PSMN7R0-100PS

N-channel 100V 6.8 mΩ standard level MOSFET in TO220.

17 October 2013 Product data sheet

1. General description

Standard level N-channel MOSFET in TO220 package qualified to 175C. 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
- Improved dynamic avalanche performance
- Suitable for standard level gate drive

3. Applications

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

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	T_j ≥ 25 °C; T_j ≤ 175 °C		-	-	100	V
I_D	drain current	T_{mb} = 25 °C; V_{GS} = 10 V; Fig. 1	[1]	-	-	100	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 2		-	-	269	W
T_j	junction temperature			-55	-	175	°C
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 15 A; T_j = 100 °C; Fig. 12		-	-	12	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 25 °C; Fig. 13		-	5.4	6.8	mΩ
Dynamic characteristics							
Q_{GD}	gate-drain charge	V_{GS} = 10 V; I_D = 25 A; V_{DS} = 50 V; Fig. 15; Fig. 14		-	36	-	nC
$Q_{G(tot)}$	total gate charge	V_{GS} = 10 V; I_D = 25 A; V_{DS} = 50 V; Fig. 14; Fig. 15		-	125	-	nC

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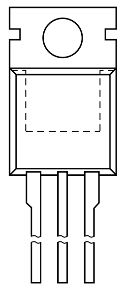
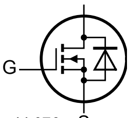
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Avalanche ruggedness							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 100 A; V_{sup} = 100 V; unclamped; R_{GS} = 50 Ω		-	-	316	mJ

[1] Continuous current is limited by package

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 **TO-220AB (SOT78)**	
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
PSMN7R0-100PS	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
PSMN7R0-100PS	PSMN7R0-100PS

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	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	100	V
V_{DGR}	drain-gate voltage	$T_j \leq 175$ °C; $T_j \geq 25$ °C; R_{GS} = 20 kΩ		-	100	V
V_{GS}	gate-source voltage			-20	20	V
I_D	drain current	V_{GS} = 10 V; T_{mb} = 100 °C; Fig. 1		-	85	A
		V_{GS} = 10 V; T_{mb} = 25 °C; Fig. 1	[1]	-	100	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10$ µs; T_{mb} = 25 °C; Fig. 3		-	475	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 2		-	269	W
T_{stg}	storage temperature			-55	175	°C
T_j	junction temperature			-55	175	°C
$T_{sld(M)}$	peak soldering temperature			-	260	°C
Source-drain diode						
I_S	source current	T_{mb} = 25 °C	[1]	-	100	A
I_{SM}	peak source current	pulsed; $t_p \leq 10$ µs; T_{mb} = 25 °C		-	475	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 100 A; V_{sup} = 100 V; unclamped; R_{GS} = 50 Ω		-	316	mJ

[1] Continuous current is limited by package

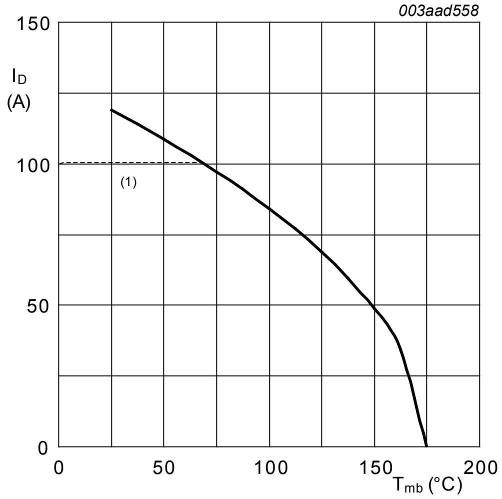


Fig. 1. Continuous drain current as a function of mounting base temperature

$V_{GS} \geq 10$ V; (1) capped at 100 A due to package.

