



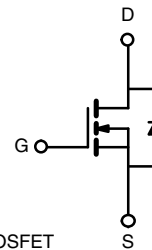
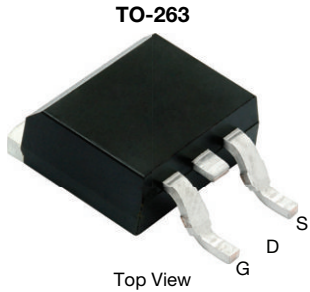
# Automotive N-Channel 40 V (D-S) 175 °C MOSFET



PRODUCT SUMMARY	
V <sub>DS</sub> (V)	40
R <sub>DS(on)</sub> (Ω) at V <sub>GS</sub> = 10 V	0.0027
I <sub>D</sub> (A)	100
Configuration	Single
Package	TO-263

## FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- 100 % R<sub>g</sub> and UIS tested
- AEC-Q101 qualified <sup>d</sup>
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V <sub>DS</sub>	40	V
Gate-Source Voltage		V <sub>GS</sub>	± 20	
Continuous Drain Current	T <sub>C</sub> = 25 °C <sup>a</sup>	I <sub>D</sub>	100	A
	T <sub>C</sub> = 125 °C		98	
Continuous Source Current (Diode Conduction) <sup>a</sup>		I <sub>S</sub>	100	
Pulsed Drain Current <sup>b</sup>		I <sub>DM</sub>	400	
Single Pulse Avalanche Current	L = 0.1 mH	I <sub>AS</sub>	70	
Single Pulse Avalanche Energy		E <sub>AS</sub>	245	
Maximum Power Dissipation <sup>b</sup>	T <sub>C</sub> = 25 °C	P <sub>D</sub>	157	W
	T <sub>C</sub> = 125 °C		52	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient	PCB Mount <sup>c</sup>	R <sub>thJA</sub>	40	°C/W
Junction-to-Case (Drain)		R <sub>thJC</sub>	0.95	

### Notes

- Package limited.
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- When mounted on 1" square PCB (FR4 material).
- Parametric verification ongoing.



SPECIFICATIONS ( $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		40	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		2.5	3.0	3.5	
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$		-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 40\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$	$V_{DS} = 40\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 40\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = 10\text{ V}$	$V_{DS} \geq 5\text{ V}$	120	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$	-	0.00225	0.00270	$\Omega$
		$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	-	0.00440	
		$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	-	0.00540	
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		-	201	-	S
<b>Dynamic <sup>b</sup></b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	-	6325	7910	$\mu\text{F}$
Output Capacitance	$C_{oss}$			-	744	930	
Reverse Transfer Capacitance	$C_{rss}$			-	314	395	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = 10\text{ V}$	$V_{DS} = 20\text{ V}, I_D = 100\text{ A}$	-	95.5	145	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			-	25.5	-	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			-	14.7	-	
Gate Resistance	$R_g$	f = 1 MHz		0.7	1.48	3.8	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.2\text{ }\Omega$ $I_D \cong 100\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		-	14	21	ns
Rise Time <sup>c</sup>	$t_r$			-	11	17	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			-	48	72	
Fall Time <sup>c</sup>	$t_f$			-	9	14	
<b>Source-Drain Diode Ratings and Characteristics <sup>b</sup></b>							
Pulsed Current <sup>a</sup>	$I_{SM}$			-	-	400	A
Forward Voltage	$V_{SD}$	$I_F = 30\text{ A}, V_{GS} = 0$		-	0.8	1.5	V

