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PSMN1R5-30BLE

N-channel 30 V 1.5 mΩ logic level MOSFET in D2PAK

12 October 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

- Enhanced forward biased safe operating area for superior linear mode operation
- Very low $R_{DS(on)}$ for low conduction losses

1.3 Applications

- Electronic fuse
- Hot swap
- Load switch
- Soft start

1.4 Quick reference data

Table 1. Quick reference data

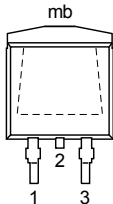
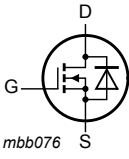
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{DS}	drain-source voltage	T _J ≥ 25 °C; T _J ≤ 175 °C		-	-	30	V
I _D	drain current	T _{mb} = 25 °C; V _{GS} = 10 V; Fig. 1	[1]	-	-	120	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 2		-	-	401	W
Static characteristics							
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _J = 25 °C; Fig. 12		-	1.3	1.5	mΩ
		V _{GS} = 4.5 V; I _D = 25 A; T _J = 25 °C; Fig. 12		-	1.7	1.85	mΩ
Dynamic characteristics							
Q _{GD}	gate-drain charge	V _{GS} = 4.5 V; I _D = 25 A; V _{DS} = 15 V; Fig. 14 ; Fig. 15		-	33.2	-	nC
Q _{G(tot)}	total gate charge	V _{GS} = 10 V; I _D = 25 A; V _{DS} = 15 V; Fig. 14 ; Fig. 15		-	228	-	nC

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; $I_D = 120\text{ A}$; $V_{sup} \leq 30\text{ V}$; unclamped; $R_{GS} = 50\text{ }\Omega$; Fig. 3	-	-	1990	mJ

[1] Capped at 120A due to package

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>D2PAK (SOT404)</p>	
2	D	drain[1]		
3	S	source		
mb	D	mounting base; connected to drain		

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

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN1R5-30BLE	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Marking

Table 4. Marking codes

Type number	Marking code
PSMN1R5-30BLE	PSMN1R5-30BLE

5. Limiting values

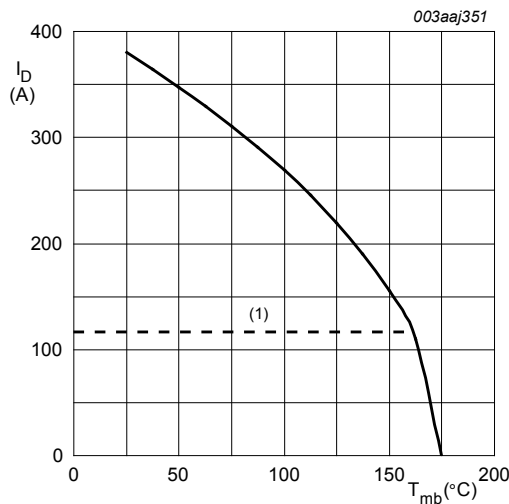
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	30	V
V_{DGR}	drain-gate voltage	$T_j \leq 175\text{ °C}$; $T_j \geq 25\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	30	V

Symbol	Parameter	Conditions		Min	Max	Unit
V_{GS}	gate-source voltage			-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 100\text{ }^{\circ}\text{C}; \text{Fig. 1}$	[1]	-	120	A
		$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ }^{\circ}\text{C}; \text{Fig. 1}$	[1]	-	120	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25\text{ }^{\circ}\text{C}; \text{Fig. 4}$		-	1521	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}; \text{Fig. 2}$		-	401	W
T_{stg}	storage temperature			-55	175	$^{\circ}\text{C}$
T_j	junction temperature			-55	175	$^{\circ}\text{C}$
$T_{sld(M)}$	peak soldering temperature			-	260	$^{\circ}\text{C}$
Source-drain diode						
I_S	source current	$T_{mb} = 25\text{ }^{\circ}\text{C}$	[1]	-	120	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25\text{ }^{\circ}\text{C}$		-	1521	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}; I_D = 120\text{ A}; V_{sup} \leq 30\text{ V}; \text{unclamped}; R_{GS} = 50\text{ }\Omega; \text{Fig. 3}$		-	1990	mJ

