



PMDT290UNE

20 V, 800 mA dual N-channel Trench MOSFET

28 December 2022

Product data sheet

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.

2. Features and benefits

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

3. Applications

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

4. Quick reference data

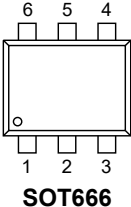
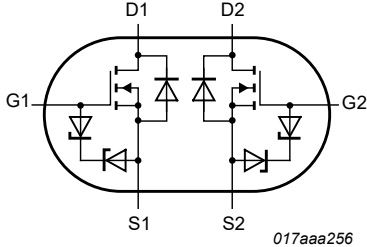
Table 1. Quick reference data

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.

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMDT290UNE	SOT666	plastic, surface-mounted package; 6 leads; 0.5 mm pitch; 1.6 mm x 1.2 mm x 0.55 mm body	SOT666

7. Marking

Table 4. Marking codes

Type number	Marking code
PMDT290UNE	AE

8. 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 °C		-	20	V
V _{GS}	gate-source voltage			-8	8	V
I _D	drain current	V _{GS} = 4.5 V; T _{amb} = 25 °C	[1]	-	800	mA
		V _{GS} = 4.5 V; T _{amb} = 100 °C	[1]	-	500	mA
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	3.2	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	330	mW
			[1]	-	390	mW
		T _{sp} = 25 °C		-	1090	mW
Per device						
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	500	mW
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		-	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.

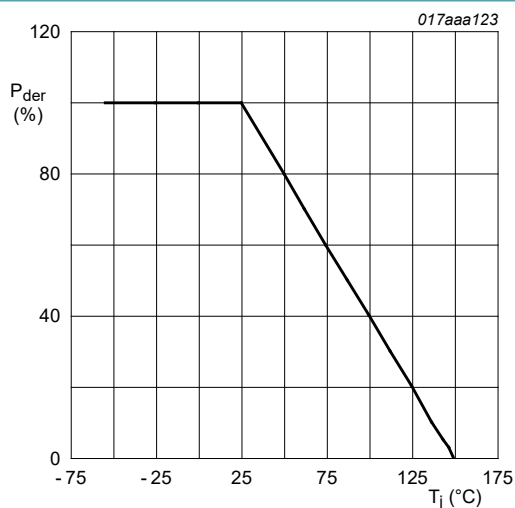


Fig. 1. Normalized total power dissipation as a function of junction temperature

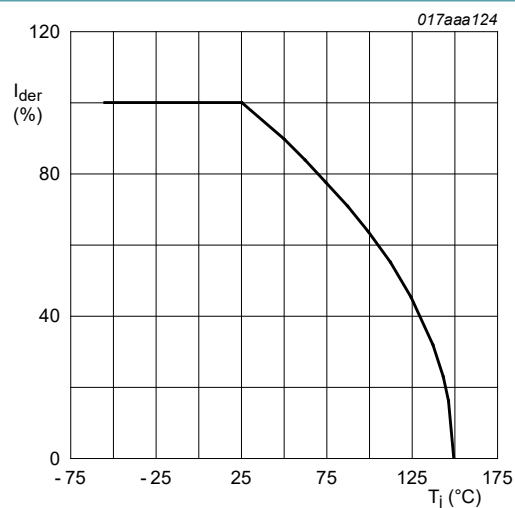


Fig. 2. Normalized continuous drain current as a function of junction temperature

