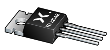

PSMN8R5-100PSF

NextPower 100 V, 8.7 mΩ N-channel MOSFET in TO220 package

10 April 2017 Product data sheet

1. General description

NextPower 100 V standard level gate drive MOSFET. Qualified to 175 °C and recommended for industrial & consumer applications.

2. Features and benefits

- Optimised for fast switching, low spiking, high efficiency
- Low Q_G x R_{DSon} FOM for high efficiency switching applications
- Low body diode losses (Q_{rr}) and fast recovery (t_{rr})
- Strong avalanche energy rating (E_{AS})
- Avalanche rated & 100% tested
- Ha-free & RoHS compliant TO220 package

3. Applications

- Synchronous rectification in AC-to-DC and DC-to-DC applications
- Brushed & BLDC motor control
- UPS & solar inverter
- LED lighting
- Battery protection
- Full-bridge & half-bridge applications
- Flyback & resonant topologies

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	25 °C ≤ T_j ≤ 175 °C		-	-	100	V
I_D	drain current	V_{GS} = 10 V; T_{mb} = 25 °C; Fig. 2	[1]	-	-	98	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 1		-	-	183	W
T_j	junction temperature			-55	-	175	°C
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; Fig. 10		-	7.5	8.7	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 100 °C; Fig. 11		-	11.2	13.5	mΩ
Dynamic characteristics							
Q_{GD}	gate-drain charge	I_D = 25 A; V_{DS} = 50 V; V_{GS} = 10 V; Fig. 12; Fig. 13		-	8.7	-	nC
$Q_{G(tot)}$	total gate charge			-	44.5	-	nC

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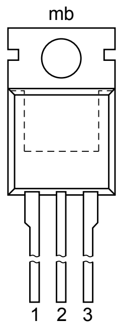
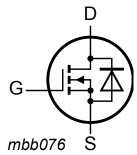
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Avalanche ruggedness							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	I_D = 34 A; V_{sup} ≤ 100 V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; Fig. 4; Unclamped	[2]	-	-	281	mJ

[1] Avalanche current is limited by I_{AS}
[2] Protected by 100% test

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
PSMN8R5-100PSF	TO-220AB	plastic, single-ended package (heatsink mounted, 1 mounting hole); 3 leads; 2.54 mm pitch; 15.6 mm x 10 mm x 4.4 mm body	SOT78

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN8R5-100PSF	PSMN8R5-100PSF

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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	25 °C ≤ T_j ≤ 175 °C		-	100	V
V_{DGR}	drain-gate voltage	25 °C ≤ T_j ≤ 175 °C; R_{GS} = 20 kΩ		-	100	V
V_{GS}	gate-source voltage			-20	20	V
P_{tot}	total power dissipation	T_{mb} = 25 °C; Fig. 1		-	183	W
I_D	drain current	V_{GS} = 10 V; T_{mb} = 25 °C; Fig. 2	[1]	-	98	A
		V_{GS} = 10 V; T_{mb} = 100 °C; Fig. 2		-	69	A
I_{DM}	peak drain current	pulsed; t_p ≤ 10 µs; T_{mb} = 25 °C; Fig. 3		-	391	A
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		-	98	A
I_{SM}	peak source current	pulsed; t_p ≤ 10 µs; T_{mb} = 25 °C		-	391	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	I_D = 34 A; V_{sup} ≤ 100 V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; Fig. 4; Unclamped	[2]	-	281	mJ
I_{AS}	non-repetitive avalanche current	V_{sup} ≤ 100 V; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; R_{GS} = 50 Ω	[2]	-	34	A

