



# 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

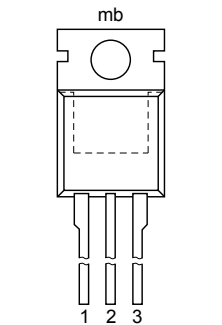
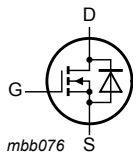
Table 1. Quick reference data

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; 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; 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.

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>TO-220AB (SOT78)</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

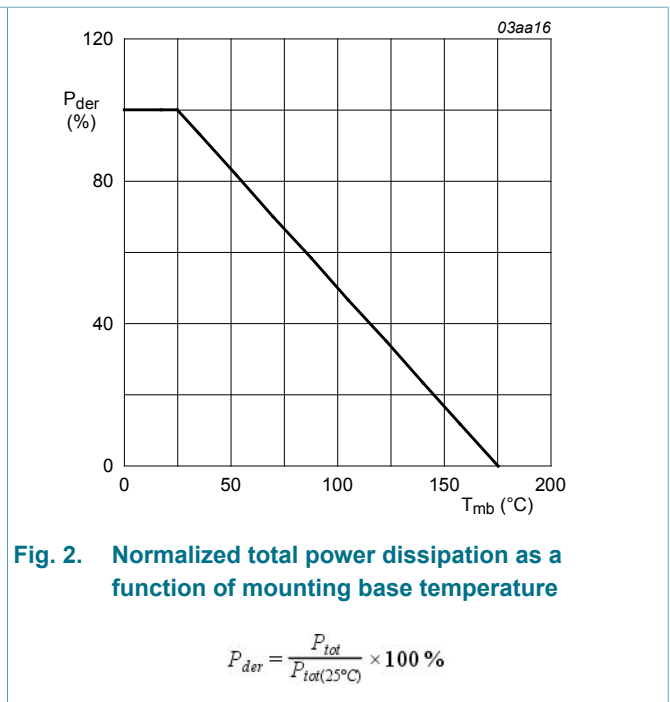
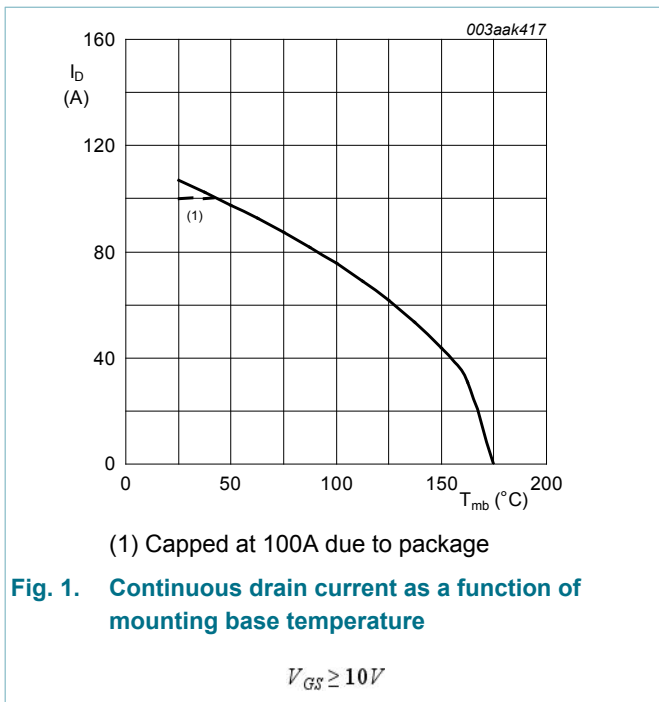
Table 5. Limiting values

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	$V_{GS} = 10\text{ V}$ ; $T_j = 25\text{ °C}$ ; Fig. 1	[1]	-	100	A
		$V_{GS} = 10\text{ V}$ ; $T_{mb} = 100\text{ °C}$ ; Fig. 1		-	75	A
$I_{DM}$	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$ ; Fig. 4	-	429	A	

