PSMN7R0-100PS

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

Rev. 02 — 7 January 2010 Product data sheet

1. Product profile

1.1 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.

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
- Load switching
- Motor control
- Server power supplies

1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	-	100	V
I_D	drain current	$T_{mb} = 25$ °C; $V_{GS} = 10$ V; see Figure 1	[1]	-	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °C; see Figure 2		-	-	269	W
T_j	junction temperature			-55	-	175	°C
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		-	-	315	mJ
Dynamic characteristics							
Q_{GD}	gate-drain charge	$V_{GS} = 10$ V; $I_D = 25$ A; $V_{DS} = 50$ V; see Figure 14 and 17		-	36	-	nC
$Q_{G(tot)}$	total gate charge	$V_{GS} = 10$ V; $I_D = 25$ A; $V_{DS} = 50$ V; see Figure 17 and 14		-	125	-	nC

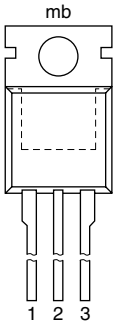
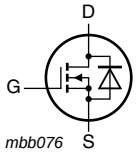
Table 1. Quick reference *…continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 15 A; T_j = 100 °C; see Figure 12	-	-	12	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 25 °C; see Figure 13	-	5.4	6.8	mΩ

[1] Continuous current is limited by package

2. Pinning information

Table 2. Pinning information

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

3. 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

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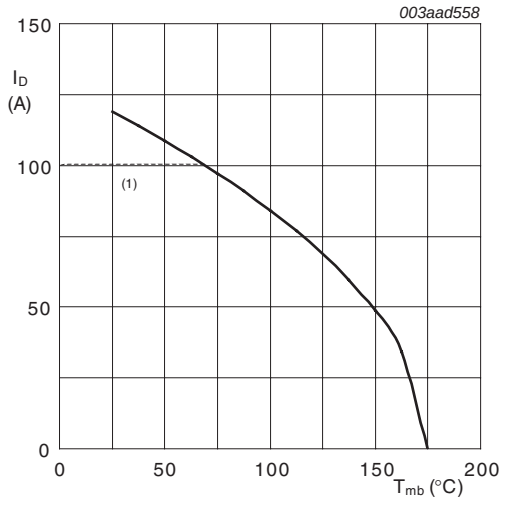
4. Limiting values

Table 4. Limiting values

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

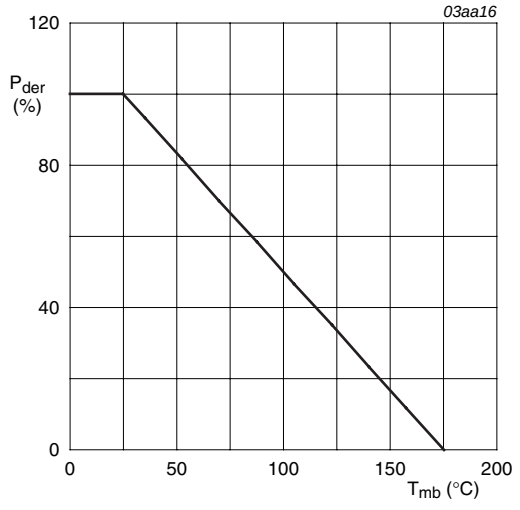
Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C		-	100	V
V_{DGR}	drain-gate voltage	$T_j \leq 175$ °C; $T_j \geq 25$ °C; R_{GS} = 20 kΩ		-	100	V
V_{GS}	gate-source voltage			-20	20	V
I_D	drain current	V_{GS} = 10 V; T_{mb} = 100 °C; see Figure 1		-	85	A
		V_{GS} = 10 V; T_{mb} = 25 °C; see Figure 1	[1]	-	100	A
I_{DM}	peak drain current	$t_p \leq 10$ µs; pulsed; T_{mb} = 25 °C; see Figure 3		-	475	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; see Figure 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	$t_p \leq 10$ µs; pulsed; 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		-	315	mJ

