



PSMN2R0-30BL

N-channel 30 V 2.1 mΩ logic level MOSFET in D2PAK

Rev. 1 — 20 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
- Load switching
- Motor control
- Server power supplies

1.4 Quick reference data

Table 1. Quick reference data

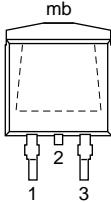
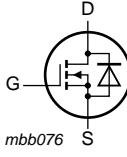
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25 \text{ }^\circ\text{C}; T_j \leq 175 \text{ }^\circ\text{C}$	-	-	30	V
I_D	drain current	$T_{mb} = 25 \text{ }^\circ\text{C}; V_{GS} = 10 \text{ V}$; see Figure 1 [1]	-	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25 \text{ }^\circ\text{C}$; see Figure 2	-	-	211	W
T_j	junction temperature		-55	-	175	$^\circ\text{C}$
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 100 \text{ }^\circ\text{C}$; see Figure 12 ; see Figure 11	-	2.51	2.9	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 11	-	1.79	2.1	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A}; V_{DS} = 15 \text{ V}$; see Figure 13 ; see Figure 14	-	16	-	nC
$Q_{G(tot)}$	total gate charge		-	55	-	nC
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10 \text{ V}; T_{j(init)} = 25 \text{ }^\circ\text{C}; I_D = 100 \text{ A}; V_{sup} \leq 30 \text{ V}; R_{GS} = 50 \Omega$; unclamped	-	-	555	mJ

[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 ^[1]		
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			Version
	Name	Description		
PSMN2R0-30BL	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)		SOT404

4. Marking

Table 4. Marking codes

Type number	Marking code
PSMN2R0-30BL	PSMN2R0-30BL

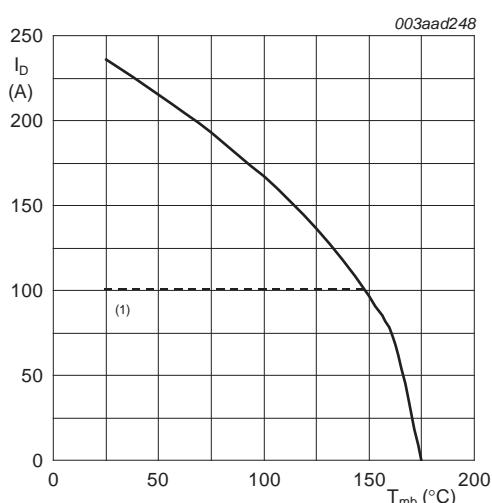
5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

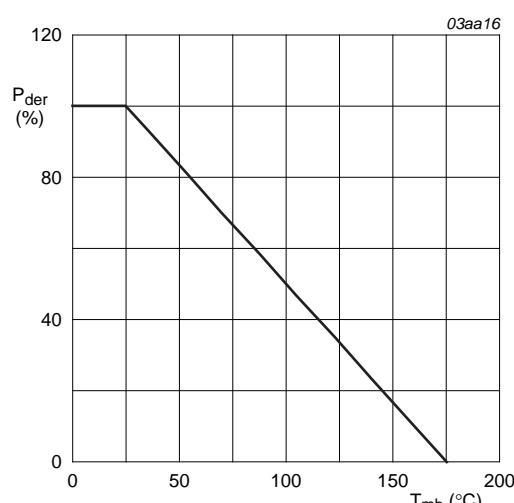
Symbol	Parameter	Conditions	Min	Max	Unit	
V_{DS}	drain-source voltage	$T_j \geq 25^\circ\text{C}; T_j \leq 175^\circ\text{C}$	-	30	V	
V_{DGR}	drain-gate voltage	$T_j \geq 25^\circ\text{C}; T_j \leq 175^\circ\text{C}; R_{GS} = 20\text{ k}\Omega$	-	30	V	
V_{GS}	gate-source voltage		-20	20	V	
I_D	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 100^\circ\text{C}$; see Figure 1	[1]	-	100	A
		$V_{GS} = 10\text{ V}; T_{mb} = 25^\circ\text{C}$; see Figure 1	[1]	-	100	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25^\circ\text{C}$; see Figure 3	-	943	A	
P_{tot}	total power dissipation	$T_{mb} = 25^\circ\text{C}$; see Figure 2	-	211	W	
T_{stg}	storage temperature		-55	175	°C	
T_j	junction temperature		-55	175	°C	
$T_{sld(M)}$	peak soldering temperature		-	260	°C	
Source-drain diode						
I_S	source current	$T_{mb} = 25^\circ\text{C}$	[1]	-	100	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25^\circ\text{C}$	-	943	A	
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25^\circ\text{C}; I_D = 100\text{ A}; V_{sup} \leq 30\text{ V}; R_{GS} = 50\text{ }\Omega$; unclamped	-	555	mJ	

