



PSMN2R0-30YL

N-channel 30 V 2 mΩ logic level MOSFET in LPAK

Rev. 4 — 10 March 2011

Product data sheet

1. Product profile

1.1 General description

Logic level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product is designed and qualified for use in industrial and communications applications.

1.2 Features and benefits

- High efficiency due to low switching and conduction losses
- Suitable for logic level gate drive sources

1.3 Applications

- Class-D amplifiers
- Motor control
- DC-to-DC converters
- 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 Figure 1 ; see Figure 3	1 -	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	97	W
T_j	junction temperature		-55	-	175	°C
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 15\text{ A}$; $T_j = 25\text{ °C}$	-	1.55	2	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 4.5\text{ V}$; $I_D = 10\text{ A}$; $V_{DS} = 12\text{ V}$; see Figure 14 ; see Figure 15	-	7.5	-	nC

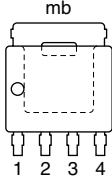
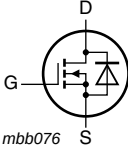
Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$Q_{G(tot)}$	total gate charge	$V_{GS} = 4.5\text{ V}$; $I_D = 10\text{ A}$; $V_{DS} = 12\text{ V}$; see Figure 14	-	30	-	nC
Avalanche ruggedness						
$E_{DS(AL)S}$	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	-	-	151	mJ

[1] Continuous current is limited by package.

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source		
2	S	source		
3	S	source		
4	G	gate		
mb	D	mounting base; connected to drain		
			SOT669 (LPAK)	

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN2R0-30YL	LPAK	plastic single-ended surface-mounted package (LPAK); 4 leads	SOT669

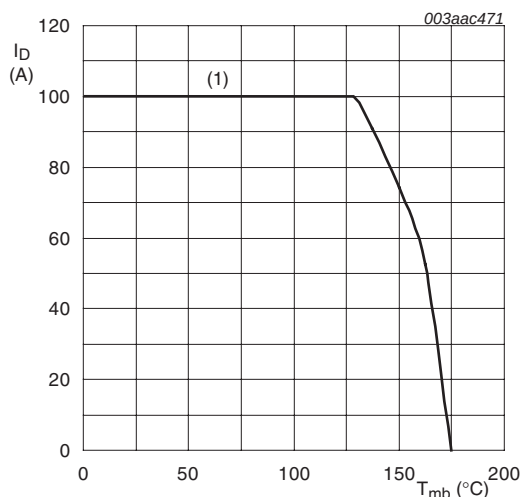
4. Limiting values

Table 4. Limiting values

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

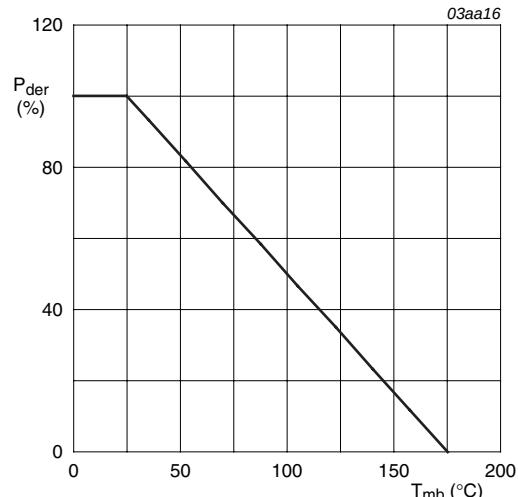
Symbol	Parameter	Conditions	Min	Max	Unit
V _{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C	-	30	V
V _{DSM}	peak drain-source voltage	t _p ≤ 25 ns; f ≤ 500 kHz; E _{DS(AL)} ≤ 280 nJ; pulsed	-	35	V
V _{DGR}	drain-gate voltage	T _j ≥ 25 °C; T _j ≤ 175 °C; R _{GS} = 20 kΩ	-	30	V
V _{GS}	gate-source voltage		-20	20	V
I _D	drain current	V _{GS} = 10 V; T _{mb} = 100 °C; see Figure 1	[1] -	100	A
		V _{GS} = 10 V; T _{mb} = 25 °C; see Figure 1 ; see Figure 3	[1] -	100	A
I _{DM}	peak drain current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C; see Figure 3	-	667	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; see Figure 2	-	97	W
T _{stg}	storage temperature		-55	175	°C
T _j	junction temperature		-55	175	°C
Source-drain diode					
I _S	source current	T _{mb} = 25 °C	[1] -	100	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C	-	667	A
Avalanche ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	V _{GS} = 10 V; T _{j(init)} = 25 °C; I _D = 100 A; V _{sup} ≤ 30 V; R _{GS} = 50 Ω; unclamped	-	151	mJ

[1] Continuous current is limited by package.



