

PSMN8R5-100XS

N-channel 100V 8.5 mΩ standard level MOSFET in TO220F (SOT186A)

29 November 2012

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel MOSFET in TO220F (SOT186A) package qualified to 175°C. 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
- Isolated package
- Suitable for standard level gate drive

1.3 Applications

- AC-to-DC power supply equipment
- Motor control
- Server power supplies
- Synchronous rectification

1.4 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	$T_{mb} = 25\text{ °C}; V_{GS} = 10\text{ V};$ Fig. 1	-	-	49	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C};$ Fig. 2	-	-	55	W
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 10\text{ A}; T_j = 25\text{ °C};$ Fig. 12 ; Fig. 13	4.5	6.4	8.5	mΩ
		$V_{GS} = 10\text{ V}; I_D = 10\text{ A}; T_j = 100\text{ °C};$ Fig. 13	-	11.18	14.9	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}; I_D = 10\text{ A}; V_{DS} = 50\text{ V};$ Fig. 14 ; Fig. 15	-	30	-	nC
$Q_{G(tot)}$	total gate charge		-	100	-	nC



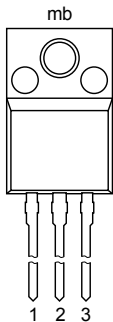
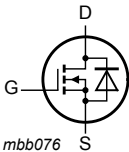
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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; $I_D = 49\text{ A}$; $V_{sup} \leq 100\text{ V}$; unclamped; $R_{GS} = 50\text{ }\Omega$; Fig. 3	-	-	439	mJ

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>TO-220F (SOT186A)</p>	 <p>mbb076</p>
2	D	drain		
3	S	source		
mb		mounting base; isolated		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN8R5-100XS	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

4. Marking

Table 4. Marking codes

Type number	Marking code
PSMN8R5-100XS	PSMN8R5-100XS

5. 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

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Symbol	Parameter	Conditions	Min	Max	Unit
V _{DGR}	drain-gate voltage	T _j ≥ 25 °C; T _j ≤ 175 °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} = 25 °C; Fig. 1	-	49	A
		V _{GS} = 10 V; T _{mb} = 100 °C; Fig. 1	-	34.6	A
I _{DM}	peak drain current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C; Fig. 4	-	196	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 2	-	55	W
T _{stg}	storage temperature		-55	175	°C
T _j	junction temperature		-55	175	°C
T _{slid(M)}	peak soldering temperature		-	260	°C
Source-drain diode					
I _S	source current	T _{mb} = 25 °C	-	46	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C	-	196	A
Avalanche ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	V _{GS} = 10 V; T _{j(initial)} = 25 °C; I _D = 49 A; V _{sup} ≤ 100 V; unclamped; R _{GS} = 50 Ω; Fig. 3	-	439	mJ

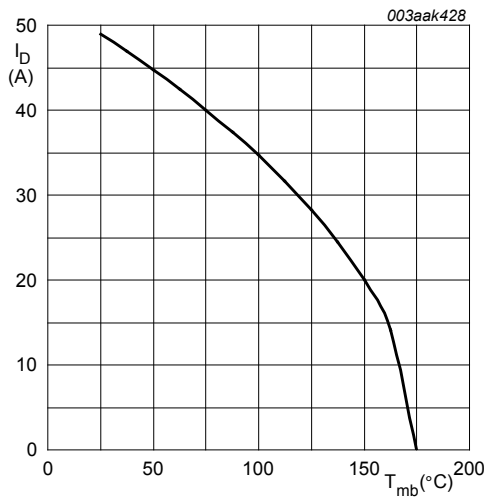


Fig. 1. Continuous drain current as a function of mounting base temperature

$$V_{GS} \geq 10V$$

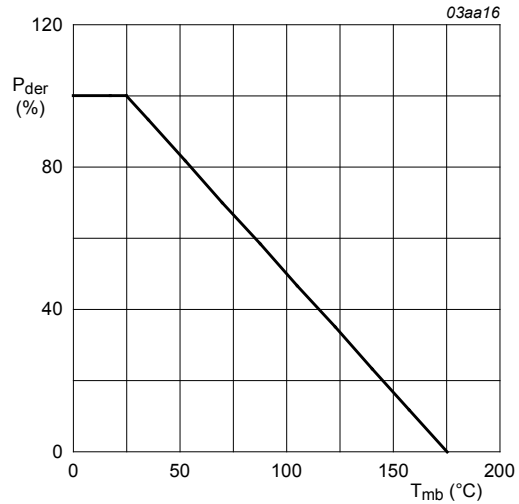


Fig. 2. Normalized total power dissipation as a function of mounting base temperature

