



PSMN2R0-30PL

N-channel 30 V 2.1 mΩ logic level MOSFET

Rev. 01 — 24 June 2009

Product data sheet

1. Product profile

1.1 General description

Logic level N-channel MOSFET in TO220 package qualified to 175 °C. This product is designed and qualified for use in a wide range of industrial, communications and domestic equipment.

1.2 Features and benefits

- High efficiency due to low switching and conduction losses
- Suitable for logic level gate drive sources

1.3 Applications

- DC-to-DC converters
- Motor control
- Load switching
- Server power supplies

1.4 Quick reference data

Table 1. Quick reference

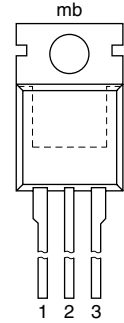
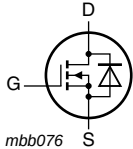
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	30	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1	[1]	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	211	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 4.5\text{ V}$; $I_D = 25\text{ A}$;	-	16	-	nC
$Q_{G(tot)}$	total gate charge	$V_{DS} = 12\text{ V}$; see Figure 13 ; see Figure 14	-	55	-	nC
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}$; $I_D = 15\text{ A}$; $T_j = 25\text{ °C}$	-	2	2.8	mΩ
		$V_{GS} = 10\text{ V}$; $I_D = 15\text{ A}$; $T_j = 25\text{ °C}$; see Figure 12	[2]	1.7	2.1	mΩ

[1] Continuous current is limited by package.

[2] Measured 3 mm from package.

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		
			SOT78 (TO-220AB)	

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PSMN2R0-30PL	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V _{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C	-	30	V
V _{DGR}	drain-gate voltage	T _j ≥ 25 °C; T _j ≤ 175 °C; R _{GS} = 20 kΩ	-	30	V
V _{GS}	gate-source voltage		-20	20	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 100 °C; see Figure 1 [1]	-	100	A
		V _{GS} = 10 V; T _{mb} = 25 °C; see Figure 1 [1]	-	100	A
I _{DM}	peak drain current	t _p ≤ 10 μs; pulsed; T _{mb} = 25 °C; see Figure 3	-	943	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; see Figure 2	-	211	W
T _{stg}	storage temperature		-55	175	°C
T _j	junction temperature		-55	175	°C

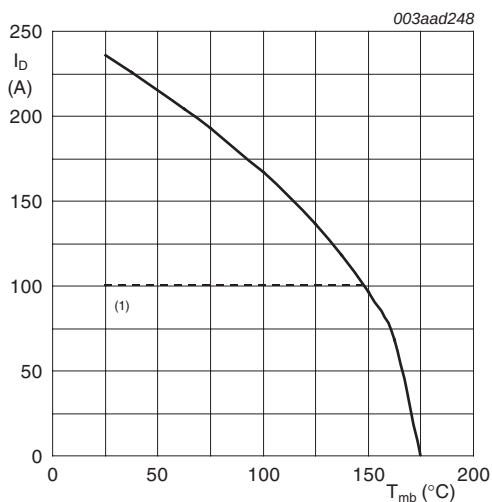
Source-drain diode

I_S	source current	$T_{mb} = 25\text{ °C}$	[1]	-	100	A
I_{SM}	peak source current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ °C}$	-	-	943	A

Avalanche ruggedness

$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; $I_D = 100\text{ A}$; $V_{sup} \leq 30\text{ V}$; $R_{GS} = 50\text{ }\Omega$; unclamped	-	-	555	mJ
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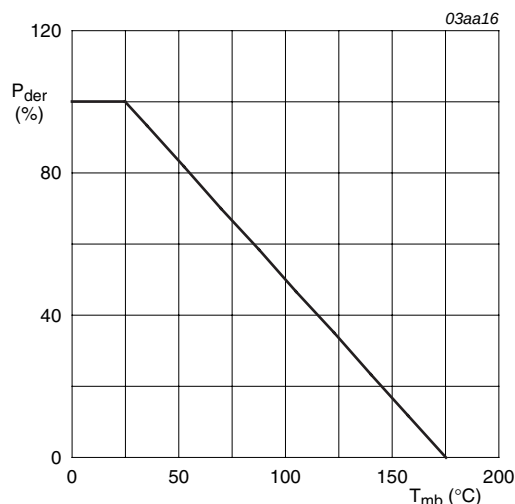
[1] Continuous current is limited by package.



