



# PMF63UNE

20 V, N-channel Trench MOSFET

20 April 2016

Product data sheet

## 1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

## 2. Features and benefits

- Trench MOSFET technology
- Low threshold voltage
- ElectroStatic Discharge (ESD) protection > 2 kV HBM

## 3. Applications

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

## 4. Quick reference data

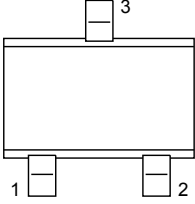
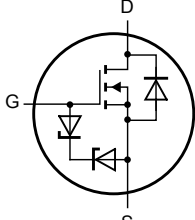
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25\text{ °C}$	-	-	20	V
$V_{GS}$	gate-source voltage		-8	-	8	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	2.2	A
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 2\text{ A}; T_j = 25\text{ °C}$	-	57	65	mΩ

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 6 cm<sup>2</sup>.

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>SC-70 (SOT323)</p>	 <p>017aaa255</p>
2	S	source		
3	D	drain		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMF63UNE	SC-70	plastic surface-mounted package; 3 leads	SOT323

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMF63UNE	Z%V

[1] % = placeholder for manufacturing site code

## 8. Limiting values

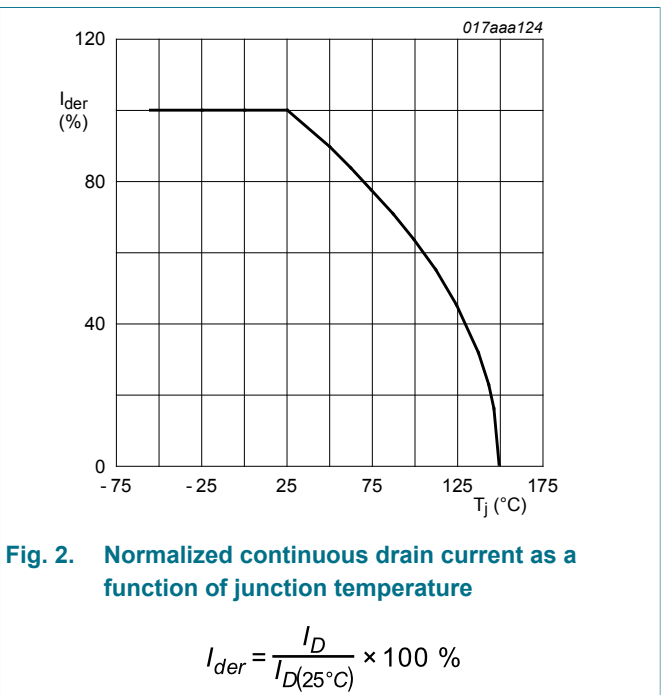
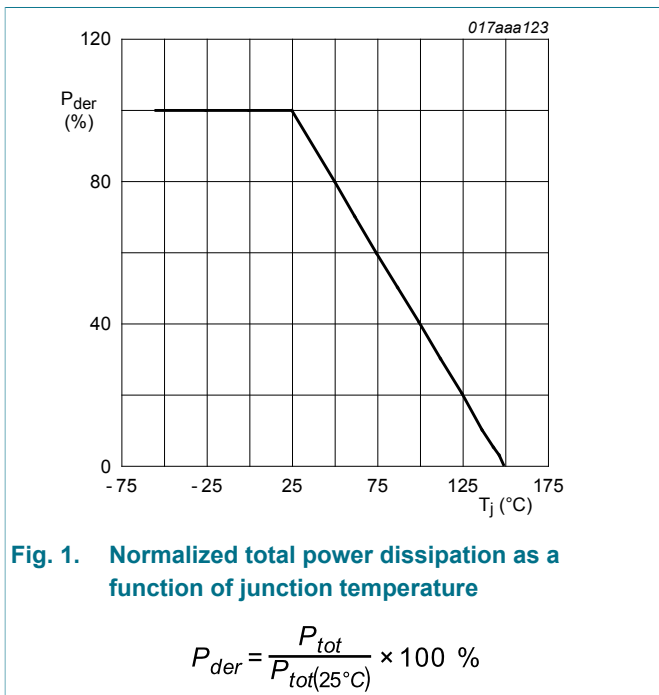
**Table 5. Limiting values**

