

PSMN5R6-100PS

N-channel 100 V 5.6 mΩ standard level MOSFET in TO220

30 November 2012

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel MOSFET in a TO-220 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
- Improved dynamic avalanche performance
- Suitable for standard level gate drive sources

1.3 Applications

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

1.4 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		-	-	306	W
Static characteristics							
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; Fig. 11 ; Fig. 12		-	4.3	5.6	mΩ
Dynamic characteristics							
Q _{GD}	gate-drain charge	V _{GS} = 10 V; I _D = 80 A; V _{DS} = 50 V; Fig. 13 ; Fig. 14		-	43	-	nC
Q _{G(tot)}	total gate charge			-	141	-	nC
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; R _{GS} = 50 Ω; unclamped		-	-	469	mJ



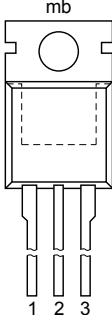
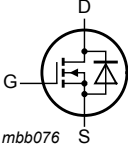
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[1] Continuous current limited by package.

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 TO-220AB (SOT78)	 mbb076
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
PSMN5R6-100PS	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Marking

Table 4. Marking codes

Type number	Marking code
PSMN5R6-100PS	PSMN5R6-100PS

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	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$		-	100	V
V_{DGR}	drain-gate voltage	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$; $R_{GS} = 20\text{ k}\Omega$		-	100	V
V_{GS}	gate-source voltage			-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_j = 100\text{ }^{\circ}\text{C}$; Fig. 1		-	95	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ }^{\circ}\text{C}$; Fig. 1	[1]	-	100	A

Symbol	Parameter	Conditions		Min	Max	Unit
I_{DM}	peak drain current	pulsed; $t_p \leq 10 \mu s$; $T_{mb} = 25^\circ C$; Fig. 3		-	539	A
P_{tot}	total power dissipation	$T_{mb} = 25^\circ C$; Fig. 2		-	306	W
T_{stg}	storage temperature			-55	175	$^\circ C$
T_j	junction temperature			-55	175	$^\circ C$
Source-drain diode						
I_S	source current	$T_{mb} = 25^\circ C$	[1]	-	100	A
I_{SM}	peak source current	pulsed; $t_p \leq 10 \mu s$; $T_{mb} = 25^\circ C$		-	539	A
Avalanche Ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10 V$; $T_{j(initial)} = 25^\circ C$; $I_D = 100 A$; $V_{sup} \leq 100 V$; $R_{GS} = 50 \Omega$; unclamped		-	469	mJ

[1] Continuous current limited by package.

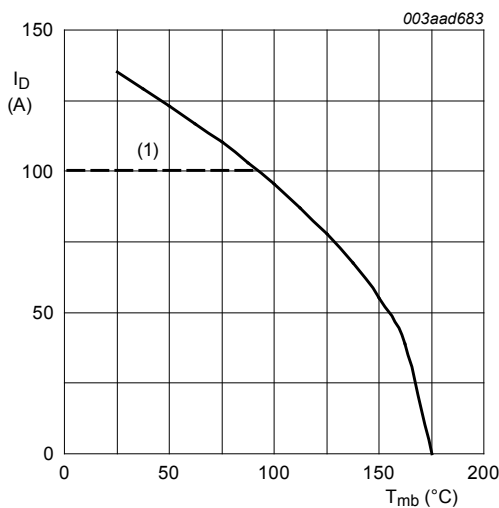


Fig. 1. Continuous drain current as a function of mounting base temperature

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

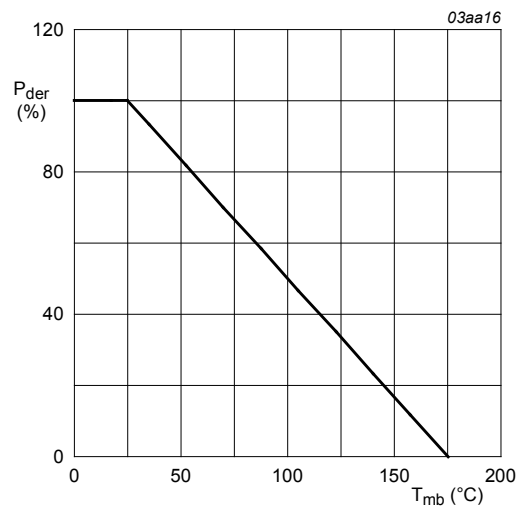


Fig. 2. Normalized total power dissipation as a function of mounting base temperature