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

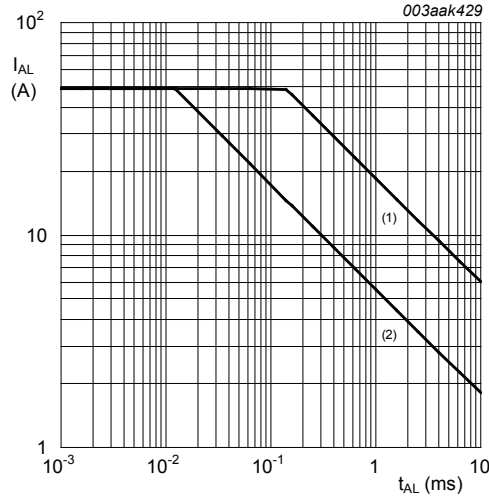


Fig. 3. Avalanche rating; avalanche current as a function of avalanche time

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

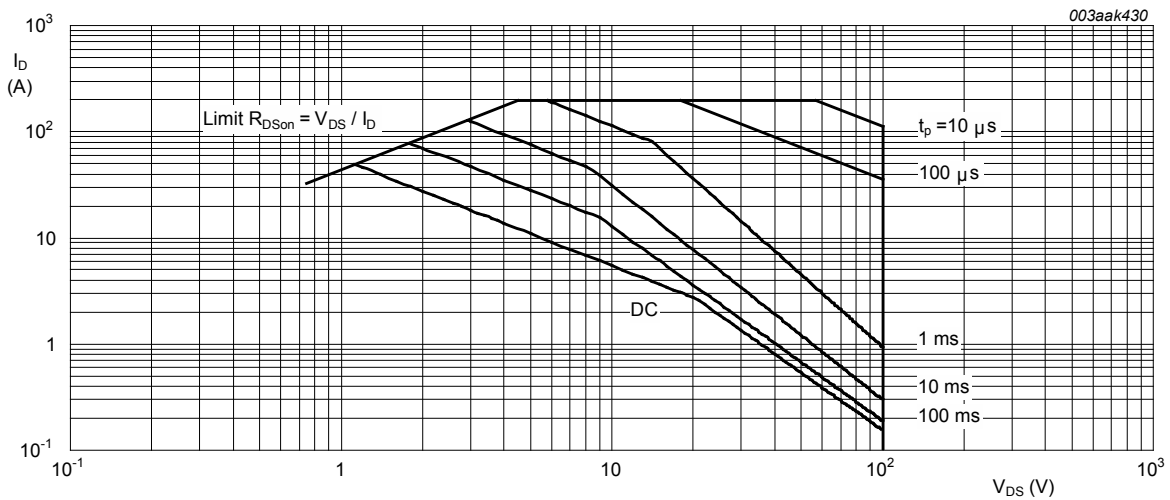


Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25^{\circ}C$; I_{DM} is a single pulse

6. 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	-	2.5	2.73	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in free air	-	55	-	K/W