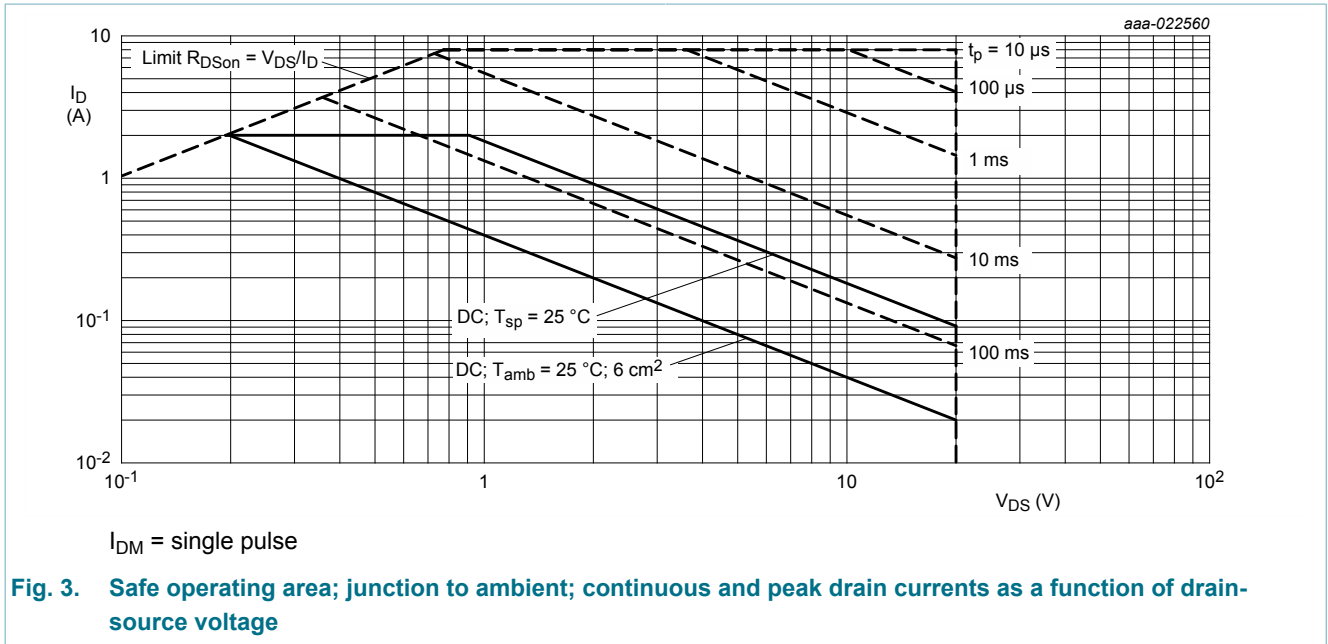
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25 °C		-	20	V
V <sub>GS</sub>	gate-source voltage			-8	8	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 25 °C; t ≤ 5 s	[1]	-	2.2	A
		V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 25 °C	[1]	-	2	A
		V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	1.3	A
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs		-	8	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	300	mW
			[1]	-	395	mW
		T <sub>sp</sub> = 25 °C		-	1.8	W
T <sub>j</sub>	junction temperature			-55	150	°C
T <sub>amb</sub>	ambient temperature			-55	150	°C
T <sub>stg</sub>	storage temperature			-65	150	°C
I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	0.37	A

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 6 cm<sup>2</sup>.