Symbol	Parameter	Conditions		Min	Max	Unit
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 2</a>		-	263	W
$T_{stg}$	storage temperature			-55	175	°C
$T_j$	junction temperature			-55	175	°C
$T_{sl(M)}$	peak soldering temperature			-	260	°C
<b>Source-drain diode</b>						
$I_S$	source current	$T_{mb} = 25\text{ °C}$	<a href="#">[1]</a>	-	100	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$		-	429	A
<b>Avalanche Ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$ ; $T_{j(\text{init})} = 25\text{ °C}$ ; $I_D = 100\text{ A}$ ; $V_{sup} \leq 100\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; unclamped; <a href="#">Fig. 3</a>		-	219	mJ

[1] Continuous current limited by package.



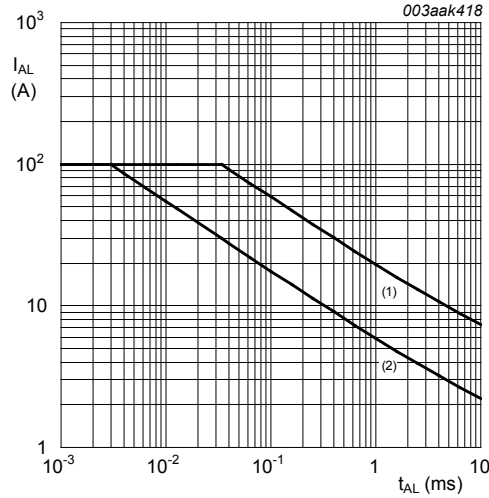


Fig. 3. Avalanche rating; avalanche current as a function of avalanche time

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

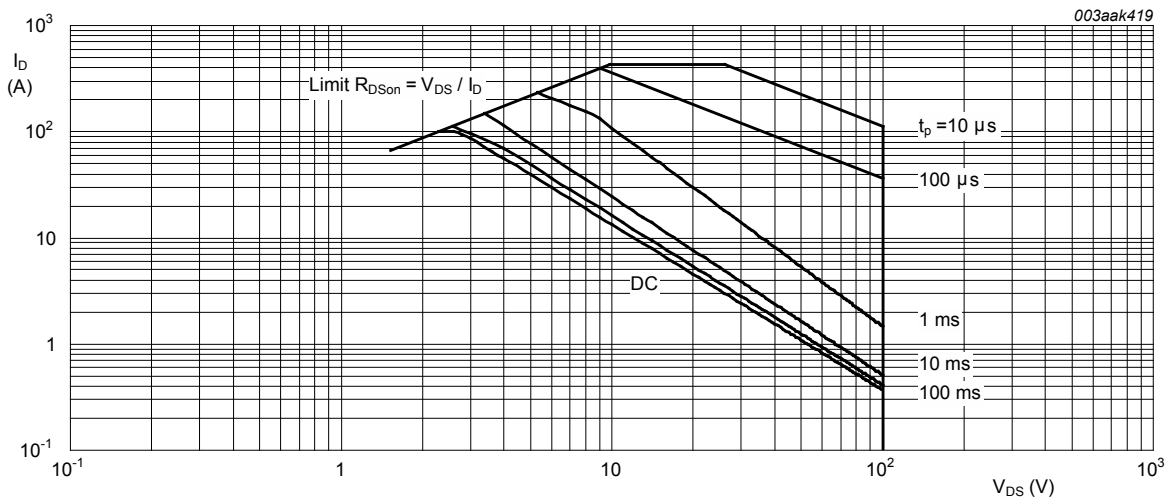


Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25^{\circ}C$ ;  $I_{DM}$  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

