



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 $Q_G \times R_{DSon}$ 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

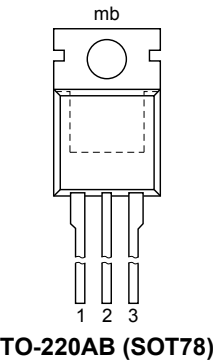
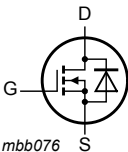
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C		-	-	100	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 25 °C; Fig. 2	[1]	-	-	98	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 1		-	-	183	W
T _j	junction temperature			-55	-	175	°C
Static characteristics							
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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Avalanche ruggedness							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 34\text{ A}$; $V_{sup} \leq 100\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ }^\circ\text{C}$; 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		
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		
			TO-220AB (SOT78)	

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

8. Limiting values

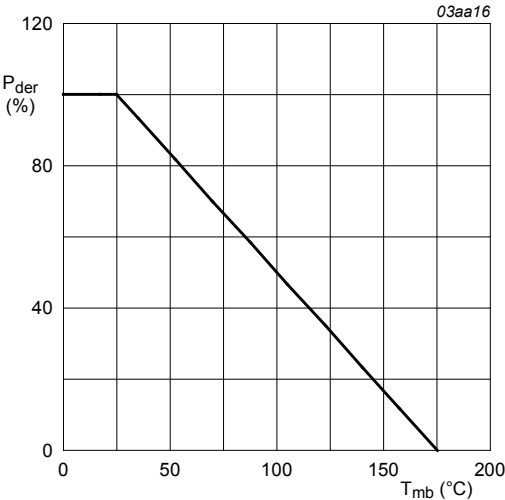
Table 5. Limiting values

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

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

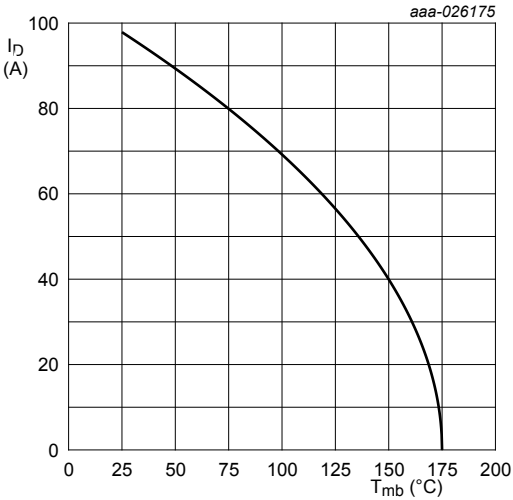
[1] Avalanche current is limited by I_{AS}

[2] Protected by 100% test



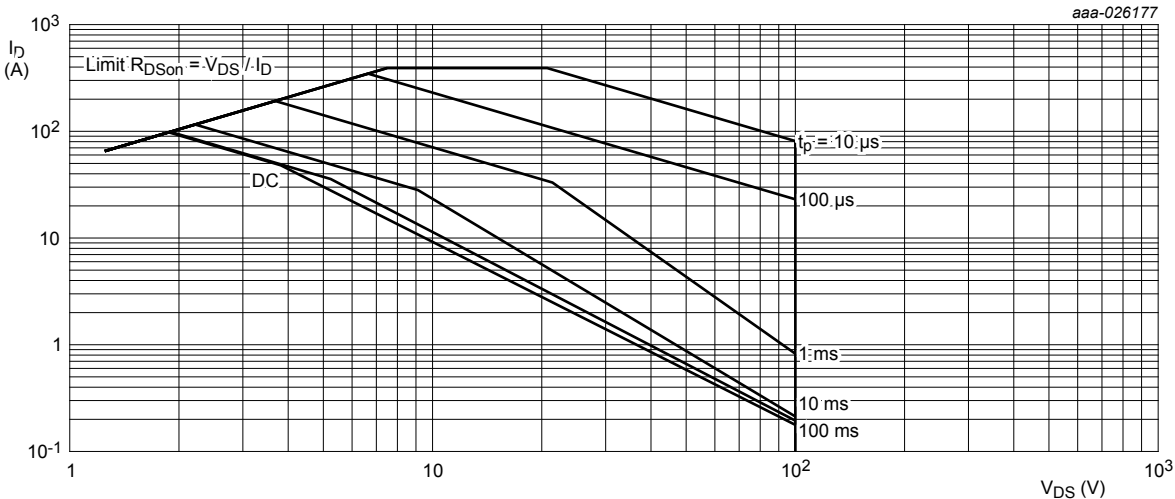
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

