

PMDT290UNE

20 V, 800 mA dual N-channel Trench MOSFET

Rev. 1 — 13 September 2011

Product data sheet

1. Product profile

1.1 General description

Dual N-channel enhancement mode Field-Effect Transistor (FET) in an ultra small and flat lead SOT666 Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

1.2 Features and benefits

- Very fast switching
- Trench MOSFET technology
- ESD protection up to 2 kV
- AEC-Q101 qualified

1.3 Applications

- Relay driver
- High-speed line driver
- Low-side loadswitch
- Switching circuits

1.4 Quick reference data

Table 1. Quick reference data

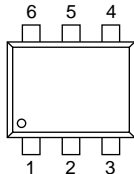
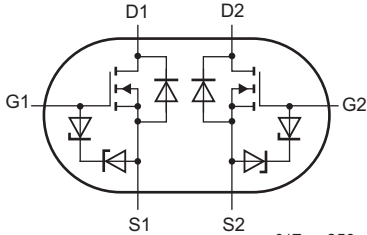
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-	20	V
V_{GS}	gate-source voltage		-8	-	8	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	800	mA
Static characteristics (per transistor)						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 500\text{ mA}; T_j = 25\text{ °C}$	-	290	380	mΩ

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



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source TR1	 <p>SOT666</p>	 <p>017aaa256</p>
2	G1	gate TR1		
3	D2	drain TR2		
4	S2	source TR2		
5	G2	gate TR2		
6	D1	drain TR1		

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PMDT290UNE	-	plastic surface-mounted package; 6 leads	SOT666

4. Marking

Table 4. Marking codes

Type number	Marking code
PMDT290UNE	AE

5. Limiting values

Table 5. Limiting values

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

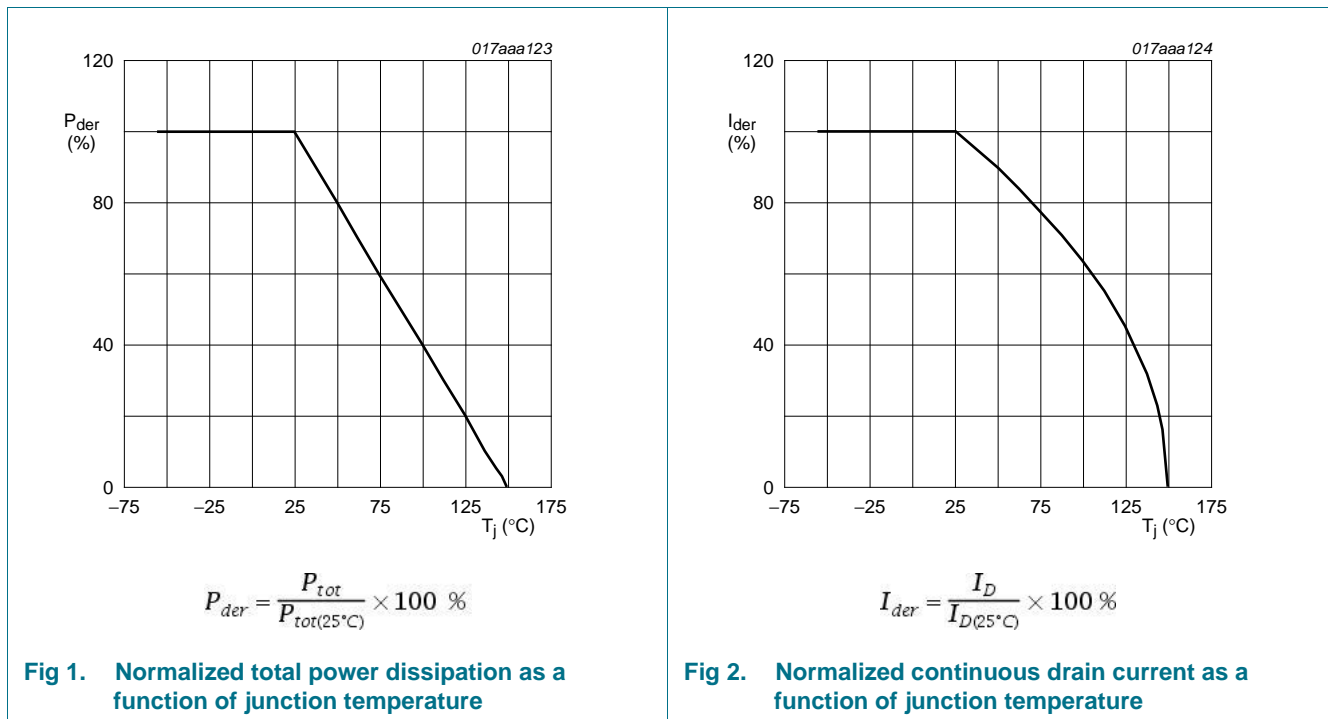
Symbol	Parameter	Conditions	Min	Max	Unit
Per transistor					
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	20	V
V_{GS}	gate-source voltage		-8	8	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	800	mA
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	500	mA
I_{DM}	peak drain current	$T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$	-	3.2	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	330	mW
			[1]	390	mW
		$T_{sp} = 25\text{ °C}$	-	1090	mW
Per device					
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	500	mW
T_j	junction temperature		-55	150	°C
T_{amb}	ambient temperature		-55	150	°C

