



# PMCA14UN

12 V, N-channel Trench MOSFET

6 August 2020

Product data sheet

## 1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DSN1010-3 (SOT8007) Surface-Mounted Device (SMD) package using Trench MOSFET technology.

## 2. Features and benefits

- Low threshold voltage
- Very fast switching
- Ultra small package: 0.96 × 0.96 × 0.24 mm
- Trench MOSFET technology

## 3. Applications

- Relay driver
- Battery management
- Low-side load switch
- Switching circuits

## 4. Quick reference data

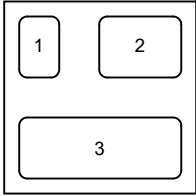
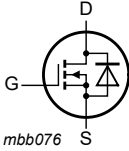
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25\text{ °C}$	-	-	12	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]	-	14	A
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 5\text{ A}; T_j = 25\text{ °C}$	-	13.2	16	mΩ

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), 4 layer 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>Transparent top view <b>DSN1010-3 (SOT8007)</b></p>	 <p>mbb076</p>
2	D	drain		
3	S	source		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMCA14UN	DSN1010-3	chip-scale package; 3 terminals; body 0.96 x 0.96 x 0.24 mm	SOT8007

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMCA14UN	L

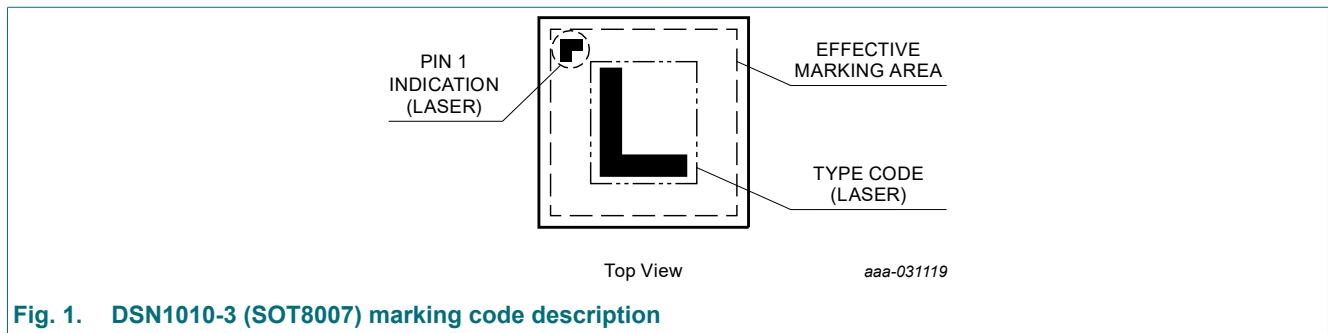


Fig. 1. DSN1010-3 (SOT8007) marking code description

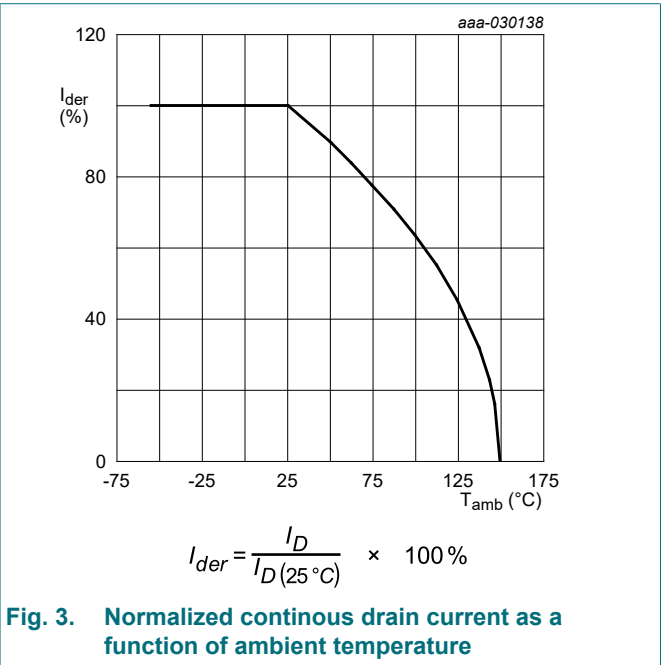
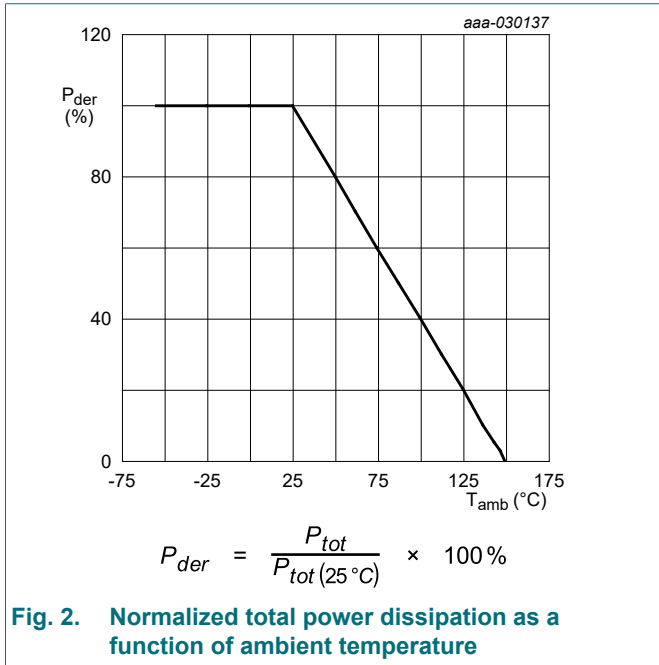
## 8. Limiting values

