



PSMN3R4-30BL

N-channel 30 V 3.3 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
- Load switching
- Motor control
- Server power supplies

1.4 Quick reference data

Table 1. Quick reference data

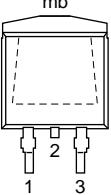
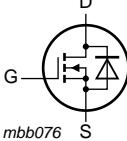
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25 \text{ }^\circ\text{C}; T_j \leq 175 \text{ }^\circ\text{C}$	-	-	30	V
I_D	drain current	$T_{mb} = 25 \text{ }^\circ\text{C}; V_{GS} = 10 \text{ V};$ see Figure 1	[1]	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25 \text{ }^\circ\text{C};$ see Figure 2	-	-	114	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 13	-	3.91	4.6	$\text{m}\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 13	-	2.79	3.3	$\text{m}\Omega$
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A}; V_{DS} = 15 \text{ V};$	-	8	-	nC
$Q_{G(tot)}$	total gate charge	see Figure 14 ; see Figure 15	-	31	-	nC
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10 \text{ V}; T_{j(\text{init})} = 25 \text{ }^\circ\text{C};$ $I_D = 100 \text{ A}; V_{sup} \leq 30 \text{ V}; R_{GS} = 50 \Omega;$ unclamped	-	-	200	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	Description	Version
PSMN3R4-30BL	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	
		SOT404	