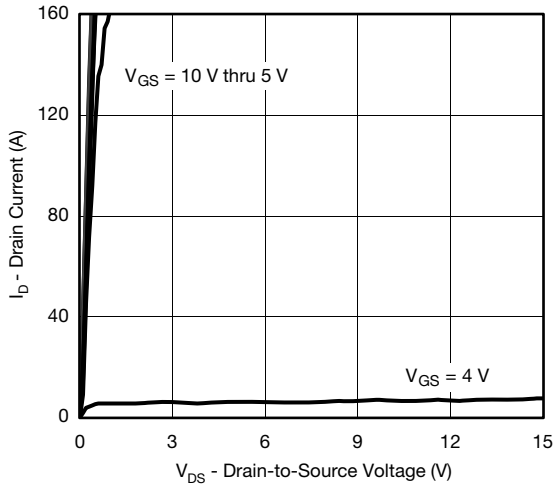
**Notes**

- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

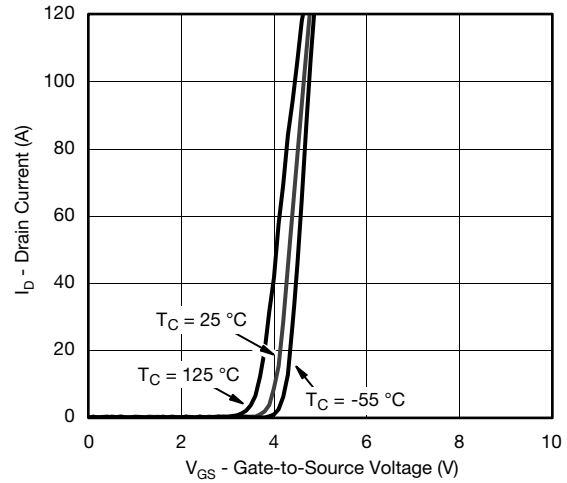
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



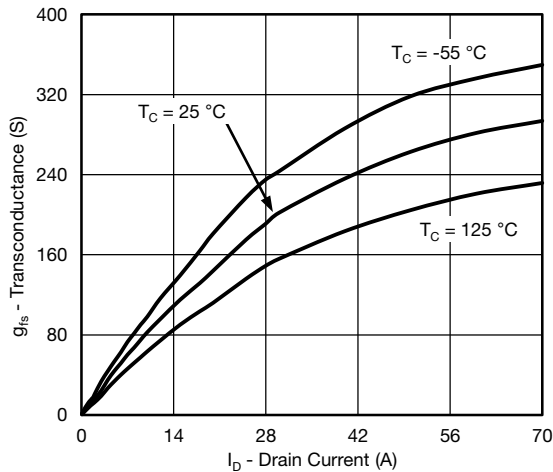
## TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