**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		-	12	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]	-	14	A
		V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 25 °C	[1]	-	11	A
		V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	7	A
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs		-	44	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	1.2	W
			[1]	-	2.5	W
		T <sub>amb</sub> = 25 °C; t ≤ 5 s	[1]	-	3.9	W
		T <sub>sp</sub> = 25 °C		-	31	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
<b>Source-drain diode</b>						
I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	1.2	A

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), 4 layer copper, tin-plated and mounting pad for drain 6 cm<sup>2</sup>.
- [2] Device mounted on an FR4 Printed-Circuit Board (PCB), 4 layer copper, tin-plated and standard footprint.



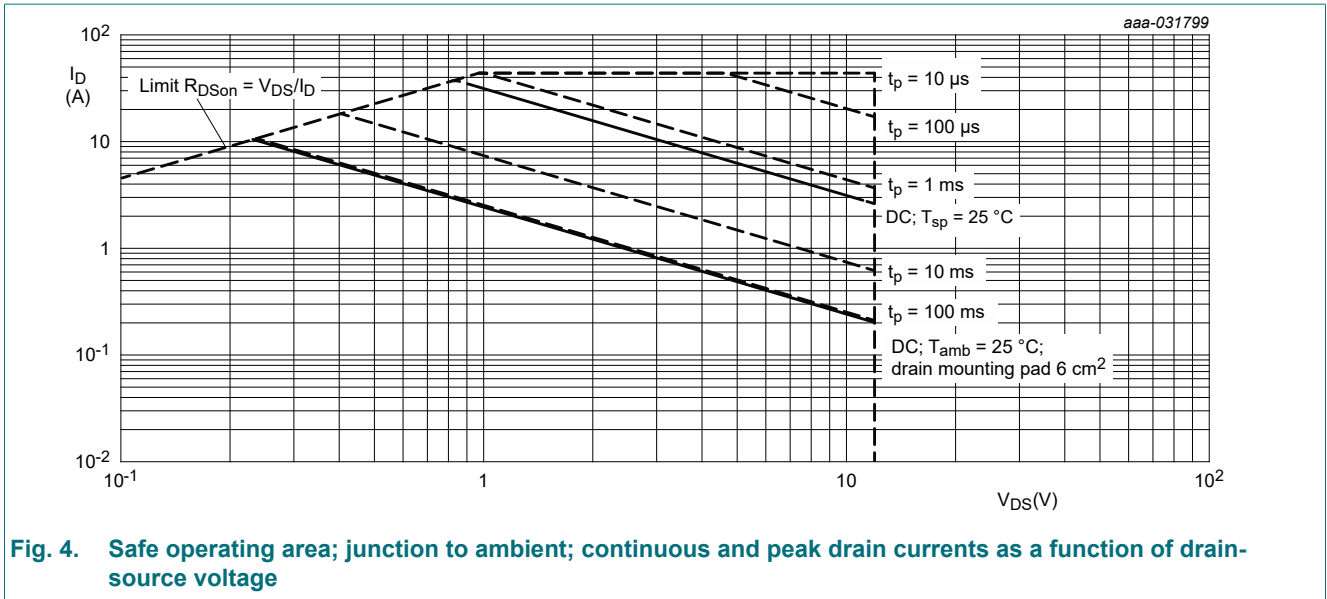


Fig. 4. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

## 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]	-	92	106	K/W
			[2]	-	43	50	K/W
		in free air; $t \leq 5$ s	[2]	-	28	32	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	2	4	K/W

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), 4 layer copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), 4 layer copper, tin-plated and mounting pad for drain 6 cm<sup>2</sup>.