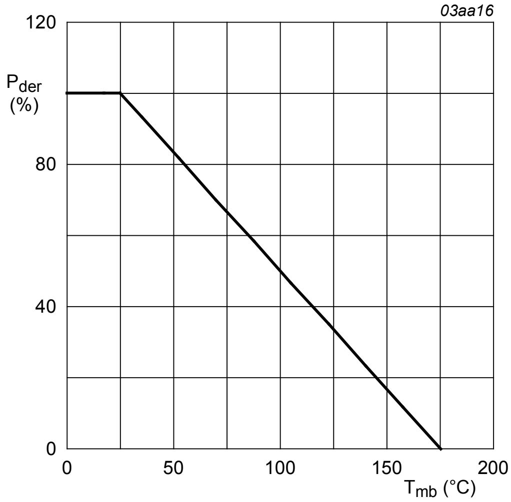


Fig. 2. Normalized total power dissipation as a function of mounting base temperature

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

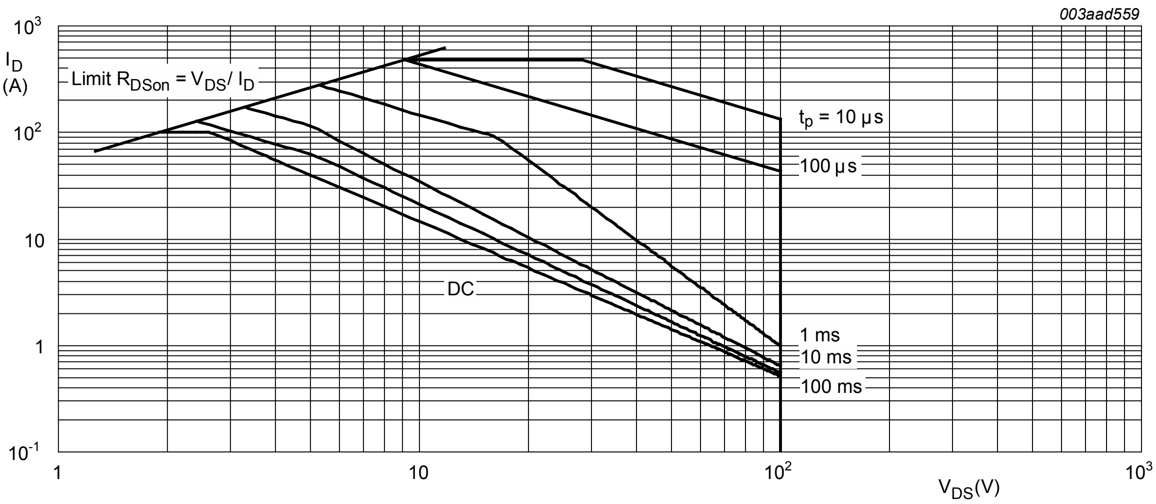


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25\,°C; I_{DM}$ is 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. 4		-	0.3	0.56	K/W

