



PSMN2R0-60BS

N-channel 60 V 2.0 m Ω standard level MOSFET in D2PAK

Rev. 01 — 17 January 2011

Objective data sheet

1. Product profile

1.1 General description

Standard level N-channel MOSFET in a 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
- 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	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	60	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1	-	-	120	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	306	W
T_j	junction temperature		-55	-	175	°C

Static characteristics

R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; see Figure 12	-	1.7	2	m Ω
		$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 100\text{ °C}$; see Figure 13 ; see Figure 12	-	2.7	3.2	m Ω



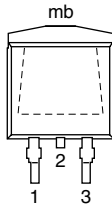
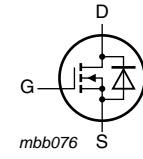
Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}; I_D = 75\text{ A};$	-	31.6	-	nC
$Q_{G(\text{tot})}$	total gate charge	$V_{DS} = 30\text{ V};$ see Figure 14 ; see Figure 15	-	137	-	nC
Avalanche ruggedness						
$E_{DS(\text{AL})S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25\text{ °C};$ $I_D = 120\text{ A}; V_{\text{sup}} \leq 60\text{ V};$ $R_{GS} = 50\text{ }\Omega; \text{Unclamped}$	-	-	913	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		
3	S	source		
mb	D	mounting base; connected to drain		

SOT404 (D2PAK)

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PSMN2R0-60BS	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

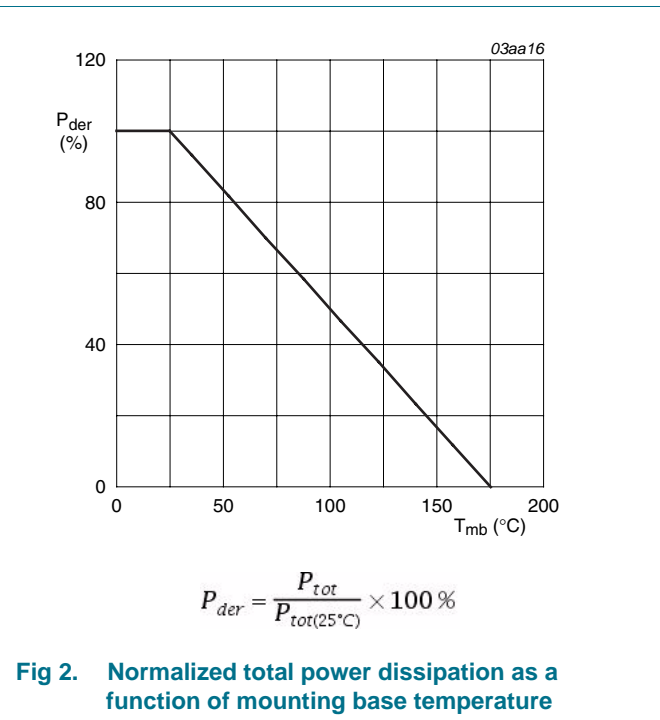
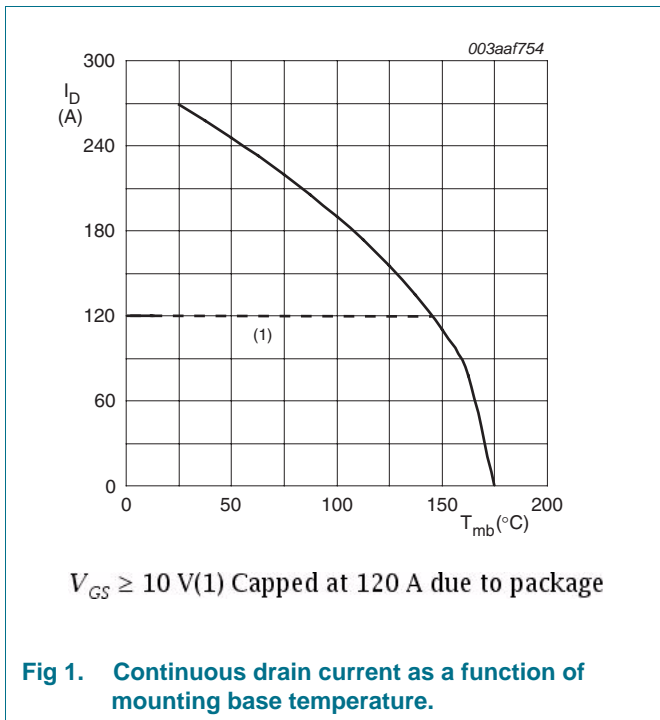
4. Limiting values

