

# PSMN027-100PS

N-channel 100V 26.8 mΩ standard level MOSFET in TO220

Rev. 02 — 19 February 2010

Objective 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

### 1.3 Applications

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

### 1.4 Quick reference data

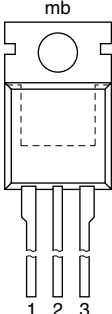
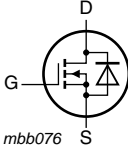
Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	-	100	V
$I_D$	drain current	$T_{mb} = 25\text{ °C}; V_{GS} = 10\text{ V};$ see <a href="#">Figure 1</a>	-	-	37	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ see <a href="#">Figure 2</a>	-	-	103	W
$T_j$	junction temperature		-55	-	175	°C
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25\text{ °C};$ $I_D = 37\text{ A}; V_{sup} \leq 100\text{ V};$ unclamped; $R_{GS} = 50\text{ }\Omega$	-	-	59	mJ
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$V_{GS} = 10\text{ V}; I_D = 30\text{ A};$	-	9	-	nC
$Q_{G(\text{tot})}$	total gate charge	$V_{DS} = 50\text{ V};$ see <a href="#">Figure 14</a> and <a href="#">15</a>	-	30	-	nC
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 15\text{ A};$ $T_j = 100\text{ °C};$ see <a href="#">Figure 12</a>	-	-	48	mΩ
		$V_{GS} = 10\text{ V}; I_D = 15\text{ A};$ $T_j = 25\text{ °C};$ see <a href="#">Figure 13</a>	-	21	26.8	mΩ



## 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

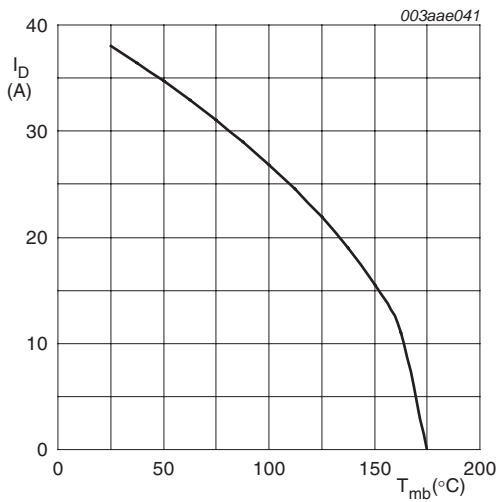
Type number	Package		Version
	Name	Description	
PSMN027-100PS	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

### 4. Limiting values

**Table 4. Limiting values**

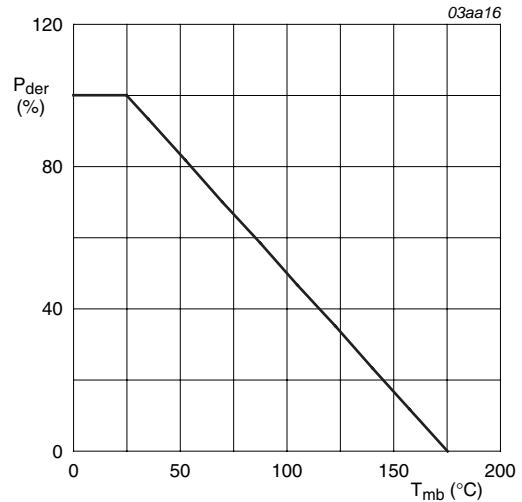
In accordance with the Absolute Maximum Rating System (IEC 60134).

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	-	100	V
V <sub>DGR</sub>	drain-gate voltage	T <sub>j</sub> ≤ 175 °C; T <sub>j</sub> ≥ 25 °C; R <sub>GS</sub> = 20 kΩ	-	100	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>	-	26	A
		V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 1</a>	-	37	A
I <sub>DM</sub>	peak drain current	t <sub>p</sub> ≤ 10 μs; pulsed; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 3</a>	-	148	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	103	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	-	37	A
I <sub>SM</sub>	peak source current	t <sub>p</sub> ≤ 10 μs; pulsed; T <sub>mb</sub> = 25 °C	-	148	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> = 37 A; V <sub>sup</sub> ≤ 100 V; unclamped; R <sub>GS</sub> = 50 Ω	-	59	mJ