4. Marking

Table 4. Marking codes

Type number	Marking code
PSMN3R4-30BL	PSMN3R4-30BL

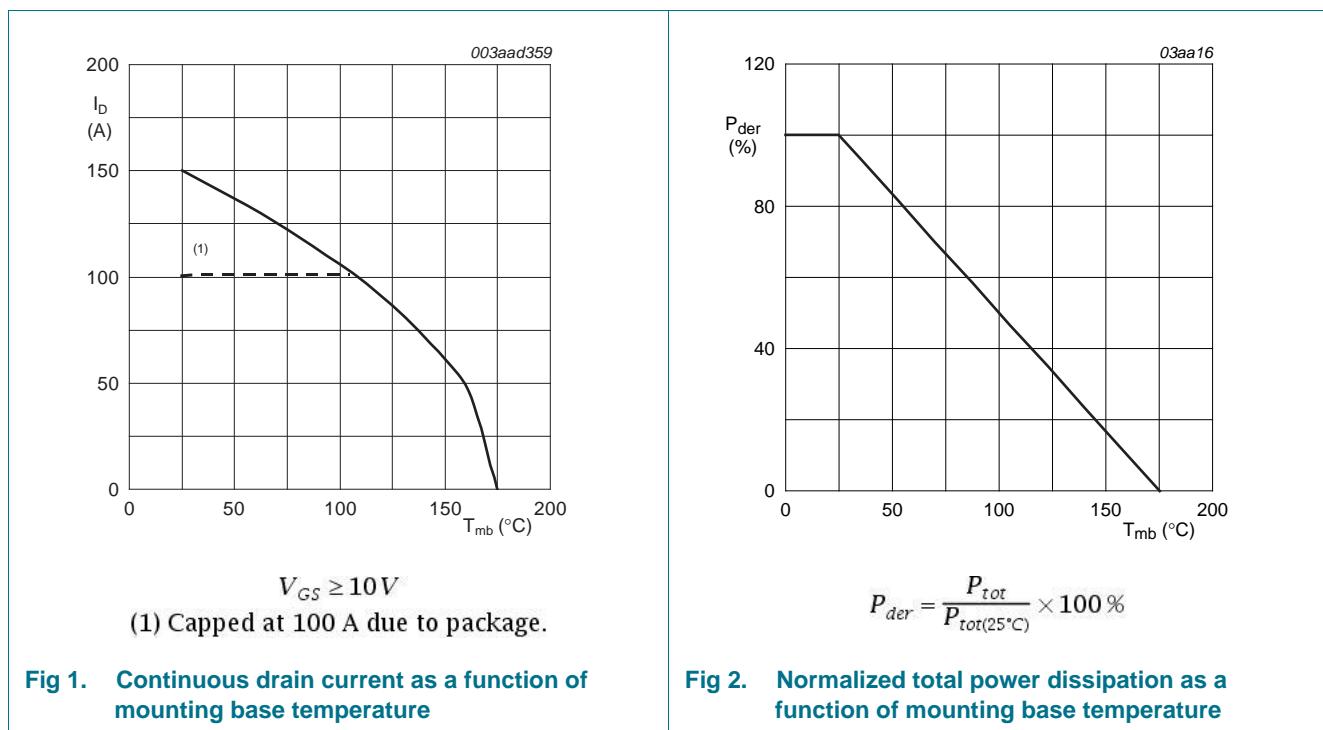
5. Limiting values

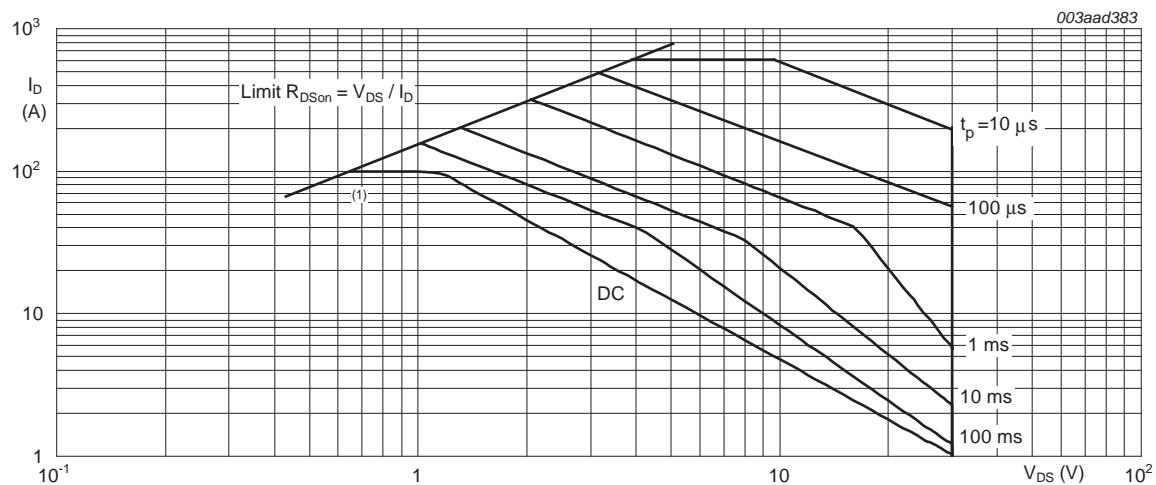
Table 5. Limiting values

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	-	609	A	
P_{tot}	total power dissipation	$T_{mb} = 25^\circ\text{C}$; see Figure 2	-	114	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; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25^\circ\text{C}$	-	609	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	-	200	mJ	

[1] Continuous current is limited by package.





$T_{mb} = 25 \text{ }^{\circ}\text{C}$; I_{DM} is a single pulse; 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	-	0.65	1	K/W
$R_{th(j\text{-a})}$	thermal resistance from junction to ambient	Minimum foot print; mounted on a printed circuit board	-	50	-	K/W

