



# PSMN8R5-100PS

N-channel 100 V 8.5 mΩ standard level MOSFET in TO220

17 October 2013

Product data sheet

## 1. General description

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

## 2. Features and benefits

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

## 3. Applications

- AC-to-DC power supply equipment
- Motor control
- Server power supplies
- Synchronous rectification

## 4. Quick reference data

Table 1. Quick reference data

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	$T_j = 25\text{ °C}; V_{GS} = 10\text{ V};$ <a href="#">Fig. 1</a>	[1]	-	100	A	
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ <a href="#">Fig. 2</a>	-	-	263	W	
<b>Static characteristics</b>							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_j = 25\text{ °C};$ <a href="#">Fig. 13</a> ; <a href="#">Fig. 12</a>	4.5	6.4	8.5	mΩ	
<b>Dynamic characteristics</b>							
$Q_{GD}$	gate-drain charge	$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; V_{DS} = 50\text{ V};$ <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	33	-	nC	
$Q_{G(tot)}$	total gate charge		-	111	-	nC	
<b>Avalanche Ruggedness</b>							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(init)} = 25\text{ °C}; I_D = 100\text{ A};$ $V_{sup} \leq 100\text{ V}; R_{GS} = 50\text{ Ω};$ unclamped; <a href="#">Fig. 3</a>	-	-	219	mJ	

[1] Continuous current limited by package.

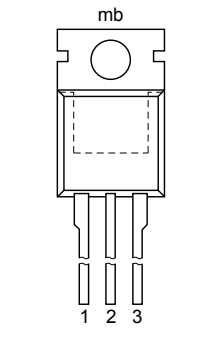
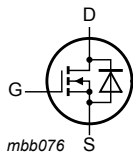


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## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>TO-220AB (SOT78)</p>	 <p>mbb076</p>
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN8R5-100PS	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN8R5-100PS	PSMN8R5-100PS

## 8. Limiting values

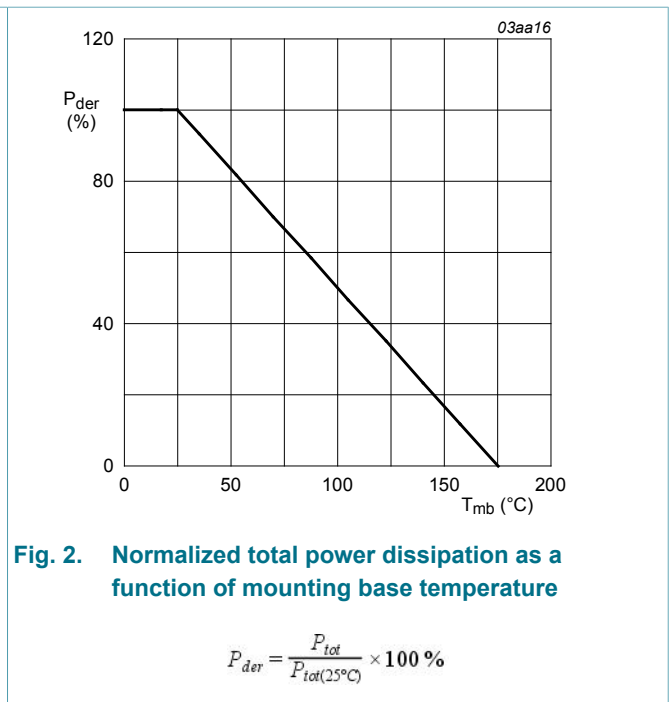
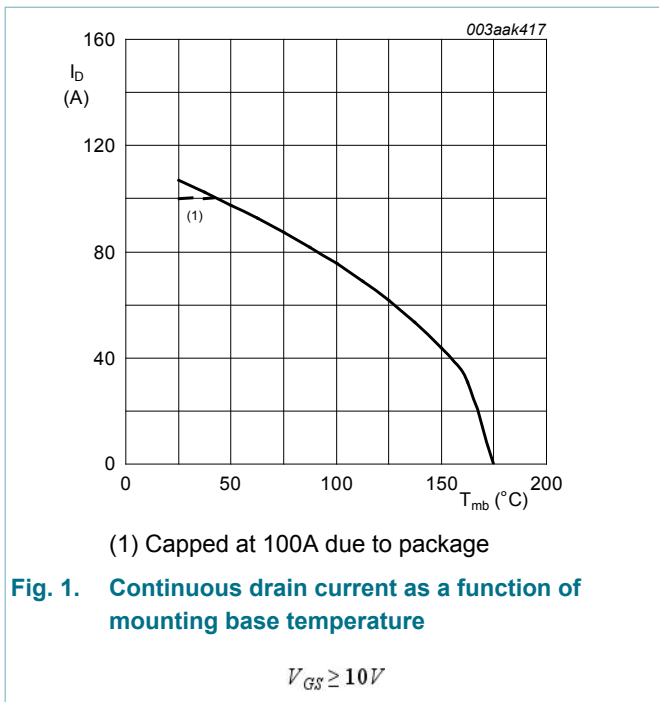
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	100	V
$V_{DGR}$	drain-gate voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}; R_{GS} = 20\text{ k}\Omega$	-	100	V
$V_{GS}$	gate-source voltage		-20	20	V
$I_D$	drain current	$V_{GS} = 10\text{ V}; T_j = 25\text{ °C}; \text{Fig. 1}$	[1]	100	A
		$V_{GS} = 10\text{ V}; T_{mb} = 100\text{ °C}; \text{Fig. 1}$		75	A
$I_{DM}$	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25\text{ °C}; \text{Fig. 4}$	-	429	A

