



# PSMN3R3-80PS

N-channel 80 V, 3.3 m $\Omega$  standard level MOSFET in TO-220

Rev. 1 — 27 October 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Standard level N-channel MOSFET in TO-220 package qualified to 175C. 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 standard level gate drive

### 1.3 Applications

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

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	-	80	V
I <sub>D</sub>	drain current	T <sub>mb</sub> = 25 °C; V <sub>GS</sub> = 10 V; see <a href="#">Figure 1</a>	[1]	-	120	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	-	338	W
T <sub>j</sub>	junction temperature		-55	-	175	°C
<b>Static characteristics</b>						
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 100 °C; see <a href="#">Figure 12</a>	-	4.6	5.4	m $\Omega$
		V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>j</sub> = 25 °C; see <a href="#">Figure 13</a>	[2]	2.8	3.3	m $\Omega$
<b>Dynamic characteristics</b>						
Q <sub>GD</sub>	gate-drain charge	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 75 A; V <sub>DS</sub> = 40 V; see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	27	-	nC
Q <sub>G(tot)</sub>	total gate charge		-	139	-	nC
<b>Avalanche ruggedness</b>						
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; I <sub>D</sub> = 120 A; V <sub>sup</sub> ≤ 80 V; R <sub>GS</sub> = 50 $\Omega$ ; unclamped	-	-	676	mJ

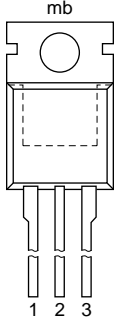
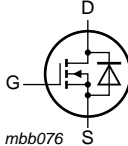
[1] Continuous current is limited by package.

[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	drain		

**SOT78 (TO-220AB)**

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
PSMN3R3-80PS	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

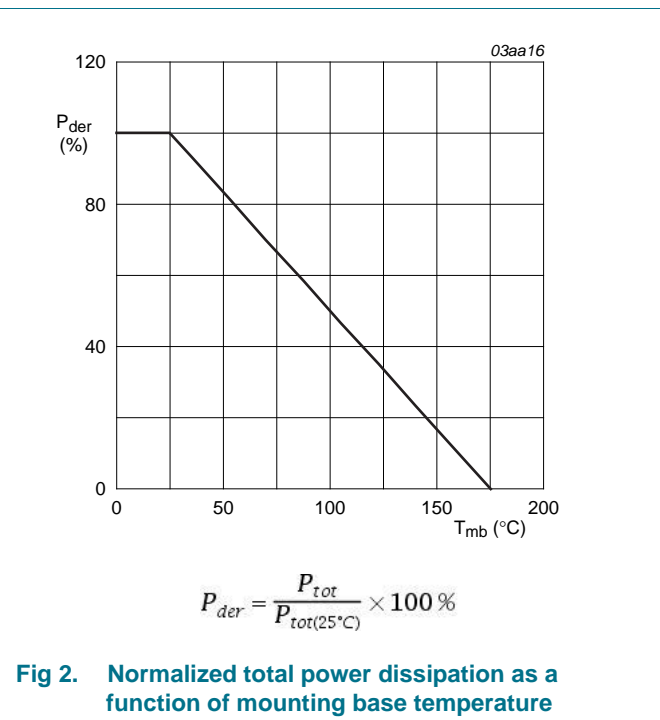
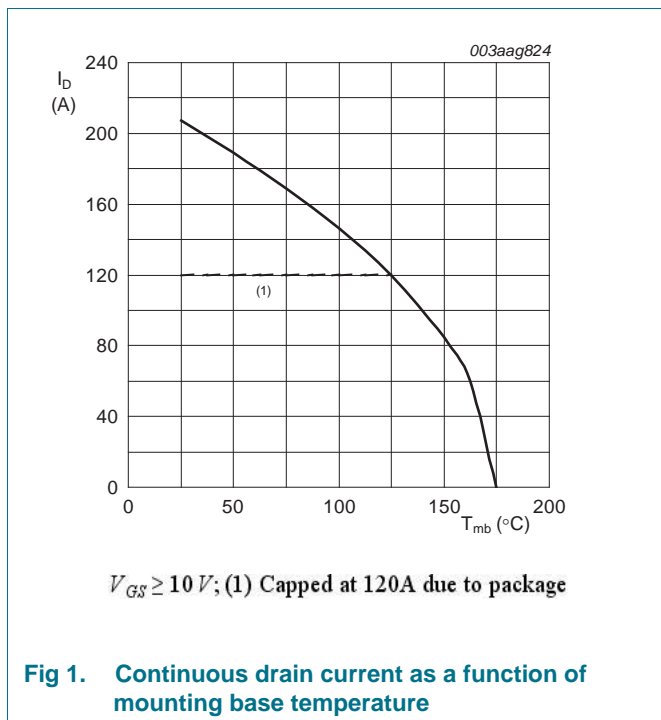
### 4. Limiting values