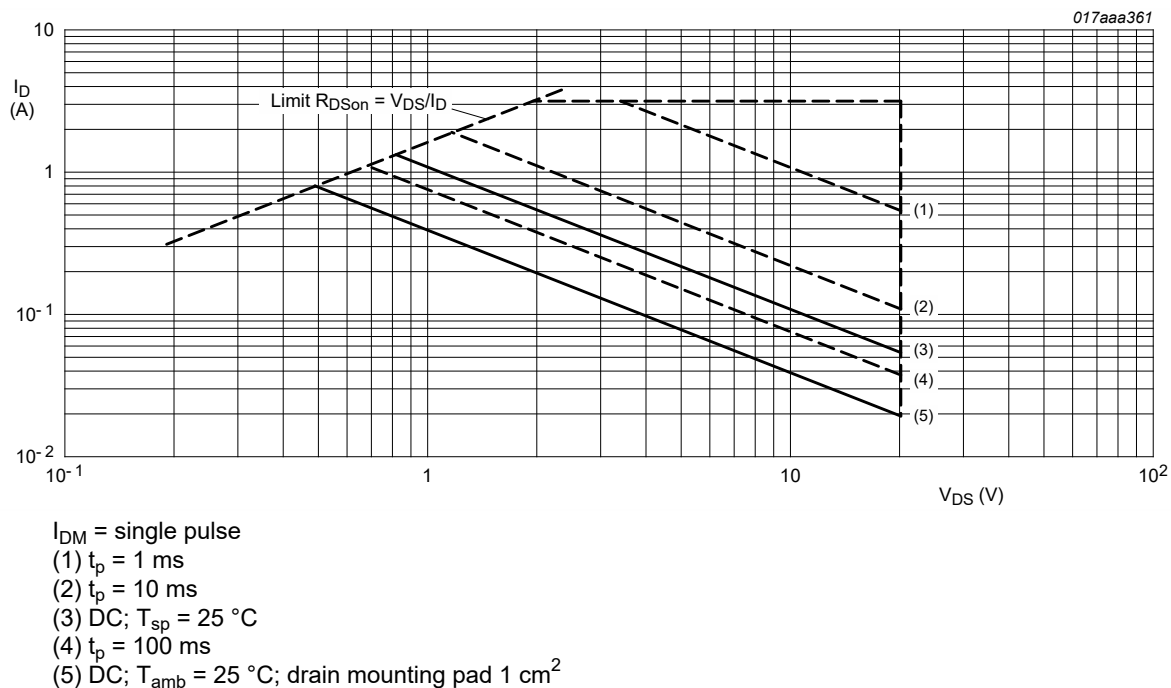


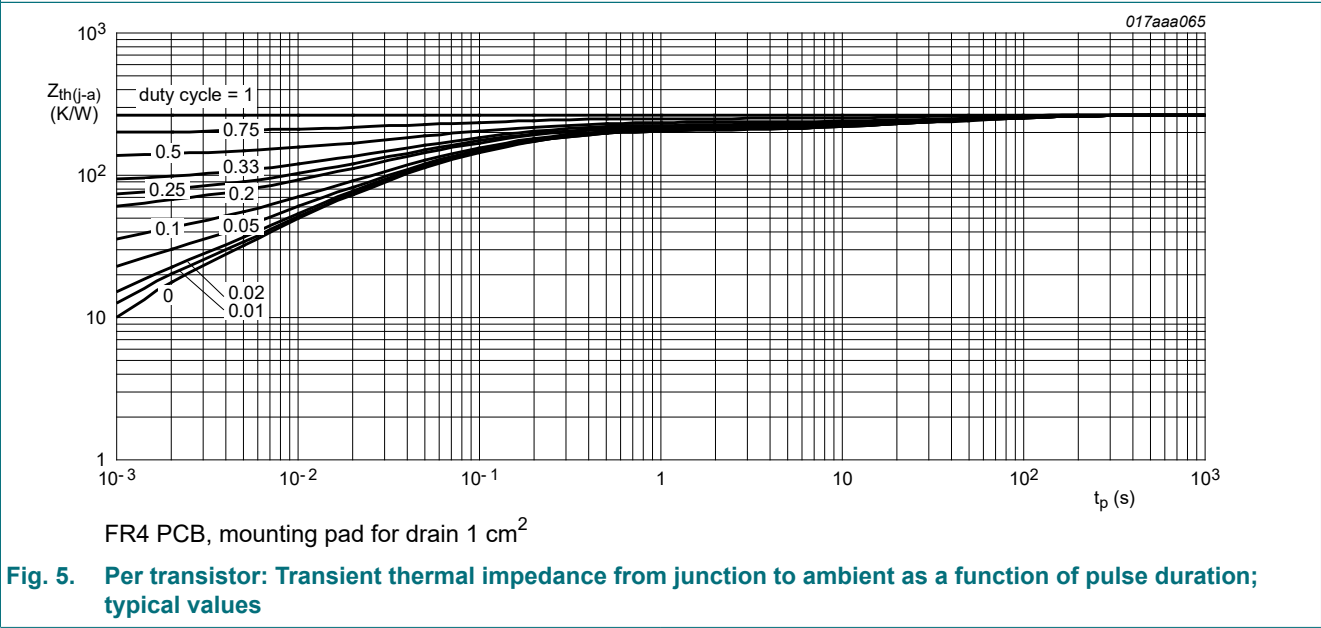
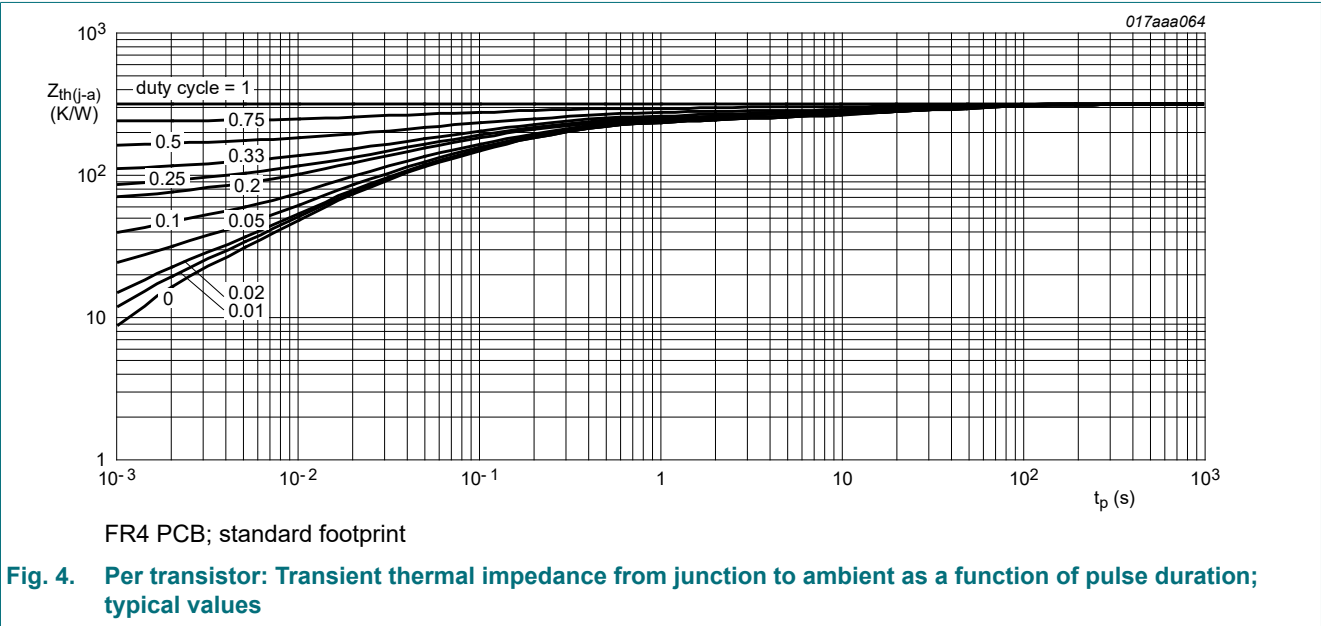
Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
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.