Symbol	Parameter	Conditions		Min	Max	Unit
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; <a href="#">Fig. 2</a>		-	263	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	<a href="#">[1]</a>	-	100	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C		-	429	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> = 100 A; V <sub>sup</sub> ≤ 100 V; R <sub>GS</sub> = 50 Ω; unclamped; <a href="#">Fig. 3</a>		-	219	mJ

[1] Continuous current limited by package.



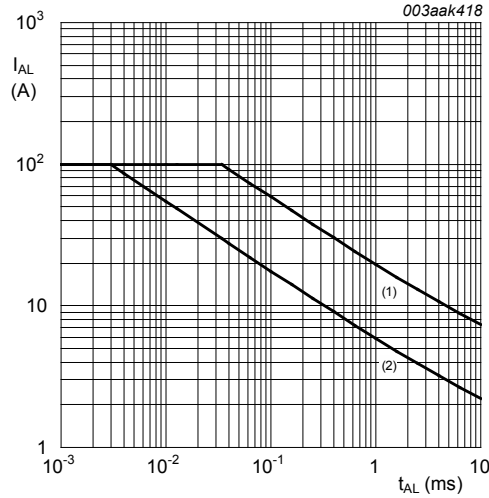


Fig. 3. Avalanche rating; avalanche current as a function of avalanche time

(1)  $T_{j (int)} = 25^{\circ}C$ ; (2)  $T_{j (int)} = 130^{\circ}C$

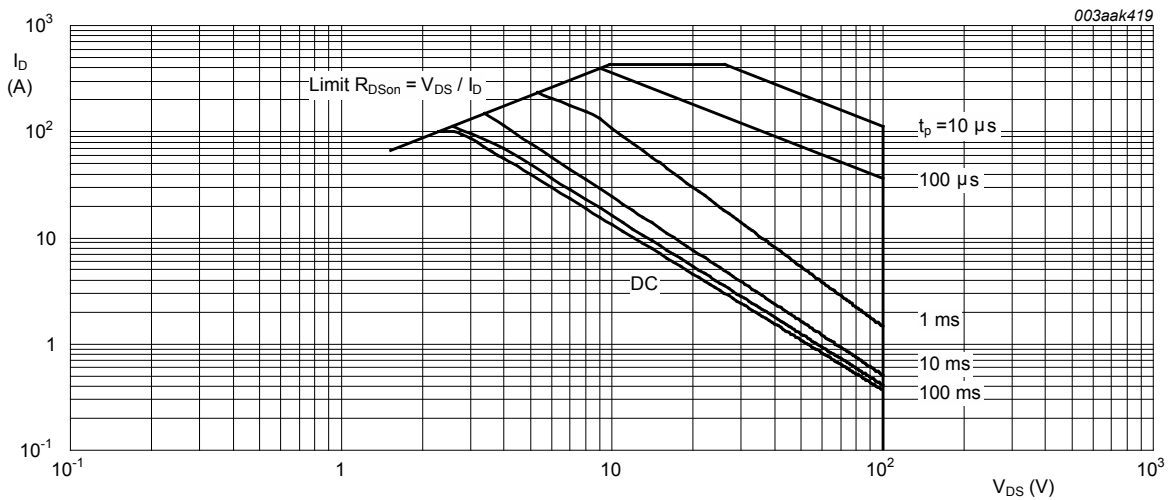


Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25^{\circ}C$ ;  $I_{DM}$  is a single pulse