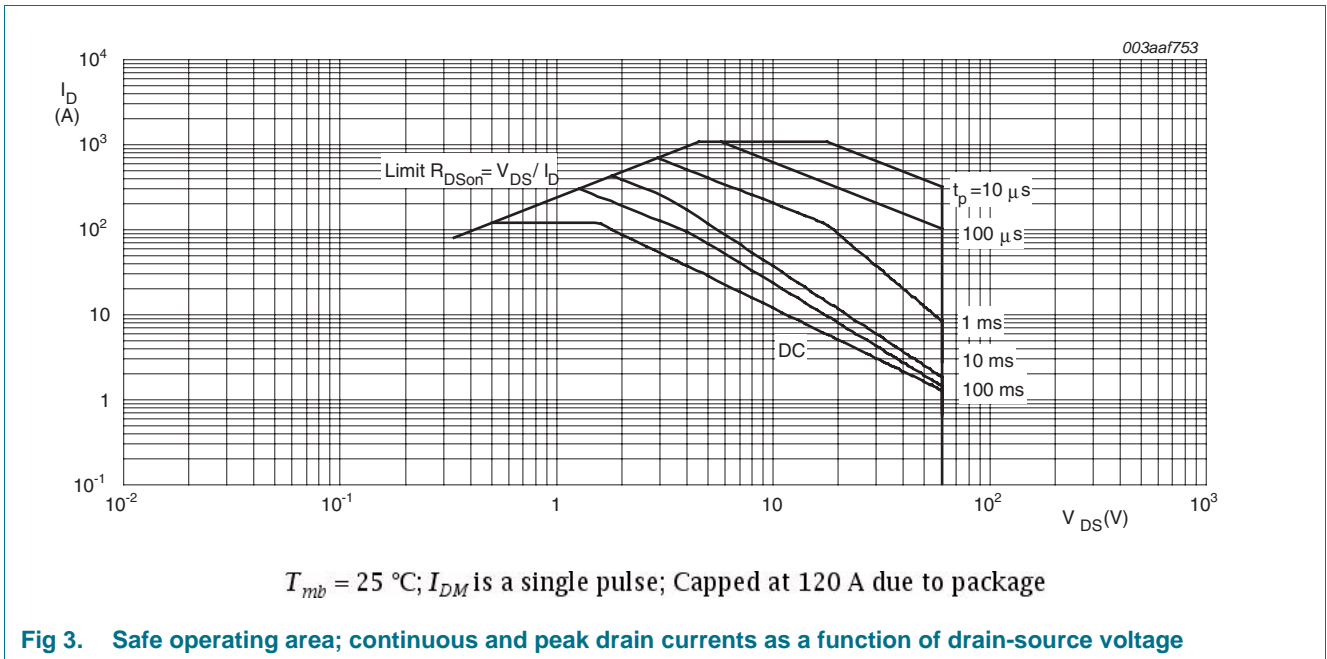
Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit	
V _{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C	-	60	V	
V _{DGR}	drain-gate voltage	T _j ≥ 25 °C; T _j ≤ 175 °C; R _{GS} = 20 kΩ	-	60	V	
V _{GS}	gate-source voltage		-20	20	V	
I _D	drain current	V _{GS} = 10 V; T _{mb} = 100 °C; see Figure 1	-	120	A	
		V _{GS} = 10 V; T _{mb} = 25 °C; see Figure 1 [1]	-	120	A	
I _{DM}	peak drain current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C; see Figure 3	-	1076	A	
P _{tot}	total power dissipation	T _{mb} = 25 °C; see Figure 2	-	306	W	
T _{stg}	storage temperature		-55	175	°C	
T _j	junction temperature		-55	175	°C	
T _{slid(M)}	peak soldering temperature		-	260	°C	
Source-drain diode						
I _S	source current	T _{mb} = 25 °C	[1]	-	120	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C	-	1076	A	
Avalanche ruggedness						
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	V _{GS} = 10 V; T _{j(init)} = 25 °C; I _D = 120 A; V _{sup} ≤ 60 V; R _{GS} = 50 Ω; Unclamped	-	913	mJ	

[1] Continuous current is limited by package.