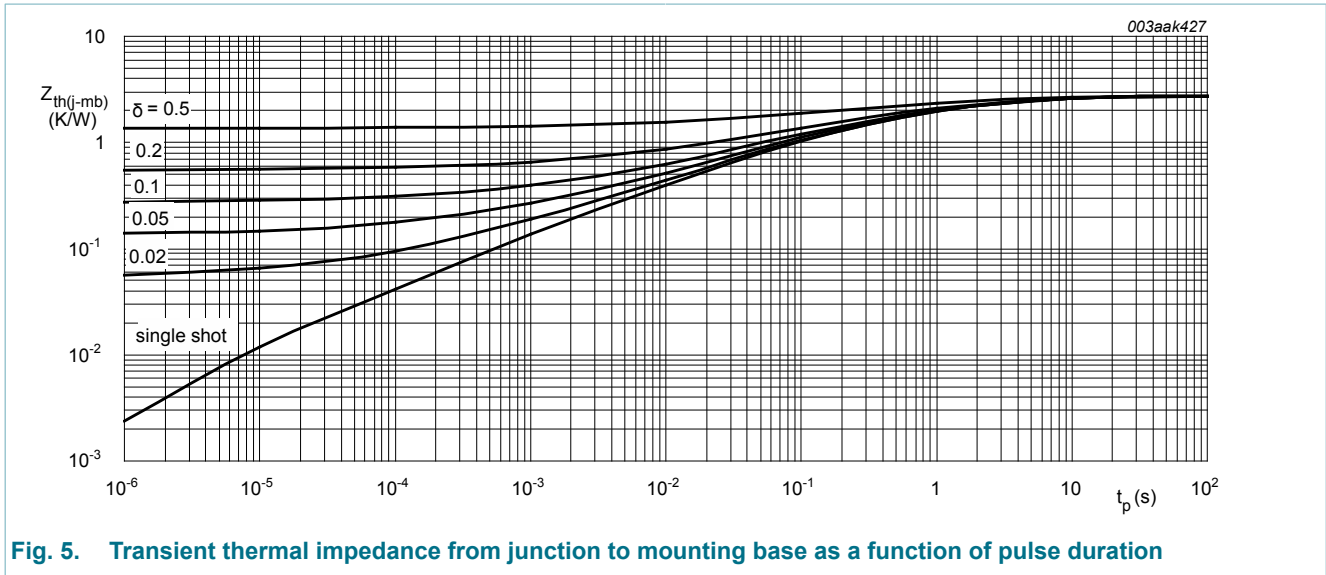


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

7. Isolation characteristics

Table 7. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_{isol}	isolation capacitance	[1]	-	10	-	pF
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; sinusoidal waveform; clean and dust free	-	-	2500	V

[1] f = 1 MHz

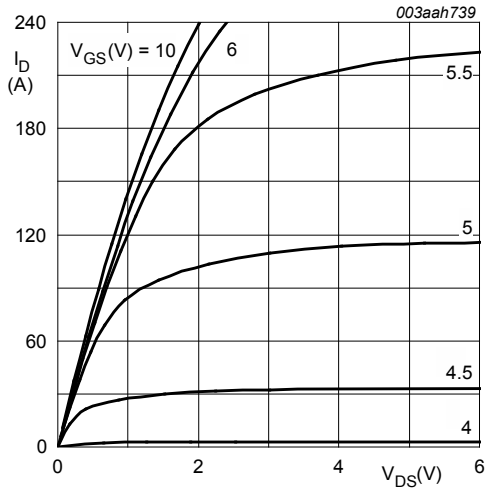
8. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_J = 25 \text{ }^\circ C$	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	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_J = 25 \text{ }^\circ C;$ Fig. 10 ; Fig. 11	2.4	3	4	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_J = 175 \text{ }^\circ C;$ Fig. 10	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_J = -55 \text{ }^\circ C;$ Fig. 10	-	-	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	μA
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_J = 100 \text{ }^\circ C$	-	-	20	μA