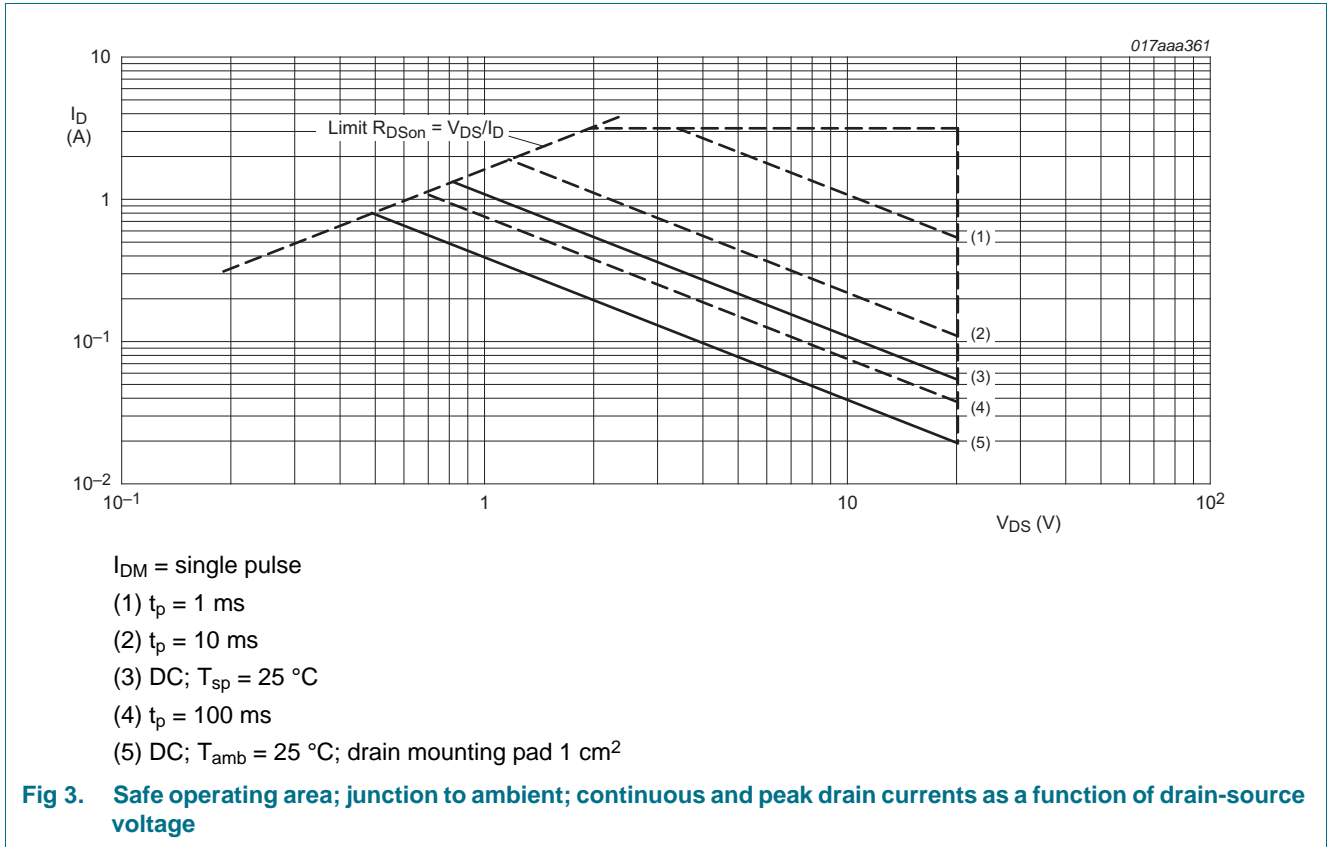
Table 5. Limiting values ...continued

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

Symbol	Parameter	Conditions	Min	Max	Unit
T _{stg}	storage temperature		-65	150	°C
Source-drain diode					
I _S	source current	T _{amb} = 25 °C	-	370	mA
ESD maximum rating					
V _{ESD}	electrostatic discharge voltage	HBM	[3]	2000	V

