



# PSMN1R6-30BL

N-channel 30 V 1.9 mΩ logic level MOSFET in D2PAK

Rev. 1 — 22 March 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Logic 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 logic level gate drive sources

### 1.3 Applications

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

### 1.4 Quick reference data

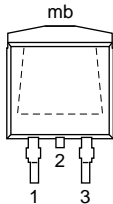
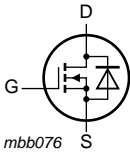
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	-	30	V
$I_D$	drain current	$T_{mb} = 25\text{ °C}; V_{GS} = 10\text{ V};$ see <a href="#">Figure 1</a>	[1]	-	100	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ see <a href="#">Figure 2</a>	-	-	306	W
$T_j$	junction temperature		-55	-	175	°C
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_j = 100\text{ °C};$ see <a href="#">Figure 13</a> ; see <a href="#">Figure 6</a>	-	2.21	2.6	mΩ
		$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_j = 25\text{ °C};$ see <a href="#">Figure 6</a>	-	1.58	1.9	mΩ
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$V_{GS} = 4.5\text{ V}; I_D = 25\text{ A}; V_{DS} = 15\text{ V};$ see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	27	-	nC
$Q_{G(tot)}$	total gate charge		-	101	-	nC
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(init)} = 25\text{ °C};$ $I_D = 100\text{ A}; V_{sup} \leq 30\text{ V}; R_{GS} = 50\text{ Ω};$ unclamped	-	-	1.7	J

[1] Continuous current is limited by package.

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain <sup>[1]</sup>		
3	S	source		
mb	D	mounting base; connected to drain		

SOT404 (D2PAK)

[1] It is not possible to make connection to pin 2

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN1R6-30BL	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Marking

Table 4. Marking codes

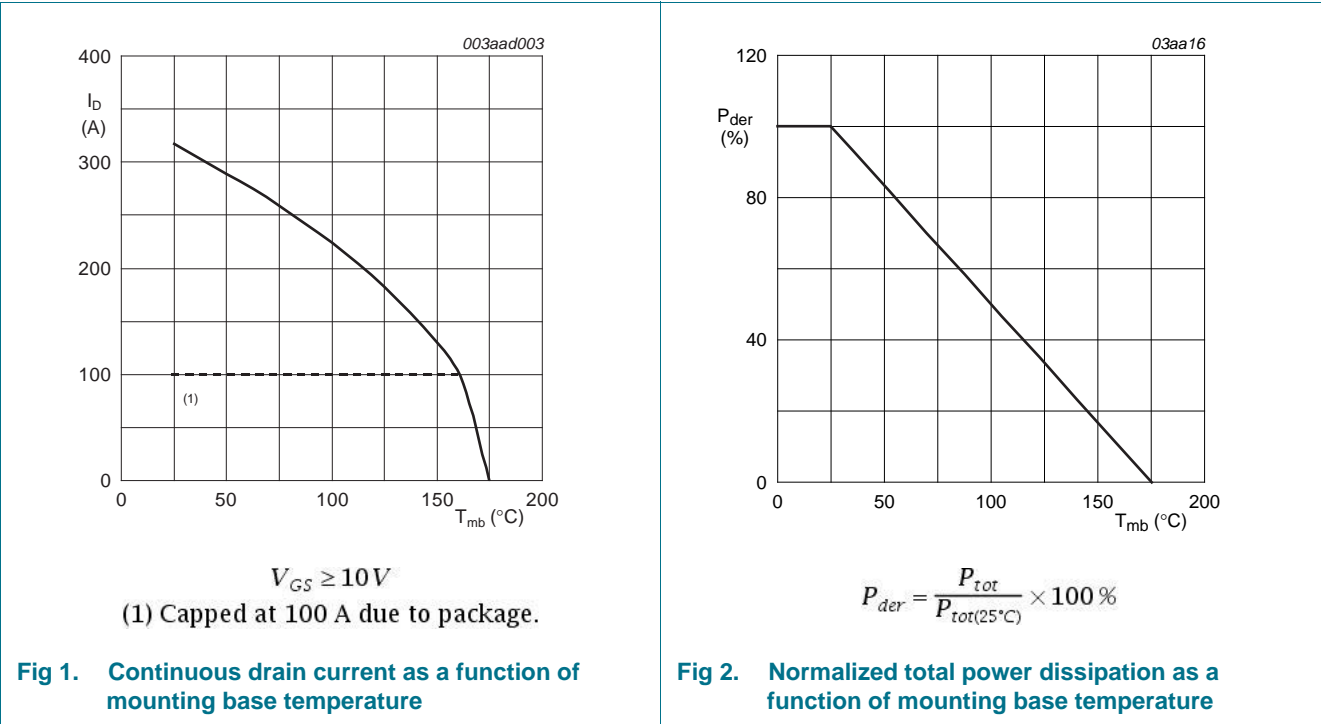
Type number	Marking code
PSMN1R6-30BL	PSMN1R6-30BL