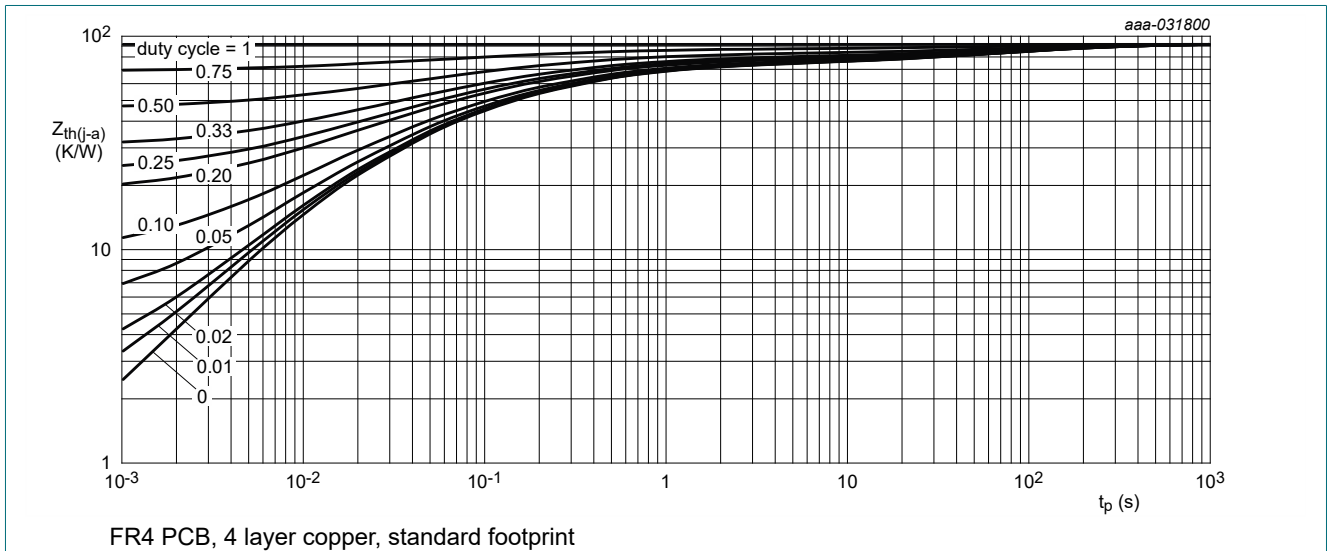


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

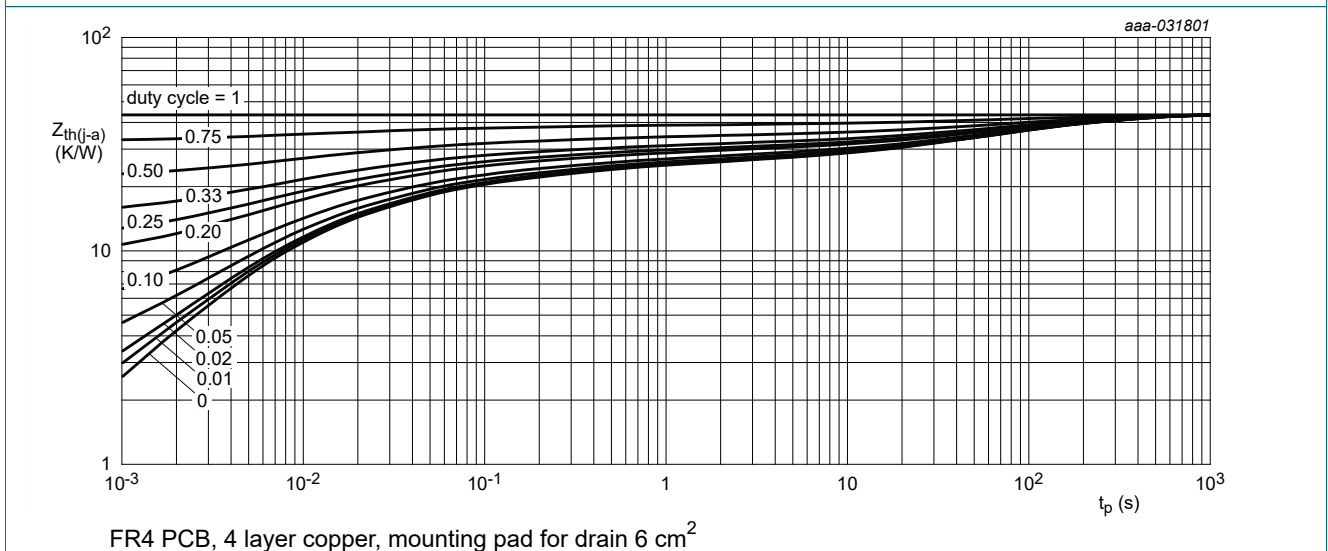


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	12	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu A$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ C$	0.4	0.6	0.9	V
$I_{DSS}$	drain leakage current	$V_{DS} = 9.6 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	100	nA
		$V_{GS} = -8 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	-	-100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5 V$ ; $I_D = 5 A$ ; $T_j = 25 \text{ }^\circ C$	-	13.2	16	m $\Omega$
		$V_{GS} = 4.5 V$ ; $I_D = 5 A$ ; $T_j = 150 \text{ }^\circ C$	-	17	21	m $\Omega$
		$V_{GS} = 3.3 V$ ; $I_D = 5 A$ ; $T_j = 25 \text{ }^\circ C$	-	14.2	17	m $\Omega$
		$V_{GS} = 2.5 V$ ; $I_D = 5 A$ ; $T_j = 25 \text{ }^\circ C$	-	16	21	m $\Omega$
		$V_{GS} = 1.8 V$ ; $I_D = 1 A$ ; $T_j = 25 \text{ }^\circ C$	-	22	35	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 6 V$ ; $I_D = 1 A$ ; $T_j = 25 \text{ }^\circ C$	-	5.6	-	S
$R_G$	gate resistance	$f = 1 \text{ MHz}$	-	1.5	-	$\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 6 V$ ; $I_D = 5 A$ ; $V_{GS} = 3.3 V$ ; $T_j = 25 \text{ }^\circ C$	-	8	12	nC
$Q_{GS}$	gate-source charge		-	1.3	-	nC
$Q_{GD}$	gate-drain charge		-	3.2	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 6 V$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	855	-	pF
$C_{oss}$	output capacitance		-	257	-	pF
$C_{rss}$	reverse transfer capacitance		-	237	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 6 V$ ; $I_D = 5 A$ ; $V_{GS} = 3.3 V$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25 \text{ }^\circ C$	-	3	-	ns
$t_r$	rise time		-	6	-	ns
$t_{d(off)}$	turn-off delay time		-	16	-	ns
$t_f$	fall time		-	11	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 1.2 A$ ; $V_{GS} = 0 V$ ; $T_j = 25 \text{ }^\circ C$	-	0.7	1.2	V