[1] Capped at 120A due to package



(1) Capped at 120A due to package

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

$$V_{GS} \geq 10\text{ V}$$

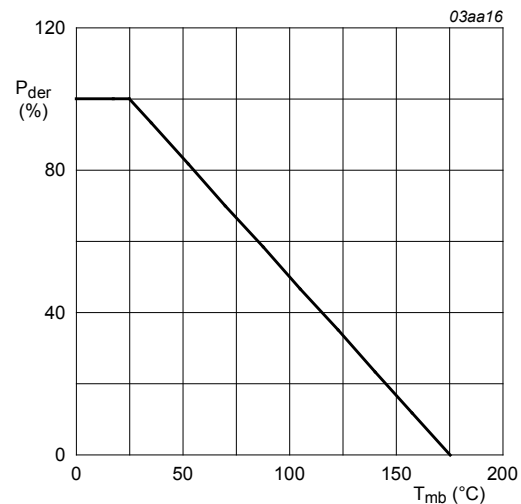


Fig. 2. Normalized total power dissipation as a function of mounting base temperature

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

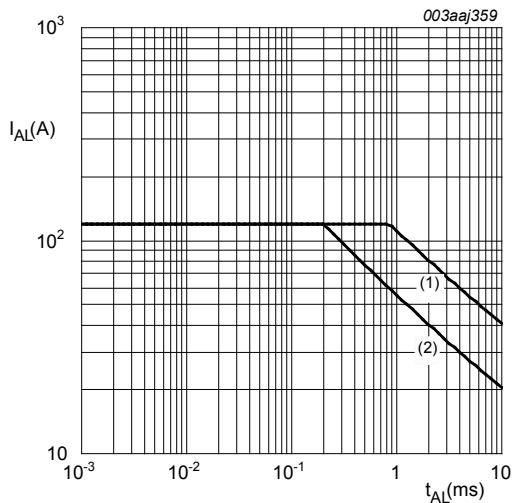


Fig. 3. Single pulse avalanche rating; avalanche current as a function of avalanche time

(1) $T_{j(jnt)} = 25^{\circ}C$; (2) $T_{j(jnt)} = 100^{\circ}C$

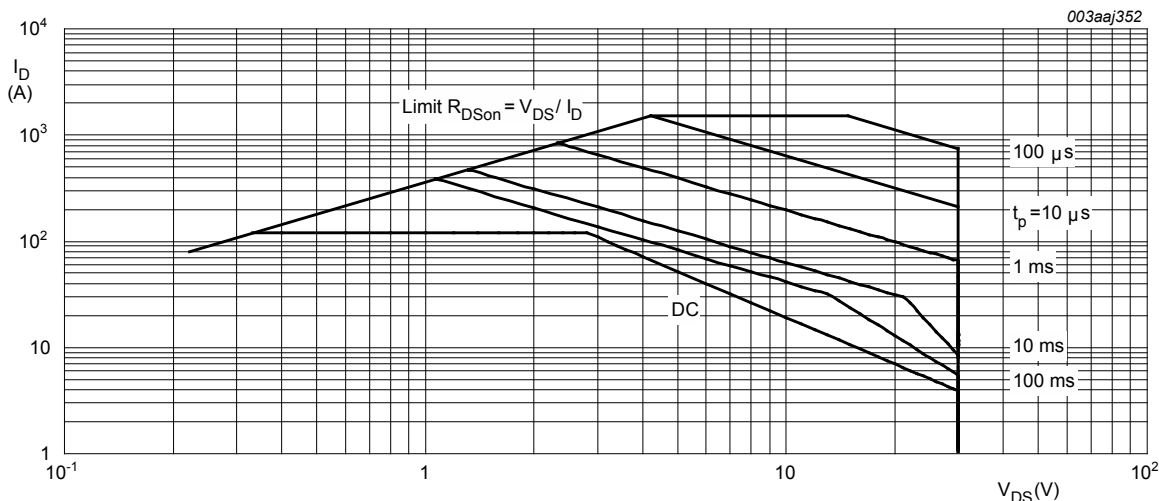


Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25^{\circ}C$; I_{DM} is a single pulse