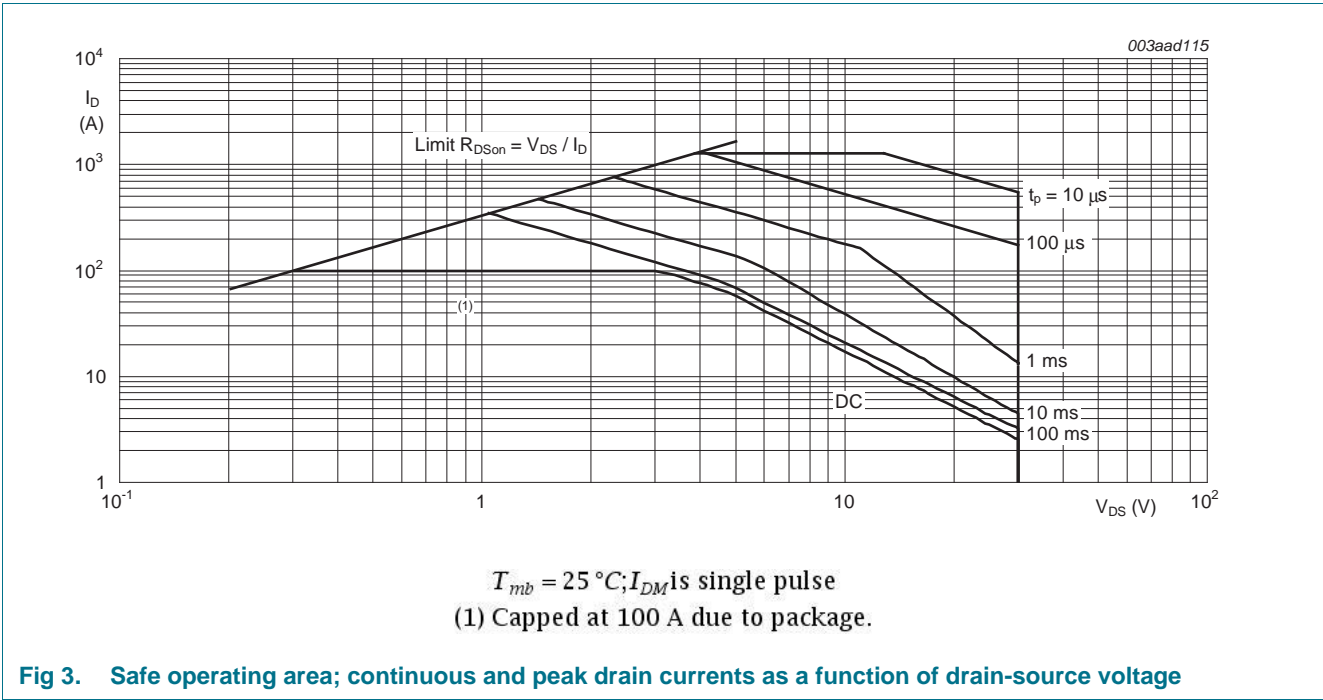
5. Limiting values

Table 5. Limiting values  
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	30	V
V <sub>DGR</sub>	drain-gate voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C; R <sub>GS</sub> = 20 kΩ	-	30	V
V <sub>GS</sub>	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 <a href="#">Figure 1</a> <sup>[1]</sup>	-	100	A
		V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 1</a> <sup>[1]</sup>	-	100	A
I <sub>DM</sub>	peak drain current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 3</a>	-	1268	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	306	W
T <sub>stg</sub>	storage temperature		-55	175	°C
T <sub>j</sub>	junction temperature		-55	175	°C