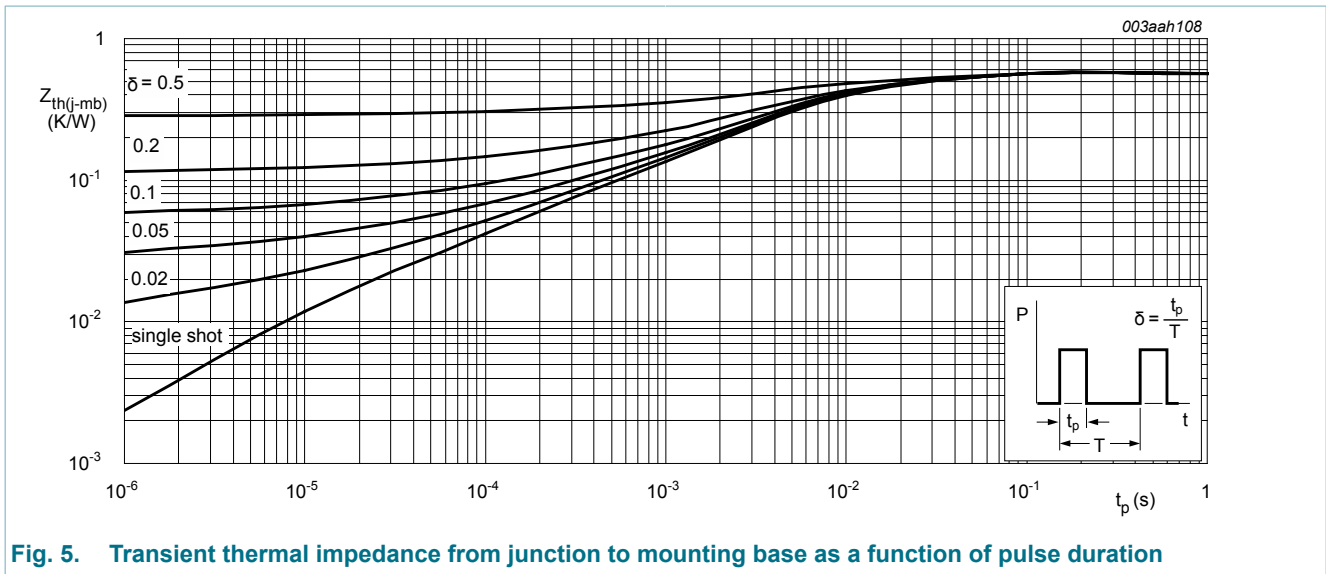


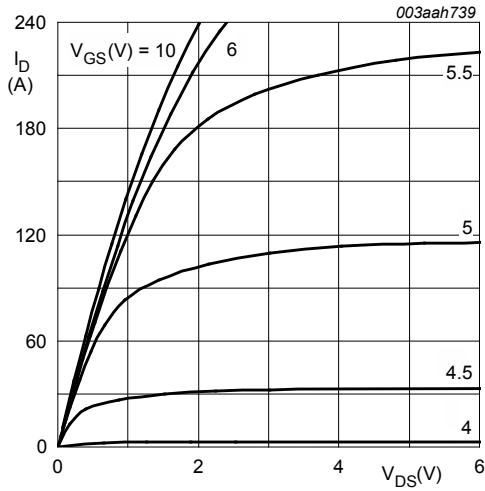
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

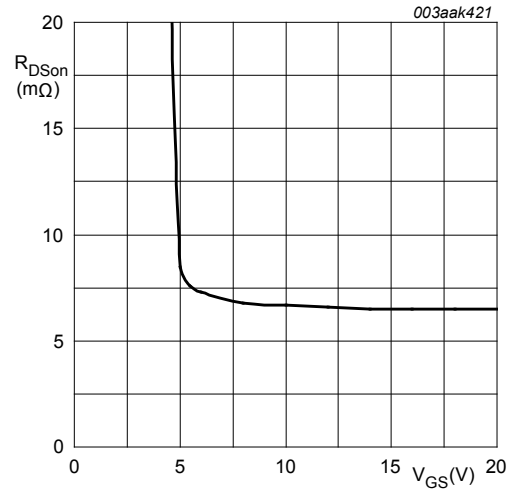
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	100	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	90	-	-	V
$V_{GS(th)}$	gate-source threshold 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>						
$Q_{G(\text{tot})}$	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
$Q_{GS(\text{th})}$	pre-threshold gate-source charge		-	16	-	nC
$Q_{GS(\text{th-pl})}$	post-threshold gate-source charge		-	8	-	nC
$Q_{GD}$	gate-drain charge		-	33	-	nC
$V_{GS(\text{pl})}$	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
$t_{d(\text{on})}$	turn-on delay time	$V_{DS} = 50 \text{ V}$ ; $R_L = 2 \text{ } \Omega$ ; $V_{GS} = 10 \text{ V}$ ; $R_{G(\text{ext})} = 5 \text{ } \Omega$	-	20	-	ns
$t_r$	rise time		-	35	-	ns
$t_{d(\text{off})}$	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