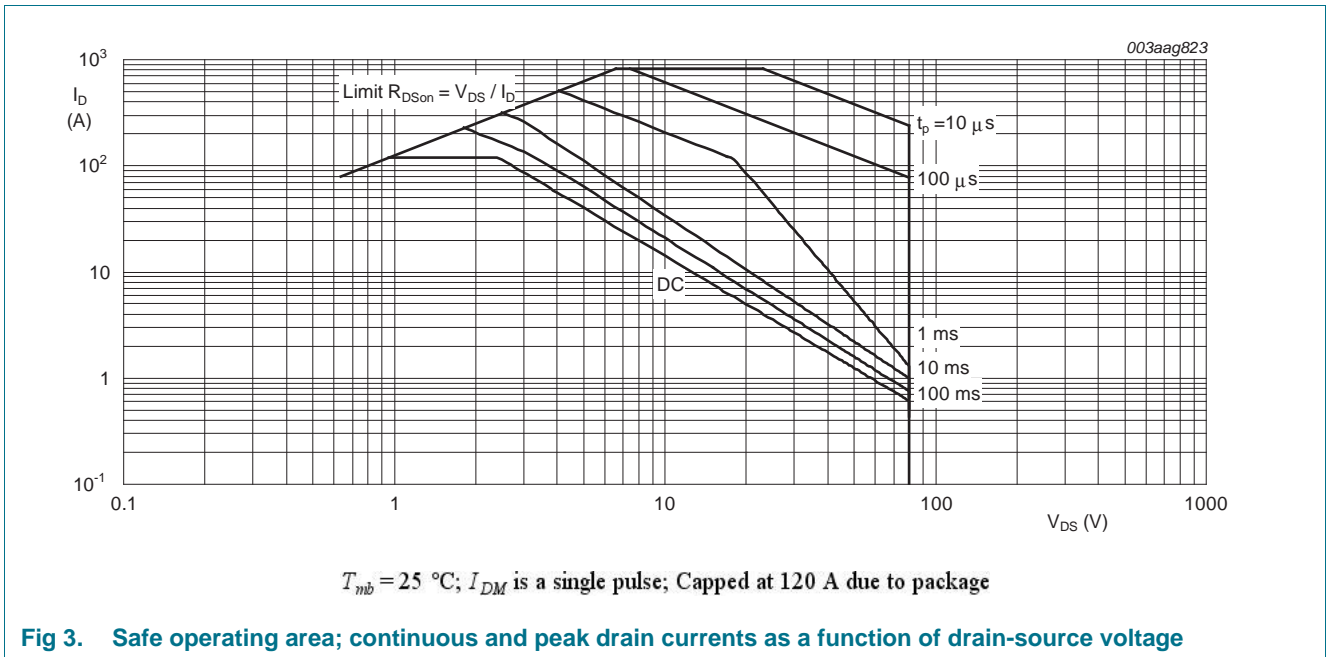
**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	80	V
V <sub>DGR</sub>	drain-gate voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C; R <sub>GS</sub> = 20 kΩ	-	80	V
V <sub>GS</sub>	gate-source voltage		-20	20	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 100 °C; see <a href="#">Figure 1</a>	[1]	120	A
		V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 1</a>	[1]	120	A
I <sub>DM</sub>	peak drain current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 3</a>	-	830	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	338	W
T <sub>stg</sub>	storage temperature		-55	175	°C
T <sub>j</sub>	junction temperature		-55	175	°C
T <sub>slid(M)</sub>	peak soldering temperature		-	260	°C
<b>Source-drain diode</b>					
I <sub>S</sub>	source current	T <sub>mb</sub> = 25 °C	[1]	120	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C	-	830	A
<b>Avalanche ruggedness</b>					
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; I <sub>D</sub> = 120 A; V <sub>sup</sub> ≤ 80 V; R <sub>GS</sub> = 50 Ω; unclamped	-	676	mJ