T <sub>sld(M)</sub>	peak soldering temperature		-	260	°C
<b>Source-drain diode</b>					
I <sub>S</sub>	source current	T <sub>mb</sub> = 25 °C <sup>[1]</sup>	-	100	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C	-	1268	A
<b>Avalanche ruggedness</b>					
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; I <sub>D</sub> = 100 A; V <sub>sup</sub> ≤ 30 V; R <sub>GS</sub> = 50 Ω; unclamped	-	1.7	J

[1] Continuous current is limited by package.

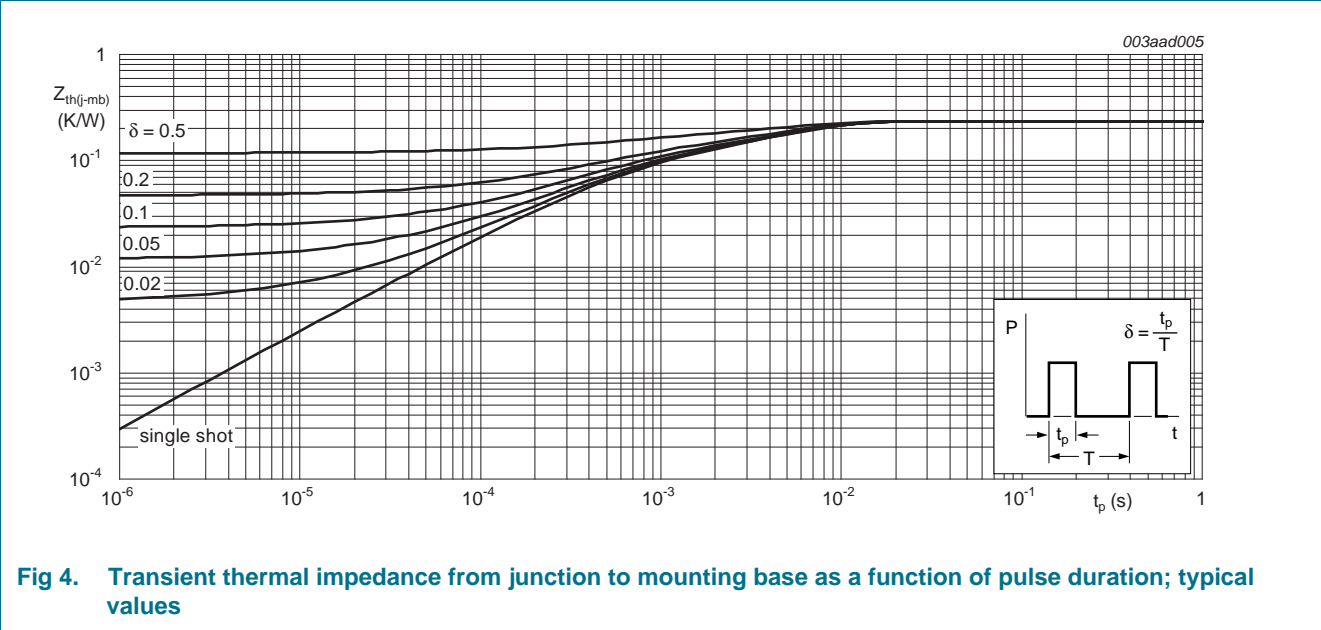




6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see <a href="#">Figure 4</a>	-	0.22	0.49	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint; mounted on a printed-circuit board	-	50	-	K/W



