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Kind regards,

Team Nexperia



PSMN050-80PS

N-channel 80 V 46 mΩ standard level MOSFET

Rev. 2 — 28 November 2011

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel MOSFET in TO220 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
- Suitable for standard level gate drive sources

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference data

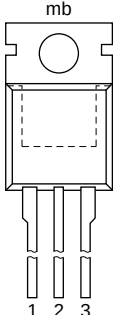
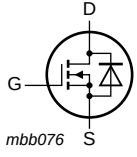
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	80	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1	-	-	22	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	56	W
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 10\text{ A}$; $T_j = 25\text{ °C}$	[1] -	37	46	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $V_{DS} = 40\text{ V}$; see Figure 14 ; see Figure 15	-	2.3	-	nC

[1] Measured 3 mm from package.



2. 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		

SOT78 (TO-220AB)

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN050-80PS	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

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	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	80	V
V_{DGR}	drain-gate voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	80	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; see Figure 1	-	16	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 1	-	22	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; see Figure 3	-	88	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	56	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25\text{ °C}$	-	22	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$	-	88	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; $I_D = 22\text{ A}$; $V_{sup} \leq 80\text{ V}$; $R_{GS} = 50\text{ }\Omega$; unclamped	-	18	mJ

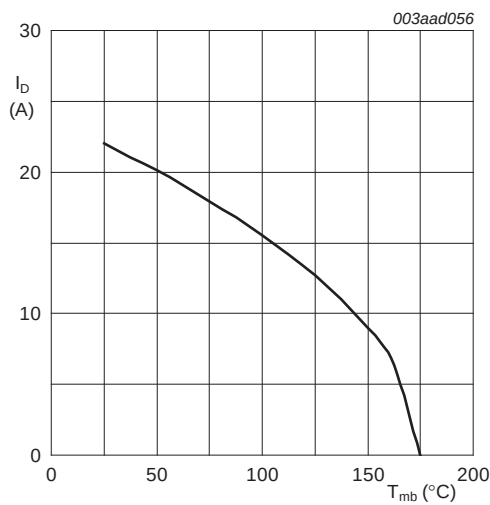
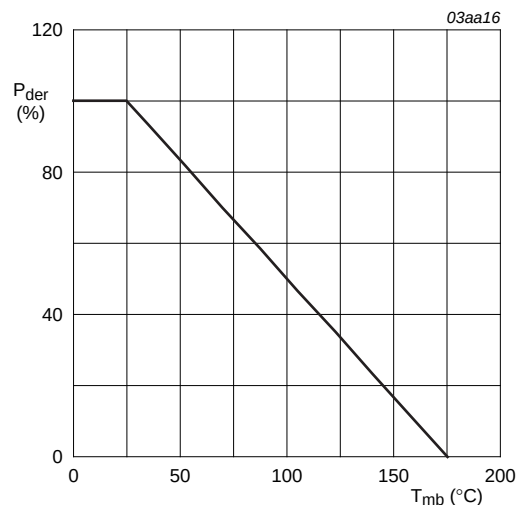
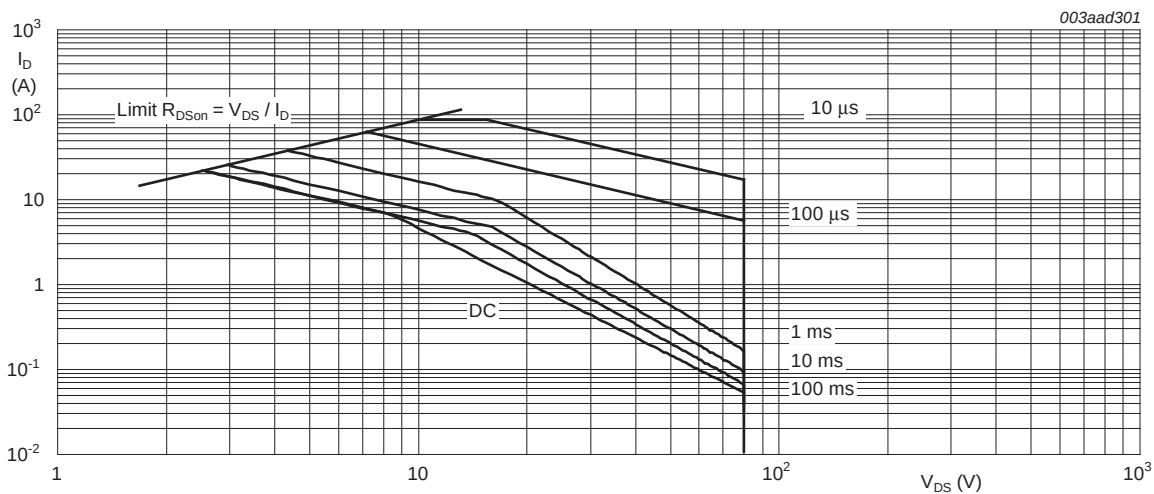