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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{GSS}	gate leakage current	V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C	-	2	100	nA
		V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C	-	2	100	nA
R _{DS(on)}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 10 A; T _j = 25 °C; Fig. 12 ; Fig. 13	4.5	6.4	8.5	mΩ
		V _{GS} = 10 V; I _D = 10 A; T _j = 100 °C; Fig. 13	-	11.18	14.9	mΩ
		V _{GS} = 10 V; I _D = 10 A; T _j = 175 °C; Fig. 13	-	16.95	22.6	mΩ
R _G	internal gate resistance (AC)	f = 1 MHz	0.36	0.71	1.42	Ω
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 10 A; V _{DS} = 50 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15	-	100	-	nC
Q _{GS}	gate-source charge		-	19	-	nC
Q _{GS(th)}	pre-threshold gate-source charge		-	14	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge		-	5	-	nC
Q _{GD}	gate-drain charge		-	30	-	nC
V _{GS(pl)}	gate-source plateau voltage	I _D = 10 A; V _{DS} = 50 V; Fig. 14 ; Fig. 15	-	4	-	V
C _{iss}	input capacitance	V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 16 ; Fig. 17	-	5512	-	pF
C _{oss}	output capacitance	V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 16	-	380	-	pF
C _{rss}	reverse transfer capacitance	V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 16 ; Fig. 17	-	256	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 50 V; R _L = 5 Ω; V _{GS} = 10 V; R _{G(ext)} = 5 Ω; T _j = 25 °C	-	21.5	-	ns
t _r	rise time		-	30	-	ns
t _{d(off)}	turn-off delay time		-	83	-	ns
t _f	fall time		-	40	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 10 A; V _{GS} = 0 V; T _j = 25 °C; Fig. 18	-	0.77	1.2	V
t _{rr}	reverse recovery time	I _S = 10 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V;	-	53	-	ns
Q _r	recovered charge	V _{DS} = 50 V	-	124	-	nC



