



PMCXB900UE

20 V, complementary N/P-channel Trench MOSFET

7 October 2013

Product data sheet

1. General description

Complementary N/P-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1010B-6 (SOT1216) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Trench MOSFET technology
- Very low threshold voltage for portable applications: $V_{GS(th)} = 0.7\text{ V}$
- Leadless ultra small and ultra thin SMD plastic package: $1.1 \times 1.0 \times 0.37\text{ mm}$
- ElectroStatic Discharge (ESD) protection $> 1\text{ kV HBM}$

3. Applications

- Relay driver
- High-speed line driver
- Level shifter
- Power management in battery-driven portables

4. Quick reference data

Table 1. Quick reference data

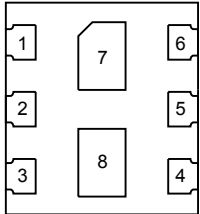
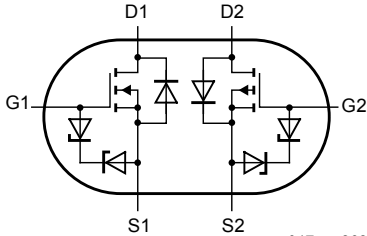
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
TR1 (N-channel), Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 600\text{ mA}; T_j = 25\text{ }^\circ\text{C}$	-	470	620	m Ω
TR2 (P-channel), Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -500\text{ mA}; T_j = 25\text{ }^\circ\text{C}$	-	1.02	1.4	Ω
TR1 (N-channel)						
V_{DS}	drain-source voltage	$T_j = 25\text{ }^\circ\text{C}$	-	-	20	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$	[1]	-	600	mA
TR2 (P-channel)						
V_{DS}	drain-source voltage	$T_j = 25\text{ }^\circ\text{C}$	-	-	-20	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$	[1]	-	-500	mA



[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 1 cm².

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source TR1	 <p>Transparent top view DFN1010B-6 (SOT1216)</p>	 <p>017aaa262</p>
2	G1	gate TR1		
3	D2	drain TR2		
4	S2	source TR2		
5	G2	gate TR2		
6	D1	drain TR1		
7	D1	drain TR1		
8	D2	drain TR2		

6. Ordering information

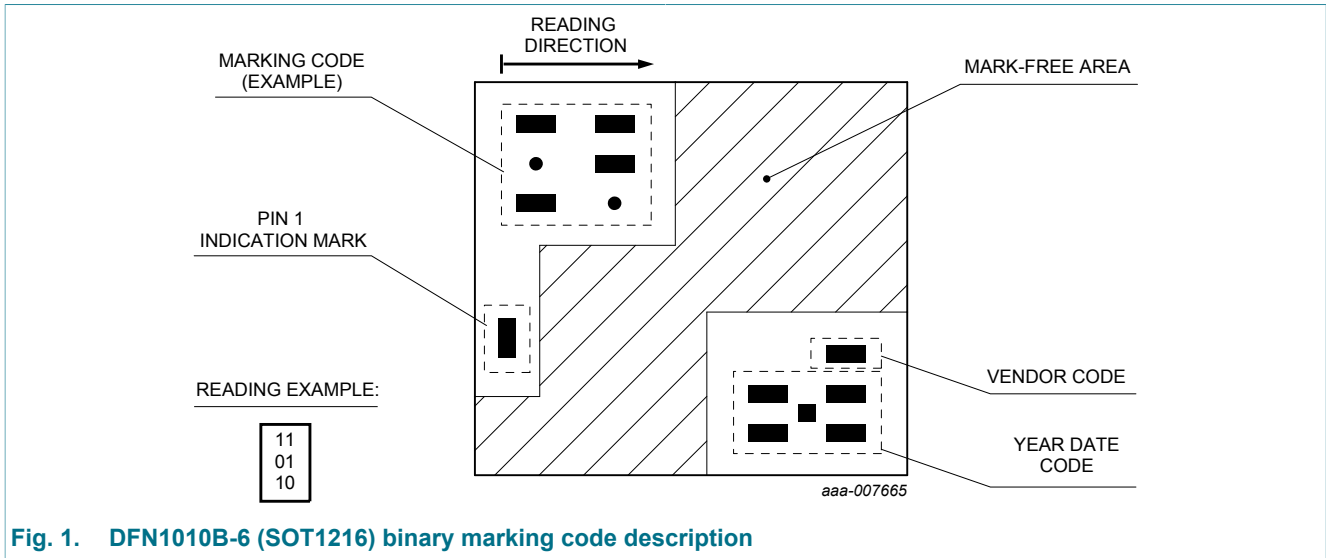
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMCXB900UE	DFN1010B-6	DFN1010B-6: plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals	SOT1216