10. 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 μA; V _{GS} = 0 V; T _J = 25 °C		20	-	-	V
V _{GSth}	gate-source threshold voltage	I _D = 250 μA; V _{DS} =V _{GS} ; T _J = 25 °C		0.5	0.75	0.95	V
I _{DSS}	drain leakage current	V _{DS} = 20 V; V _{GS} = 0 V; T _J = 25 °C		-	-	1	μA
		V _{DS} = 20 V; V _{GS} = 0 V; T _J = 150 °C		-	-	10	μA
I _{GSS}	gate leakage current	V _{GS} = 8 V; V _{DS} = 0 V; T _J = 25 °C		-	-	2	μA
		V _{GS} = -8 V; V _{DS} = 0 V; T _J = 25 °C		-	-	2	μA
		V _{GS} = 4.5 V; V _{DS} = 0 V; T _J = 25 °C		-	-	500	nA
		V _{GS} = -4.5 V; V _{DS} = 0 V; T _J = 25 °C		-	-	500	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 4.5 V; I _D = 500 mA; T _J = 25 °C		-	290	380	mΩ
		V _{GS} = 4.5 V; I _D = 500 mA; T _J = 150 °C		-	460	610	mΩ
		V _{GS} = 2.5 V; I _D = 400 mA; T _J = 25 °C		-	420	620	mΩ
		V _{GS} = 1.8 V; I _D = 100 mA; T _J = 25 °C		-	600	1100	mΩ
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 200 mA; T _J = 25 °C		-	1.6	-	S
Dynamic characteristics (per transistor)							
Q _{G(tot)}	total gate charge	V _{DS} = 10 V; I _D = 500 mA; V _{GS} = 4.5 V; T _J = 25 °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 MHz; V _{GS} = 0 V; T _J = 25 °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 Ω; V _{GS} = 4.5 V; R _{G(ext)} = 6 Ω; T _J = 25 °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 mA; V _{GS} = 0 V; T _J = 25 °C		0.48	0.77	1.2	V