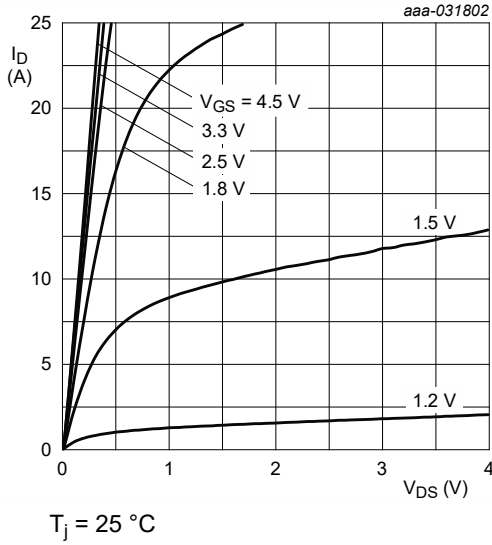


Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values

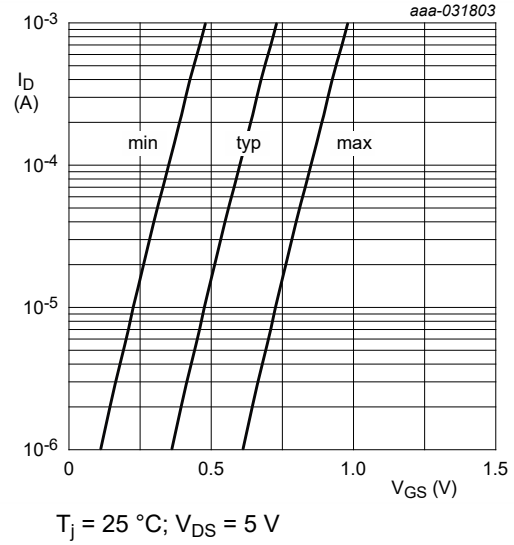


Fig. 8. Subthreshold drain current as a function of gate-source voltage

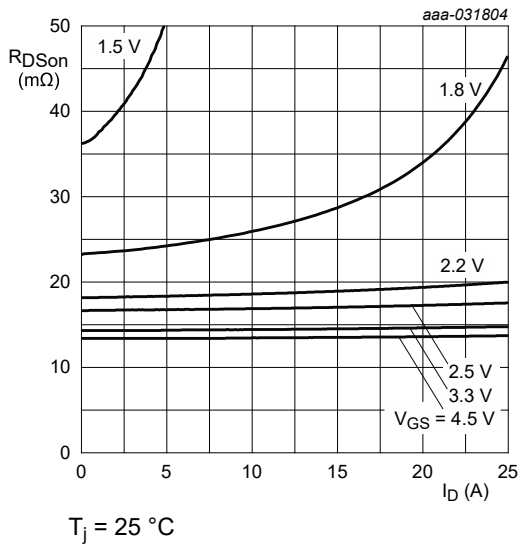


Fig. 9. Drain-source on-state resistance as a function of drain current; typical values