$$V_{GS} \geq 10\text{ V}$$

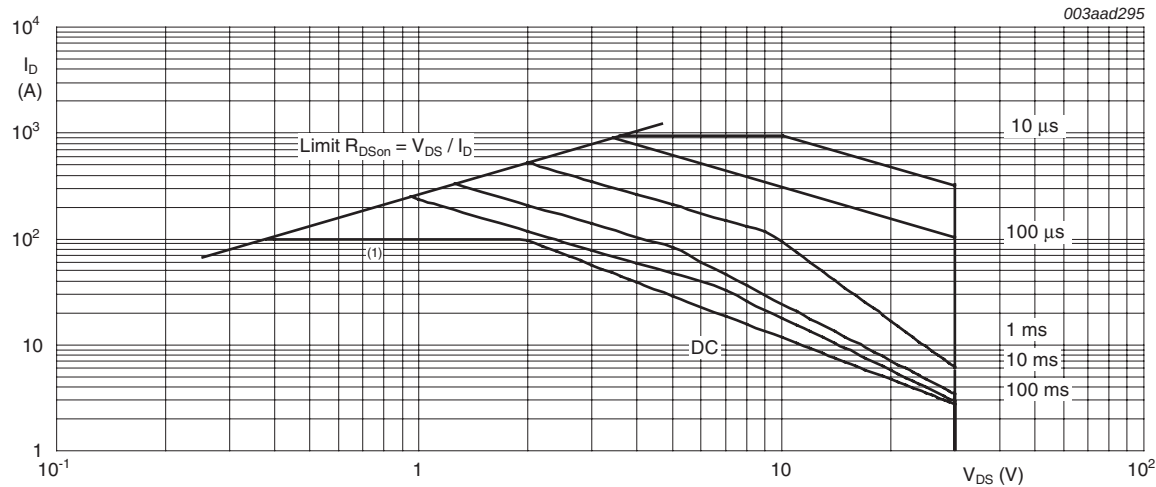
(1) Capped at 100 A due to package.

Fig 1. Normalized continuous drain current as a function of mounting base temperature



$$P_{der} = \frac{P_{tot}}{P_{tot(25\text{ °C})}} \times 100\%$$

Fig 2. Normalized total power dissipation as a function of mounting base temperature



$T_{mb} = 25\text{ }^{\circ}\text{C}; I_{DM}$ is single pulse
(1) Capped at 100 A due to package.