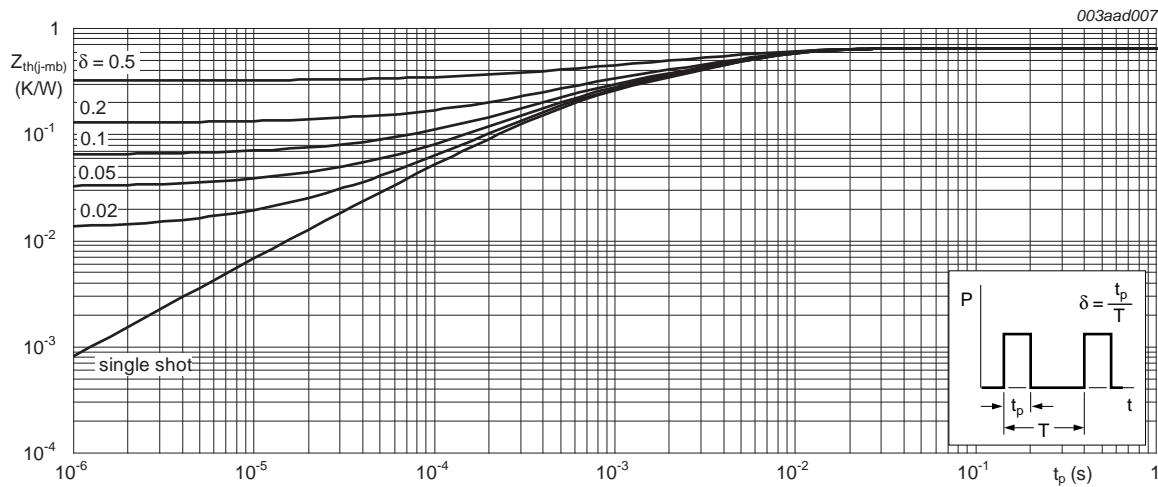


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics

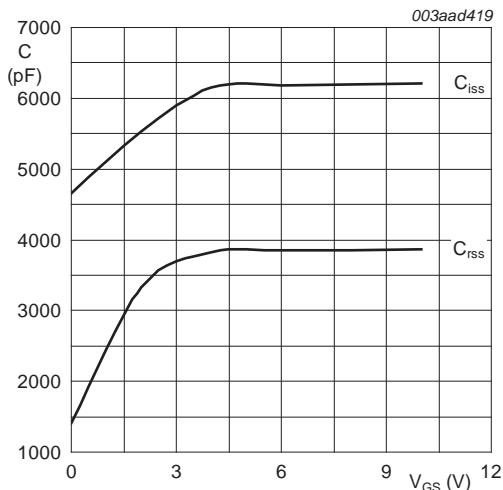
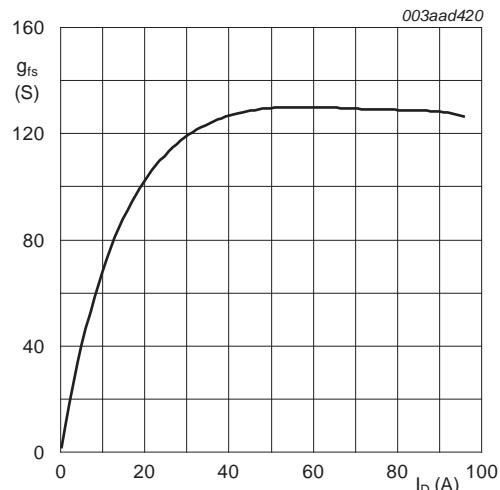
Tested to JEDEC standards where applicable.

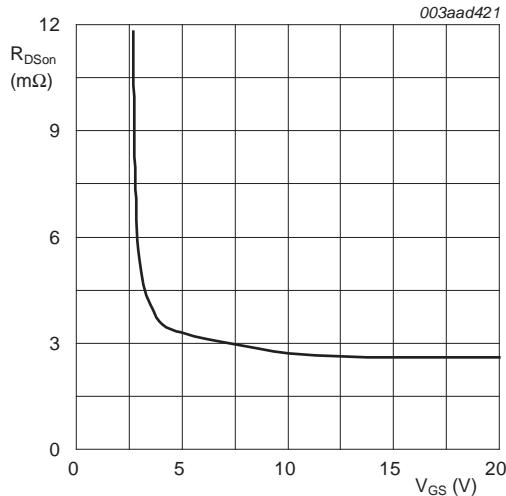
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25^\circ C$	30	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55^\circ C$	27	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25^\circ C;$ see Figure 10 ; see Figure 11	1.3	1.7	2.15	V
		$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175^\circ C;$ see Figure 11	0.5	-	-	V
		$I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55^\circ C;$ see Figure 11	-	-	2.45	V
I_{DSS}	drain leakage current	$V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25^\circ C$	-	0.3	5	μA
		$V_{DS} = 30 V; V_{GS} = 0 V; T_j = 125^\circ C$	-	-	100	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_{DSon}	drain-source on-state resistance	$V_{GS} = 10 V; I_D = 25 A; T_j = 175^\circ C;$ see Figure 12 ; see Figure 13	-	5.3	6.2	$m\Omega$
		$V_{GS} = 4.5 V; I_D = 25 A; T_j = 25^\circ C;$ see Figure 13	-	3.27	3.8	$m\Omega$
		$V_{GS} = 10 V; I_D = 25 A; T_j = 100^\circ C;$ see Figure 12 ; see Figure 13	-	3.91	4.6	$m\Omega$
		$V_{GS} = 10 V; I_D = 25 A; T_j = 25^\circ C;$ see Figure 13	-	2.79	3.3	$m\Omega$
R_G	gate resistance	$f = 1 MHz$	-	1	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 25 A; V_{DS} = 15 V; V_{GS} = 10 V;$ see Figure 14 ; see Figure 15	-	64	-	nC
		$I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V$	-	58	-	nC
Q_{GS}	gate-source charge	$I_D = 25 A; V_{DS} = 15 V; V_{GS} = 4.5 V;$ see Figure 14 ; see Figure 15	-	31	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	12	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	6.2	-	nC
Q_{GD}	gate-drain charge		-	5.8	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25 A; V_{DS} = 15 V;$ see Figure 14 ; see Figure 15	-	2.8	-	V
C_{iss}	input capacitance	$V_{DS} = 15 V; V_{GS} = 0 V; f = 1 MHz;$	-	3907	-	pF
C_{oss}	output capacitance	$T_j = 25^\circ C;$ see Figure 16	-	822	-	pF
C_{rss}	reverse transfer capacitance		-	356	-	pF