[1] Continuous current is limited by package.

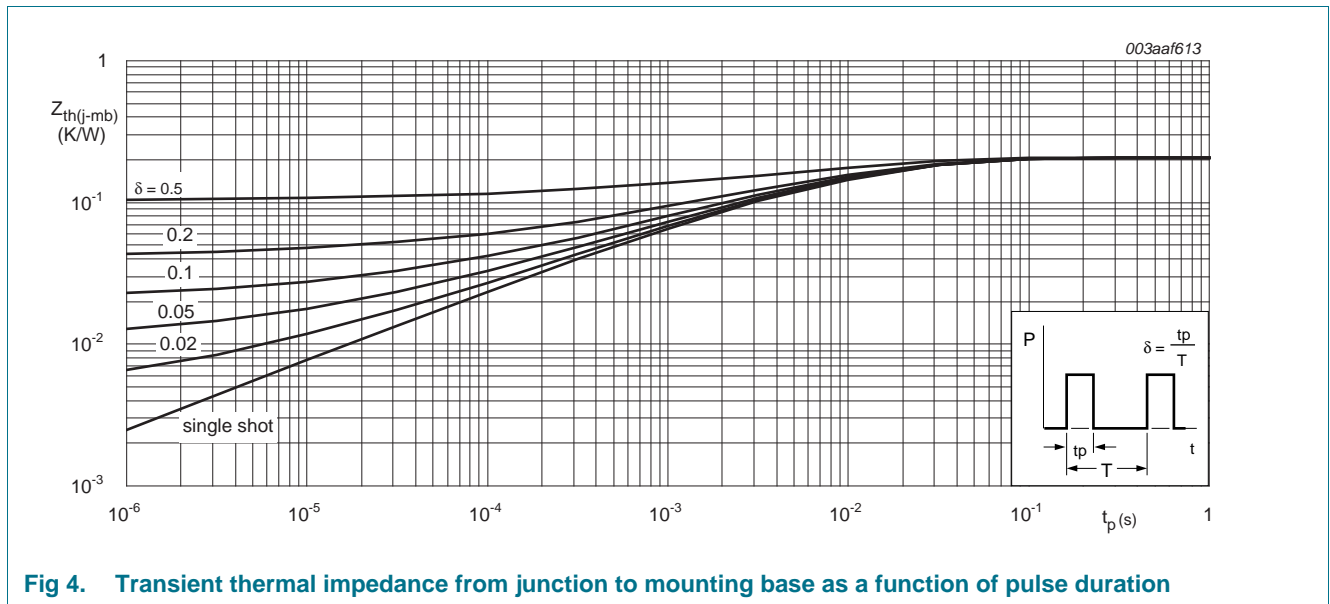




### 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see <a href="#">Figure 4</a>	-	0.22	0.44	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Vertical in free air	-	60	-	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
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	73	-	-	V
		$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	80	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 10</a>	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see <a href="#">Figure 10</a>	-	-	4.6	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	2	3	4	V
$I_{DSS}$	drain leakage current	$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.02	10	$\mu\text{A}$
		$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 12</a>	-	6.7	7.9	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 100 \text{ }^\circ\text{C};$ see <a href="#">Figure 12</a>	-	4.6	5.4	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 13</a>	<a href="#">11</a>	-	2.8	3.3
$R_G$	internal gate resistance (AC)	$f = 1 \text{ MHz}$	-	0.9	-	Ω
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}$	-	135	-	nC
		$I_D = 75 \text{ A}; V_{DS} = 40 \text{ V}; V_{GS} = 10 \text{ V};$ see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	139	-	nC
$Q_{GS}$	gate-source charge		-	51	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	30	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	21	-	nC
$Q_{GD}$	gate-drain charge		-	27	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25 \text{ A}; V_{DS} = 40 \text{ V};$ see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	5.8	-	V
$C_{iss}$	input capacitance	$V_{DS} = 40 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 16</a>	-	9961	-	pF
$C_{oss}$	output capacitance		-	847	-	pF
$C_{rss}$	reverse transfer capacitance		-	401	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 40 \text{ V}; R_L = 0.53 \text{ } \Omega;$	-	41	-	ns
$t_r$	rise time	$V_{GS} = 10 \text{ V}; R_{G(ext)} = 10 \text{ } \Omega; I_D = 75 \text{ A}$	-	43	-	ns
$t_{d(off)}$	turn-off delay time		-	109	-	ns
$t_f$	fall time		-	44	-	ns

Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 17</a>	-	0.8	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 25\text{ A}$ ; $di_S/dt = 100\text{ A}/\mu\text{s}$ ;	-	63	-	ns
$Q_r$	recovered charge	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 20\text{ V}$	-	121	-	nC

[1] Measured 3 mm from package.

