



# PSMN1R8-30BL

N-channel 30 V, 1.8 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

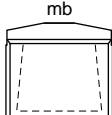
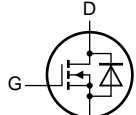
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	-	30	V
$I_D$	drain current	$T_{mb} = 25\text{ °C}; V_{GS} = 10\text{ V};$ see <a href="#">Figure 1</a>	[1]	-	100	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C};$ see <a href="#">Figure 2</a>	-	-	270	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 12</a>	-	2.17	2.6	mΩ
		$V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_j = 25\text{ °C};$ see <a href="#">Figure 12</a>	-	1.55	1.8	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>	-	22	-	nC
$Q_{G(tot)}$	total gate charge		-	83	-	nC
<b>Avalanche ruggedness</b>						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(init)} = 25\text{ °C}; I_D = 100\text{ A};$ $V_{sup} \leq 30\text{ V}; R_{GS} = 50\text{ }\Omega;$ unclamped	-	-	1.1	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
PSMN1R8-30BL	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PSMN1R8-30BL	PSMN1R8-30BL

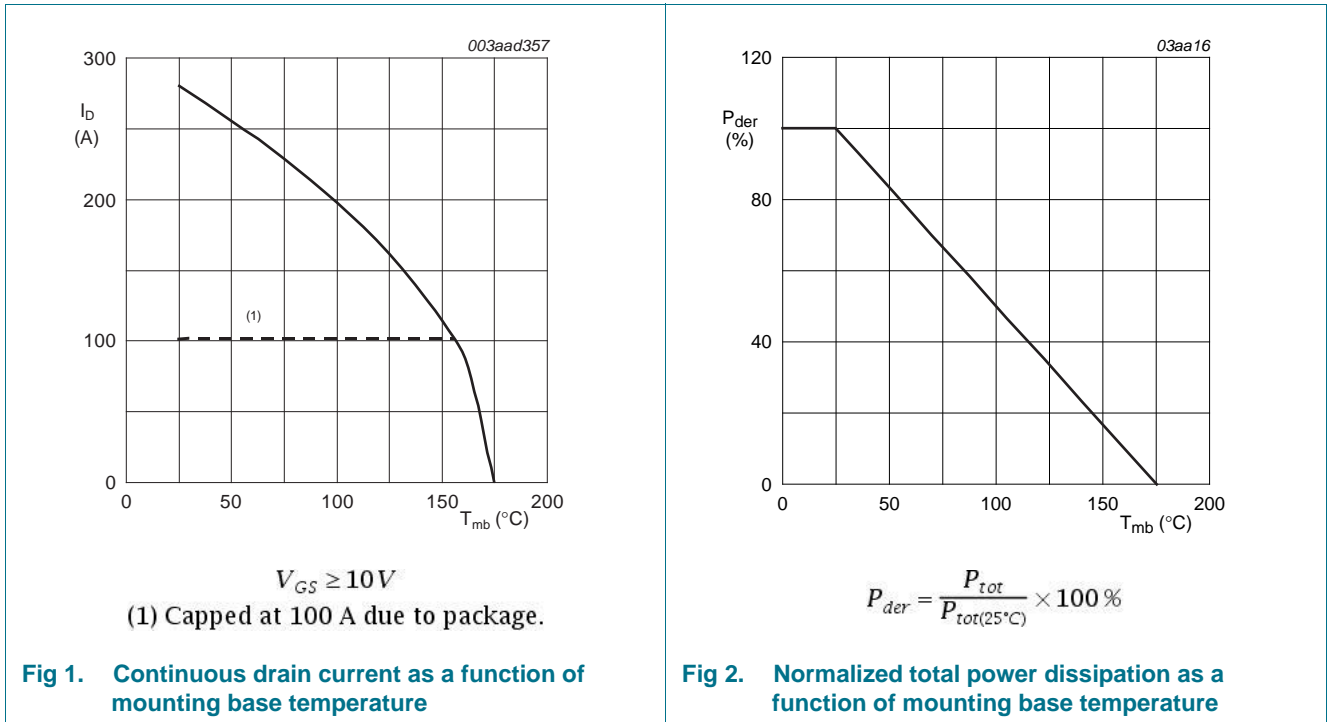
5. Limiting values

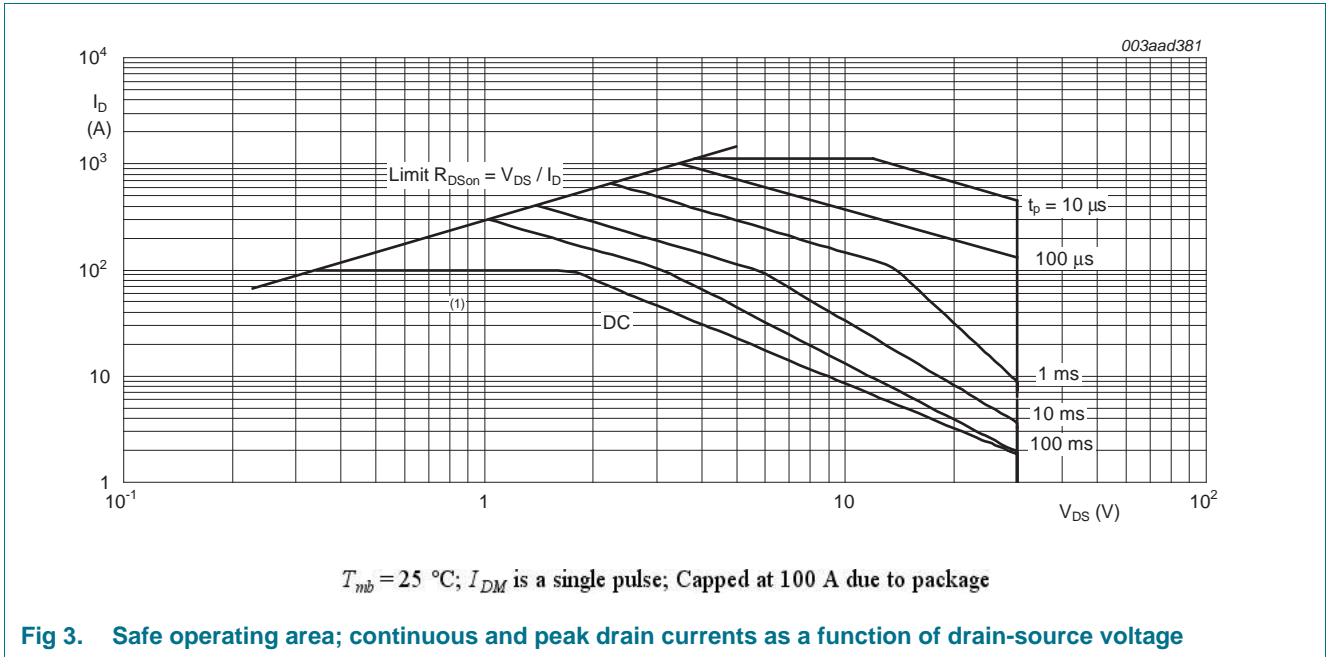
Table 5. Limiting values

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 Figure 1 [1]	-	100	A
		V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C; see Figure 1 [1]	-	100	A
I <sub>DM</sub>	peak drain current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C; see Figure 3	-	1120	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see Figure 2	-	270	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 [1]	-	100	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C	-	1120	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	-	1.1	J

[1] Continuous current is limited by package.

