



PSMN1R3-100ASF

NextPower 100 V, 1.3 mOhm, N-channel MOSFET in
CCPAK1212 package

6 December 2024

Product data sheet

1. General description

NextPower 100 V, standard level gate drive MOSFET. Qualified to 175 °C and recommended for high power industrial and consumer applications.

2. Features and benefits

- Low Q_{rr} for higher efficiency and lower spiking
- 355 Amps $I_{D(max)}$ continuous current rating
- Low $Q_G \times R_{DS(on)}$ FOM for high efficiency switching applications
- Strong avalanche energy rating (E_{as})
- Avalanche rated and 100% tested
- Ha-free and RoHS compliant CCPAK1212 package

3. Applications

- Battery protection
- High power full and half-bridge configurations
- BLDC motor control
- OR-ing

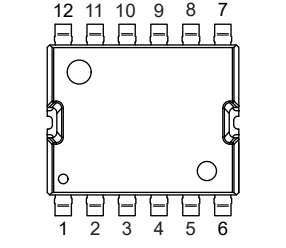
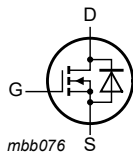
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	-	100	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C}; \text{Fig. 2}$	-	-	355	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}; \text{Fig. 1}$	-	-	935	W
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_j = 25\text{ °C}; \text{Fig. 11}$	-	1.02	1.3	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$I_D = 25\text{ A}; V_{DS} = 50\text{ V}; V_{GS} = 10\text{ V}; T_j = 25\text{ °C}; \text{Fig. 13}; \text{Fig. 14}$	14	46	106	nC
Source-drain diode						
Q_r	recovered charge	$I_S = 25\text{ A}; di_S/dt = -100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}; T_j = 25\text{ °C}; \text{Fig. 17}$	-	74	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>CCPAK1212 (SOT8000A)</p>	 <p>mbb076</p>
2	S	source		
3	S	source		
4	S	source		
5	S	source		
6	S	source		
7	D	drain		
8	D	drain		
9	D	drain		
10	D	drain		
11	D	drain		
12	D	drain		
mb	D	mounting base; connected to drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN1R3-100ASF	CCPAK1212	Plastic, surface mounted copper clip package (CCPAK1212); 13 terminals; 2.0 mm pitch, 12 mm x 12 mm x 2.5 mm body	SOT8000A

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN1R3-100ASF	XP1F3S10A

8. Limiting values

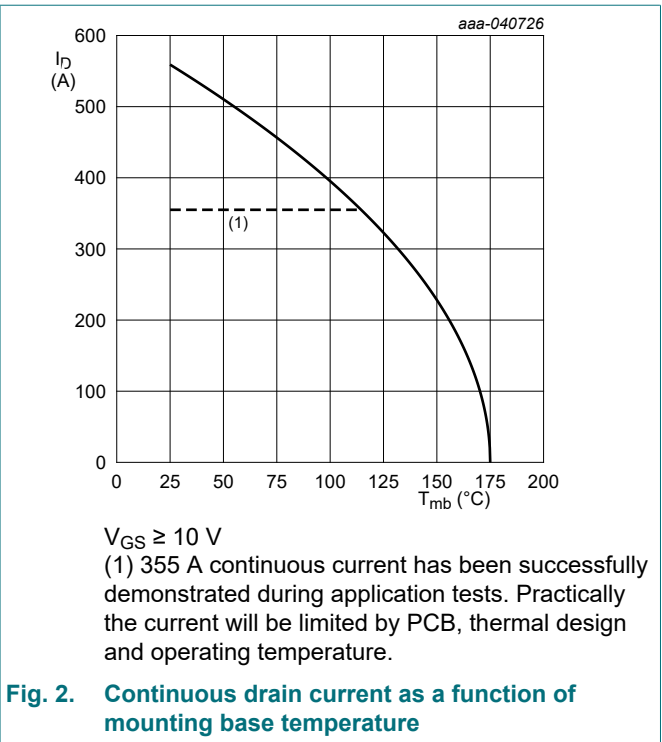
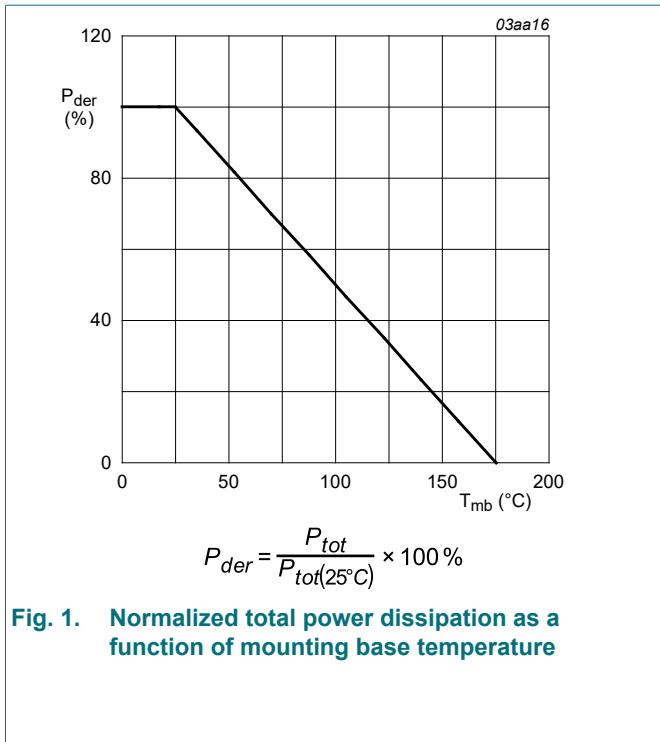
Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). $T_j = 25\text{ °C}$ unless otherwise stated.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	100	V
V_{DGR}	drain-gate voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	100	V
V_{GS}	gate-source voltage		-20	20	V
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Fig. 1	-	935	W
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 2	-	355	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; Fig. 2	-	355	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; Fig. 3	-	2236	A