[1] Continuous current is limited by package



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

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

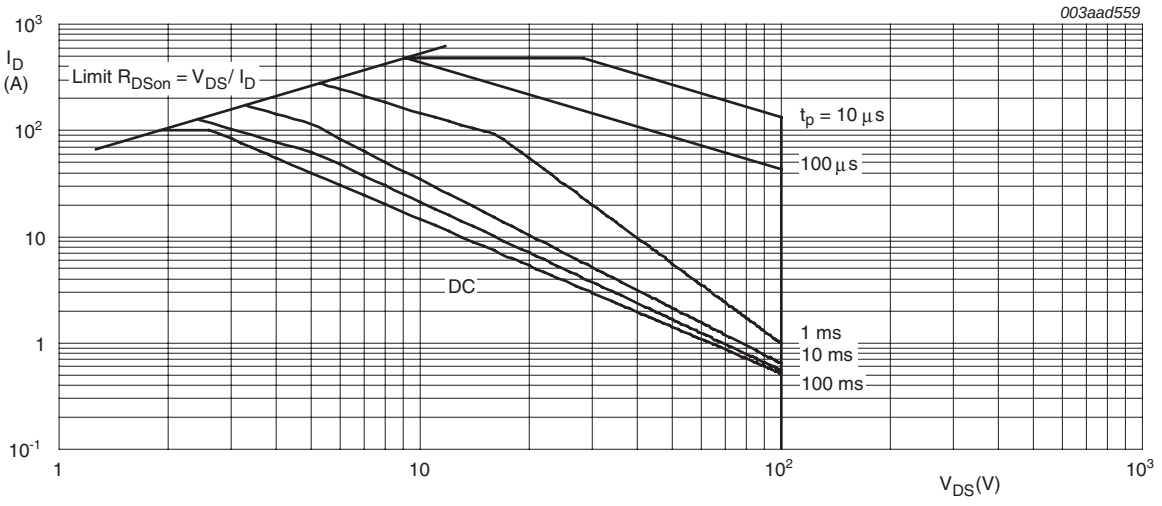


$$P_{der} = \frac{P_{tot}}{P_{tot(25°C)}} \times 100\,\%$$

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

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$T_{mb} = 25\,°C; I_{DM}$ is single pulse

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

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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 Figure 4	-	0.3	0.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air	-	60	-	K/W