7. Marking

Table 4. Marking codes

Type number	Marking code
PMCXB900UE	10 00 00



8. Limiting values

Table 5. Limiting values

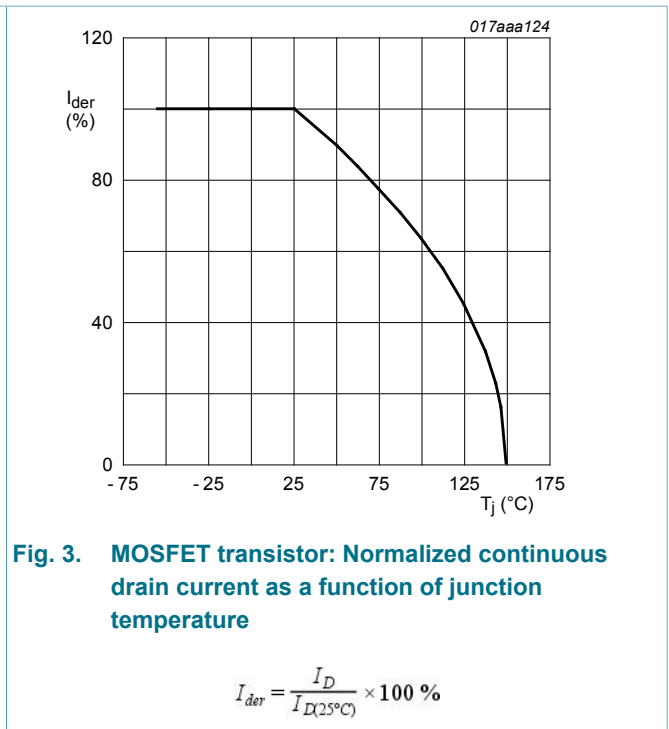
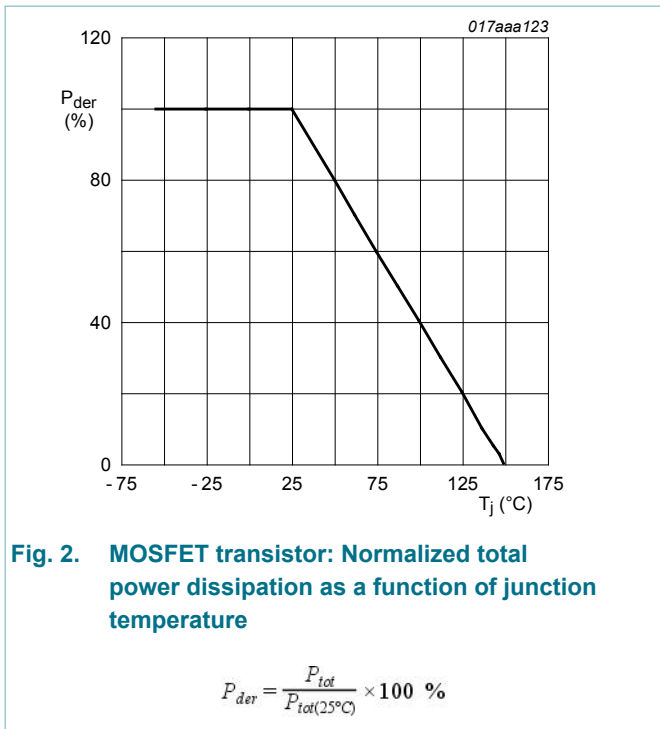
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
TR1 (N-channel)						
V_{DS}	drain-source voltage	$T_j = 25\text{ }^\circ\text{C}$		-	20	V
V_{GS}	gate-source voltage			-8	8	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$	[1]	-	600	mA
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ }^\circ\text{C}$	[1]	-	400	mA
I_{DM}	peak drain current	$T_{amb} = 25\text{ }^\circ\text{C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	2.5	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ }^\circ\text{C}$	[2]	-	265	mW
			[1]	-	380	mW
		$T_{sp} = 25\text{ }^\circ\text{C}$		-	4025	mW
TR1 (N-channel), Source-drain diode						
I_S	source current	$T_{amb} = 25\text{ }^\circ\text{C}$	[1]	-	400	mA
TR2 (P-channel)						
V_{DS}	drain-source voltage	$T_j = 25\text{ }^\circ\text{C}$		-	-20	V
V_{GS}	gate-source voltage			-8	8	V

20 V, complementary N/P-channel Trench MOSFET

Symbol	Parameter	Conditions		Min	Max	Unit
I _D	drain current	V _{GS} = -4.5 V; T _{amb} = 25 °C	[1]	-	-500	mA
		V _{GS} = -4.5 V; T _{amb} = 100 °C	[1]	-	-300	mA
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	-2	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	265	mW
			[1]	-	380	mW
		T _{sp} = 25 °C		-	4025	mW
TR2 (P-channel), Source-drain diode						
I _S	source current	T _{amb} = 25 °C	[1]	-	-350	mA
Per device						
T _j	junction temperature			-55	150	°C
T _{amb}	ambient temperature			-55	150	°C
T _{stg}	storage temperature			-65	150	°C

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 1 cm².
- [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



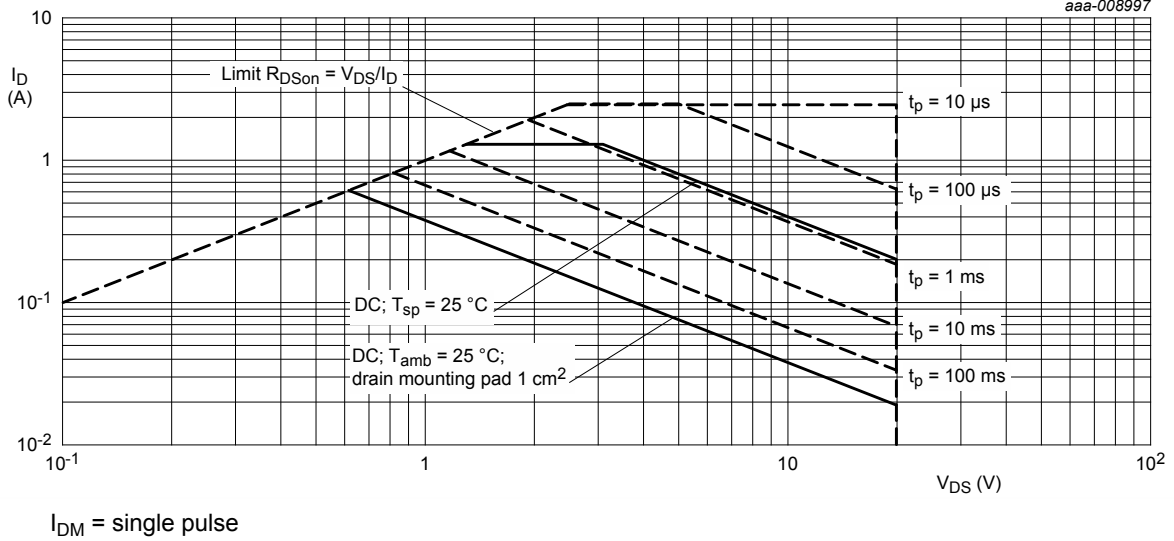


Fig. 4. TR1 (N-channel): safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