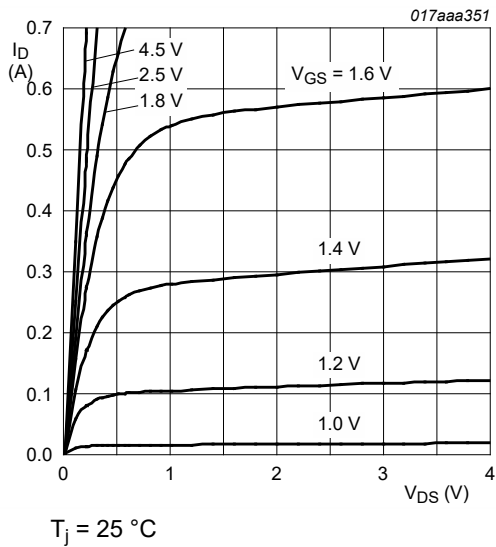


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

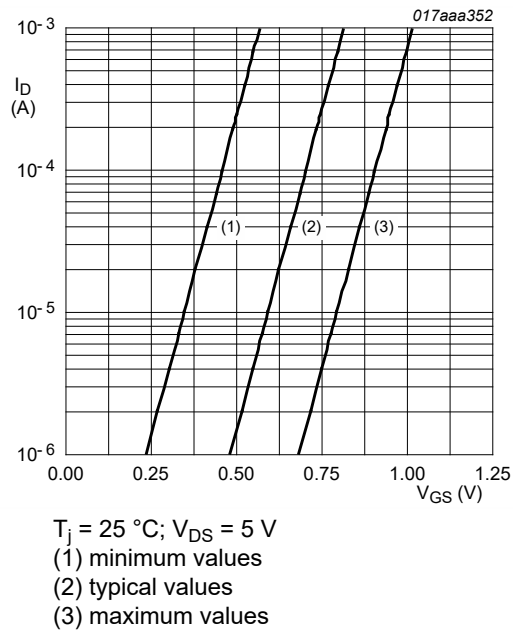


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

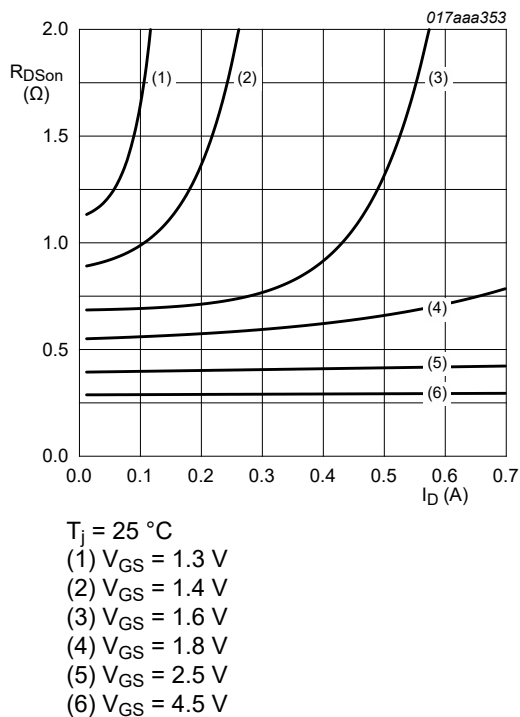


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

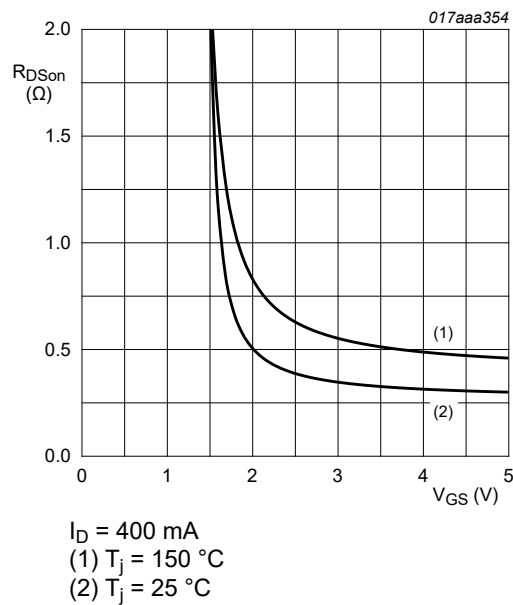


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

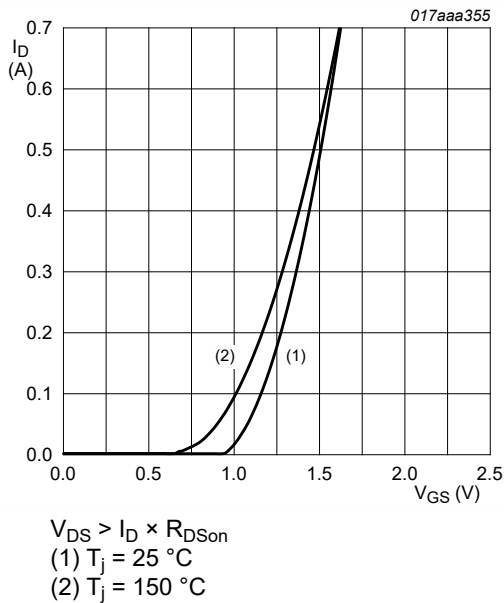


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

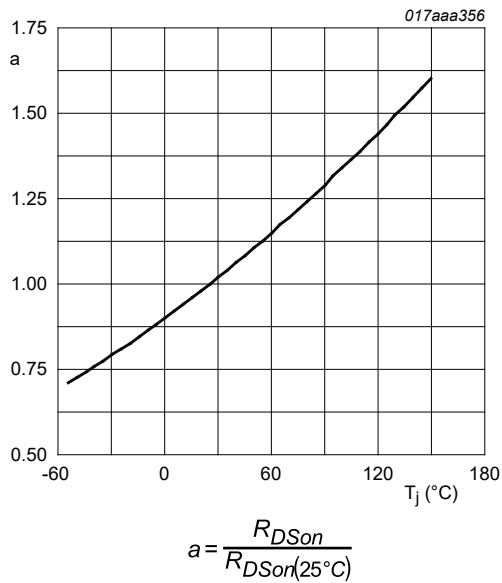