## 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	-	0.49	0.57	K/W

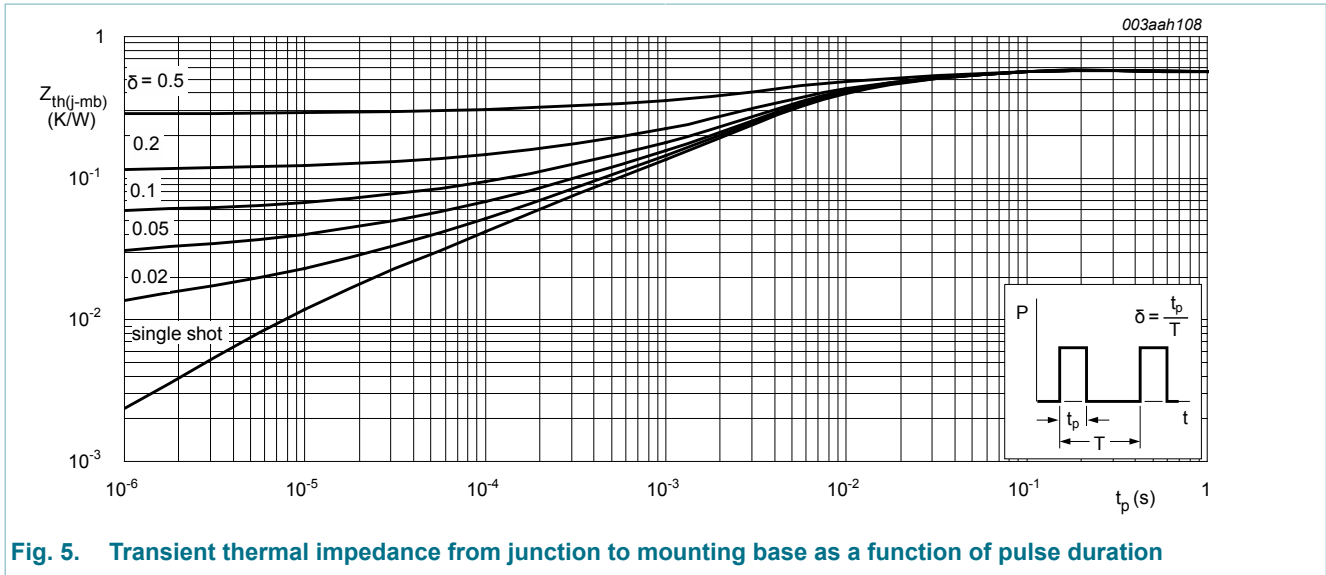


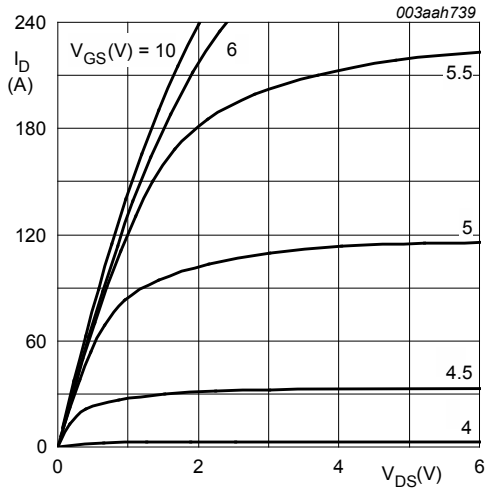
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	100	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	90	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C;$ <a href="#">Fig. 10</a> ; <a href="#">Fig. 11</a>	2.4	3	4	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ C;$ <a href="#">Fig. 10</a>	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ C;$ <a href="#">Fig. 10</a>	-	-	4.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.02	1	$\mu A$
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 100 \text{ }^\circ C$	-	-	20	$\mu A$
$I_{GSS}$	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
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ C;$ <a href="#">Fig. 12</a>	-	16.95	22.6	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 100 \text{ }^\circ C;$ <a href="#">Fig. 12</a>	-	11.18	14.9	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ C;$ <a href="#">Fig. 13</a> ; <a href="#">Fig. 12</a>	4.5	6.4	8.5	mΩ
$R_G$	gate resistance	$f = 1 \text{ MHz}$	0.36	0.71	1.42	Ω

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 25\text{ A}$ ; $V_{DS} = 50\text{ V}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	111	-	nC