5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	0.22	0.49	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Vertical in free air	-	60	-	K/W

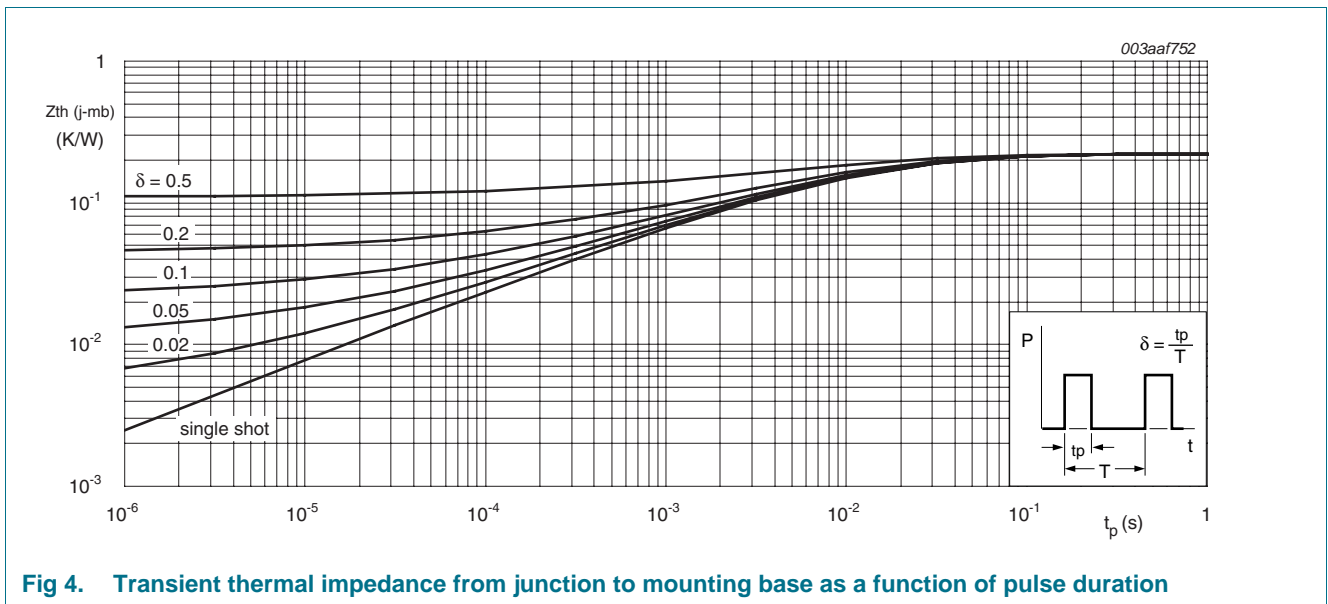


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	54	-	-	V
		$I_D = 250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	60	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 10 ; see Figure 11	2	3	4	V
V_{GSth}	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C}$; see Figure 11	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C}$; see Figure 11	-	-	4.6	V
I_{DSS}	drain leakage current	$V_{DS} = 60 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.03	1	μA
		$V_{DS} = 60 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	μA
I_{GSS}	gate leakage current	$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 12	-	1.7	2	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ\text{C}$; see Figure 13 ; see Figure 12	-	3.6	4.2	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 100 \text{ }^\circ\text{C}$; see Figure 13 ; see Figure 12	-	2.7	3.2	mΩ
R_G	gate resistance	$f = 1 \text{ MHz}$	-	0.9	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 75 \text{ A}; V_{DS} = 30 \text{ V}; V_{GS} = 10 \text{ V}$; see Figure 14 ; see Figure 15	-	137	-	nC
		$I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}$; see Figure 14 ; see Figure 15	-	129	-	nC
Q_{GS}	gate-source charge	$I_D = 75 \text{ A}; V_{DS} = 30 \text{ V}; V_{GS} = 10 \text{ V}$	-	48	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge	$I_D = 75 \text{ A}; V_{DS} = 30 \text{ V}; V_{GS} = 10 \text{ V}$; see Figure 14 ; see Figure 15	-	29.3	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	18.8	-	nC
Q_{GD}	gate-drain charge		-	31.6	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$V_{DS} = 30 \text{ V}$; see Figure 14 ; see Figure 15	-	5.7	-	V
C_{iss}	input capacitance	$V_{DS} = 30 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 16	-	9997	-	pF
C_{oss}	output capacitance		-	1210	-	pF
C_{rss}	reverse transfer capacitance		-	594	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 0.4 \text{ } \Omega; V_{GS} = 10 \text{ V}$; $R_{G(ext)} = 4.7 \text{ } \Omega; I_D = 75 \text{ A}$	-	42	-	ns
t_r	rise time	$V_{DS} = 30 \text{ V}; R_L = 0.4 \text{ } \Omega; V_{GS} = 10 \text{ V}$; $R_{G(ext)} = 4.7 \text{ } \Omega$	-	56	-	ns
$t_{d(off)}$	turn-off delay time		-	115	-	ns
t_f	fall time		-	48.5	-	ns

Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ °C}$; see Figure 17	-	0.8	1.2	V
t_{rr}	reverse recovery time	$I_S = 25\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 30\text{ V}$	-	57.2	-	ns
Q_r	recovered charge	$I_S = 25\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 30\text{ V}$	-	80	-	nC

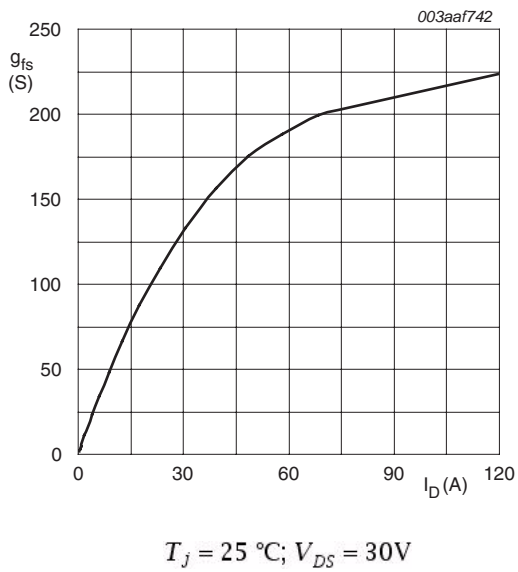


Fig 5. Forward transconductance as a function of drain current; typical values

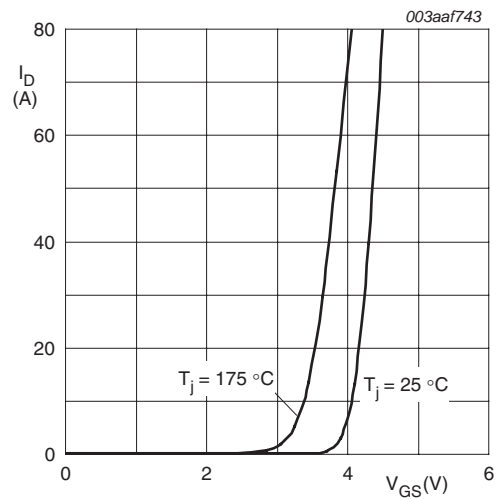
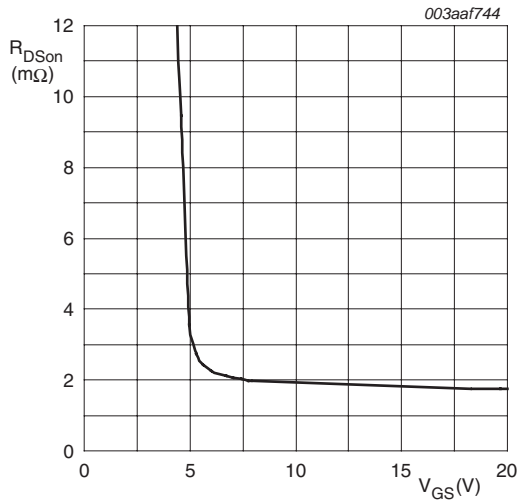
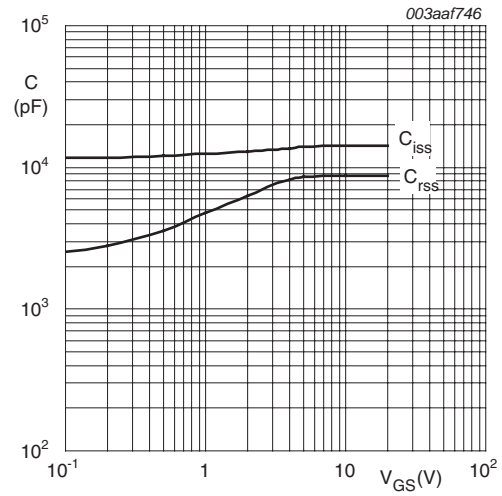


