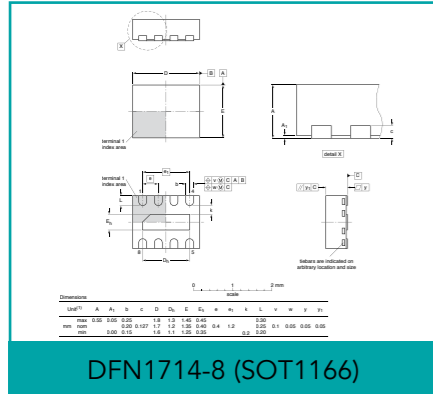


### 8-Pin SMD Packages

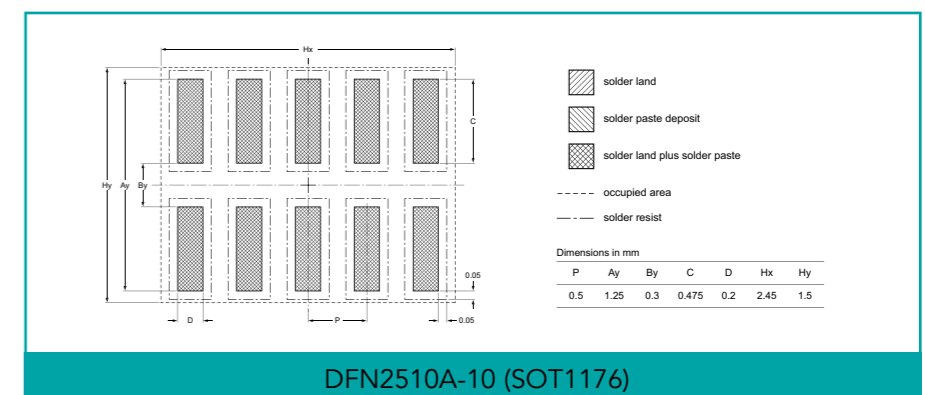
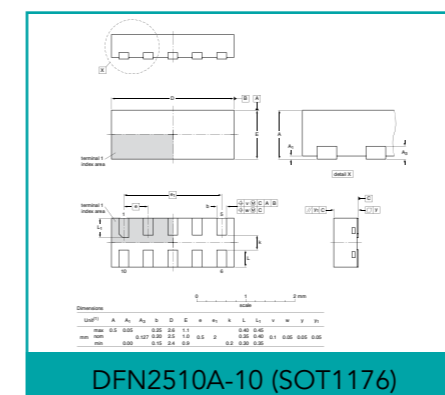
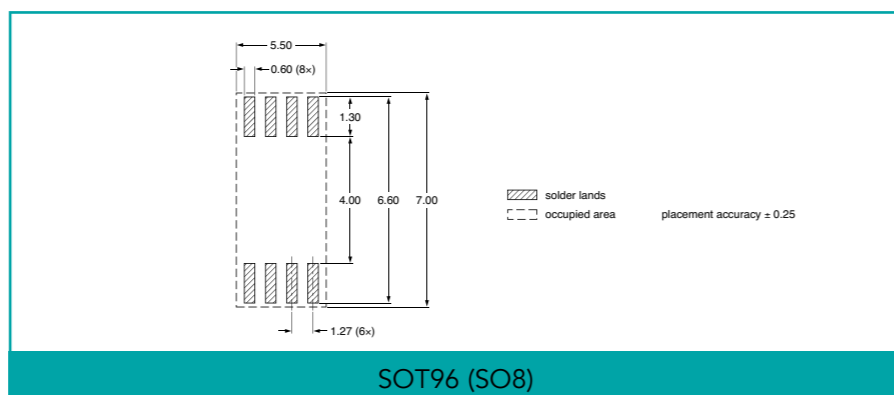
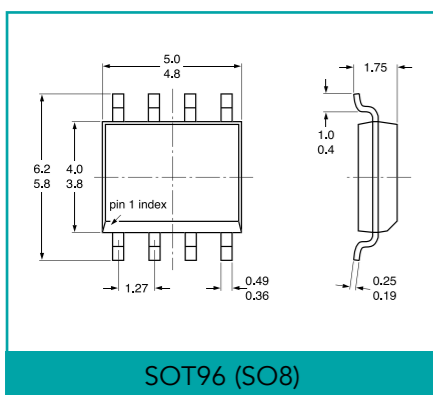