$Q_{GS}$	gate-source charge		-	24	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	16	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	8	-	nC
$Q_{GD}$	gate-drain charge		-	33	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 15\text{ A}$ ; $V_{DS} = 50\text{ V}$ ; <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>	-	4.4	-	V
$C_{iss}$	input capacitance	$V_{DS} = 50\text{ V}$ ; $V_{GS} = 0\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 16</a> ; <a href="#">Fig. 17</a>	-	5512	-	pF
$C_{oss}$	output capacitance	$V_{DS} = 50\text{ V}$ ; $V_{GS} = 0\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 17</a>	-	380	-	pF
$C_{rss}$	reverse transfer capacitance	$V_{DS} = 50\text{ V}$ ; $V_{GS} = 0\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 16</a> ; <a href="#">Fig. 17</a>	-	256	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 50\text{ V}$ ; $R_L = 2\text{ }\Omega$ ; $V_{GS} = 10\text{ V}$ ; $R_{G(ext)} = 5\text{ }\Omega$	-	20	-	ns
$t_r$	rise time		-	35	-	ns
$t_{d(off)}$	turn-off delay time		-	87	-	ns
$t_f$	fall time		-	43	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 18</a>	-	0.82	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 25\text{ A}$ ; $di_S/dt = -100\text{ A}/\mu\text{s}$ ; $V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$	-	53	-	ns
$Q_r$	recovered charge		-	124	-	nC



