



# PSMN017-80PS

N-channel 80 V 17 mΩ standard level MOSFET in TO220

Rev. 3 — 27 September 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Standard 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 standard level gate drive sources

### 1.3 Applications

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

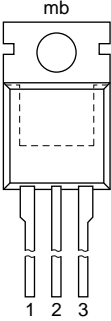
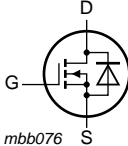
### 1.4 Quick reference data

Table 1. Quick reference 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>	-	-	50	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	-	103	W
T <sub>j</sub>	junction temperature		-55	-	175	°C
Static characteristics						
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 10 A; T <sub>j</sub> = 100 °C; see <a href="#">Figure 12</a>	-	15.2	29	mΩ
		V <sub>GS</sub> = 10 V; I <sub>D</sub> = 10 A; T <sub>j</sub> = 25 °C; see <a href="#">Figure 13</a>	-	13.7	17	mΩ
Dynamic characteristics						
Q <sub>GD</sub>	gate-drain charge	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A;	-	6	-	nC
Q <sub>G(tot)</sub>	total gate charge	V <sub>DS</sub> = 40 V; see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	26	-	nC
Avalanche ruggedness						
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> = 50 A; V <sub>sup</sub> ≤ 80 V; R <sub>GS</sub> = 50 Ω; unclamped	-	-	55	mJ

## 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

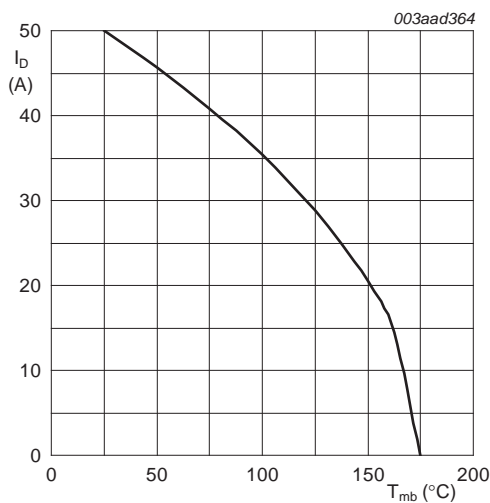
Type number	Package			Version
	Name	Description		
PSMN017-80PS	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB		SOT78

## 4. Limiting values

Table 4. Limiting values

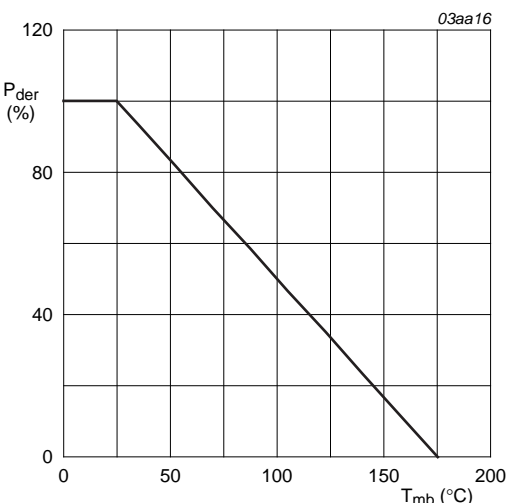
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$	-	80	V
$V_{DGR}$	drain-gate voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	80	V
$V_{GS}$	gate-source voltage		-20	20	V
$I_D$	drain current	$V_{GS} = 10\text{ V}$ ; $T_{mb} = 100\text{ °C}$ ; see <a href="#">Figure 1</a>	-	35	A
		$V_{GS} = 10\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 1</a>	-	50	A
$I_{DM}$	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 3</a>	-	200	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>	-	103	W
$T_{stg}$	storage temperature		-55	175	°C
$T_j$	junction temperature		-55	175	°C
<b>Source-drain diode</b>					
$I_S$	source current	$T_{mb} = 25\text{ °C}$	-	50	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$	-	200	A
<b>Avalanche ruggedness</b>					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$ ; $T_{j(\text{init})} = 25\text{ °C}$ ; $I_D = 50\text{ A}$ ; $V_{sup} \leq 80\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; unclamped	-	55	mJ