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





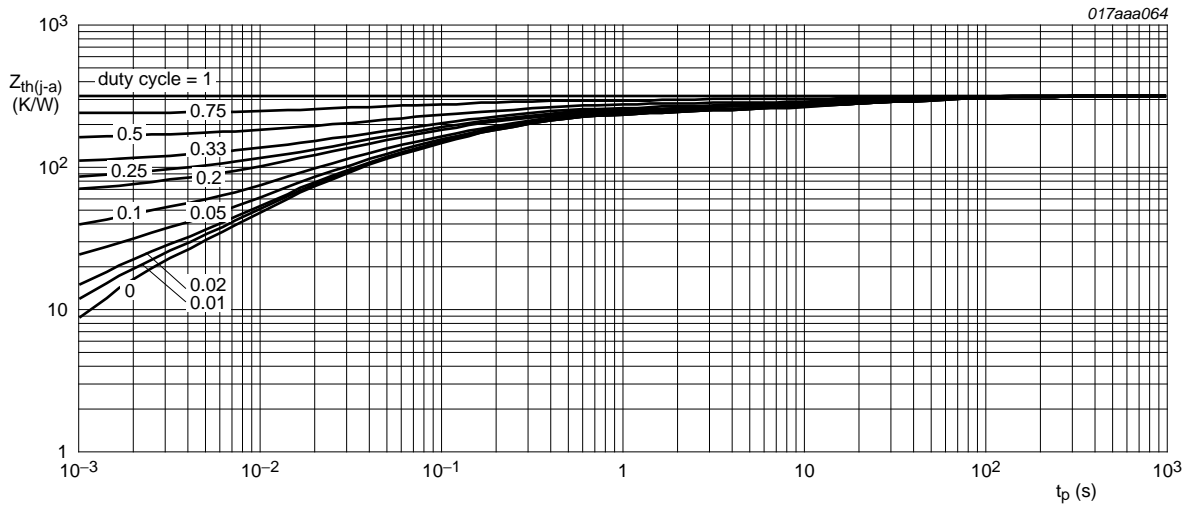
6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	330	380	K/W
			[2]	-	280	320	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	115	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	250	K/W

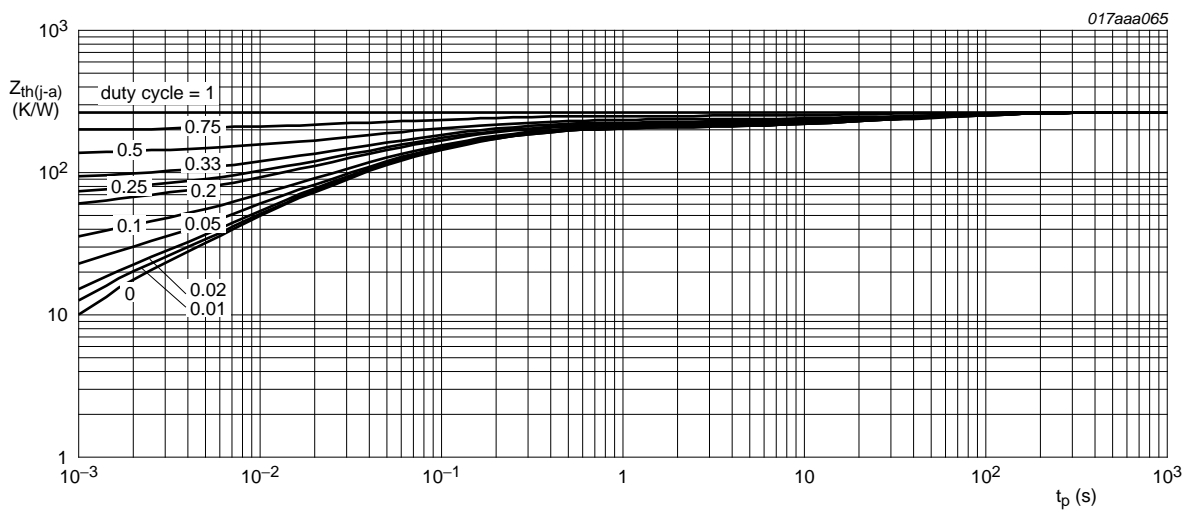
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB; standard footprint