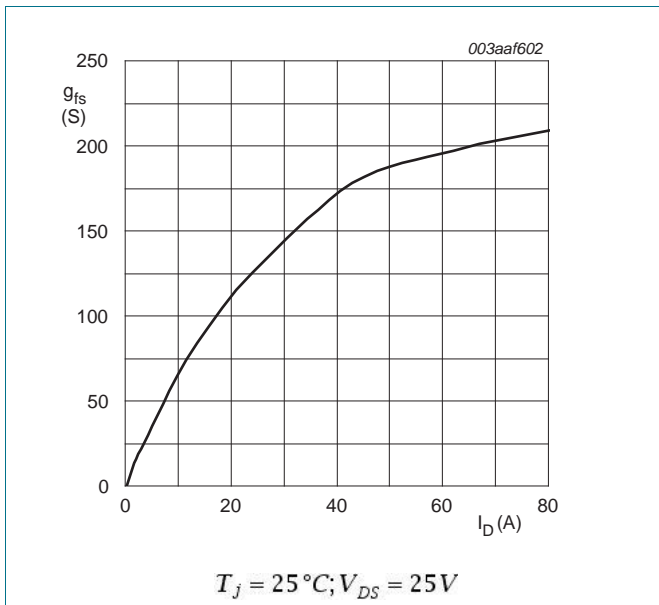


Fig 5. Forward transconductance as a function of drain current; typical values

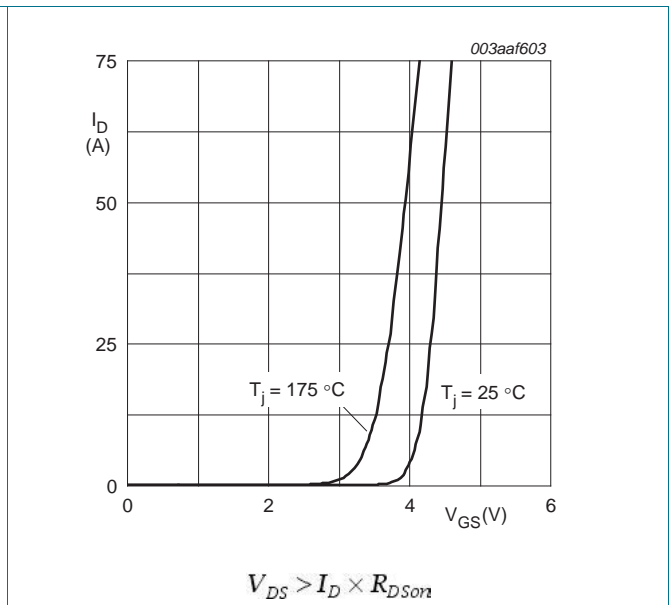


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values

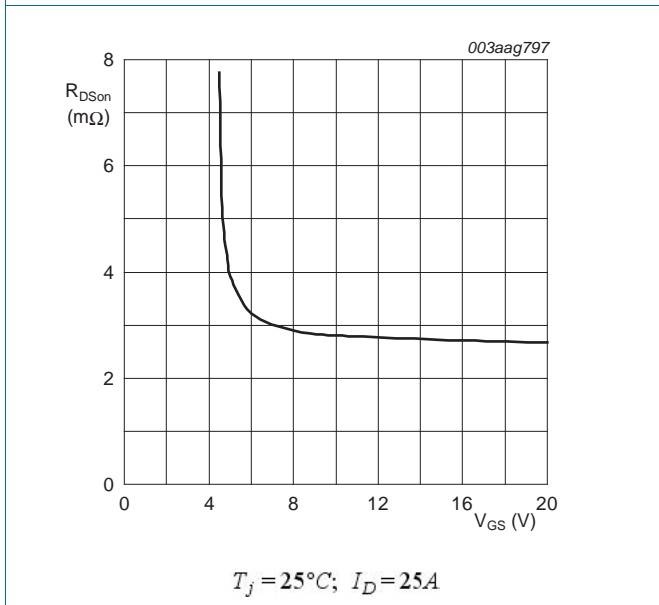


Fig 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