Symbol	Parameter	Conditions	Min	Max	Unit
T _{stg}	storage temperature		-55	175	°C
T _j	junction temperature		-55	175	°C
T _{slid(M)}	peak soldering temperature		-	260	°C
Source-drain diode					
I _S	source current	T _{mb} = 25 °C	-	355	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C	-	2236	A
Avalanche ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 99 A; V _{sup} ≤ 100 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; t _p = 175 μs; Fig. 4	[1]	-	1126 mJ
I _{AS}	non-repetitive avalanche current	V _{sup} = 100 V; V _{GS} = 10 V; T _{j(init)} = 25 °C; R _{GS} = 50 Ω; Fig. 4	[1]	-	99 A

[1] Protected by 100% test



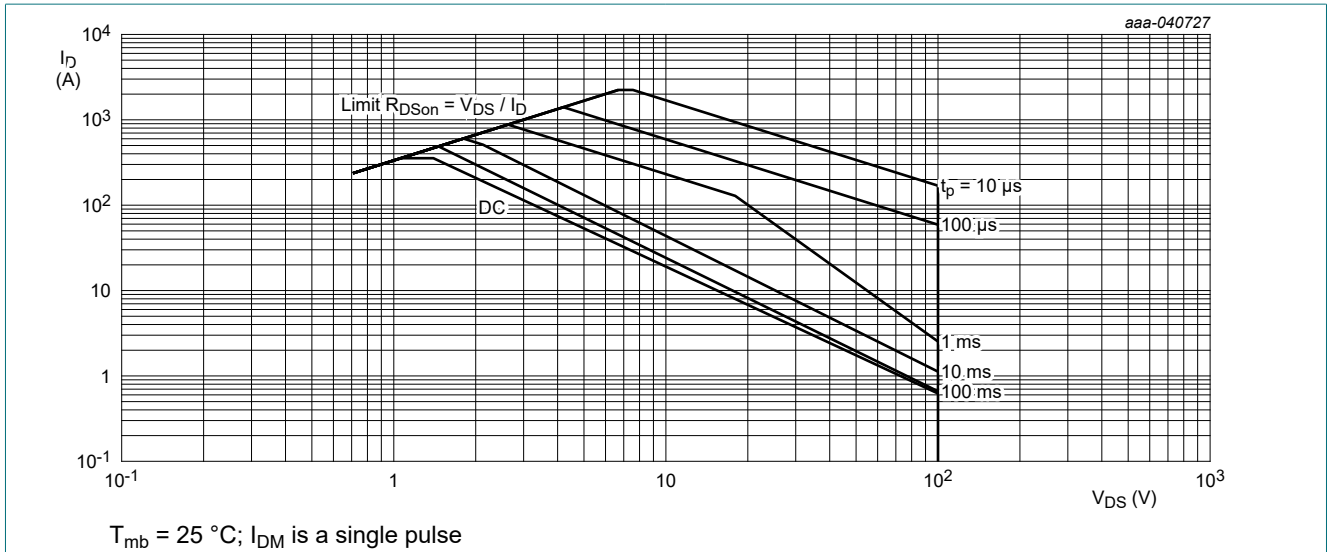


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

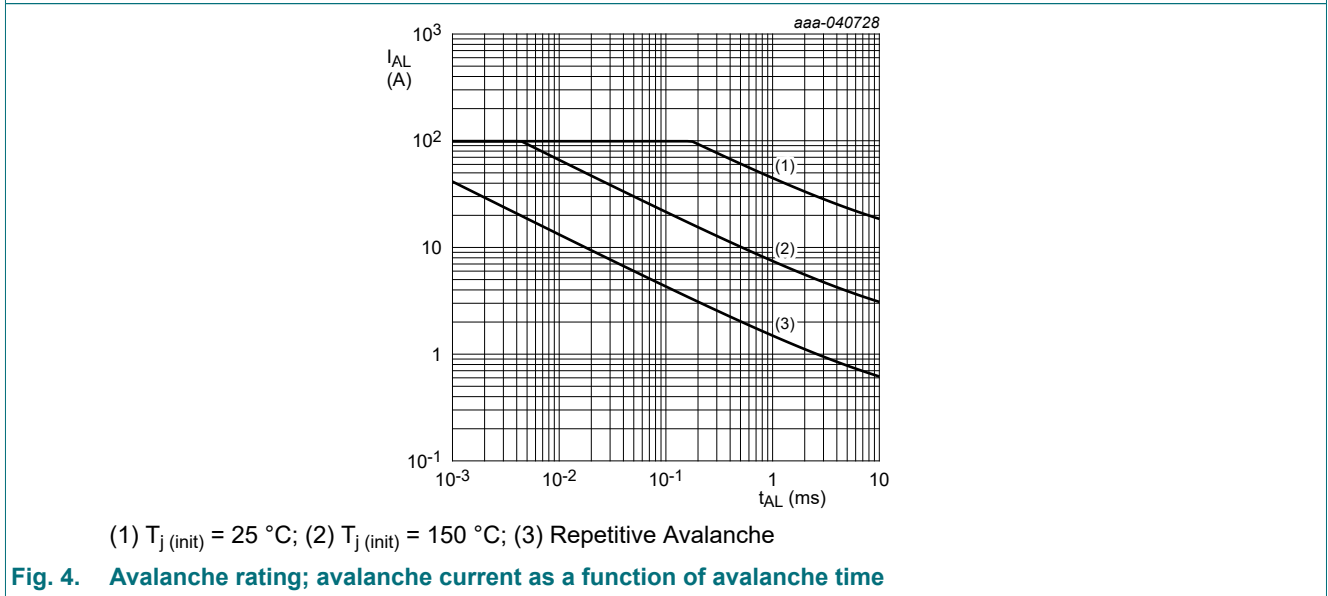


Fig. 4. Avalanche rating; avalanche current as a function of avalanche time

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 5	-	0.123	0.16	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Fig. 6	-	58	-	K/W
		Fig. 7	-	29	-	K/W