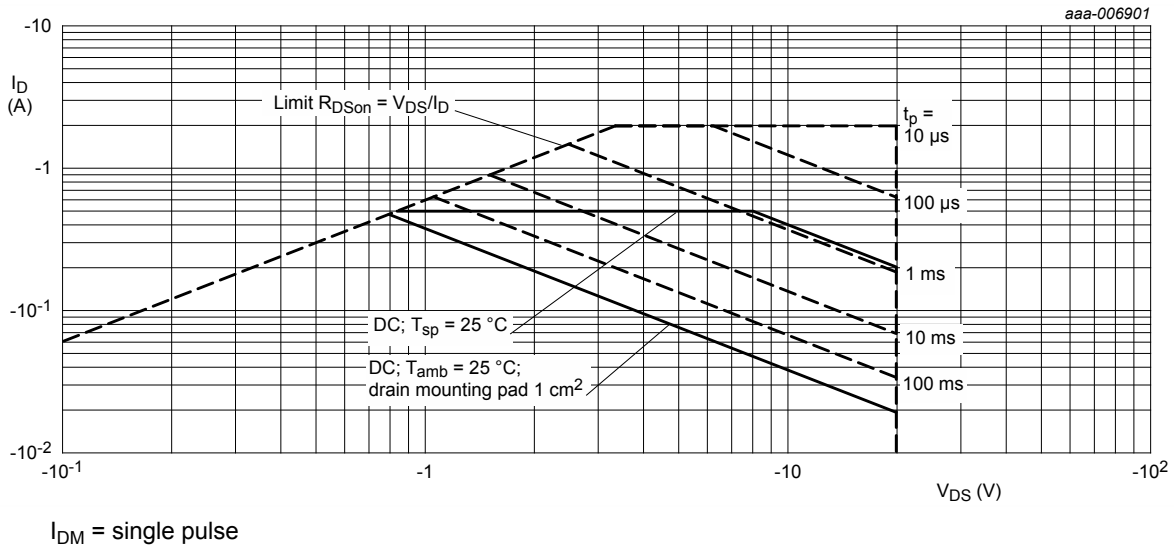


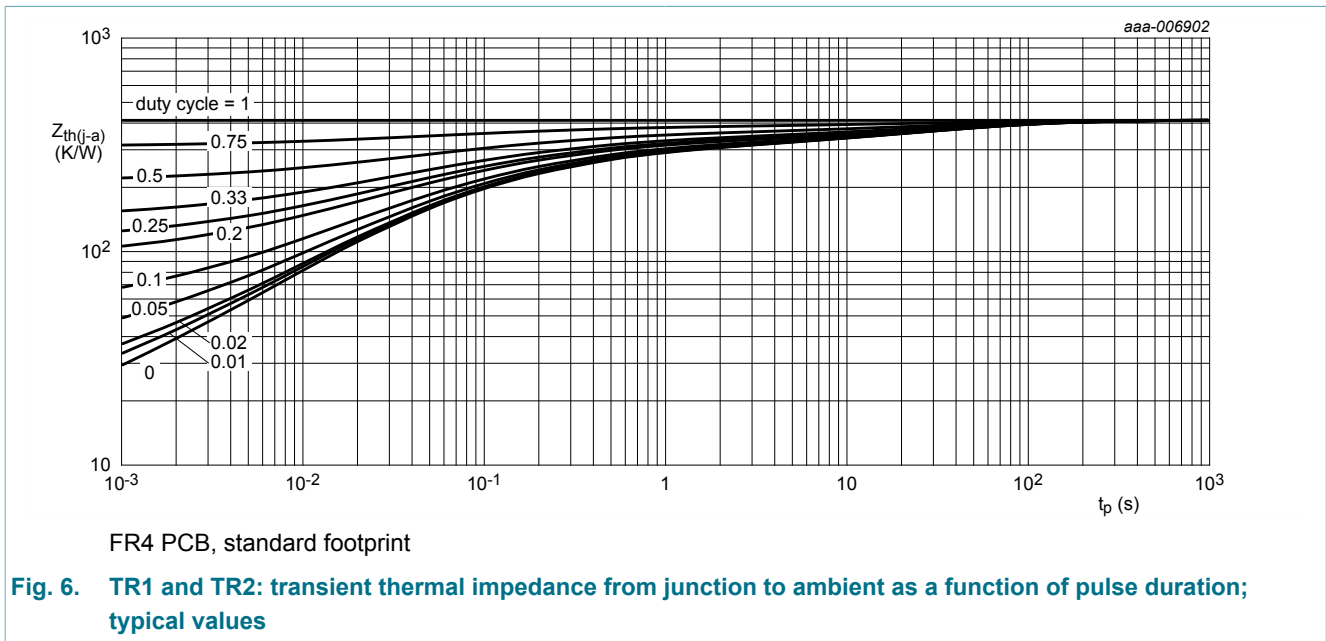
Fig. 5. TR2 (P-channel): safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

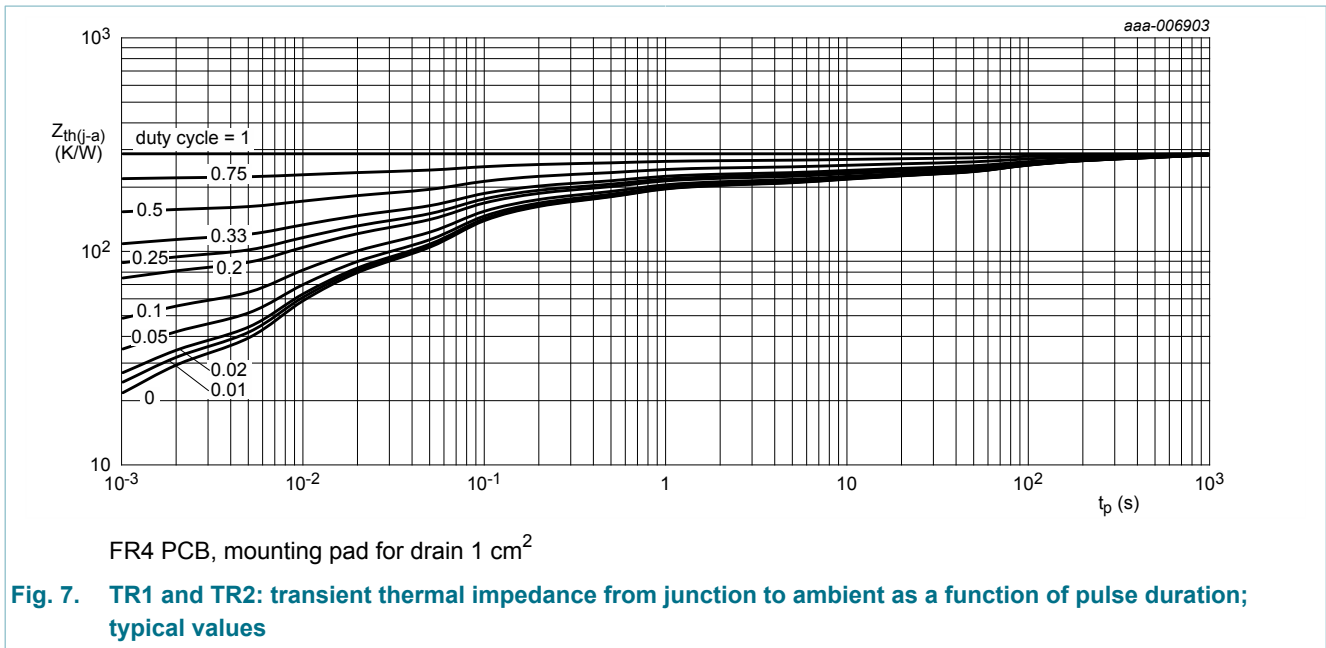
9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
TR1 (N-channel)							
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1]	-	410	475	K/W
			[2]	-	285	330	K/W
R _{th(j-sp)}	thermal resistance from junction to solder point			-	27	31	K/W
TR2 (P-channel)							
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1]	-	410	475	K/W
			[2]	-	285	330	K/W
R _{th(j-sp)}	thermal resistance from junction to solder point			-	27	31	K/W

- [1] Device mounted on an FR4 PCB, single-sided copper; tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 1 cm².