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



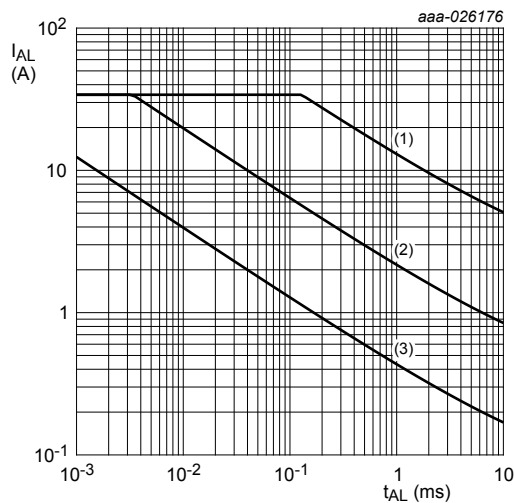
$V_{GS} \geq 10$ V

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



(1) $T_{j\text{ (init)}} = 25\text{ }^{\circ}\text{C}$; (2) $T_{j\text{ (init)}} = 150\text{ }^{\circ}\text{C}$; (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

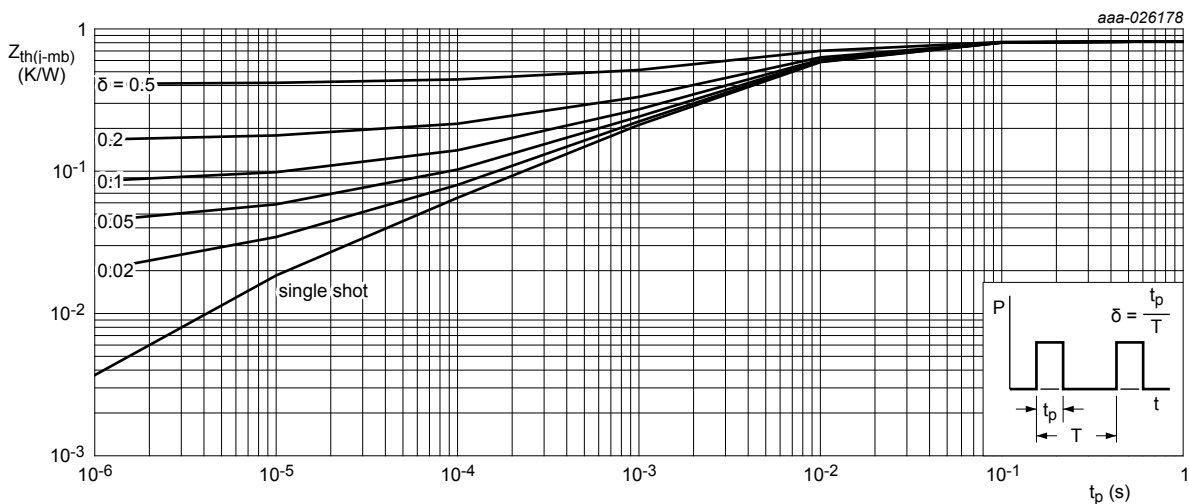


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu A$; $V_{GS} = 0\ V$; $T_j = 25\ ^\circ C$	100	-	-	V
		$I_D = 250\ \mu A$; $V_{GS} = 0\ V$; $T_j = -55\ ^\circ C$	90	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\ mA$; $V_{DS}=V_{GS}$; $T_j = -55\ ^\circ C$	-	3.6	-	V
		$I_D = 1\ mA$; $V_{DS}=V_{GS}$; $T_j = 175\ ^\circ C$	-	1.8	-	V
		$I_D = 1\ mA$; $V_{DS}=V_{GS}$; $T_j = 25\ ^\circ C$; Fig. 9	2	3.1	4	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25\ ^\circ C \leq T_j \leq 175\ ^\circ C$	-	-8.4	-	mV/K
I_{DSS}	drain leakage current	$V_{DS} = 100\ V$; $V_{GS} = 0\ V$; $T_j = 25\ ^\circ C$	-	0.05	1	μA
		$V_{DS} = 100\ V$; $V_{GS} = 0\ V$; $T_j = 125\ ^\circ C$	-	-	100	μA
I_{GSS}	gate leakage current	$V_{GS} = -20\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	5	100	nA
		$V_{GS} = 20\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	5	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\ V$; $I_D = 25\ A$; $T_j = 25\ ^\circ C$; Fig. 10	-	7.5	8.7	mΩ
		$V_{GS} = 7\ V$; $I_D = 25\ A$; $T_j = 25\ ^\circ C$; Fig. 10	-	8.9	13.2	mΩ
		$V_{GS} = 10\ V$; $I_D = 25\ A$; $T_j = 100\ ^\circ C$; Fig. 11	-	11.2	13.5	mΩ
		$V_{GS} = 10\ V$; $I_D = 25\ A$; $T_j = 175\ ^\circ C$; 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	$V_{DS} = 50\ V$; $V_{GS} = 0\ V$; $f = 1\ MHz$; $T_j = 25\ ^\circ C$; Fig. 14	-	3181	-	pF
C_{oss}	output capacitance		-	551	-	pF
C_{rss}	reverse transfer capacitance		-	12	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 50\ V$; $R_L = 2\ \Omega$; $V_{GS} = 10\ V$; $R_{G(ext)} = 5\ \Omega$; $T_j = 25\ ^\circ C$	-	16.8	-	ns
t_r	rise time		-	26.8	-	ns