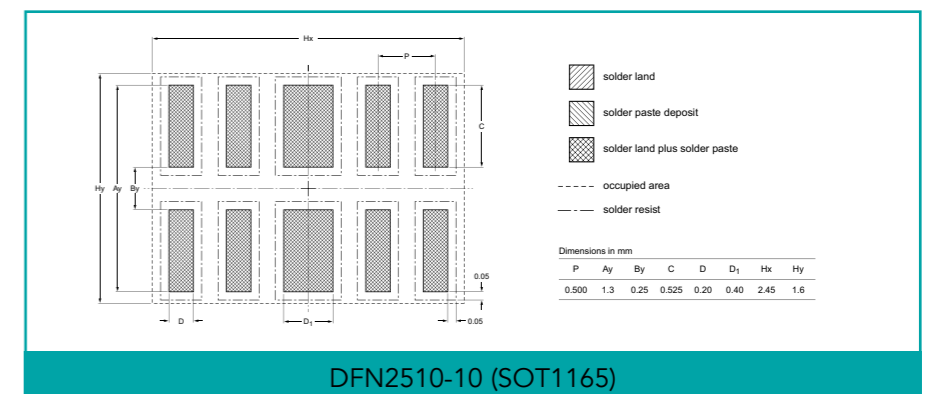
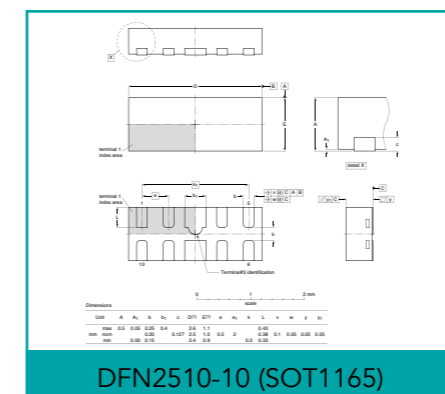
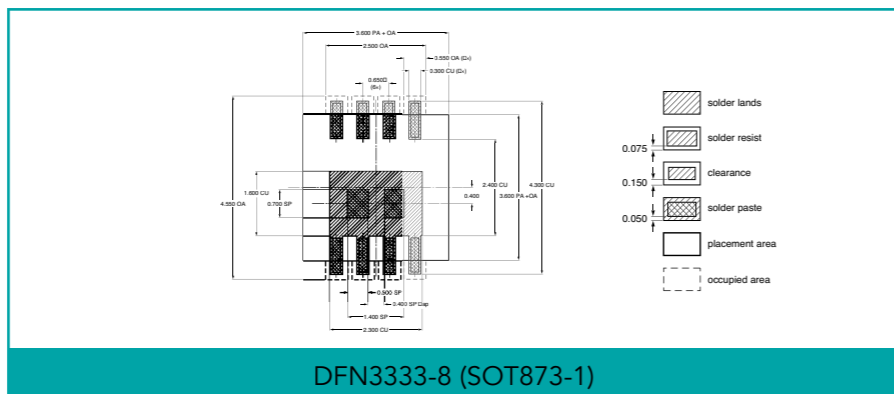
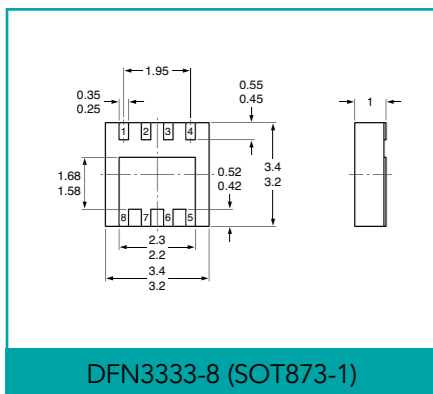
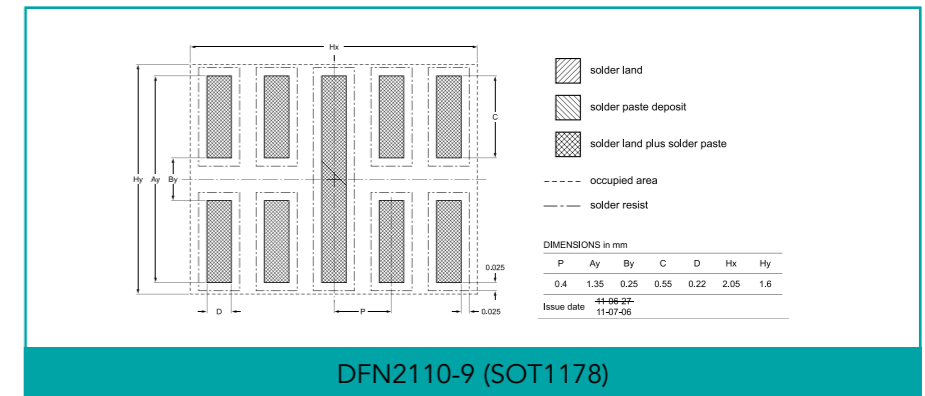
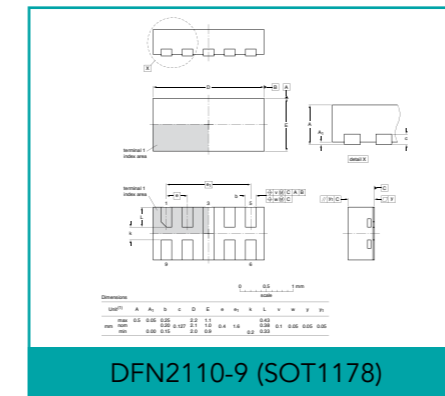


