



PSMN1R0-80CSE

N-channel, 80 V, 0.95 mOhm, MOSFET with enhanced SOA in CCPAK1212i package

12 August 2024

Preliminary data sheet

1. General description

N-channel enhancement mode MOSFET in a CCPAK1212i package qualified to 175 °C. Part of Nexperia's Application Specific MOSFETs (ASFETs) for Hotswap and Soft Start. The PSMN1R0-80CSE delivers very low R_{DSon} and enhanced safe operating area performance in a high-reliability copper-clip package (CCPAK1212i).

PSMN1R0-80CSE complements the latest "hot-swap" controllers - robust enough to withstand substantial inrush currents during turn-on, low R_{DSon} to minimize I^2R losses and deliver optimum efficiency when turned fully ON.

2. Features and benefits

- Fully optimized Safe Operating Area (SOA) for superior linear mode operation
- Low R_{DSon} for low I^2R conduction losses
- CCPAK1212i package for applications that demand the highest performance and reliability
- Inverted package, suitable for top-side cooling

3. Applications

- Hot swap
- Load switch
- Soft start
- E-fuse
- Telecommunication systems based on a 48 V backplane/supply rail

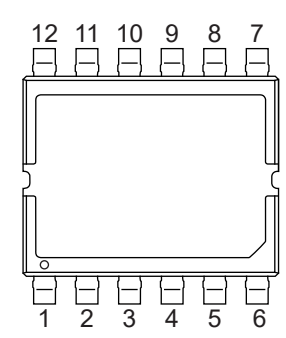
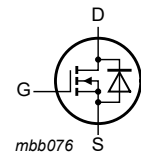
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	-	80	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C};$ Fig. 2	-	-	495	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C};$ Fig. 1	-	-	1.55	kW
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_j = 25\text{ °C};$ Fig. 11	-	0.76	0.95	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$I_D = 25\text{ A}; V_{DS} = 40\text{ V}; V_{GS} = 10\text{ V};$ $T_j = 25\text{ °C};$ Fig. 13 ; Fig. 14	13	42.5	98	nC
Source-drain diode						
Q_r	recovered charge	$I_S = 25\text{ A}; di_S/dt = -100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V};$ $V_{DS} = 40\text{ V}; T_j = 25\text{ °C};$ Fig. 17	-	101	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p style="text-align: center;"><i>sot8005a_sv</i> CCPAK1212i (SOT8005A)</p>	 <p style="text-align: center;"><i>mbb076</i></p>
2	S	source		
3	S	source		
4	S	source		
5	S	source		
6	G	gate		
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
PSMN1R0-80CSE	CCPAK1212i	Plastic, surface mounted copper clip package (CCPAK1212i); 12 terminals; 2.0 mm pitch, 12 mm × 12 mm × 2.5 mm body	SOT8005A