Fig 1. Continuous drain current as a function of mounting base temperature



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

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



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

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

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	-	2.2	2.7	K/W

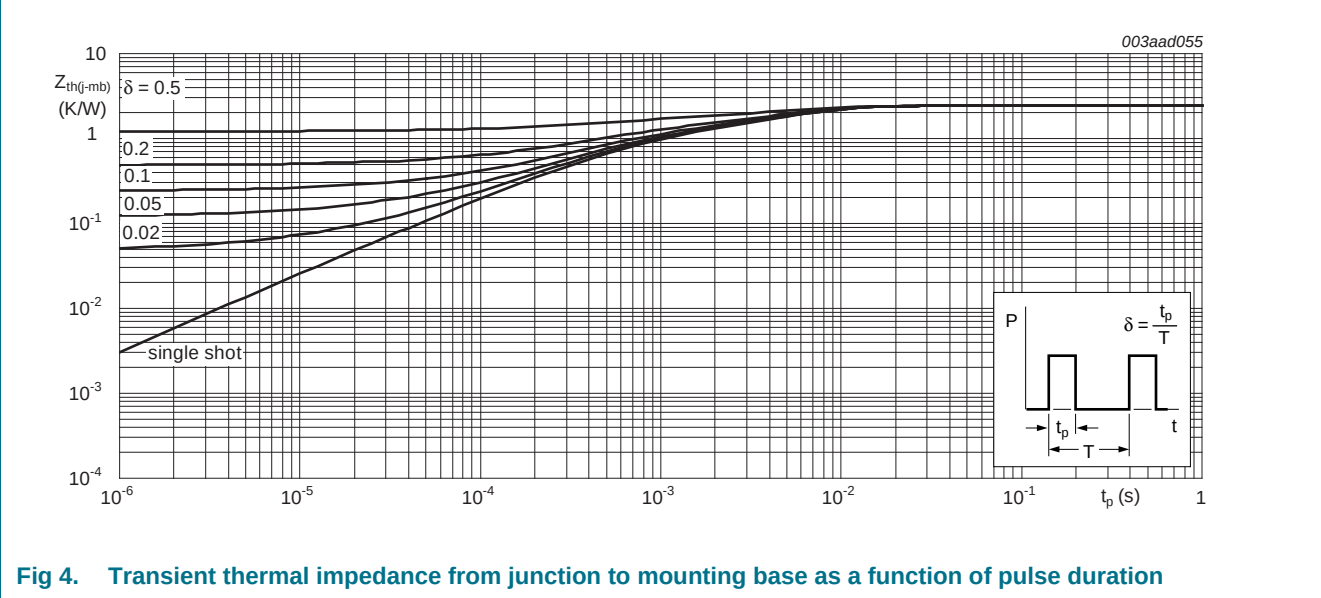


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

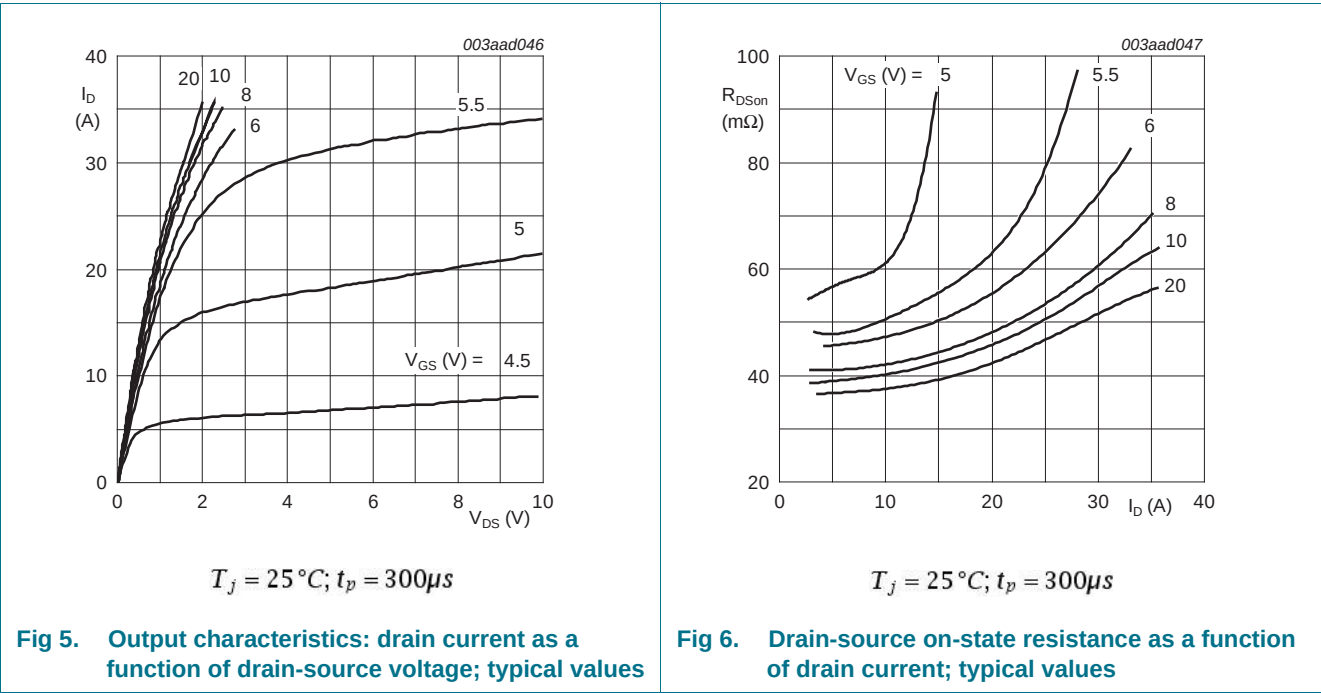
Tested to JEDEC standards where applicable.