10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
TR1 (N-channel), Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	0.45	0.7	0.95	V
I_{DSS}	drain leakage current	$V_{DS} = 20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	μA
I_{GSS}	gate leakage current	$V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	10	μA
		$V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	-10	μA
		$V_{GS} = 4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	μA
		$V_{GS} = -4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	-1	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 V; I_D = 600 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	470	620	m Ω
		$V_{GS} = 4.5 V; I_D = 600 \text{ mA}; T_j = 150 \text{ }^\circ C$	-	760	1000	m Ω
		$V_{GS} = 2.5 V; I_D = 500 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	620	850	m Ω
		$V_{GS} = 1.8 V; I_D = 100 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	845	1300	m Ω
		$V_{GS} = 1.5 V; I_D = 10 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	1125	3000	m Ω
		$V_{GS} = 1.2 V; I_D = 1 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	2210	-	m Ω
g_{fs}	transfer conductance	$V_{DS} = 5 V; I_D = 600 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	1	-	S

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
TR1 (N-channel), Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10\text{ V}; I_D = 600\text{ mA}; V_{GS} = 4.5\text{ V};$ $T_j = 25\text{ }^\circ\text{C}$	-	0.4	0.7	nC
Q_{GS}	gate-source charge		-	0.1	-	nC
Q_{GD}	gate-drain charge		-	0.1	-	nC
C_{iss}	input capacitance	$V_{DS} = 10\text{ V}; f = 1\text{ MHz}; V_{GS} = 0\text{ V};$ $T_j = 25\text{ }^\circ\text{C}$	-	21.3	-	pF
C_{oss}	output capacitance		-	5.4	-	pF
C_{rss}	reverse transfer capacitance		-	4.2	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10\text{ V}; I_D = 600\text{ mA}; V_{GS} = 4.5\text{ V};$ $R_{G(ext)} = 6\text{ }^\Omega; T_j = 25\text{ }^\circ\text{C}$	-	5.6	-	ns
t_r	rise time		-	9.2	-	ns
$t_{d(off)}$	turn-off delay time		-	19	-	ns
t_f	fall time		-	51	-	ns
TR1 (N-channel), Source-drain diode characteristics						
V_{SD}	source-drain voltage	$I_S = 360\text{ mA}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	0.8	1.2	V
TR2 (P-channel), Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250\text{ }^\mu\text{A}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = -250\text{ }^\mu\text{A}; V_{DS} = V_{GS}; T_j = 25\text{ }^\circ\text{C}$	-0.45	-0.7	-0.95	V
I_{DSS}	drain leakage current	$V_{DS} = -20\text{ V}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	-1	μA
I_{GSS}	gate leakage current	$V_{GS} = 8\text{ V}; V_{DS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	10	μA
		$V_{GS} = -8\text{ V}; V_{DS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	-10	μA
		$V_{GS} = 4.5\text{ V}; V_{DS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	1	μA
		$V_{GS} = -4.5\text{ V}; V_{DS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	-1	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -500\text{ mA}; T_j = 25\text{ }^\circ\text{C}$	-	1.02	1.4	Ω
		$V_{GS} = -4.5\text{ V}; I_D = -500\text{ mA}; T_j = 150\text{ }^\circ\text{C}$	-	1.54	2.1	Ω
		$V_{GS} = -2.5\text{ V}; I_D = -200\text{ mA}; T_j = 25\text{ }^\circ\text{C}$	-	1.27	2.2	Ω
		$V_{GS} = -1.8\text{ V}; I_D = -40\text{ mA}; T_j = 25\text{ }^\circ\text{C}$	-	1.7	3.3	Ω
		$V_{GS} = -1.5\text{ V}; I_D = -10\text{ mA}; T_j = 25\text{ }^\circ\text{C}$	-	2.3	5	Ω
		$V_{GS} = -1.2\text{ V}; I_D = -1\text{ mA}; T_j = 25\text{ }^\circ\text{C}$	-	3.5	-	Ω
g_{fs}	transfer conductance	$V_{DS} = -10\text{ V}; I_D = -500\text{ mA}; T_j = 25\text{ }^\circ\text{C}$	-	480	-	mS
TR2 (P-channel), Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10\text{ V}; I_D = -450\text{ mA};$ $V_{GS} = -4.5\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	1.19	2.1	nC
Q_{GS}	gate-source charge		-	0.17	-	nC
Q_{GD}	gate-drain charge		-	0.1	-	nC

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_{iss}	input capacitance	$V_{DS} = -10\text{ V}; f = 1\text{ MHz}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	43	-	pF
C_{oss}	output capacitance		-	14	-	pF
C_{rss}	reverse transfer capacitance		-	8	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10\text{ V}; I_D = -450\text{ mA}; V_{GS} = -4.5\text{ V}; R_{G(ext)} = 6\text{ }\Omega; T_j = 25\text{ }^\circ\text{C}$	-	2.3	-	ns
t_r	rise time		-	5	-	ns
$t_{d(off)}$	turn-off delay time		-	13.5	-	ns
t_f	fall time		-	6	-	ns
TR2 (P-channel), Source-drain diode characteristics						
V_{SD}	source-drain voltage	$I_S = -115\text{ mA}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-0.7	-1.2	V

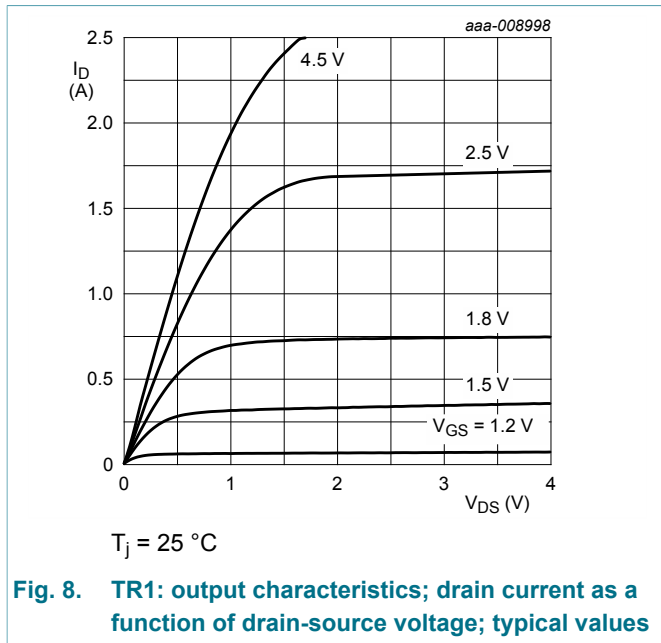


Fig. 8. TR1: output characteristics; drain current as a function of drain-source voltage; typical values

