

# PSMN6R5-80BS

# N-channel 80V 6.9m $\Omega$ standard level MOSFET in D2PAK Rev. 2 — 2 March 2012 Product data

Product data sheet

#### **Product profile** 1.

# 1.1 General description

Standard level N-channel MOSFET in D2PAK 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
- Load switching

- Motor control
- Server power supplies

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$V_{DS}$	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	-	80	V
I <sub>D</sub>	drain current	$T_{mb} = 25 \text{ °C}; V_{GS} = 10 \text{ V}; \text{ see } \frac{\text{Figure 1}}{\text{Model}}$	<u>[1]</u> -	-	100	Α
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <u>Figure 2</u>	-	-	210	W
Tj	junction temperature		-55	-	175	°C
Static characteristics						
R <sub>DSon</sub>	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ °C};$ see Figure 13	-	5.9	6.9	mΩ
Dynamic cha	racteristics					
$Q_{GD}$	gate-drain charge	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; V_{DS} = 40 \text{ V};$	-	16	-	nC
Q <sub>G(tot)</sub>	total gate charge	see Figure 14; see Figure 15	-	71	-	nC
Avalanche ru	Avalanche ruggedness					
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	$V_{GS}$ = 10 V; $T_{j(init)}$ = 25 °C; $I_D$ = 49 A; $V_{sup}$ ≤ 80 V; $R_{GS}$ = 50 $\Omega$ ; unclamped	-	-	700	mJ

<sup>[1]</sup> Continuous current rating is limited by package.



# 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		_
2	D	drain[1]	mb	B
3	S	source		
mb	D	mounting base; connected to drain	1 3	mbb076 S
			SOT404 (D2PAK)	

<sup>[1]</sup> It is not possible to make connection to pin 2.

# 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN6R5-80BS	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

# 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 <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	80	V
$V_{DGR}$	drain-gate voltage	$T_j \ge 25 \text{ °C}; T_j \le 175 \text{ °C}; R_{GS} = 20 \text{ k}\Omega$	-	80	V
$V_{GS}$	gate-source voltage		-20	20	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 100 °C; see <u>Figure 1</u>	-	82	Α
		V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C; see <u>Figure 1</u>	<u>[1]</u> -	100	Α
I <sub>DM</sub>	peak drain current	pulsed; $t_p \le 10 \mu s$ ; $T_{mb} = 25 °C$ ; see <u>Figure 3</u>	-	470	Α
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <u>Figure 2</u>	-	210	W
T <sub>stg</sub>	storage temperature		-55	175	°C
Tj	junction temperature		-55	175	°C
T <sub>sld(M)</sub>	peak soldering temperature		-	260	°C
Source-d	rain diode				
Is	source current	T <sub>mb</sub> = 25 °C	-	100	Α
I <sub>SM</sub>	peak source current	pulsed; $t_p \le 10 \ \mu s$ ; $T_{mb} = 25 \ ^{\circ}C$	-	470	Α
Avalanche ruggedness					
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	$V_{GS}$ = 10 V; $T_{j(init)}$ = 25 °C; $I_D$ = 49 A; $V_{sup}$ ≤ 80 V; $R_{GS}$ = 50 $\Omega$ ; unclamped	-	700	mJ

<sup>[1]</sup> Continuous current rating is limited by package.

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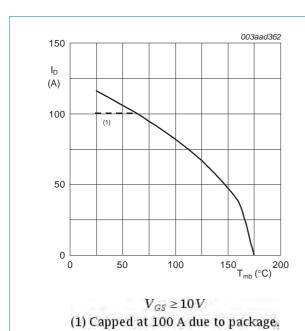