V<sub>GS</sub> ≥ 10 V

**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**

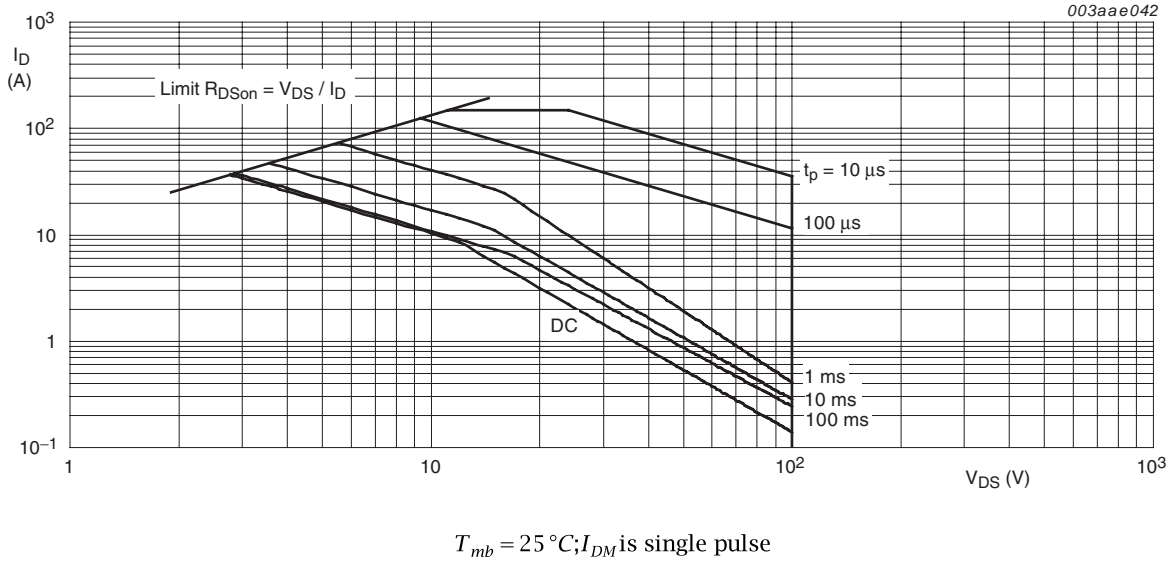


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

## 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>	-	0.8	1.46	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air	-	60	-	K/W