## 7. Characteristics

**Table 7. Characteristics**

Tested to JEDEC standards where applicable.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = 25 ^\circ C$	30	-	-	V
		$I_D = 250 \mu A$ ; $V_{GS} = 0 V$ ; $T_j = -55 ^\circ C$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 ^\circ C$ ; see <a href="#">Figure 11</a> ; see <a href="#">Figure 12</a>	1.3	1.7	2.15	V
		$I_D = 1 mA$ ; $V_{DS} = V_{GS}$ ; $T_j = 175 ^\circ C$ ; see <a href="#">Figure 12</a>	0.5	-	-	V
		$I_D = 1 mA$ ; $V_{DS} = V_{GS}$ ; $T_j = -55 ^\circ C$ ; see <a href="#">Figure 12</a>	-	-	2.45	V
$I_{DSS}$	drain leakage current	$V_{DS} = 30 V$ ; $V_{GS} = 0 V$ ; $T_j = 25 ^\circ C$	-	-	5	$\mu A$
		$V_{DS} = 30 V$ ; $V_{GS} = 0 V$ ; $T_j = 125 ^\circ C$	-	-	150	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 16 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 ^\circ C$	-	10	100	nA
		$V_{GS} = -16 V$ ; $V_{DS} = 0 V$ ; $T_j = 25 ^\circ C$	-	10	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 V$ ; $I_D = 25 A$ ; $T_j = 175 ^\circ C$ ; see <a href="#">Figure 13</a> ; see <a href="#">Figure 6</a>	-	3	3.5	mΩ
		$V_{GS} = 4.5 V$ ; $I_D = 25 A$ ; $T_j = 25 ^\circ C$ ; see <a href="#">Figure 6</a>	-	1.84	2.2	mΩ
		$V_{GS} = 10 V$ ; $I_D = 25 A$ ; $T_j = 100 ^\circ C$ ; see <a href="#">Figure 13</a> ; see <a href="#">Figure 6</a>	-	2.21	2.6	mΩ
		$V_{GS} = 10 V$ ; $I_D = 25 A$ ; $T_j = 25 ^\circ C$ ; see <a href="#">Figure 6</a>	-	1.58	1.9	mΩ
$R_G$	gate resistance	$f = 1 MHz$	-	0.98	-	Ω
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 25 A$ ; $V_{DS} = 15 V$ ; $V_{GS} = 10 V$ ; see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	212	-	nC
		$I_D = 0 A$ ; $V_{DS} = 0 V$ ; $V_{GS} = 10 V$	-	193	-	nC
		$I_D = 25 A$ ; $V_{DS} = 15 V$ ; $V_{GS} = 4.5 V$ ; see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	101	-	nC
$Q_{GS}$	gate-source charge		-	33	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	20	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	13	-	nC
$Q_{GD}$	gate-drain charge		-	27	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25 A$ ; $V_{DS} = 15 V$ ; see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	2.5	-	V
$C_{iss}$	input capacitance	$V_{DS} = 15 V$ ; $V_{GS} = 0 V$ ; $f = 1 MHz$ ;	-	12493	-	pF
$C_{oss}$	output capacitance	$T_j = 25 ^\circ C$ ; see <a href="#">Figure 16</a>	-	2486	-	pF
$C_{rss}$	reverse transfer capacitance		-	1034	-	pF

Table 7. Characteristics ...continued  
Tested to JEDEC standards where applicable.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t <sub>d(on)</sub>	turn-on delay time	V <sub>DS</sub> = 15 V; R <sub>L</sub> = 0.5 Ω; V <sub>GS</sub> = 4.5 V; R <sub>G(ext)</sub> = 4.7 Ω	-	104	-	ns
t <sub>r</sub>	rise time		-	163	-	ns
t <sub>d(off)</sub>	turn-off delay time		-	174	-	ns
t <sub>f</sub>	fall time		-	87	-	ns
Source-drain diode						
V <sub>SD</sub>	source-drain voltage	I <sub>S</sub> = 25 A; V <sub>GS</sub> = 0 V; T <sub>j</sub> = 25 °C; see <a href="#">Figure 17</a>	-	0.77	1.2	V
t <sub>rr</sub>	reverse recovery time	I <sub>S</sub> = 25 A; dI <sub>S</sub> /dt = -100 A/μs;	-	64	-	ns
Q <sub>r</sub>	recovered charge	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 15 V	-	79	-	nC