### 8-Pin SMD Packages

### 8-Pin SMD Packages



### More than 8-Pin SMD Packages





More than 8-Pin SMD Packages

More than 8-Pin SMD Packages

**DFN2512-12 (SOT1158)**

**DFN2512-12 (SOT1158)**

Legend:  
 [Hatched] solder land  
 [Diagonal lines] solder paste deposit  
 [Cross-hatched] solder land plus solder paste  
 [Dashed] occupied area  
 [Solid] solder resist

DIMENSIONS in mm

P	Ay	By	D	SLx	Sly	SPx tot	SPy tot	Gx	Gy	Hx	Hy
0.40	1.75	0.75	0.22	2.1	0.35	0.9	0.2	2.45	1.45	2.75	2.0

Issue date: 11-07-06

**DFN2521-12 (SOT1156)**

**DFN2521-12 (SOT1156)**

Legend:  
 [Hatched] solder land  
 [Diagonal lines] solder paste deposit  
 [Cross-hatched] solder land plus solder paste  
 [Dashed] occupied area  
 [Solid] solder resist

DIMENSIONS in mm

P	Ay	By	D	SLx	Sly	SPx tot	SPy tot	Gx	Gy	Hx	Hy
0.40	1.75	0.75	0.22	2.1	0.35	0.9	0.2	2.45	1.45	2.75	2.0

Issue date: 11-07-06

**DFN2514-12 (SOT1167)**

**DFN2514-12 (SOT1167)**

Legend:  
 [Hatched] solder land  
 [Diagonal lines] solder paste deposit  
 [Cross-hatched] solder land plus solder paste  
 [Dashed] occupied area

DIMENSIONS in mm

P	Ay	By	D	SLx	Sly	SPx tot	SPy tot	Gx	Gy	Hx	Hy	nSPx	nSPy
0.400	1.780	0.780	0.220	2.200	0.400	1.800	0.300	0.400	0.300	2.430	1.700	2.710	1.990

Issue date: 11-07-06

**DFN2626-10 (SOT1197)**

**DFN2626-10 (SOT1197)**

Legend:  
 [Hatched] solder land  
 [Diagonal lines] solder paste deposit  
 [Cross-hatched] solder land plus solder paste  
 [Dashed] occupied area  
 [Solid] solder resist

DIMENSIONS in mm

P	Ay	By	D	SLx	Sly	SPx tot	SPy tot	Gx	Gy	Hx	Hy
0.5	3.05	1.9	0.25	2.2	1.3	0.8	0.4	2.6	2.65	2.85	3.1

Issue date: 11-07-06

**DFN2514U-12 (SOT984)**

**DFN2514U-12 (SOT984)**

Generic footprint pattern. Refer to the package outline drawing for actual layout.