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	Fig. 5	-	0.3	0.37	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	minimum footprint; FR4 board	-	50	-	K/W

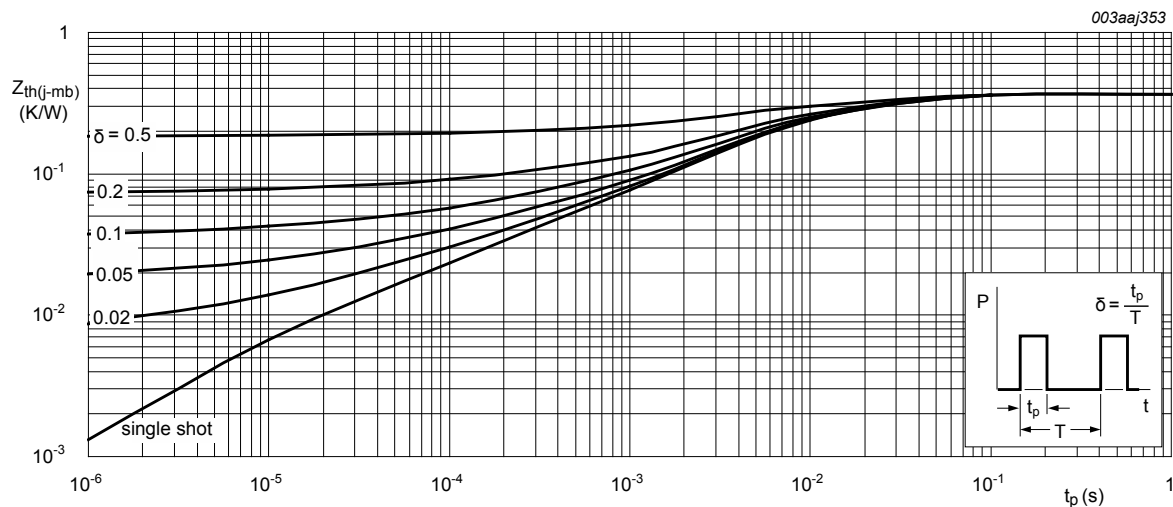


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_J = -55 ^\circ C$	27	-	-	V
		$I_D = 250 \mu A$; $V_{GS} = 0 V$; $T_J = 25 ^\circ C$	30	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_J = 175 ^\circ C$; Fig. 10	0.5	-	-	V
		$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_J = 25 ^\circ C$; Fig. 11 ; Fig. 10	1.3	1.7	2.15	V
		$I_D = 1 mA$; $V_{DS} = V_{GS}$; $T_J = -55 ^\circ C$; Fig. 10	-	-	2.45	V
I_{DSS}	drain leakage current	$V_{DS} = 30 V$; $V_{GS} = 0 V$; $T_J = 25 ^\circ C$	-	0.5	10	μA
		$V_{DS} = 30 V$; $V_{GS} = 0 V$; $T_J = 100 ^\circ C$	-	-	200	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	$V_{GS} = 10 V$; $I_D = 25 A$; $T_J = 25 ^\circ C$; Fig. 12	-	1.3	1.5	mΩ
		$V_{GS} = 10 V$; $I_D = 25 A$; $T_J = 100 ^\circ C$; Fig. 12 ; Fig. 13	-	-	2.1	mΩ
		$V_{GS} = 4.5 V$; $I_D = 25 A$; $T_J = 25 ^\circ C$; Fig. 12	-	1.7	1.85	mΩ
		$V_{GS} = 10 V$; $I_D = 25 A$; $T_J = 175 ^\circ C$; Fig. 12 ; Fig. 13	-	-	2.9	mΩ