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN1R0-80CSE	XP1E0S80C

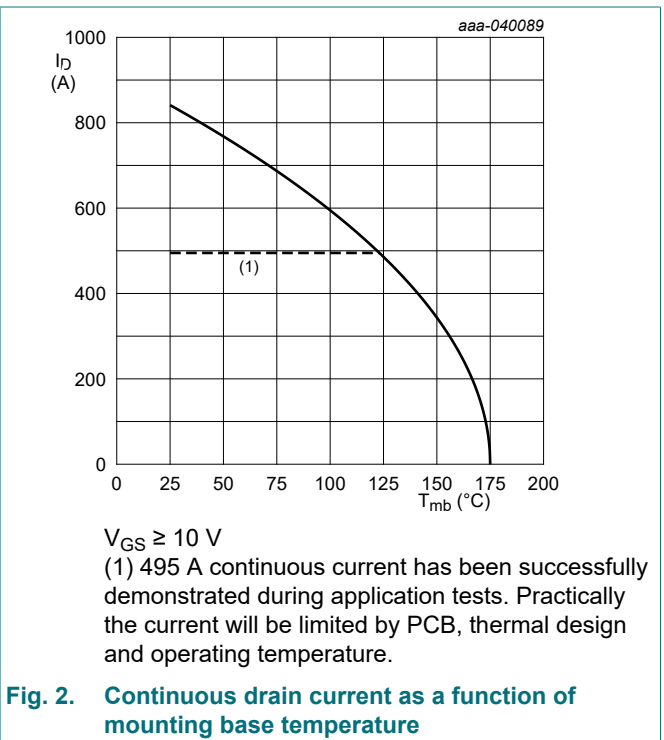
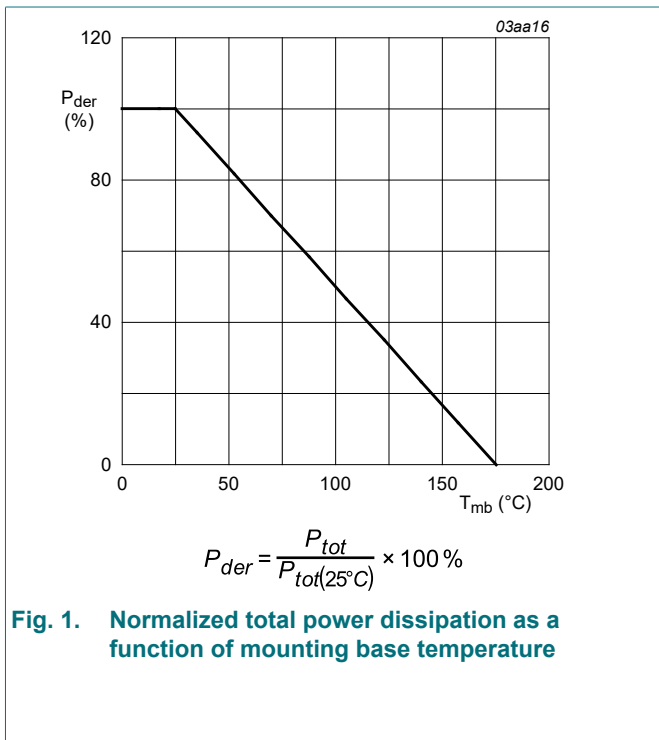
8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C	-	80	V
V _{DGR}	drain-gate voltage	25 °C ≤ T _j ≤ 175 °C; R _{GS} = 20 kΩ	-	80	V
V _{GS}	gate-source voltage		-20	20	V
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 1	-	1.55	kW
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; Fig. 2	-	495	A
		V _{GS} = 10 V; T _{mb} = 100 °C; Fig. 2	-	495	A
I _{DM}	peak drain current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C; Fig. 3	-	3365	A
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	-	420	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C	-	3365	A
Avalanche ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 129 A; V _{sup} ≤ 80 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; t _p = 282 μs; Fig. 4	[1]	-	1890 mJ
I _{AS}	non-repetitive avalanche current	V _{sup} ≤ 80 V; V _{GS} = 10 V; T _{j(init)} = 25 °C; R _{GS} = 50 Ω; Fig. 4	[1]	-	129 A