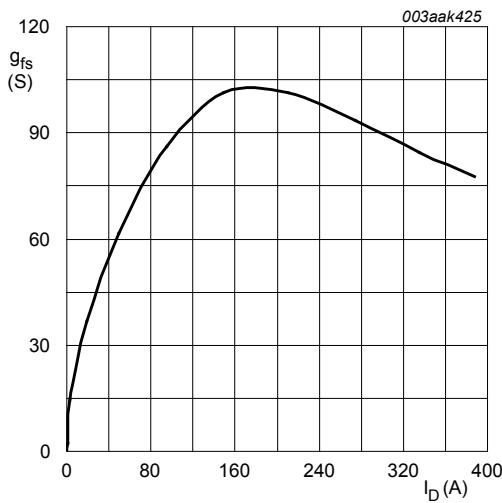
$T_j = 25\text{ }^\circ\text{C}; t_p = 300\text{ }\mu\text{s}$

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



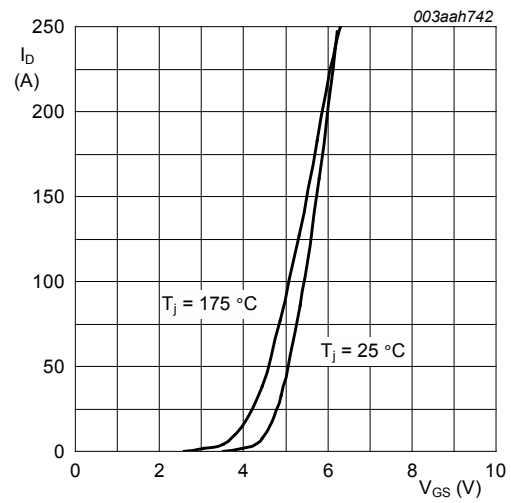
**Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values**

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



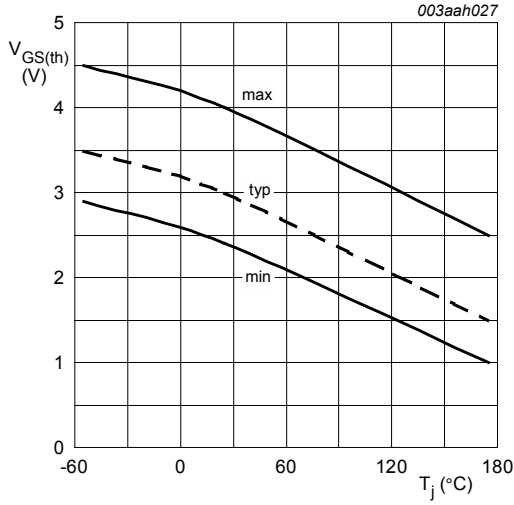
**Fig. 8. Forward transconductance as a function of drain current; typical values**

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



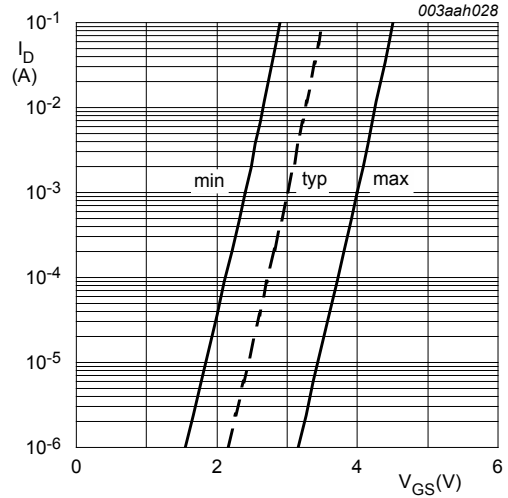
**Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values**