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R _G	internal gate resistance (AC)	f = 1 MHz		0.5	1.1	2.2	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 25 A; V _{DS} = 15 V; V _{GS} = 10 V; Fig. 14 ; Fig. 15		-	228	-	nC
		I _D = 25 A; V _{DS} = 15 V; V _{GS} = 4.5 V; Fig. 14 ; Fig. 15		-	108	-	nC
		I _D = 0 A; V _{DS} = 0 V; V _{GS} = 10 V		-	210	-	nC
Q _{GS}	gate-source charge	I _D = 25 A; V _{DS} = 15 V; V _{GS} = 4.5 V; Fig. 14 ; Fig. 15		-	31.8	-	nC
Q _{GS(th)}	pre-threshold gate-source charge			-	21.5	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge			-	10.3	-	nC
Q _{GD}	gate-drain charge			-	33.2	-	nC
V _{GS(pl)}	gate-source plateau voltage	I _D = 25 A; V _{DS} = 15 V; Fig. 14 ; Fig. 15		-	2.5	-	V
C _{iss}	input capacitance	V _{DS} = 15 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 16		-	14934	-	pF
C _{oss}	output capacitance			-	2741	-	pF
C _{rss}	reverse transfer capacitance			-	1168	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 15 V; R _L = 0.6 Ω; V _{GS} = 4.5 V; R _{G(ext)} = 4.7 Ω; T _j = 25 °C		-	100.6	-	ns
t _r	rise time			-	156.1	-	ns
t _{d(off)}	turn-off delay time			-	191.8	-	ns
t _f	fall time			-	99.2	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C; Fig. 17		-	0.78	1.2	V
t _{rr}	reverse recovery time	I _S = 25 A; dI _S /dt = 100 A/μs; V _{GS} = 0 V; V _{DS} = 15 V		-	62.5	-	ns
Q _r	recovered charge			-	96.8	-	nC