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





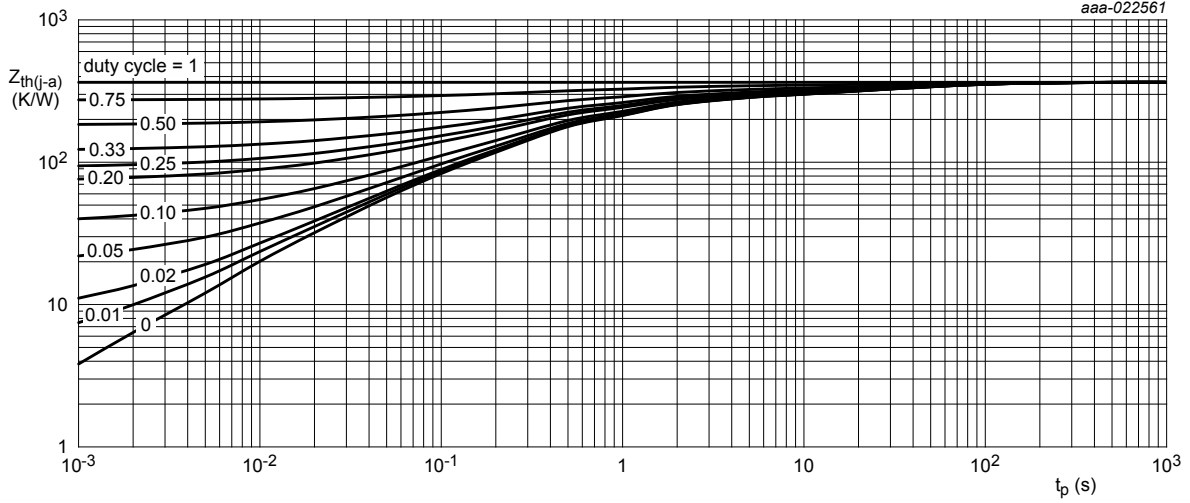
## 9. Thermal characteristics

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]	-	363	418	K/W
			[2]	-	276	317	K/W
		in free air; $t \leq 5$ s	[2]	-	238	273	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	60	69	K/W

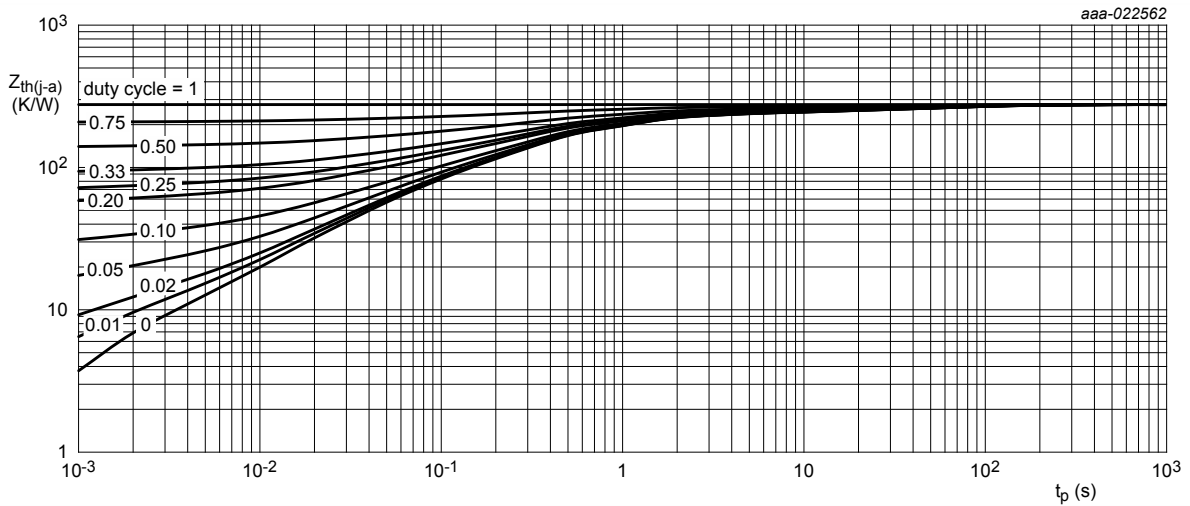
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper; tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain  $6 \text{ cm}^2$ .



FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for drain 6 cm<sup>2</sup>

Fig. 5. 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
<b>Static characteristics</b>						
$V_{(BR)DSS}$	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	1	V
$I_{DSS}$	drain leakage current	$V_{DS} = 20 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 8 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	10	$\mu A$
		$V_{GS} = -8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-10	$\mu A$
		$V_{GS} = 4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	5	$\mu A$
		$V_{GS} = -4.5 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-5	$\mu A$
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5 V$ ; $I_D = 2 A$ ; $T_j = 25 \text{ }^\circ C$	-	57	65	m $\Omega$
		$V_{GS} = 4.5 V$ ; $I_D = 2 A$ ; $T_j = 150 \text{ }^\circ C$	-	84	96	m $\Omega$
		$V_{GS} = 2.5 V$ ; $I_D = 1.8 A$ ; $T_j = 25 \text{ }^\circ C$	-	64	74	m $\Omega$
		$V_{GS} = 1.8 V$ ; $I_D = 0.8 A$ ; $T_j = 25 \text{ }^\circ C$	-	78	88	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 5 V$ ; $I_D = 2 A$ ; $T_j = 25 \text{ }^\circ C$	-	9	-	S
$R_G$	gate resistance	$f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ C$	-	1.8	-	$\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10 V$ ; $I_D = 2 A$ ; $V_{GS} = 4.5 V$ ; $T_j = 25 \text{ }^\circ C$	-	3.9	5.85	nC
$Q_{GS}$	gate-source charge		-	0.3	-	nC
$Q_{GD}$	gate-drain charge		-	0.9	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 10 V$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	289	-	pF
$C_{oss}$	output capacitance		-	51	-	pF
$C_{rss}$	reverse transfer capacitance		-	42	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10 V$ ; $I_D = 2 A$ ; $V_{GS} = 4.5 V$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25 \text{ }^\circ C$	-	8	-	ns
$t_r$	rise time		-	27	-	ns
$t_{d(off)}$	turn-off delay time		-	35	-	ns
$t_f$	fall time		-	19	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 0.37 A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	0.7	1.2	V