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



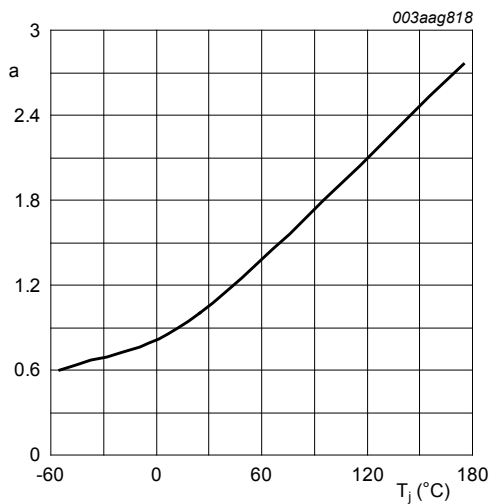
**Fig. 10. Gate-source threshold voltage as a function of junction temperature**

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



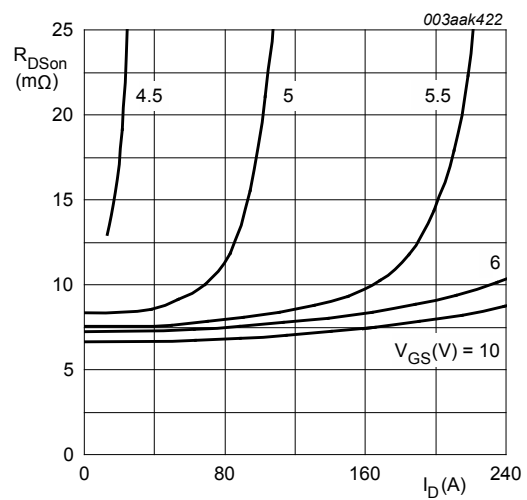
**Fig. 11. Sub-threshold drain current as a function of gate-source voltage**

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



**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**

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



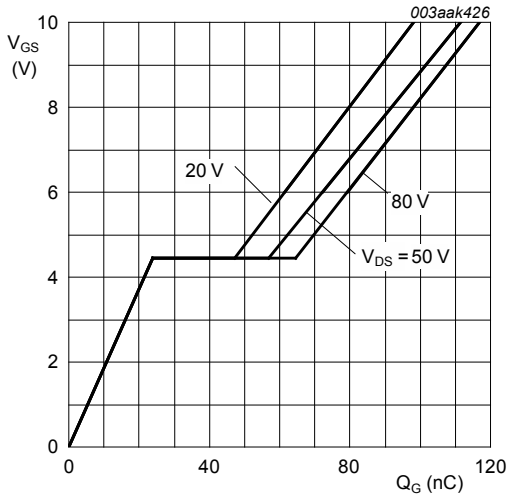


Fig. 14. Gate-source voltage as a function of gate charge; typical values

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

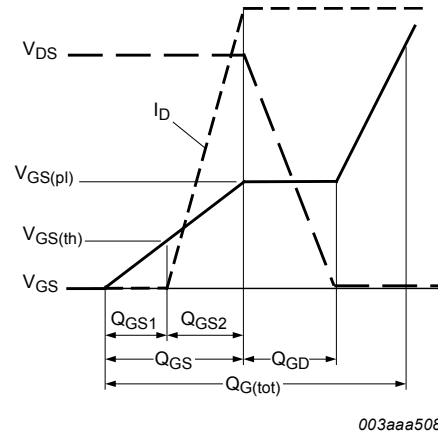


Fig. 15. Gate charge waveform definitions

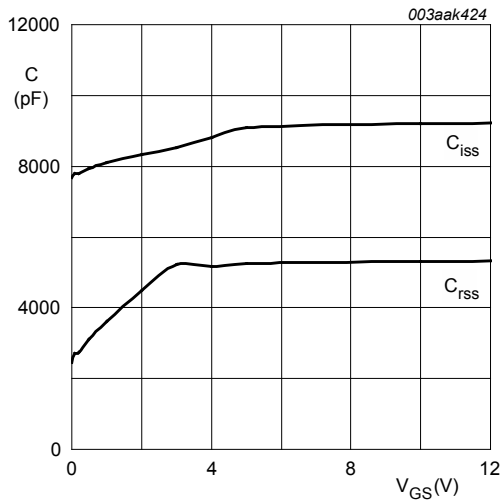


Fig. 16. Input and reverse transfer capacitances as a function of gate-source voltage, typical values