[1] Continuous current is limited by package.



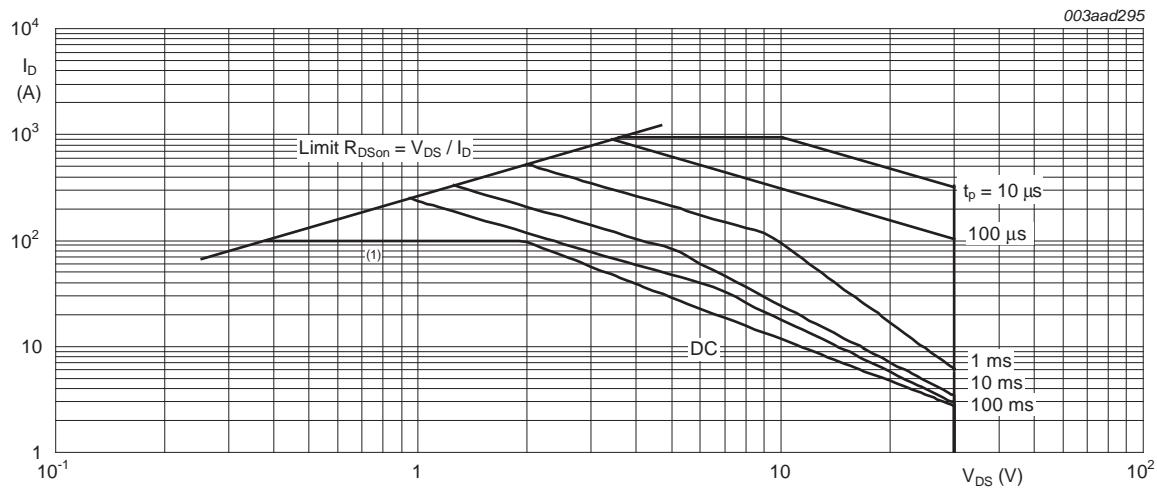
$V_{GS} \geq 10\text{ V}$
(1) Capped at 100 A due to package.

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



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

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

6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j\text{-mb})}$	thermal resistance from junction to mounting base	see Figure 4	-	0.41	0.71	K/W
$R_{th(j\text{-a})}$	thermal resistance from junction to ambient	maximum foot print; mounted on a printed circuit board	-	50	-	K/W