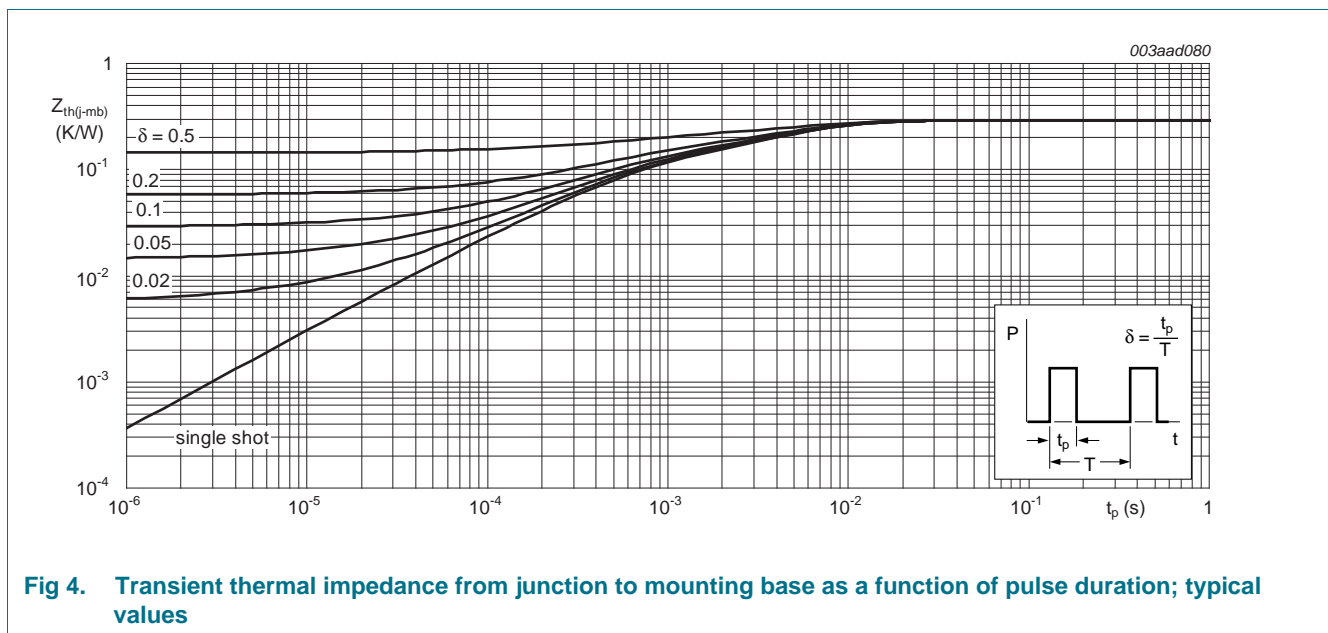




## 6. Thermal characteristics

**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>	-	0.3	0.56	K/W
$R_{th(j-a)}$	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; typical values**