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



FR4 PCB, mounting pad for drain 1 cm²

Fig 5. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics (per transistor)						
$V_{(BR)DSS}$	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	$I_D = 250 \mu A$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ C$	0.5	0.75	0.95	V
I_{DSS}	drain leakage current	$V_{DS} = 20 V$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	1	μA
		$V_{DS} = 20 V$; $V_{GS} = 0 V$; $T_j = 150 \text{ }^\circ C$	-	-	10	μA
I_{GSS}	gate leakage current	$V_{GS} = 8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	2	μA
		$V_{GS} = -8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	2	μA
		$V_{GS} = 4.5 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	500	nA
		$V_{GS} = -4.5 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	500	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 V$; $I_D = 500 \text{ mA}$; $T_j = 25 \text{ }^\circ C$	-	290	380	m Ω
		$V_{GS} = 4.5 V$; $I_D = 500 \text{ mA}$; $T_j = 150 \text{ }^\circ C$	-	460	610	m Ω
		$V_{GS} = 2.5 V$; $I_D = 400 \text{ mA}$; $T_j = 25 \text{ }^\circ C$	-	420	620	m Ω
		$V_{GS} = 1.8 V$; $I_D = 100 \text{ mA}$; $T_j = 25 \text{ }^\circ C$	-	600	1100	m Ω
g_{fs}	forward transconductance	$V_{DS} = 10 V$; $I_D = 200 \text{ mA}$; $T_j = 25 \text{ }^\circ C$	-	1.6	-	S
Dynamic characteristics (per transistor)						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10 V$; $I_D = 500 \text{ mA}$; $V_{GS} = 4.5 V$; $T_j = 25 \text{ }^\circ C$	-	0.45	0.68	nC
Q_{GS}	gate-source charge		-	0.15	-	nC
Q_{GD}	gate-drain charge		-	0.15	-	nC
C_{iss}	input capacitance	$V_{DS} = 10 V$; $f = 1 \text{ MHz}$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	55	83	pF
C_{oss}	output capacitance		-	15	-	pF
C_{rss}	reverse transfer capacitance		-	7	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10 V$; $R_L = 250 \Omega$; $V_{GS} = 4.5 V$; $R_{G(ext)} = 6 \Omega$; $T_j = 25 \text{ }^\circ C$	-	6	12	ns
t_r	rise time		-	4	-	ns
$t_{d(off)}$	turn-off delay time		-	86	172	ns
t_f	fall time		-	31	-	ns
Source-drain diode (per transistor)						
V_{SD}	source-drain voltage	$I_S = 300 \text{ mA}$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	0.48	0.77	1.2	V