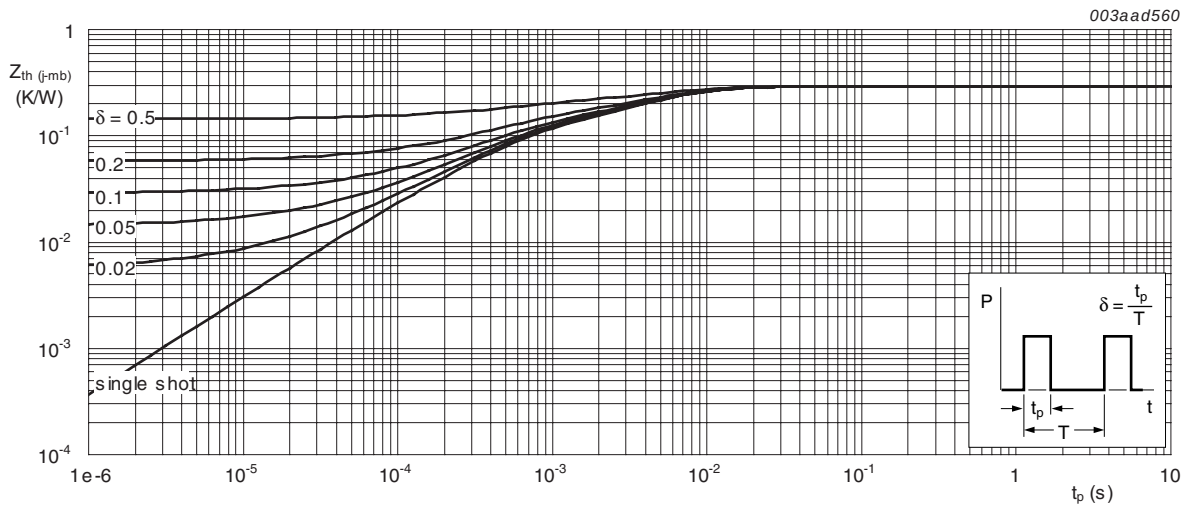


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

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6. Characteristics

Table 6. Characteristics

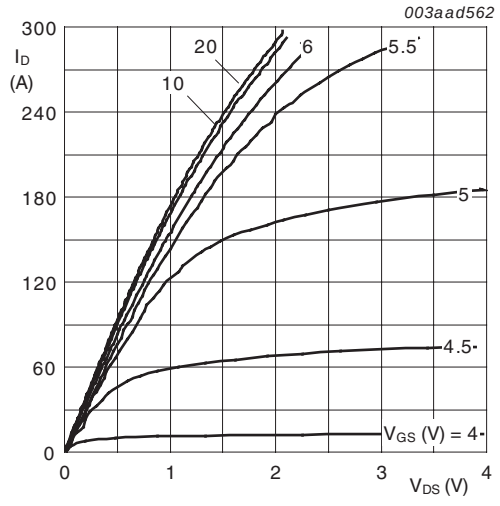
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 0.25 mA; V_{GS} = 0 V; T_j = -55 °C	90	-	-	V
		I_D = 0.25 mA; V_{GS} = 0 V; T_j = 25 °C	100	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; see Figure 10	1	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 11 and 10	2	3	4	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 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; see Figure 12	-	-	12	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 175 °C; see Figure 12	-	15	19	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 25 °C; see Figure 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; see Figure 17 and 14	-	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; see Figure 14 and 17	-	28	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge	I_D = 25 A; V_{DS} = 50 V; V_{GS} = 10 V; see Figure 14	-	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; see Figure 14 and 17	-	36	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	V_{DS} = 50 V; see Figure 14 and 17	-	4.3	-	V
C_{iss}	input capacitance	V_{DS} = 50 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; see Figure 15	-	6686	-	pF
C_{oss}	output capacitance		-	438	-	pF
C_{rss}	reverse transfer capacitance		-	272	-	pF

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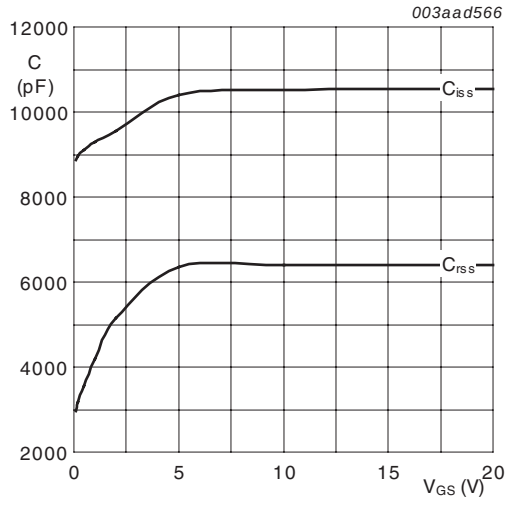
Table 6. Characteristics *…continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{d(on)}$	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; see Figure 16	-	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