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

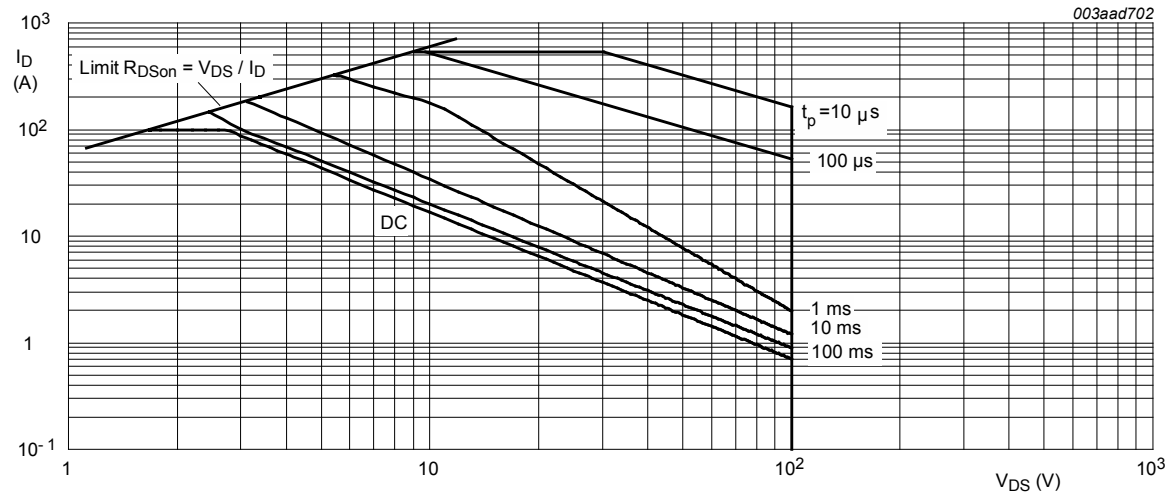


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25\text{ }^{\circ}\text{C}$; I_{DM} is a single pulse; (1) Capped at 100 A due to package