Table 7. Characteristics ...continued

Tested to JEDEC standards where applicable.

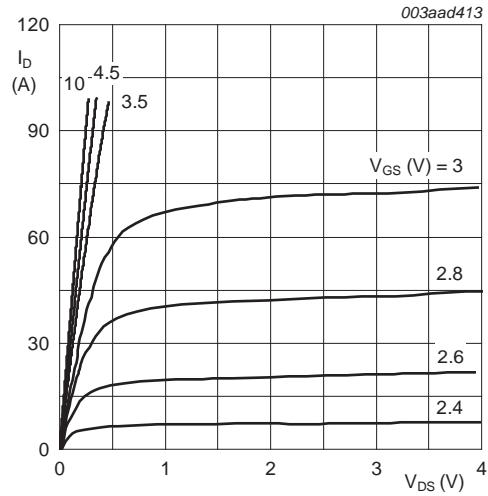
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{d(on)}$	turn-on delay time	$V_{DS} = 15 \text{ V}$; $R_L = 0.5 \Omega$; $V_{GS} = 4.5 \text{ V}$;	-	40	-	ns
t_r	rise time	$R_{G(ext)} = 4.7 \Omega$	-	73	-	ns
$t_{d(off)}$	turn-off delay time		-	59	-	ns
t_f	fall time		-	28	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 17	-	0.7	1.2	V
t_{rr}	reverse recovery time	$I_S = 25 \text{ A}$; $dI_S/dt = -100 \text{ A}/\mu\text{s}$;	-	36	-	ns
Q_r	recovered charge	$V_{GS} = 0 \text{ V}$; $V_{DS} = 15 \text{ V}$	-	28	-	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** $T_j = 25 \text{ }^\circ\text{C}; V_{DS} = 15 \text{ V}$ **Fig 6. Forward transconductance as a function of drain current; typical values**