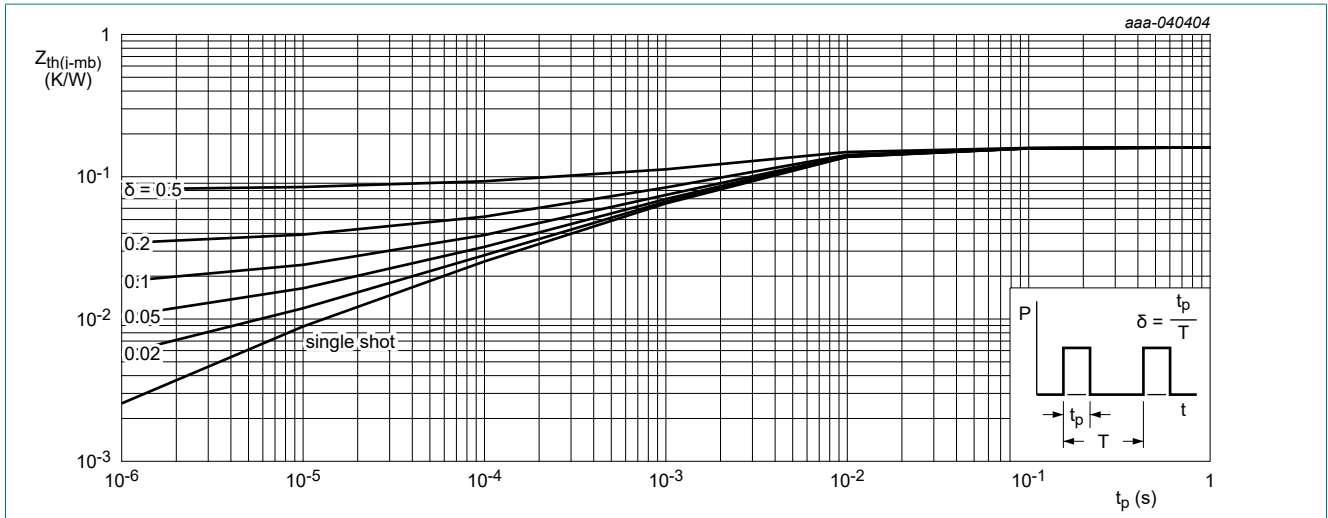


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

70 μm thick on FR4 board

Copper area 25.4mm square; 70 μm thick on FR4 board

Fig. 6. PCB layout with minimum footprint for thermal resistance from junction to ambient

Fig. 7. PCB layout for thermal resistance from junction to ambient

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	100	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	90	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C$	2	3.08	4	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 175 \text{ }^\circ C$	-	1.58	-	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$	-	3.6	-	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25 \text{ }^\circ C \leq T_j \leq 150 \text{ }^\circ C$	-	-9.32	-	mV/K
I_{DSS}	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.08	1.6	μA
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ C$	-	31	160	μA
I_{GSS}	gate leakage current	$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
		$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA

NextPower 100 V, 1.3 mOhm, N-channel MOSFET in CCPAK1212 package

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11	-	1.02	1.3	mΩ
		$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 100\text{ °C}$; Fig. 12	-	1.7	2.1	mΩ
		$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 175\text{ °C}$; Fig. 12	-	2.4	3	mΩ
		$V_{GS} = 7\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11	-	1.28	1.92	mΩ