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

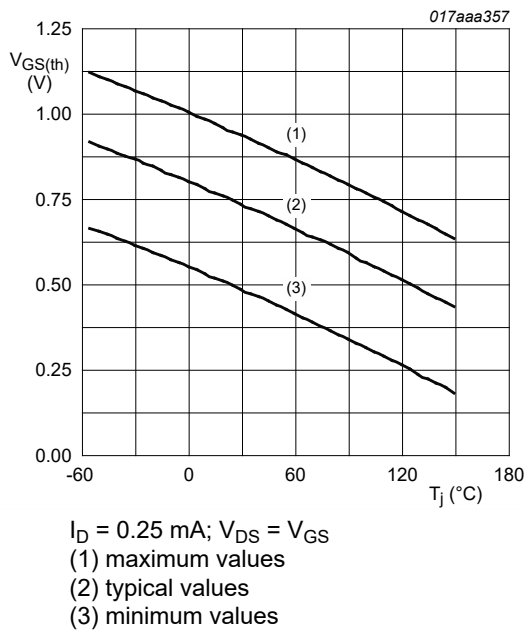


Fig. 12. Gate-source threshold voltage as a function of junction temperature

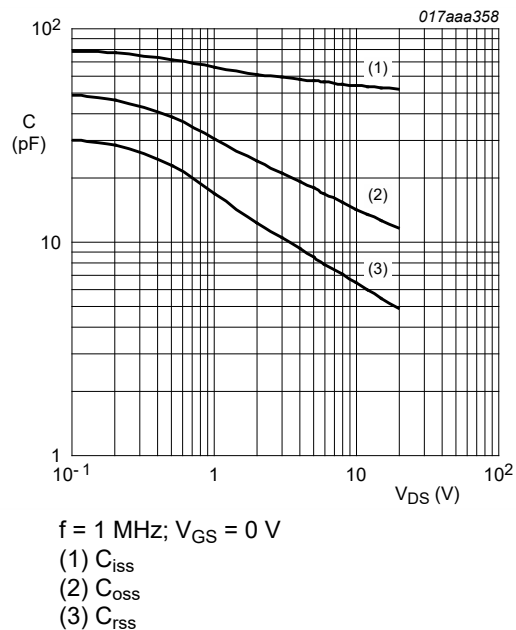
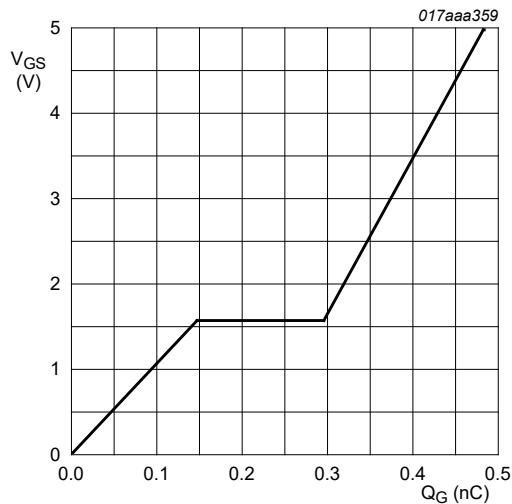


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



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

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

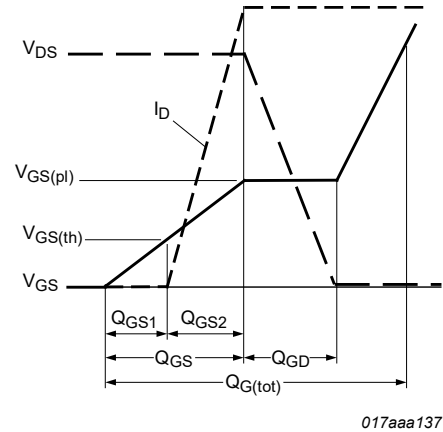
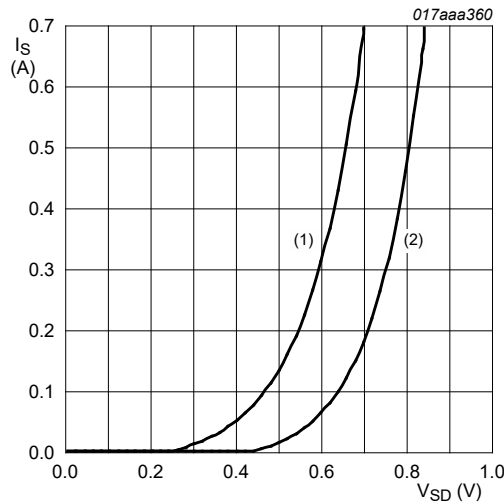