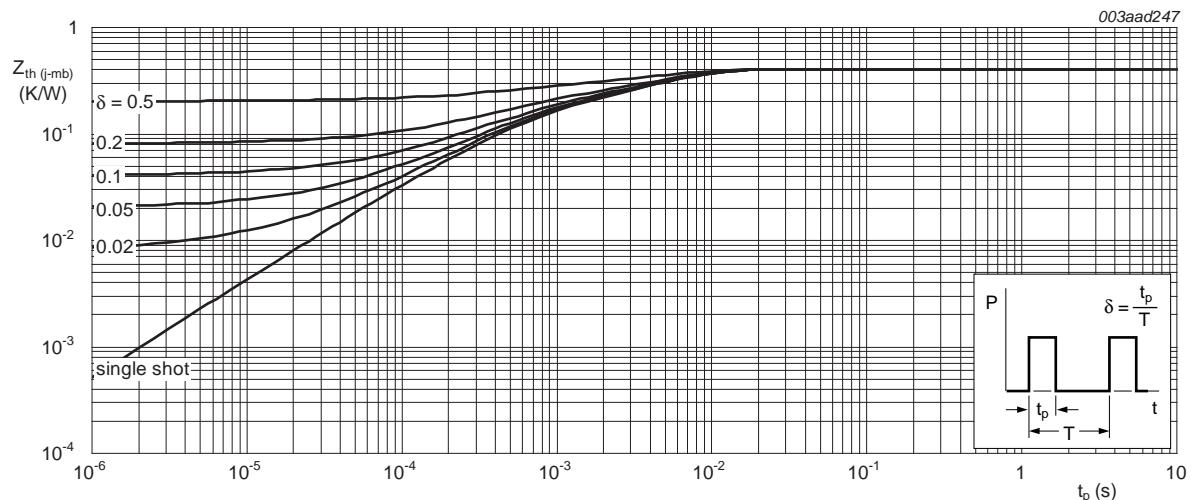


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

7. Characteristics

Table 7. Characteristics

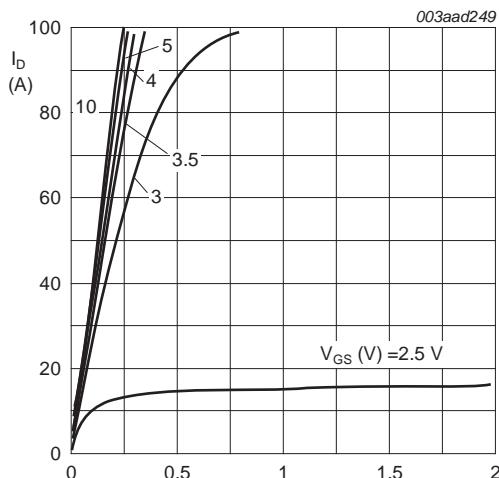
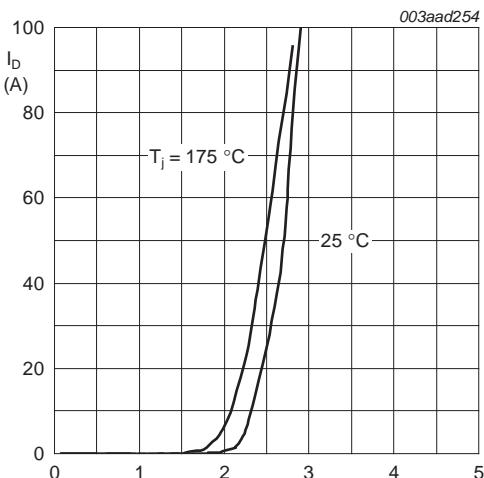
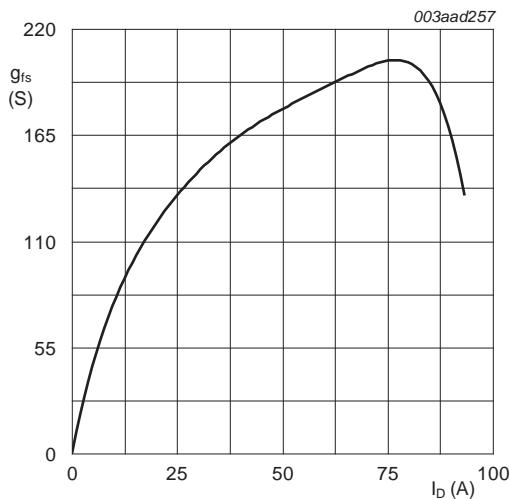
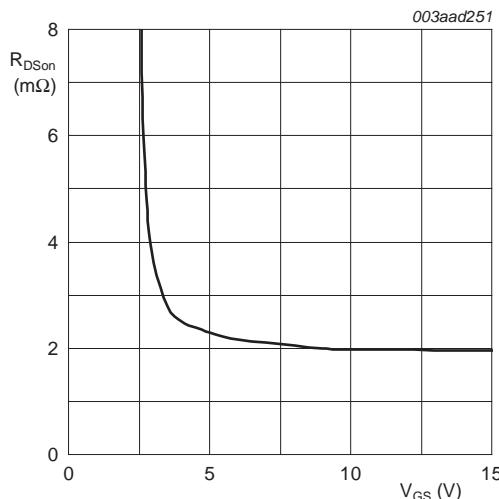
Tested to JEDEC standards where applicable.

