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PMN16XNE

20 V, N-channel Trench MOSFET

29 January 2016

Product data sheet

1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a small SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Trench MOSFET technology
- Low threshold voltage
- Very fast switching
- Enhanced power dissipation capability of 1400 mW
- ElectroStatic Discharge (ESD) protection > 1 kV HBM

3. Applications

- LED driver
- Power management
- Low-side loadswitch
- Switching circuits

4. Quick reference data

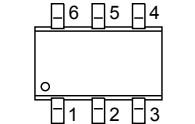
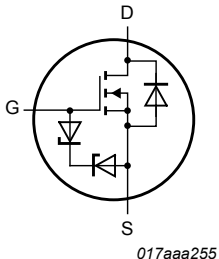
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$		-	-	20	V
V_{GS}	gate-source voltage			-12	-	12	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	-	9.1	A
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 6.9\text{ A}; T_j = 25\text{ °C}$		-	15	19	mΩ

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm².

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	D	drain	 TSOP6 (SOT457)	 017aaa255
2	D	drain		
3	G	gate		
4	S	source		
5	D	drain		
6	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMN16XNE	TSOP6	plastic surface-mounted package (TSOP6); 6 leads	SOT457

7. Marking

Table 4. Marking codes

Type number	Marking code
PMN16XNE	G7

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V _{DS}	drain-source voltage	T _j = 25 °C		-	20	V
V _{GS}	gate-source voltage			-12	12	V
I _D	drain current	V _{GS} = 4.5 V; T _{amb} = 25 °C; t ≤ 5 s	[1]	-	9.1	A
		V _{GS} = 4.5 V; T _{amb} = 25 °C	[1]	-	6.9	A
		V _{GS} = 4.5 V; T _{amb} = 100 °C	[1]	-	4.4	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	28	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	550	mW
			[1]	-	1.4	W
		T _{sp} = 25 °C		-	6.25	W
T _j	junction temperature			-55	150	°C
T _{amb}	ambient temperature			-55	150	°C
T _{stg}	storage temperature			-65	150	°C
Source-drain diode						
I _S	source current	T _{amb} = 25 °C	[1]	-	1.3	A

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm².

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

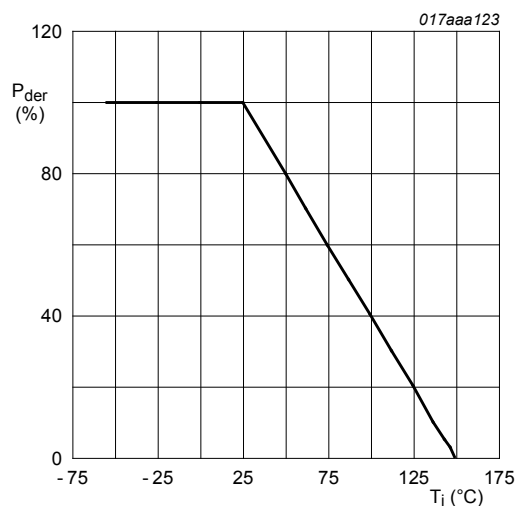


Fig. 1. Normalized total power dissipation as a function of junction temperature

$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100 \%$$

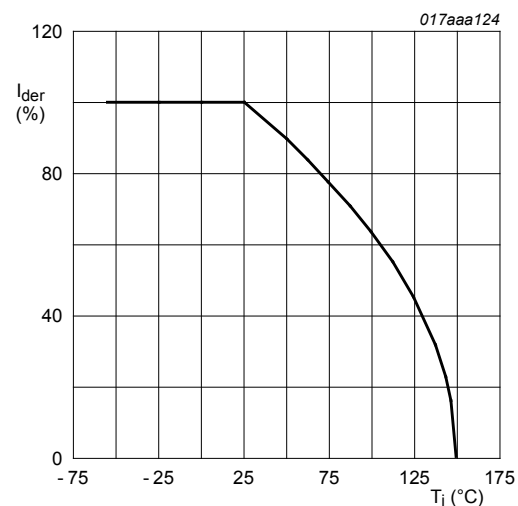


Fig. 2. Normalized continuous drain current as a function of junction temperature