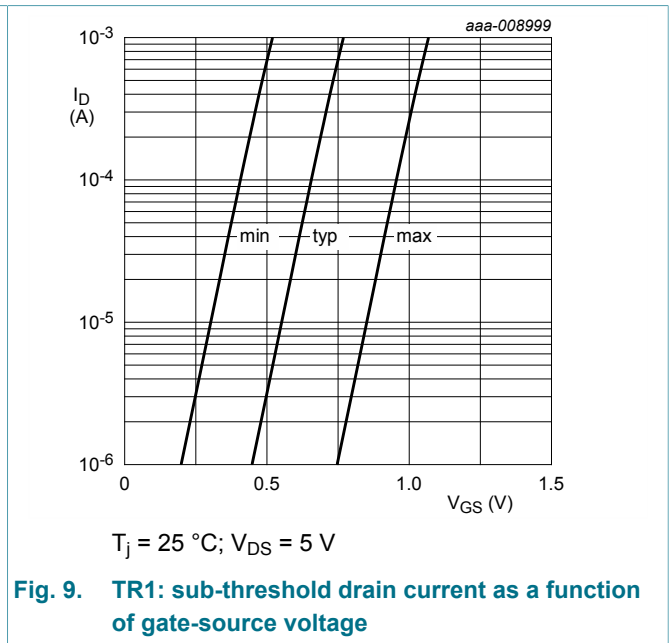


Fig. 9. TR1: sub-threshold drain current as a function of gate-source voltage

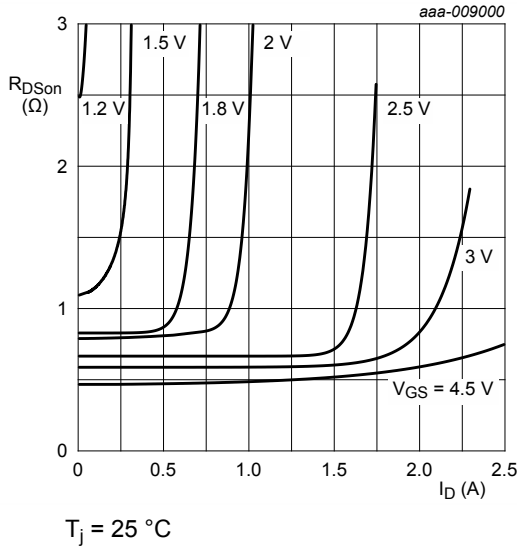


Fig. 10. TR1: drain-source on-state resistance as a function of drain current; typical values

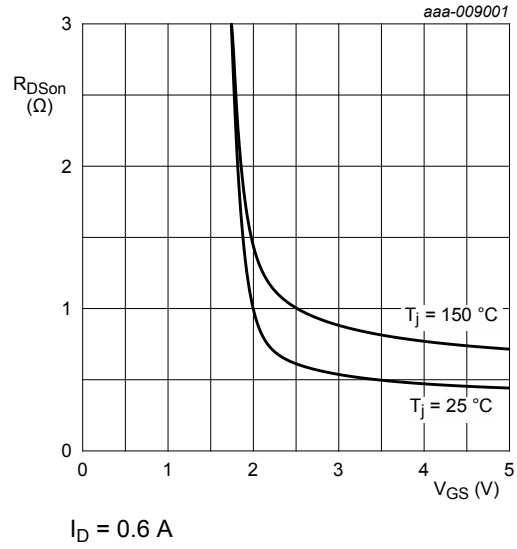


Fig. 11. TR1: drain-source on-state resistance as a function of gate-source voltage; typical values

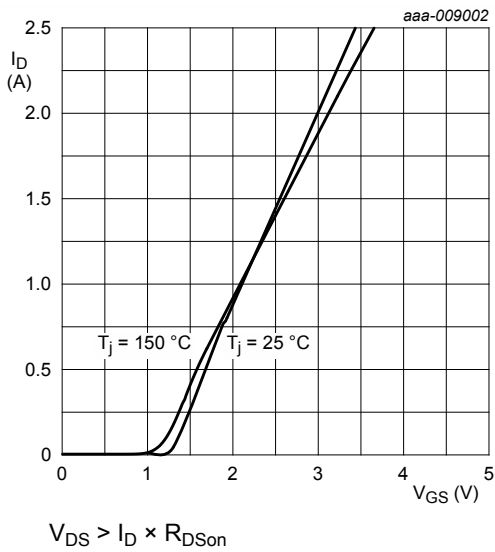


Fig. 12. TR1: transfer characteristics; drain current as a function of gate-source voltage; typical values

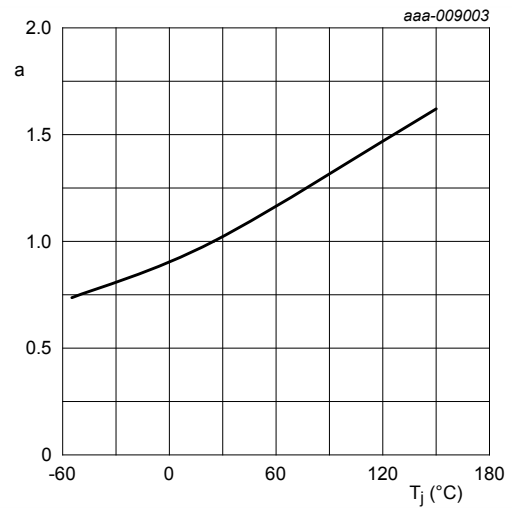
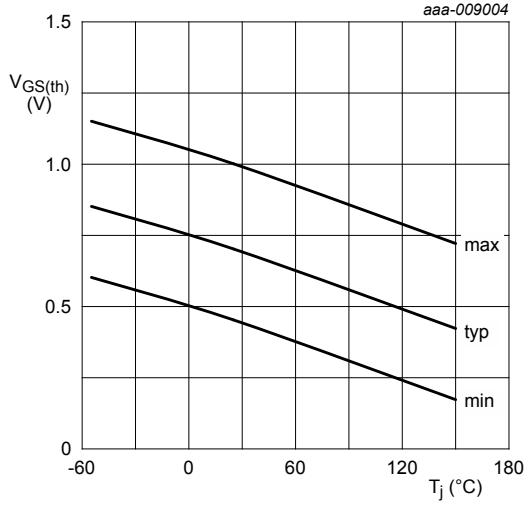