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

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

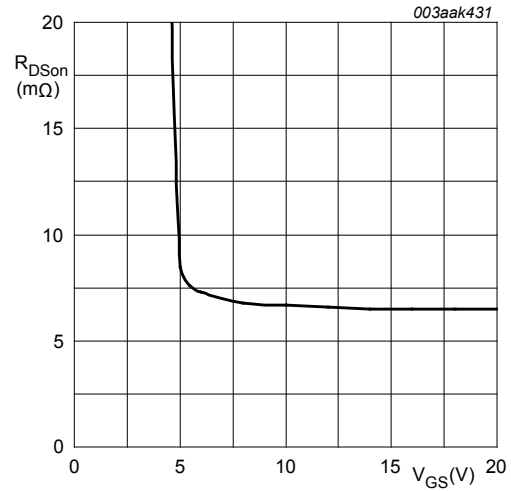


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

$T_j = 25^\circ\text{C}$; $I_D = 10\text{A}$

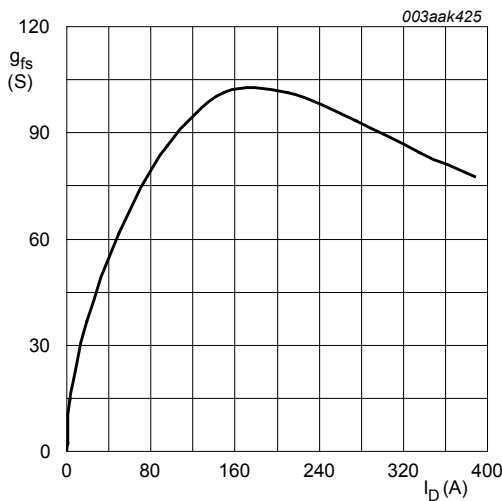


Fig. 8. Forward transconductance as a function of drain current; typical values

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

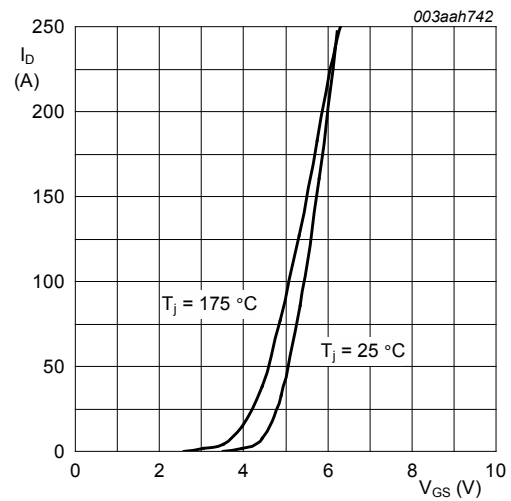


Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values

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

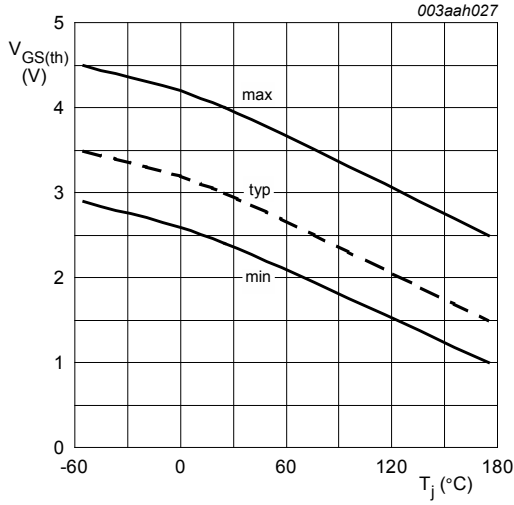


Fig. 10. Gate-source threshold voltage as a function of junction temperature

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

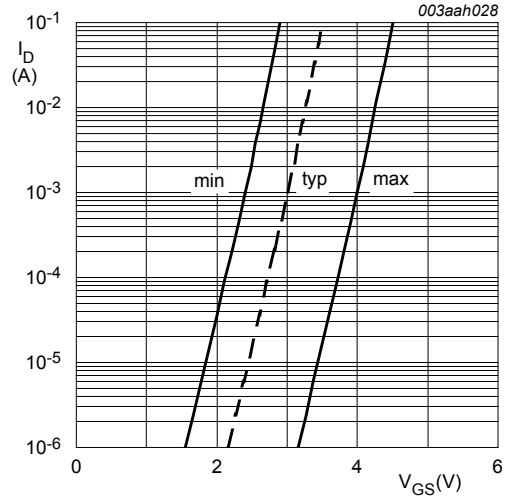


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

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

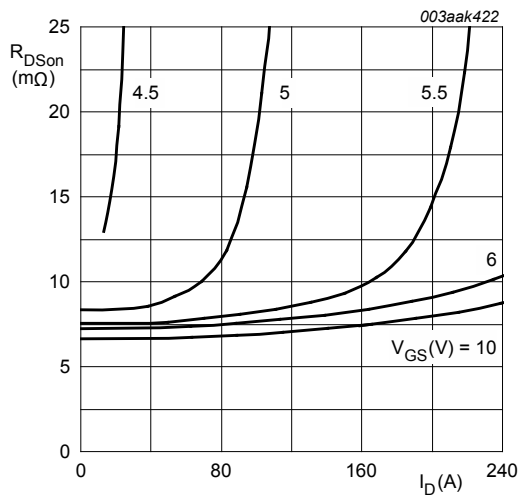


Fig. 12. Drain-source on-state resistance as a function of drain current; typical values

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

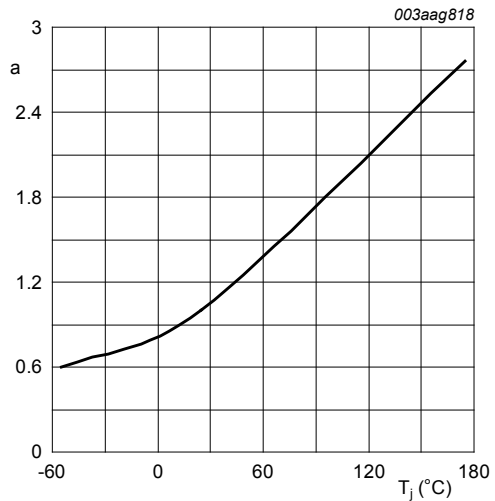


Fig. 13. Normalized drain-source on-state resistance factor as a function of junction temperature