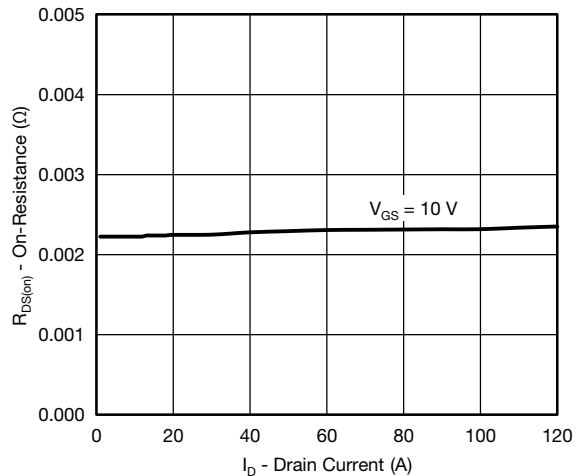
Output Characteristics



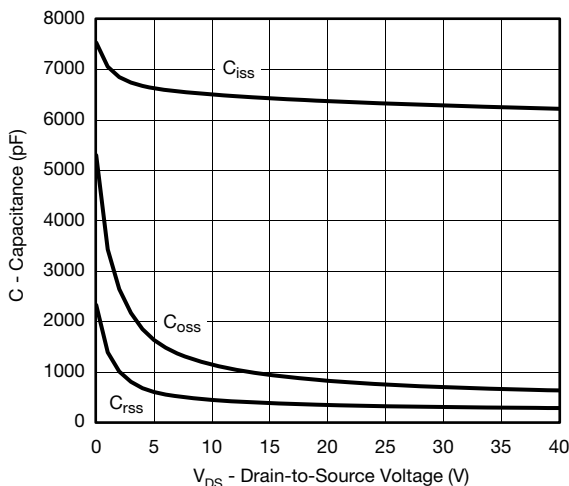
Transfer Characteristics



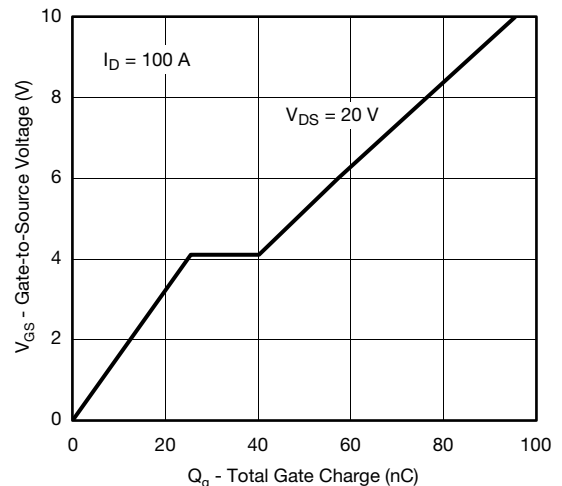
Transconductance



On-Resistance vs. Drain Current



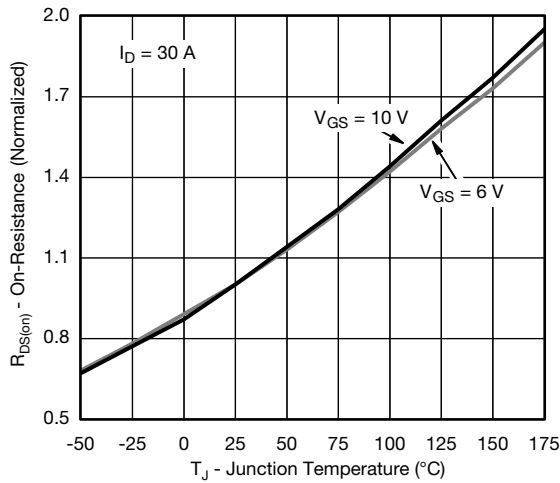
Capacitance



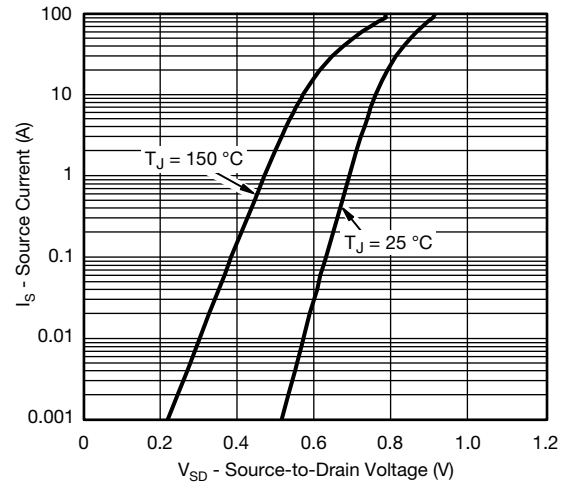
Gate Charge



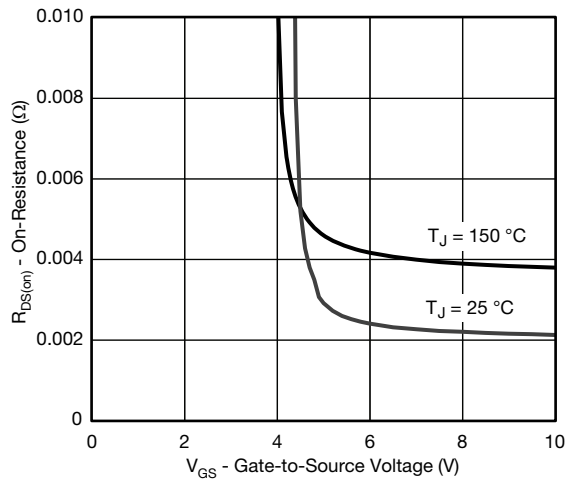
## TYPICAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