Legend:  
 [Hatched] solder land  
 [Diagonal lines] solder paste deposit  
 [Cross-hatched] solder land plus solder paste  
 [Dashed] occupied area  
 [Solid] solder resist

DIMENSIONS in mm

P	Ay	By	D	SLx	Sly	SPx tot	SPy tot	Gx	Gy	Hx	Hy	nSPx	nSPy
0.400	1.780	0.780	0.220	2.200	0.400	1.800	0.300	0.400	0.300	2.430	1.700	2.710	1.990

Issue date: 11-07-06

**DFN3312-16 (SOT1159)**

**DFN3312-16 (SOT1159)**

Legend:  
 [Hatched] solder land  
 [Diagonal lines] solder paste deposit  
 [Cross-hatched] solder land plus solder paste  
 [Dashed] occupied area  
 [Solid] solder resist

DIMENSIONS in mm

P	Ay	By	D	SLx	Sly	SPx tot	SPy tot	Gx	Gy	Hx	Hy
0.40	2.15	0.75	0.21	2.9	0.35	1.3	0.2	3.25	1.45	3.55	2.4

Issue date: 11-07-06

**DFN2520-9 (SOT1333)**

**DFN2520-9 (SOT1333)**

Legend:  
 [Hatched] solder land  
 [Dashed] occupied area

DIMENSIONS in mm

P1	Ay	C	D1
0.50	2.30	1.07	0.30

**DFN3314-16 (SOT1168)**

**DFN3314-16 (SOT1168)**

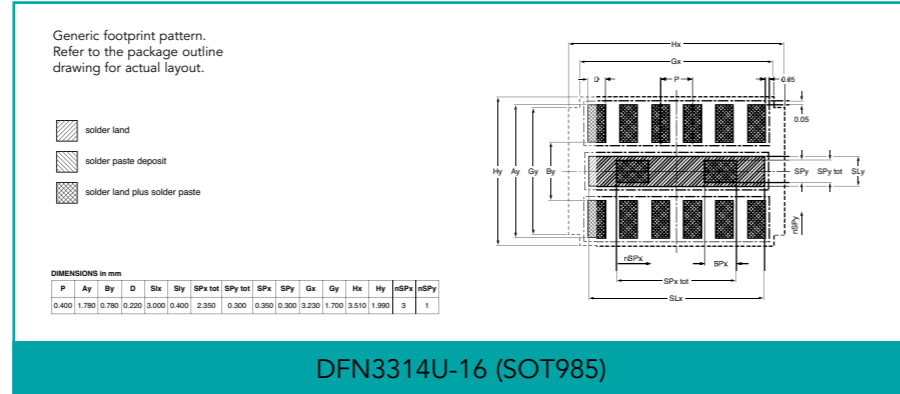
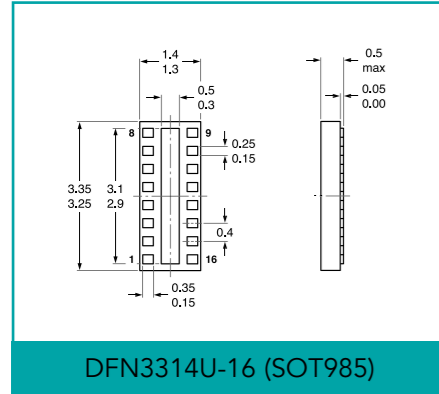
Legend:  
 [Hatched] solder land  
 [Diagonal lines] solder paste deposit  
 [Cross-hatched] solder land plus solder paste  
 [Dashed] occupied area  
 [Solid] solder resist