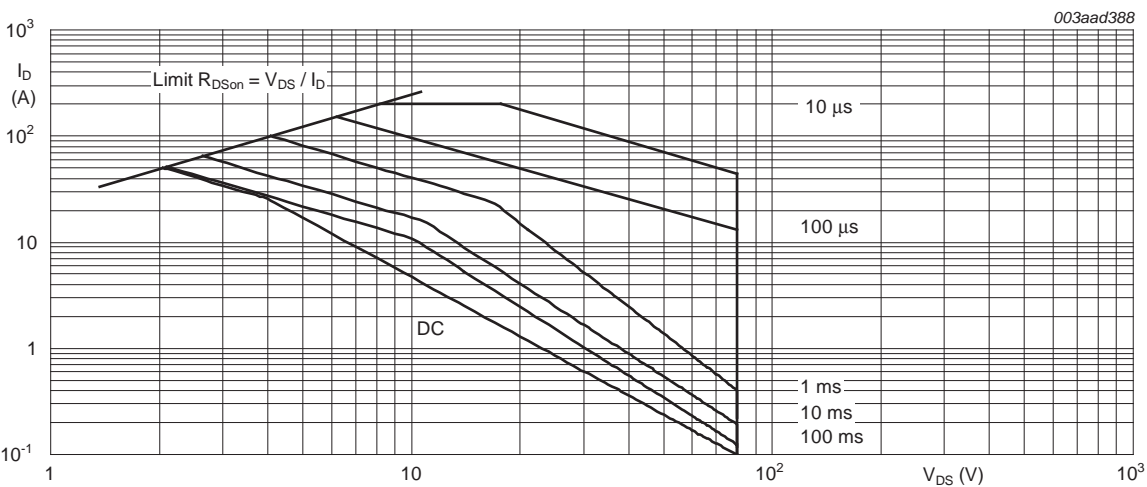
$V_{GS} \geq 10V$

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



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

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



$V_{GS} \geq 10V$

(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 <a href="#">Figure 4</a>	-	1	1.5	K/W