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

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	0.41	0.71	K/W

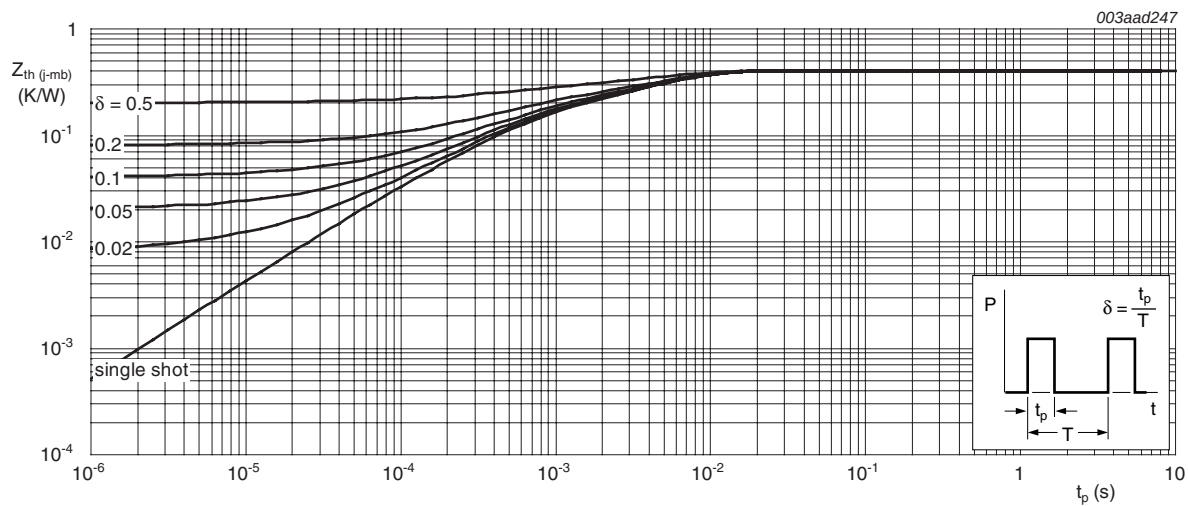


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

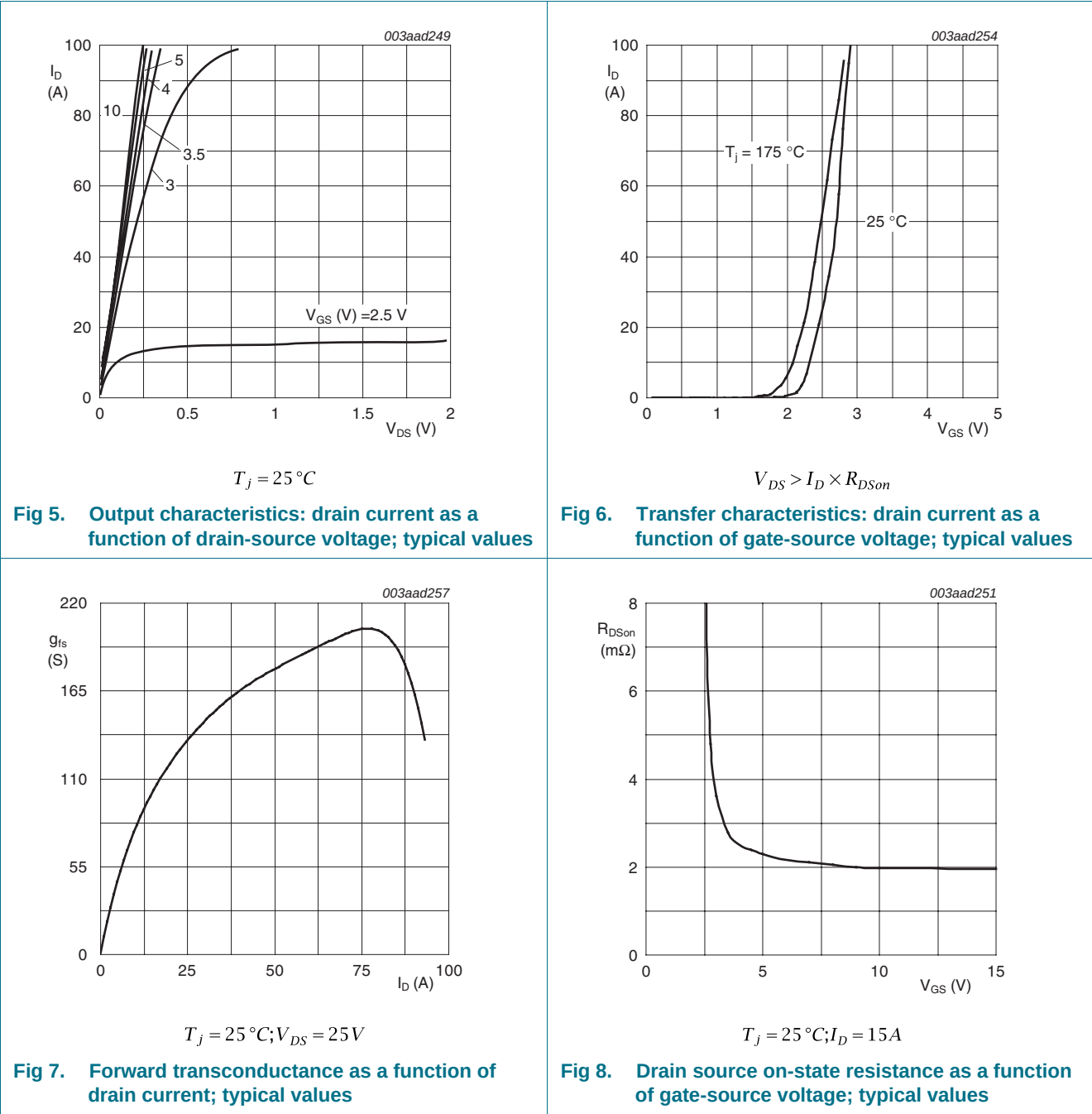
Table 6. Characteristics

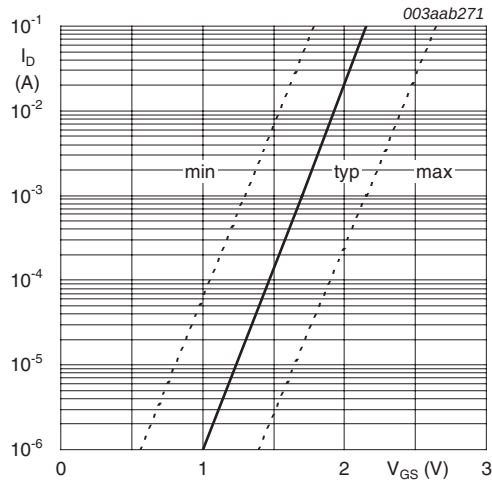
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C	30	-	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _j = -55 °C	27	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; see Figure 9 ; see Figure 10	1.3	1.7	2.15	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 175 °C; see Figure 10	0.5	-	-	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C; see Figure 10	-	-	2.45	V
I _{DSS}	drain leakage current	V _{DS} = 30 V; V _{GS} = 0 V; T _j = 25 °C	-	-	3	μA
		V _{DS} = 30 V; V _{GS} = 0 V; T _j = 125 °C	-	-	70	μA
I _{GSS}	gate leakage current	V _{GS} = 16 V; V _{DS} = 0 V; T _j = 25 °C	-	-	100	nA
		V _{GS} = -16 V; V _{DS} = 0 V; T _j = 25 °C	-	-	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 4.5 V; I _D = 15 A; T _j = 25 °C	-	2	2.8	mΩ
		V _{GS} = 10 V; I _D = 15 A; T _j = 100 °C; see Figure 11	-	-	3	mΩ