R_G	gate resistance	$f = 1\text{ MHz}$; $T_j = 25\text{ °C}$	0.54	1.08	2.16	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 25\text{ A}$; $V_{DS} = 50\text{ V}$; $V_{GS} = 10\text{ V}$; $T_j = 25\text{ °C}$; Fig. 13 ; Fig. 14	128	255	383	nC
		$I_D = 0\text{ A}$; $V_{DS} = 0\text{ V}$; $V_{GS} = 10\text{ V}$; $T_j = 25\text{ °C}$	-	228	-	nC
Q_{GS}	gate-source charge	$I_D = 25\text{ A}$; $V_{DS} = 50\text{ V}$; $V_{GS} = 10\text{ V}$; $T_j = 25\text{ °C}$; Fig. 13 ; Fig. 14	46	76.5	107	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	51	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	25.4	-	nC
Q_{GD}	gate-drain charge		14	46	106	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25\text{ A}$; $V_{DS} = 50\text{ V}$; $T_j = 25\text{ °C}$; Fig. 13 ; Fig. 14	-	4.4	-	V
C_{iss}	input capacitance	$V_{DS} = 50\text{ V}$; $V_{GS} = 0\text{ V}$; $f = 1\text{ MHz}$; $T_j = 25\text{ °C}$; Fig. 15	10901	18168	25436	pF
C_{oss}	output capacitance		2494	4157	6652	pF
C_{rss}	reverse transfer capacitance		9	92	239	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 50\text{ V}$; $R_L = 2\text{ Ω}$; $V_{GS} = 10\text{ V}$; $R_{G(ext)} = 5\text{ Ω}$; $T_j = 25\text{ °C}$	-	67	-	ns
t_r	rise time		-	63	-	ns
$t_{d(off)}$	turn-off delay time		-	157	-	ns
t_f	fall time		-	84	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ °C}$; Fig. 16	-	0.76	1	V
t_{rr}	reverse recovery time	$I_S = 25\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $T_j = 25\text{ °C}$; Fig. 17	-	62	-	ns
Q_r	recovered charge		-	74	-	nC

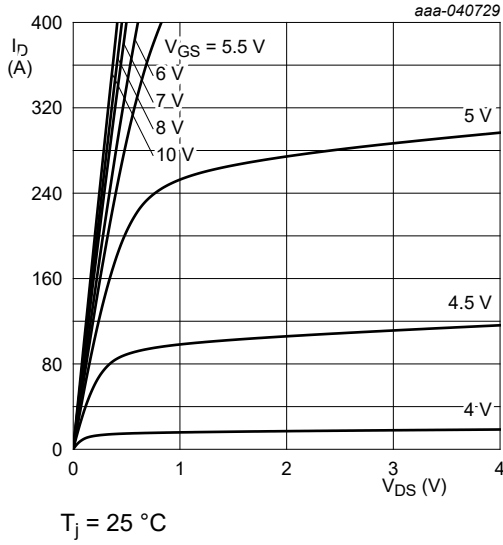


Fig. 8. Output characteristics; drain current as a function of drain-source voltage; typical values