[1] Protected by 100% test



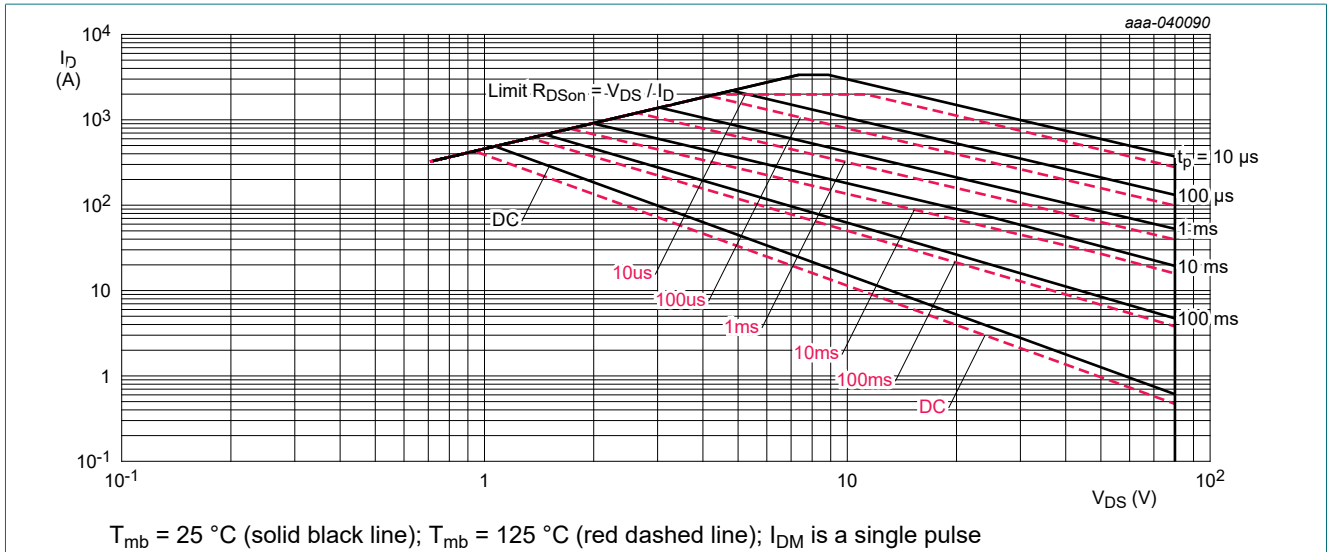


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

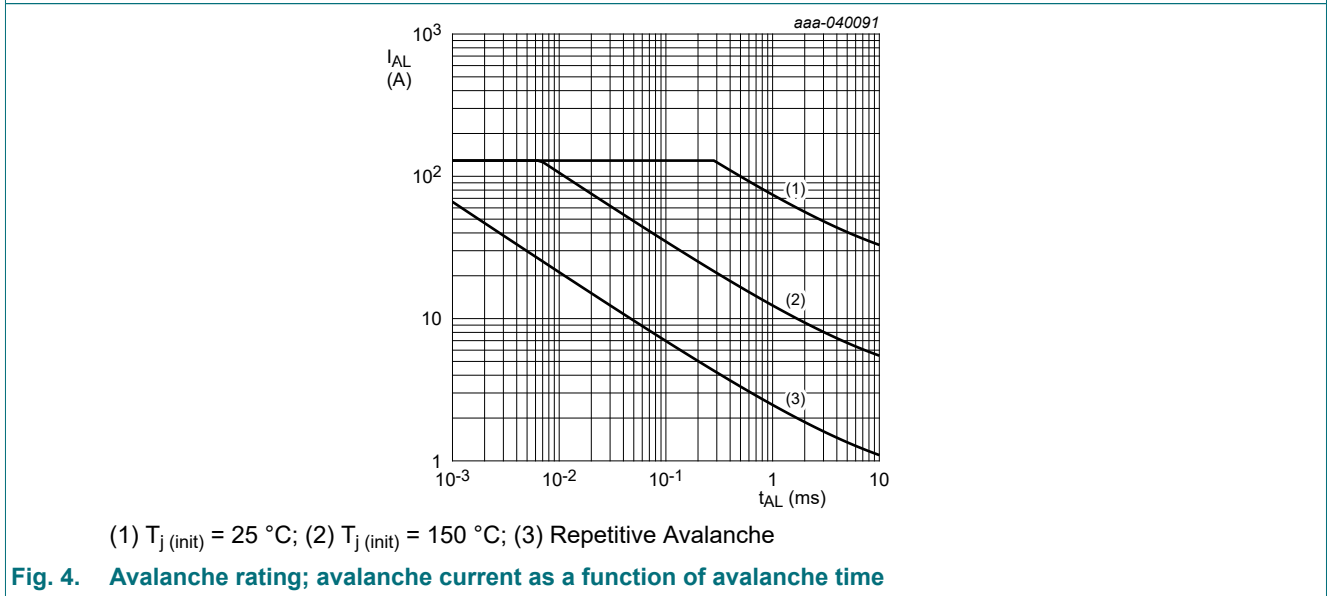


Fig. 4. Avalanche rating; avalanche current as a function of avalanche time

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	-	0.075	0.1	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Fig. 6	-	47.4	-	K/W
		Fig. 7	-	11.7	-	K/W