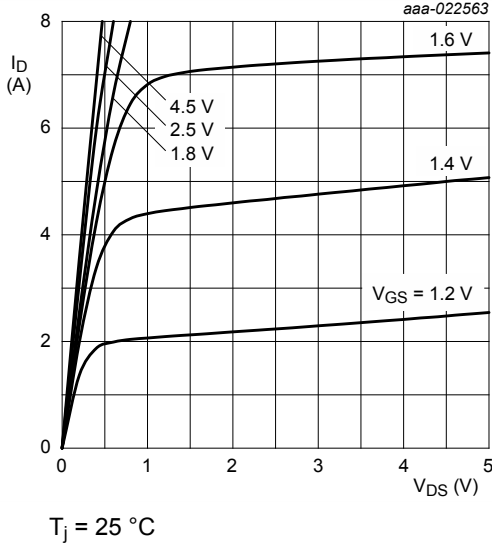


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

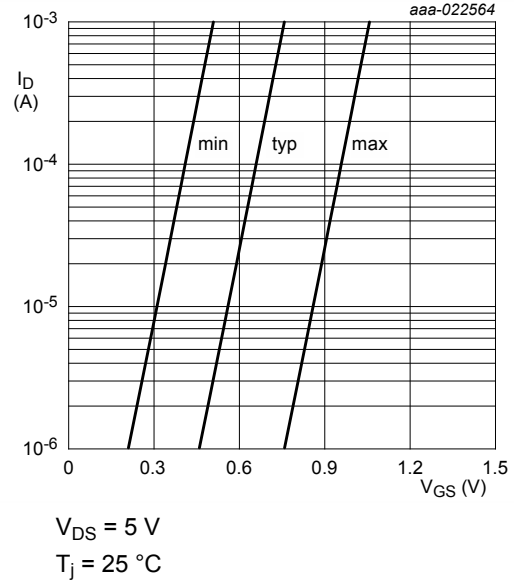


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

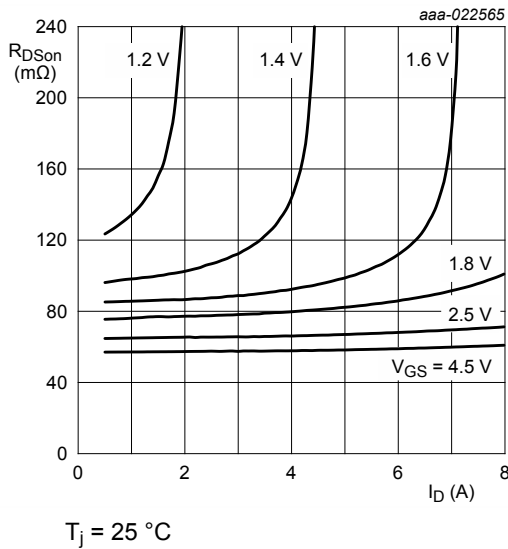


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

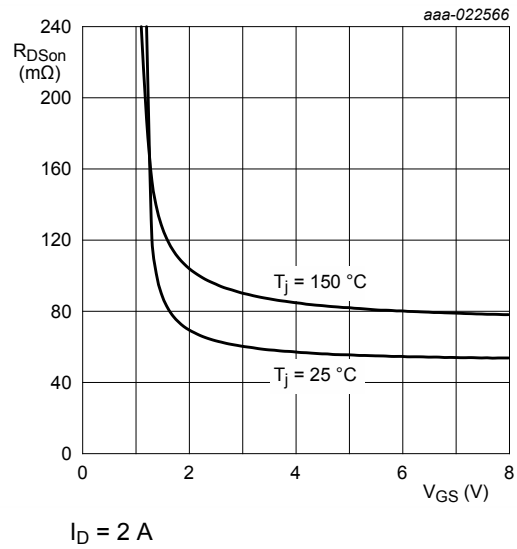
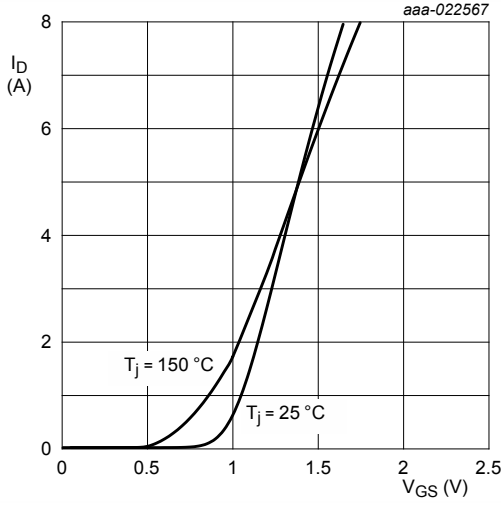


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



$$V_{DS} > I_D \times R_{DSon}$$

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

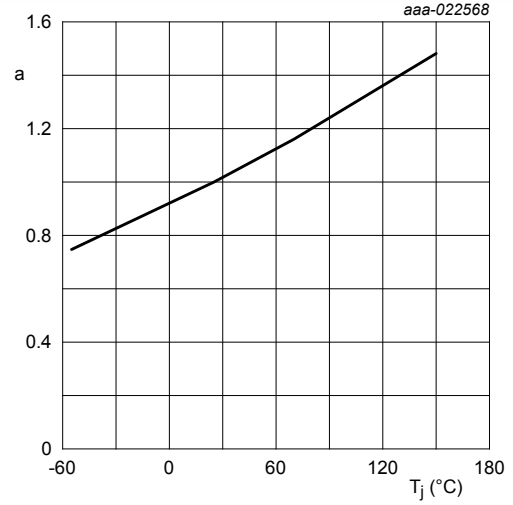
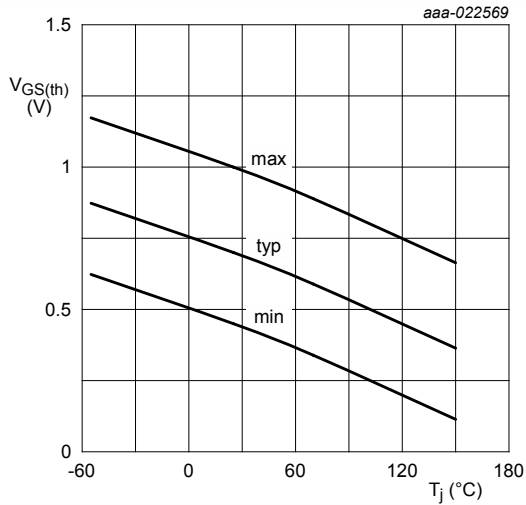