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

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



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

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

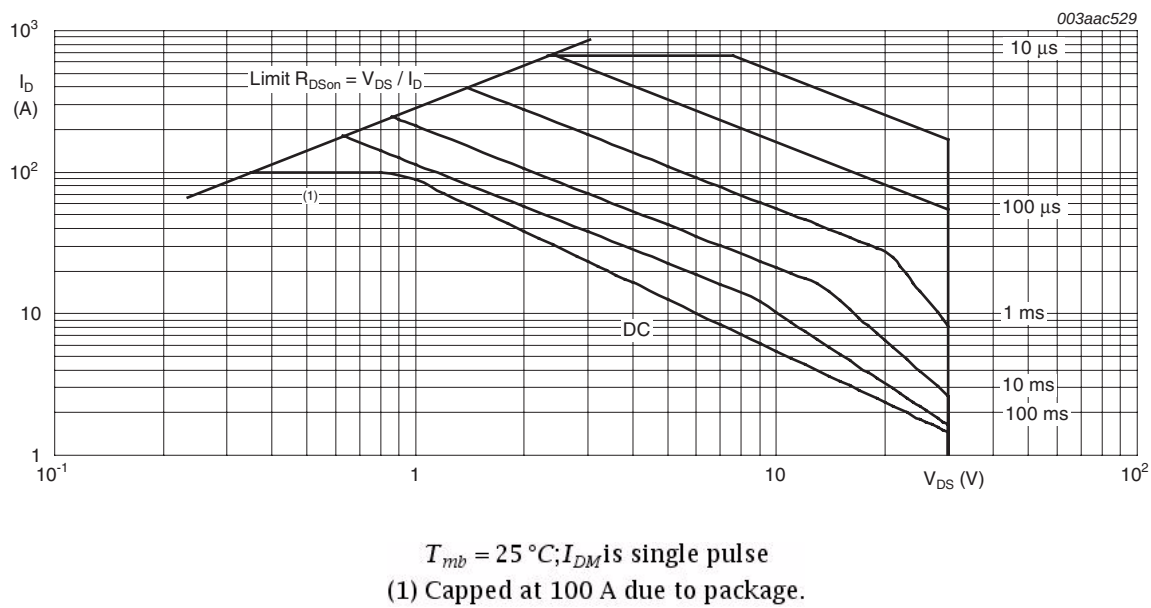


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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	-	0.4	1.28	K/W