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. 4	-	0.3	0.49	K/W

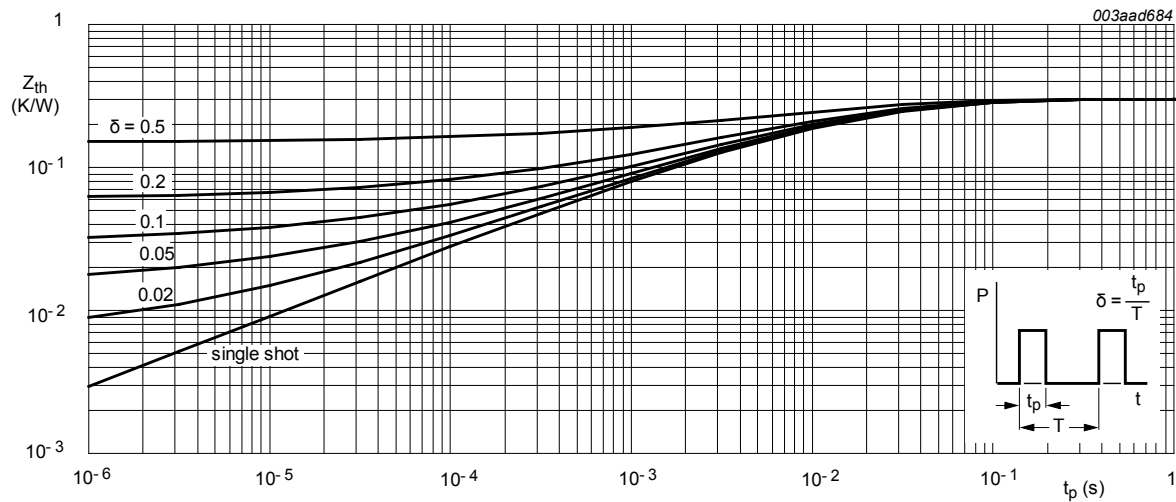


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

7. 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 = 25 °C; Fig. 8 ; Fig. 9		2	3	4	V
V _{GSth}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 175 °C; Fig. 9		1	-	-	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C; Fig. 9		-	-	4.6	V
I _{DSS}	drain leakage current	V _{DS} = 100 V; V _{GS} = 0 V; T _j = 25 °C		-	0.02	10	μA
		V _{DS} = 100 V; V _{GS} = 0 V; T _j = 175 °C		-	-	500	μA
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 _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 175 °C; Fig. 10		-	-	15.7	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; Fig. 11 ; Fig. 12		-	4.3	5.6	mΩ
R _G	gate resistance	f = 1 MHz		-	0.97	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 80 A; V _{DS} = 50 V; V _{GS} = 10 V; Fig. 13 ; Fig. 14		-	141	-	nC
Q _{GS}	gate-source charge			-	36	-	nC
Q _{GD}	gate-drain charge			-	43	-	nC
C _{iss}	input capacitance	V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 15 ; Fig. 16		-	8061	-	pF
C _{oss}	output capacitance	V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 15		-	561	-	pF
C _{rss}	reverse transfer capacitance	V _{DS} = 50 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 15 ; Fig. 16		-	330	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 50 V; R _L = 0.6 Ω; V _{GS} = 10 V; R _{G(ext)} = 1.5 Ω		-	31	-	ns
t _r	rise time			-	46	-	ns
t _{d(off)}	turn-off delay time			-	83	-	ns
t _f	fall time			-	34	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C; Fig. 17		-	0.79	1.2	V

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
t_{rr}	reverse recovery time	$I_S = 25\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$;		-	67	-	ns
Q_r	recovered charge	$V_{DS} = 50\text{ V}$		-	182	-	nC

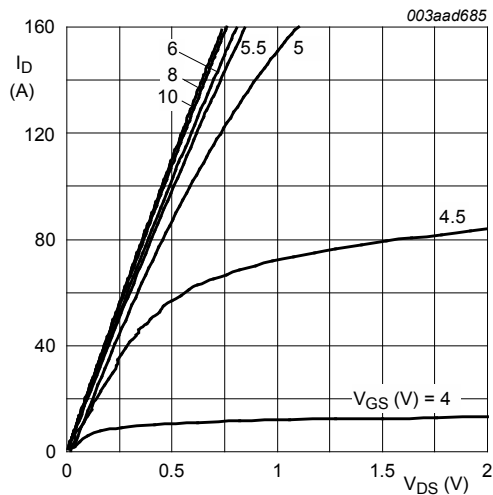


Fig. 5. Output characteristics: drain current as a function of drain-source voltage; typical values