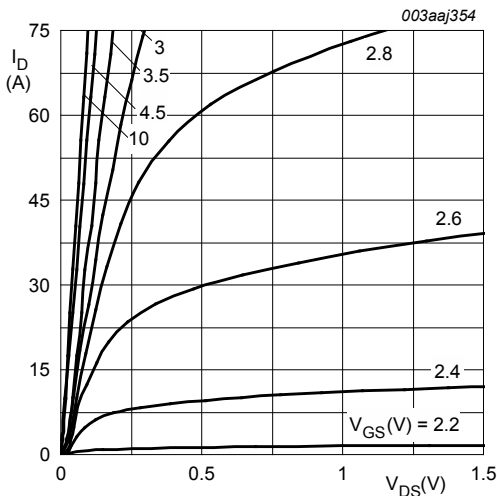


Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values

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

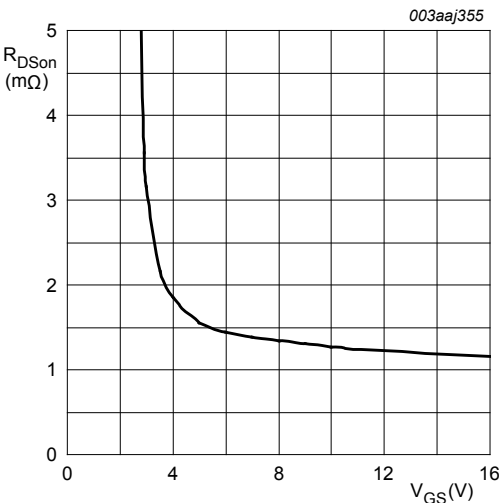


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

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

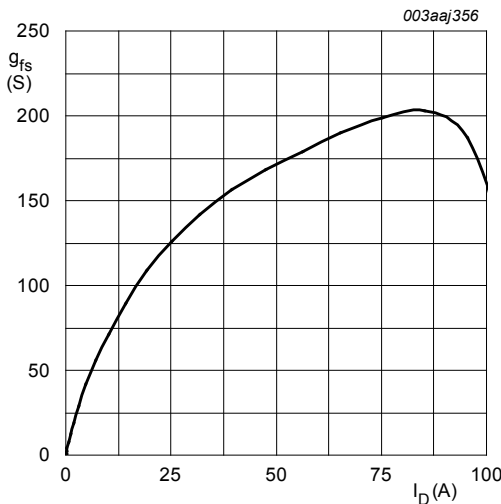


Fig. 8. Forward transconductance as a function of drain current; typical values

$T_j = 25^{\circ}\text{C}; V_{DS} = 10\text{ V}$

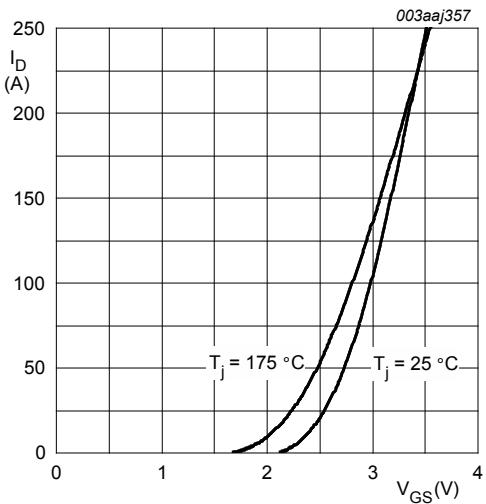


Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values

$V_{DS} = 10\text{ V}$

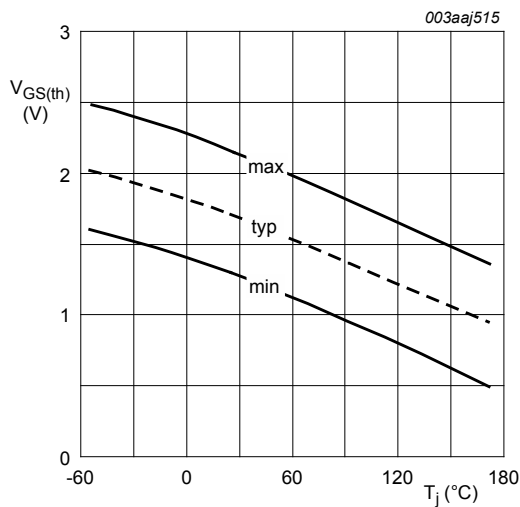


Fig. 10. Gate-source threshold voltage as a function of junction temperature

$$V_{DS} = V_{GS}$$

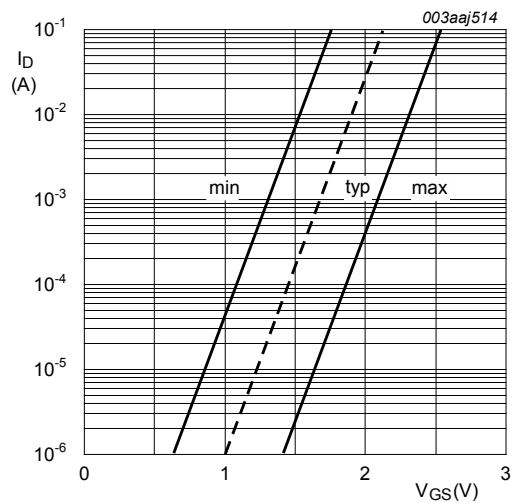


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

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

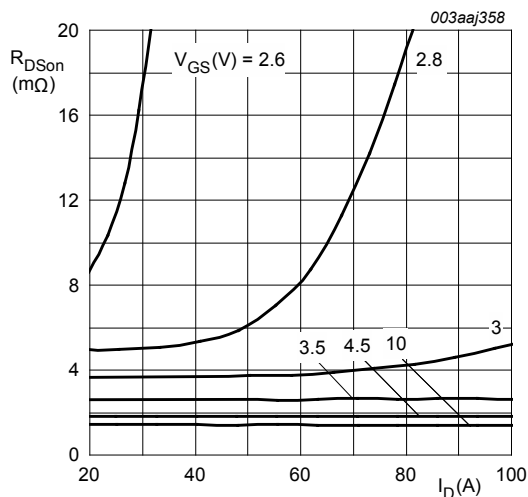


Fig. 12. Drain-source on-state resistance as a function of drain current; typical values