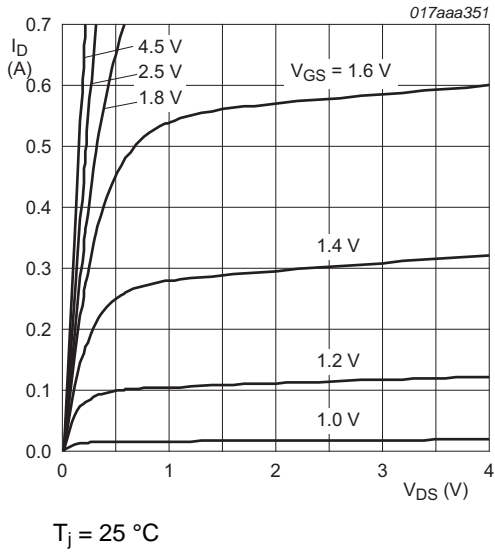


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

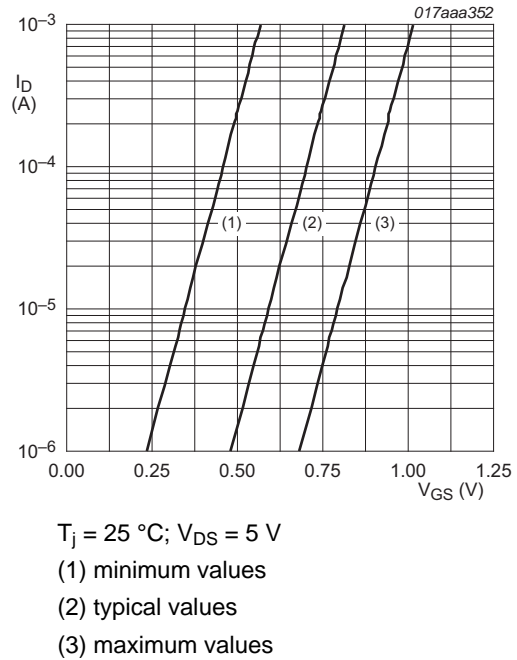
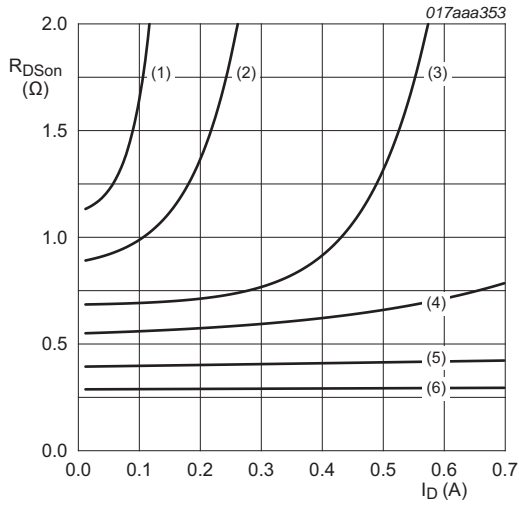
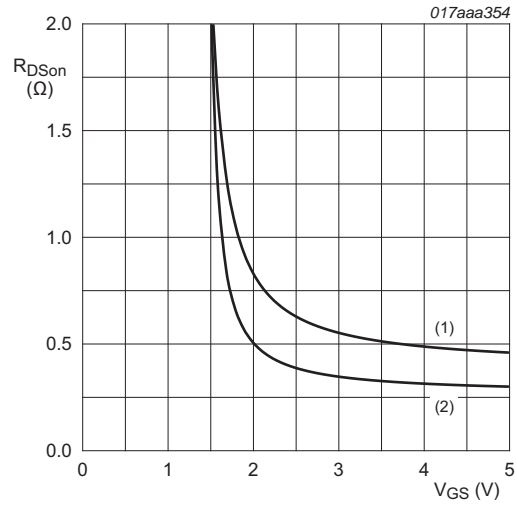


Fig 7. Sub-threshold drain current as a function of gate-source voltage
 (1) minimum values
 (2) typical values
 (3) maximum values



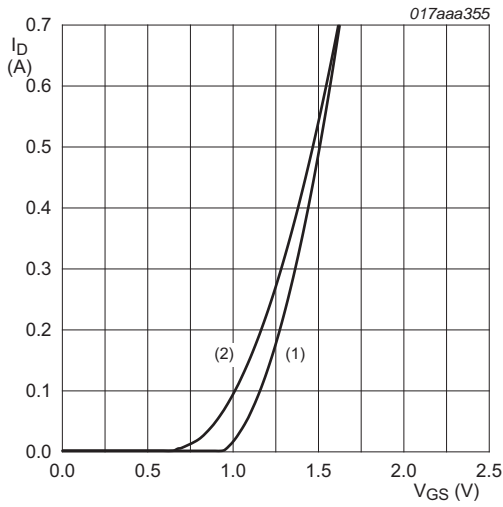
$T_j = 25\text{ °C}$
 (1) $V_{GS} = 1.3\text{ V}$
 (2) $V_{GS} = 1.4\text{ V}$
 (3) $V_{GS} = 1.6\text{ V}$
 (4) $V_{GS} = 1.8\text{ V}$
 (5) $V_{GS} = 2.5\text{ V}$
 (6) $V_{GS} = 4.5\text{ V}$