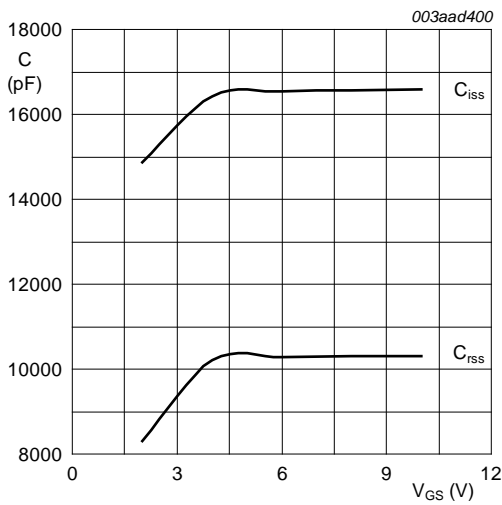
## 7. Characteristics

**Table 7. Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	30	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a>	1.3	1.7	2.15	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ C$ ; see <a href="#">Figure 11</a>	0.5	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ C$ ; see <a href="#">Figure 11</a>	-	-	2.45	V
$I_{DSS}$	drain leakage current	$V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	0.3	4	$\mu A$
		$V_{DS} = 30 V; V_{GS} = 0 V; T_j = 125 \text{ }^\circ C$	-	-	200	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 16 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	10	100	nA
		$V_{GS} = -16 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	10	100	nA
$R_{Dson}$	drain-source on-state resistance	$V_{GS} = 4.5 V; I_D = 25 A; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 12</a>	-	1.82	2.1	mΩ
		$V_{GS} = 10 V; I_D = 25 A; T_j = 175 \text{ }^\circ C$ ; see <a href="#">Figure 13</a> ; see <a href="#">Figure 12</a>	-	2.95	3.5	mΩ
		$V_{GS} = 10 V; I_D = 25 A; T_j = 100 \text{ }^\circ C$ ; see <a href="#">Figure 13</a> ; see <a href="#">Figure 12</a>	-	2.17	2.6	mΩ
		$V_{GS} = 10 V; I_D = 25 A; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 12</a>	-	1.55	1.8	mΩ
$R_G$	gate resistance	$f = 1 \text{ MHz}$	-	1	-	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>	-	170	-	nC
		$I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V$	-	158	-	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>	-	83	-	nC
$Q_{GS}$	gate-source charge		-	29	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	17	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	12	-	nC
$Q_{GD}$	gate-drain charge		-	22	-	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>	-	2.6	-	V
$C_{iss}$	input capacitance	$V_{DS} = 15 V; V_{GS} = 0 V; f = 1 \text{ MHz}$ ;	-	10180	-	pF
$C_{oss}$	output capacitance	$T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 16</a>	-	2000	-	pF
$C_{rss}$	reverse transfer capacitance		-	872	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15 V; R_L = 0.5 \text{ } \Omega; V_{GS} = 4.5 V$ ;	-	92	-	ns
$t_r$	rise time	$R_{G(ext)} = 4.7 \text{ } \Omega$	-	156	-	ns
$t_{d(off)}$	turn-off delay time		-	135	-	ns
$t_f$	fall time		-	69	-	ns

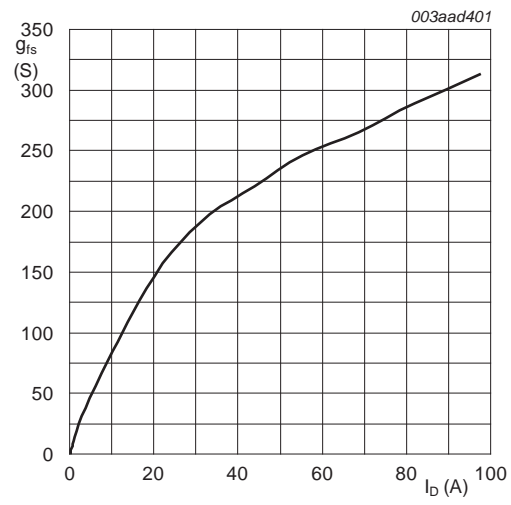
Table 7. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; $T_j = 25\text{ °C}$ ; see Figure 17	-	0.7	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 25\text{ A}$ ; $di_S/dt = -100\text{ A}/\mu\text{s}$ ;	-	64	-	ns
$Q_r$	recovered charge	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 15\text{ V}$	-	60	-	nC



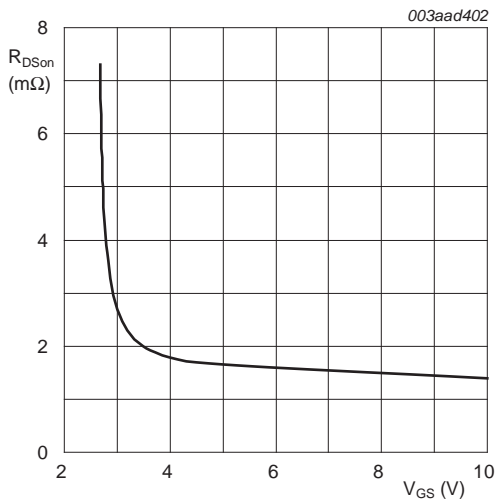
$V_{DS} = 0\text{ V}; f = 1\text{ MHz}$

Fig 5. Input and reverse transfer capacitances as a function of gate-source voltage; typical values



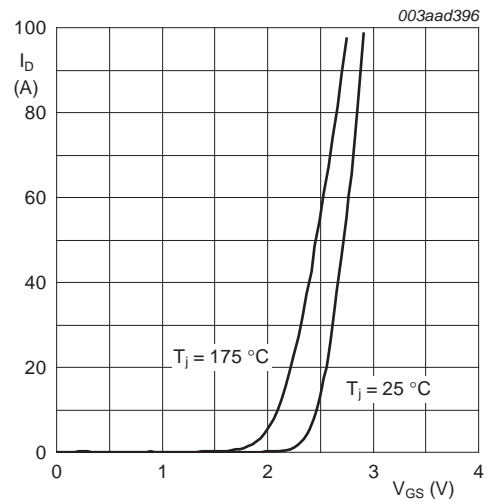
$T_j = 25\text{ °C}; V_{DS} = 15\text{ V}$