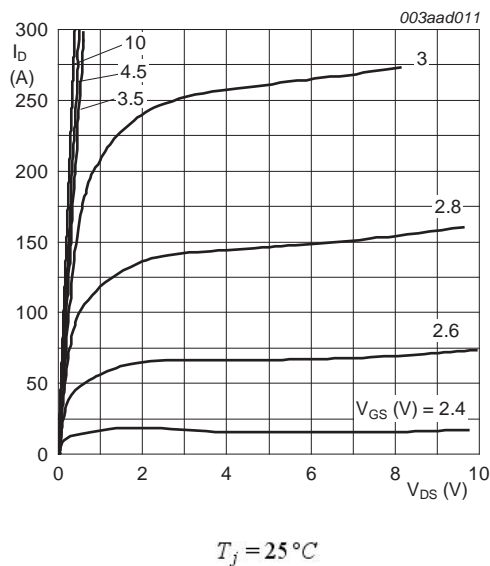


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

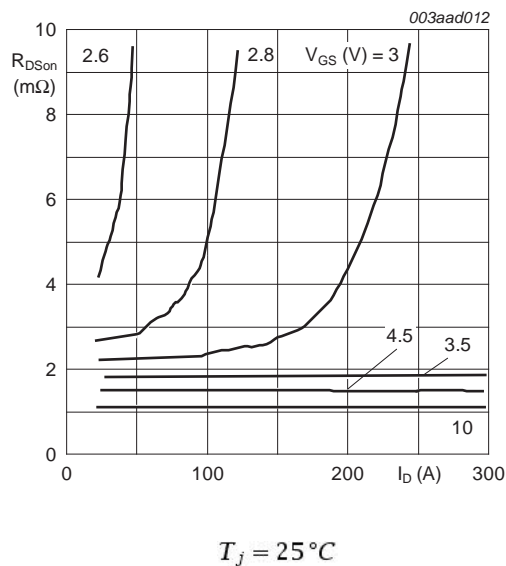
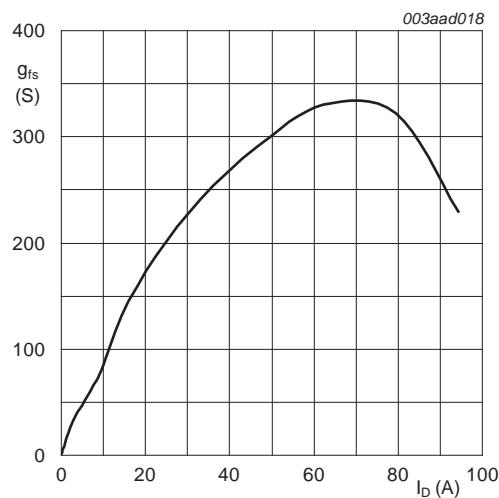
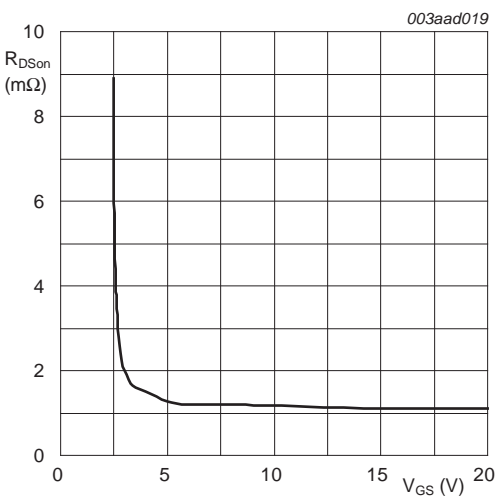