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air		-	60	-	K/W

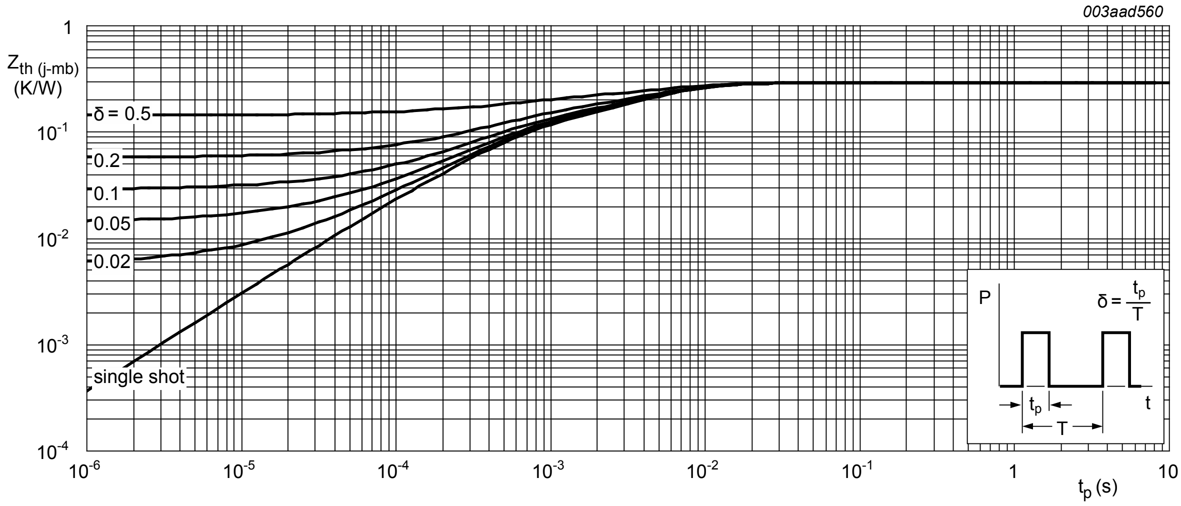


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 0.25 mA; V_{GS} = 0 V; T_j = -55 °C		90	-	-	V
		I_D = 0.25 mA; V_{GS} = 0 V; T_j = 25 °C		100	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; Fig. 10		1	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; Fig. 11; Fig. 10		2	3	4	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; Fig. 10		-	-	4.6	V
I_{DSS}	drain leakage current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 125 °C		-	-	150	µA
		V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 °C		-	0.08	5	µA
I_{GSS}	gate leakage current	V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C		-	10	100	nA
		V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C		-	10	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 15 A; T_j = 100 °C; Fig. 12		-	-	12	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 175 °C; Fig. 12		-	15	19	mΩ

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		V_{GS} = 10 V; I_D = 15 A; T_j = 25 °C; Fig. 13		-	5.4	6.8	mΩ
R_G	internal gate resistance (AC)	f = 1 MHz		-	0.74	-	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	I_D = 25 A; V_{DS} = 50 V; V_{GS} = 10 V; Fig. 14; Fig. 15		-	125	-	nC
		I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V		-	100	-	nC
Q_{GS}	gate-source charge	I_D = 25 A; V_{DS} = 50 V; V_{GS} = 10 V; Fig. 15; Fig. 14		-	28	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge	I_D = 25 A; V_{DS} = 50 V; V_{GS} = 10 V; Fig. 15		-	19.4	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge			-	9	-	nC
Q_{GD}	gate-drain charge	I_D = 25 A; V_{DS} = 50 V; V_{GS} = 10 V; Fig. 15; Fig. 14		-	36	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	V_{DS} = 50 V; Fig. 15; Fig. 14		-	4.3	-	V
C_{iss}	input capacitance	V_{DS} = 50 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; Fig. 16		-	6686	-	pF
C_{oss}	output capacitance			-	438	-	pF
C_{rss}	reverse transfer capacitance			-	272	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 50 V; R_L = 2 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 4.7 Ω; T_j = 25 °C		-	34.6	-	ns
t_r	rise time			-	45.6	-	ns
$t_{d(off)}$	turn-off delay time			-	103.9	-	ns
t_f	fall time			-	49.5	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	I_S = 25 A; V_{GS} = 0 V; T_j = 25 °C; Fig. 17		-	0.8	1.2	V
t_{rr}	reverse recovery time	I_S = 25 A; dI_S/dt = 100 A/µs; V_{GS} = 0 V; V_{DS} = 50 V		-	64	-	ns
Q_r	recovered charge			-	167	-	nC

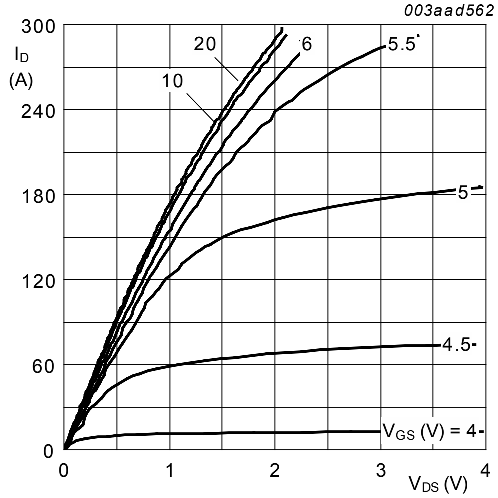


Fig. 5. Output characteristics: drain current as a function of drain-source voltage; typical values