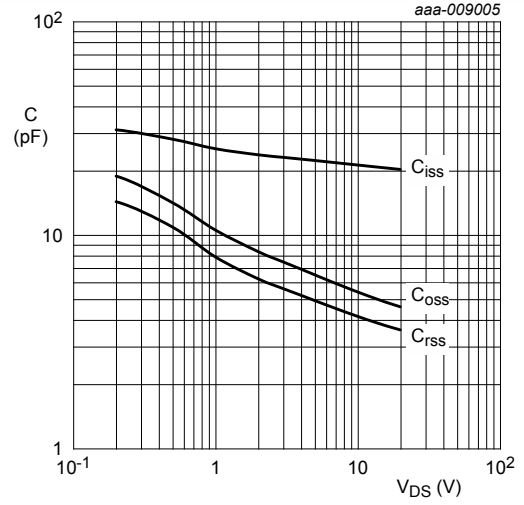
Fig. 13. TR1: normalized drain-source on-state resistance as a function of junction temperature; typical values

$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$



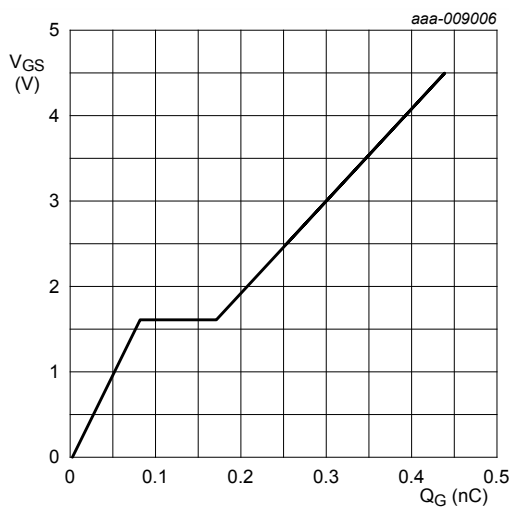
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$

Fig. 14. TR1: gate-source threshold voltage as a function of junction temperature



$f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}$

Fig. 15. TR1: input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$I_D = 0.6 \text{ A}; V_{DS} = 10 \text{ V}; T_{amb} = 25 \text{ °C}$

Fig. 16. TR1: gate-source voltage as a function of gate charge; typical values

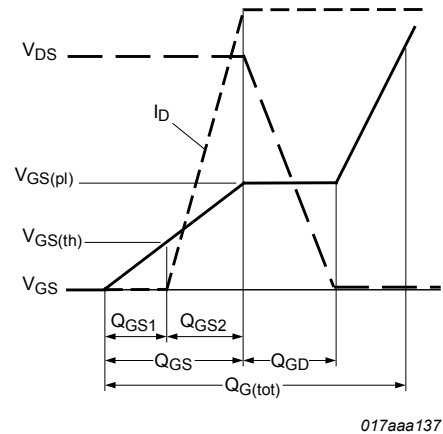


Fig. 17. Gate charge waveform definitions

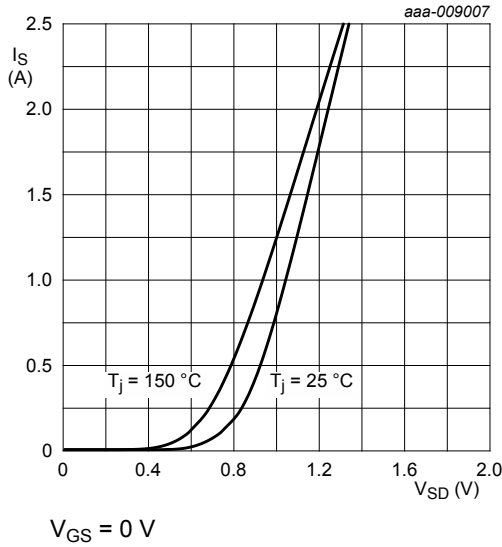


Fig. 18. TR1: source current as a function of source-drain voltage; typical values

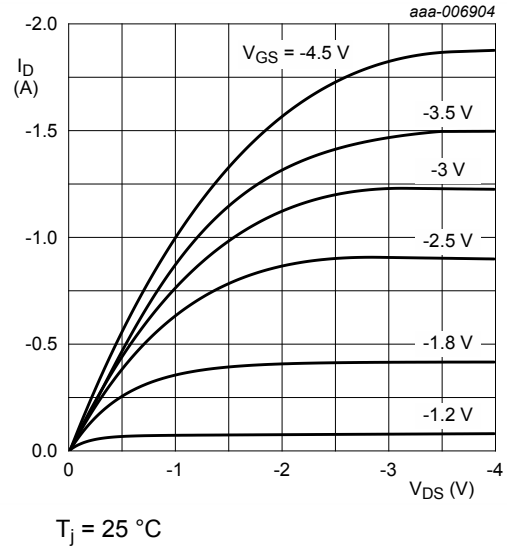


Fig. 19. TR2: output characteristics; drain current as a function of drain-source voltage; typical values

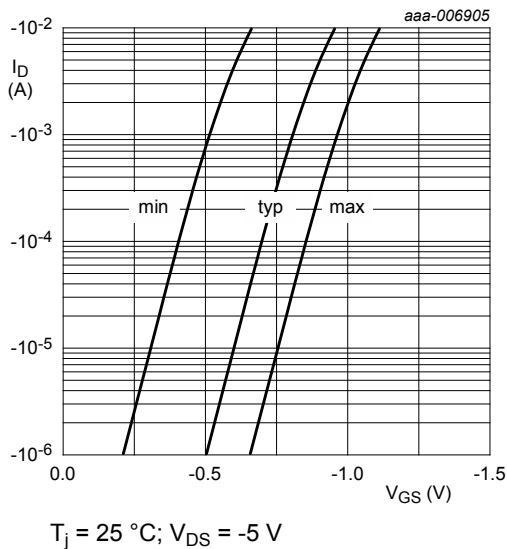


Fig. 20. TR2: sub-threshold drain current as a function of gate-source voltage

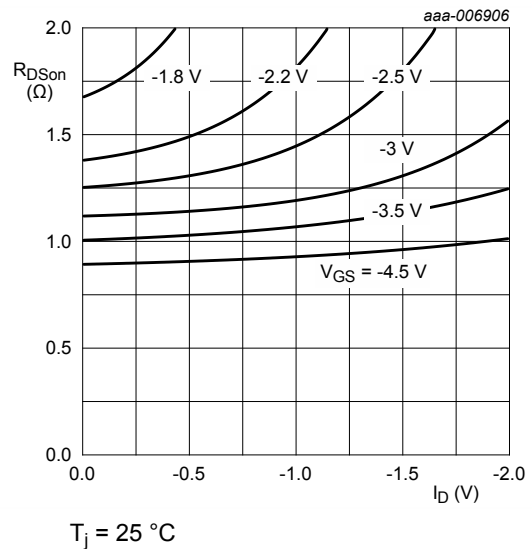


Fig. 21. TR2: drain-source on-state resistance as a function of drain current; typical values