$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ\text{C})}}$$

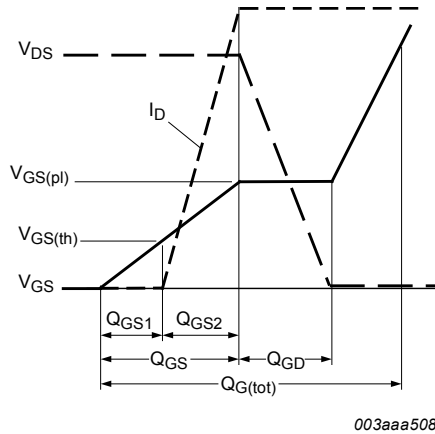


Fig. 14. Gate charge waveform definitions

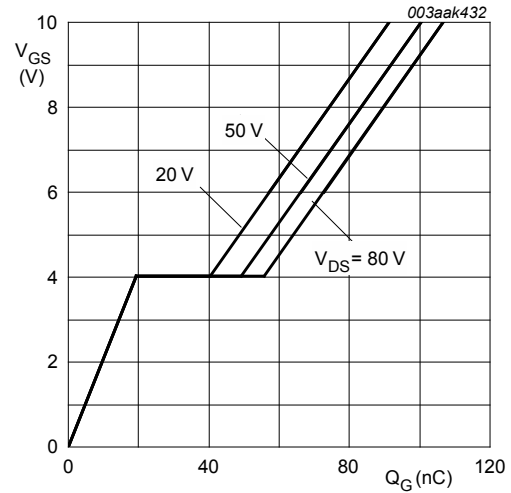


Fig. 15. Gate-source voltage as a function of gate charge; typical values

$T_j = 25^\circ C; I_D = 10A$

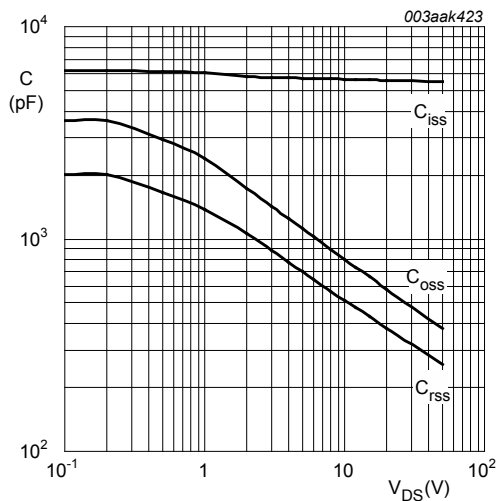


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

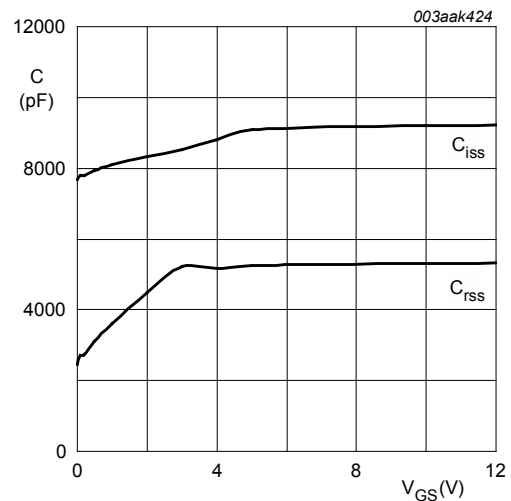


Fig. 17. Input and reverse transfer capacitances as a function of gate-source voltage, typical values