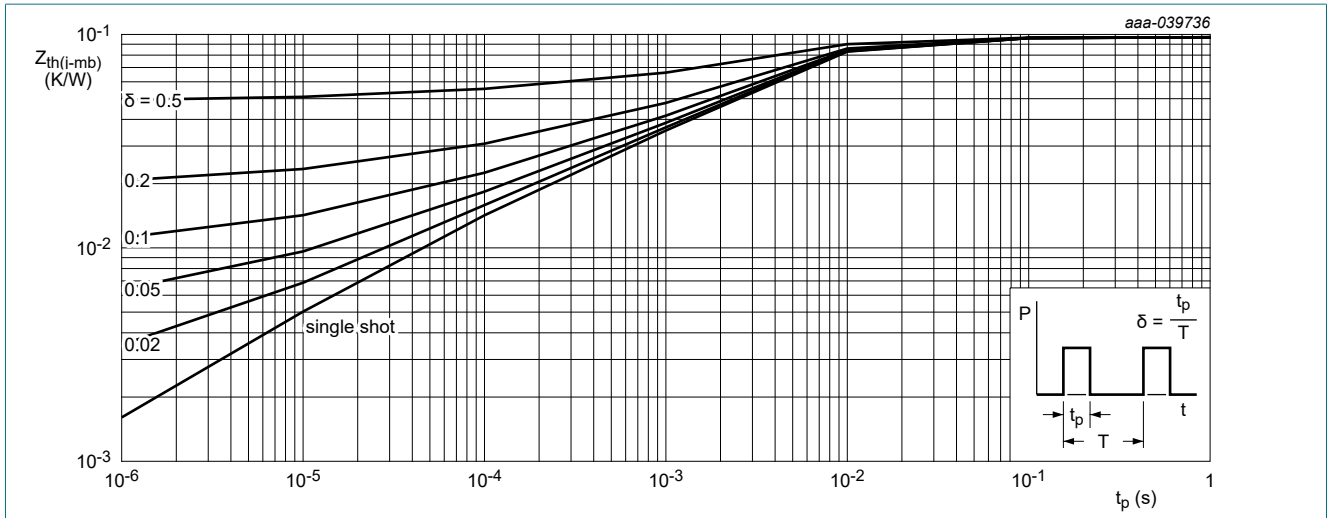


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

<p style="text-align: right;">aaa-040399</p> <p>70 μm thick copper on FR4 board</p> <p>Fig. 6. PCB layout with minimum footprint for thermal resistance from junction to ambient</p>	<p style="text-align: right;">aaa-040400</p> <p>Copper area 25.4 mm square; 70 μm thick on FR4 board</p> <p>Fig. 7. PCB layout for thermal resistance from junction to ambient</p>
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10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	80	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	72	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C$	2	2.8	3.6	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 175 \text{ }^\circ C$	-	1.71	-	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$	-	3.2	-	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25 \text{ }^\circ C \leq T_j \leq 150 \text{ }^\circ C$	-	-6.92	-	mV/K
I_{DSS}	drain leakage current	$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.19	2	μA
		$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ C$	-	42	200	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
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ C$; Fig. 11	-	0.76	0.95	m Ω
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 100 \text{ }^\circ C$; Fig. 12	-	1.2	1.5	m Ω
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ C$; Fig. 12	-	1.6	2.2	m Ω
R_G	gate resistance	$f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ C$	0.67	1.35	2.69	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 25 \text{ A}; V_{DS} = 40 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ C$; Fig. 13 ; Fig. 14	168	336	504	nC
		$I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ C$	-	305	-	nC
Q_{GS}	gate-source charge	$I_D = 25 \text{ A}; V_{DS} = 40 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ C$; Fig. 13 ; Fig. 14	68	113	158	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	74.5	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	38	-	nC
Q_{GD}	gate-drain charge		13	42.5	98	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25 \text{ A}; V_{DS} = 40 \text{ V}; T_j = 25 \text{ }^\circ C$; Fig. 13 ; Fig. 14	-	4.5	-	V
C_{iss}	input capacitance	$V_{DS} = 40 \text{ V}; V_{GS} = 0 \text{ V}; f = 0.5 \text{ MHz}; T_j = 25 \text{ }^\circ C$; Fig. 15	15772	26287	36802	pF
C_{oss}	output capacitance		3684	6139	9823	pF
C_{rss}	reverse transfer capacitance		16	163	489	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 40 \text{ V}; R_L = 1.6 \text{ } \Omega; V_{GS} = 10 \text{ V}; R_{G(ext)} = 5 \text{ } \Omega; T_j = 25 \text{ }^\circ C$	-	95	-	ns
t_r	rise time		-	84	-	ns
$t_{d(off)}$	turn-off delay time		-	205	-	ns
t_f	fall time		-	107	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$; Fig. 16	-	0.76	1	V