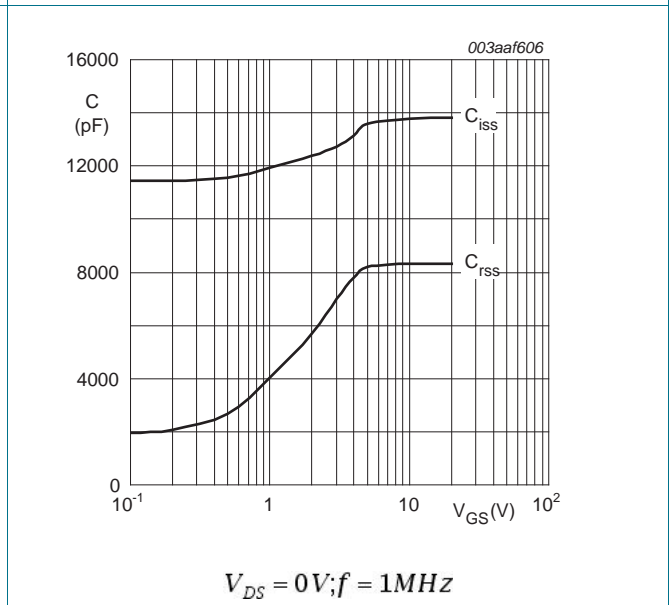


Fig 8. Input and reverse transfer capacitances as a function of gate-source voltage; typical values

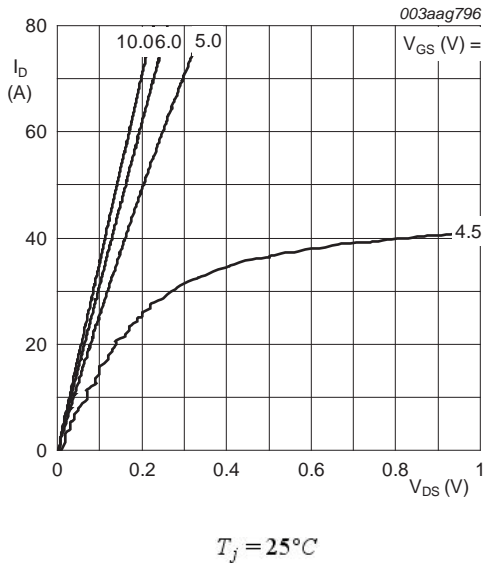


Fig 9. Output characteristics; drain current as a function of drain-source voltage; typical values