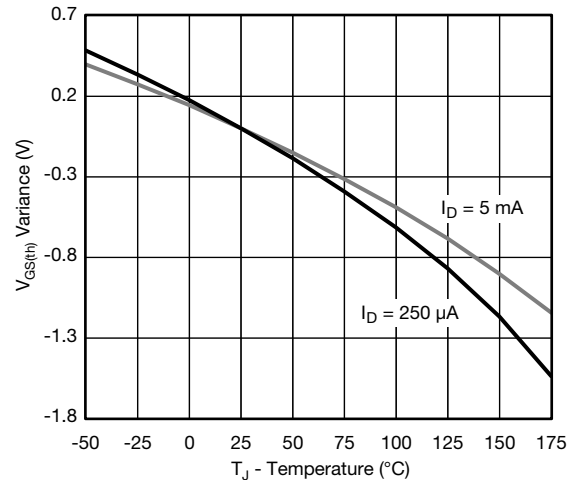
On-Resistance vs. Junction Temperature



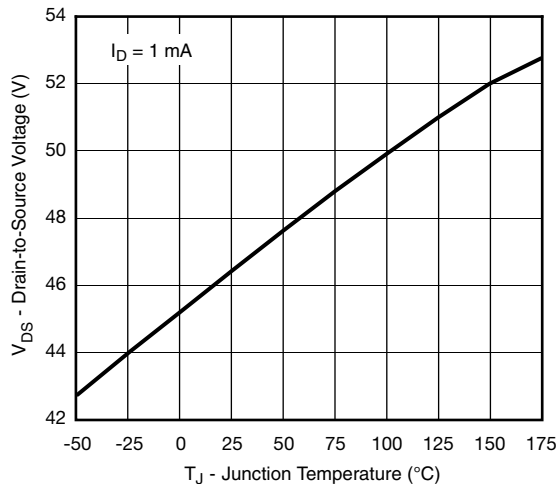
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