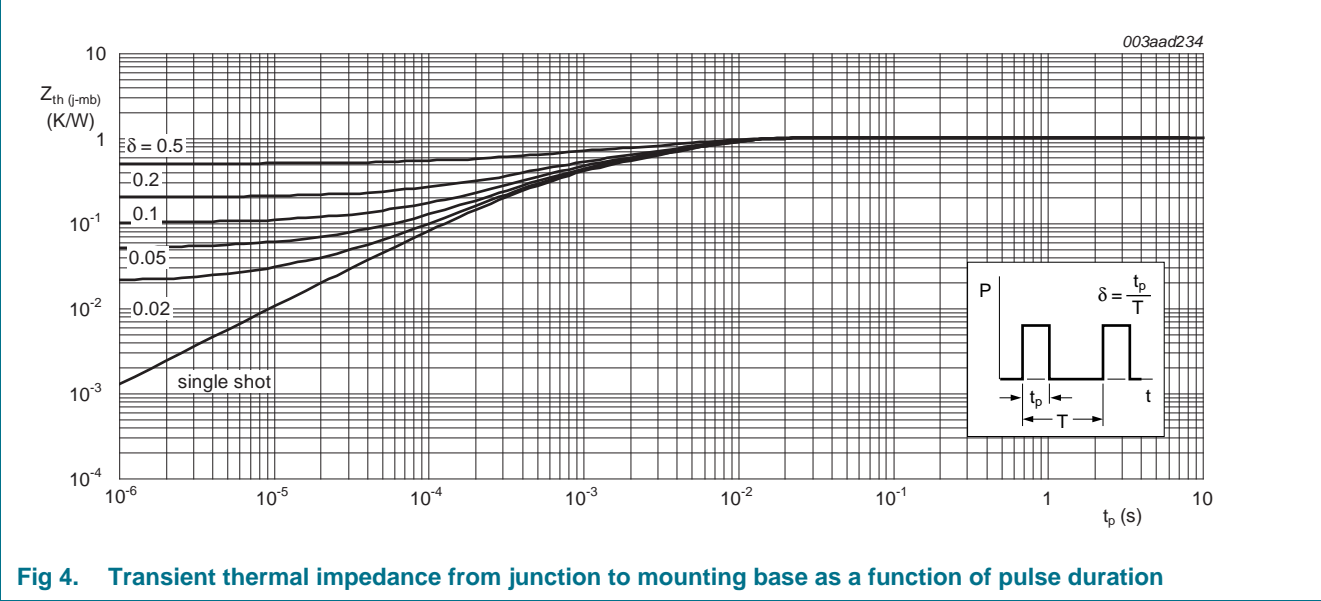


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 6. Characteristics

**Table 6. Characteristics**

Tested to JEDEC standards where applicable.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$ ; $V_{GS} = 0\ \text{V}$ ; $T_j = -55\ ^\circ\text{C}$	73	-	-	V
		$I_D = 250\ \mu\text{A}$ ; $V_{GS} = 0\ \text{V}$ ; $T_j = 25\ ^\circ\text{C}$	80	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\ \text{mA}$ ; $V_{DS} = V_{GS}$ ; $T_j = 175\ ^\circ\text{C}$ ; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	1	-	-	V
		$I_D = 1\ \text{mA}$ ; $V_{DS} = V_{GS}$ ; $T_j = -55\ ^\circ\text{C}$ ; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	-	-	4.8	V
		$I_D = 1\ \text{mA}$ ; $V_{DS} = V_{GS}$ ; $T_j = 25\ ^\circ\text{C}$ ; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	2	3	4	V
$I_{DSS}$	drain leakage current	$V_{DS} = 80\ \text{V}$ ; $V_{GS} = 0\ \text{V}$ ; $T_j = 25\ ^\circ\text{C}$	-	0.3	2	$\mu\text{A}$
		$V_{DS} = 80\ \text{V}$ ; $V_{GS} = 0\ \text{V}$ ; $T_j = 125\ ^\circ\text{C}$	-	-	50	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = -20\ \text{V}$ ; $V_{DS} = 0\ \text{V}$ ; $T_j = 25\ ^\circ\text{C}$	-	10	100	nA
		$V_{GS} = 20\ \text{V}$ ; $V_{DS} = 0\ \text{V}$ ; $T_j = 25\ ^\circ\text{C}$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\ \text{V}$ ; $I_D = 10\ \text{A}$ ; $T_j = 175\ ^\circ\text{C}$ ; see <a href="#">Figure 12</a>	-	32.64	40.8	mΩ
		$V_{GS} = 10\ \text{V}$ ; $I_D = 10\ \text{A}$ ; $T_j = 100\ ^\circ\text{C}$ ; see <a href="#">Figure 12</a>	-	15.2	29	mΩ
		$V_{GS} = 10\ \text{V}$ ; $I_D = 10\ \text{A}$ ; $T_j = 25\ ^\circ\text{C}$ ; see <a href="#">Figure 13</a>	-	13.7	17	mΩ
$R_G$	internal gate resistance (AC)	$f = 1\ \text{MHz}$	-	1	-	Ω
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 0\ \text{A}$ ; $V_{DS} = 0\ \text{V}$ ; $V_{GS} = 10\ \text{V}$	-	22	-	nC
		$I_D = 25\ \text{A}$ ; $V_{DS} = 40\ \text{V}$ ; $V_{GS} = 10\ \text{V}$ ; see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	26	-	nC
$Q_{GS}$	gate-source charge		-	7.7	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	4.6	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	3	-	nC
$Q_{GD}$	gate-drain charge		-	6	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25\ \text{A}$ ; $V_{DS} = 40\ \text{V}$ ; see <a href="#">Figure 15</a>	-	4.7	-	V
$C_{iss}$	input capacitance	$V_{DS} = 40\ \text{V}$ ; $V_{GS} = 0\ \text{V}$ ; $f = 1\ \text{MHz}$ ;	-	1573	-	pF
$C_{oss}$	output capacitance	$T_j = 25\ ^\circ\text{C}$ ; see <a href="#">Figure 16</a>	-	154	-	pF
$C_{rss}$	reverse transfer capacitance		-	88	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 40\ \text{V}$ ; $R_L = 1.6\ \Omega$ ; $V_{GS} = 10\ \text{V}$ ;	-	14	-	ns
$t_r$	rise time	$R_{G(ext)} = 4.7\ \Omega$	-	12	-	ns
$t_{d(off)}$	turn-off delay time		-	27	-	ns
$t_f$	fall time		-	8	-	ns