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



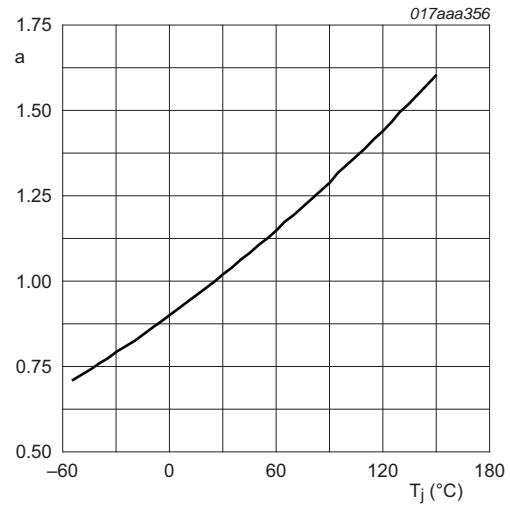
$I_D = 400\text{ mA}$
 (1) $T_j = 150\text{ °C}$
 (2) $T_j = 25\text{ °C}$

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



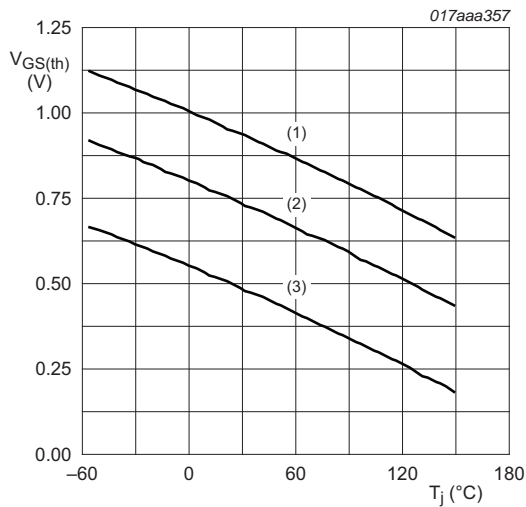
$V_{DS} > I_D \times R_{DS(on)}$
 (1) $T_j = 25\text{ }^\circ\text{C}$
 (2) $T_j = 150\text{ }^\circ\text{C}$

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



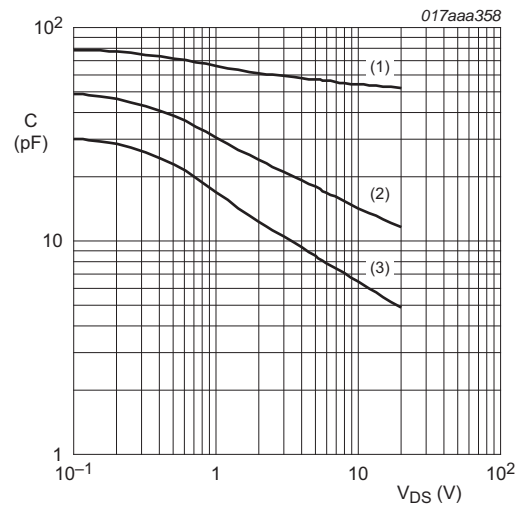
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ\text{C})}}$$

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



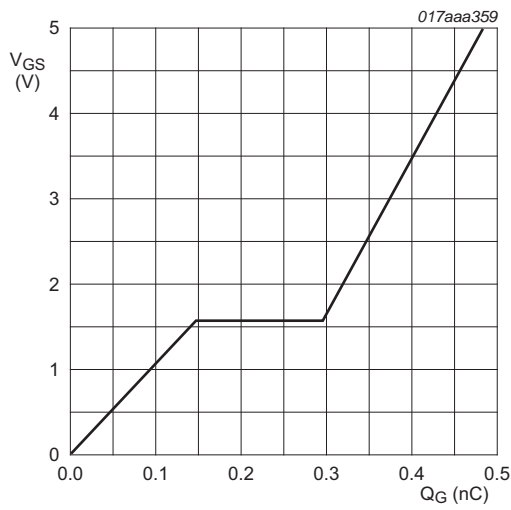
$I_D = 0.25\text{ mA}; V_{DS} = V_{GS}$
 (1) maximum values
 (2) typical values
 (3) minimum values

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



$f = 1\text{ MHz}; V_{GS} = 0\text{ V}$
 (1) C_{iss}
 (2) C_{oss}
 (3) C_{rss}

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



$I_D = 0.5 \text{ A}; V_{DS} = 10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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