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

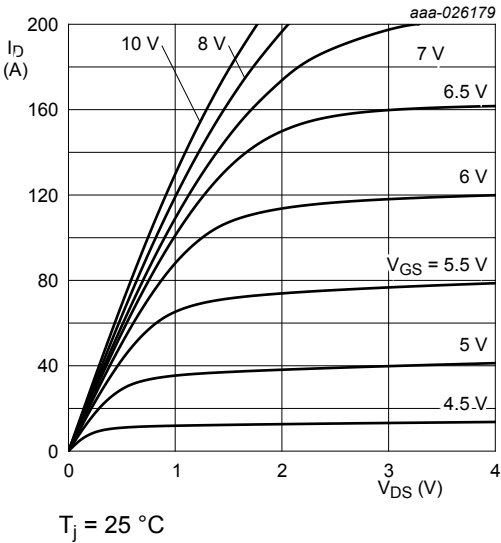


Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values

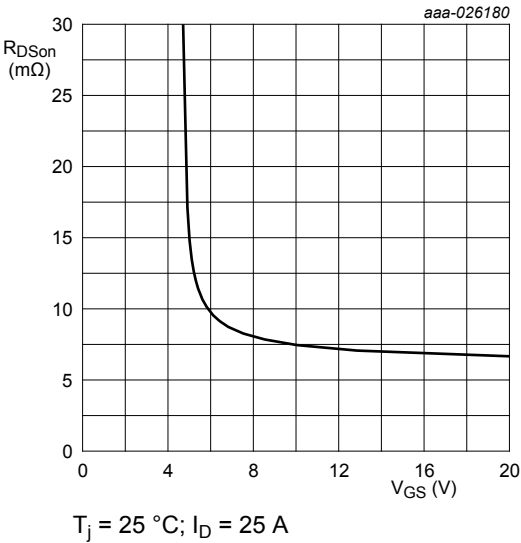


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

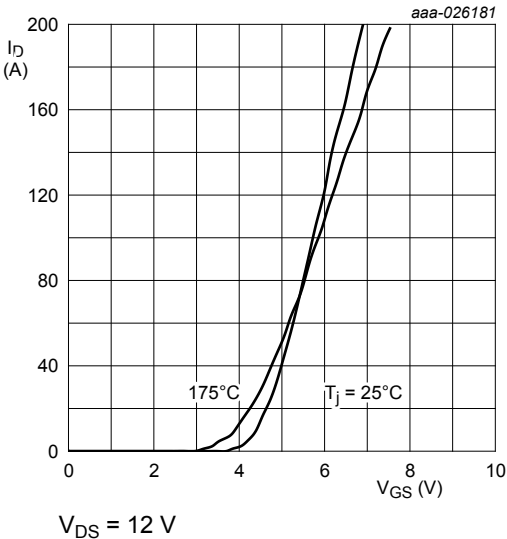


Fig. 8. Transfer characteristics; drain current as a function of gate-source voltage; typical values