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



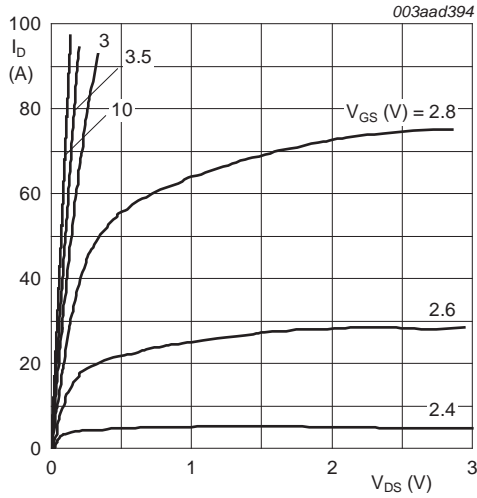
$T_j = 25\text{ °C}; I_D = 25\text{ A}$

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



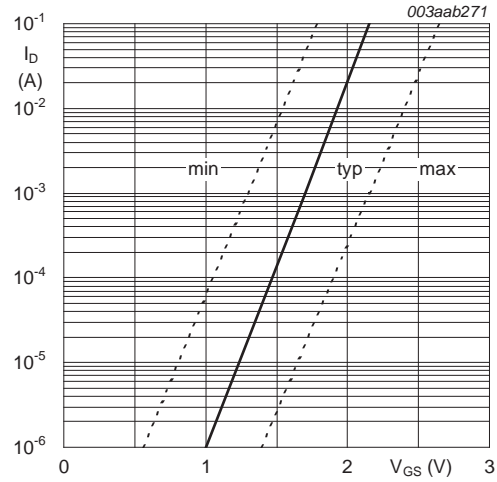
$V_{DS} > I_D \times R_{DS(on)}$

Fig 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values



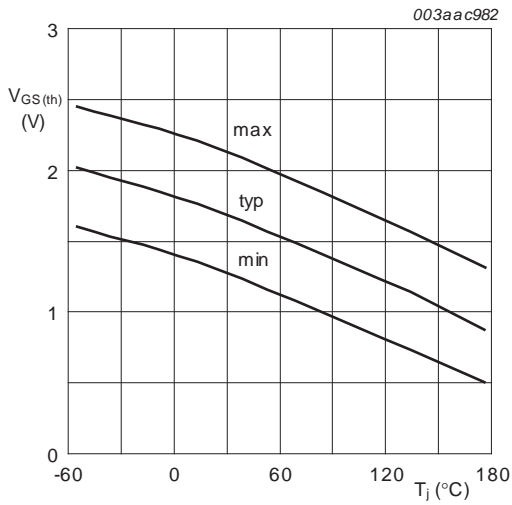
$T_j = 25^\circ\text{C}$

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



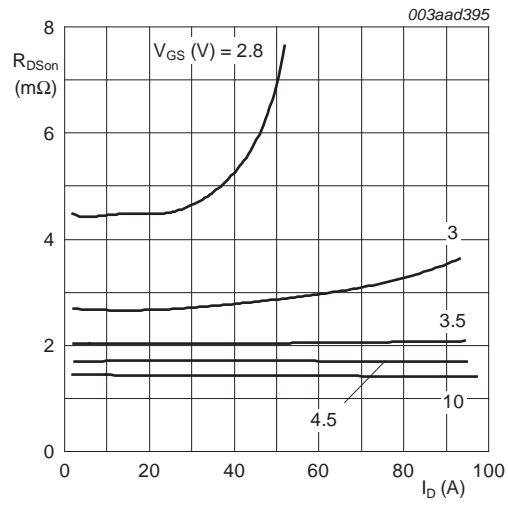
$T_j = 25^\circ\text{C}; V_{DS} = 5\text{V}$