		V _{GS} = 10 V; I _D = 15 A; T _j = 25 °C; see Figure 12	[2]	-	1.7	2.1
R _G	gate resistance	f = 1 MHz	-	0.78	-	Ω
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 12 V; V _{GS} = 10 V; see Figure 13 ; see Figure 14	-	117	-	nC
		I _D = 25 A; V _{DS} = 12 V; V _{GS} = 4.5 V; see Figure 13 ; see Figure 14	-	55	-	nC
Q _{GS}	gate-source charge	I _D = 25 A; V _{DS} = 12 V; V _{GS} = 4.5 V; see Figure 13 ; see Figure 14	-	17	-	nC
Q _{GS(th)}	pre-threshold gate-source charge		-	11	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge		-	6	-	nC
Q _{GD}	gate-drain charge		-	16	-	nC
V _{GS(pl)}	gate-source plateau voltage	V _{DS} = 12 V; see Figure 13 ; see Figure 14	-	2.6	-	V
C _{iss}	input capacitance	V _{DS} = 12 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; see Figure 15	-	6810	-	pF
C _{oss}	output capacitance		-	1410	-	pF
C _{rss}	reverse transfer capacitance		-	650	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 12 V; R _L = 0.5 Ω; V _{GS} = 4.5 V; R _{G(ext)} = 4.7 Ω	-	63	-	ns
t _r	rise time		-	125	-	ns
t _{d(off)}	turn-off delay time		-	111	-	ns
t _f	fall time		-	59	-	ns

Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$; see Figure 16	-	0.76	1.2	V
t_{rr}	reverse recovery time	$I_S = 20\text{ A}$; $dI_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$;	-	49	-	ns
Q_r	recovered charge	$V_{DS} = 30\text{ V}$	-	66	-	nC

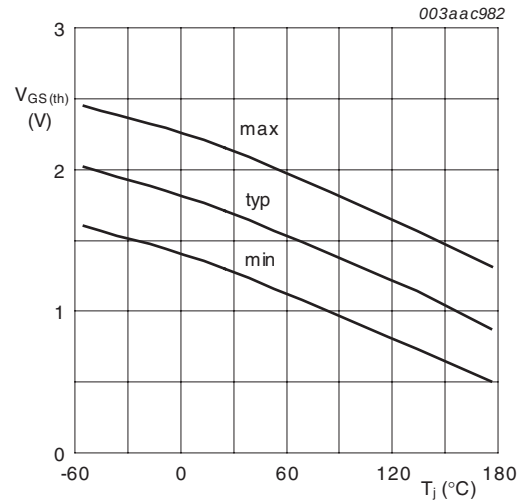
- [1] Tested to JEDEC standards where applicable.
[2] Measured 3 mm from package.





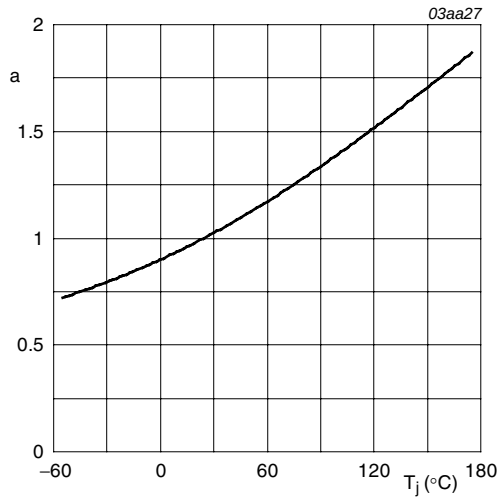
$$T_j = 25^\circ\text{C}; V_{DS} = 5\text{ V}$$

Fig 9. Sub-threshold drain current as a function of gate-source voltage



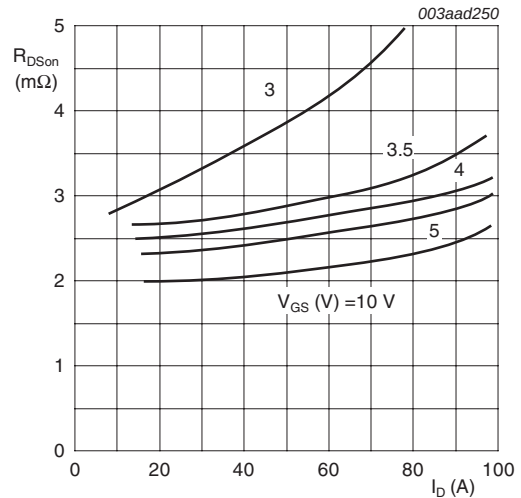
$$I_D = 1\text{ mA}; V_{DS} = V_{GS}$$

Fig 10. Gate-source threshold voltage as a function of junction temperature



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

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



$$T_j = 25^\circ\text{C}$$

Fig 12. Drain-source on-state resistance as a function of drain current; typical values