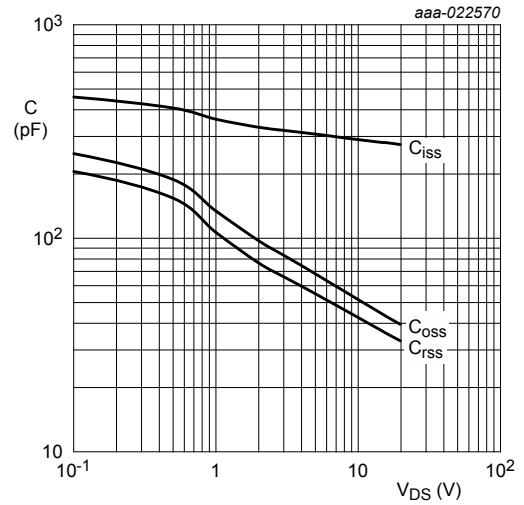
Fig. 11. Normalized drain-source on-state resistance as a function of ambient temperature; typical values

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



$$I_D = 250 \mu\text{A}; V_{DS} = V_{GS}$$

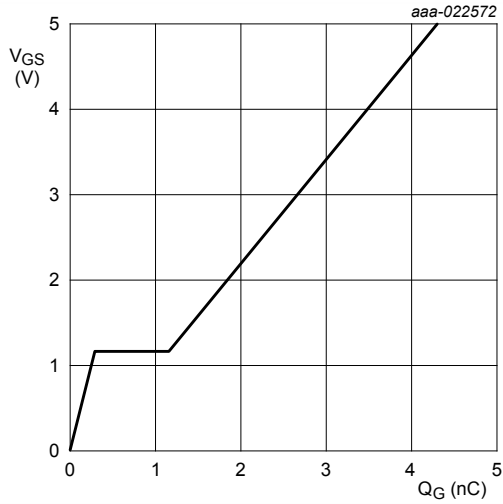
Fig. 12. Gate-source threshold voltage as a function of ambient temperature



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

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





$V_{DS} = 10\text{ V}; I_D = 2\text{ A}$

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

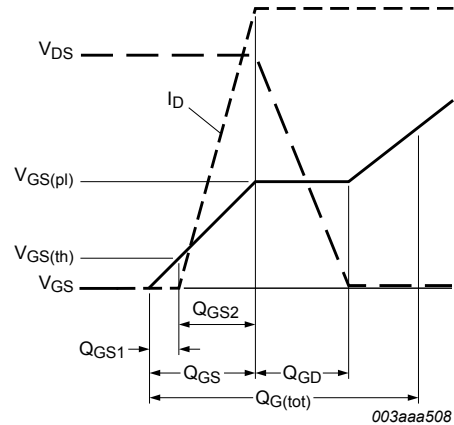
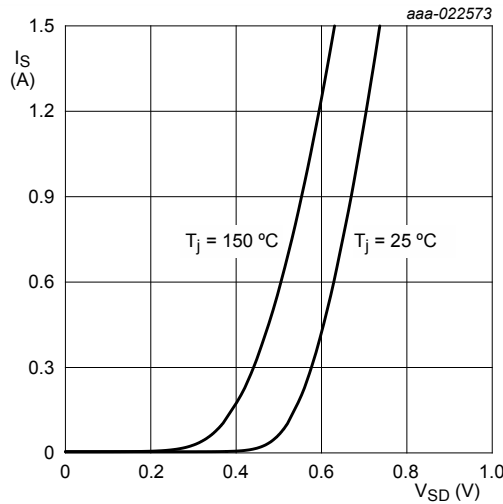