$$I_{der} = \frac{I_D}{I_{D(25^{\circ}\text{C})}} \times 100 \%$$

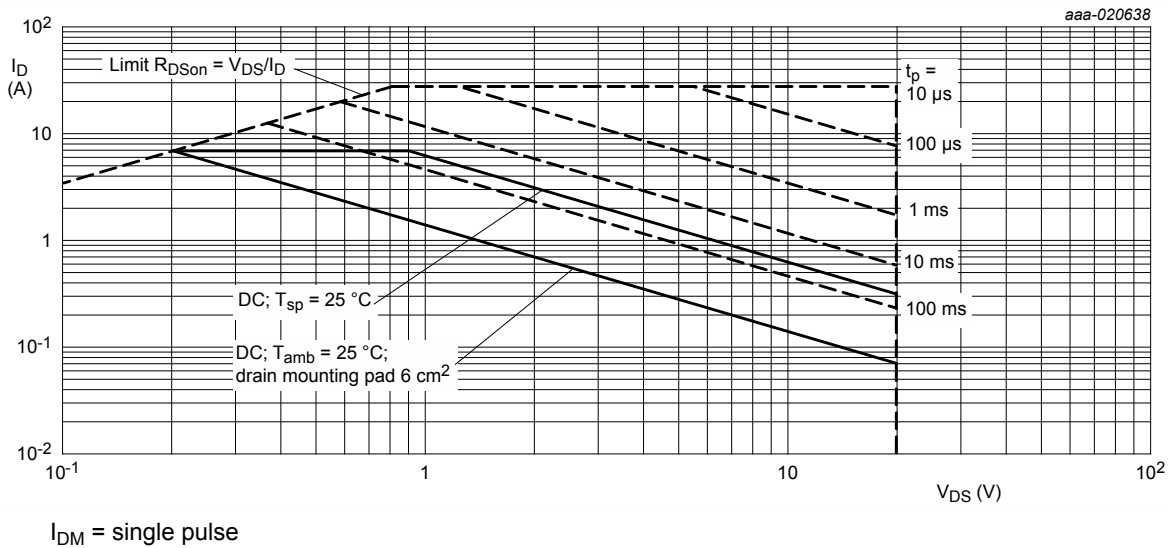


Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	195	225	K/W
			[2]	-	78	90	K/W
		in free air; $t \leq 5$ s	[2]	-	45	52	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	15	20	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, mounting pad for drain 6 cm².