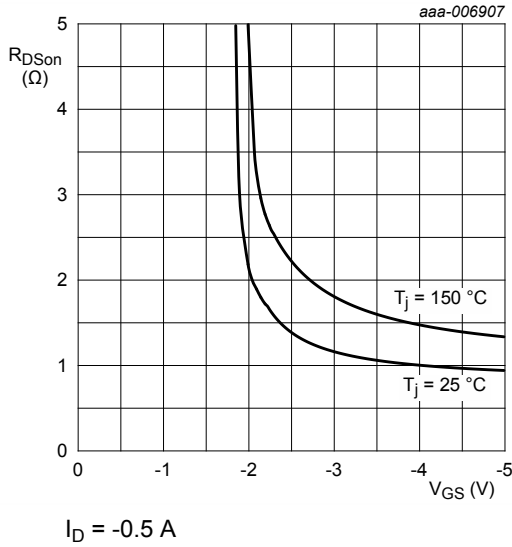


Fig. 22. TR2: drain-source on-state resistance as a function of gate-source voltage; typical values

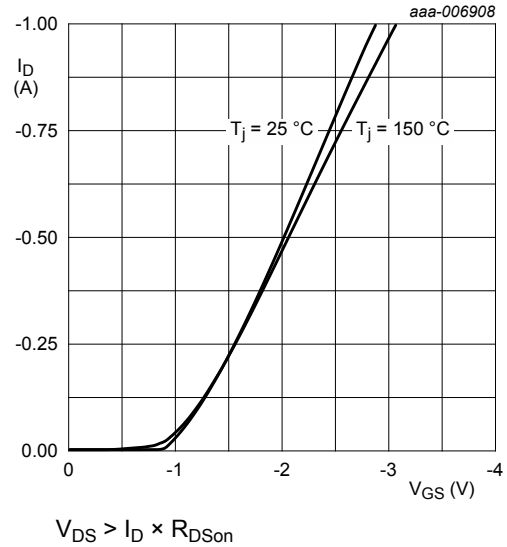


Fig. 23. TR2: transfer characteristics; drain current as a function of gate-source voltage; typical values

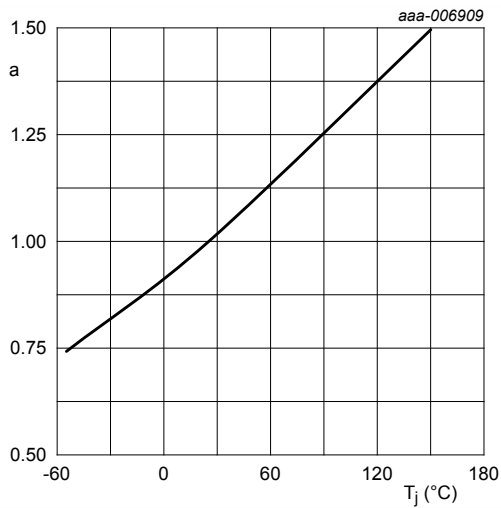


Fig. 24. TR2: normalized drain-source on-state resistance as a function of junction temperature; typical values

$$a = \frac{R_{DSon}}{R_{DSon(25^\circ C)}}$$

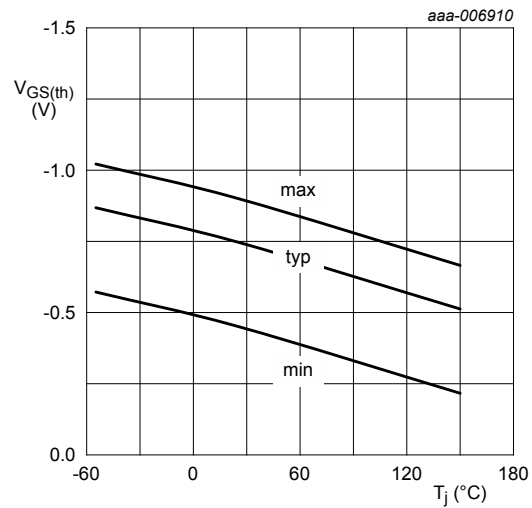
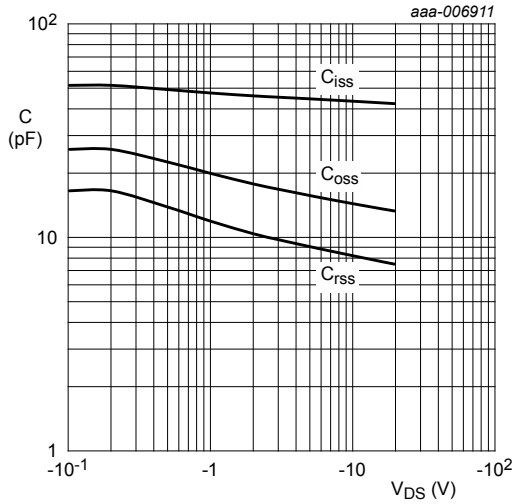
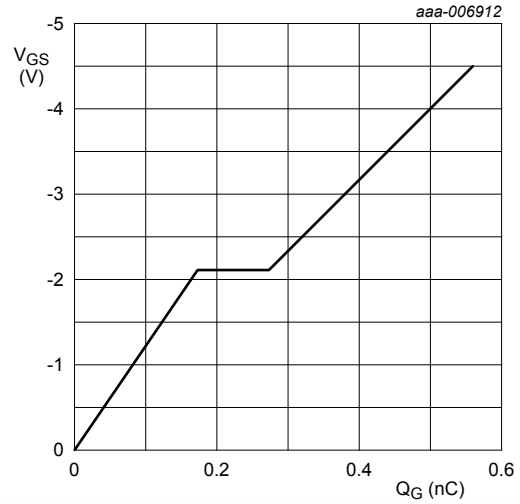


Fig. 25. TR2: gate-source threshold voltage as a function of junction temperature