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

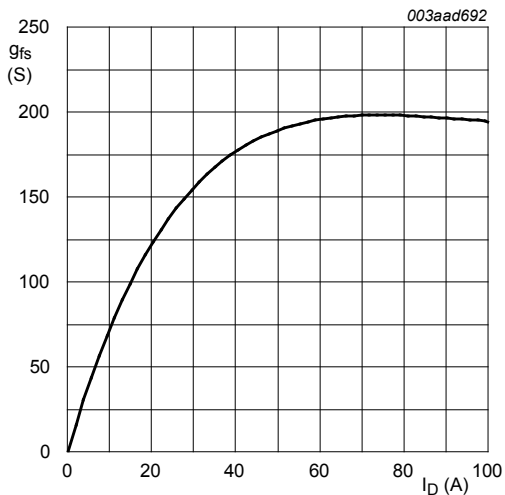


Fig. 6. Forward transconductance as a function of drain current; typical values

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

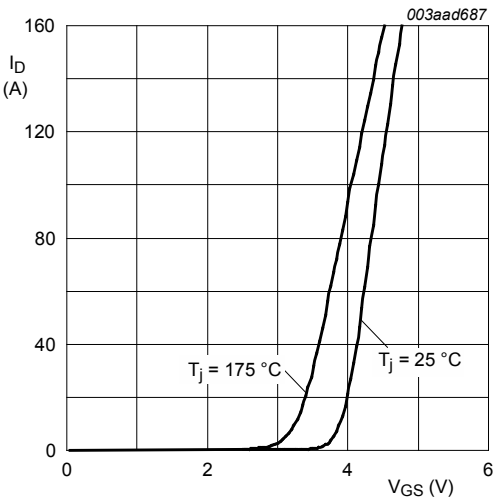


Fig. 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values

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

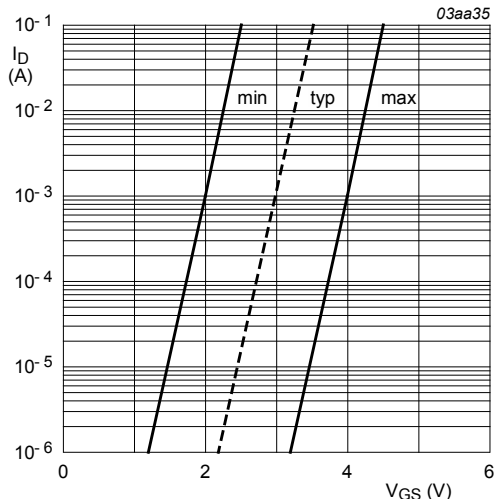


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

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

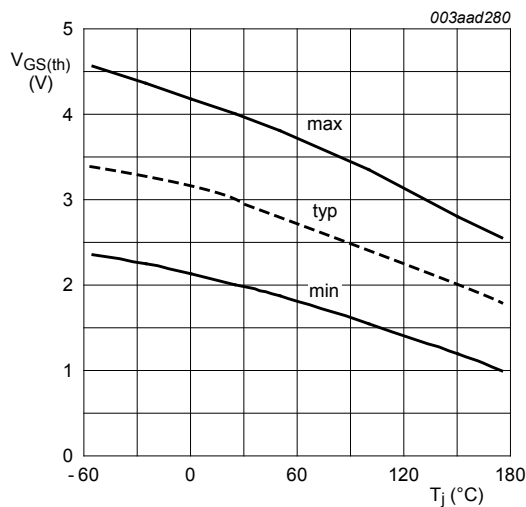


Fig. 9. Gate-source threshold voltage as a function of junction temperature

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

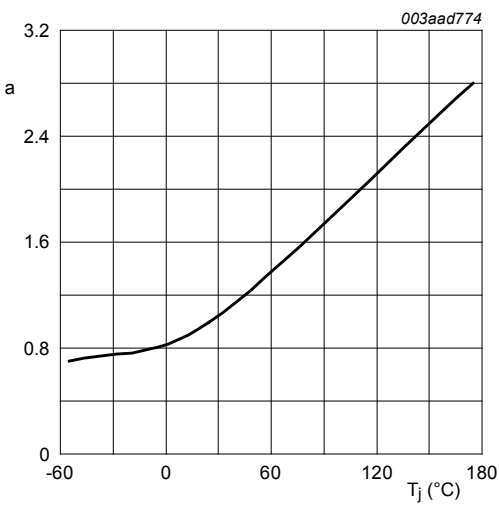


Fig. 10. Normalized drain-source on-state resistance factor as a function of junction temperature

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

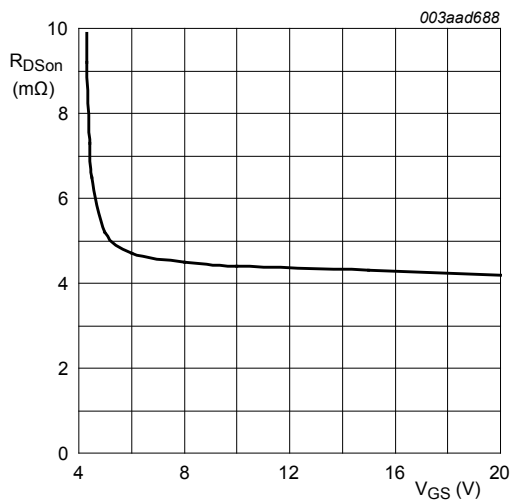


Fig. 11. Drain-source on-state resistance as a function of gate-source voltage; typical values

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

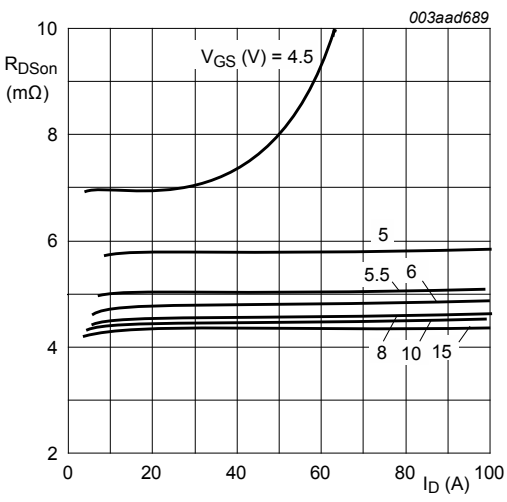


Fig. 12. Drain-source on-state resistance as a function of drain current; typical values