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values



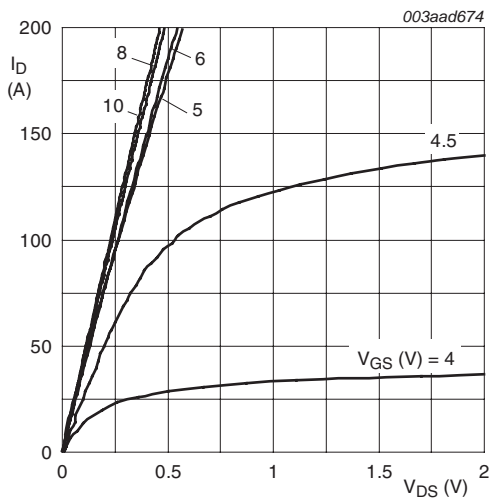
$T_j = 25\text{ °C}; I_D = 25\text{ A}$

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



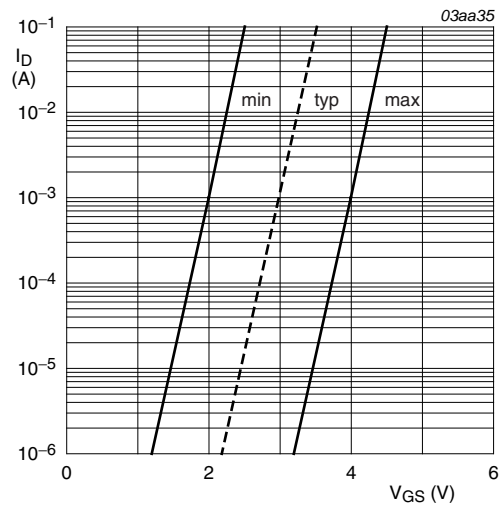
$V_{DS} = 0\text{ V}; f = 1\text{ MHz}$

Fig 8. Input and reverse transfer capacitances as a function of gate-source voltage, typical values



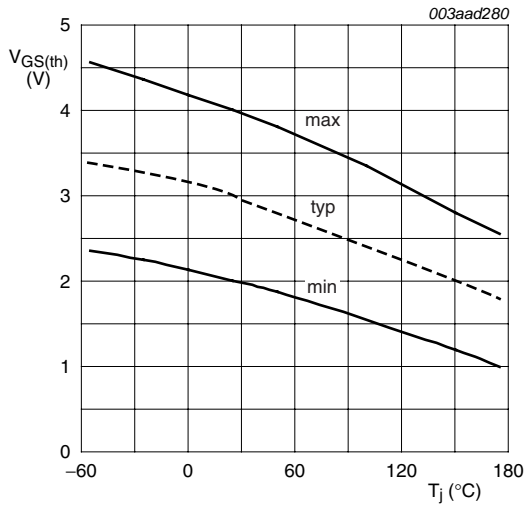
$T_j = 25\text{ °C}; t_p = 300\text{ }\mu\text{s}$

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



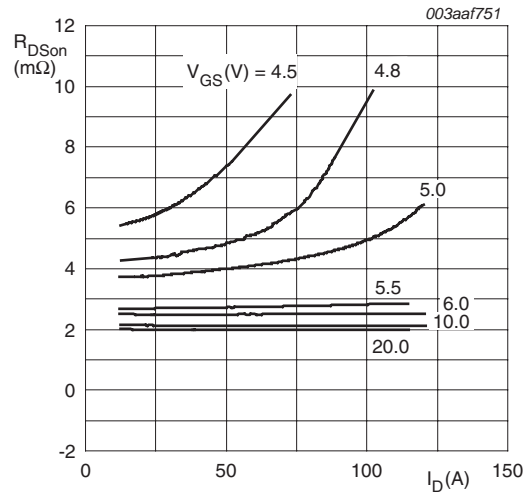
$T_j = 25\text{ °C}; V_{DS} = 5\text{ V}$