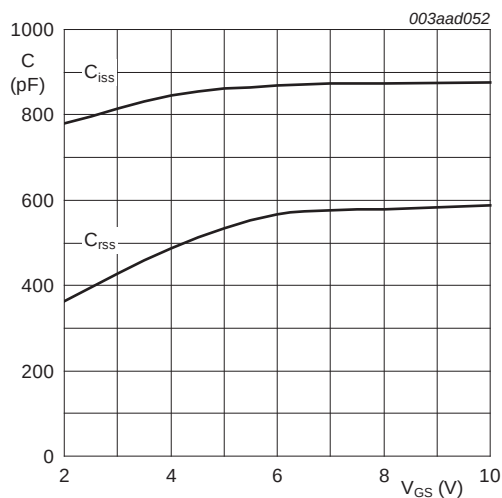
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _j = -55 °C	73	-	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C	80	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 175 °C; see Figure 11 ; see Figure 12	1	-	-	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C; see Figure 11 ; see Figure 12	-	-	4.6	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; see Figure 11 ; see Figure 12	2	3	4	V
I _{DSS}	drain leakage current	V _{DS} = 80 V; V _{GS} = 0 V; T _j = 25 °C	-	-	1	μA
		V _{DS} = 80 V; V _{GS} = 0 V; T _j = 125 °C	-	-	15	μA
I _{GSS}	gate leakage current	V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C	-	-	100	nA
		V _{GS} = 20 V; V _{DS} = 0 V; T _j = 25 °C	-	-	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 10 A; T _j = 100 °C; see Figure 13	-	-	74	mΩ
		V _{GS} = 10 V; I _D = 10 A; T _j = 25 °C 11	-	37	46	mΩ
R _G	internal gate resistance (AC)	f = 1 MHz	-	2	-	Ω
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 0 A; V _{DS} = 0 V; V _{GS} = 10 V	-	9	-	nC
		I _D = 25 A; V _{DS} = 40 V; V _{GS} = 10 V; see Figure 14 ; see Figure 15	-	11	-	nC
Q _{GS}	gate-source charge		-	3.8	-	nC
Q _{GS(th)}	pre-threshold gate-source charge	I _D = 25 A; V _{DS} = 40 V; V _{GS} = 10 V; see Figure 14	-	1.9	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge		-	1.9	-	nC
Q _{GD}	gate-drain charge	I _D = 25 A; V _{DS} = 40 V; V _{GS} = 10 V; see Figure 14 ; see Figure 15	-	2.3	-	nC
V _{GS(pl)}	gate-source plateau voltage	V _{DS} = 40 V	-	5.2	-	V
C _{iss}	input capacitance	V _{DS} = 12 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; see Figure 17	-	633	-	pF
C _{oss}	output capacitance		-	100	-	pF
C _{rss}	reverse transfer capacitance		-	50	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 12 V; R _L = 0.5 Ω; V _{GS} = 10 V; R _{G(ext)} = 4.7 Ω	-	9.2	-	ns
t _r	rise time		-	1	-	ns
t _{d(off)}	turn-off delay time		-	16	-	ns
t _f	fall time		-	2.4	-	ns

Table 6. Characteristics ...continued
Tested to JEDEC standards where applicable.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 15\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$; see Figure 16	-	0.86	1.2	V
t_{rr}	reverse recovery time	$I_S = 50\text{ A}$; $dI_S/dt = 100\text{ A}/\mu\text{s}$;	-	32	-	ns
Q_r	recovered charge	$V_{GS} = 0\text{ V}$; $V_{DS} = 40\text{ V}$	-	28	-	nC

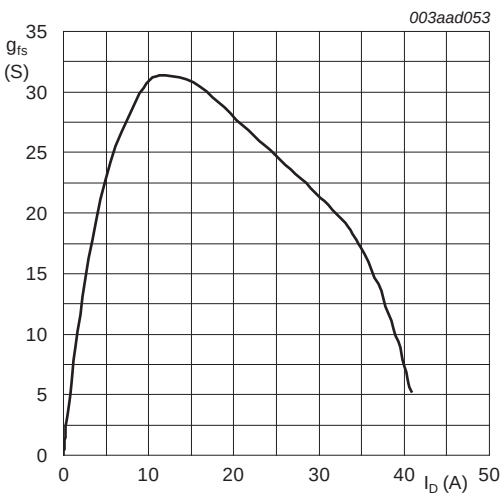
[1] Measured 3 mm from package.





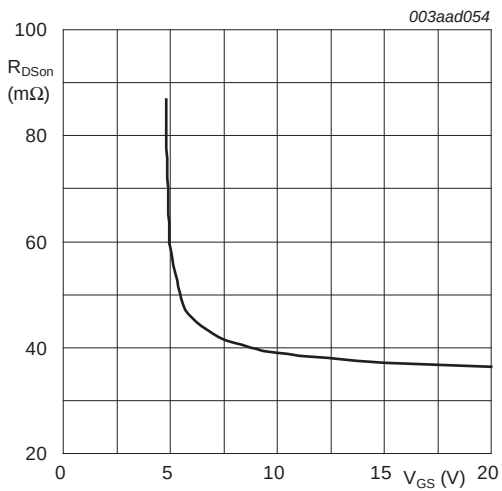
$V_{DS} = 0\text{ V}; f = 1\text{ MHz}$

Fig 7. Input and reverse transfer capacitances as a function of gate-source voltage; typical values