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

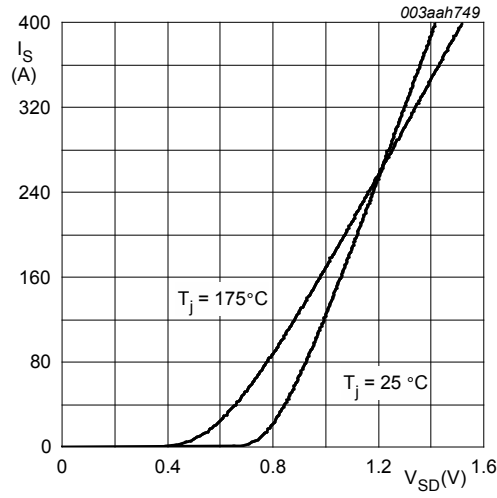


Fig. 18. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

$$V_{GS} = 0V$$

9. Package outline

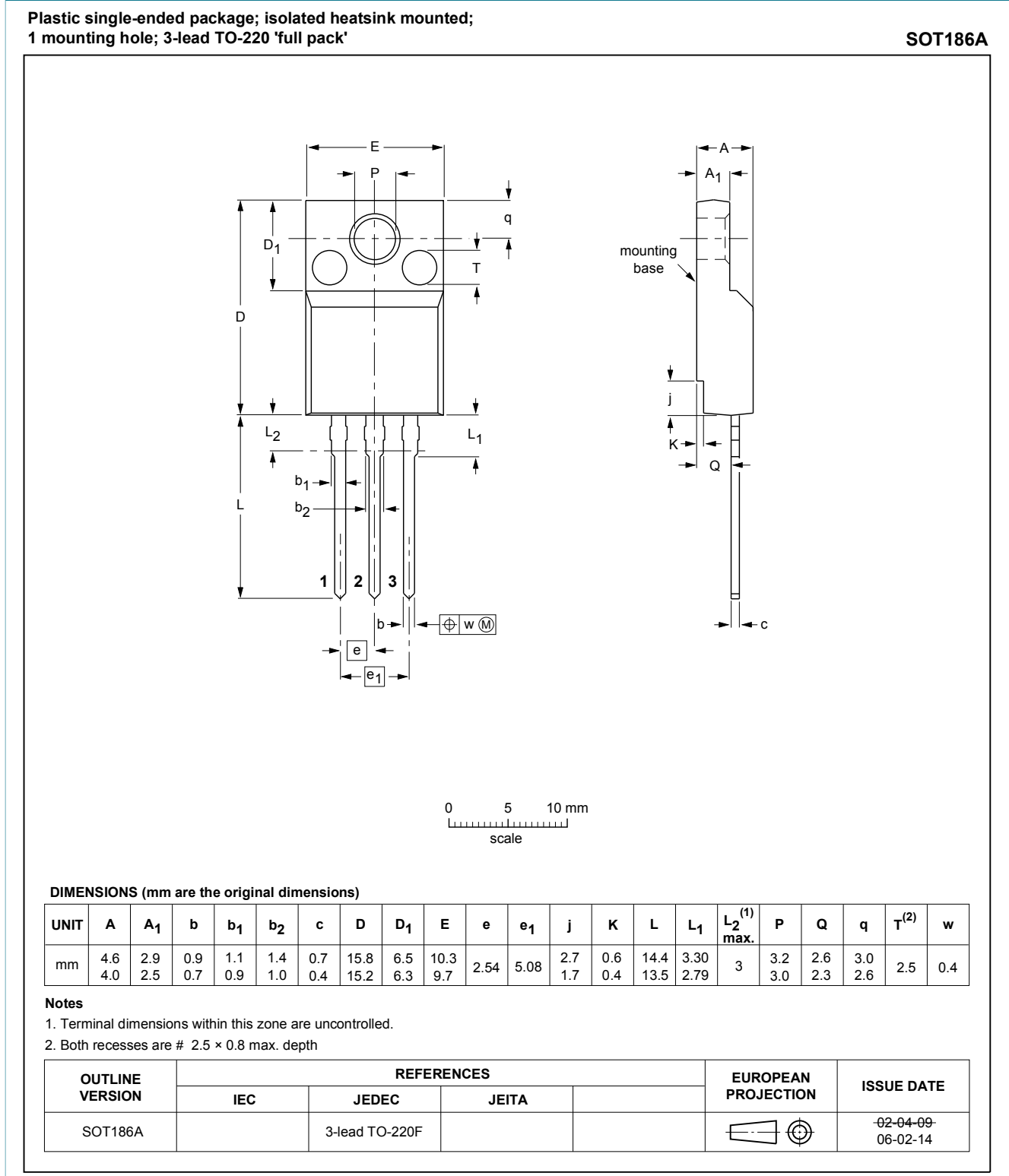


Fig. 19. Package outline TO-220F (SOT186A)

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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.
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