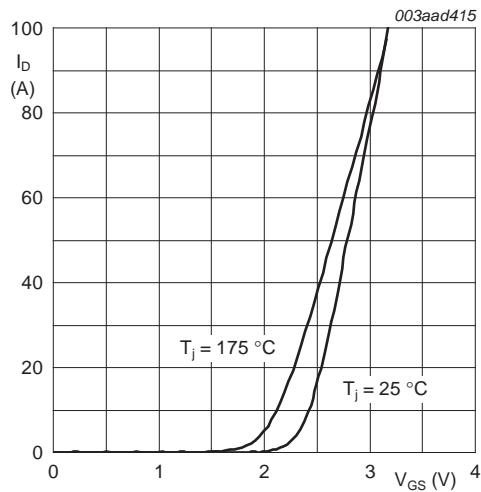
$T_j = 25^\circ C; I_D = 25A$

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



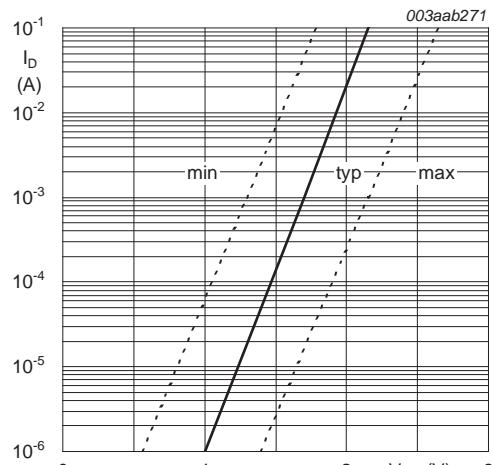
$T_j = 25^\circ C$

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



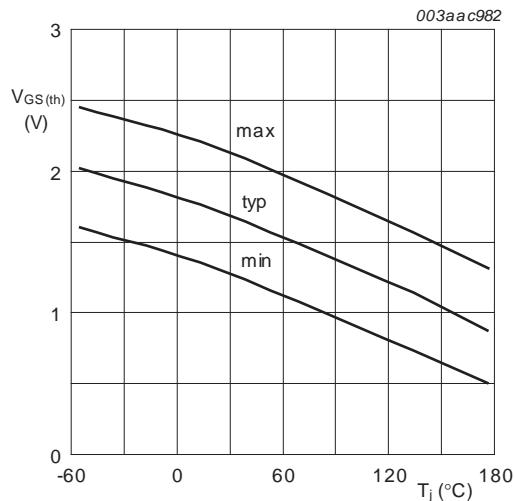
$V_{DS} > I_D \times R_{DS(on)}$

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



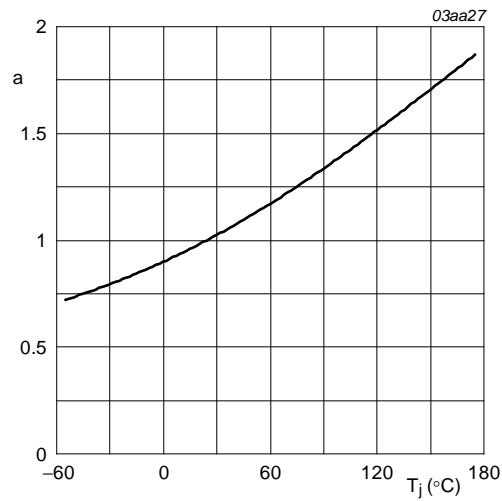
$T_j = 25^\circ C; V_{DS} = 5V$

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



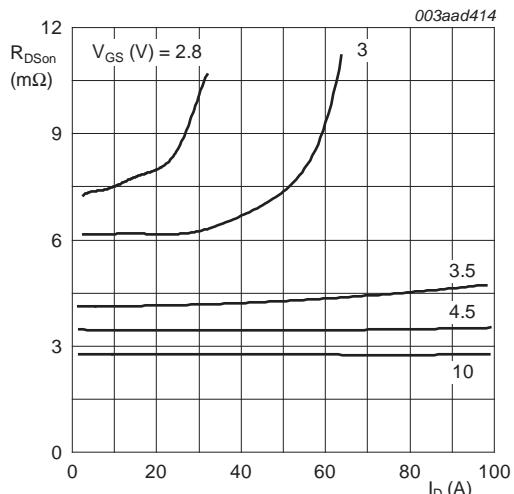
$$I_D = 1\text{mA}; V_{DS} = V_{GS}$$

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



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

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



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

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

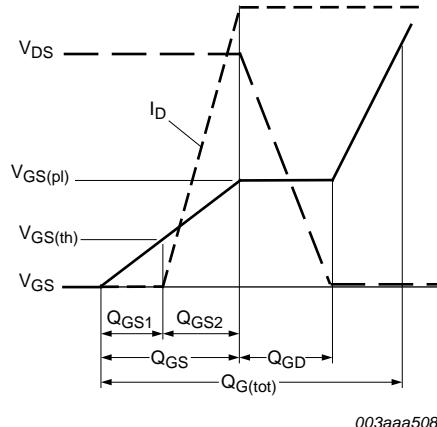
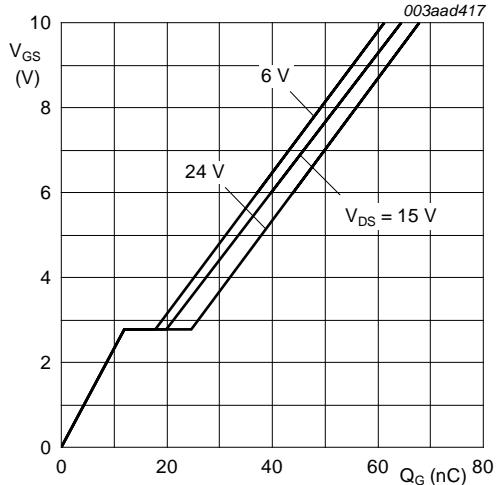
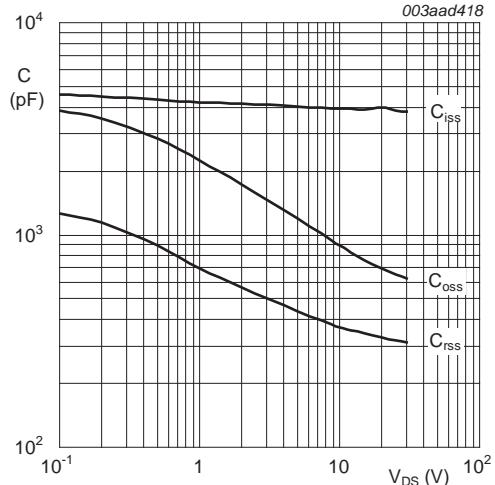