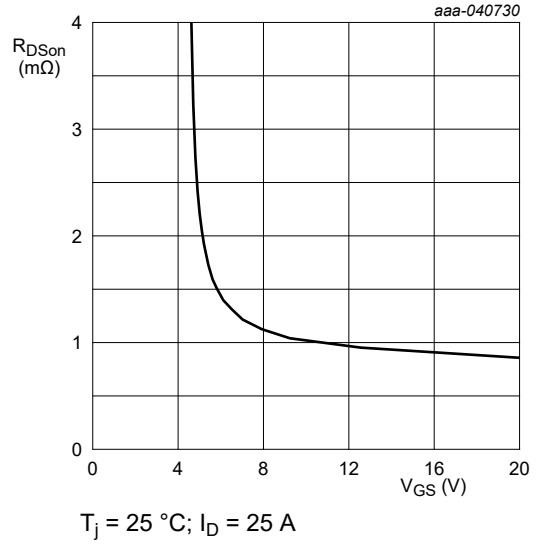


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

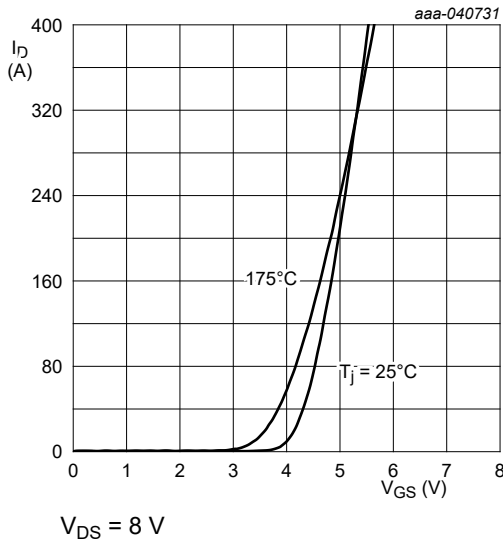


Fig. 10. Transfer characteristics; drain current as a function of gate-source voltage; typical values

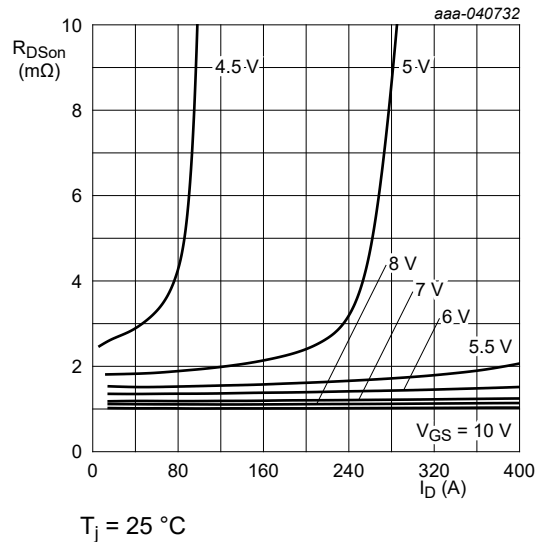
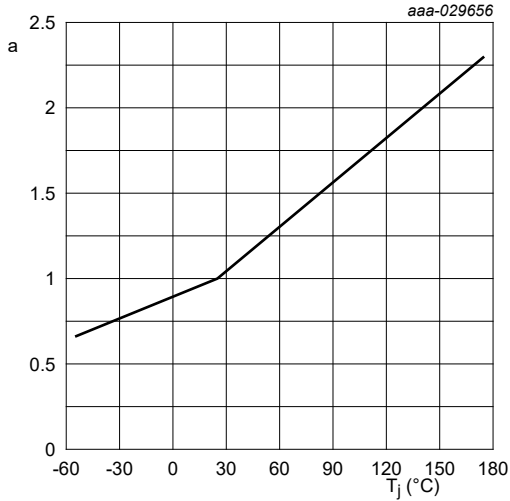
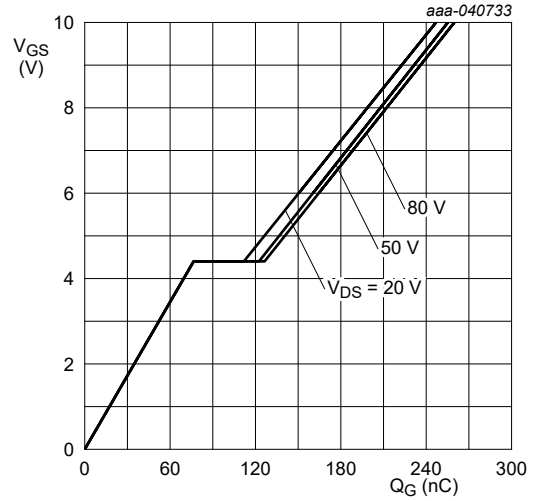