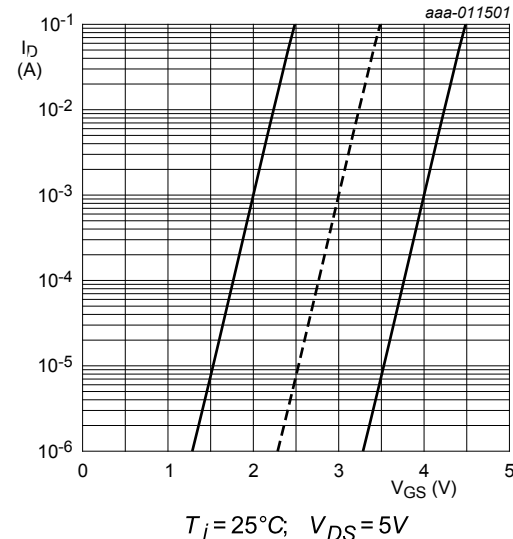


Fig. 9. Sub-threshold drain current as a function of gate-source voltage

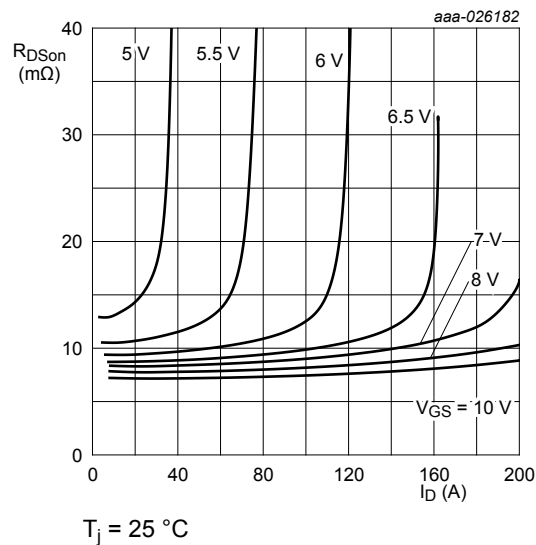


Fig. 10. Drain-source on-state resistance as a function of drain current; typical values

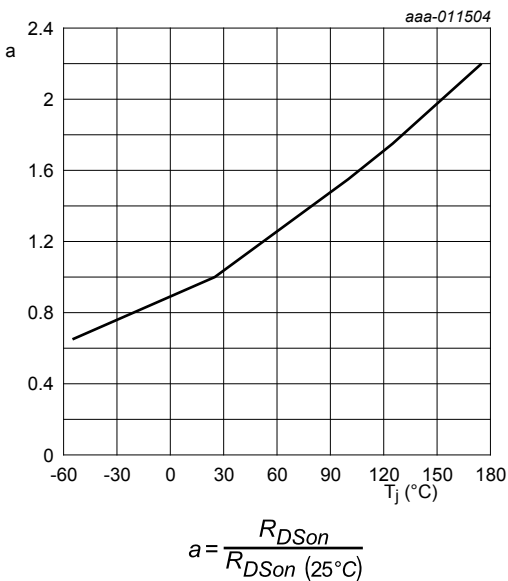


Fig. 11. Normalized drain-source on-state resistance factor as a function of junction temperature