Fig. 15. Gate charge waveform definitions



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

11. Test information

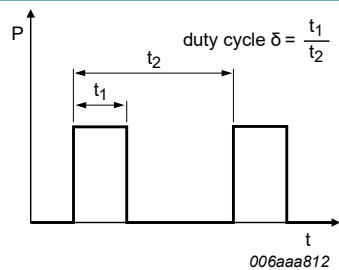


Fig. 17. Duty cycle definition

12. Package outline

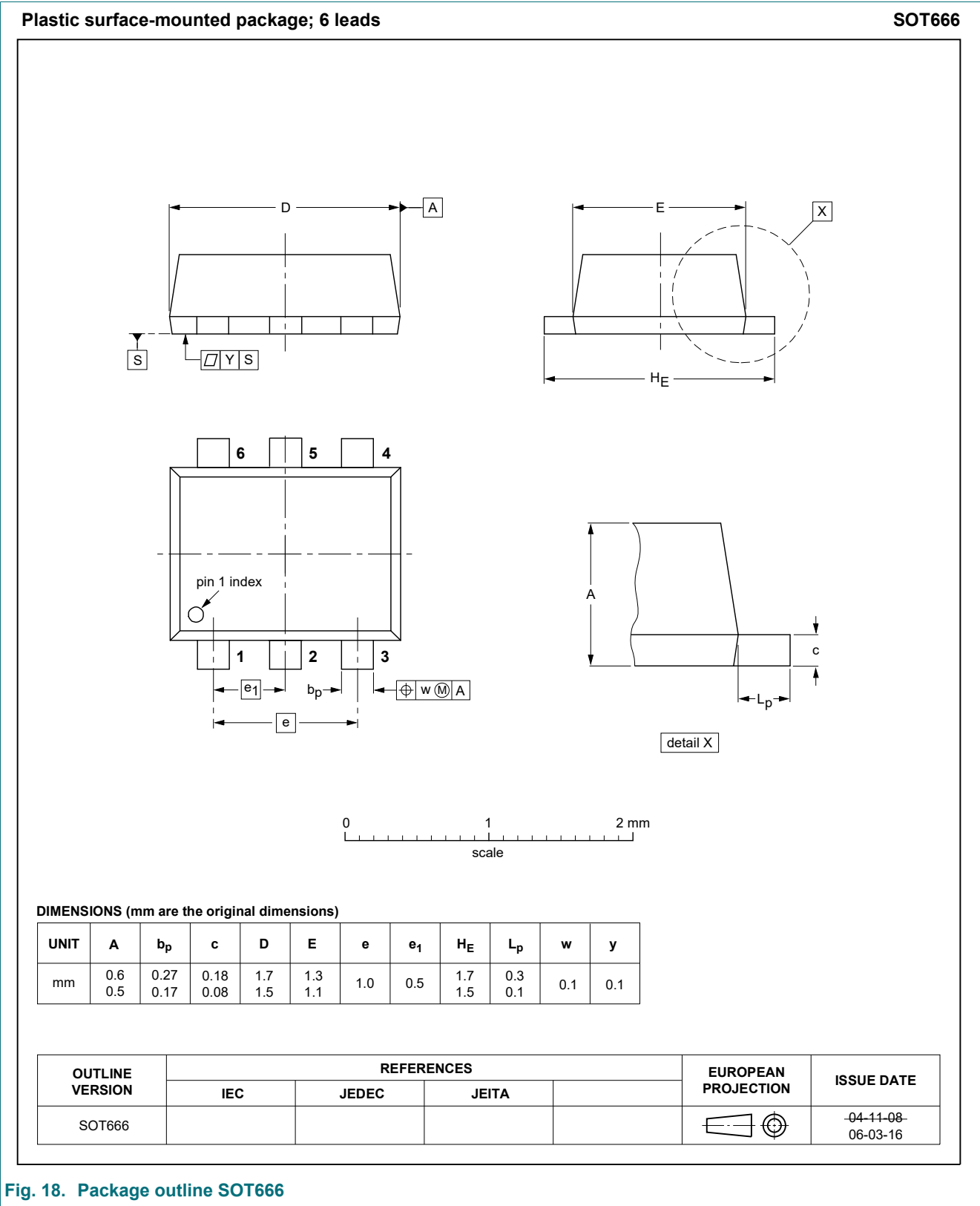


Fig. 18. Package outline SOT666

13. Soldering

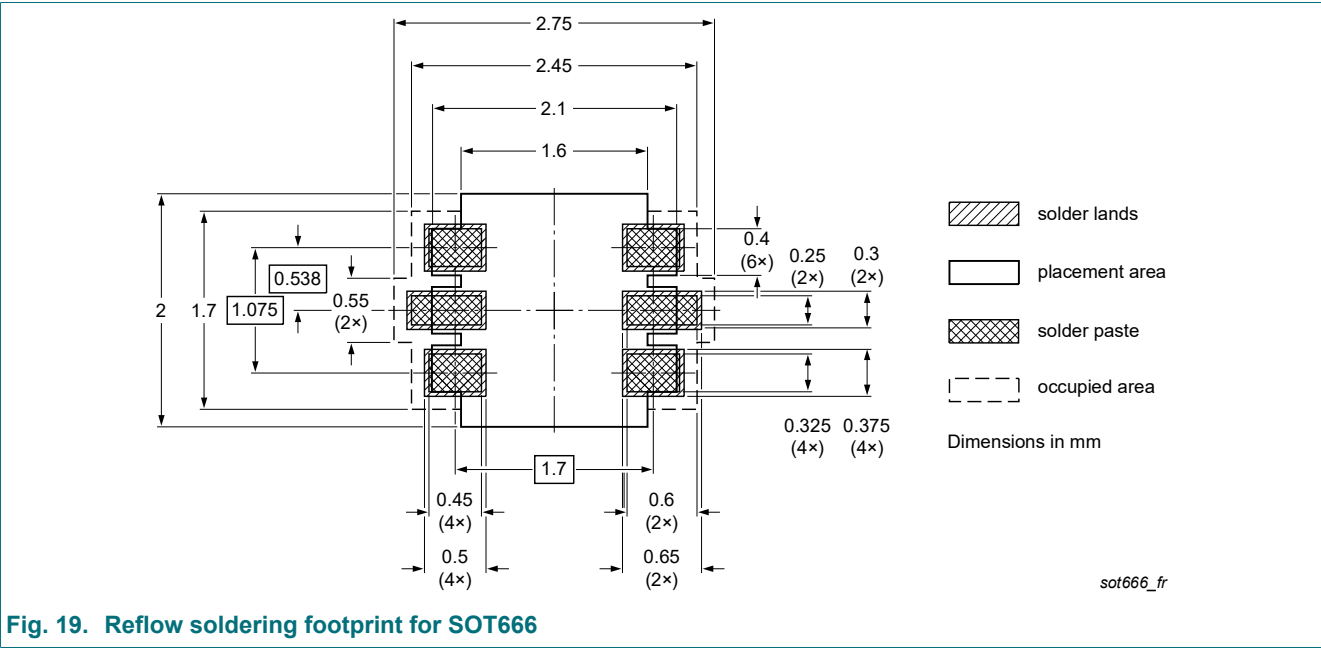


Fig. 19. Reflow soldering footprint for SOT666

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMDT290UNE v.2	20221228	Product data sheet	-	PMDT290UNE v.1
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia • Legal texts have been adapted to the new company name where appropriate • Product changed to non-automotive qualification			
PMDT290UNE v.1	20110913	Product data sheet	-	-

15. Legal information

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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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