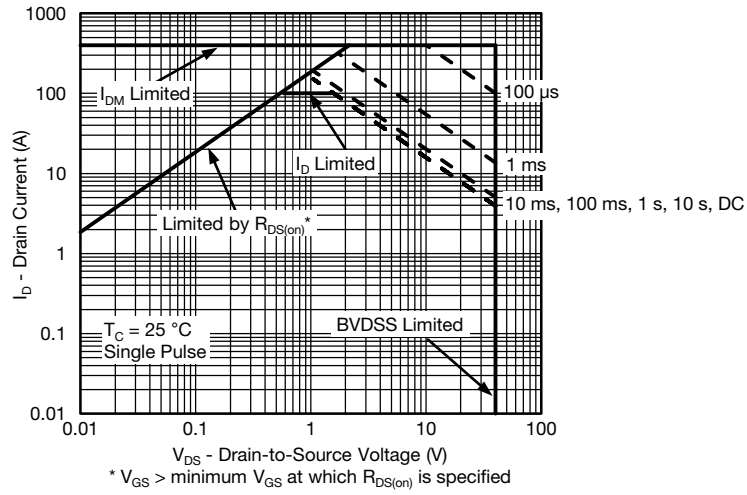
Threshold Voltage



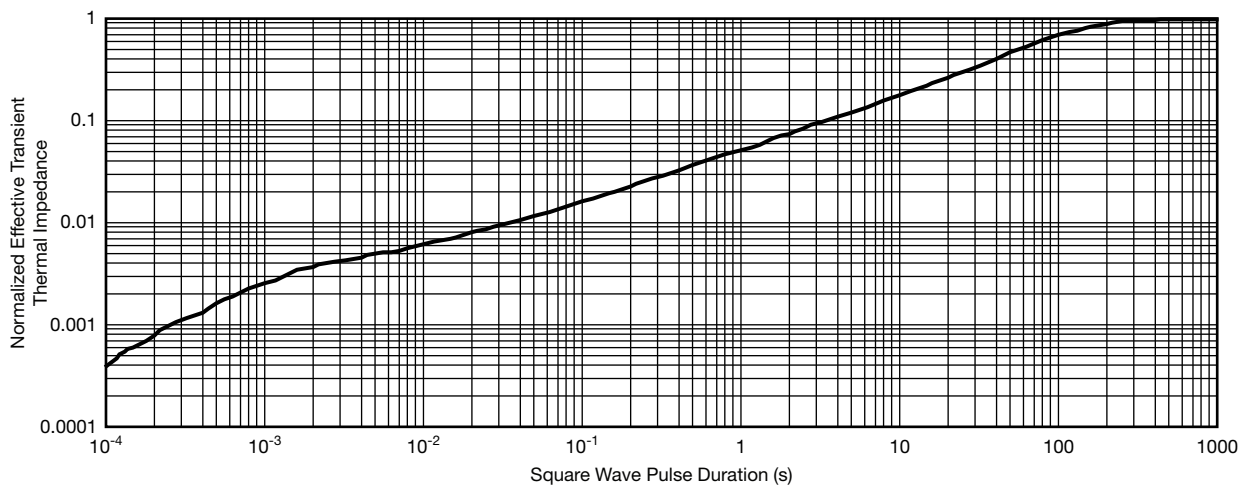
Drain Source Breakdown vs. Junction Temperature



**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



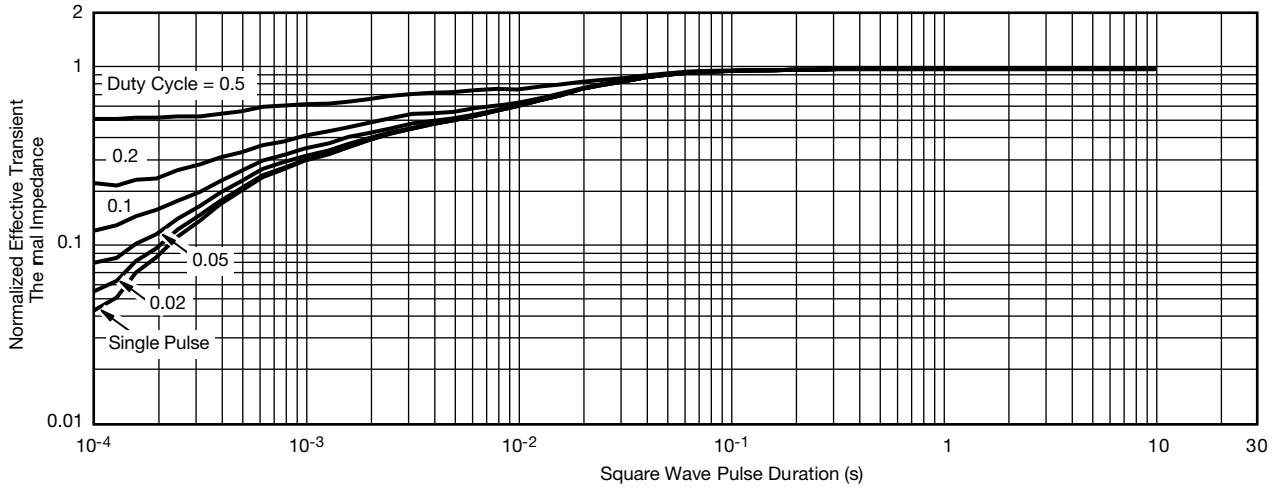
**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



**Normalized Thermal Transient Impedance, Junction-to-Case**

**Note**

- The characteristics shown in the two graphs
    - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
    - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)
- are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?62769](http://www.vishay.com/ppg?62769).