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values



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

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



$T_j = 25^\circ\text{C}; I_D = 25\text{ A}$

Fig. 13. Gate-source voltage as a function of gate charge; typical values

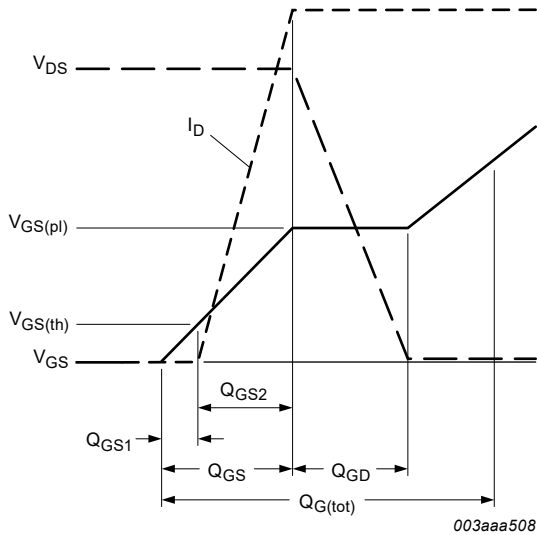
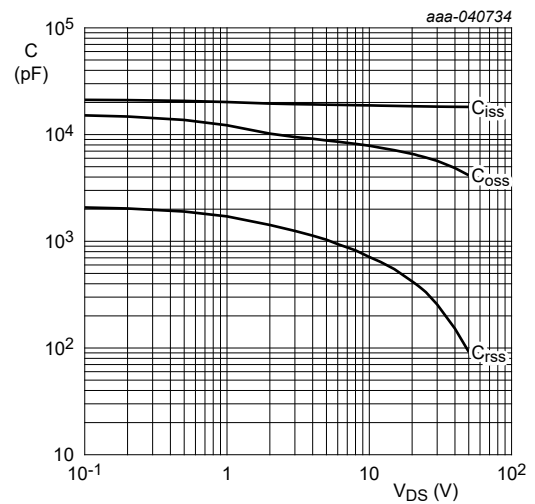
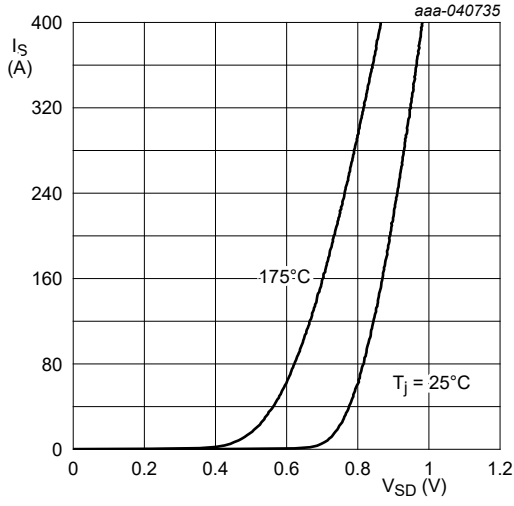