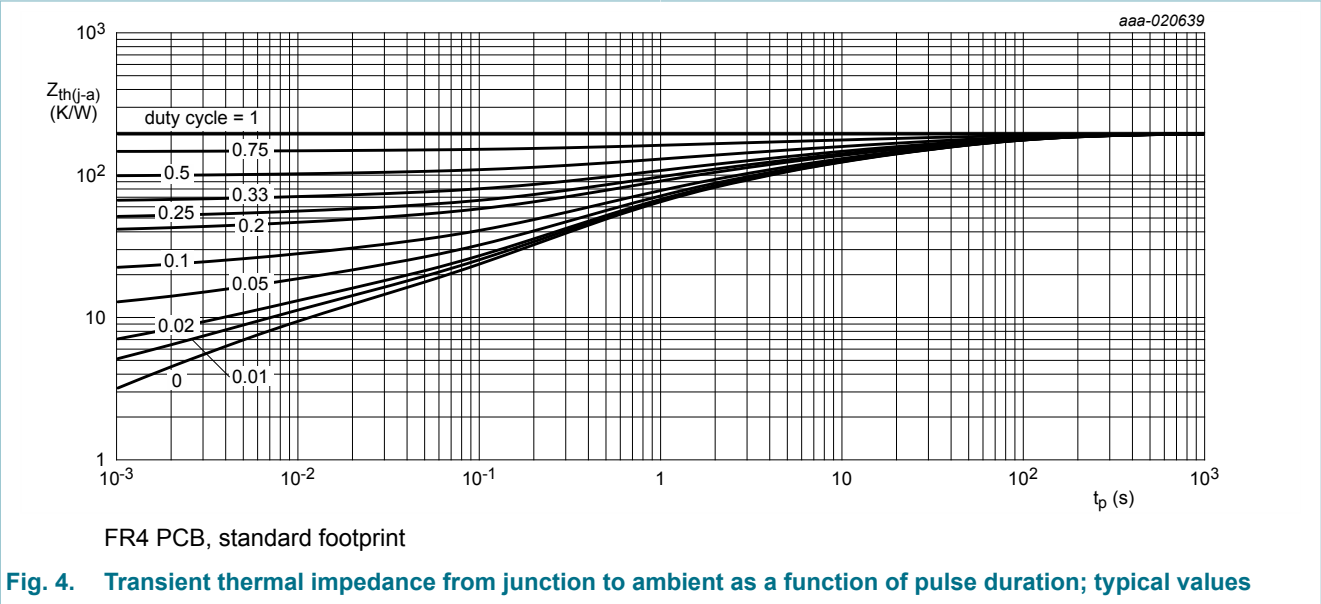
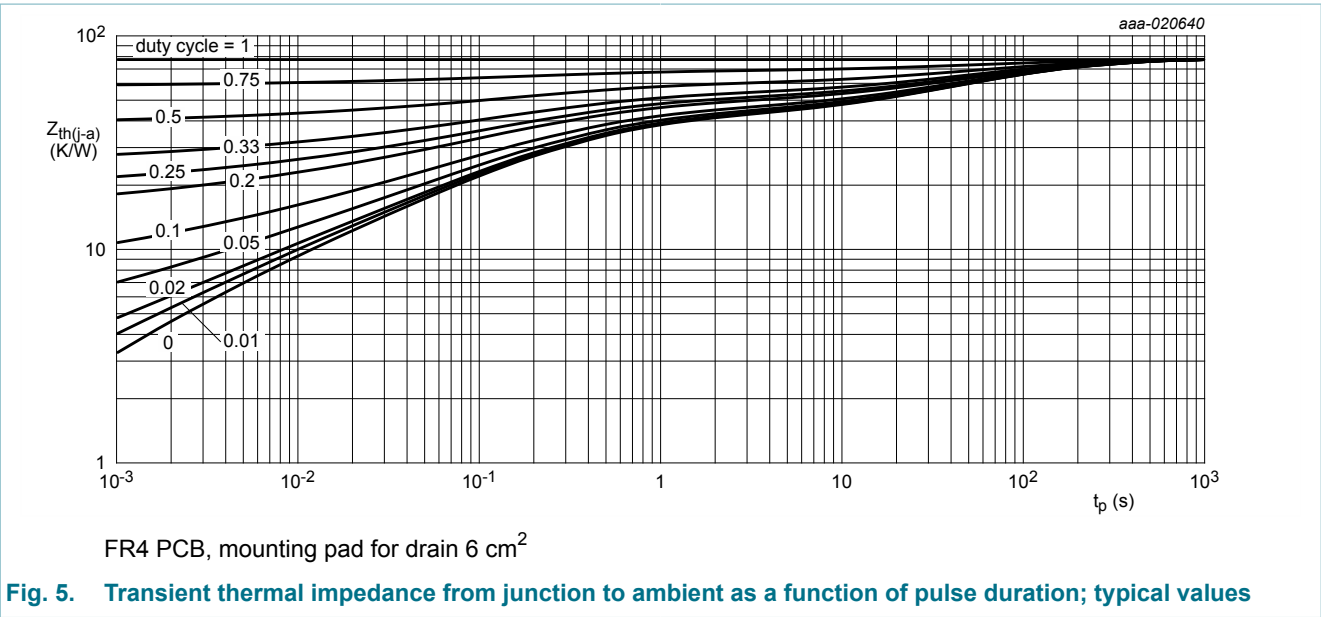