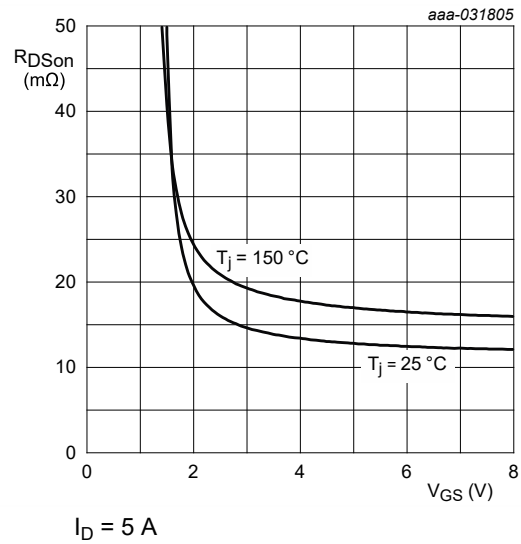


Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values

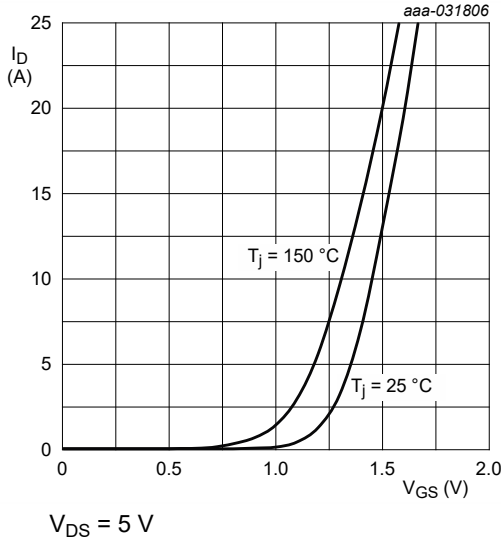


Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values

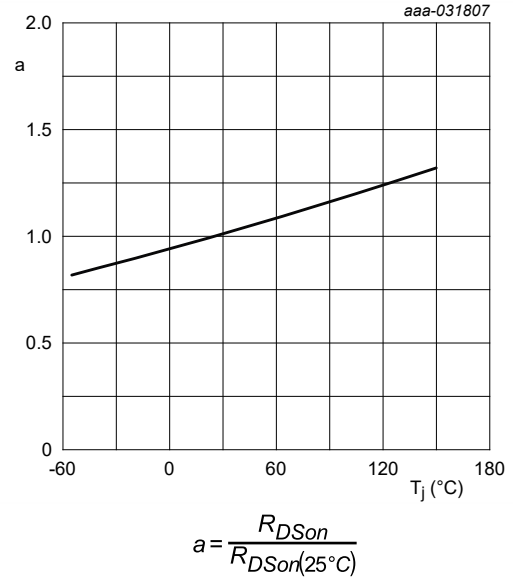


Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

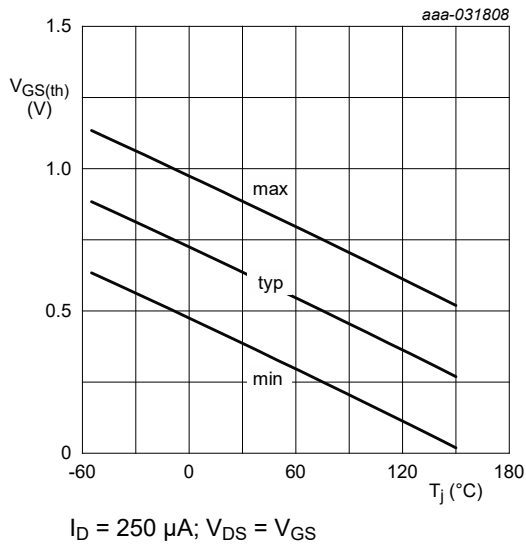


Fig. 13. Gate-source threshold voltage as a function of junction temperature