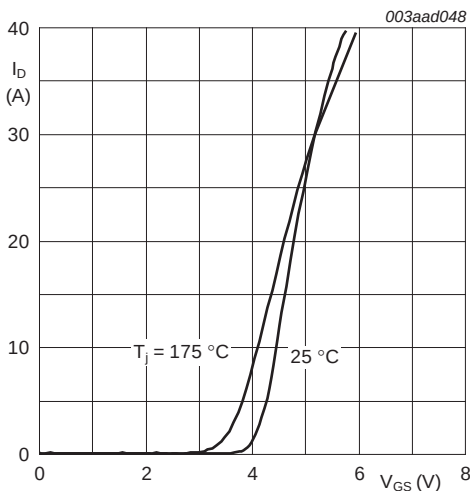
$T_j = 25\text{ }^{\circ}\text{C}; V_{DS} = 15\text{ V}$

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



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

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



$V_{DS} = 15\text{ V}$

Fig 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

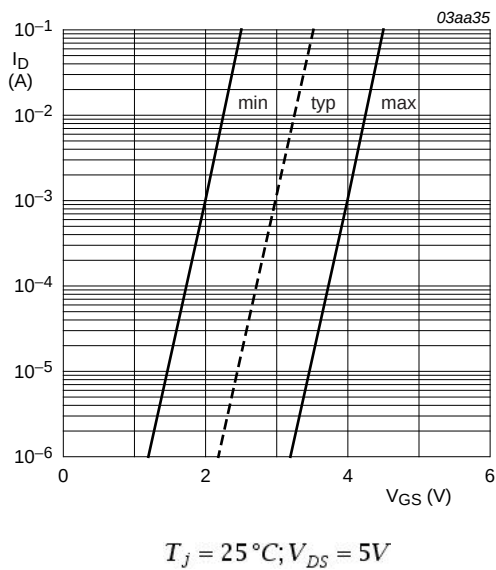


Fig 11. Sub-threshold drain current as a function of gate-source voltage

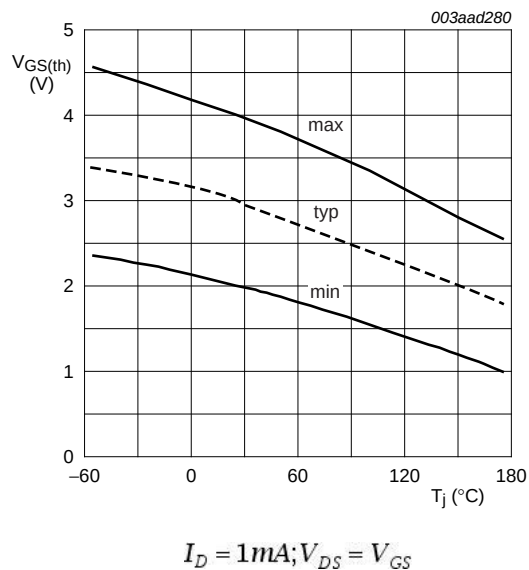


Fig 12. Gate-source threshold voltage as a function of junction temperature