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

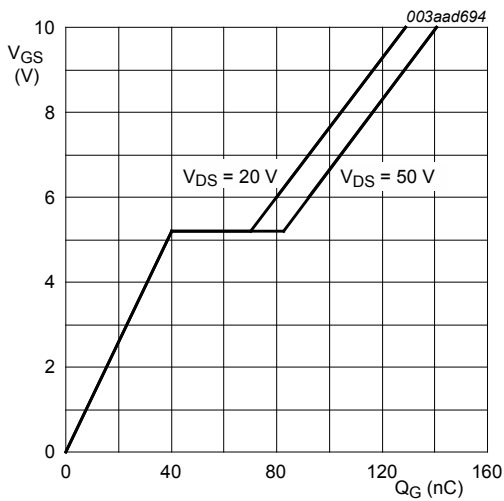


Fig. 13. Gate-source voltage as a function of gate charge; typical values

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

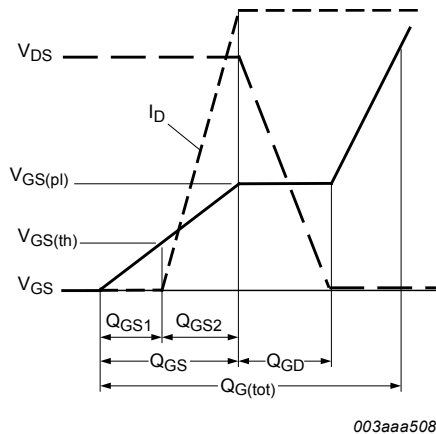


Fig. 14. Gate charge waveform definitions

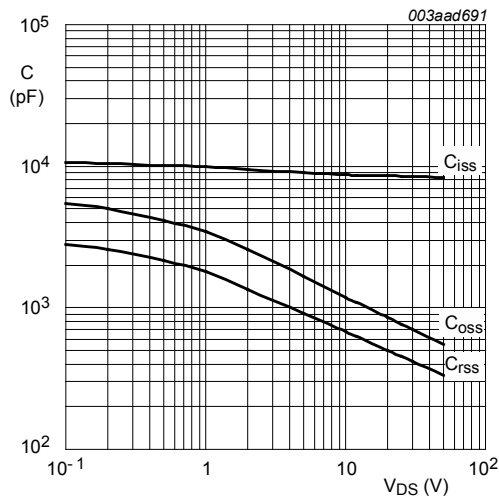


Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

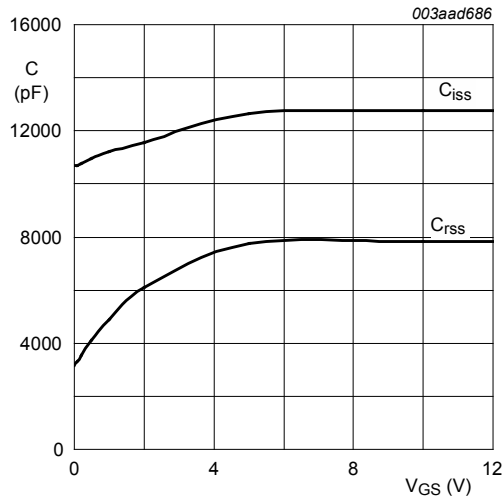


Fig. 16. Input and reverse transfer capacitances as a function of gate-source voltage, typical values