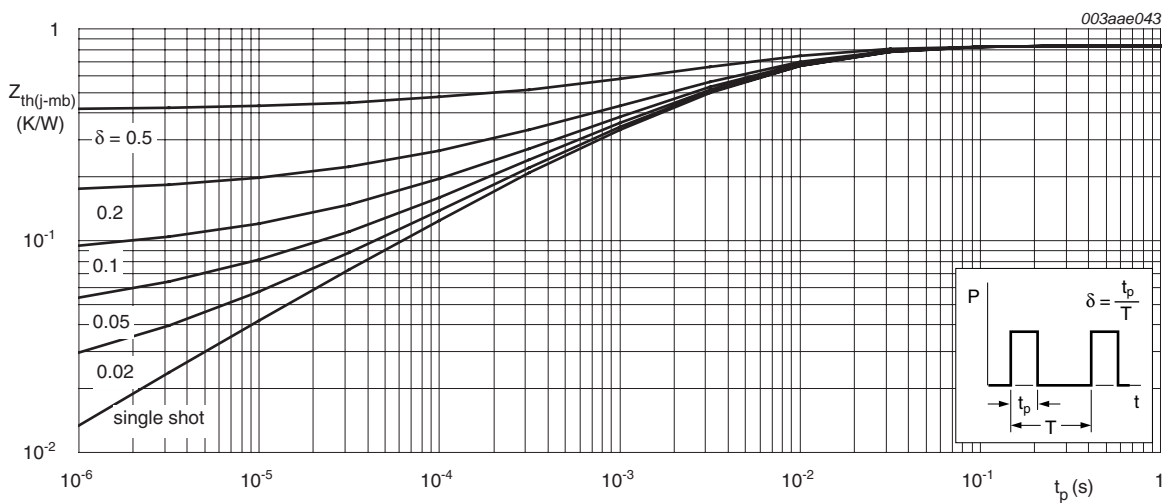


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration; typical values

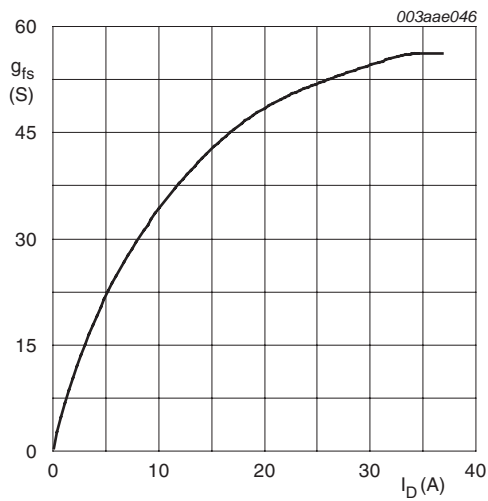
## 6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	90	-	-	V
		$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	100	-	-	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
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 11</a> and <a href="#">10</a>	2	3	4	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see <a href="#">Figure 10</a>	-	-	4.8	V
$I_{DSS}$	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ\text{C}$	-	-	50	$\mu\text{A}$
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.08	2	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	10	100	nA
		$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 100 \text{ }^\circ\text{C};$ see <a href="#">Figure 12</a>	-	-	48	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 12</a>	-	59	75	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 13</a>	-	21	26.8	mΩ
$R_G$	internal gate resistance (AC)	$f = 1 \text{ MHz}$	-	0.92	-	Ω
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 30 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V};$ see <a href="#">Figure 14</a> and <a href="#">15</a>	-	30	-	nC
		$I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}$	-	24	-	nC
$Q_{GS}$	gate-source charge	$I_D = 30 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V};$ see <a href="#">Figure 14</a> and <a href="#">15</a>	-	8	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge	$I_D = 30 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V};$ see <a href="#">Figure 14</a>	-	4.8	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	3.4	-	nC
$Q_{GD}$	gate-drain charge	$I_D = 30 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V};$ see <a href="#">Figure 14</a> and <a href="#">15</a>	-	9	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$V_{DS} = 50 \text{ V};$ see <a href="#">Figure 14</a> and <a href="#">15</a>	-	4.9	-	V
$C_{iss}$	input capacitance	$V_{DS} = 50 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 16</a>	-	1624	-	pF
$C_{oss}$	output capacitance		-	115	-	pF
$C_{rss}$	reverse transfer capacitance		-	74	-	pF

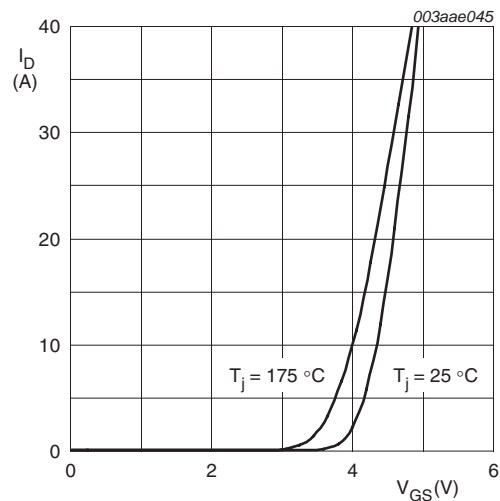
Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{d(on)}$	turn-on delay time	$V_{DS} = 50\text{ V}; R_L = 1.7\ \Omega; V_{GS} = 10\text{ V};$	-	14.4	-	ns
$t_r$	rise time	$R_{G(ext)} = 4.7\ \Omega; T_j = 25\text{ }^\circ\text{C}$	-	11.4	-	ns
$t_{d(off)}$	turn-off delay time		-	29.6	-	ns
$t_f$	fall time		-	8.9	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 15\text{ A}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C};$ see <a href="#">Figure 17</a>	-	0.8	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 10\text{ A}; di_S/dt = 100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V};$	-	47	-	ns
$Q_r$	recovered charge	$V_{DS} = 50\text{ V}$	-	91	-	nC



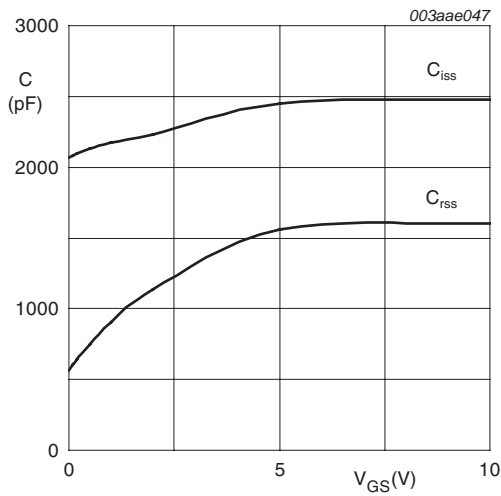
$T_j = 25\text{ }^\circ\text{C}; V_{DS} = 10\text{ V}$