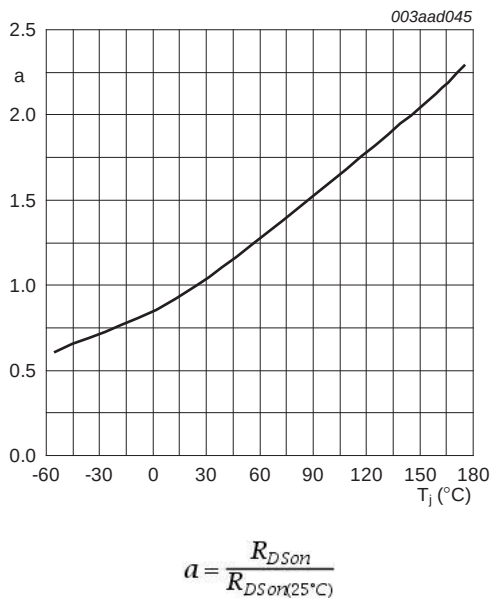


Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature

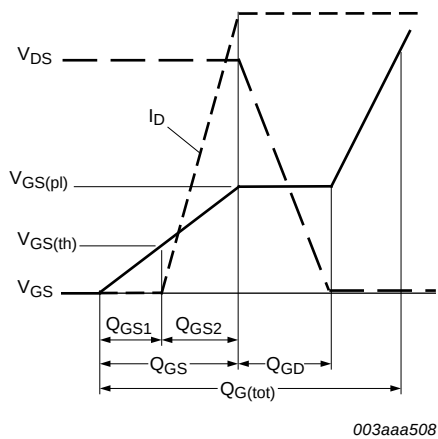


Fig 14. Gate charge waveform definitions

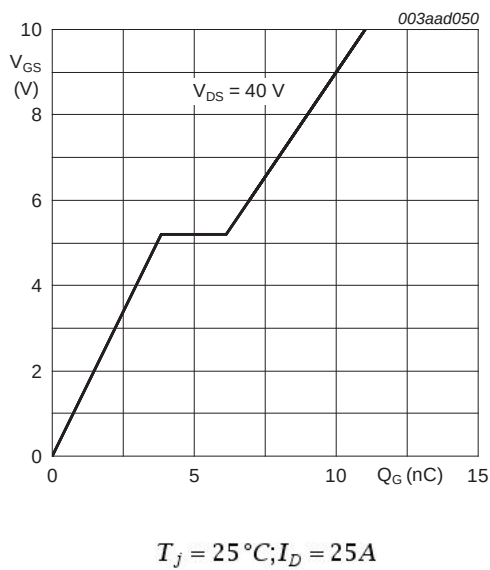


Fig 15. Gate-source voltage as a function of gate charge; typical values

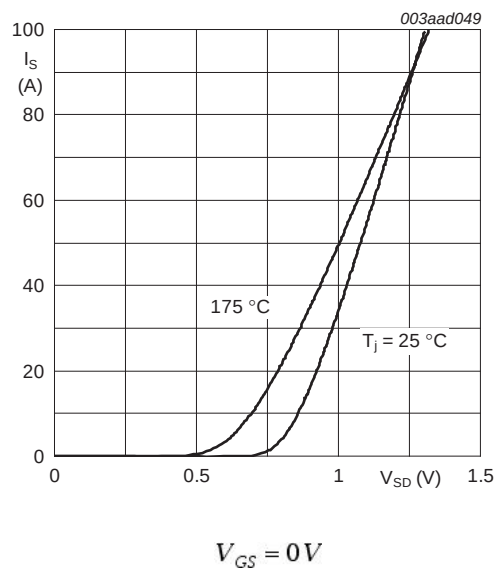


Fig 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

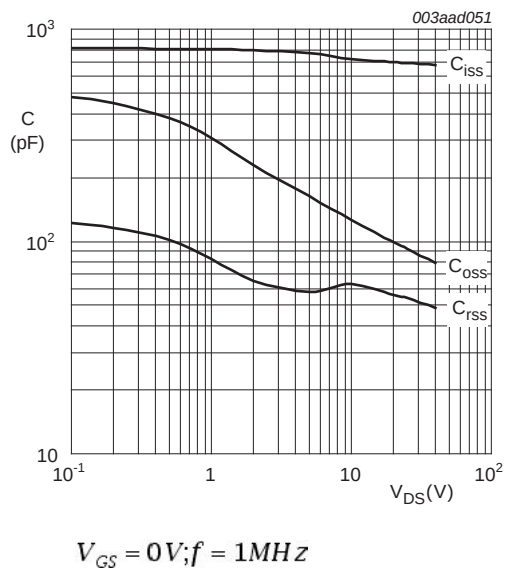


Fig 17. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB SOT78

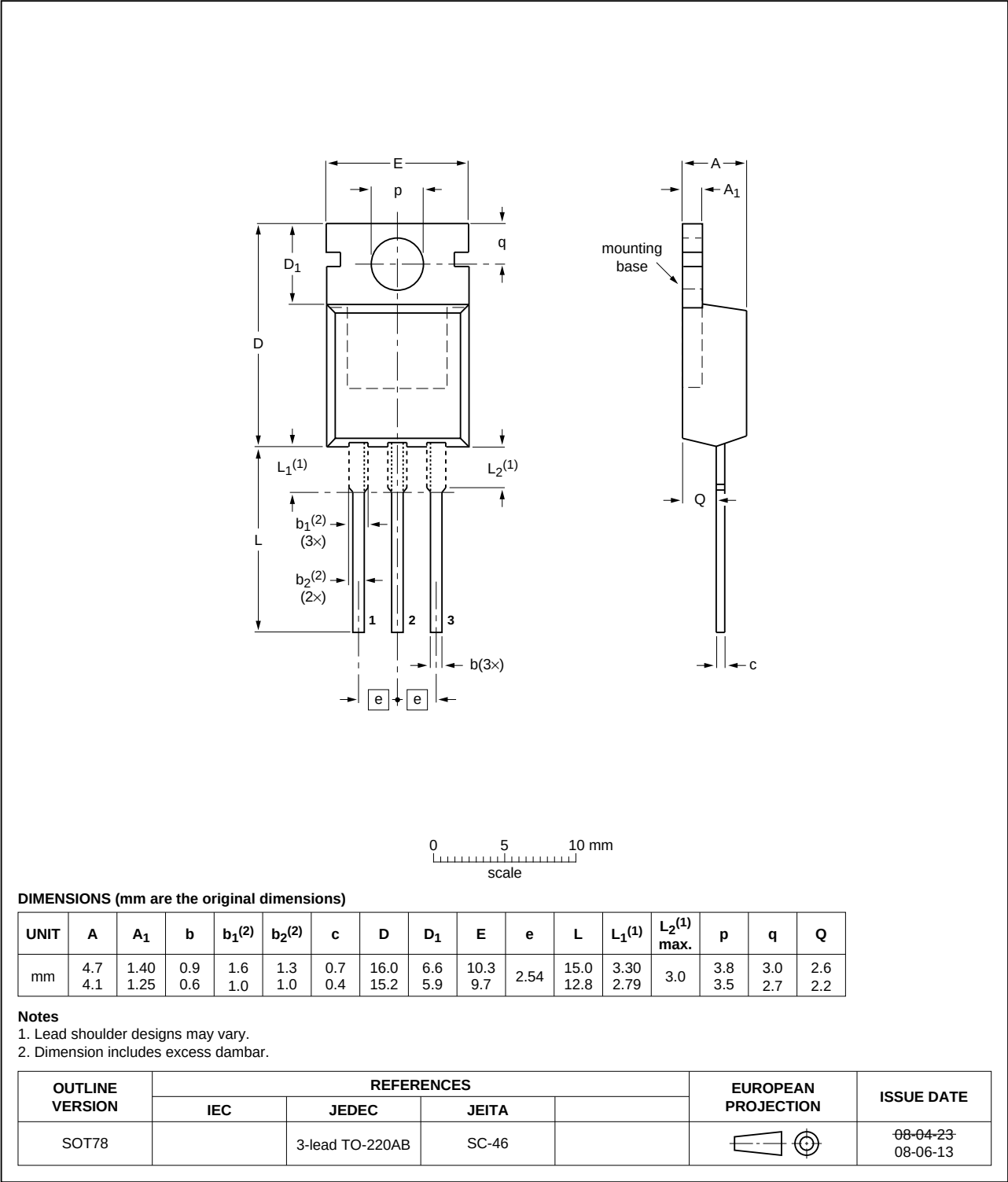


Fig 18. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN050-80PS v.2	20111128	Product data sheet	-	PSMN050-80PS v.1
Modifications:	• Various changes to content.			
PSMN050-80PS v.1	20090610	Product data sheet	-	-

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".

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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	2
5	Thermal characteristics	4
6	Characteristics	5
7	Package outline	10
8	Revision history	11
9	Legal information	12
9.1	Data sheet status	12
9.2	Definitions	12
9.3	Disclaimers	12
9.4	Trademarks	13
10	Contact information	13

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