Fig. 14. Gate charge waveform definitions



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

Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$V_{GS} = 0$ V

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

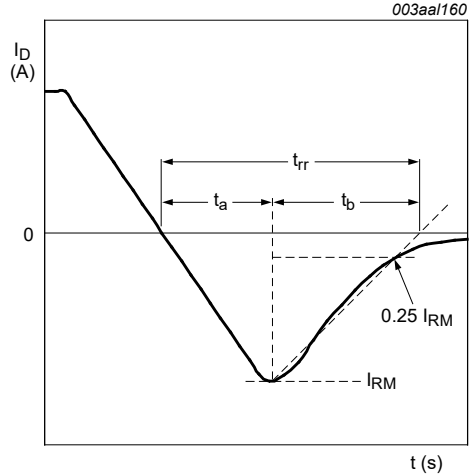
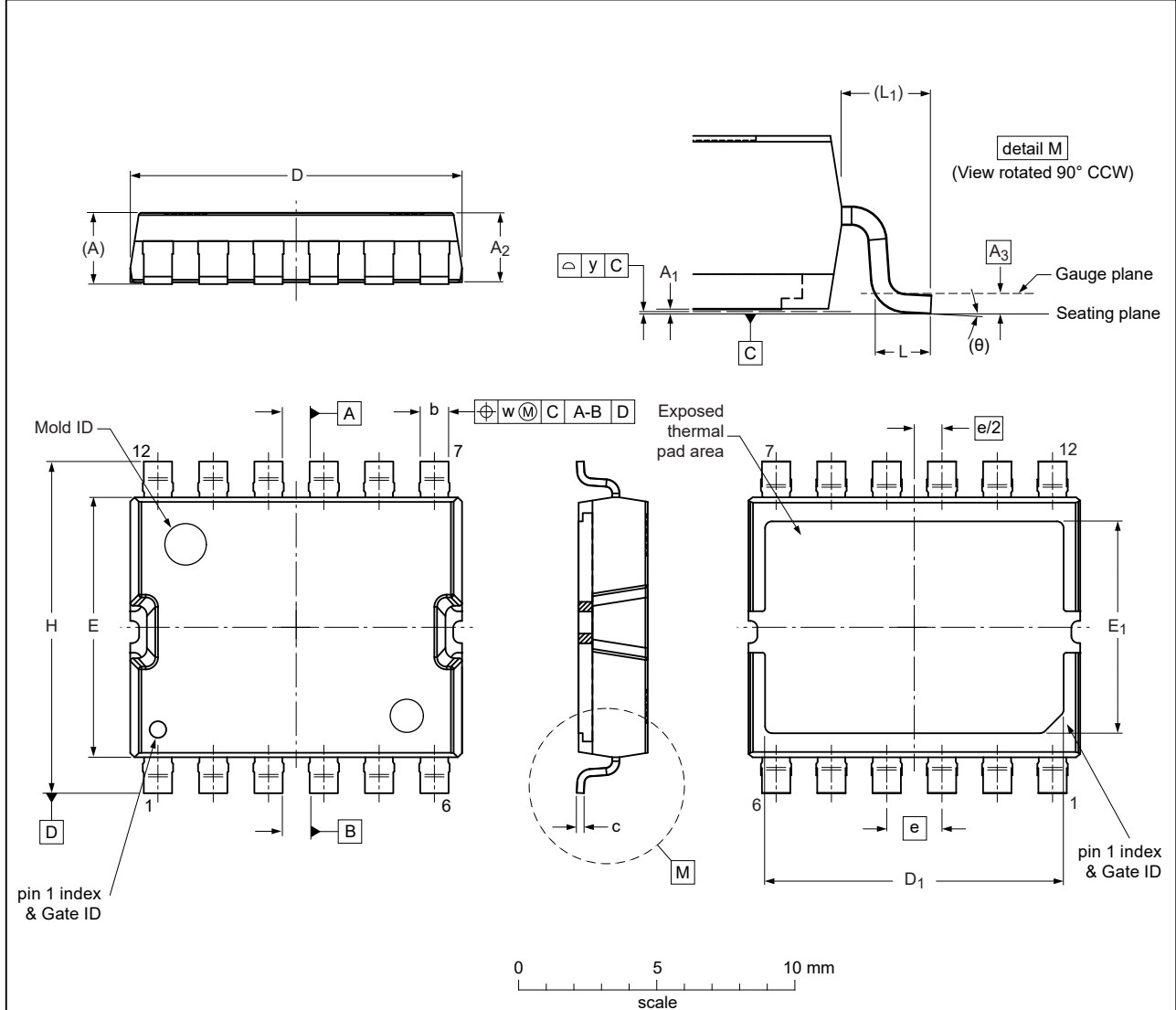


Fig. 17. Reverse recovery timing definition

11. Package outline

Plastic, surface mounted copper clip package (CCPAK1212);
13 terminals; 2.0 mm pitch, 12 mm x 12 mm x 2.5 mm body

SOT8000A



Dimensions (mm are the original dimensions)