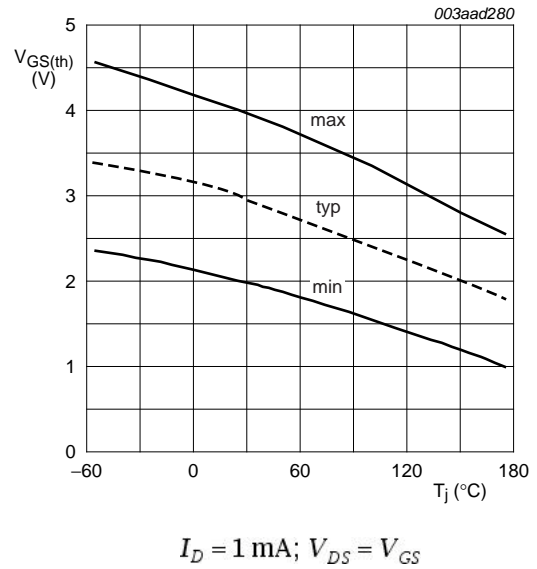


Fig 10. Gate-source threshold voltage as a function of junction temperature

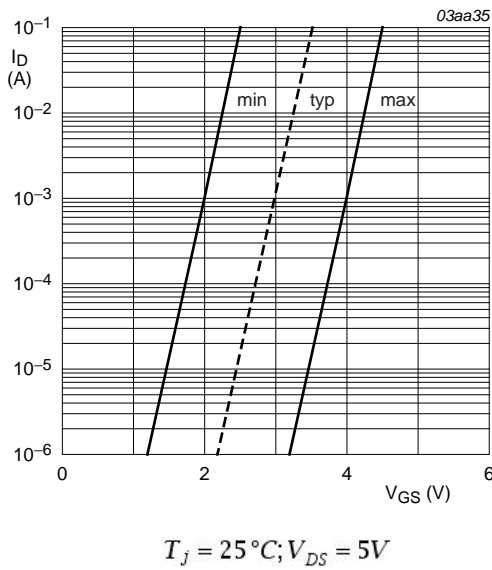


Fig 11. Sub-threshold drain current as a function of gate-source voltage

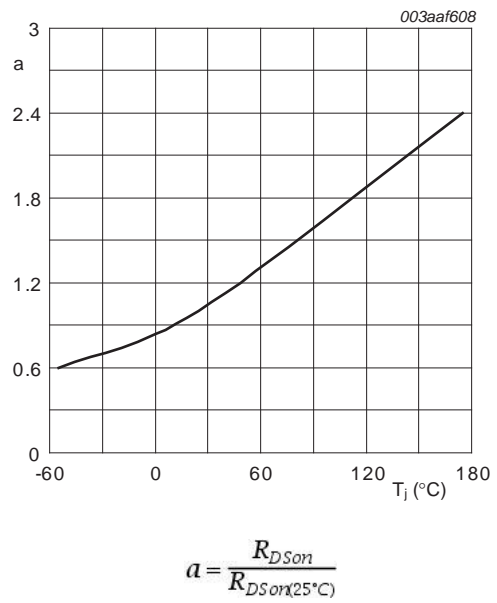


Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature



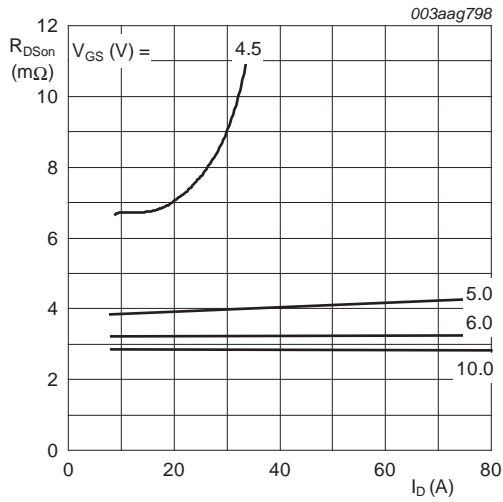


Fig 13. Drain-source on-state resistance as a function of drain current; typical values