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



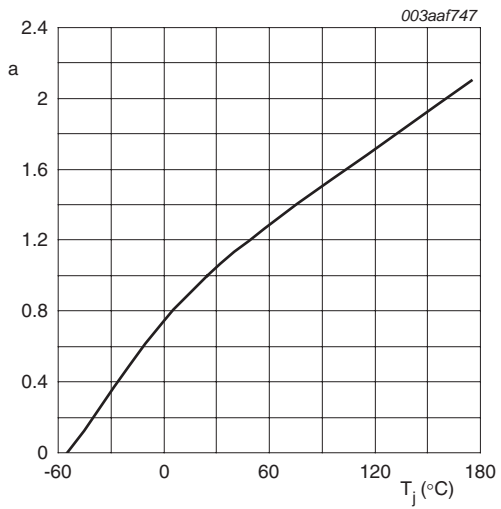
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



$T_j = 25 \text{ °C}$

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



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

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

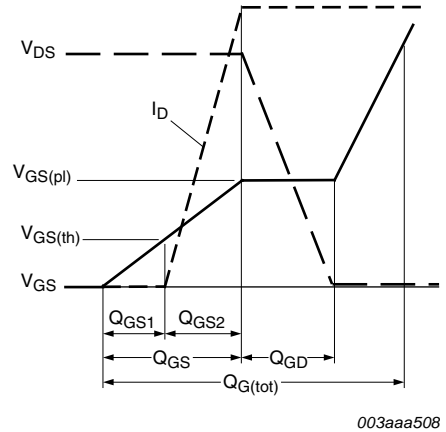
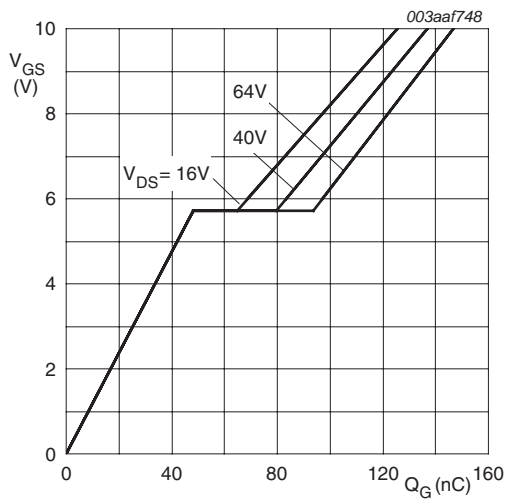
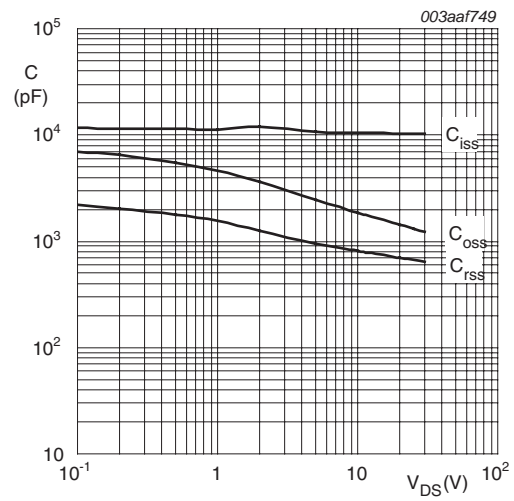