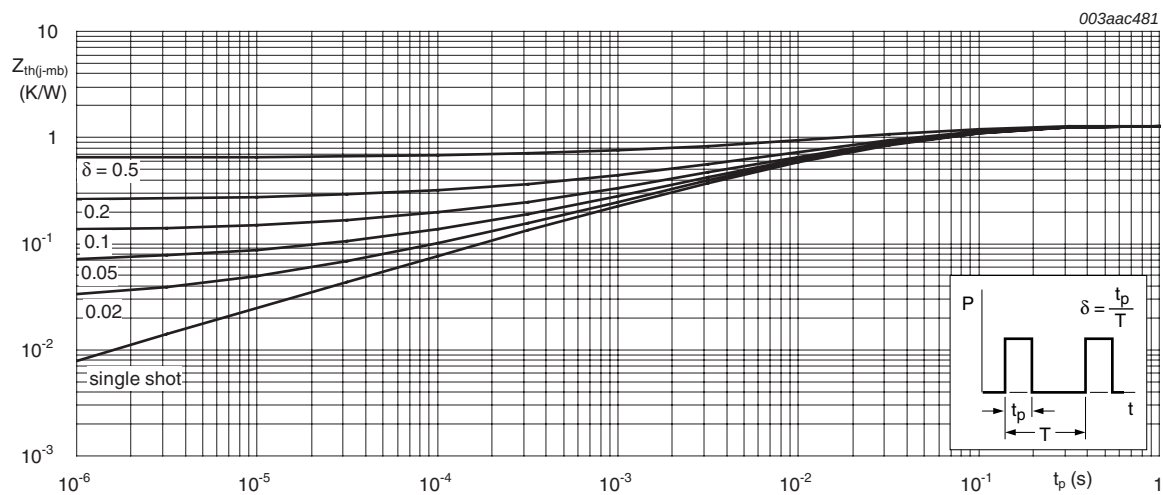


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. 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 11 ; see Figure 12	1.3	1.7	2.15	V
		$I_D = 1\ mA$; $V_{DS} = V_{GS}$; $T_j = 150\ ^\circ C$; see Figure 12	0.65	-	-	V
		$I_D = 1\ mA$; $V_{DS} = V_{GS}$; $T_j = -55\ ^\circ C$; see Figure 12	-	-	2.45	V
I_{DSS}	drain leakage current	$V_{DS} = 30\ V$; $V_{GS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	1	μA
		$V_{DS} = 30\ V$; $V_{GS} = 0\ V$; $T_j = 150\ ^\circ C$	-	-	100	μA
I_{GSS}	gate leakage current	$V_{GS} = 16\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	100	nA
		$V_{GS} = -16\ V$; $V_{DS} = 0\ V$; $T_j = 25\ ^\circ C$	-	-	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\ V$; $I_D = 15\ A$; $T_j = 25\ ^\circ C$	-	2.13	2.63	mΩ
		$V_{GS} = 10\ V$; $I_D = 15\ A$; $T_j = 150\ ^\circ C$; see Figure 13	-	-	3.3	mΩ
		$V_{GS} = 10\ V$; $I_D = 15\ A$; $T_j = 25\ ^\circ C$	-	1.55	2	mΩ
R_G	gate resistance	$f = 1\ MHz$	-	0.75	1.5	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 10\ A$; $V_{DS} = 12\ V$; $V_{GS} = 10\ V$; see Figure 14 ; see Figure 15	-	64	-	nC
		$I_D = 0\ A$; $V_{DS} = 0\ V$; $V_{GS} = 10\ V$	-	59	-	nC
		$I_D = 10\ A$; $V_{DS} = 12\ V$; $V_{GS} = 4.5\ V$; see Figure 14	-	30	-	nC
Q_{GS}	gate-source charge	$I_D = 10\ A$; $V_{DS} = 12\ V$; $V_{GS} = 4.5\ V$; see Figure 14 ; see Figure 15	-	9.8	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	6.6	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	3.2	-	nC
Q_{GD}	gate-drain charge		-	7.5	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$V_{DS} = 12\ V$; see Figure 14 ; see Figure 15	-	2.34	-	V
C_{iss}	input capacitance	$V_{DS} = 12\ V$; $V_{GS} = 0\ V$; $f = 1\ MHz$; $T_j = 25\ ^\circ C$; see Figure 16	-	3980	-	pF
C_{oss}	output capacitance		-	857	-	pF
C_{rss}	reverse transfer capacitance		-	347	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 12\ V$; $R_L = 0.5\ \Omega$; $V_{GS} = 4.5\ V$; $R_{G(ext)} = 4.7\ \Omega$	-	39	-	ns
t_r	rise time		-	65	-	ns
$t_{d(off)}$	turn-off delay time		-	63	-	ns
t_f	fall time		-	28	-	ns

Table 6. Characteristics ...continued
Tested to JEDEC standards where applicable.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25\text{ A}$; $V_{GS} = 0\text{ V}$; $T_J = 25\text{ °C}$; see Figure 17	-	0.78	1.2	V
t_{rr}	reverse recovery time	$I_S = 20\text{ A}$; $dI_S/dt = -100\text{ A/}\mu\text{s}$; $V_{GS} = 0\text{ V}$;	-	43	-	ns
Q_r	recovered charge	$V_{DS} = 20\text{ V}$	-	49	-	nC