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

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

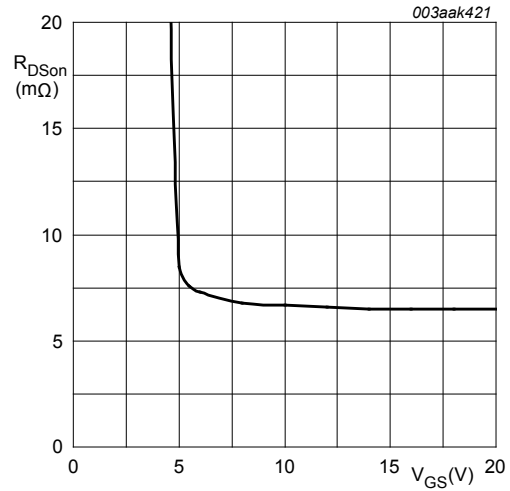


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

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

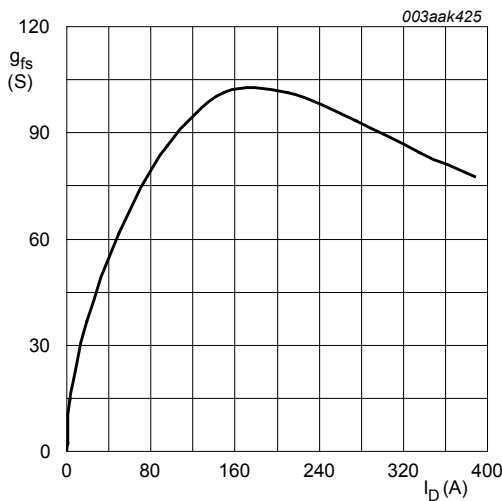


Fig. 8. Forward transconductance as a function of drain current; typical values

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

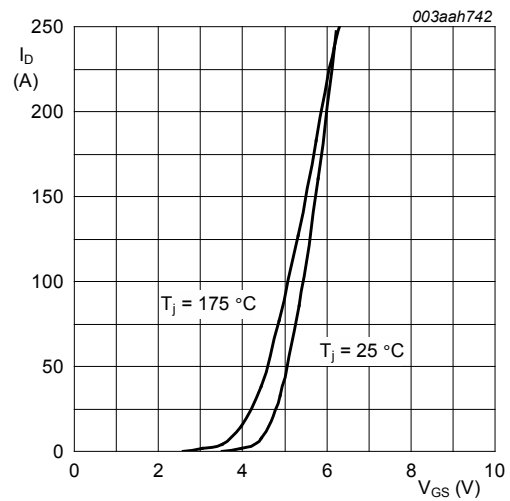
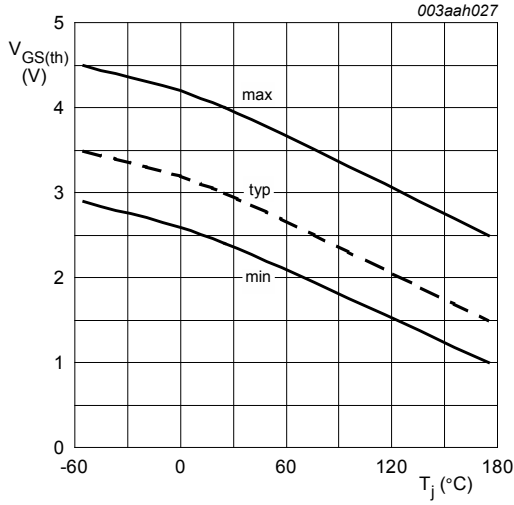


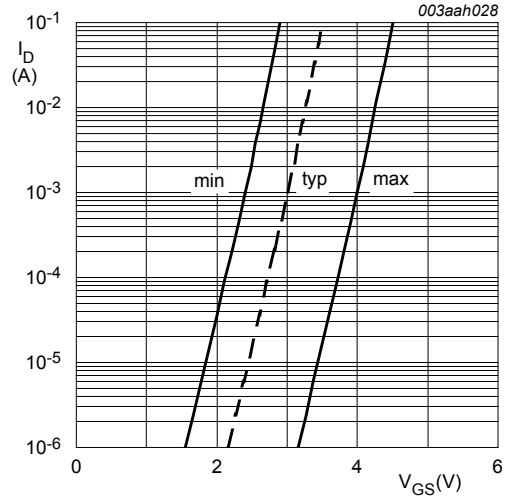
Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values