Fig 1. Continuous drain current as a function of mounting base temperature

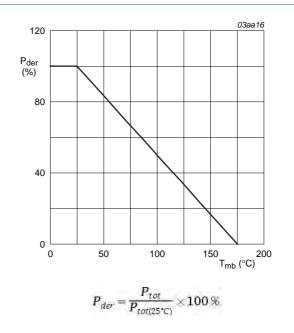
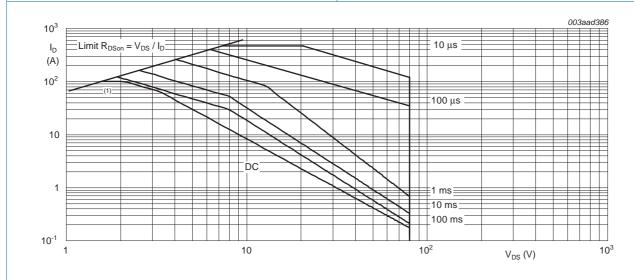


Fig 2. Normalized total power dissipation as a function of mounting base temperature



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

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	Тур	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	0.4	0.7	K/W
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	Minimum footprint; mounted on a printed circuit board	-	50	-	K/W

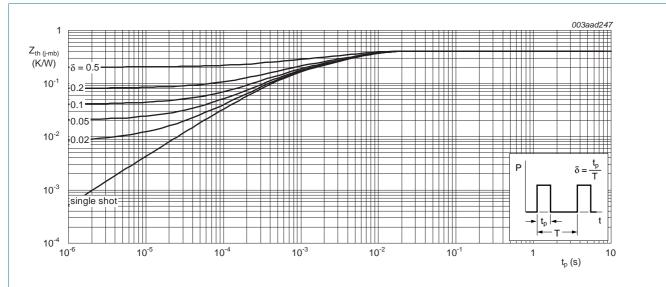


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

# 6. Characteristics

Table 6. Characteristics

Tested to JEDEC standards where applicable.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static chara	octeristics					
V <sub>(BR)DSS</sub>	drain-source	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 °C$	73	-	-	V
	breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 °C$	80	-	-	V
V <sub>GS(th)</sub>	gate-source threshold voltage	$I_D = 1$ mA; $V_{DS} = V_{GS}$ ; $T_j = 175$ °C; see <u>Figure 10</u> ; see <u>Figure 11</u>	1	-	-	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$ ; $T_j = -55$ °C; see <u>Figure 10</u> ; see <u>Figure 11</u>	-	-	4.6	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$ ; $T_j = 25$ °C; see <u>Figure 10</u> ; see <u>Figure 11</u>	2.3	3	4	V
I <sub>DSS</sub>	drain leakage current	$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	0.3	10	μΑ
		$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ °C}$	-	-	150	μΑ
I <sub>GSS</sub> gate leakage	gate leakage current	$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	10	100	nA
		$V_{GS}$ = 20 V; $V_{DS}$ = 0 V; $T_j$ = 25 °C	-	10	100	nA
DOON	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 100 \text{ °C};$ see Figure 12	-	-	11.5	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 175 ^{\circ}\text{C};$ see Figure 12	-	-	16.56	mΩ
		$V_{GS} = 10 \text{ V; } I_D = 15 \text{ A; } T_j = 25 \text{ °C;}$ see Figure 13	-	5.9	6.9	mΩ
$R_G$	internal gate resistance (AC)	f = 1 MHz	-	0.75	-	Ω
Dynamic ch	aracteristics					
Q <sub>G(tot)</sub>	total gate charge	$I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V$	-	61	-	nC
		$I_D = 25 \text{ A}; V_{DS} = 40 \text{ V}; V_{GS} = 10 \text{ V};$	-	71	-	nC
$Q_{GS}$	gate-source charge	see <u>Figure 14</u> ; see <u>Figure 15</u>	-	19	-	nC
Q <sub>GS(th)</sub>	pre-threshold gate-source charge		-	13.2	-	nC
Q <sub>GS(th-pl)</sub>	post-threshold gate-source charge		-	5.8	-	nC
$Q_{GD}$	gate-drain charge		-	16	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25 \text{ A}$ ; $V_{DS} = 40 \text{ V}$ ; see <u>Figure 15</u>	-	4.3	-	V
C <sub>iss</sub>	input capacitance	$V_{DS} = 40 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$	-	4461	-	pF
C <sub>oss</sub>	output capacitance	T <sub>j</sub> = 25 °C; see <u>Figure 16</u>	-	410	-	pF
C <sub>rss</sub>	reverse transfer capacitance		-	214	-	pF
t <sub>d(on)</sub>	turn-on delay time	$V_{DS} = 40 \text{ V}; R_L = 0.5 \Omega; V_{GS} = 10 \text{ V};$	-	26	-	ns
t <sub>r</sub>	rise time	$R_{G(ext)} = 4.7 \Omega$	-	24	-	ns
t <sub>d(off)</sub>	turn-off delay time		-	57	-	ns
t <sub>f</sub>	fall time		-	22	-	ns