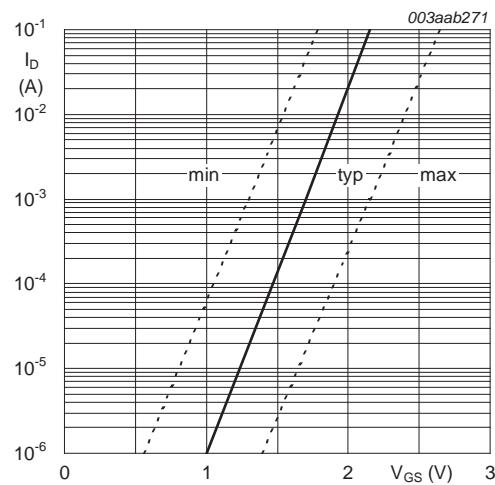
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25^\circ C$	30	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55^\circ C$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25^\circ C;$ see Figure 9 ; see Figure 10	1.3	1.7	2.15	V
		$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175^\circ C;$ see Figure 10	0.5	-	-	V
		$I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55^\circ C;$ see Figure 10	-	-	2.45	V
I_{DSS}	drain leakage current	$V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25^\circ C$	-	0.02	3	μA
		$V_{DS} = 30 V; V_{GS} = 0 V; T_j = 125^\circ C$	-	-	70	μA
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	$V_{GS} = 4.5 V; I_D = 25 A; T_j = 25^\circ C;$ see Figure 11	-	2.47	2.9	$m\Omega$
		$V_{GS} = 10 V; I_D = 25 A; T_j = 175^\circ C;$ see Figure 12 ; see Figure 11	-	3.4	4	$m\Omega$
		$V_{GS} = 10 V; I_D = 25 A; T_j = 100^\circ C;$ see Figure 12 ; see Figure 11	-	2.51	2.9	$m\Omega$
		$V_{GS} = 10 V; I_D = 25 A; T_j = 25^\circ C;$ see Figure 11	-	1.79	2.1	$m\Omega$
R_G	gate resistance	$f = 1 MHz$	-	0.78	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V$	-	107	-	nC
		$I_D = 25 A; V_{DS} = 15 V; V_{GS} = 10 V;$ see Figure 13 ; see Figure 14	-	117	-	nC
		$I_D = 25 A; V_{DS} = 15 V; V_{GS} = 4.5 V;$ see Figure 13 ; see Figure 14	-	55	-	nC
Q_{GS}	gate-source charge	-	17	-	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge	-	11	-	-	nC
$Q_{GS(th-p)}$	post-threshold gate-source charge	-	6	-	-	nC
Q_{GD}	gate-drain charge	-	16	-	-	nC
$V_{GS(pi)}$	gate-source plateau voltage	$I_D = 25 A; V_{DS} = 25 V;$ see Figure 13 ; see Figure 14	-	2.6	-	V
C_{iss}	input capacitance	$V_{DS} = 15 V; V_{GS} = 0 V; f = 1 MHz;$	-	6810	-	pF
C_{oss}	output capacitance	$T_j = 25^\circ C;$ see Figure 15	-	1410	-	pF
C_{rss}	reverse transfer capacitance	-	650	-	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15 V; R_L = 0.5 \Omega; V_{GS} = 4.5 V;$	-	63	-	ns
t_r	rise time	$R_{G(ext)} = 4.7 \Omega$	-	125	-	ns
$t_{d(off)}$	turn-off delay time	-	111	-	-	ns
t_f	fall time	-	59	-	-	ns