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

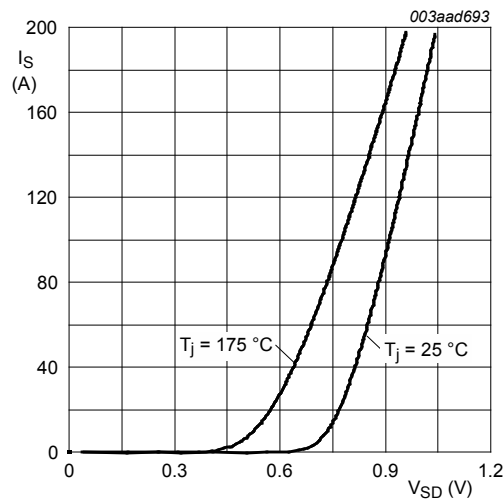


Fig. 17. Source current as a function of source-drain voltage; typical values

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

8. Package outline

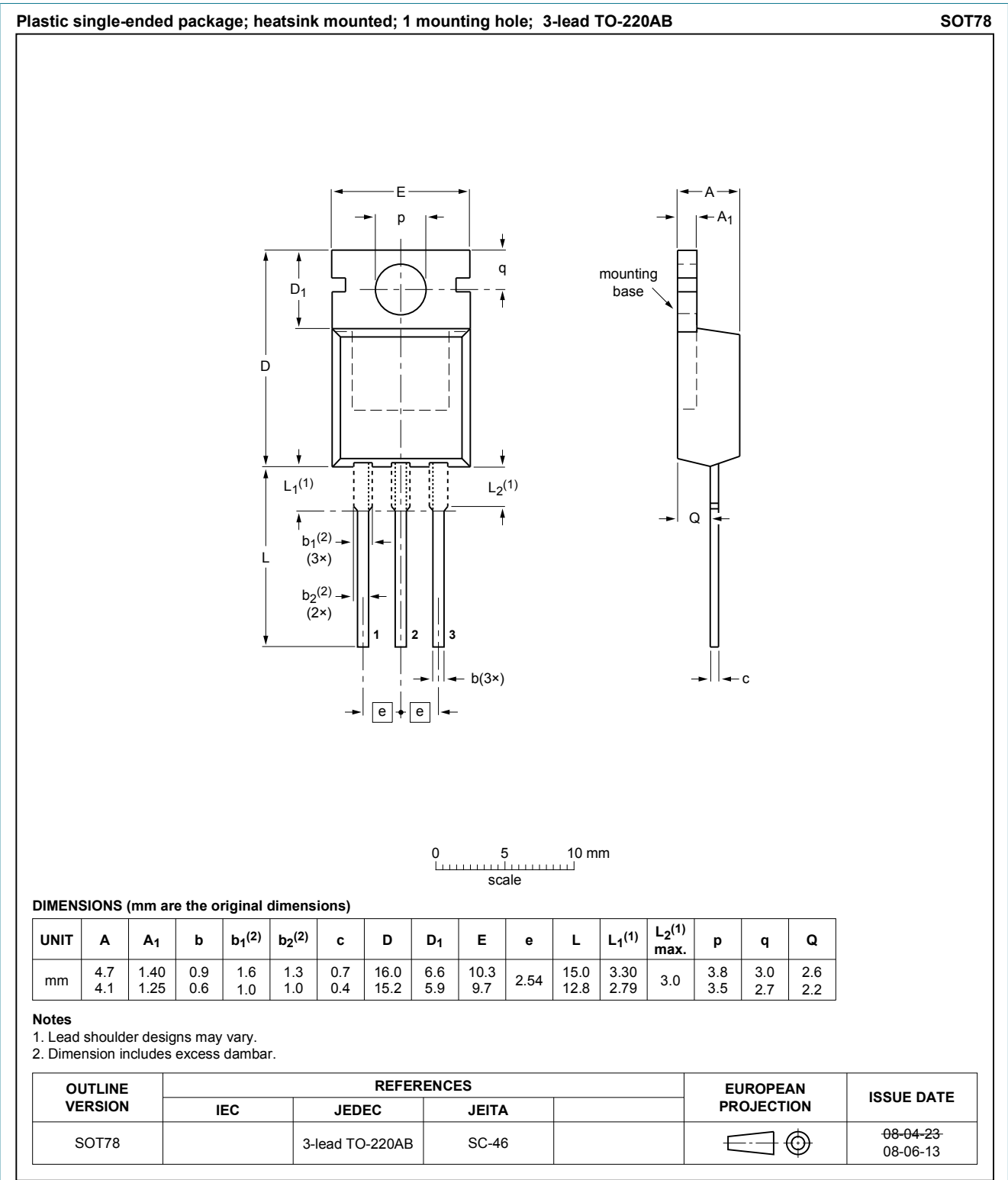


Fig. 18. Package outline TO-220AB (SOT78)

9. Legal information

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Document status [1][2]	Product status [3]	Definition
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Product [short] data sheet	Production	This document contains the product specification.

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