N-channel, 80 V, 0.95 mOhm, MOSFET with enhanced SOA in CCPAK1212i package

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_{rr}	reverse recovery time	$I_S = 25 \text{ A}$; $di_S/dt = -100 \text{ A}/\mu\text{s}$; $V_{GS} = 0 \text{ V}$;	-	75	-	ns
Q_r	recovered charge	$V_{DS} = 40 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 17	-	101	-	nC

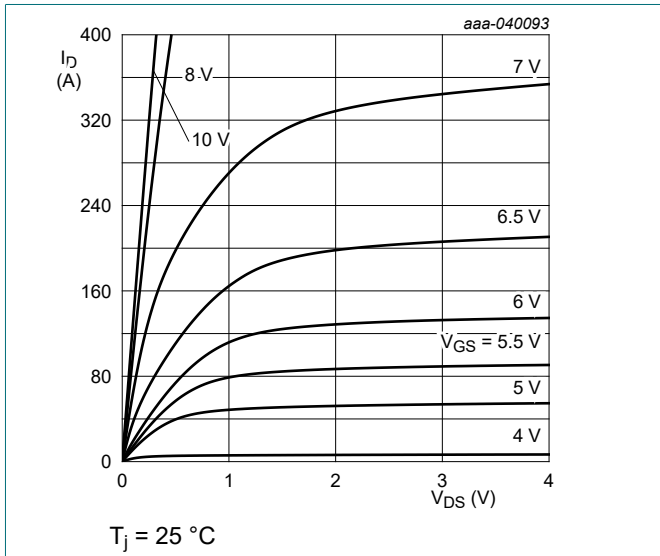


Fig. 8. Output characteristics; drain current as a function of drain-source voltage; typical values