$V_{DS} = 10\text{V}$



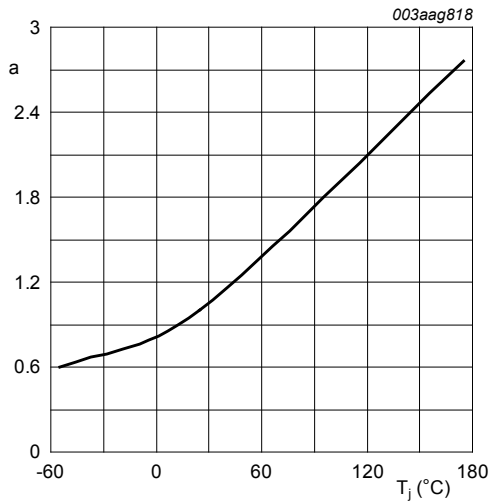
**Fig. 10. Gate-source threshold voltage as a function of junction temperature**

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



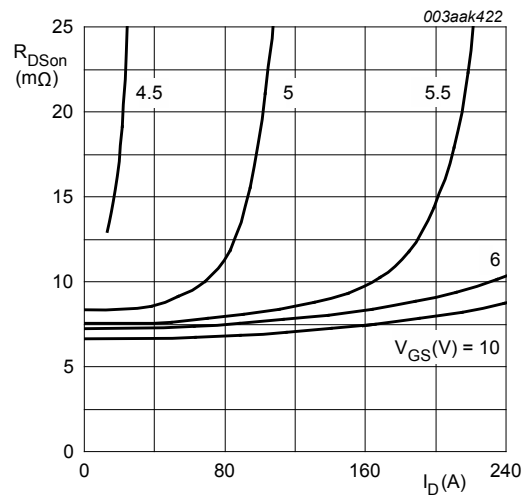
**Fig. 11. Sub-threshold drain current as a function of gate-source voltage**

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



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

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



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

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



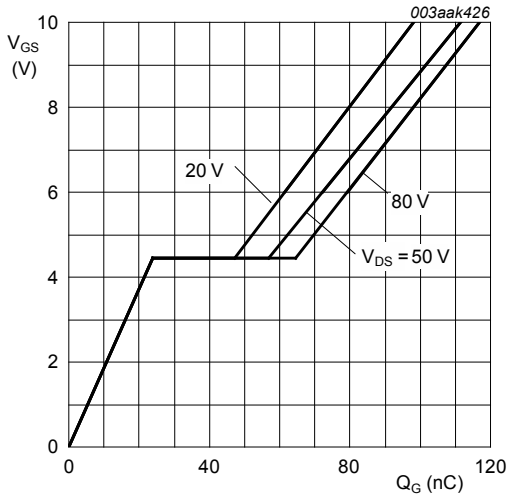


Fig. 14. Gate-source voltage as a function of gate charge; typical values

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

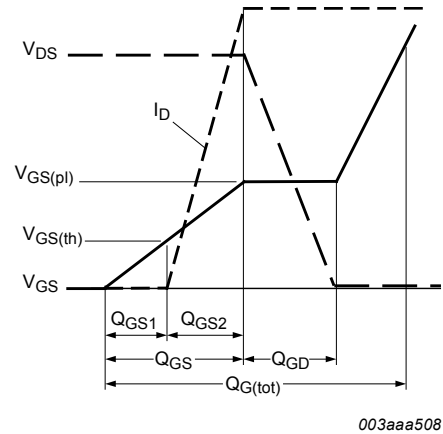


Fig. 15. Gate charge waveform definitions

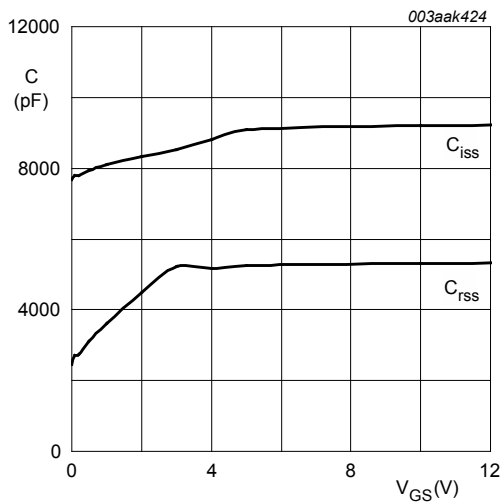


Fig. 16. Input and reverse transfer capacitances as a function of gate-source voltage, typical values