Table 7. Characteristics ...continued

Tested to JEDEC standards where applicable.

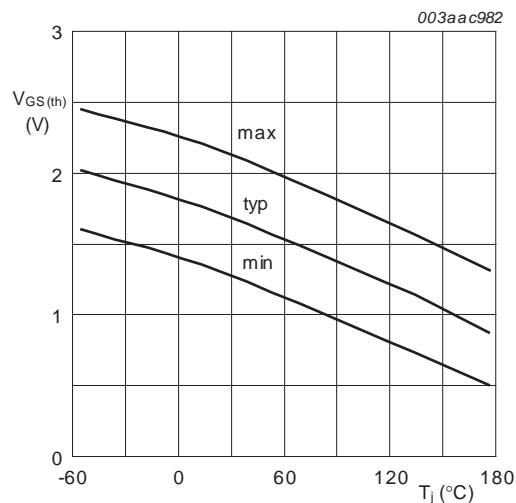
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 16	-	0.76	1.2	V
t_{rr}	reverse recovery time	$I_S = 25 \text{ A}; dI_S/dt = -100 \text{ A}/\mu\text{s};$	-	49	-	ns
Q_r	recovered charge	$V_{GS} = 0 \text{ V}; V_{DS} = 15 \text{ V}$	-	66	-	nC

 $T_j = 25 \text{ }^\circ\text{C}$ **Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values** $V_{DS} > I_D \times R_{DSon}$ **Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values** $T_j = 25 \text{ }^\circ\text{C}; V_{DS} = 25 \text{ V}$ **Fig 7. Forward transconductance as a function of drain current; typical values** $T_j = 25 \text{ }^\circ\text{C}; I_D = 15 \text{ A}$ **Fig 8. Drain source on-state resistance as a function of gate-source voltage; typical values**



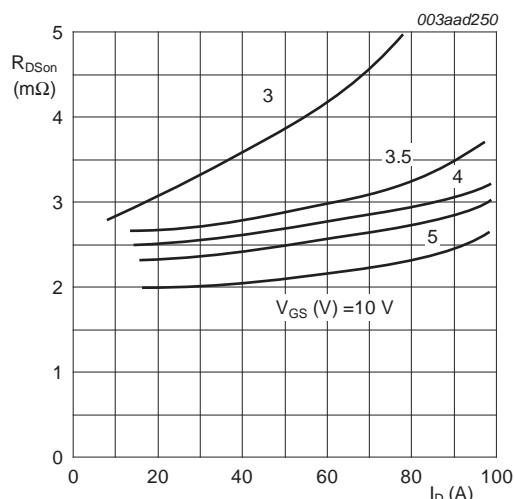
$T_j = 25^\circ\text{C}; V_{DS} = 5\text{V}$

Fig 9. Sub-threshold drain current as a function of gate-source voltage



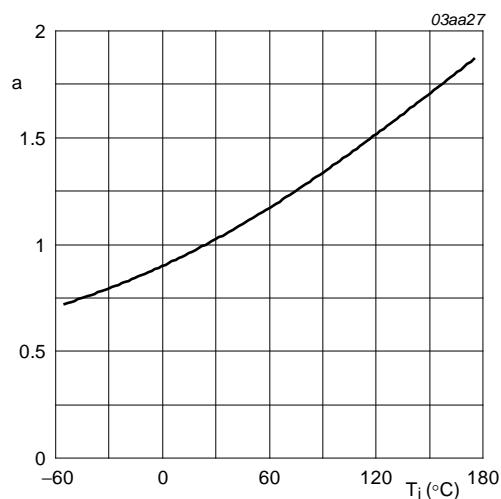
$I_D = 1\text{mA}; V_{DS} = V_{GS}$

Fig 10. Gate-source threshold voltage as a function of junction temperature



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

Fig 11. 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 12. Normalized drain-source on-state resistance factor as a function of junction temperature