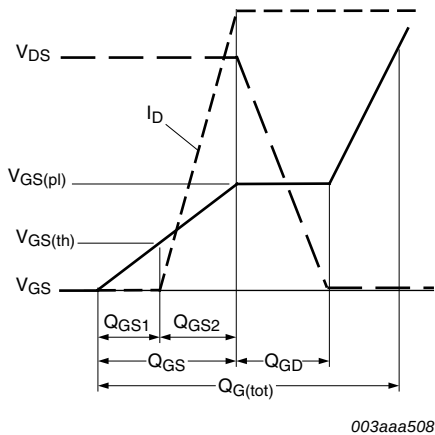
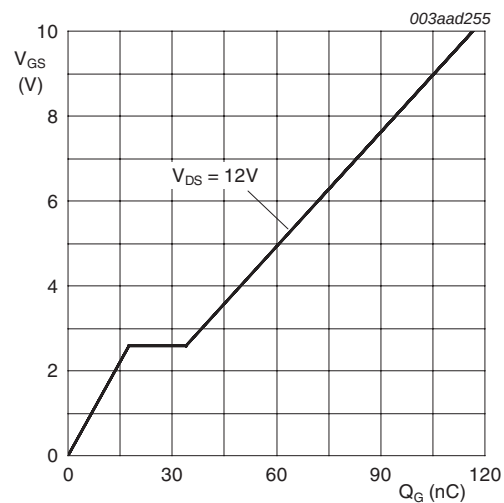
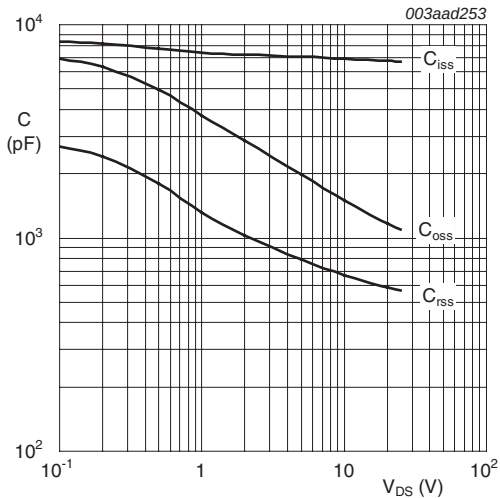


Fig 13. Gate charge waveform definitions



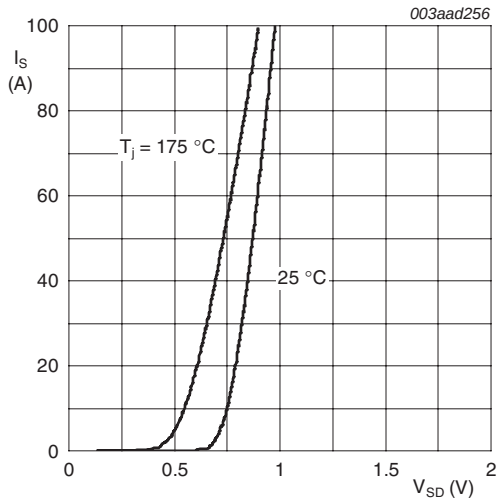
$T_j = 25\text{ }^{\circ}\text{C}; I_D = 25\text{ A}$

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



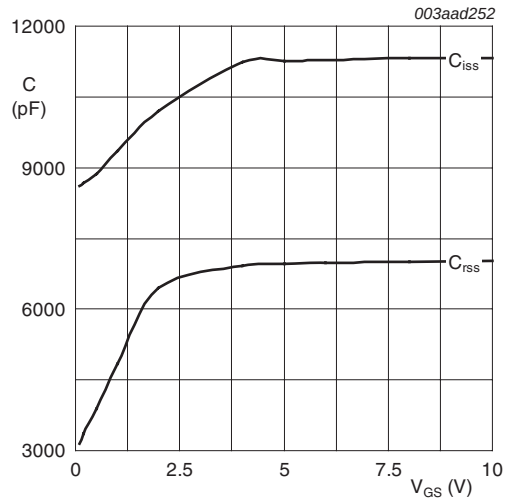
$V_{GS} = 0\text{ V}; f = 1\text{ MHz}$

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



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

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



$$V_{DS} = 0V; f = 1MHz$$

Fig 17. Input and reverse transfer capacitances as a function of gate-source voltage; typical values