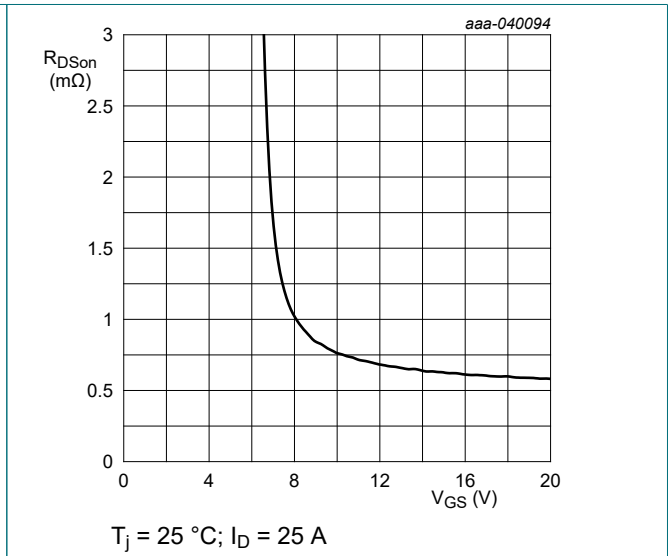


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

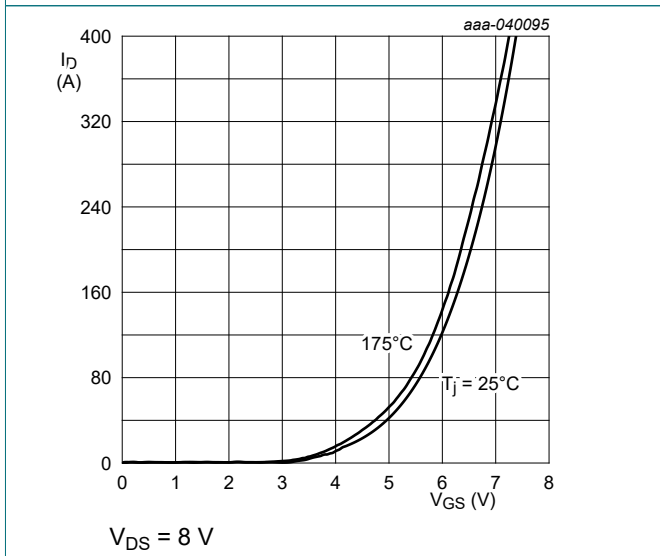


Fig. 10. Transfer characteristics; drain current as a function of gate-source voltage; typical values

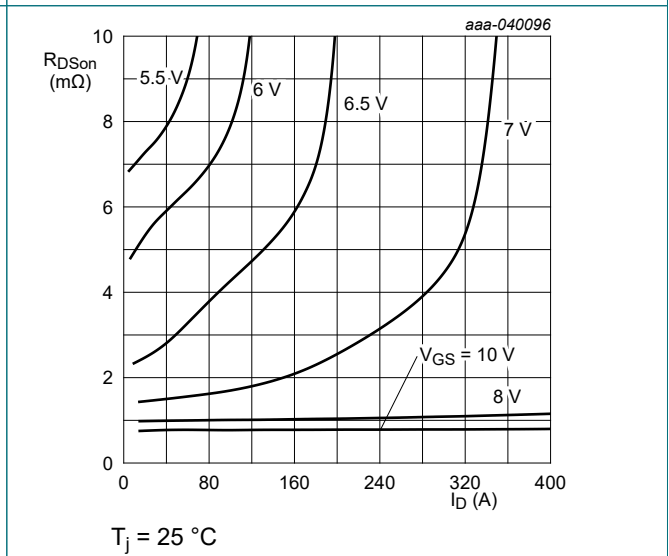
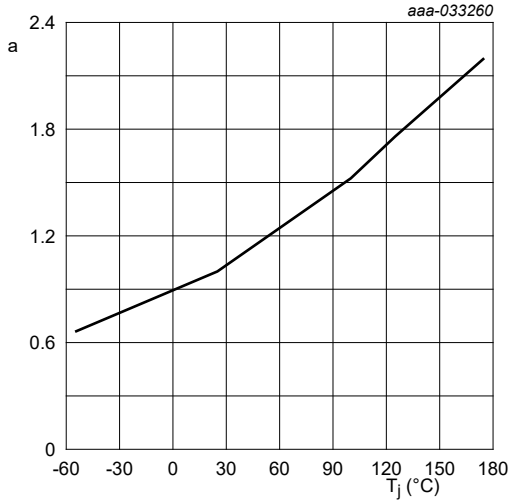
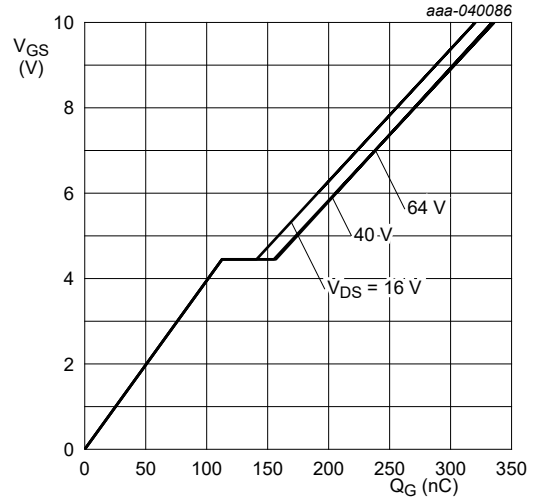