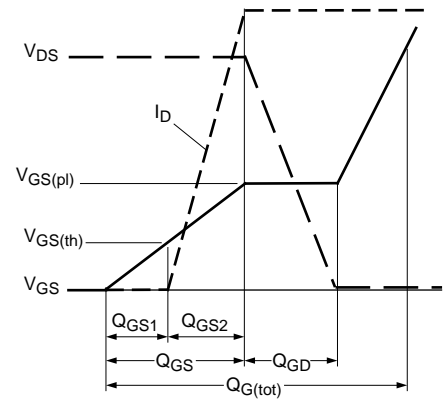


Fig 14. Gate charge waveform definitions

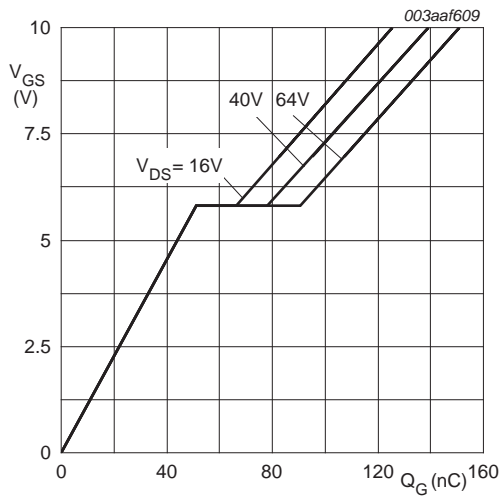


Fig 15. Gate-source voltage as a function of gate charge; typical values

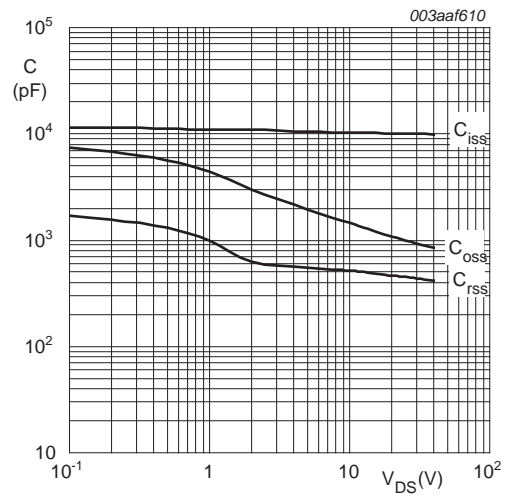


Fig 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

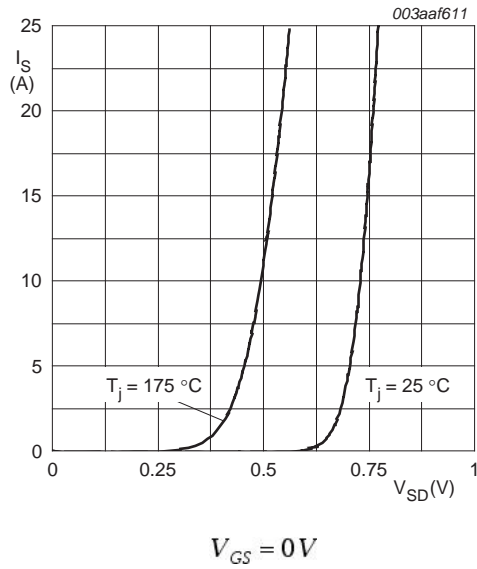


Fig 17. Source current as a function of source-drain voltage; typical values

## 7. Package outline

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

SOT78

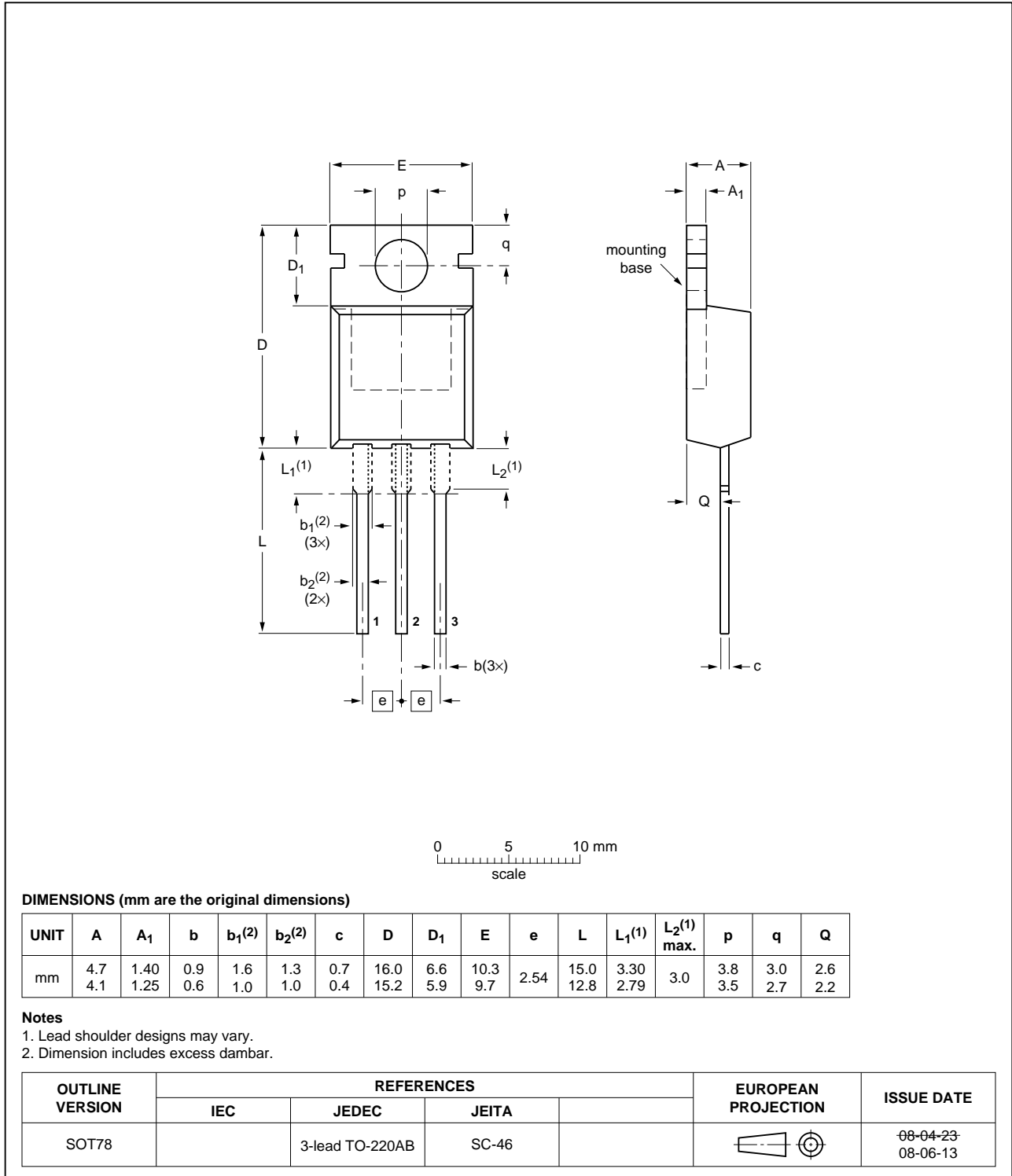


Fig 18. Package outline SOT78 (TO-220AB)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN3R3-80PS v.1	20111027	Product data sheet	-	-

## 9. Legal information

### 9.1 Data sheet status

Document status <sup>[1]</sup> <sup>[2]</sup>	Product status <sup>[3]</sup>	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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**11. Contents**

**1 Product profile . . . . .1**

1.1 General description . . . . .1

1.2 Features and benefits . . . . .1

1.3 Applications . . . . .1

1.4 Quick reference data . . . . .1

**2 Pinning information . . . . .2**

**3 Ordering information . . . . .2**

**4 Limiting values . . . . .3**

**5 Thermal characteristics . . . . .5**

**6 Characteristics . . . . .6**

**7 Package outline . . . . .11**

**8 Revision history . . . . .12**

**9 Legal information . . . . .13**

9.1 Data sheet status . . . . .13

9.2 Definitions . . . . .13

9.3 Disclaimers . . . . .13

9.4 Trademarks . . . . .14

**10 Contact information . . . . .14**

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