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu A$; $V_{GS} = 0\ V$; $T_j = 25\ ^\circ C$	20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = 250\ \mu A$; $V_{DS} = V_{GS}$; $T_j = 25\ ^\circ C$	0.4	0.65	0.9	V
I_{DSS}	drain leakage current	$V_{DS} = 20\ V$; $V_{GS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	1	μA
I_{GSS}	gate leakage current	$V_{GS} = 8\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	10	μA
		$V_{GS} = -8\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	-10	μA
		$V_{GS} = 4.5\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	2	μA
		$V_{GS} = -4.5\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	-2	μA
		$V_{GS} = 2.5\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	100	nA
		$V_{GS} = -2.5\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	-100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5\ V$; $I_D = 6.9\ A$; $T_j = 25\ ^\circ C$	-	15	19	m Ω
		$V_{GS} = 4.5\ V$; $I_D = 6.9\ A$; $T_j = 150\ ^\circ C$	-	23	29	m Ω
		$V_{GS} = 2.5\ V$; $I_D = 6.2\ A$; $T_j = 25\ ^\circ C$	-	19	24	m Ω
		$V_{GS} = 1.8\ V$; $I_D = 1.9\ A$; $T_j = 25\ ^\circ C$	-	22	30	m Ω
		$V_{GS} = 1.5\ V$; $I_D = 0.1\ A$; $T_j = 25\ ^\circ C$	-	30	70	m Ω
g_{fs}	forward transconductance	$V_{DS} = 10\ V$; $I_D = 2\ A$; $T_j = 25\ ^\circ C$	-	13	-	S
R_G	gate resistance	$f = 1\ MHz$; $T_j = 25\ ^\circ C$	-	2.4	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10\ V$; $I_D = 6\ A$; $V_{GS} = 4.5\ V$; $T_j = 25\ ^\circ C$	-	12	17	nC
Q_{GS}	gate-source charge		-	1.4	-	nC
Q_{GD}	gate-drain charge		-	2.2	-	nC
C_{iss}	input capacitance	$V_{DS} = 10\ V$; $f = 1\ MHz$; $V_{GS} = 0\ V$; $T_j = 25\ ^\circ C$	-	1136	-	pF
C_{oss}	output capacitance		-	137	-	pF
C_{rss}	reverse transfer capacitance		-	112	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10\ V$; $I_D = 6\ A$; $V_{GS} = 4.5\ V$; $R_{G(ext)} = 6\ \Omega$; $T_j = 25\ ^\circ C$	-	9	-	ns
t_r	rise time		-	20	-	ns
$t_{d(off)}$	turn-off delay time		-	31	-	ns
t_f	fall time		-	32	-	ns

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 1.3\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$	-	0.7	1.2	V