DIMENSIONS in mm

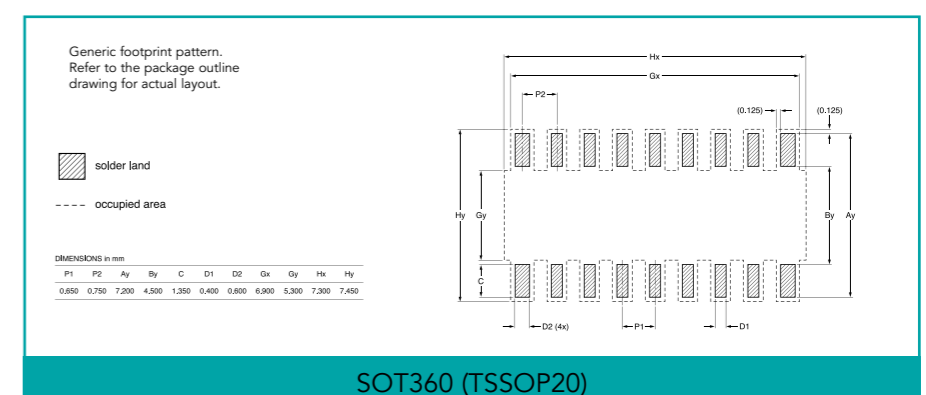
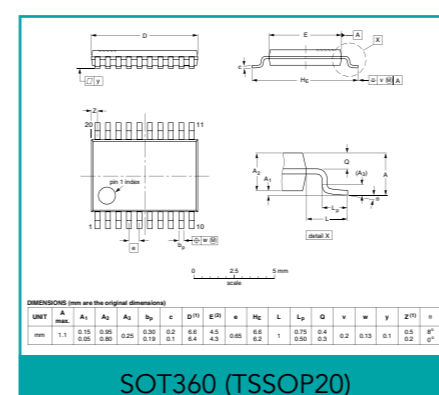
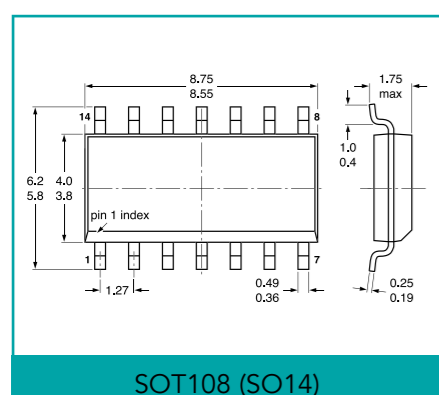
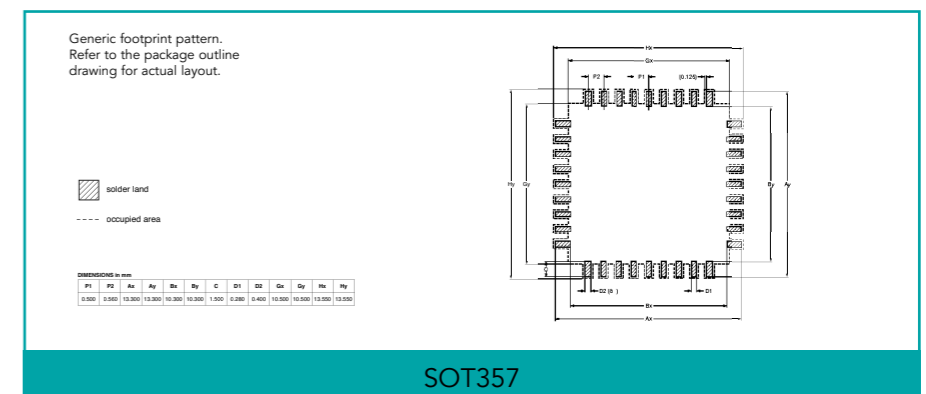
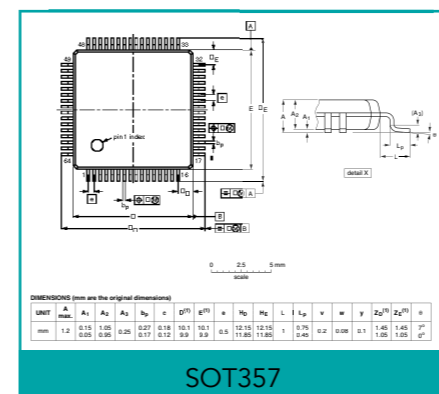