$T_j = 25\,°C$

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

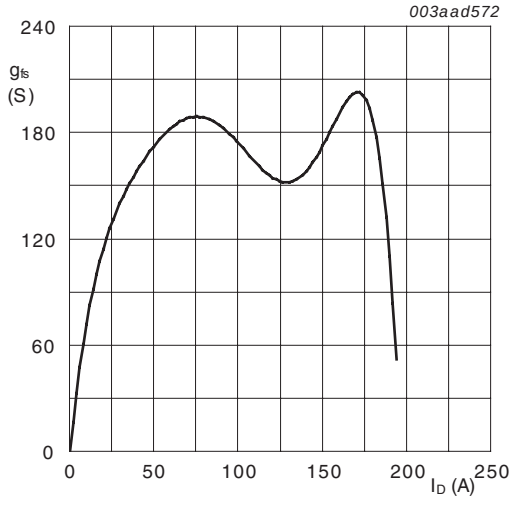


$V_{DS} = 0\,V; f = 1\,MHz$

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

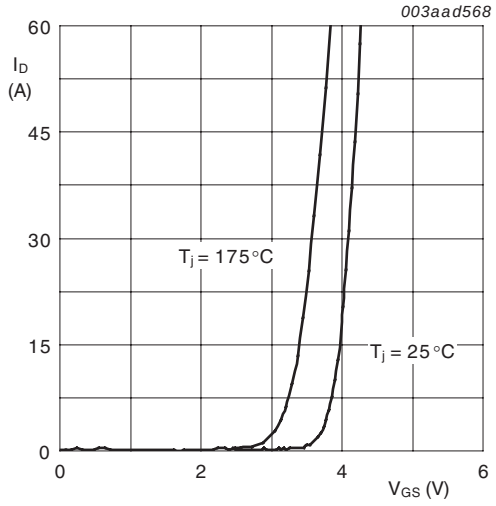
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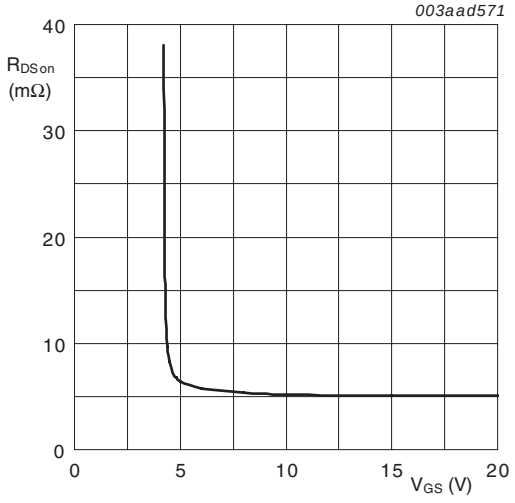
$T_j = 25\,°C; V_{DS} = 15\,V$