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

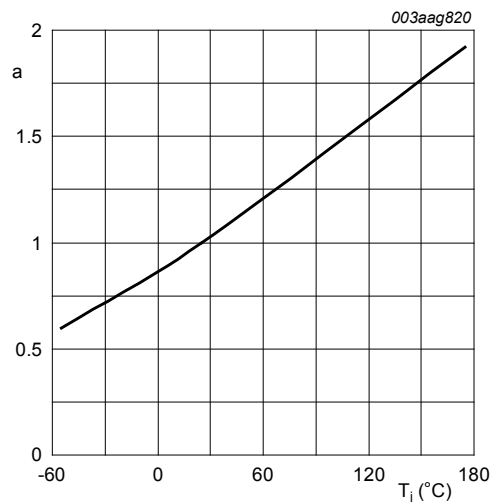


Fig. 13. Normalized drain-source on-state resistance factor as a function of junction temperature

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

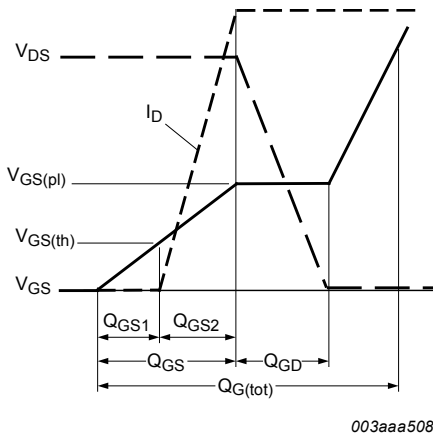


Fig. 14. Gate charge waveform definitions

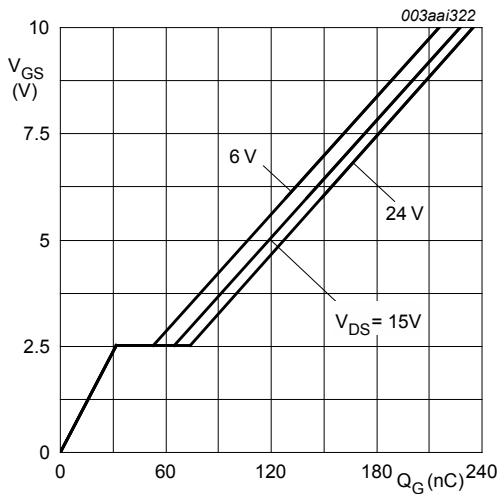


Fig. 15. Gate-source voltage as a function of gate charge; typical values

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