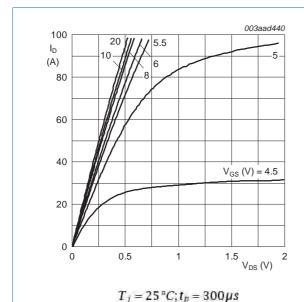
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Characteristics ...continued Table 6.

Tested to JEDEC standards where applicable.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Source-drai	in diode					
$V_{SD}$	source-drain voltage	$I_S = 15 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 ^{\circ}\text{C};$ see <u>Figure 17</u>	-	0.79	1.2	V
t <sub>rr</sub>	reverse recovery time	$I_S = 25 \text{ A}$ ; $dI_S/dt = 100 \text{ A/}\mu\text{s}$ ; $V_{GS} = 0 \text{ V}$ ;	-	48	-	ns
Q <sub>r</sub>	recovered charge	$V_{DS} = 40 \text{ V}$	-	82	-	nC



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

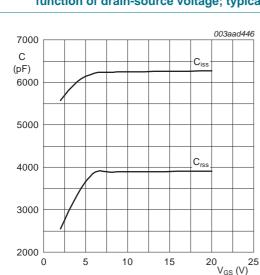
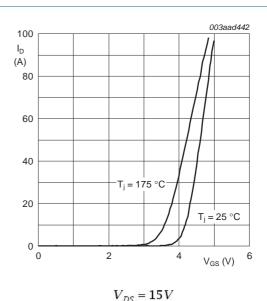
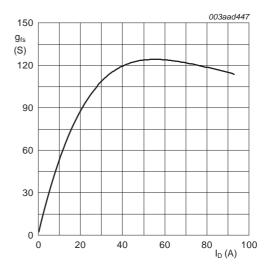


Fig 7. Input and reverse transfer capacitances as a function of gate-source voltage; typical values

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



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



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

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

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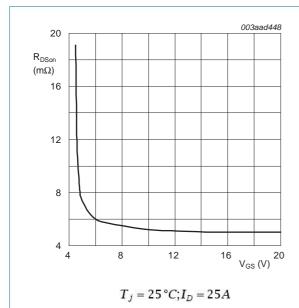


Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

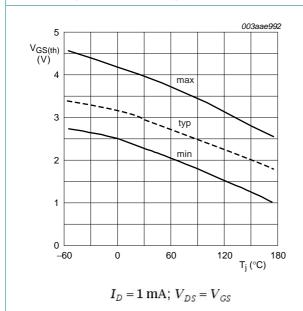


Fig 11. Gate-source threshold voltage as a function of junction temperature

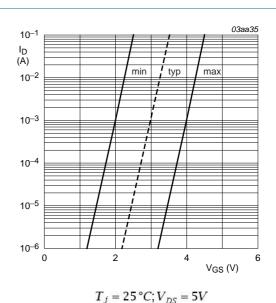


Fig 10. Sub-threshold drain current as a function of gate-source voltage

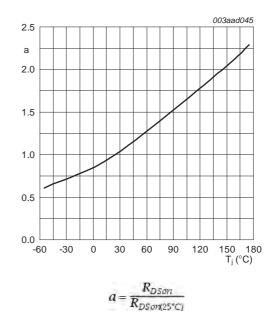


Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature

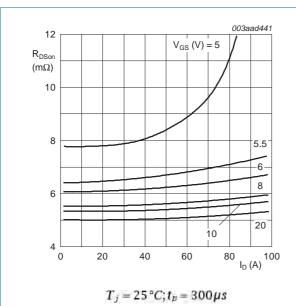


Fig 13. Drain-source on-state resistance as a function of drain current; typical values