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



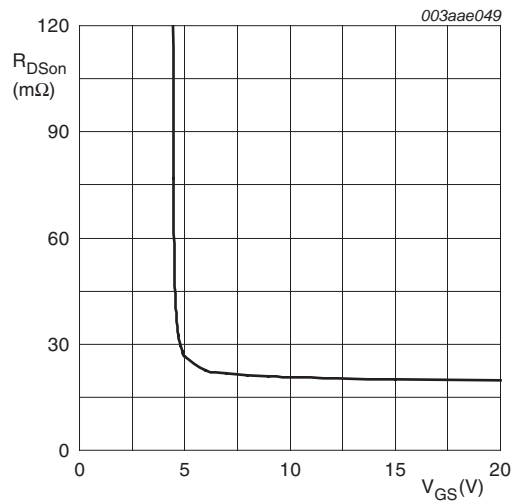
$V_{DS} > I_D \times R_{DS(on)}$

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



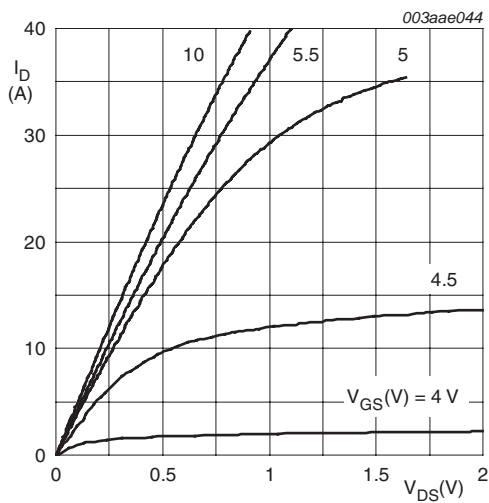
$V_{DS} = 0V; f = 1MHz$

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



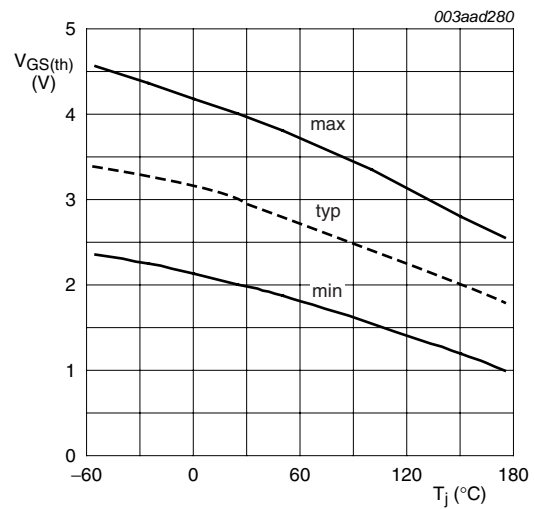
$T_j = 25^\circ C; I_D = 10A$

Fig 8. Drain-source on-state resistance as a function of gate-source voltage; typical values