REVISION HISTORY <sup>a</sup>		
REVISION	DATE	DESCRIPTION OF CHANGE
B	04-Aug-15	• Revised R <sub>g</sub> minimum limit

**Note**

a. As of April 2014



D<sup>2</sup>PAK / TO-263 and TO-262

Ordering codes for the SQ rugged series power MOSFETs in the D<sup>2</sup>PAK / TO-263 and TO-262 packages:

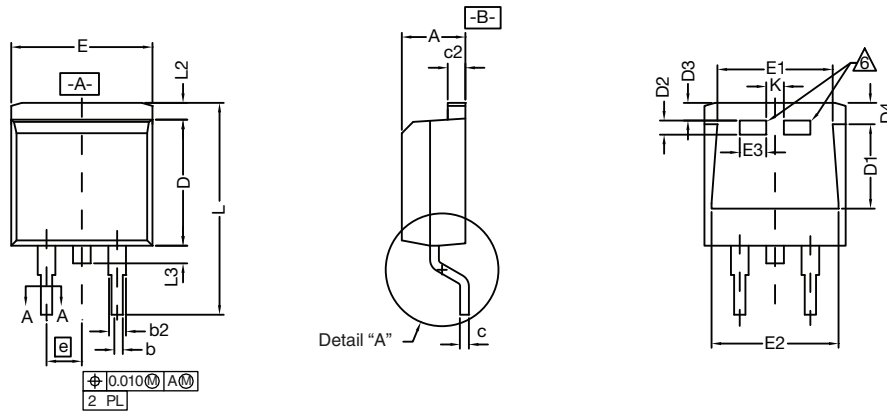
DATASHEET PART NUMBER	OLD ORDERING CODE <sup>a</sup>	NEW ORDERING CODE
SQM100N04-2m7	SQM100N04-2M7-GE3	SQM100N04-2M7_GE3
SQM100N10-10	SQM100N10-10-GE3	SQM100N10-10_GE3
SQM110N05-06L	SQM110N05-06L-GE3	SQM110N05-06L_GE3
SQM110P06-8m9L	SQM110P06-8M9L-GE3	SQM110P06-8M9L_GE3
SQM120N02-1m3L	SQM120N02-1M3L-GE3	SQM120N02-1M3L_GE3
SQM120N03-1m5L	SQM120N03-1M5L-GE3	SQM120N03-1M5L_GE3
SQM120N04-1m7	SQM120N04-1M7-GE3	SQM120N04-1M7_GE3
SQM120N04-1m7L	SQM120N04-1M7L-GE3	SQM120N04-1M7L_GE3
SQM120N04-1m9	SQM120N04-1M9-GE3	SQM120N04-1M9_GE3
SQM120N06-06	SQM120N06-06-GE3	SQM120N06-06_GE3
SQM120N06-3m5L	SQM120N06-3M5L-GE3	SQM120N06-3M5L_GE3
SQM120N10-09	SQM120N10-09-GE3	SQM120N10-09_GE3
SQM120N10-3m8	SQM120N10-3M8-GE3	SQM120N10-3M8_GE3
SQM120P04-04L	SQM120P04-04L-GE3	SQM120P04-04L_GE3
SQM120P06-07L	SQM120P06-07L-GE3	SQM120P06-07L_GE3
SQM120P10-10m1L	-	SQM120P10_10m1LGE3
SQM200N04-1m1L	SQM200N04-1M1L-GE3	SQM200N04-1M1L_GE3
SQM200N04-1m7L	SQM200N04-1M7L-GE3	SQM200N04-1M7L_GE3
SQM200N04-1m8	SQM200N04-1M8-GE3	SQM200N04-1M8_GE3
SQM25N15-52	SQM25N15-52-GE3	SQM25N15-52_GE3
SQM35N30-97	SQM35N30-97-GE3	SQM35N30-97_GE3
SQM40010EL	-	SQM40010EL_GE3
SQM40N10-30	SQM40N10-30-GE3	SQM40N10-30_GE3
SQM40N15-38	SQM40N15-38-GE3	SQM40N15-38_GE3
SQM40P10-40L	SQM40P10-40L-GE3	SQM40P10-40L_GE3
SQM47N10-24L	SQM47N10-24L-GE3	SQM47N10-24L_GE3
SQM50020EL	-	SQM50020EL_GE3
SQM50N04-4m0L	SQM50N04-4M0L-GE3	SQM50N04-4M0L_GE3
SQM50N04-4m1	SQM50N04-4M1-GE3	SQM50N04-4M1_GE3
SQM50P03-07	SQM50P03-07-GE3	SQM50P03-07_GE3
SQM50P04-09L	SQM50P04-09L-GE3	SQM50P04-09L_GE3
SQM50P06-15L	SQM50P06-15L-GE3	SQM50P06-15L_GE3
SQM50P08-25L	SQM50P08-25L-GE3	SQM50P08-25L_GE3
SQM60030E	-	SQM60030E_GE3
SQM60N06-15	SQM60N06-15-GE3	SQM60N06-15_GE3
SQM60N20-35	SQM60N20-35-GE3	SQM60N20-35_GE3
SQM70060EL	-	SQM70060EL_GE3
SQM85N15-19	SQM85N15-19-GE3	SQM85N15-19_GE3
SQV120N10-3m8	SQV120N10-3m8-GE3	SQV120N10-3m8_GE3
SQV120N06-4m7L	-	SQV120N06-4m7L_GE3