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

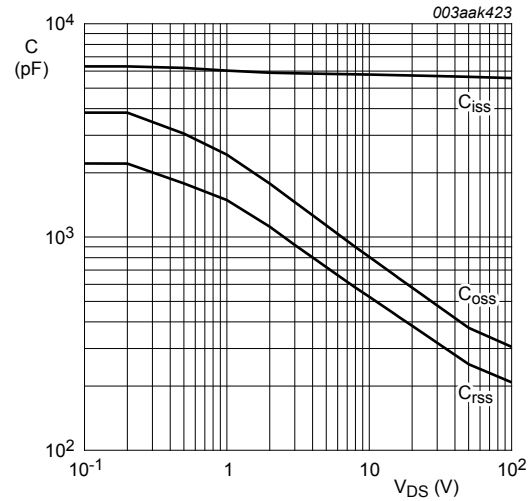


Fig. 17. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

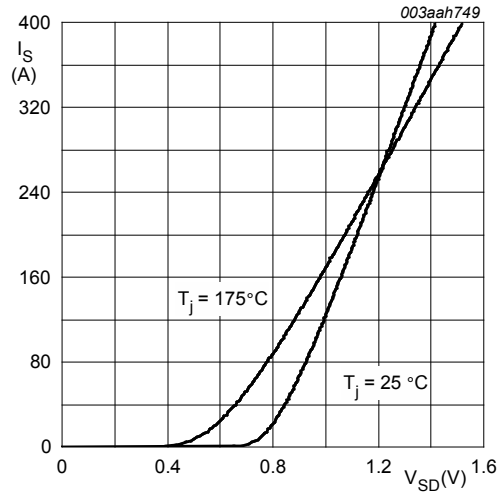


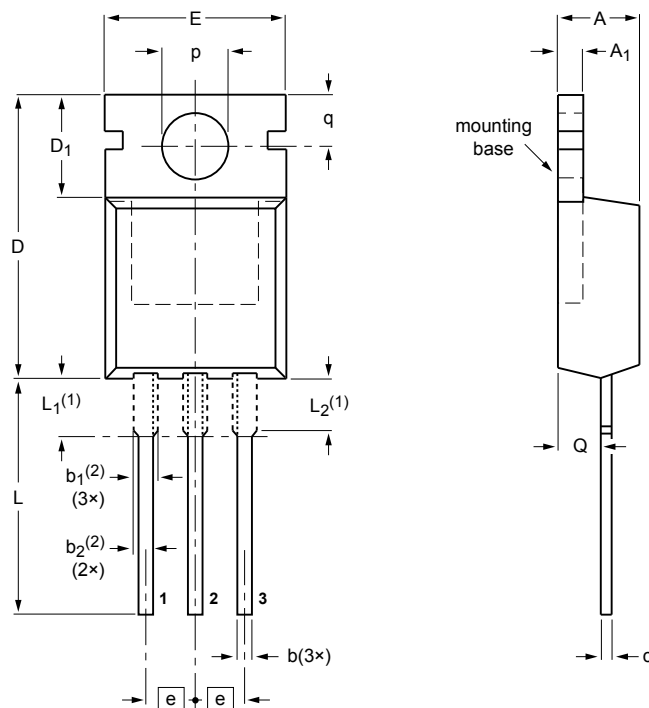
Fig. 18. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

$$V_{GS} = 0V$$

### 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)

## 12. Legal information

### 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.

- [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.nexperia.com>.

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## 13. Contents

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 Date of release: 17 October 2013