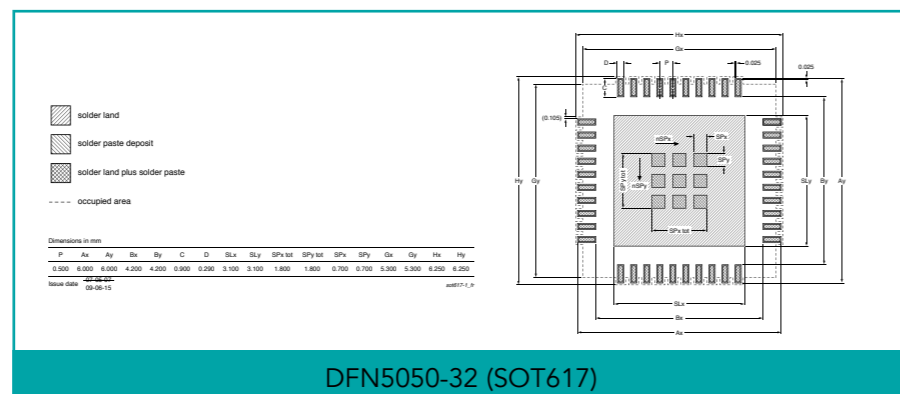
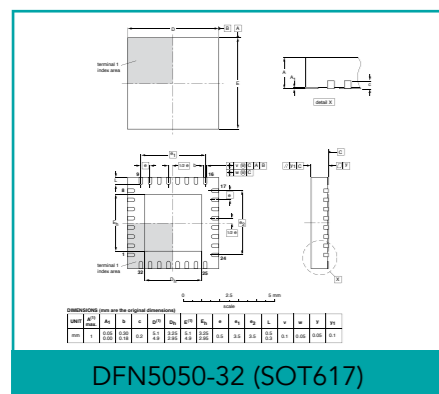
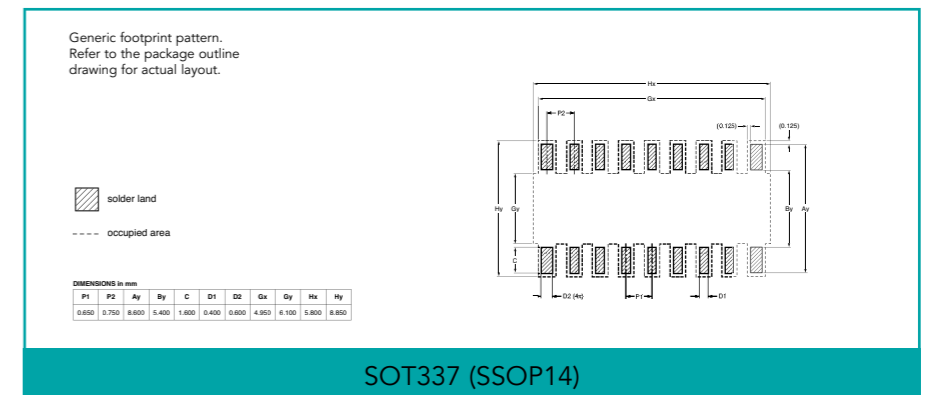
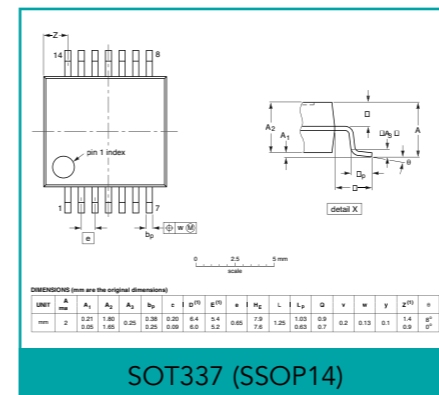
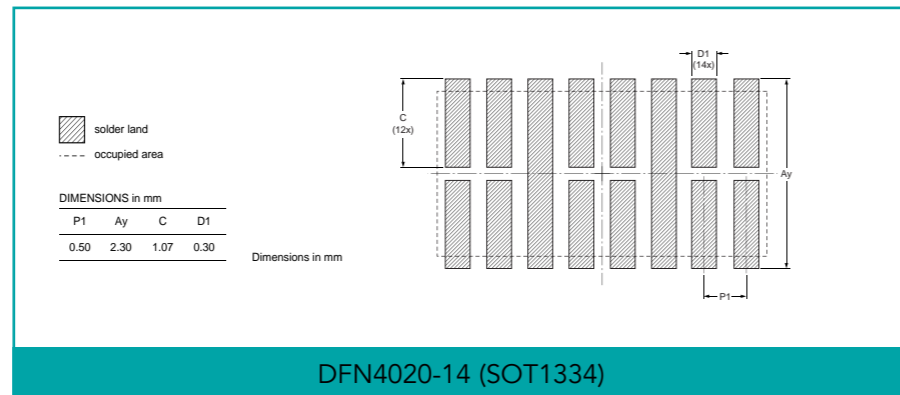
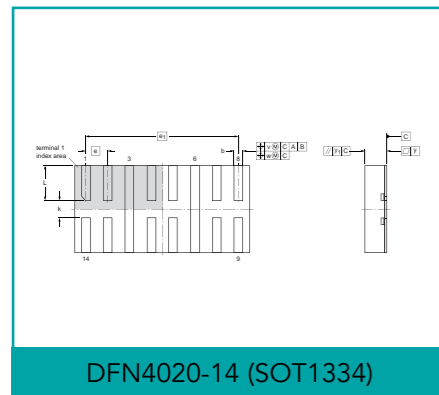