[1] Avalanche current is limited by I_{AS}
[2] Protected by 100% test

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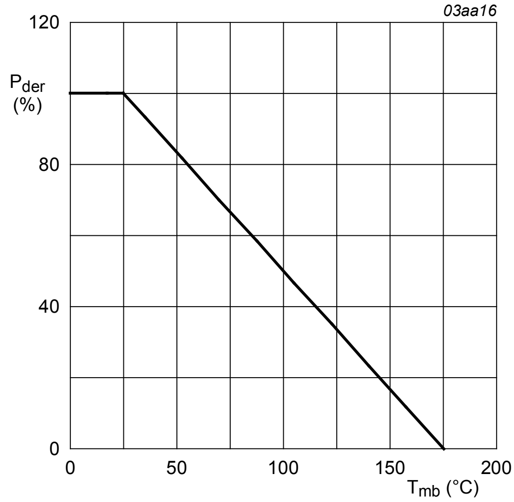
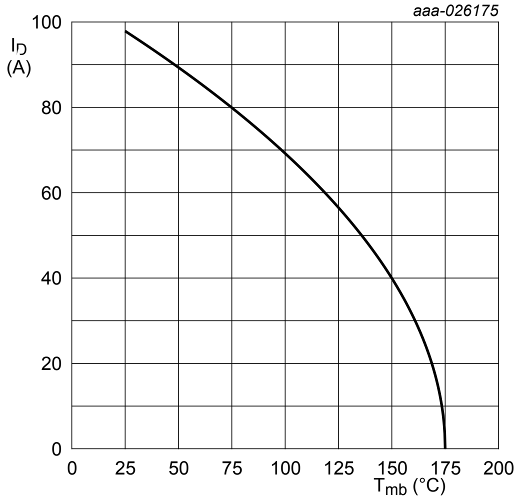


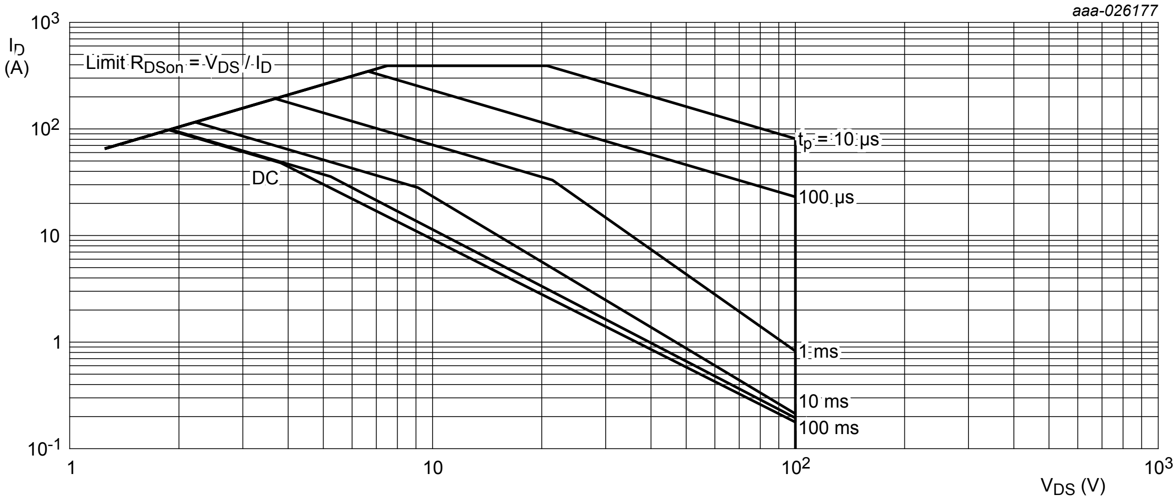
$$P_{der} = \frac{P_{tot}}{P_{tot(25°C)}} \times 100\,\%$$

Fig. 1. Normalized total power dissipation as a function of mounting base temperature



$V_{GS} \geq 10$ V

Fig. 2. Continuous drain current as a function of mounting base temperature



T_{mb} = 25 °C; I_{DM} is a single pulse

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

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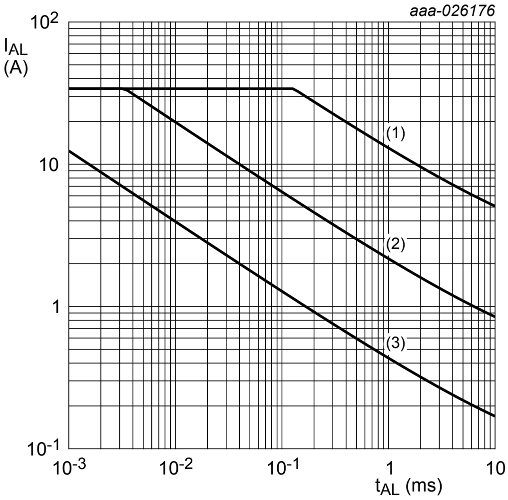