Table 6. Characteristics ...continued  
Tested to JEDEC standards where applicable.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
$V_{SD}$	source-drain voltage	$I_S = 10\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 17</a>	-	0.79	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 40\text{ A}$ ; $dI_S/dt = 100\text{ A/}\mu\text{s}$ ;	-	41	-	ns
$Q_r$	recovered charge	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 40\text{ V}$	-	55	-	nC

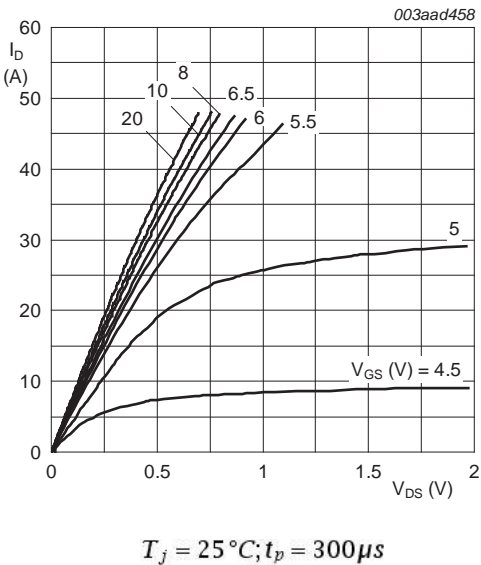


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

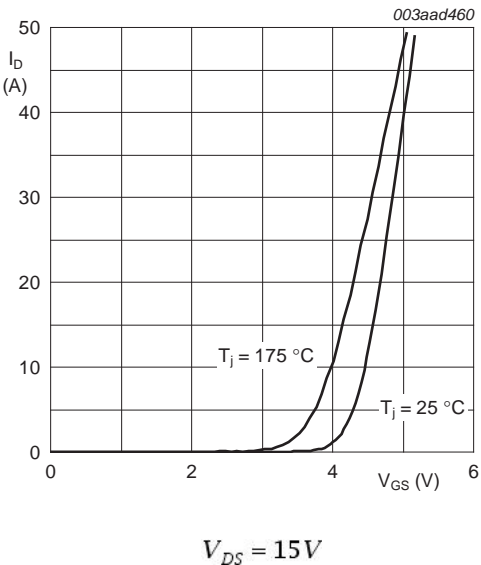


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values

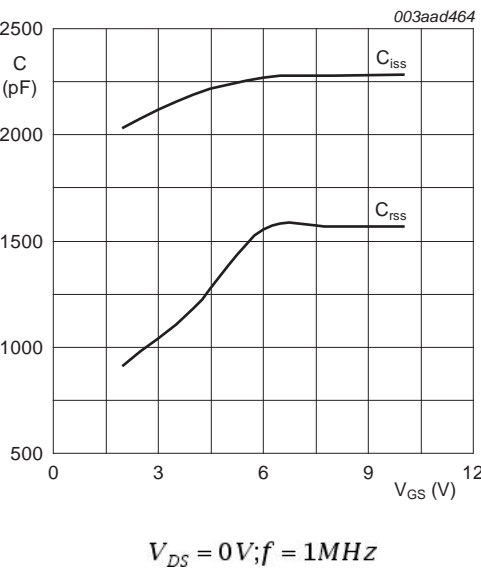


Fig 7. Input and reverse transfer capacitances as a function of gate-source voltage; typical values