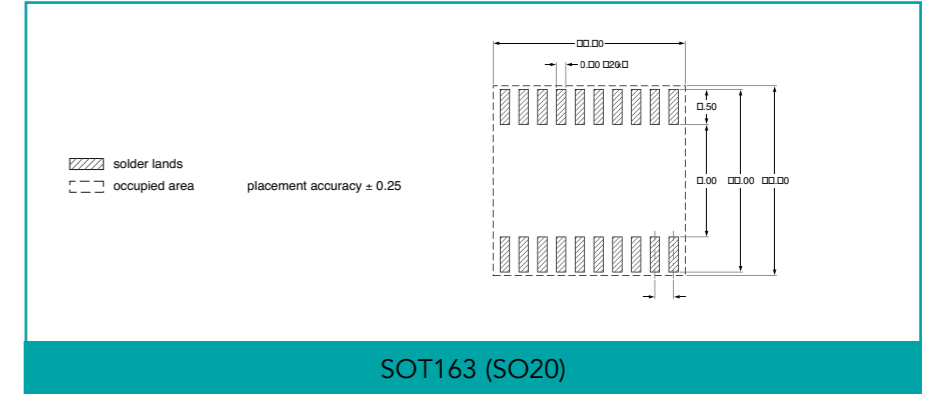
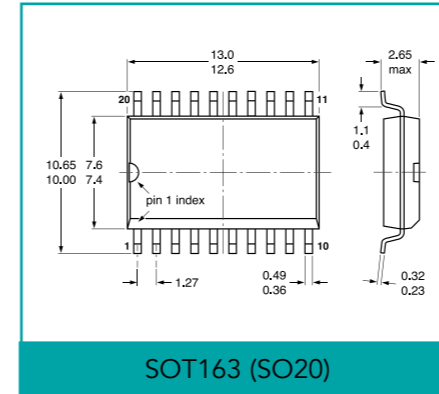
P	Ay	By	D	SLx	Sly	SPx tot	SPy tot	Gx	Gy	Hx	Hy	nSPx	nSPy
0.400	1.780	0.780	0.220	2.200	0.400	1.800	0.300	0.300	0.300	2.430	1.700	2.710	1.990