(1) $T_{j\ (init)}$ = 25 °C; (2) $T_{j\ (init)}$ = 150 °C; (3) Repetitive Avalanche

Fig. 4. Avalanche rating; avalanche current as a function of avalanche time

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		-	0.71	0.82	K/W

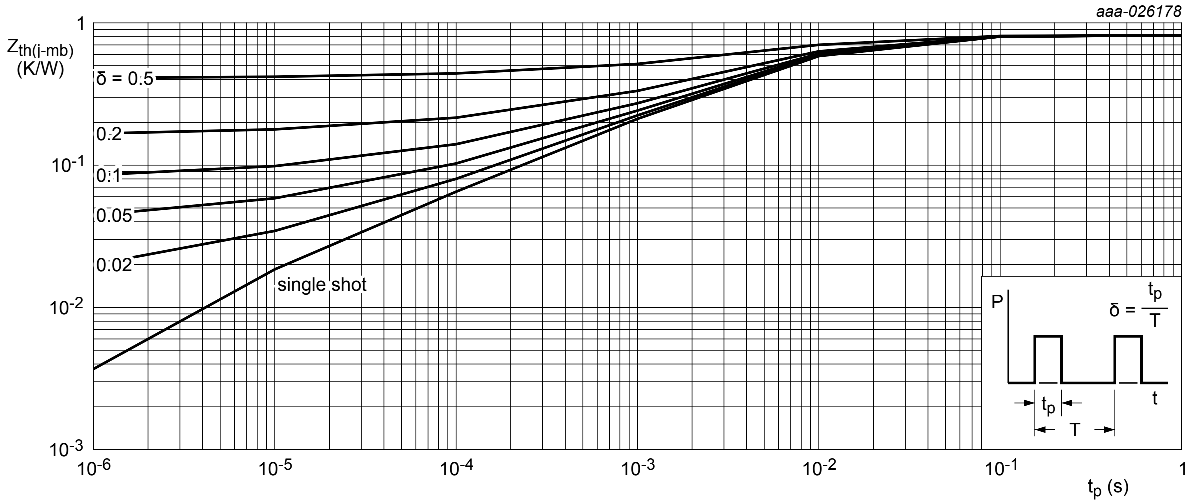

Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

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10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 250 µA; V_{GS} = 0 V; T_j = 25 °C		100	-	-	V
		I_D = 250 µA; V_{GS} = 0 V; T_j = -55 °C		90	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS}=V_{GS}; T_j = -55 °C		-	3.6	-	V
		I_D = 1 mA; V_{DS}=V_{GS}; T_j = 175 °C		-	1.8	-	V
		I_D = 1 mA; V_{DS}=V_{GS}; T_j = 25 °C; Fig. 9		2	3.1	4	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	25 °C ≤ T_j ≤ 175 °C		-	-8.4	-	mV/K
I_{DSS}	drain leakage current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 °C		-	0.05	1	µA
		V_{DS} = 100 V; V_{GS} = 0 V; T_j = 125 °C		-	-	100	µA
I_{GSS}	gate leakage current	V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C		-	5	100	nA
		V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C		-	5	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; Fig. 10		-	7.5	8.7	mΩ
		V_{GS} = 7 V; I_D = 25 A; T_j = 25 °C; Fig. 10		-	8.9	13.2	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 100 °C; Fig. 11		-	11.2	13.5	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; Fig. 11		-	16	19	mΩ
R_G	gate resistance	f = 1 MHz		-	1.54	-	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	I_D = 25 A; V_{DS} = 50 V; V_{GS} = 10 V; Fig. 12; Fig. 13		-	44.5	-	nC
		I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V		-	22.9	-	nC
Q_{GS}	gate-source charge	I_D = 25 A; V_{DS} = 50 V; V_{GS} = 10 V; Fig. 12; Fig. 13		-	14.5	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge			-	8.8	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge			-	5.6	-	nC
Q_{GD}	gate-drain charge			-	8.7	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	I_D = 25 A; V_{DS} = 50 V; Fig. 12; Fig. 13		-	4.8	-	V
C_{iss}	input capacitance	V_{DS} = 50 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; Fig. 14		-	3181	-	pF
C_{oss}	output capacitance			-	551	-	pF
C_{rss}	reverse transfer capacitance			-	12	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 50 V; R_L = 2 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 5 Ω; T_j = 25 °C		-	16.8	-	ns
t_r	rise time			-	26.8	-	ns