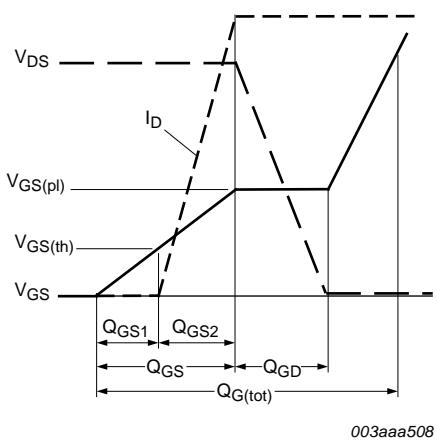


Fig 13. Gate charge waveform definitions

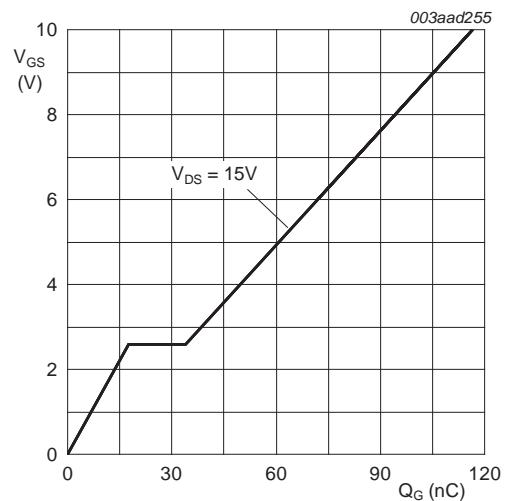

 $T_j = 25^\circ\text{C}; I_D = 25\text{A}$

Fig 14. Gate-source voltage as a function of gate charge; typical values

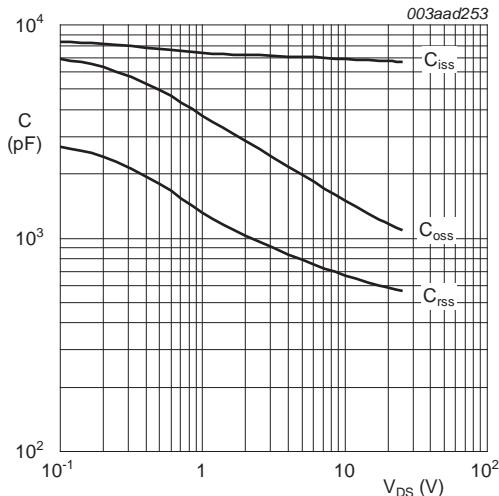

 $V_{GS} = 0\text{ V}; f = 1\text{ MHz}$

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

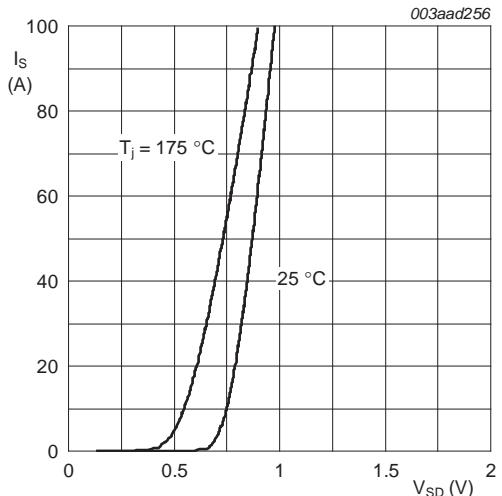

 $V_{GS} = 0\text{ V}$

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

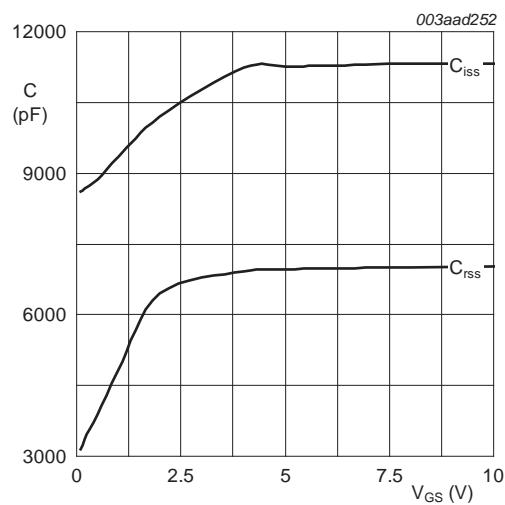