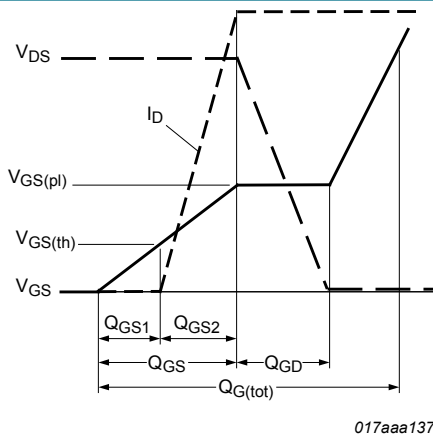
f = 1 MHz; V_{GS} = 0 V

Fig. 26. TR2: input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



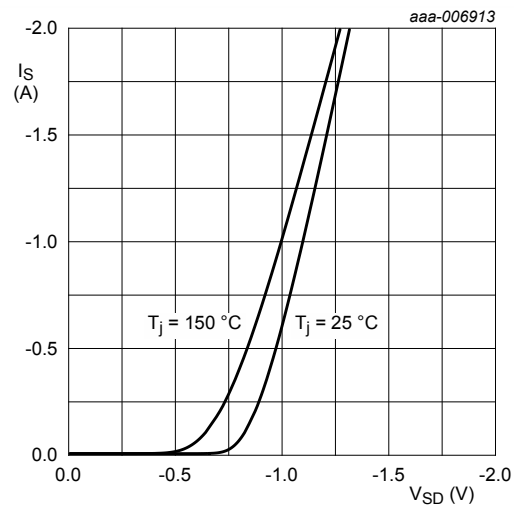
I_D = -0.45 A; V_{DS} = -10 V; T_{amb} = 25 °C

Fig. 27. TR2: gate-source voltage as a function of gate charge; typical values



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Fig. 28. Gate charge waveform definitions



V_{GS} = 0 V

Fig. 29. TR2: source current as a function of source-drain voltage; typical values

11. Test information

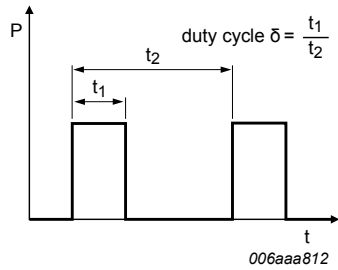


Fig. 30. Duty cycle definition

12. Package outline

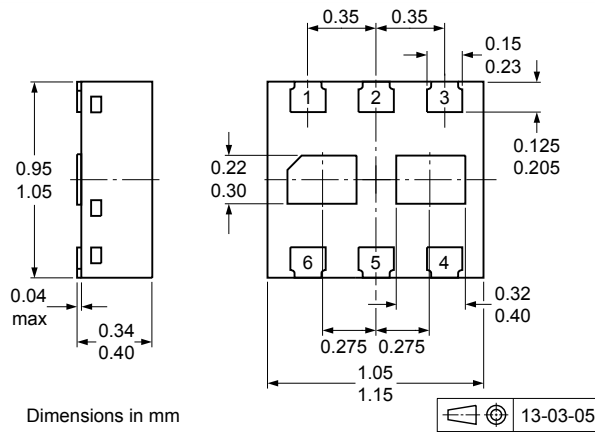


Fig. 31. Package outline DFN1010B-6 (SOT1216)

13. Soldering

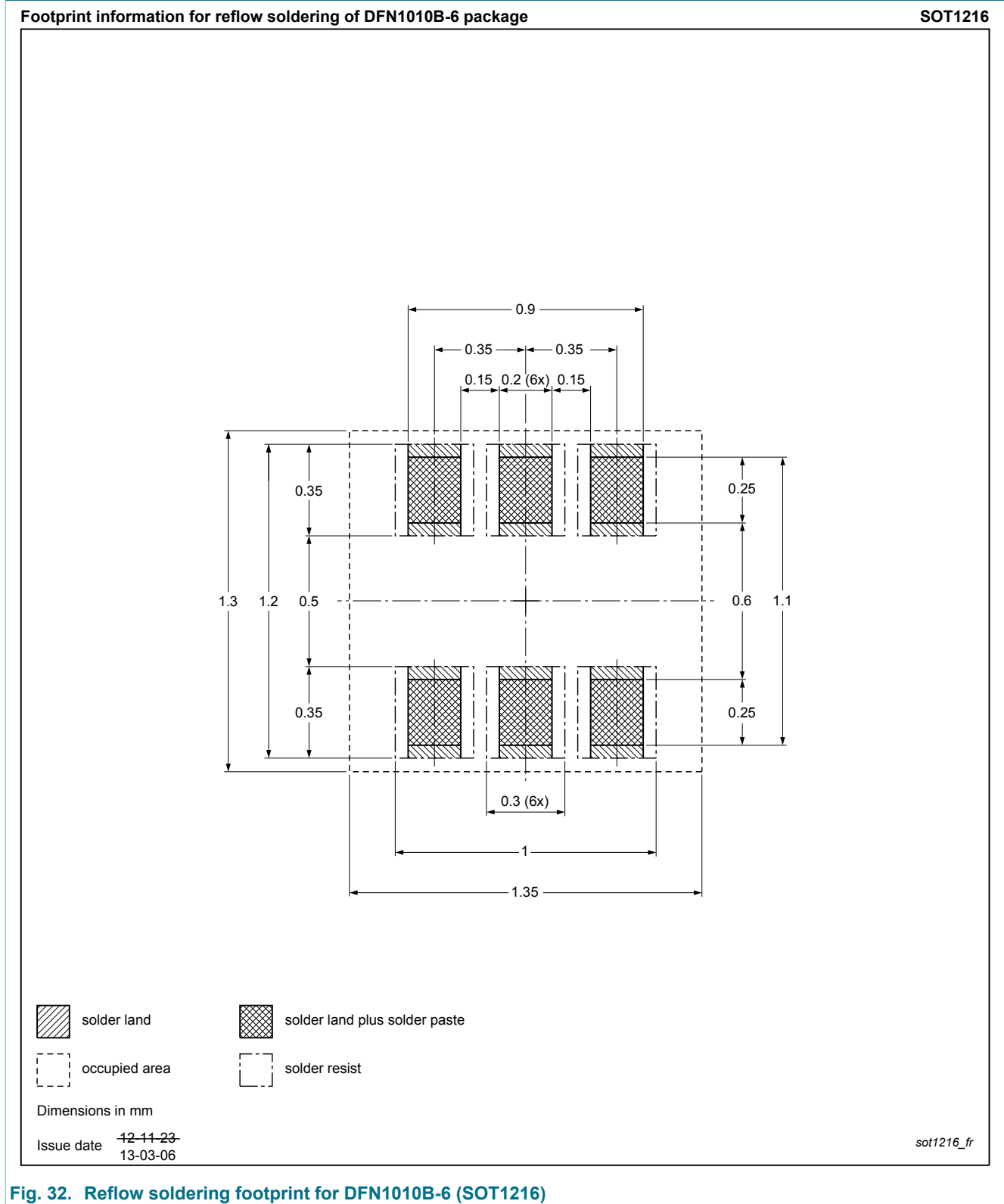


Fig. 32. Reflow soldering footprint for DFN1010B-6 (SOT1216)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMCXB900UE v.1	20131007	Product data sheet	-	-

15. Legal information

15.1 Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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