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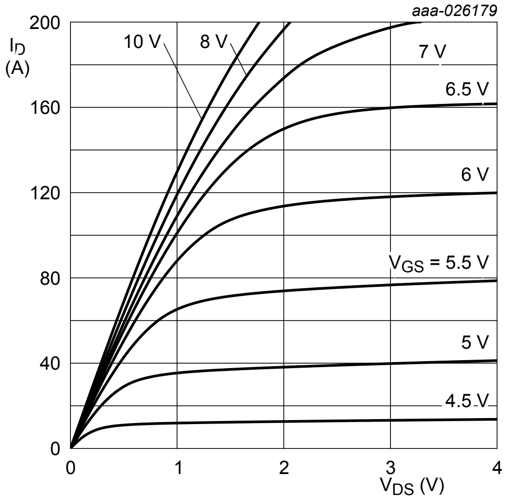
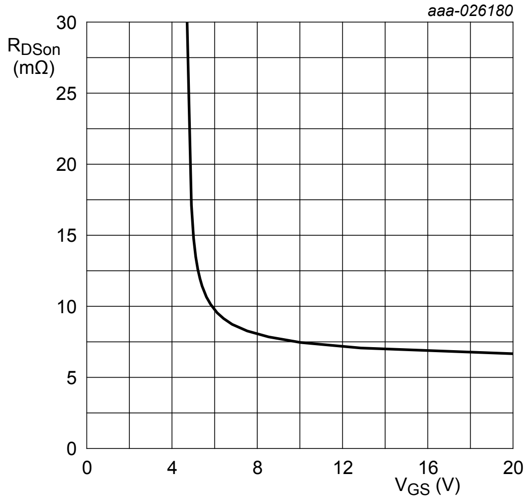
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$t_{d(off)}$	turn-off delay time			-	31.5	-	ns
t_f	fall time			-	23.6	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	I_S = 25 A; V_{GS} = 0 V; T_j = 25 °C; Fig. 15		-	0.83	1.2	V
t_{rr}	reverse recovery time	I_S = 25 A; dI_S/dt = -100 A/µs; V_{GS} = 0 V; V_{DS} = 50 V; Fig. 16		-	51	-	ns
Q_r	recovered charge			-	70	-	nC