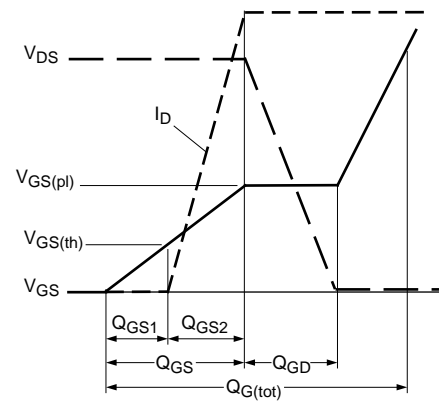
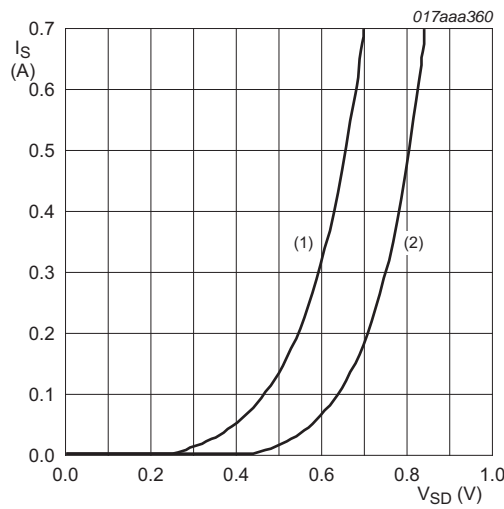


Fig 15. Gate charge waveform definitions



$V_{GS} = 0 \text{ V}$
 (1) $T_j = 150 \text{ }^\circ\text{C}$
 (2) $T_j = 25 \text{ }^\circ\text{C}$