$T_j = 25\,°C$

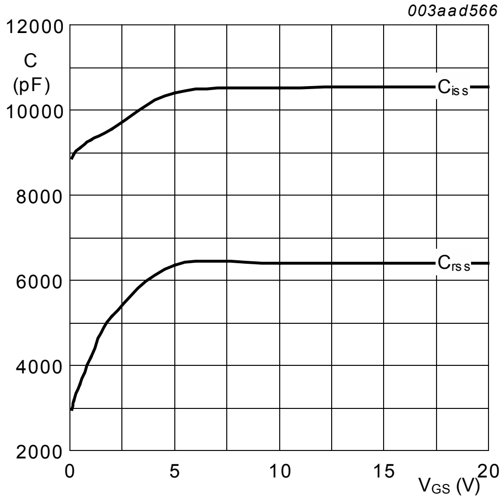


Fig. 6. Input and reverse transfer capacitances as a function of gate-source voltage; typical values

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

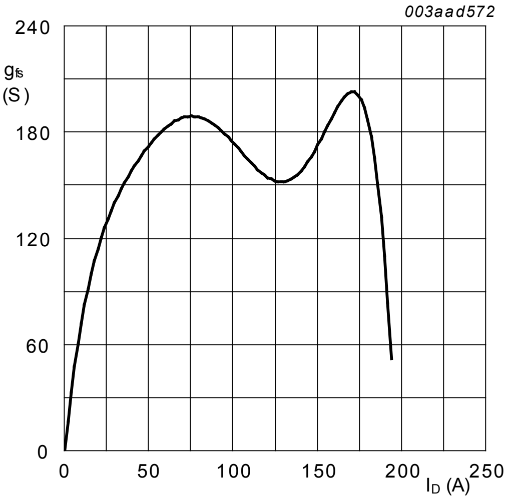


Fig. 7. Forward transconductance as a function of drain current; typical values

$T_j = 25\,°C; V_{DS} = 15\,V$

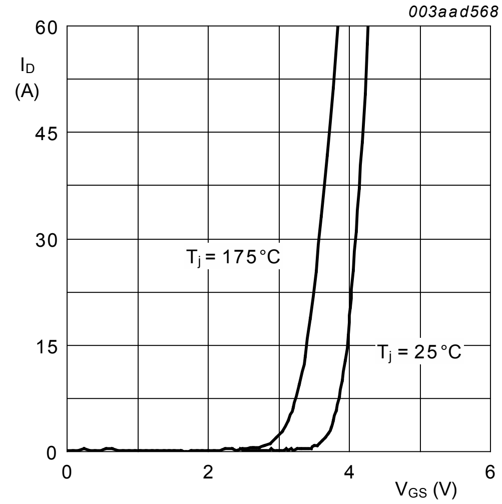


Fig. 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

$V_{DS} > I_D \times R_{DSon}$

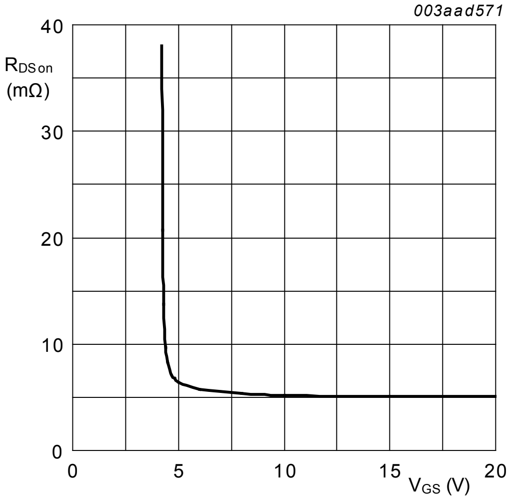


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