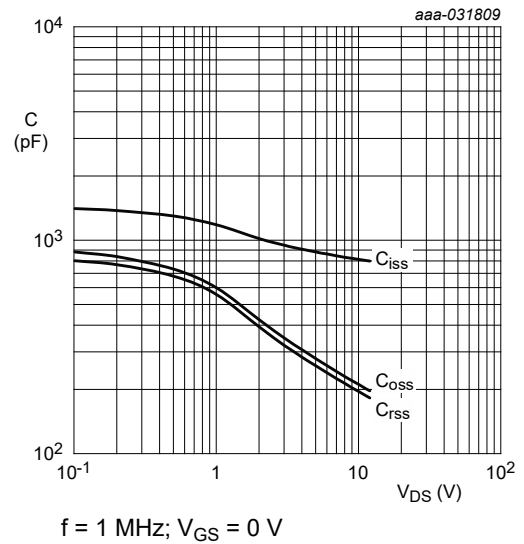
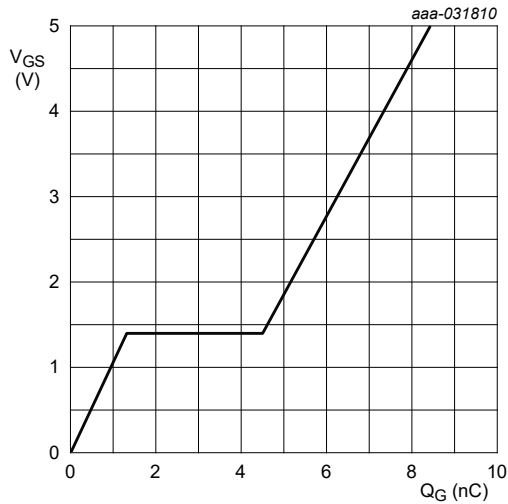


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values





$I_D = 5 \text{ A}; V_{DS} = 6 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$

Fig. 15. Gate-source voltage as a function of gate charge; typical values

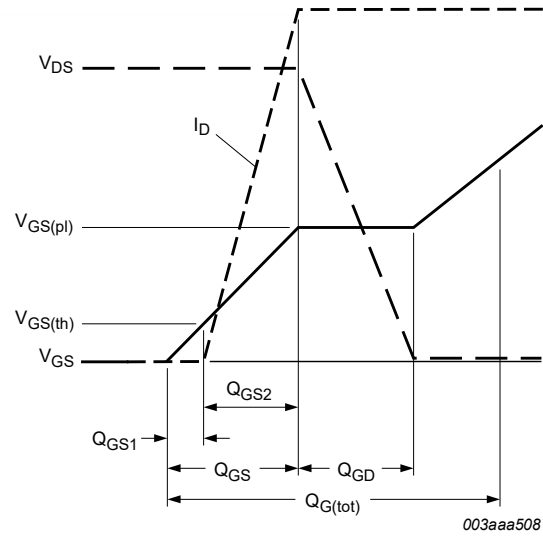
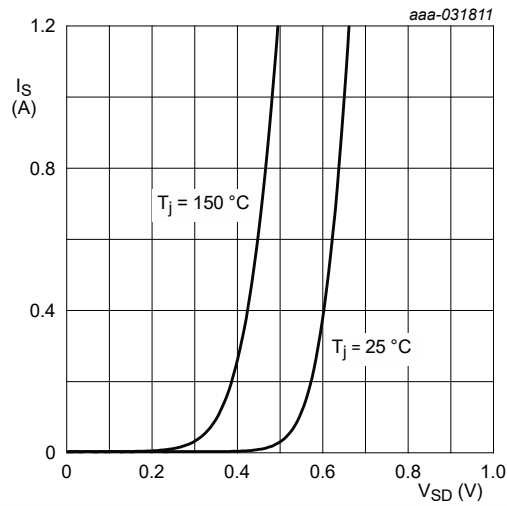