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

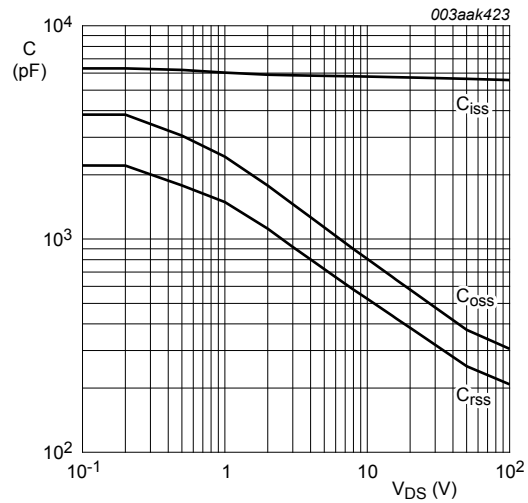


Fig. 17. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

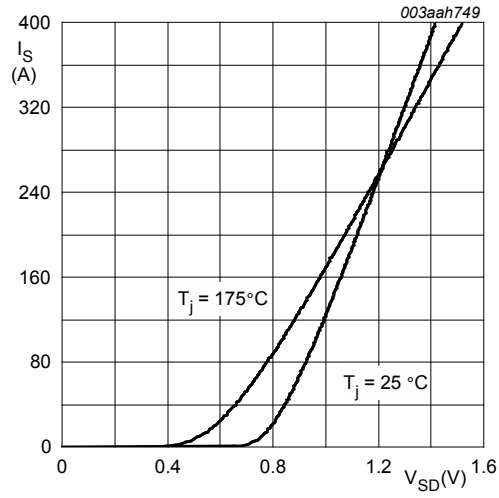


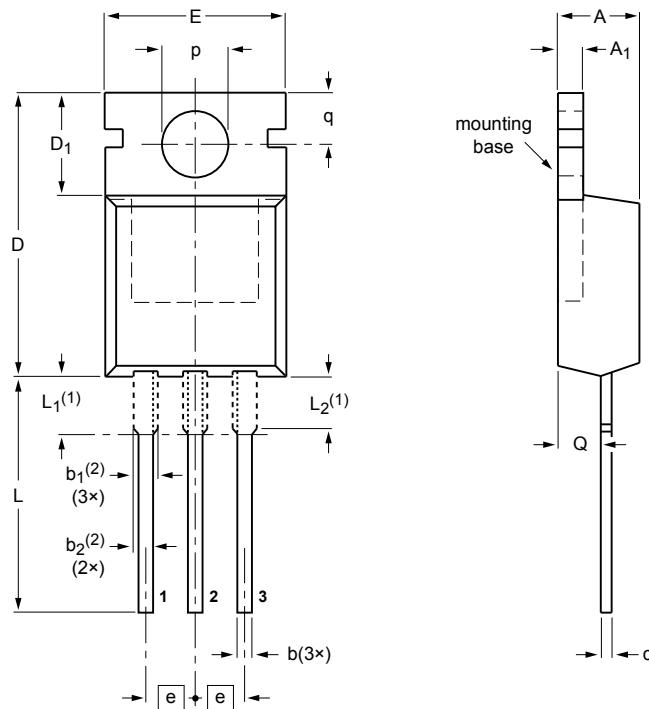
Fig. 18. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

$$V_{GS} = 0V$$

### 11. Package outline

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

SOT78



**DIMENSIONS** (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub> (2)	b <sub>2</sub> (2)	c	D	D <sub>1</sub>	E	e	L	L <sub>1</sub> (1)	L <sub>2</sub> (1) max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

**Notes**

- 1. Lead shoulder designs may vary.
- 2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT78		3-lead TO-220AB	SC-46		08-04-23 08-06-13

**Fig. 19. Package outline TO-220AB (SOT78)**

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### 12.1 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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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