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



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

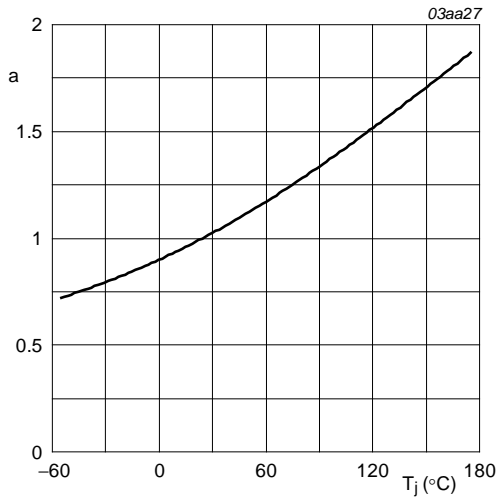
Fig 11. Gate-source threshold voltage as a function of junction temperature



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

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





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

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

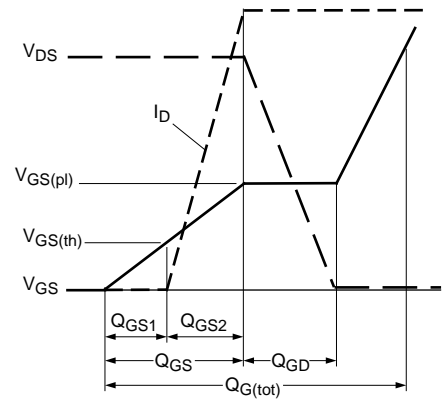
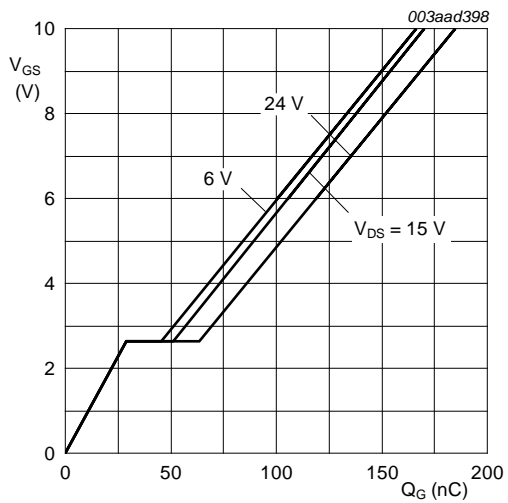
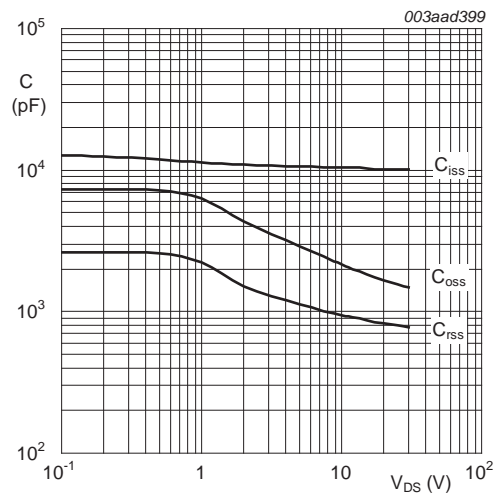