Fig 14. Gate charge waveform definitions



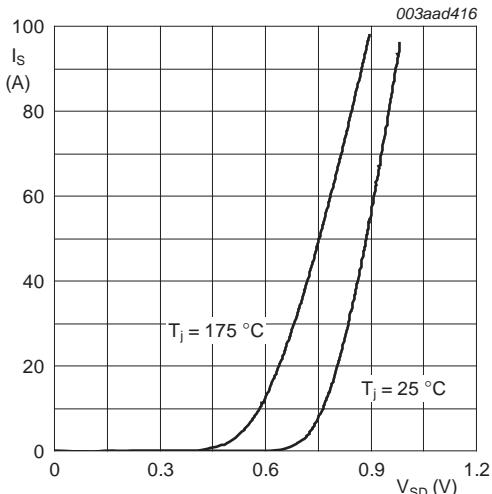
$T_j = 25^\circ\text{C}; I_D = 25\text{ A}$

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



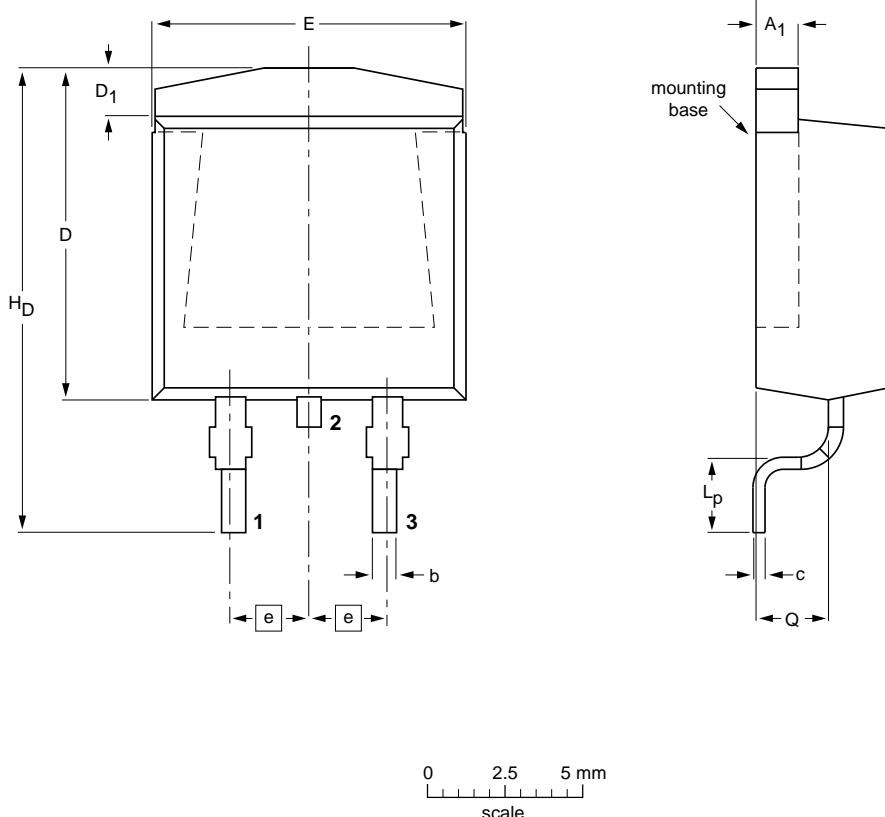
$V_{GS} = 0\text{ V}$

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 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
PSMN3R4-30BL v.1	20120322	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.

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12. 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	Marking	2
5	Limiting values	3
6	Thermal characteristics	5
7	Characteristics	6
8	Package outline	11
9	Revision history	12
10	Legal information	13
10.1	Data sheet status	13
10.2	Definitions	13
10.3	Disclaimers	13
10.4	Trademarks	14
11	Contact information	14

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