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB SOT78

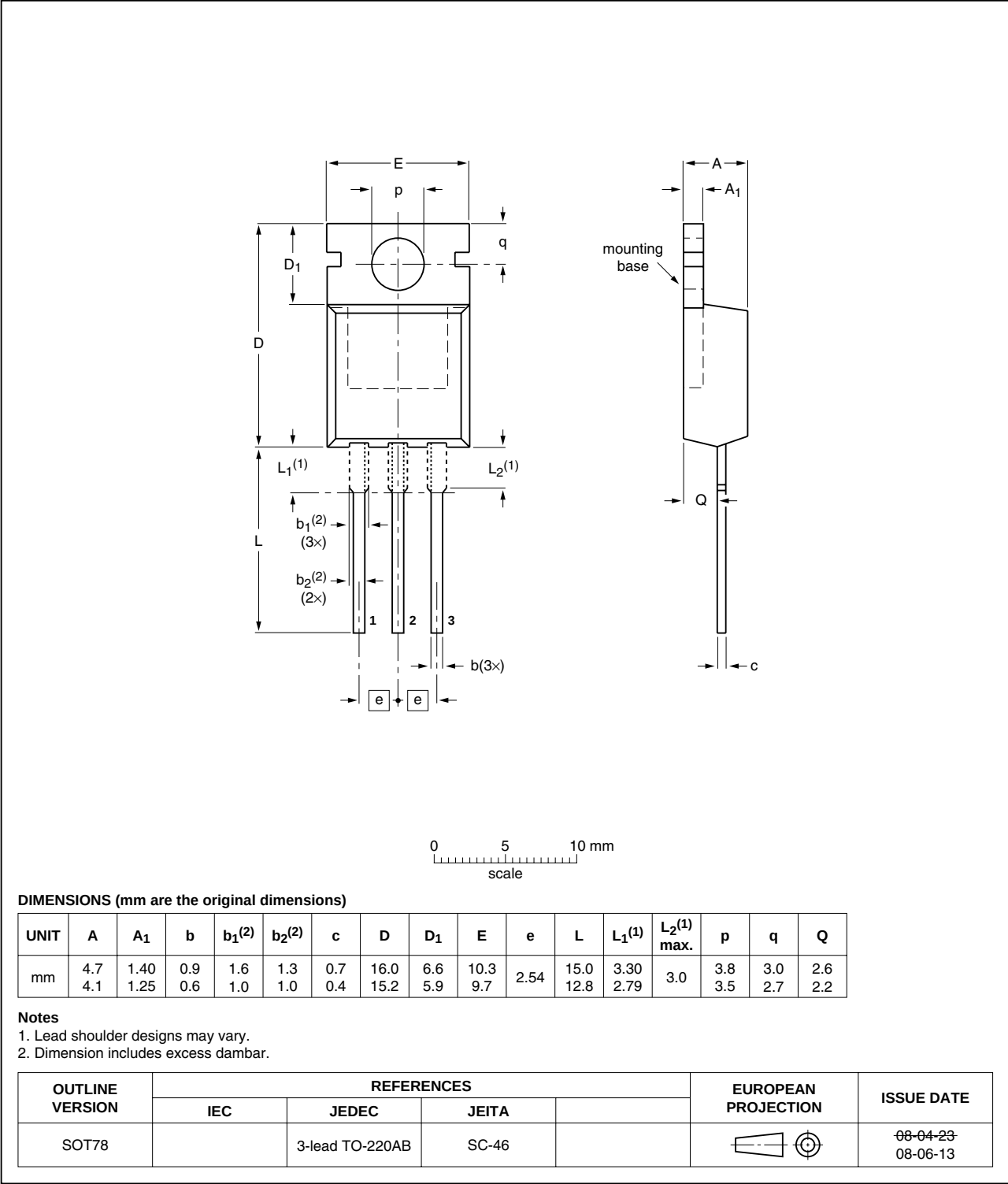


Fig 18. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN2R0-30PL_1	20090624	Product data sheet	-	-

9. Legal information

9.1 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.

[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".

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