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values



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

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

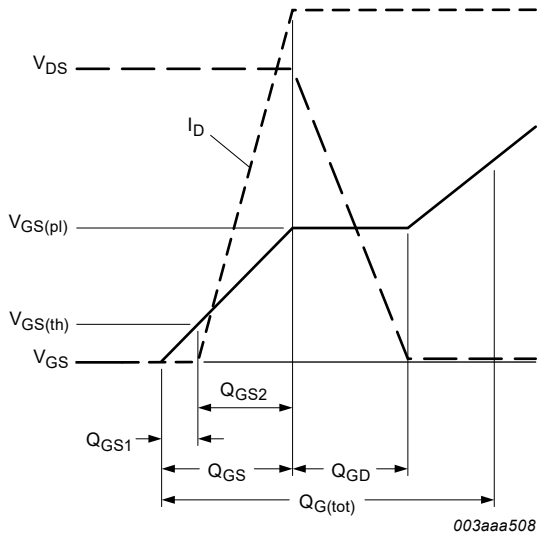
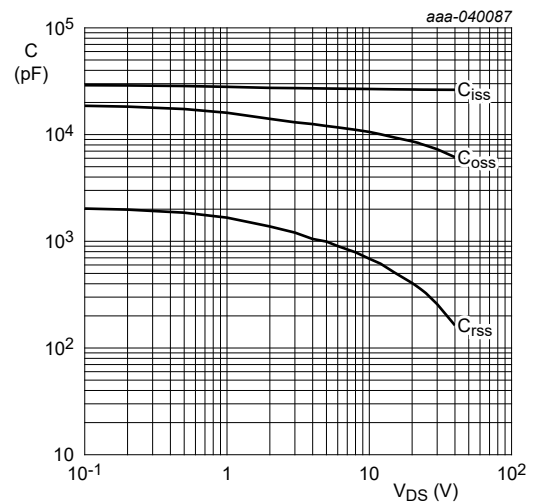
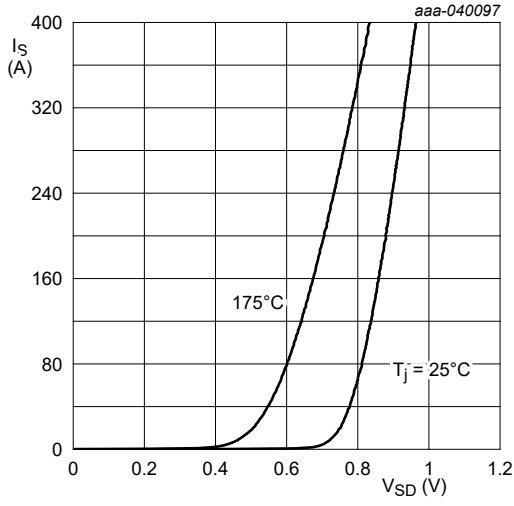