Fig. 16. Gate charge waveform definitions



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

Fig. 17. Source current as a function of source-drain voltage; typical values

11. Test information

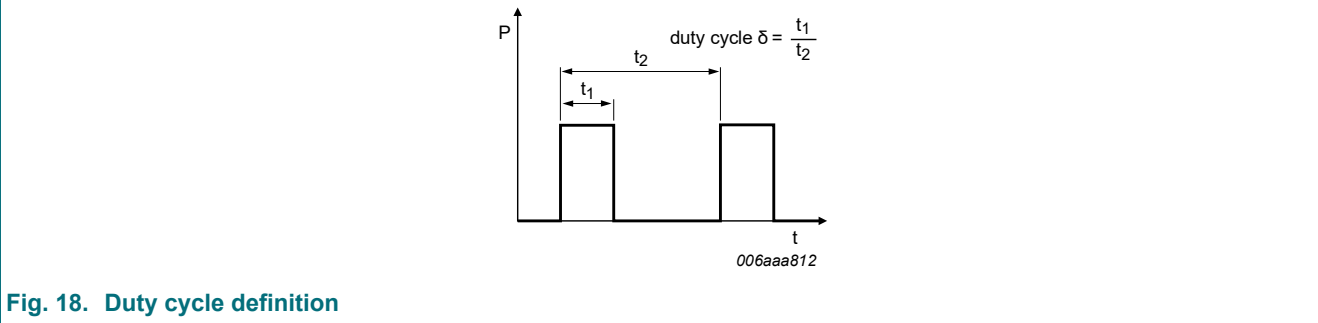
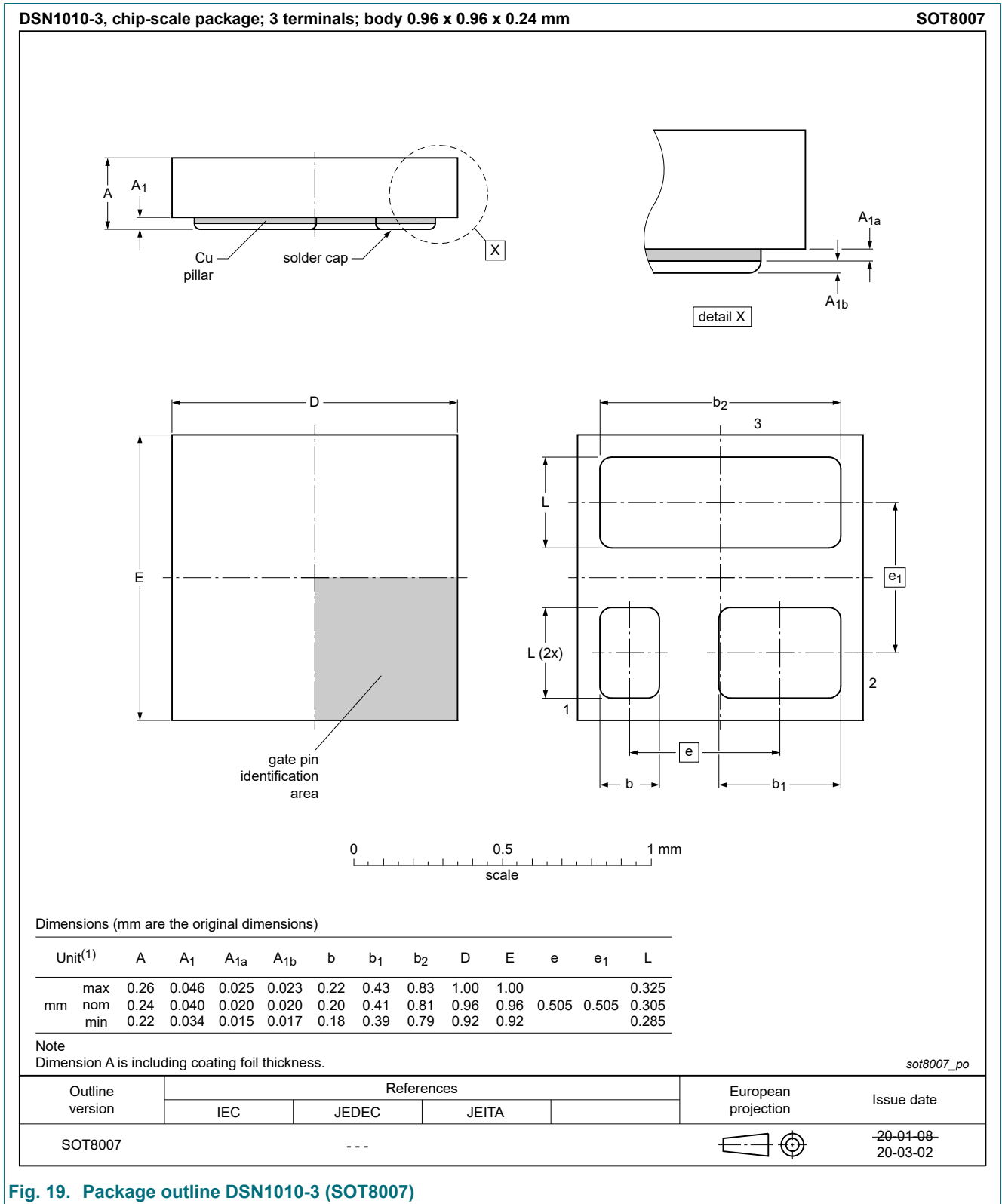