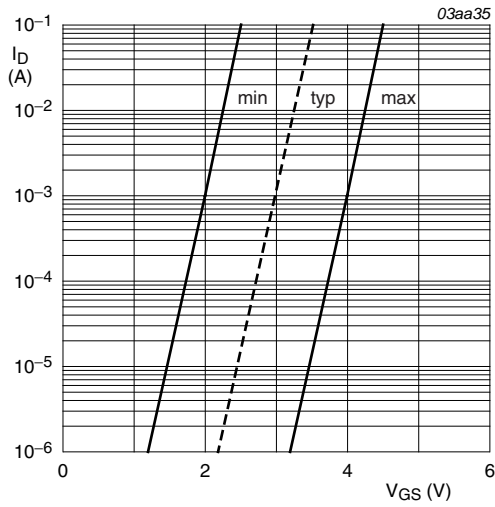
$T_j = 25^\circ C$

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



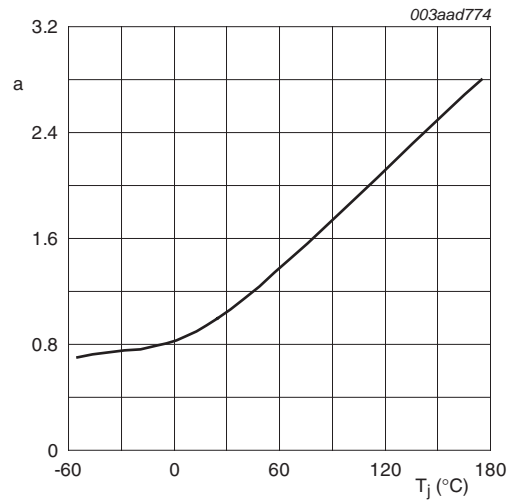
$I_D = 1 mA; V_{DS} = V_{GS}$

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



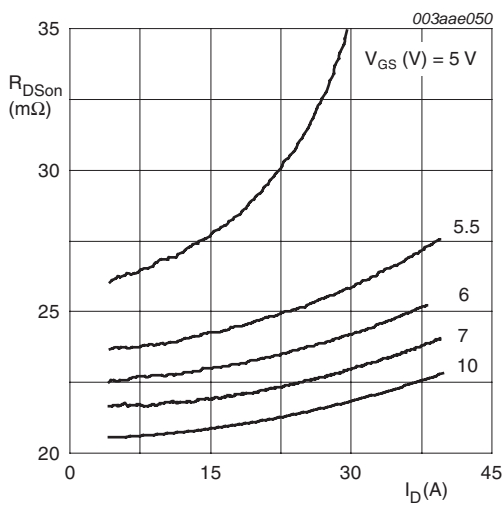
$T_j = 25^\circ\text{C}; V_{DS} = 5\text{V}$

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



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

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



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

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

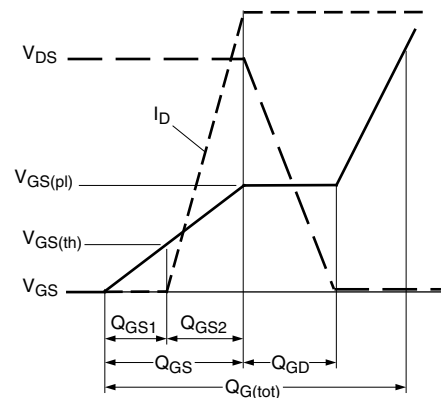
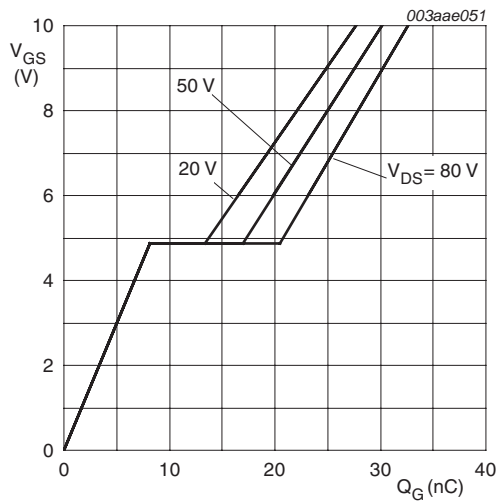


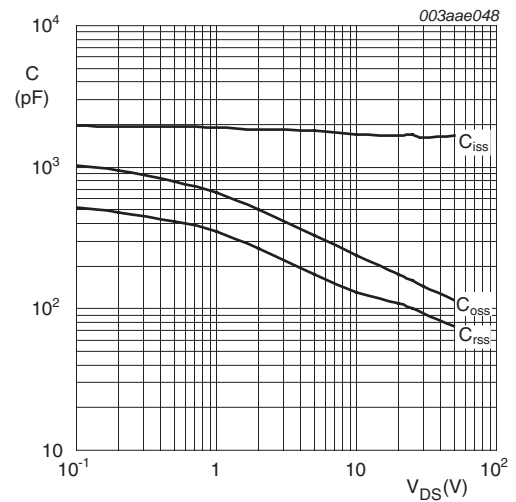
Fig 14. Gate charge waveform definitions





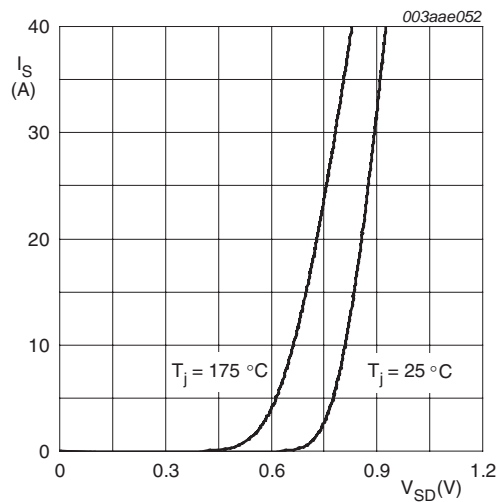
$T_j = 25\text{ }^\circ\text{C}; I_D = 30\text{ A}$