Unit ⁽¹⁾	A(ref)	A ₁	A ₂	A ₃	b	c	D	D ₁	E	E ₁	e	H	L	L ₁ (ref)	w	y	θ(ref)	
max		0.13	2.65		1.12	0.30	12.15	10.95	9.55	7.40		12.15	1.0					
mm nom	2.75			0.25							2.0			1.3	0.20	0.1	4°	
min		0	2.4		0.93	0.22	11.85	10.65	9.25	7.10		11.85	0.6					

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included for dimension D.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included for dimension E.

sot8000a_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT8000A		MO-359			23-12-12 24-04-16

Fig. 18. Package outline CCPAK1212 (SOT8000A)

12. Soldering

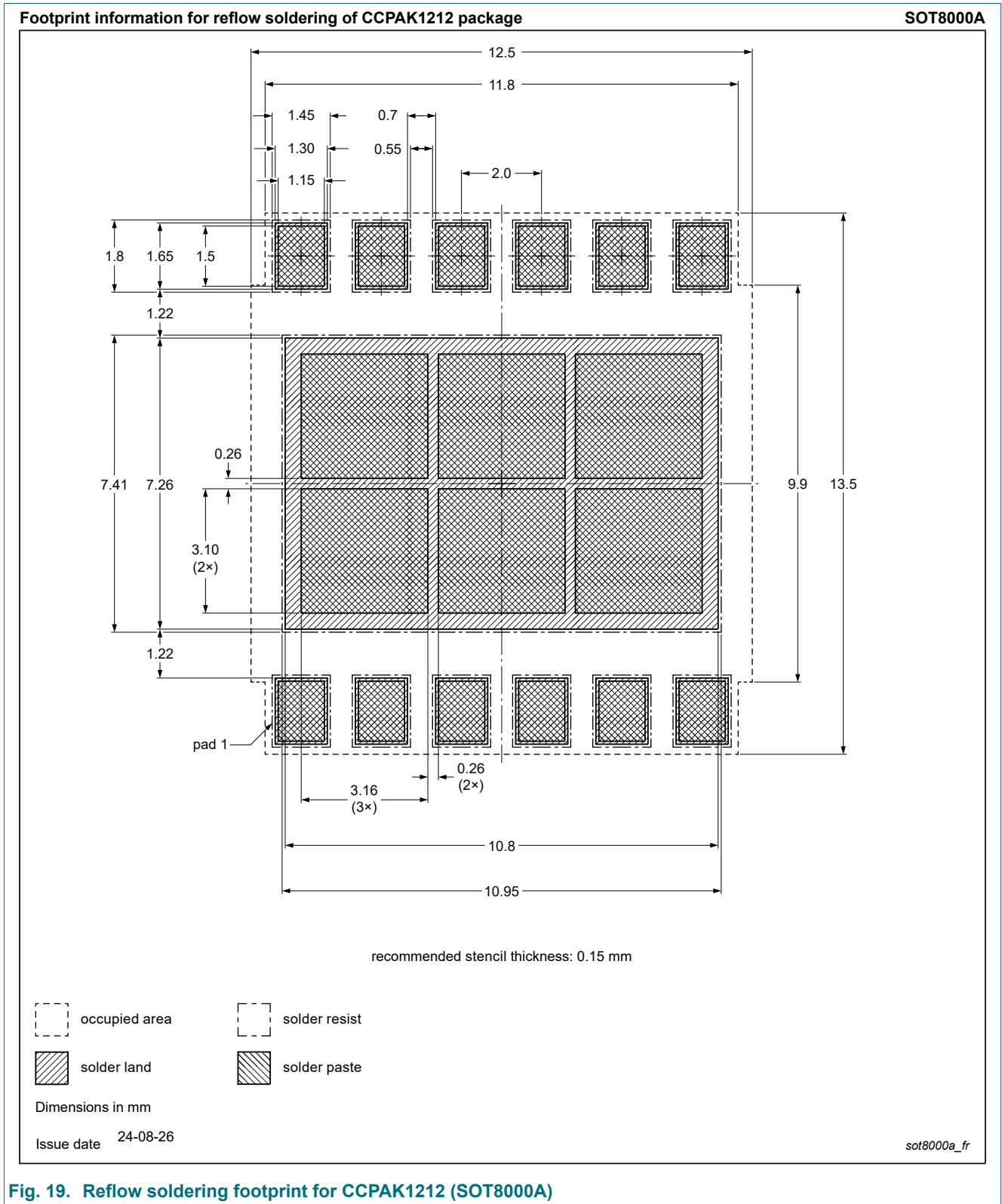


Fig. 19. Reflow soldering footprint for CCPAK1212 (SOT8000A)

13. 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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Date of release: 6 December 2024