Fig 6. Drain-source on-state resistance as a function of drain current; typical values



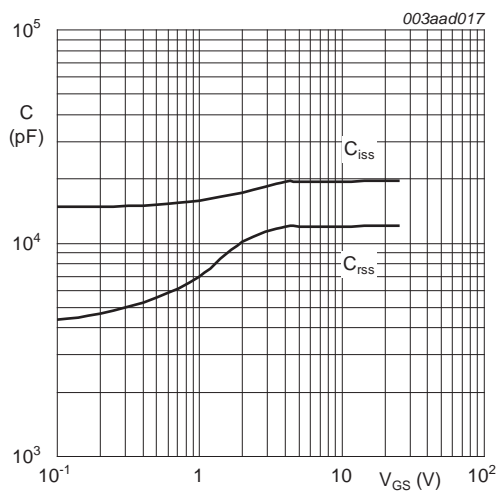
$T_j = 25\text{ }^{\circ}\text{C}; V_{DS} = 15\text{ V}$

Fig 7. Forward transconductance as a function of drain current; typical values



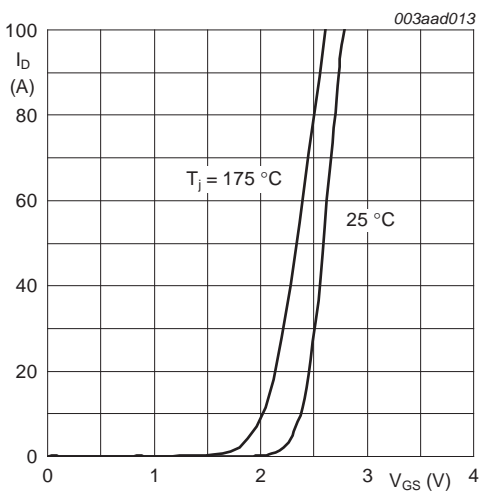
$T_j = 25\text{ }^{\circ}\text{C}; I_D = 25\text{ A}$

Fig 8. Drain-source on-state resistance as a function of gate-source voltage; typical values



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

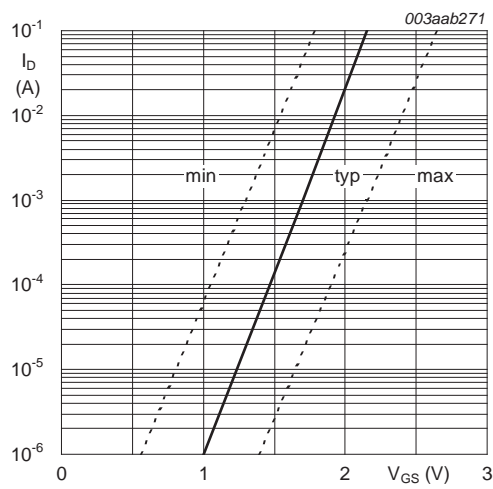
Fig 9. Input and reverse transfer capacitances as a function of gate-source voltage; typical values



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

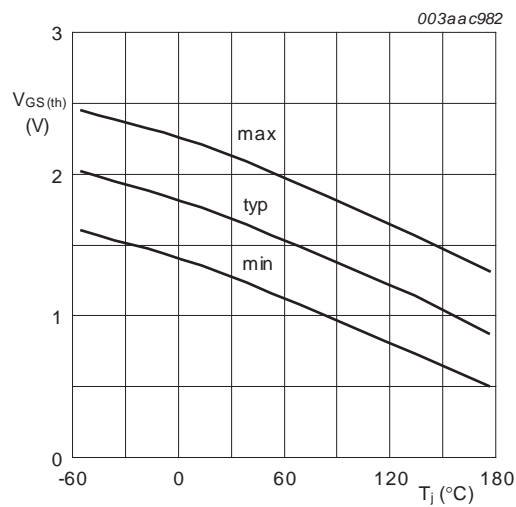
Fig 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values