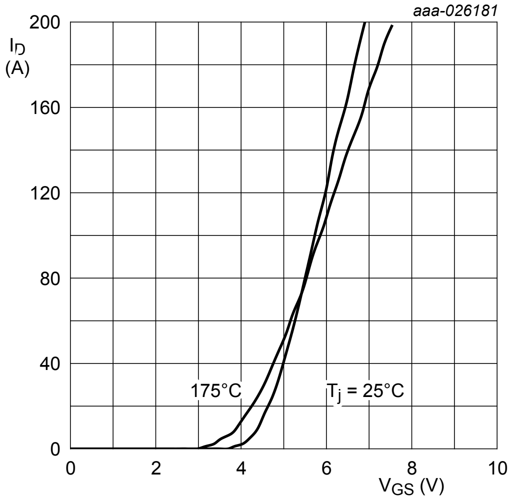
T_j = 25 °C

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



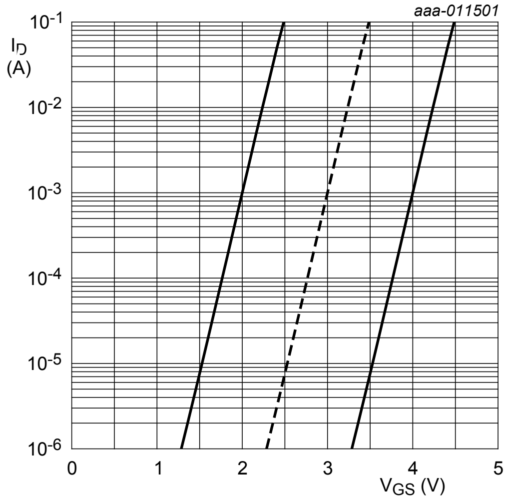
T_j = 25 °C; I_D = 25 A

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



V_{DS} = 12 V

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



$T_j = 25°C$; $V_{DS} = 5V$

Fig. 9. Sub-threshold drain current as a function of gate-source voltage

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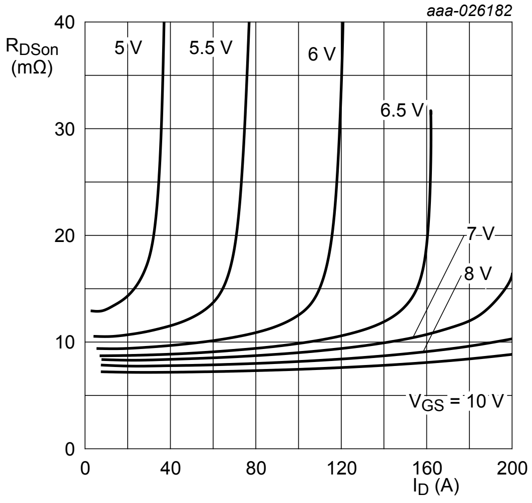
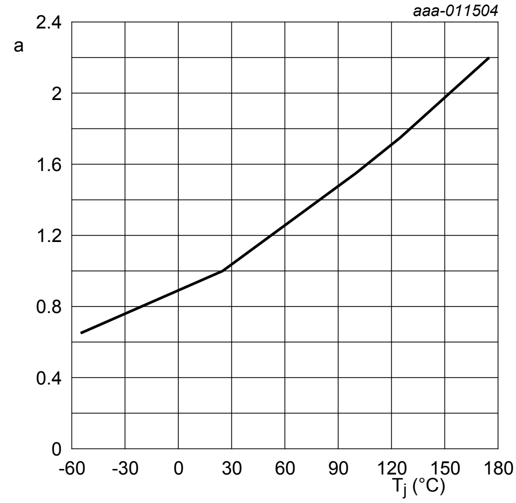


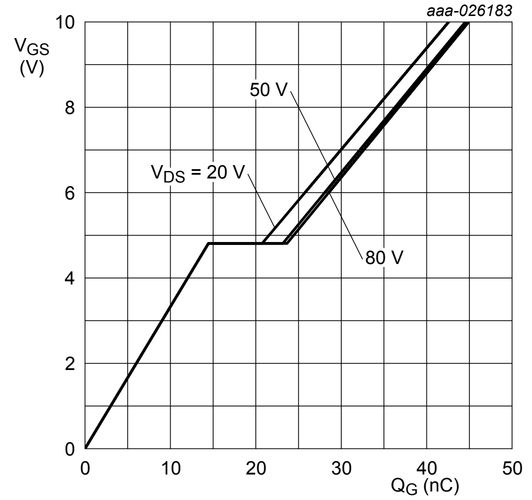
T_j = 25 °C

Fig. 10. Drain-source on-state resistance as a function of drain current; typical values



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

Fig. 11. Normalized drain-source on-state resistance factor as a function of junction temperature