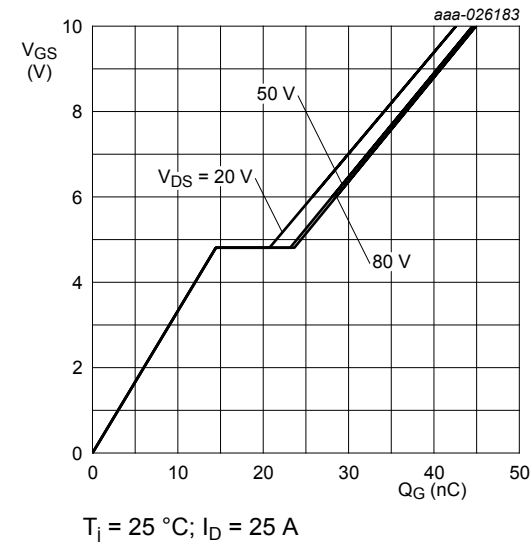


Fig. 12. Gate-source voltage as a function of gate charge; typical values

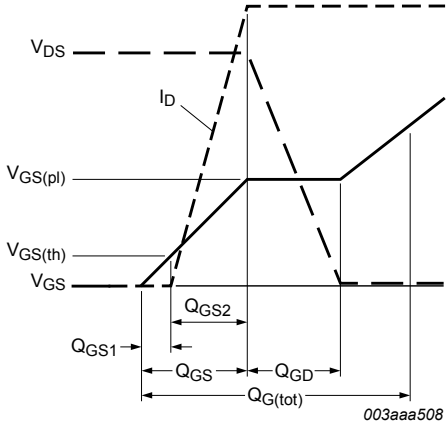


Fig. 13. Gate charge waveform definitions

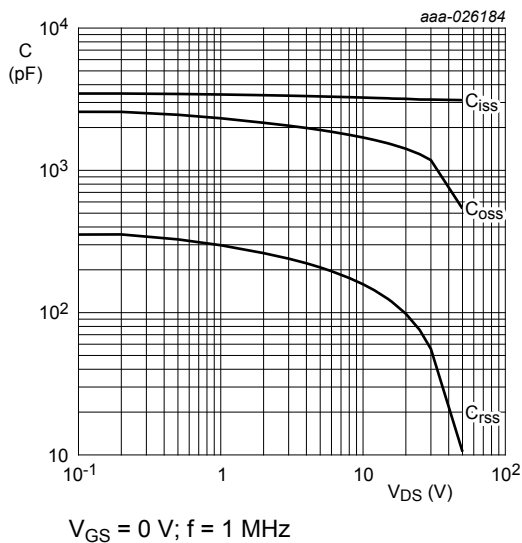


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

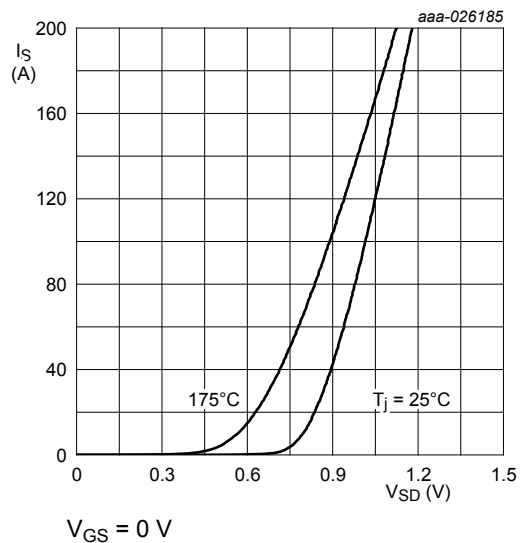


Fig. 15. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

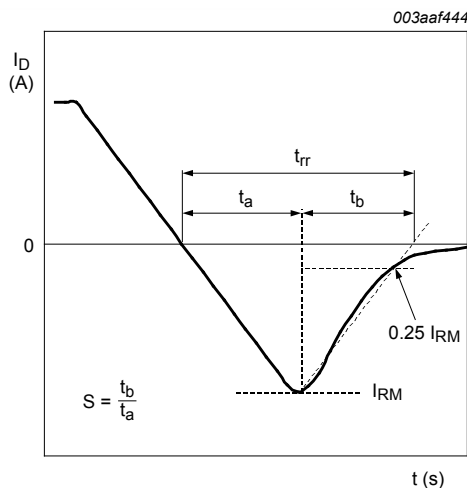
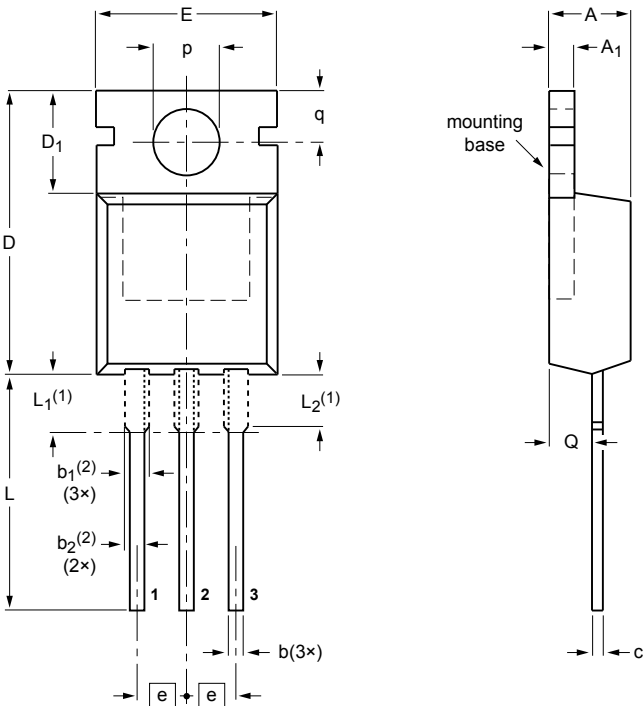


Fig. 16. Reverse recovery timing definition

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)

12. Legal information

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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13. Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Quick reference data..... 1

5. Pinning information.....2

6. Ordering information.....2

7. Marking.....2

8. Limiting values..... 3

9. Thermal characteristics..... 5

10. Characteristics.....6

11. Package outline..... 10

12. Legal information..... 11

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