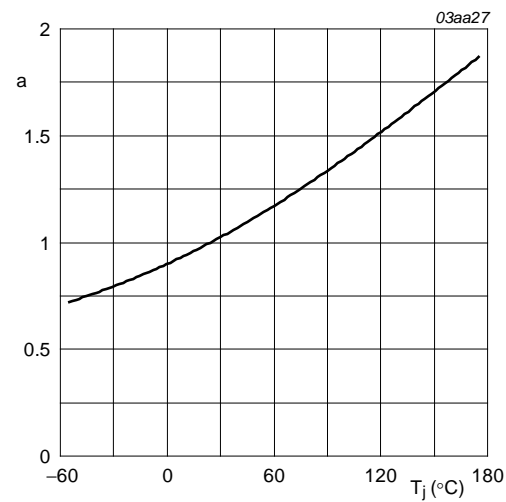
$T_j = 25\text{ }^{\circ}\text{C}; V_{DS} = 5\text{ V}$

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



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

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



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

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

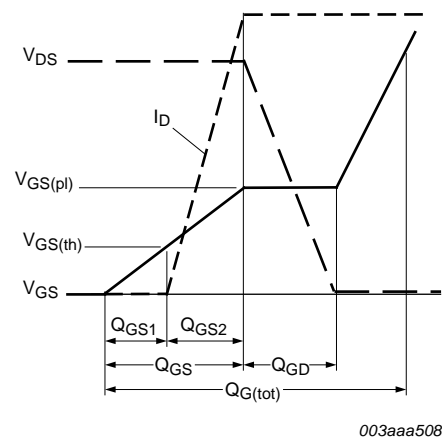


Fig 14. Gate charge waveform definitions

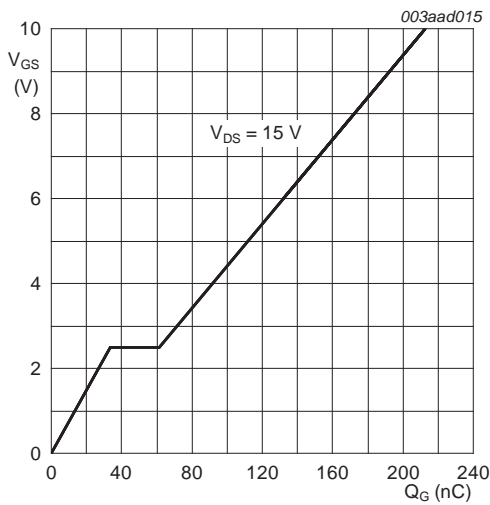


Fig 15. Gate-source voltage as a function of gate charge; typical values

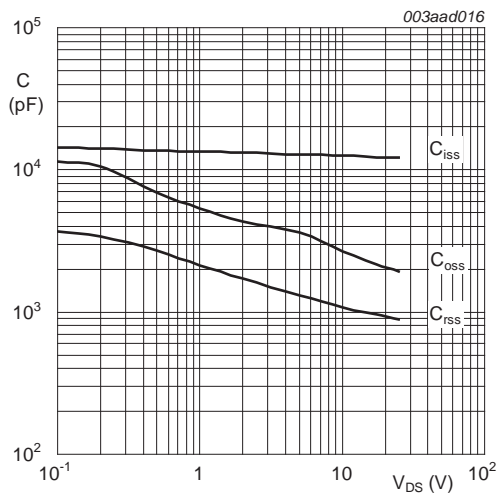


Fig 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

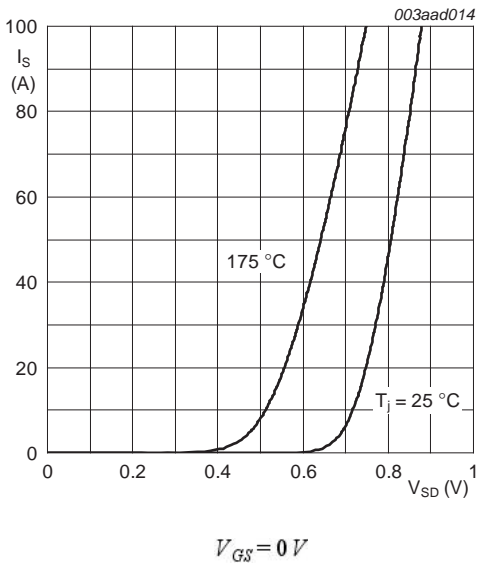
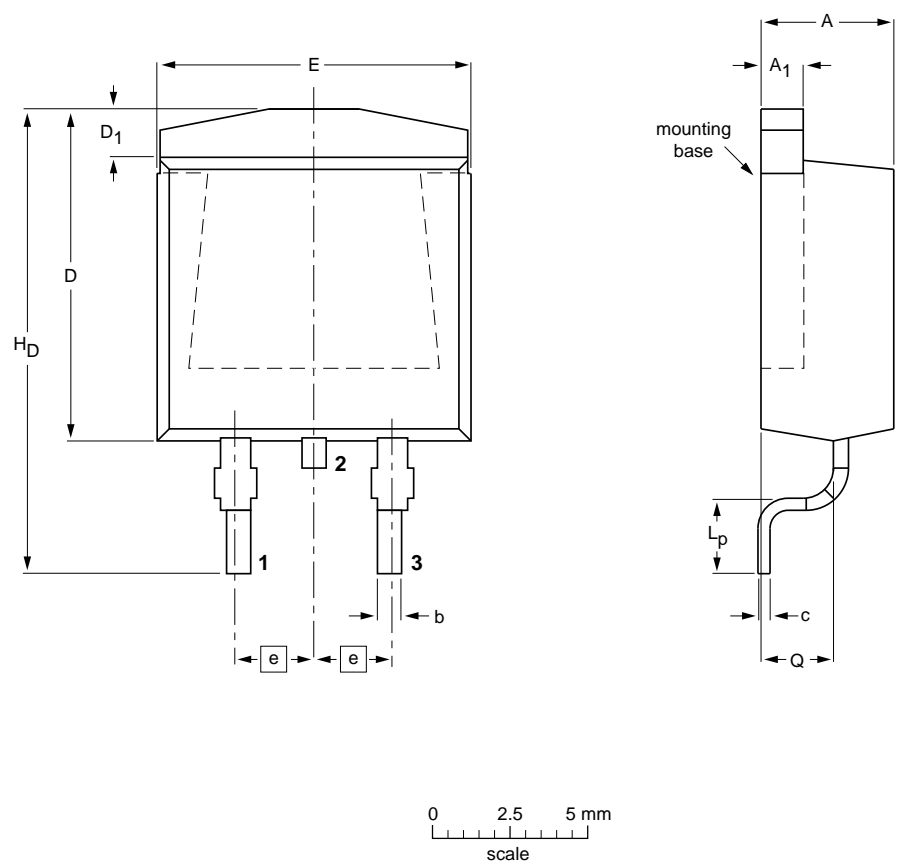


Fig 17. Source current as a function of source-drain voltage; typical values

8. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)

SOT404



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	c	D <sub>max.</sub>	D <sub>1</sub>	E	e	L <sub>p</sub>	H <sub>D</sub>	Q
mm	4.50 4.10	1.40 1.27	0.85 0.60	0.64 0.46	11	1.60 1.20	10.30 9.70	2.54	2.90 2.10	15.80 14.80	2.60 2.20

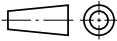
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT404						05-02-11 06-03-16

Fig 18. Package outline SOT404 (D2PAK)

9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN1R6-30BL v.1	20120322	Product data sheet	-	-

## 10. Legal information

### 10.1 Data sheet status

Document status <sup>[1] [2]</sup>	Product status <sup>[3]</sup>	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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[2] The term 'short data sheet' is explained in section "Definitions".

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