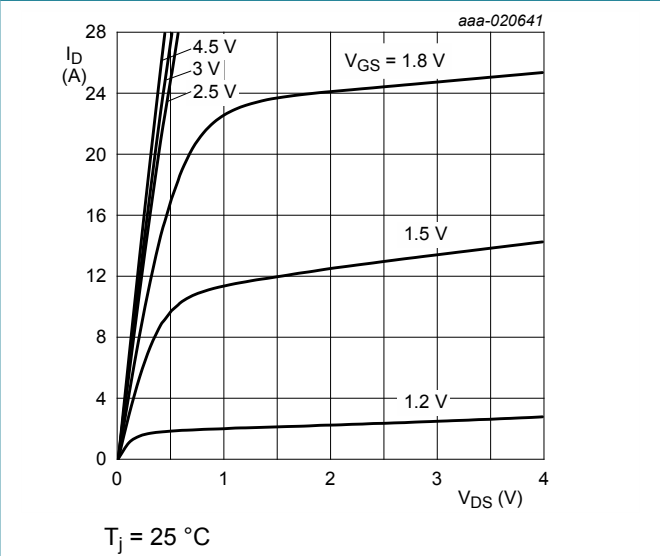


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

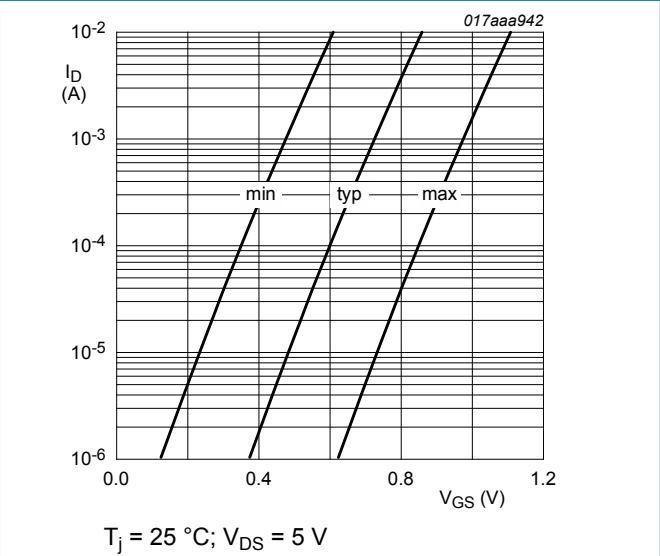


Fig. 7. Subthreshold drain current as a function of gate-source voltage

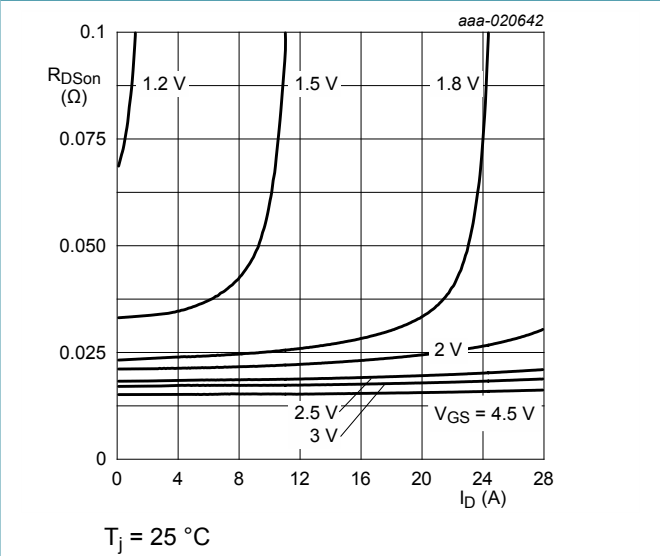


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

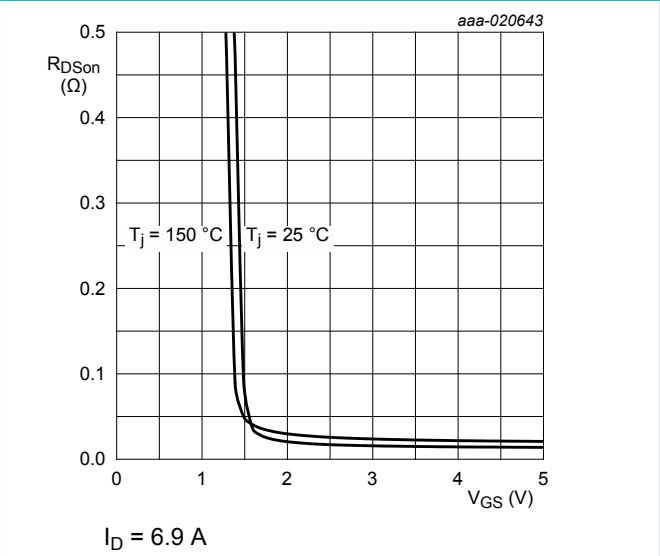


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

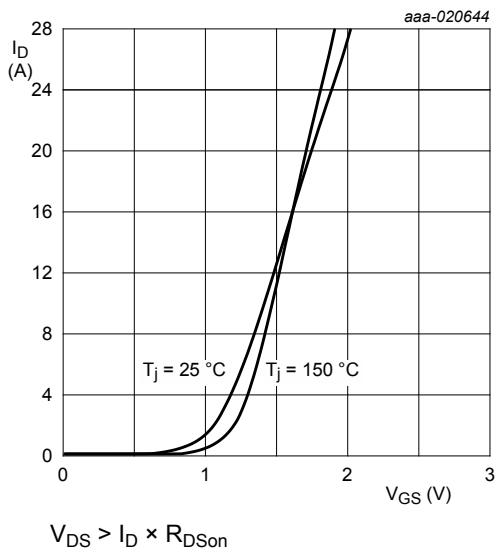


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

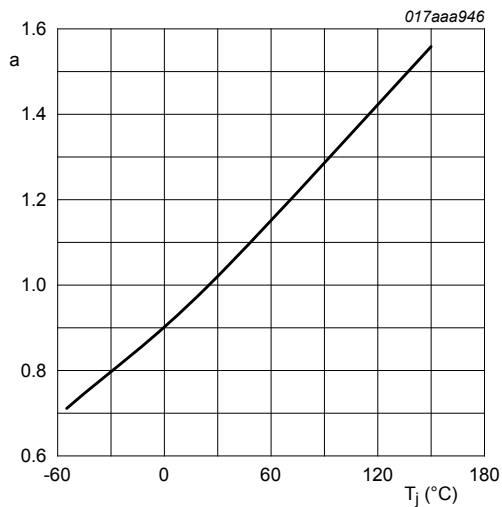