T_j = 25 °C; I_D = 25 A

Fig. 12. Gate-source voltage as a function of gate charge; typical values

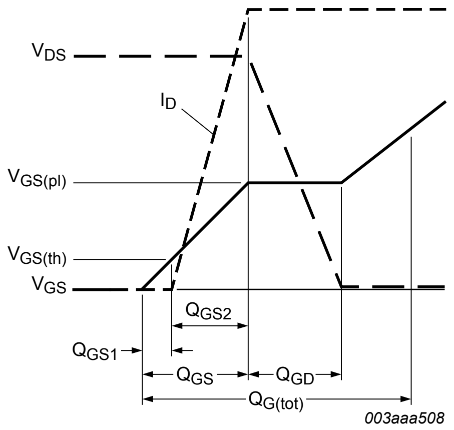


Fig. 13. Gate charge waveform definitions

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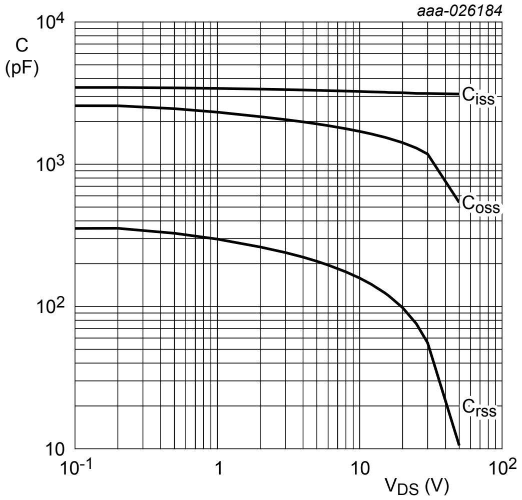
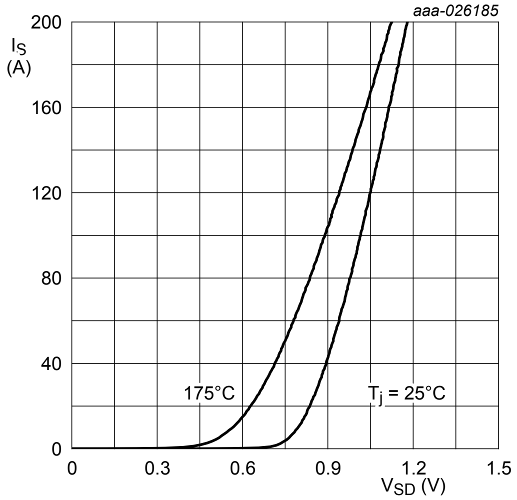


V_{GS} = 0 V; f = 1 MHz

Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



V_{GS} = 0 V

Fig. 15. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

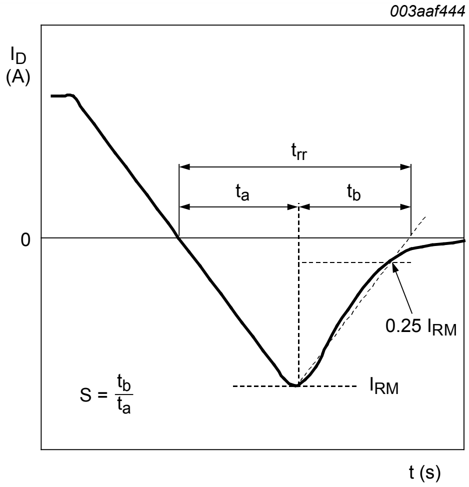


Fig. 16. Reverse recovery timing definition

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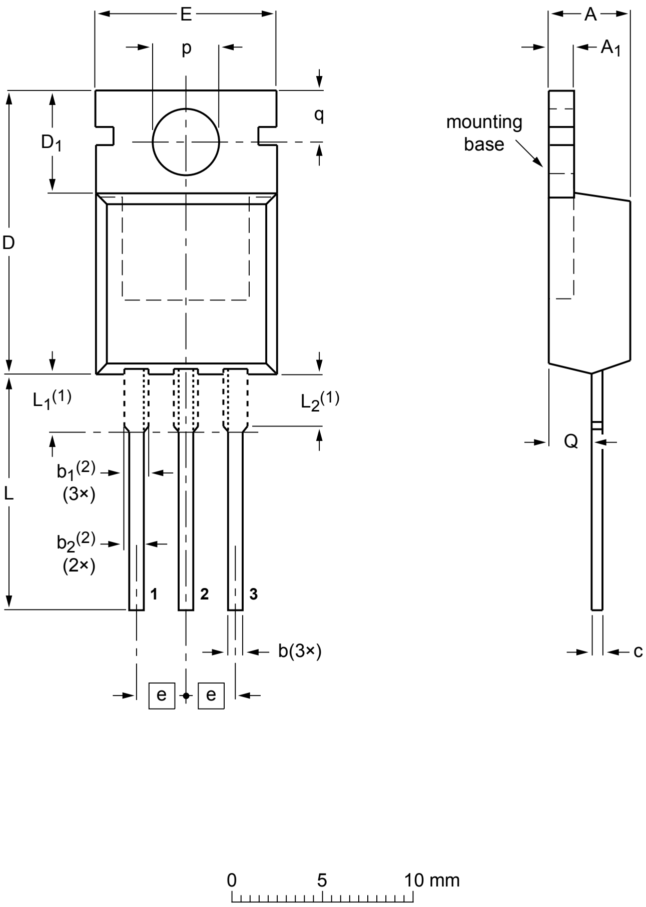
11. Package outline

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. 17. Package outline TO-220AB (SOT78)

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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".
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13. Contents

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Date of release: 10 April 2017