Fig. 14. Gate charge waveform definitions



$V_{GS} = 0\text{ V}; f = 0.5\text{ MHz}$

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



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

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

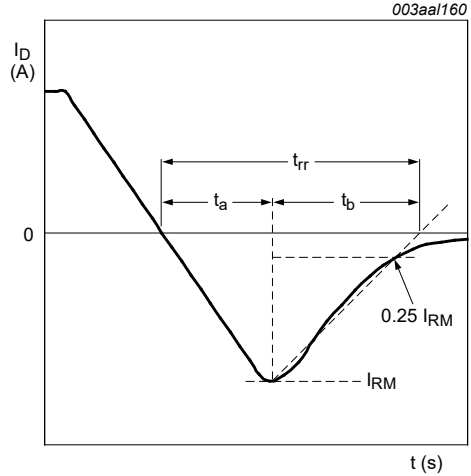


Fig. 17. Reverse recovery timing definition

11. Package outline

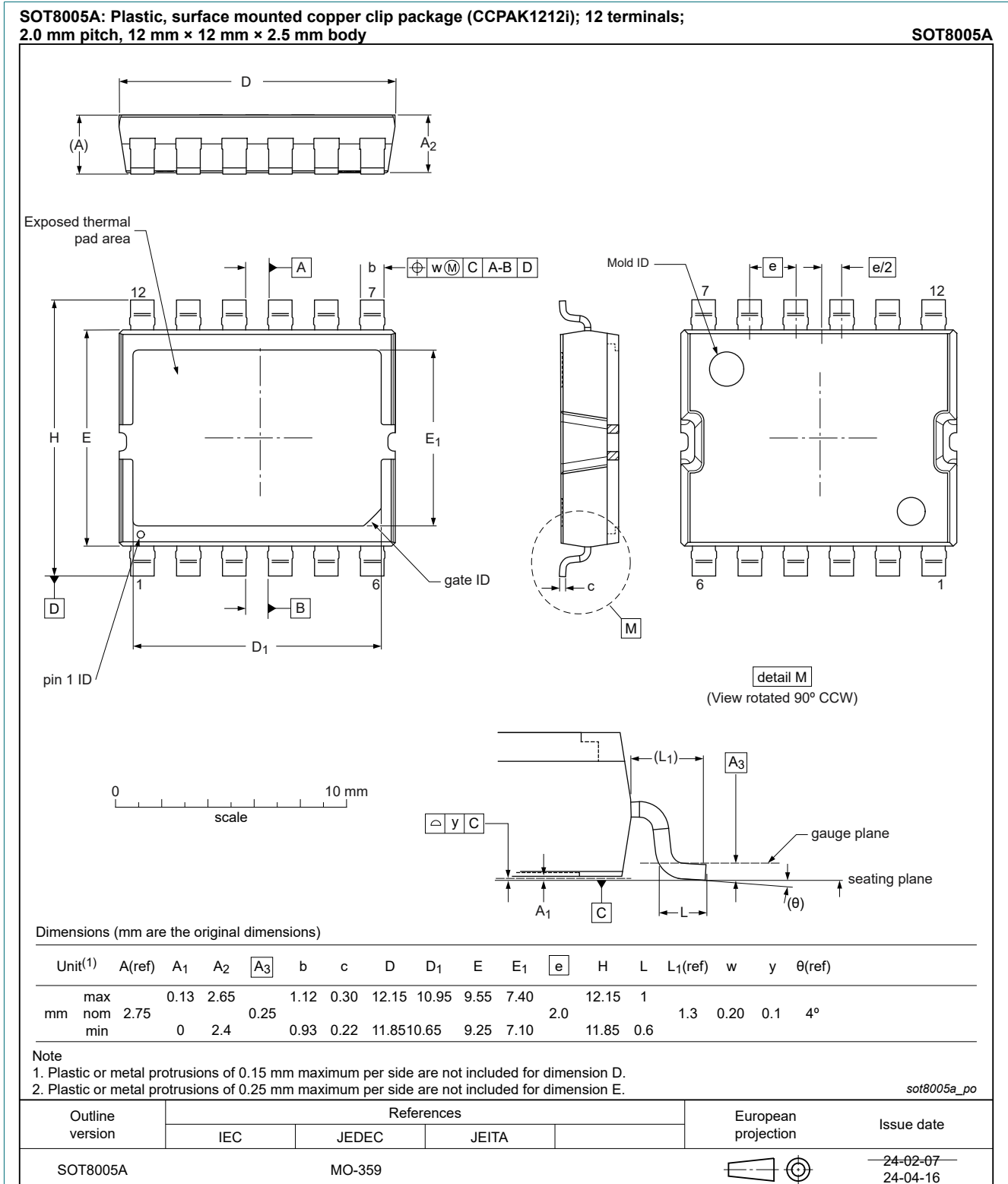


Fig. 18. Package outline CCPAK1212i (SOT8005A)

12. Legal information

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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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