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

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

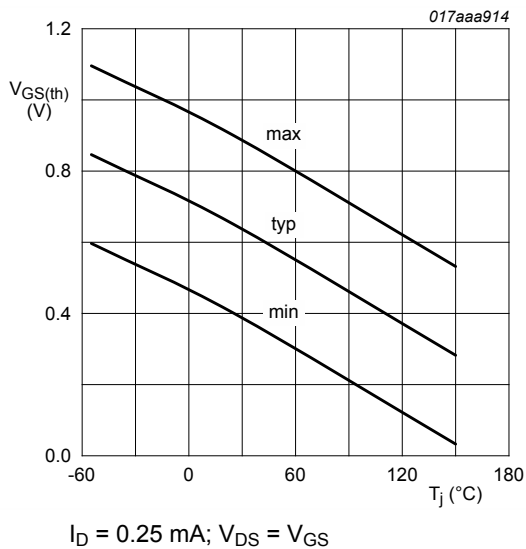


Fig. 12. Gate-source threshold voltage as a function of junction temperature

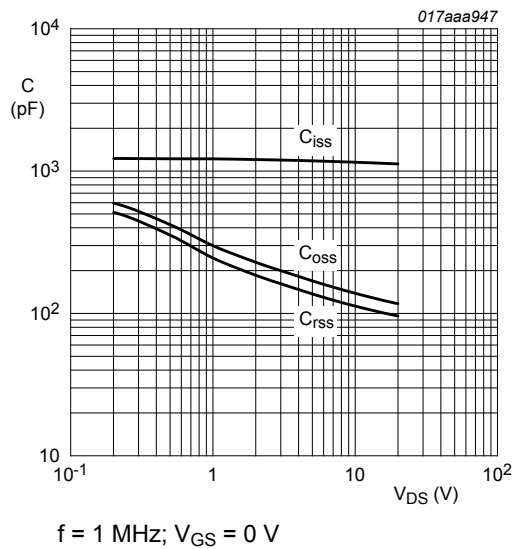


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

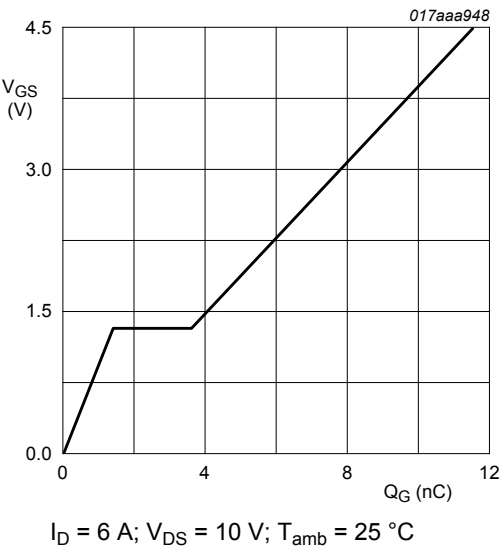


Fig. 14. Gate-source voltage as a function of gate charge; typical values

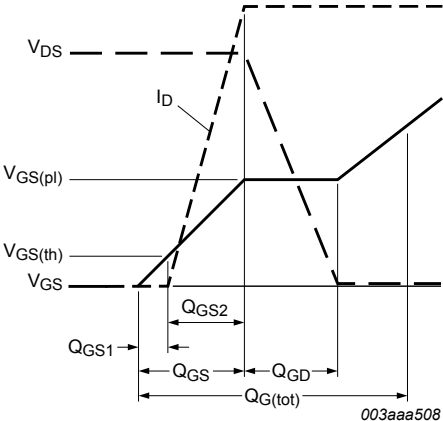
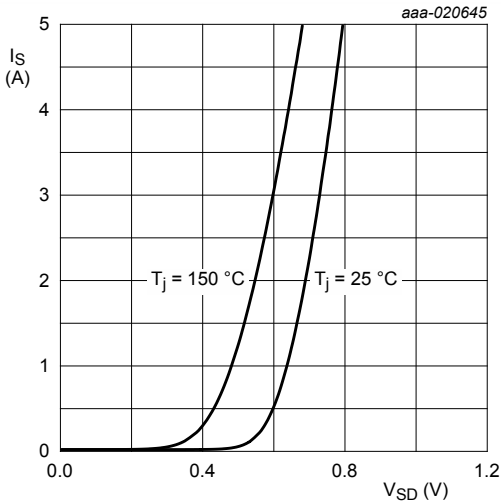