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



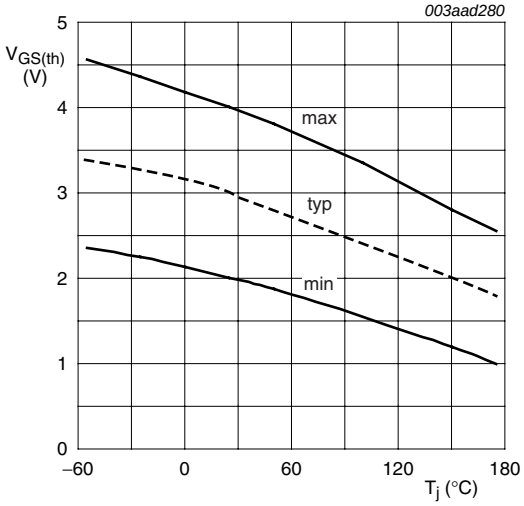
$V_{DS} > I_D \times R_{DSon}$

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



$T_j = 25\,°C; I_D = 15\,A$

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

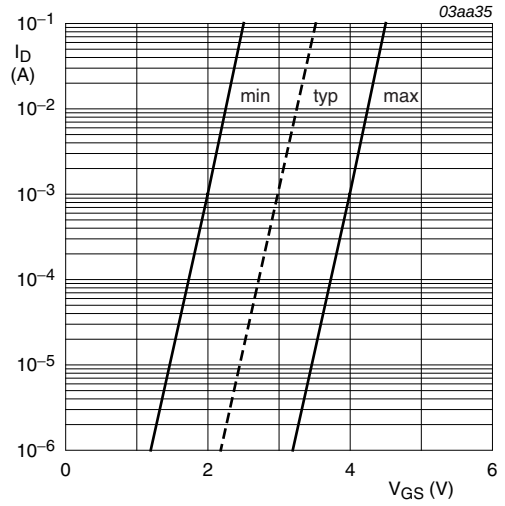


$I_D = 1\,mA; V_{DS} = V_{GS}$

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

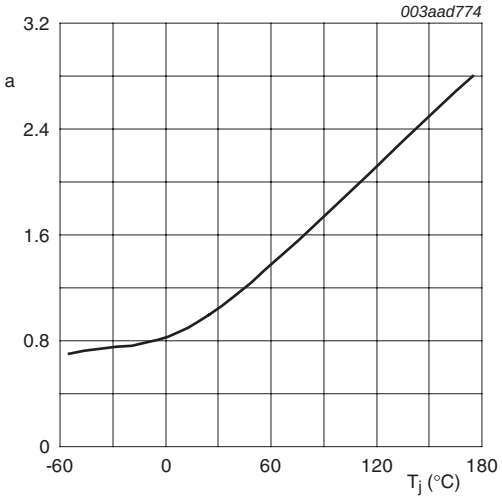
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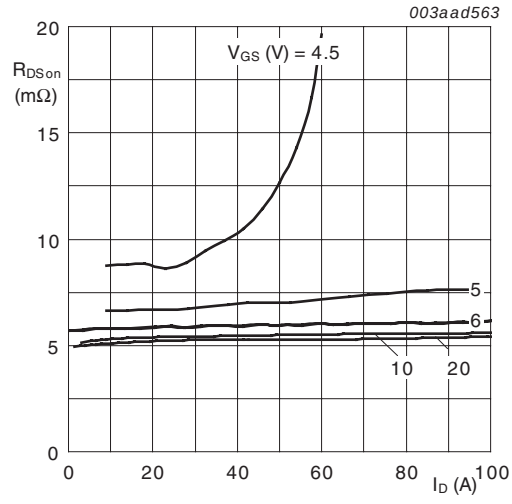
$T_j = 25\,°C; V_{DS} = 5V$

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



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

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



$T_j = 25\,°C$

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

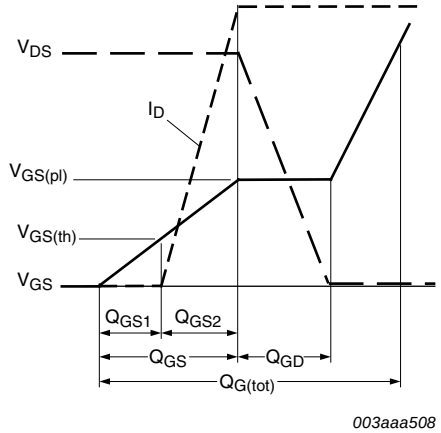
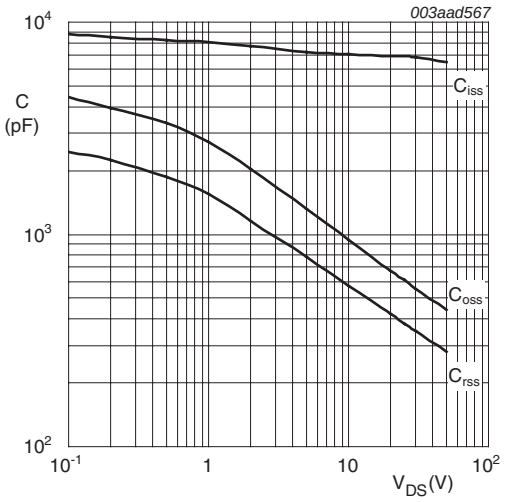


Fig 14. Gate charge waveform definitions

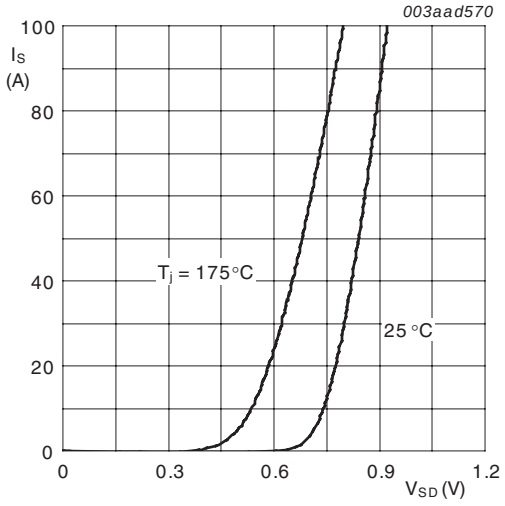
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$V_{GS} = 0\,V; f = 1\,MHz$