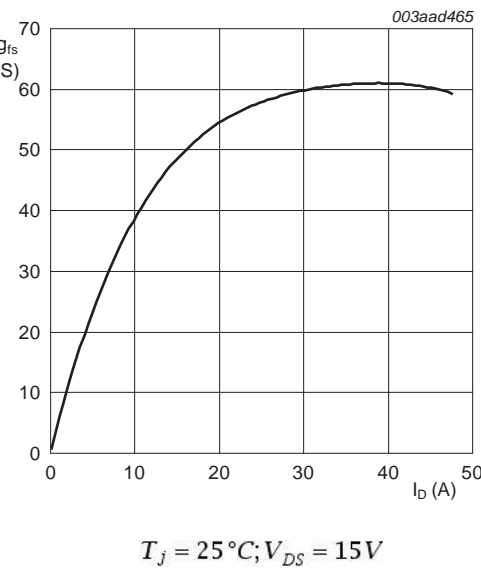
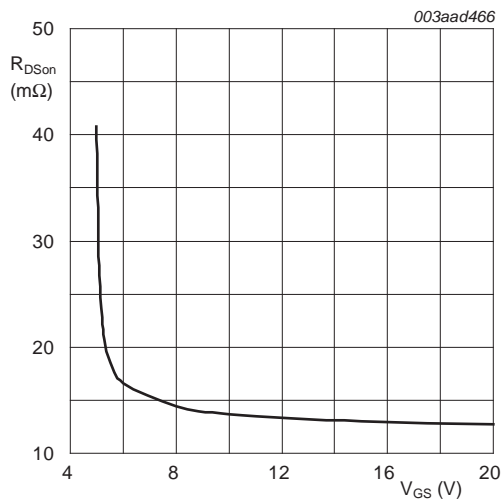
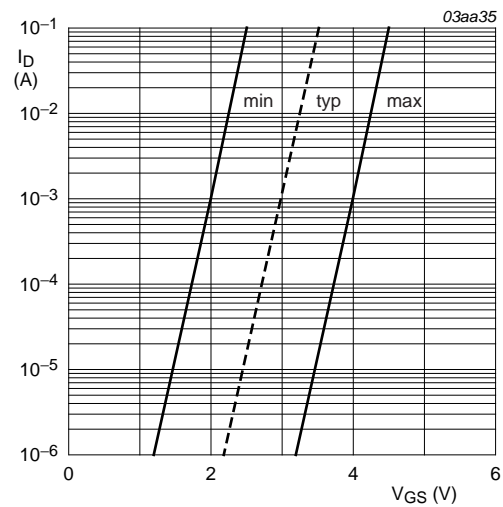


Fig 8. Forward transconductance as a function of drain current; typical values



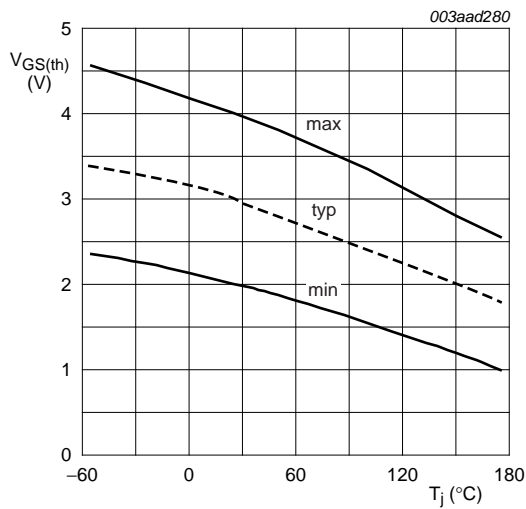
$$T_j = 25^\circ\text{C}; I_D = 25\text{A}$$

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



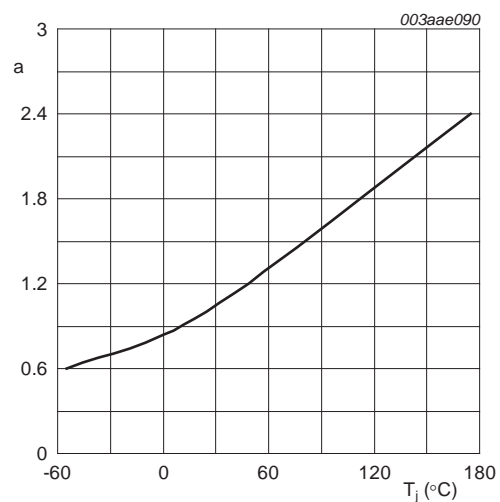
$$T_j = 25^\circ\text{C}; V_{DS} = 5\text{V}$$