Fig 14. Gate charge waveform definitions



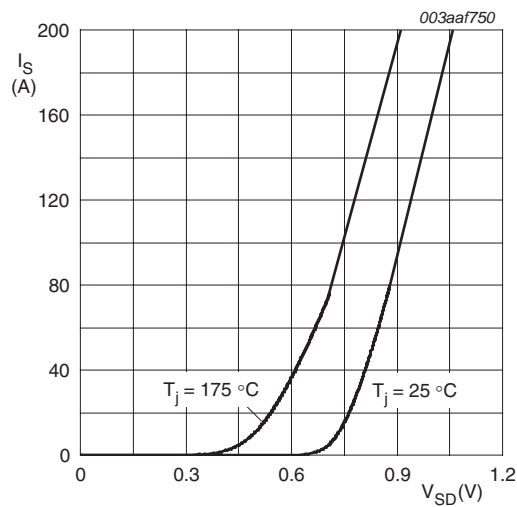
$T_j = 25\text{ °C}; I_D = 80\text{ A}$

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

7. Package outline

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

SOT404

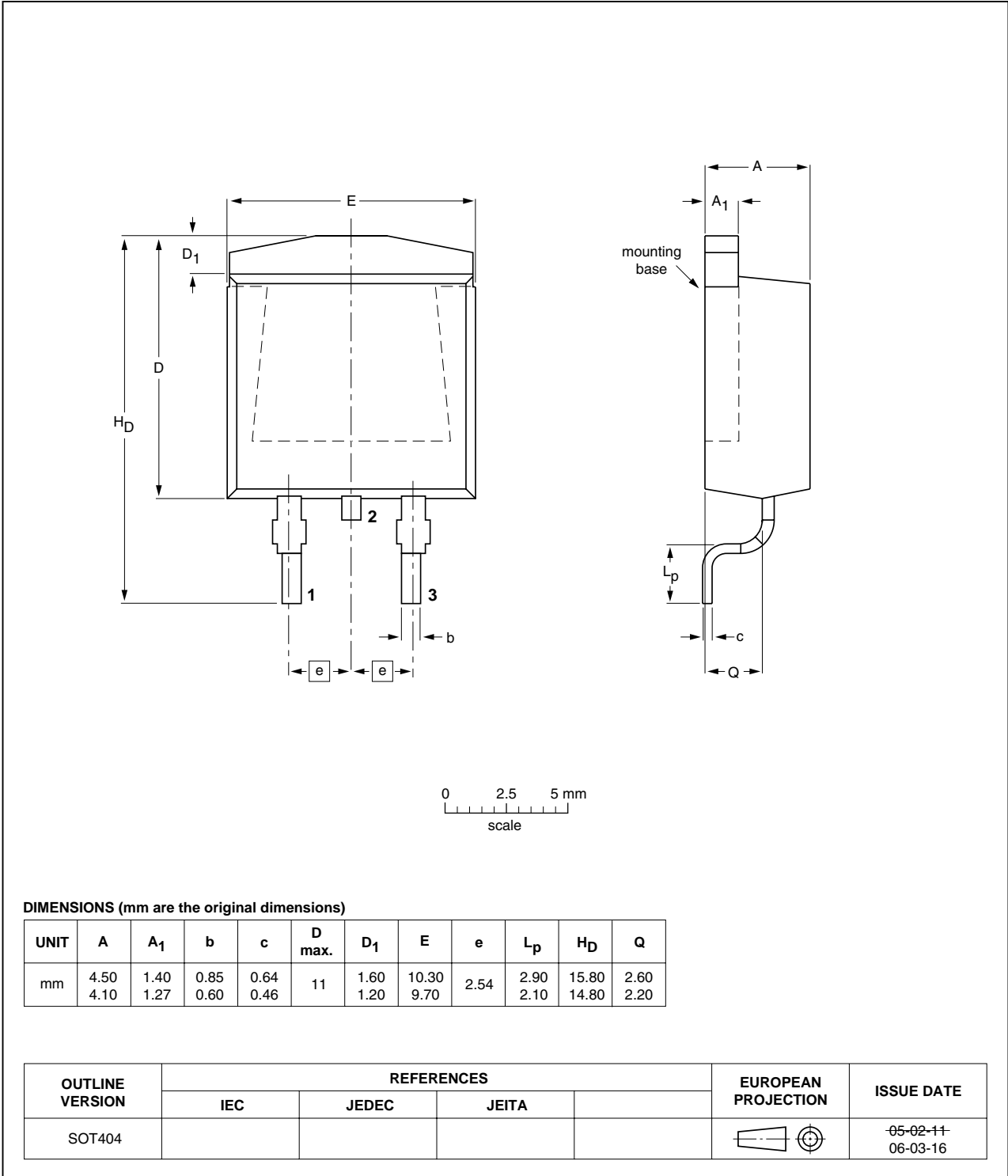


Fig 18. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN2R0-60BS v.1	20110117	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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