Fig. 15. MOSFET transistor: Gate charge waveform definitions



$V_{GS} = 0\text{ V}$

Fig. 16. Source current as a function of source-drain voltage; typical values

11. Test information

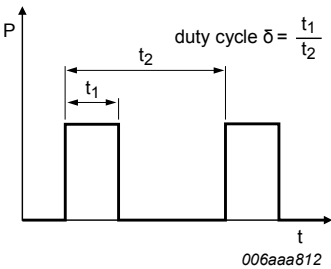
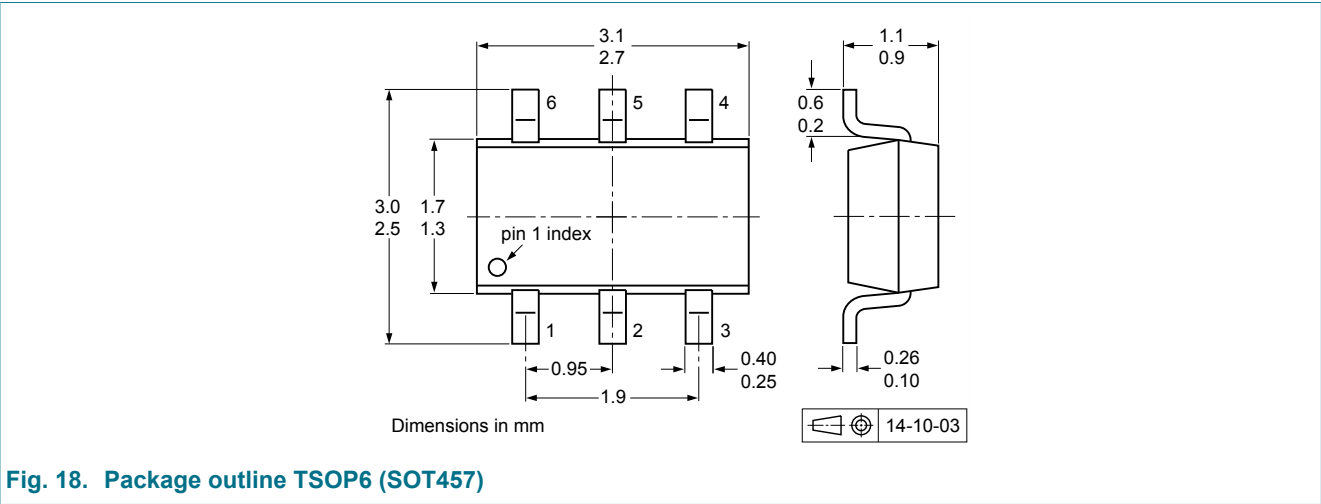
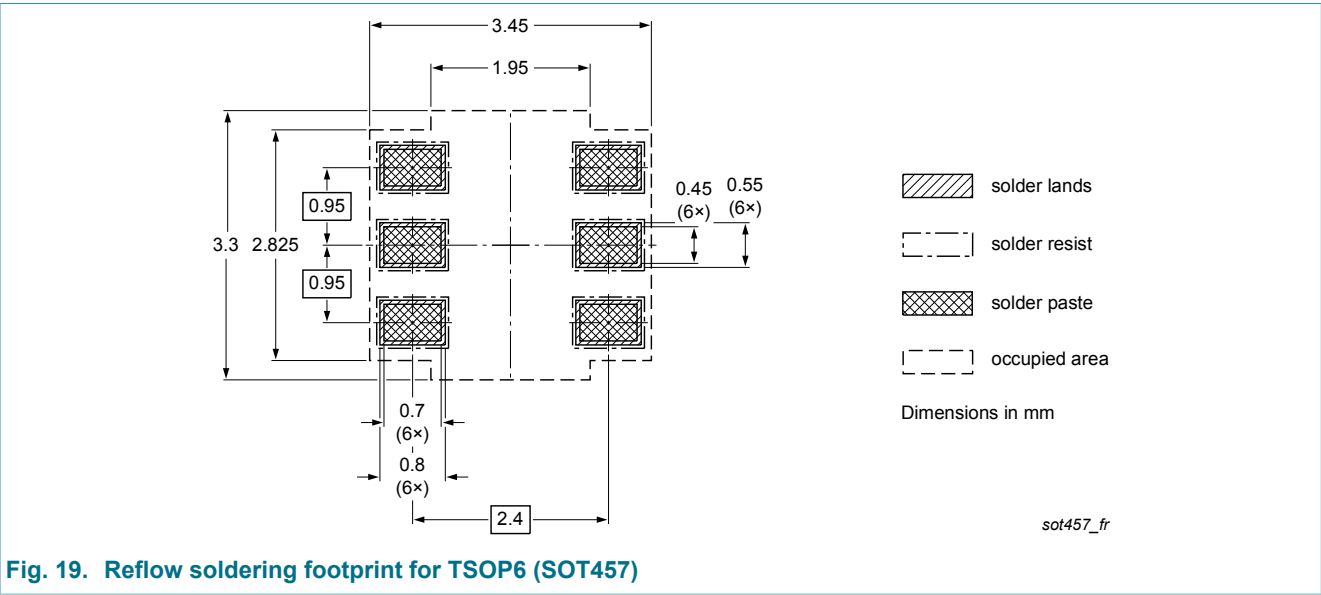