Fig. 15. Gate charge waveform definitions



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

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

## 11. Test information

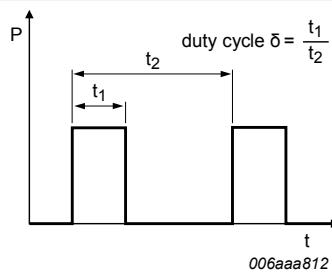


Fig. 17. Duty cycle definition

## 12. Package outline

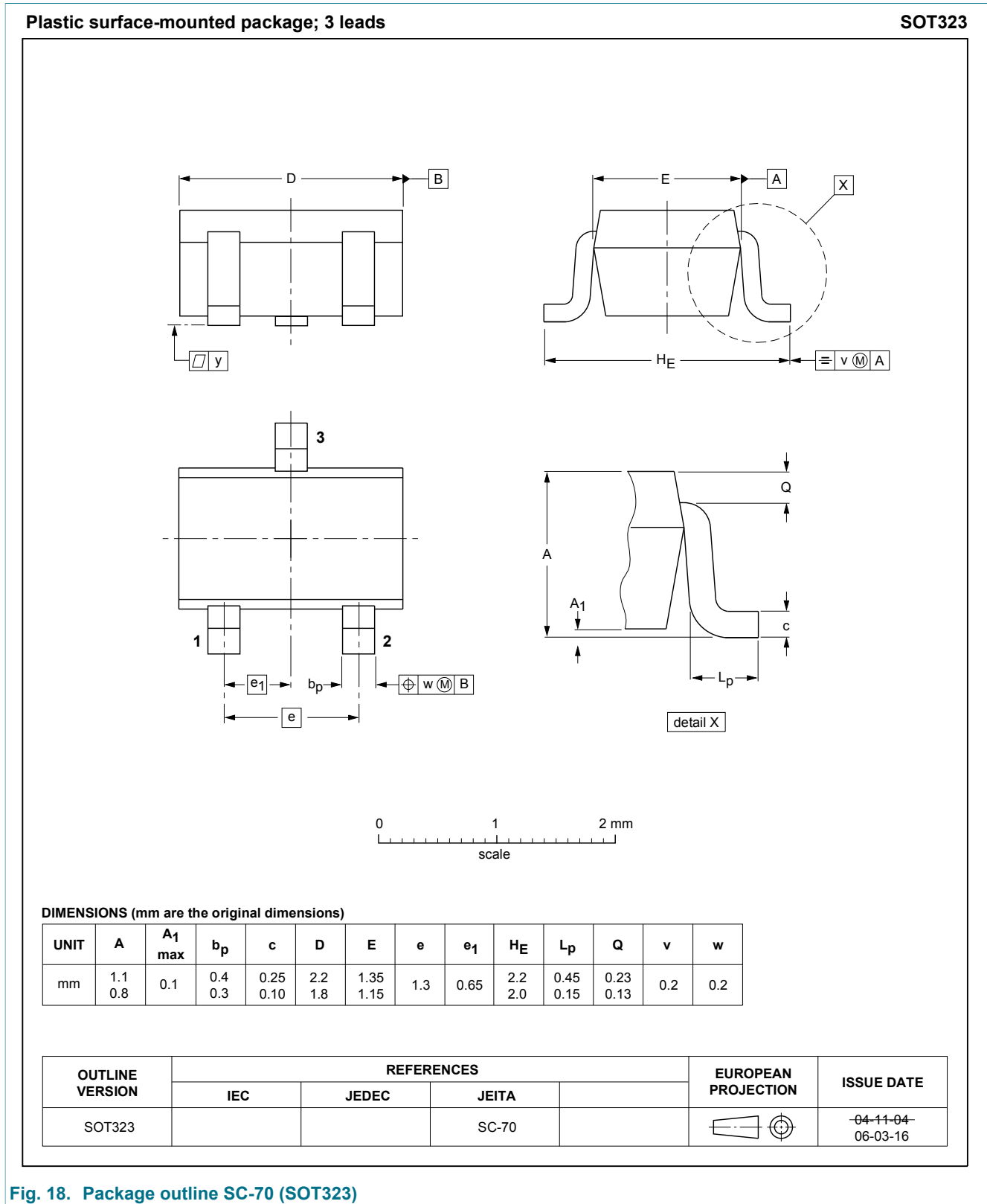


Fig. 18. Package outline SC-70 (SOT323)