$T_j = 25\,°C; I_D = 15A$

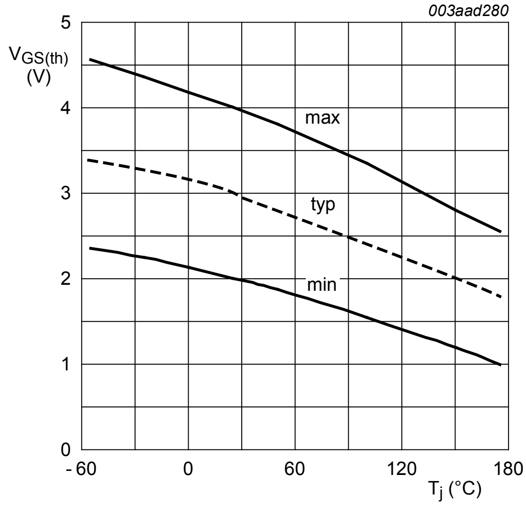


Fig. 10. Gate-source threshold voltage as a function of junction temperature

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

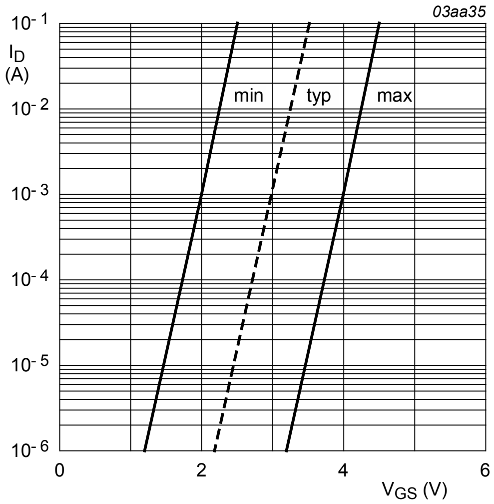


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25\,°C; V_{DS} = 5V$

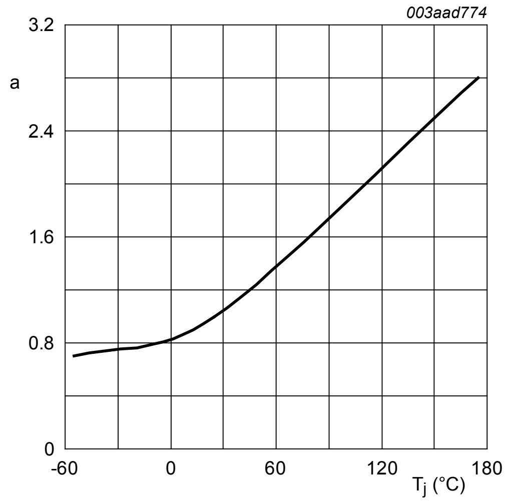


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

$$a = \frac{R_{DSon}}{R_{DSon(25\,°C)}}$$

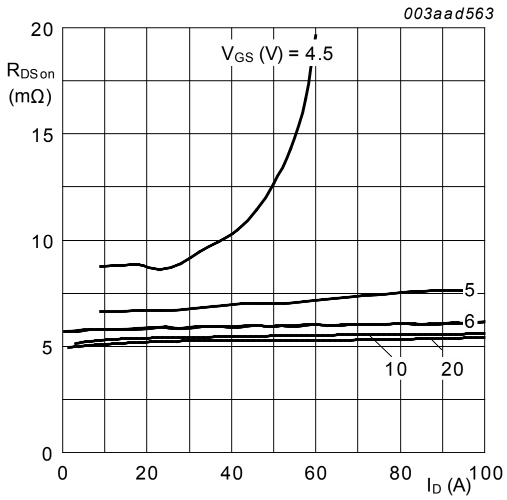


Fig. 13. Drain-source on-state resistance as a function of drain current; typical values