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

8. Test information

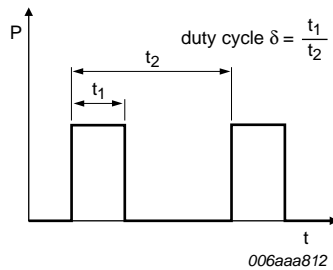


Fig 17. Duty cycle definition

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

9. Package outline

Plastic surface-mounted package; 6 leads

SOT666

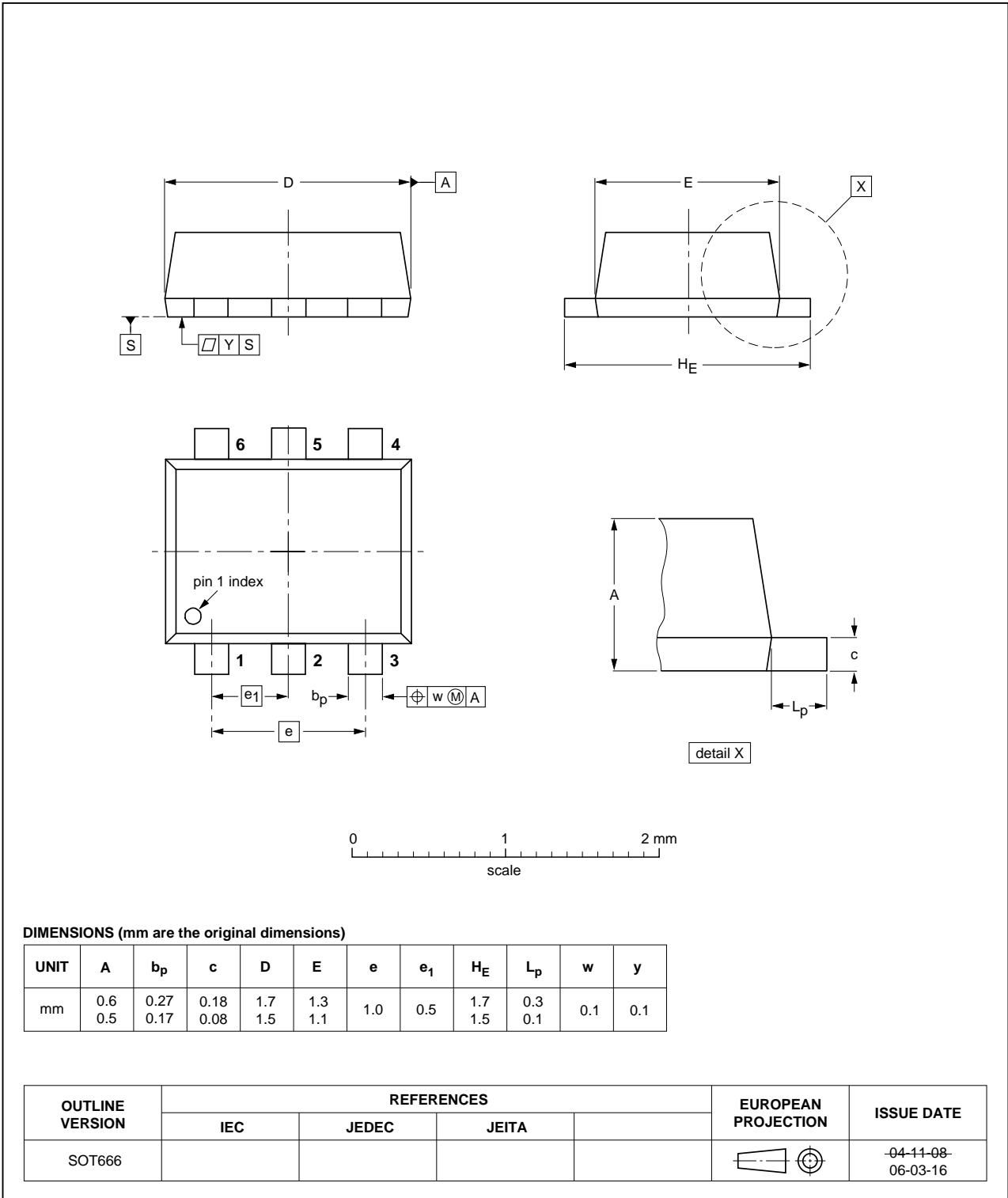


Fig 18. Package outline SOT666

10. Soldering

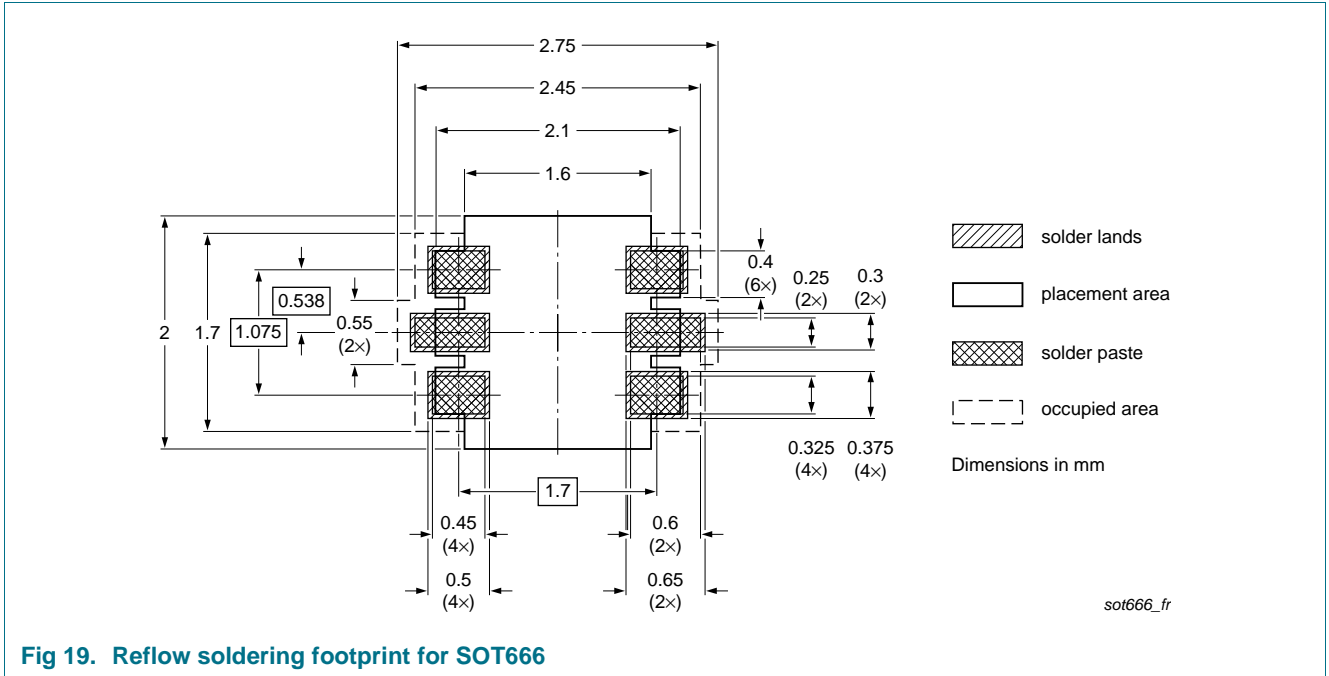


Fig 19. Reflow soldering footprint for SOT666

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMDT290UNE v.1	20110913	Product data sheet	-	-

12. Legal information

12.1 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.
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