### 13. Soldering

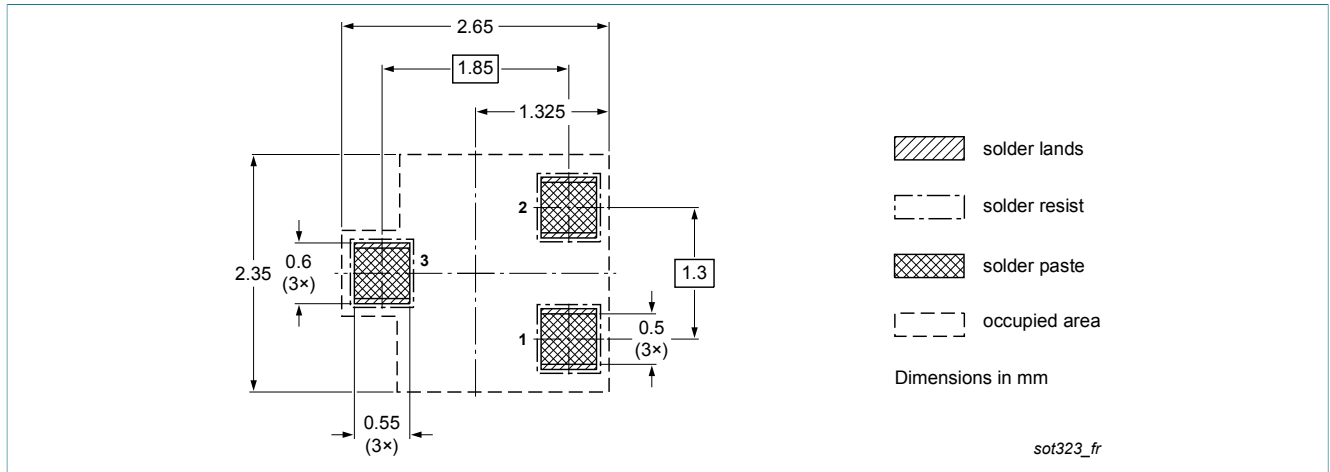


Fig. 19. Reflow soldering footprint for SC-70 (SOT323)

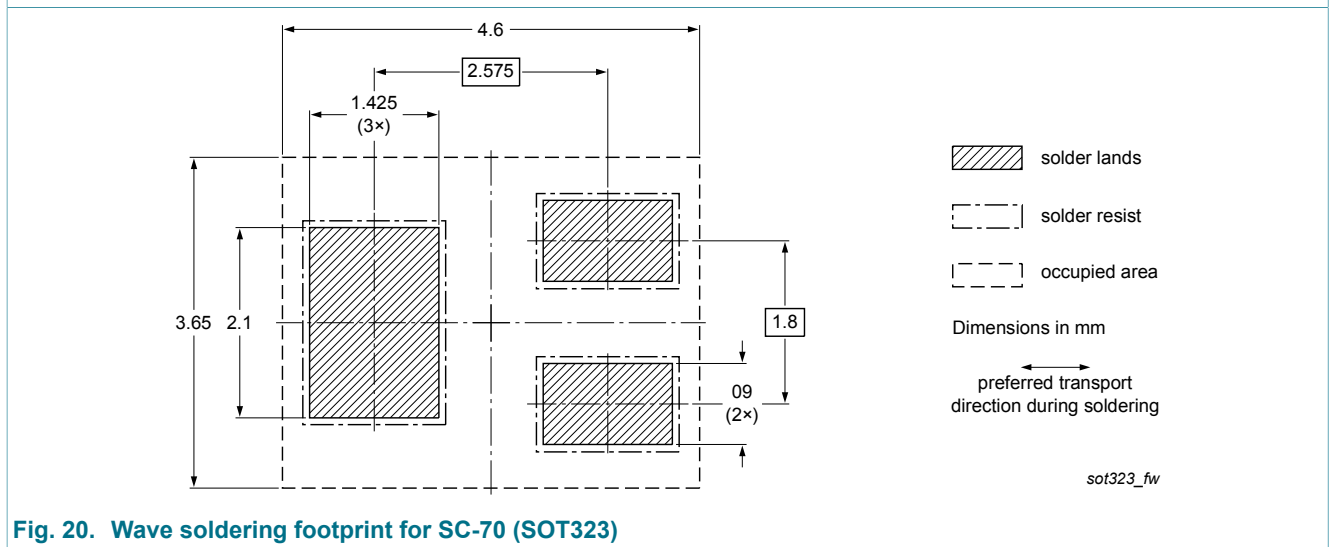


Fig. 20. Wave soldering footprint for SC-70 (SOT323)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMF63UNE v.1	20160420	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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