Issue date: 11-07-06

### More than 8-Pin SMD Packages



### More than 8-Pin SMD Packages



### More than 8-Pin SMD Packages

pin 1 index

0 2.5 5 mm scale

UNIT	A <sub>1</sub>	A <sub>2</sub>	b <sub>1</sub>	c	D <sub>1</sub>	D <sub>2</sub>	G <sub>x</sub>	G <sub>y</sub>	H <sub>x</sub>	H <sub>y</sub>
mm	1.1	0.15	0.35	0.25	0.10	0.11	4.5	0.65	6.5	7.45

**SOT402 (TSSOP14)**

Generic footprint pattern. Refer to the package outline drawing for actual layout.

■ solder land  
--- occupied area

0.650 0.750 7.200 4.500 1.350 0.400 0.600 4.950 5.300 5.800 7.450

**SOT402 (TSSOP14)**

pin 1 index

0.27 0.17 0.20 0.09 1.1 max 0.7 0.5

**SOT510 (TSSOP38)**

Generic footprint pattern. Refer to the package outline drawing for actual layout.

■ solder land  
--- occupied area

0.500 0.500 7.200 4.500 1.350 0.280 0.400 9.770 5.300 10.500 7.450

**SOT510 (TSSOP38)**

pin 1 index

0.635 0.31 0.20 1.73 max 0.89 0.41 0.25 0.18

**SOT519 (SSOP16)**

Generic footprint pattern. Refer to the package outline drawing for actual layout.

■ solder land  
--- occupied area

0.635 0.660 6.600 4.200 1.200 0.450 0.500 5.245 4.500 5.500 6.850

**SOT519 (SSOP16)**

pin 1 index

0.5 0.30 0.15 1.1 max 0.7 0.4 0.23 0.15

**SOT552 (TSSOP10)**

Generic footprint pattern. Refer to the package outline drawing for actual layout.

■ solder land  
--- occupied area

0.500 0.550 5.400 3.200 1.100 0.300 0.400 2.750 3.900 3.700 5.650

**SOT552 (TSSOP10)**

Dimensions in mm

### Glass diodes

Dimensions

Unit	b	D	G	L
mm	max 1.30	5.3	9.6	
mm	nom 1.18	4.8	7.2	25.4
mm	min 0.052	0.21	0.375	
inches	nom 0.046	0.19	0.285	1.00

0 2.5 5 mm scale

**SOD141 (DO201AD)**

0.56 max 1.85 max 25.4 min 4.25 max 25.4 min

**SOD27 (DO-35)**

0.81 max 2.6 max 28 min 4.8 max 28 min

**SOD66 (DO-41)**

0.55 max 1.6 max 25.4 min 3.04 max 25.4 min

**SOD68 (DO-34)**

### Single Ended and Through Hole Packages

Dimensions (mm are the original dimensions)

UNIT	A	b	b <sub>1</sub>	c	D	d	E	e	e <sub>1</sub>	L	L <sub>1</sub> (1)
mm	5.2	0.48	0.66	0.45	4.8	1.7	4.2	2.54	1.27	14.5	2.5
mm	5.0	0.40	0.55	0.38	4.4	1.4	3.6			12.7	

Note  
1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

0 2.5 5 mm scale

**SOT54 (TO92)**

Dimensions

Unit	A	A <sub>1</sub>	b	b <sub>1</sub> (1)	c	D	D <sub>1</sub>	E	e	H	L	P	Q	q
mm	max 4.7	1.40	0.95	1.7	0.65	15.8	6.8	10.30	5.08	16.25	15.0	3.7	2.6	2.9
mm	nom 4.3	1.15	0.70	1.3	0.45	15.6	6.4	9.65 (REF)	15.70	12.5	3.5	2.2	2.7	
mm	min													

Note  
1. Protruded dambar are included in the dimension.

0 5 10 mm scale

**SOD59**

Dimensions in mm



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1PS705B85	45	ACT108	122	BAS40-05V	45	BAT54VV	45	BC51PA	70
1PS705B86	45	ACT108W	122	BAS40-05W	45	BAT54W	45	BC52-10PA	70
1PS745B23	38	ACTT10	122	BAS40-06	44	BAT54XY	45	BC52-16PA	70
1PS755B45	45	ACTT10X	122	BAS40-06W	45	BAT720	38	BC52PA	70
1PS765B10	45	ACTT12	122	BAS40-07	44	BAT721	44	BC53-10PA	70
1PS765B17	45	ACTT12B	122	BAS40-07V	45	BAT721A	44	BC53-16PA	70
1PS765B21	45	ACTT12X	122	BAS40H	45	BAT721C	44	BC53PA	70
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