Note

a. Old ordering code is obsolete and no longer valid for new orders



### TO-263 (D<sup>2</sup>PAK): 3-LEAD



DIM.	INCHES		MILLIMETERS		
	MIN.	MAX.	MIN.	MAX.	
A	0.160	0.190	4.064	4.826	
b	0.020	0.039	0.508	0.990	
b1	0.020	0.035	0.508	0.889	
b2	0.045	0.055	1.143	1.397	
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	0.027	0.584	0.685
c2	0.045	0.055	1.143	1.397	
D	0.340	0.380	8.636	9.652	
D1	0.220	0.240	5.588	6.096	
D2	0.038	0.042	0.965	1.067	
D3	0.045	0.055	1.143	1.397	
D4	0.044	0.052	1.118	1.321	
E	0.380	0.410	9.652	10.414	
E1	0.245	-	6.223	-	
E2	0.355	0.375	9.017	9.525	
E3	0.072	0.078	1.829	1.981	
e	0.100 BSC		2.54 BSC		
K	0.045	0.055	1.143	1.397	
L	0.575	0.625	14.605	15.875	
L1	0.090	0.110	2.286	2.794	
L2	0.040	0.055	1.016	1.397	
L3	0.050	0.070	1.270	1.778	
L4	0.010 BSC		0.254 BSC		
M	-	0.002	-	0.050	
ECN: T13-0707-Rev. K, 30-Sep-13					
DWG: 5843					

**Notes**

- Plane B includes maximum features of heat sink tab and plastic.
- No more than 25 % of L1 can fall above seating plane by max. 8 mils.
- Pin-to-pin coplanarity max. 4 mils.
- \*: Thin lead is for SUB, SYB.  
Thick lead is for SUM, SYM, SQM.
- Use inches as the primary measurement.
- This feature is for thick lead.

**RECOMMENDED MINIMUM PADS FOR D<sup>2</sup>PAK: 3-Lead**



Recommended Minimum Pads  
Dimensions in Inches/(mm)

[Return to Index](#)



## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.