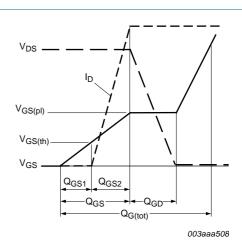


Fig 14. Gate charge waveform definitions

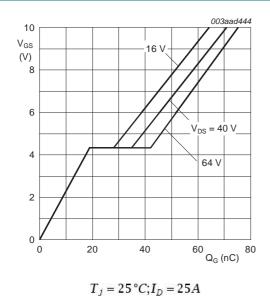
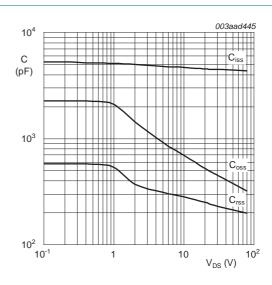


Fig 15. Gate-source voltage as a function of gate

charge; typical values



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

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

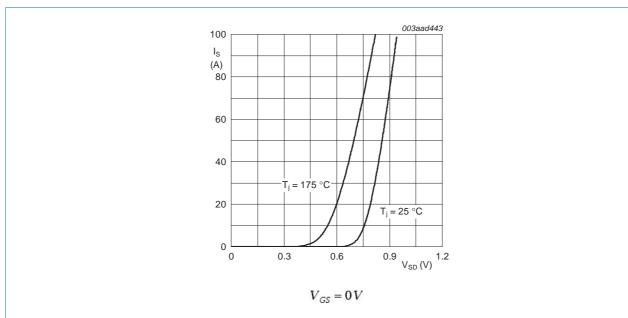


Fig 17. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

# 7. Package outline

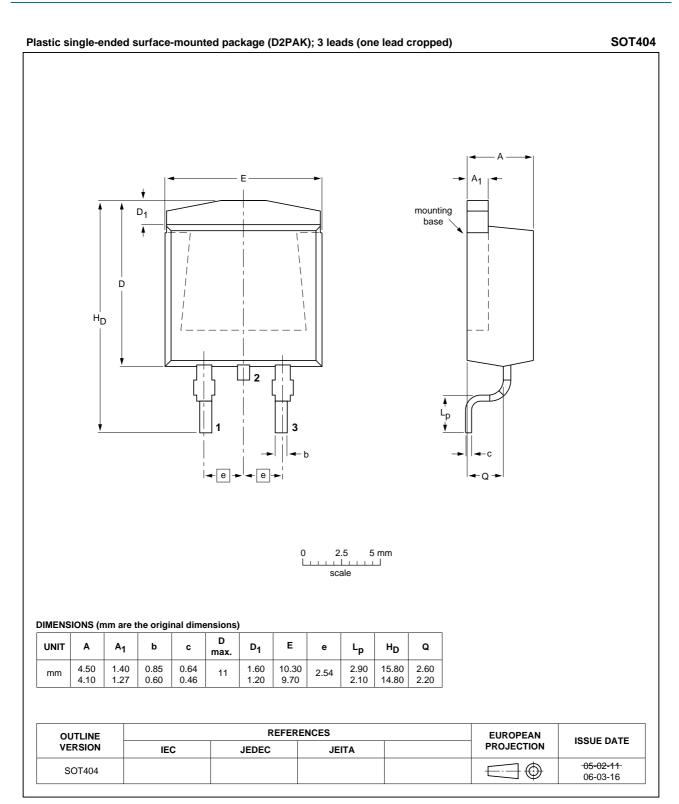


Fig 18. Package outline SOT404 (D2PAK)

# 8. Revision history

## Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN6R5-80BS v.2	20120302	Product data sheet	-	PSMN6R5-80BS v.1
Modifications:	<ul> <li>Status changed fr</li> </ul>	om objective to product.		
	<ul> <li>Various changes t</li> </ul>	to content.		
PSMN6R5-80BS v.1	20111021	Objective 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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# PSMN6R5-80BS

# **Nexperia**

N-channel 80V 6.9m $\Omega$  standard level MOSFET in D2PAK

# 11. Contents

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