**Fig 10.** Sub-threshold drain current as a function of gate-source voltage



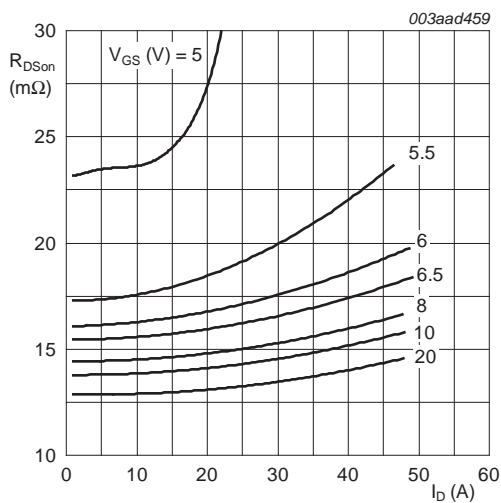
$$I_D = 1\text{mA}; V_{DS} = V_{GS}$$

**Fig 11.** Gate-source threshold voltage as a function of junction temperature



$$a = \frac{R_{DS(on)}}{R_{DS(on)@25^\circ\text{C}}}$$

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



$T_j = 25^\circ C; t_p = 300 \mu s$

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

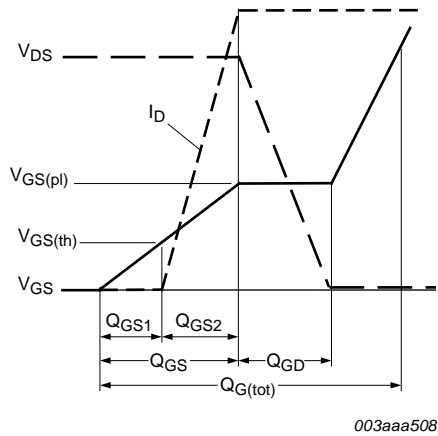
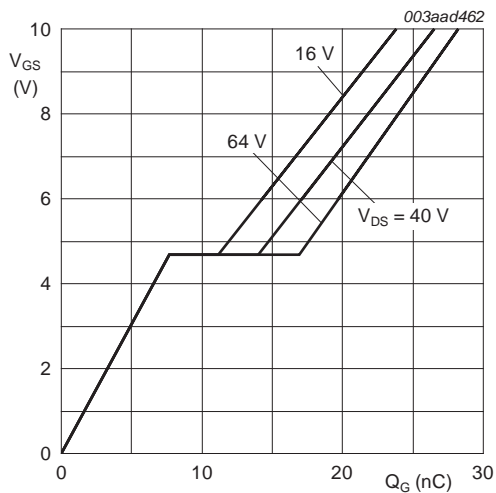
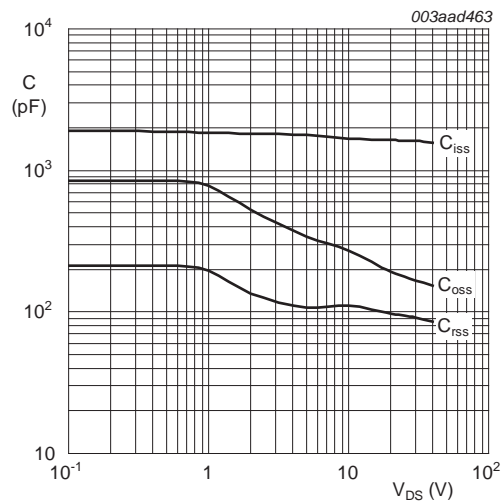