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



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

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



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

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

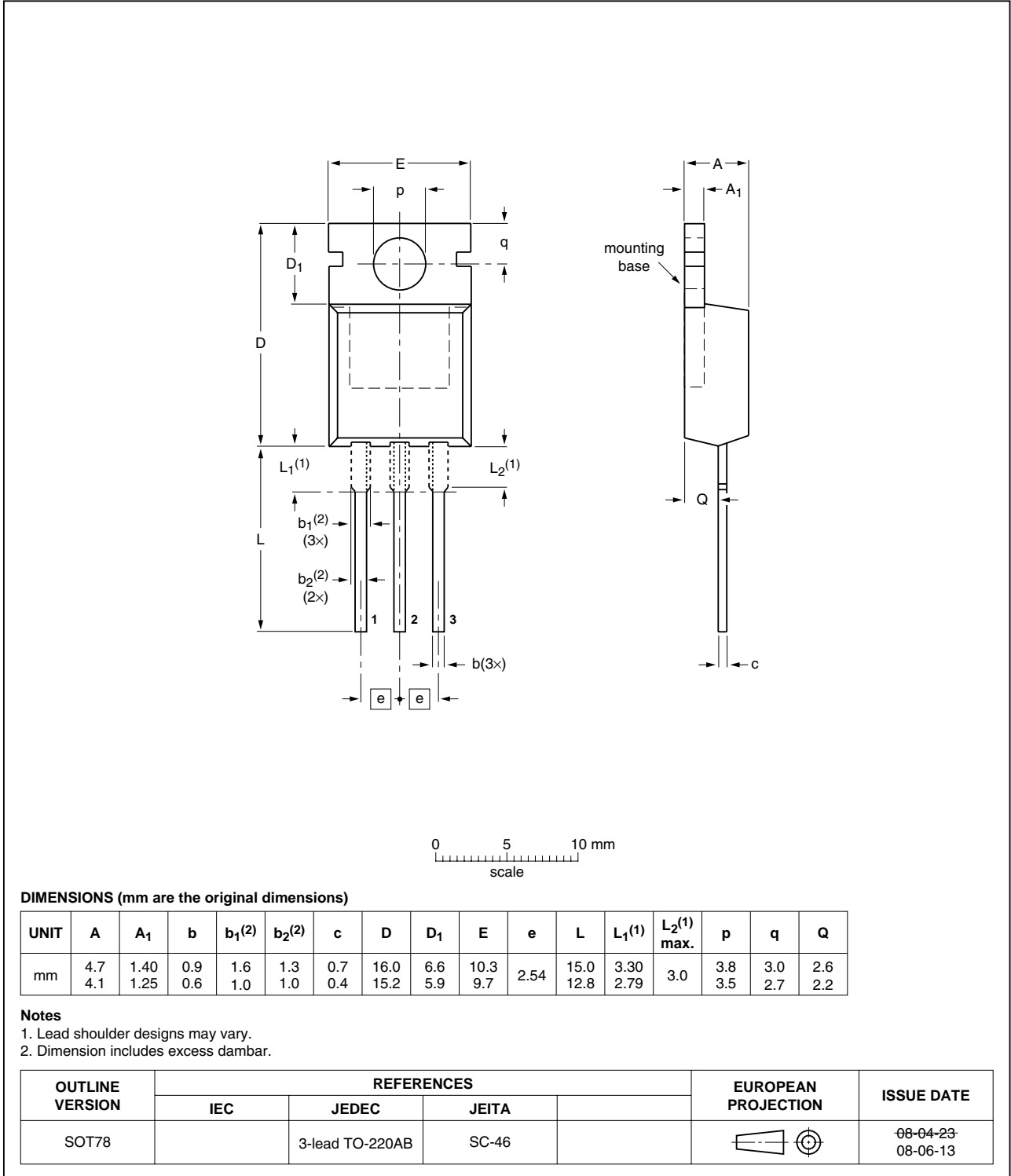


Fig 18. Package outline SOT78 (TO-220AB)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN027-100PS_2	20100219	Objective data sheet	-	PSMN027-100PS_1
Modifications:	• Various changes to content.			
PSMN027-100PS_1	20100122	Objective data sheet	-	-

## 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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