Fig 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

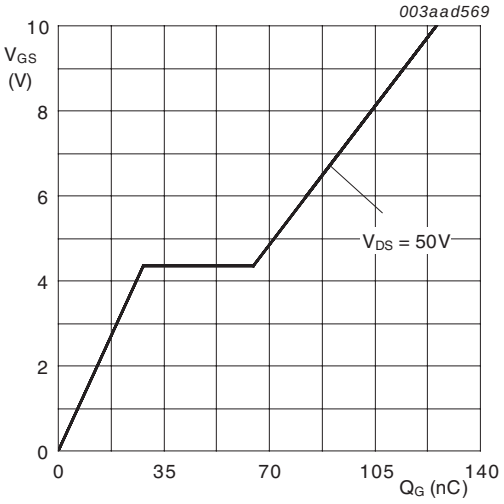


$V_{GS} = 0\,V$

Fig 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

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$T_j = 25\,°C; I_D = 25A$

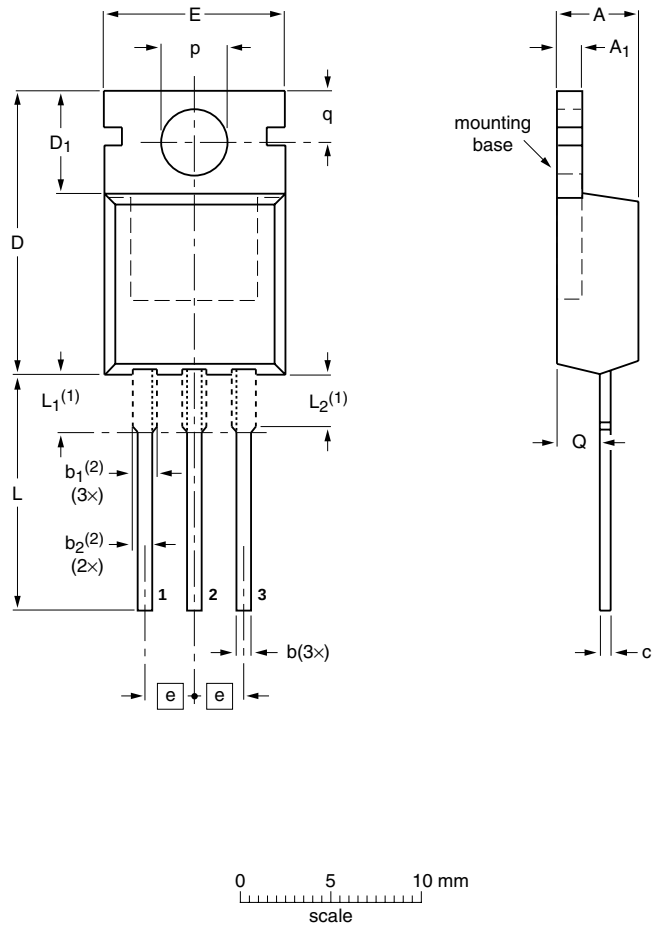
Fig 17. Gate-source voltage as a function of gate charge; typical values

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7. 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 SOT78 (TO-220AB)

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8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN7R0-100PS_2	20100107	Product data sheet	-	PSMN7R0-100PS_1
Modifications:	• Status changed from objective to product.			
PSMN7R0-100PS_1	20090917	Objective data sheet	-	-

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9. Legal information

9.1 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.nxp.com.

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11. Contents

1 Product profile 1
1.1 General description 1
1.2 Features and benefits 1
1.3 Applications 1
1.4 Quick reference data 1
2 Pinning information 2
3 Ordering information 2
4 Limiting values 3
5 Thermal characteristics 5
6 Characteristics 6
7 Package outline 12
8 Revision history 13
9 Legal information 14
9.1 Data sheet status 14
9.2 Definitions 14
9.3 Disclaimers 14
9.4 Trademarks 15
10 Contact information 15

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Date of release: 7 January 2010
Document identifier: PSMN7R0-100PS_2