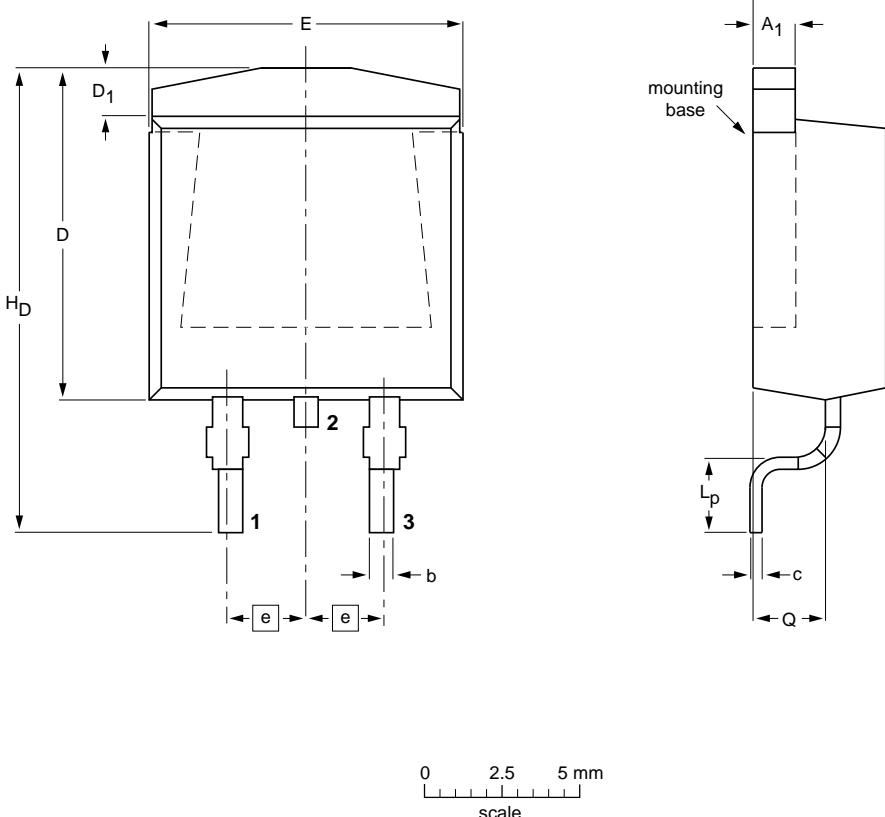
 $V_{DS} = 0 \text{ V}; f = 1 \text{ MHz}$

Fig 17. Input and reverse transfer capacitances as a function of gate-source 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 ₁	b	c	D _{max.}	D ₁	E	e	L _p	H _D	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
PSMN2R0-30BL v.1	20120320	Product data sheet	-	-

10. Legal information

10.1 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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12. Contents

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