$T_j = 25\,°C$

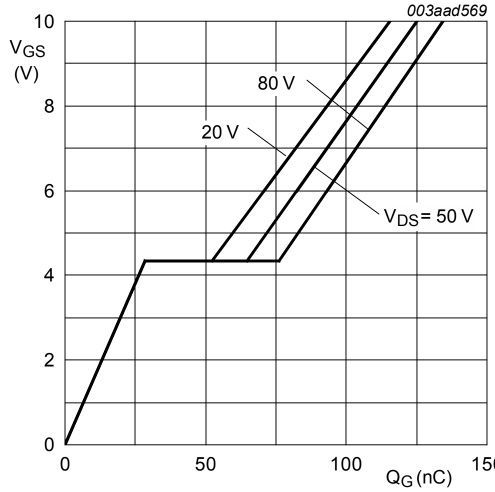


Fig. 14. Gate-source voltage as a function of gate charge; typical values

$T_j = 25\,°C; I_D = 25\,A$

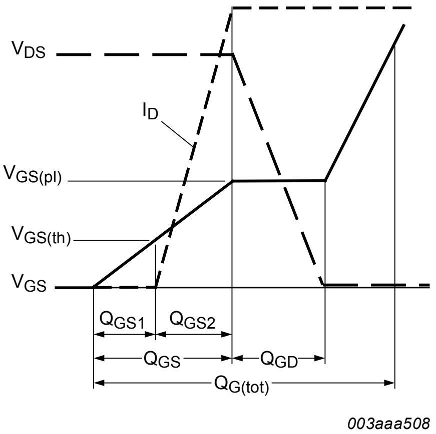


Fig. 15. Gate charge waveform definitions

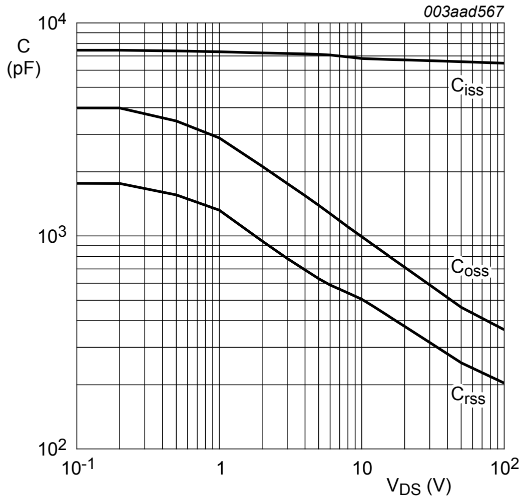


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

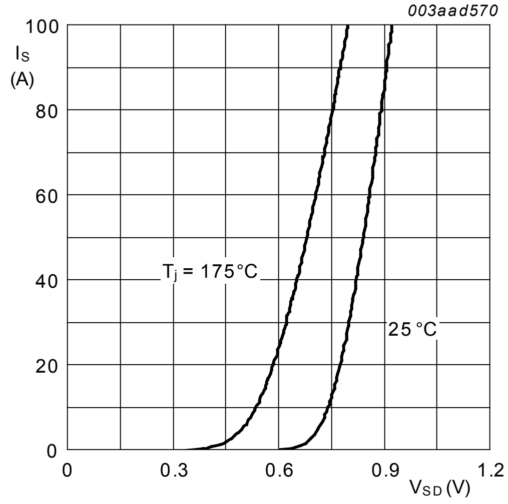
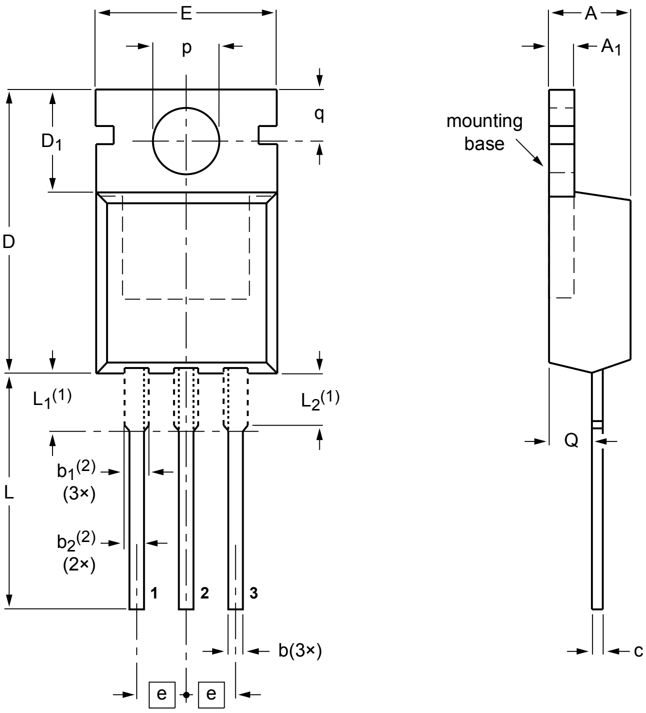


Fig. 17. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

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

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_1	b	b_1(2)	b_2(2)	c	D	D_1	E	e	L	L_1(1)	L_2(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.

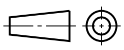
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			~~08-04-23~~ 08-06-13

Fig. 18. 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