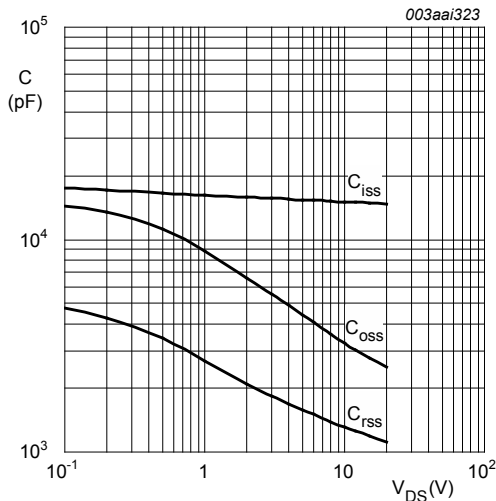


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

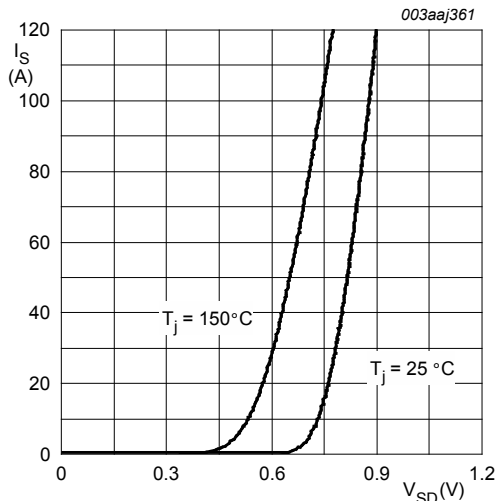


Fig. 17. Source current as a function of source-drain voltage; typical values

$V_{GS} = 0V$

8. Package outline

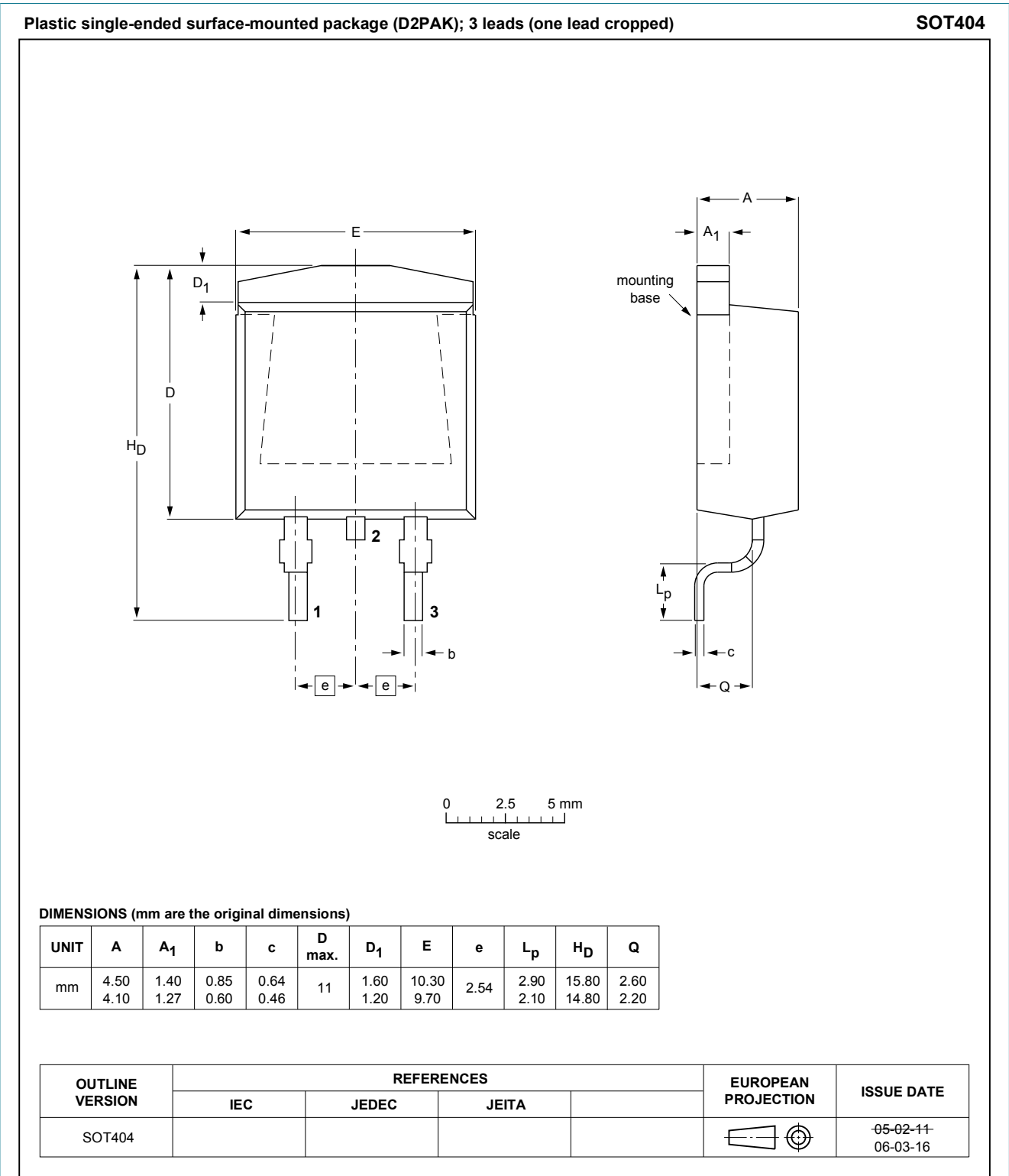


Fig. 18. Package outline D2PAK (SOT404)

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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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