Fig 14. Gate charge waveform definitions



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

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



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

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

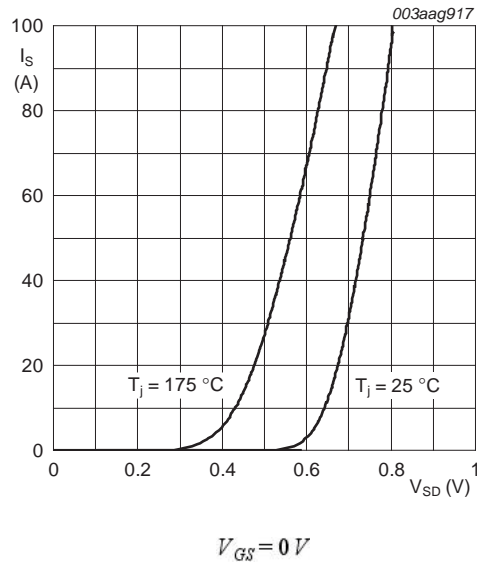


Fig 17. Source current as a function of source-drain voltage; typical values

### 8. Package outline

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

SOT404

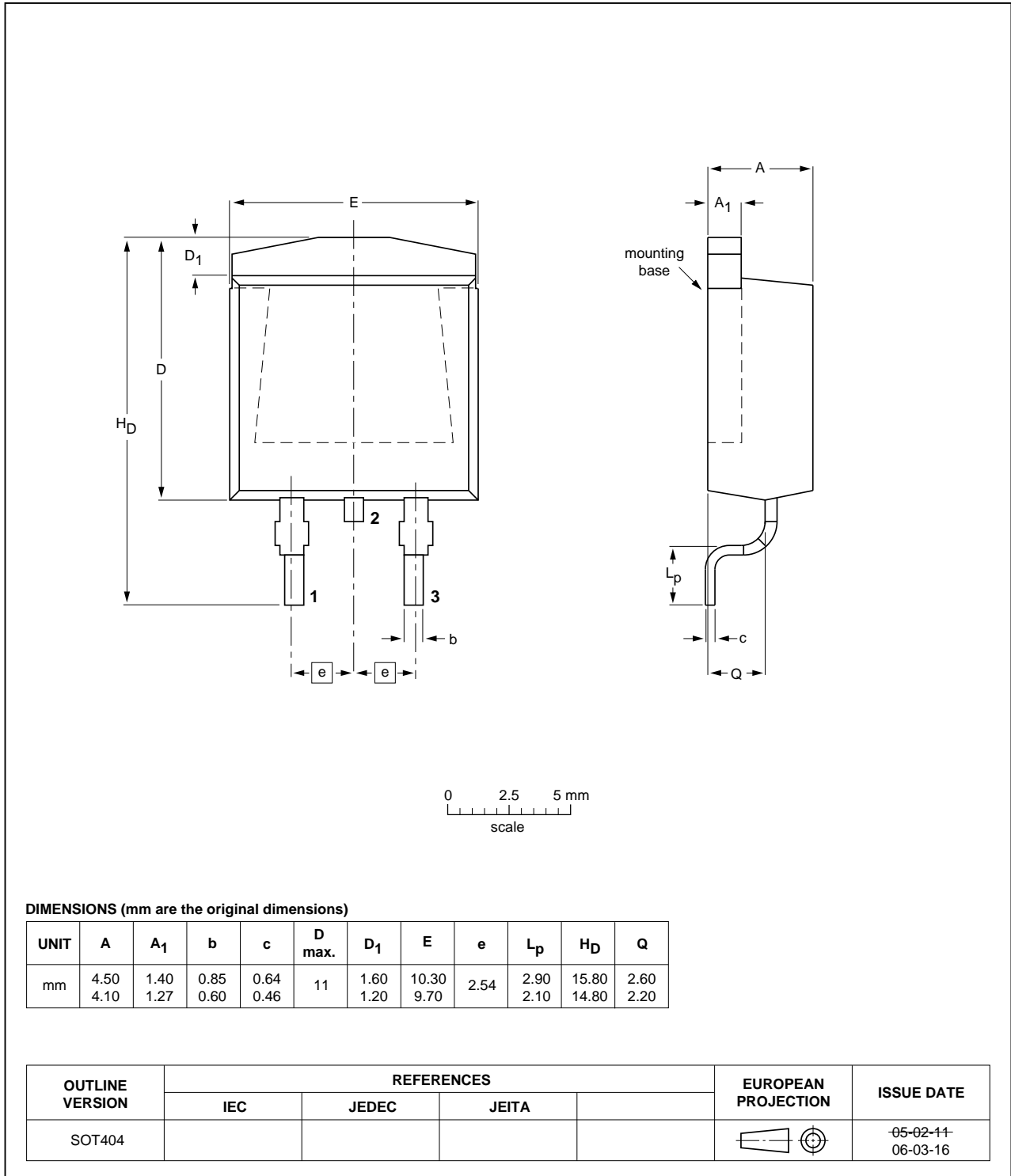


Fig 18. Package outline SOT404 (D2PAK)

## 9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN1R8-30BL v.1	20120322	Product data sheet	-	-

## 10. Legal information

### 10.1 Data sheet status

Document status <sup>[1]</sup> [2]	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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Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

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