Fig. 17. Duty cycle definition

12. Package outline



13. Soldering



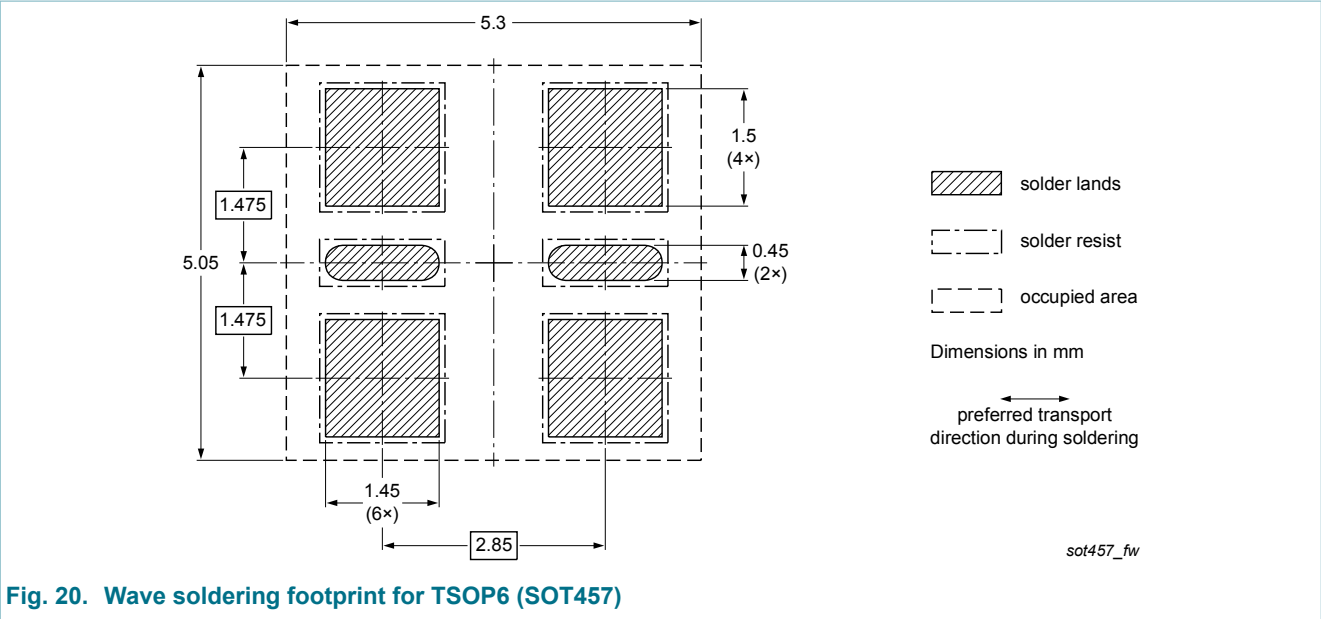


Fig. 20. Wave soldering footprint for TSOP6 (SOT457)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMN16XNE v.1	20160129	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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