Fig 14. Gate charge waveform definitions



$T_j = 25^\circ C; I_D = 25 A$

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



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

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



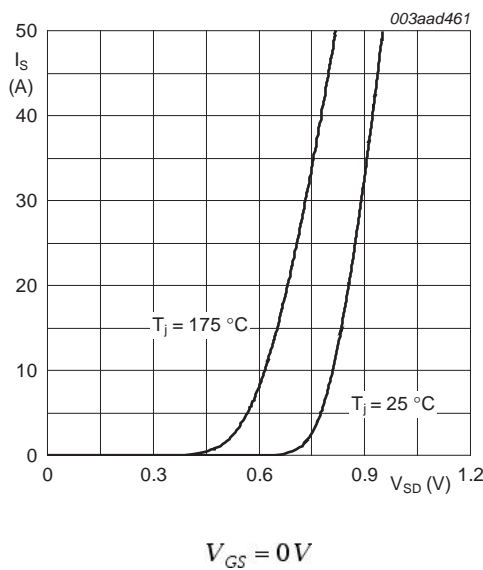


Fig 17. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

7. Package outline

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

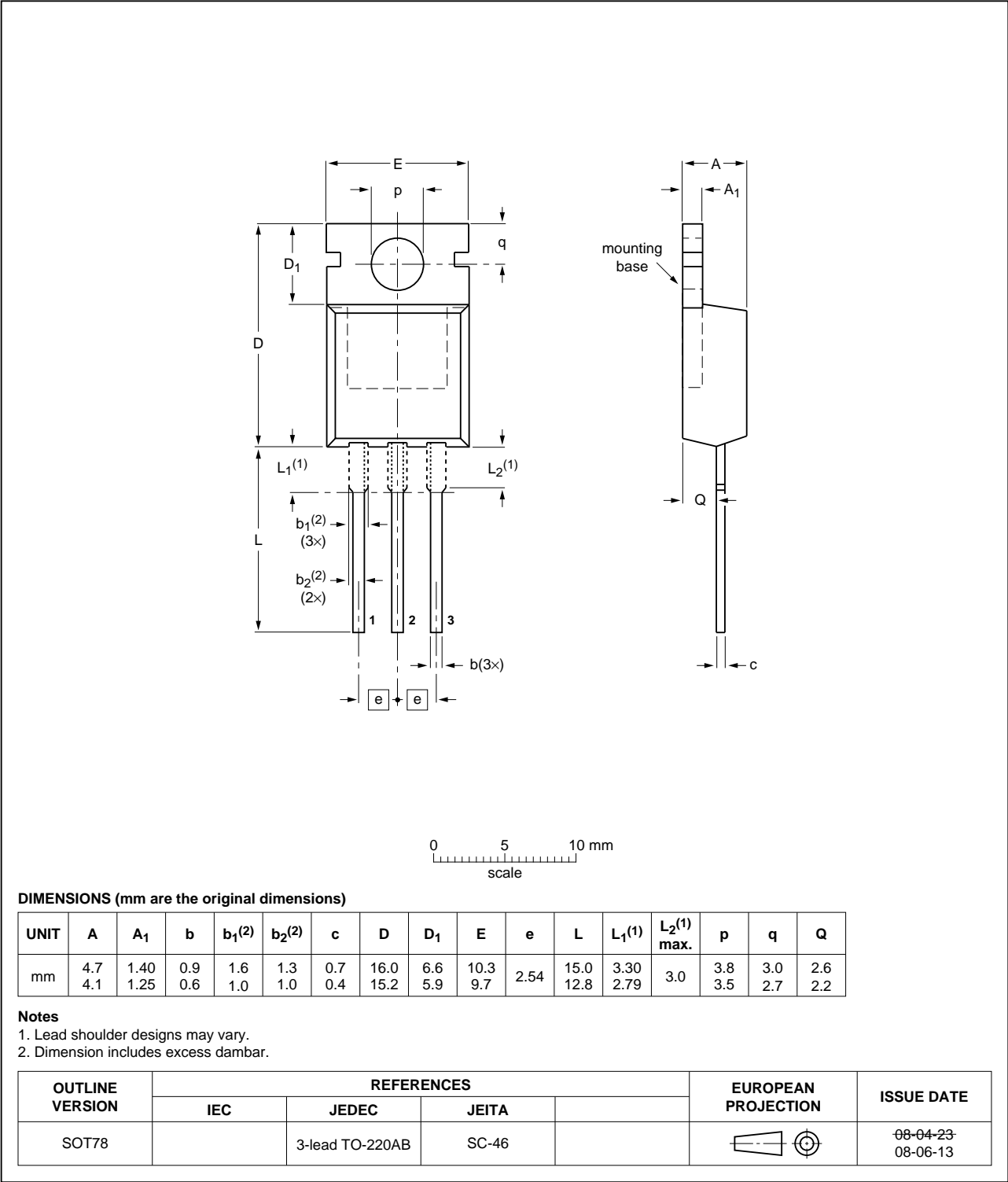


Fig 18. Package outline SOT78 (TO-220AB)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN017-80PS v.3	20110927	Product data sheet	-	PSMN017-80PS v.2
Modifications:	• Various changes to content.			
PSMN017-80PS v.2	20101101	Product data sheet	-	PSMN017-80PS v.1

## 9. Legal information

### 9.1 Data sheet status

Document status <sup>[1] [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.

[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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