Fig. 18. Duty cycle definition

## 12. Package outline



**Fig. 19. Package outline DSN1010-3 (SOT8007)**

### 13. Soldering

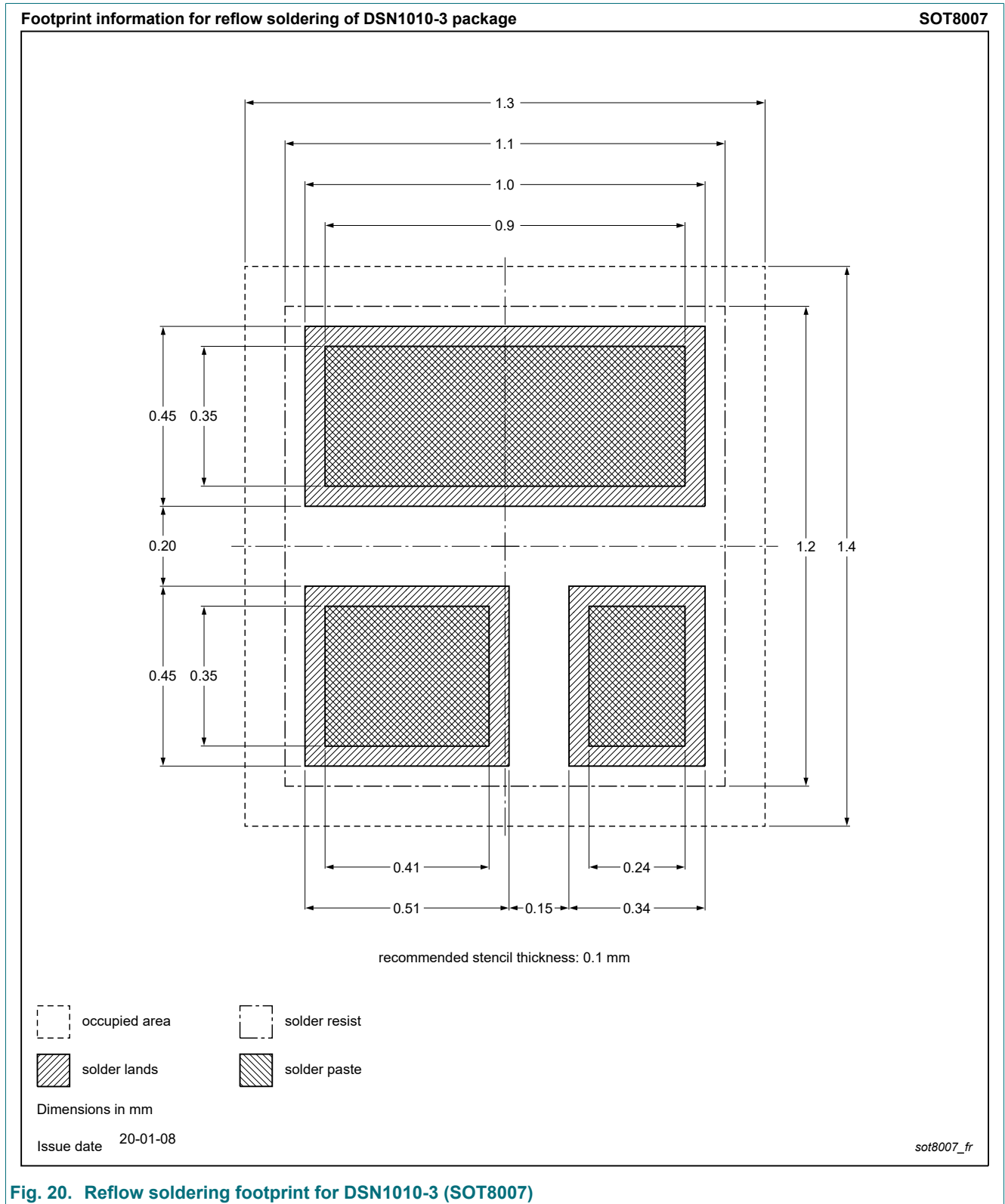


Fig. 20. Reflow soldering footprint for DSN1010-3 (SOT8007)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMCA14UN v.1	20200806	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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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