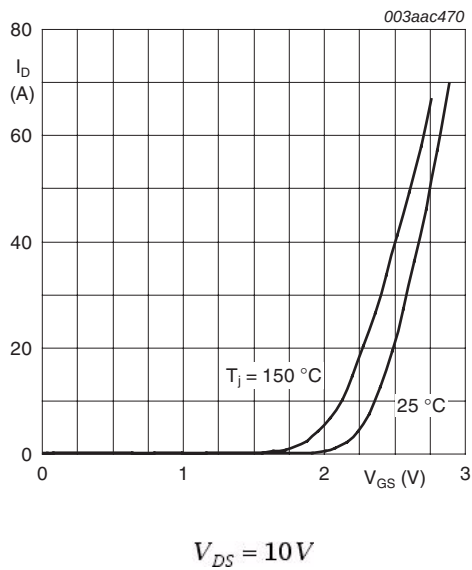


Fig 5. Transfer characteristics: drain current as a function of gate-source voltage; typical values

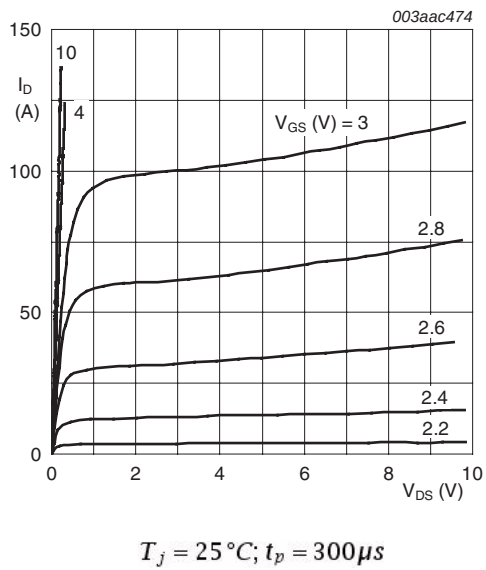


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

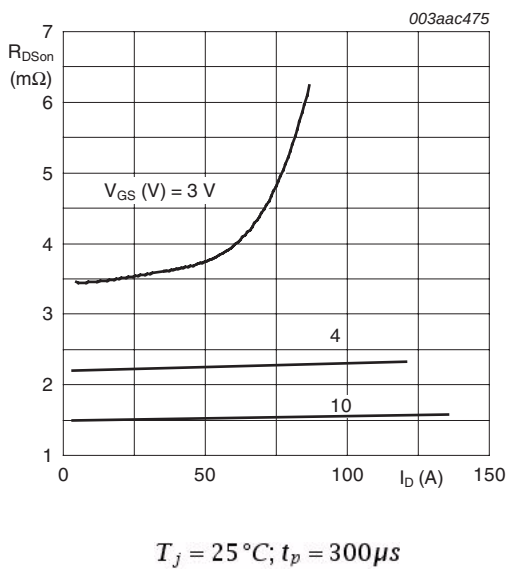


Fig 7. Drain-source on-state resistance as a function of drain current; typical values

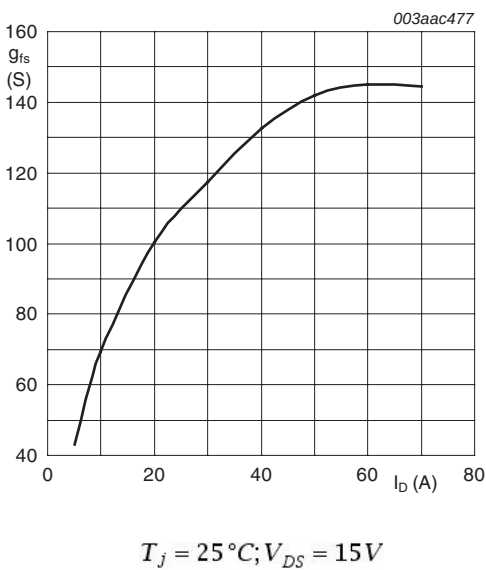


Fig 8. Forward transconductance as a function of drain current; typical values

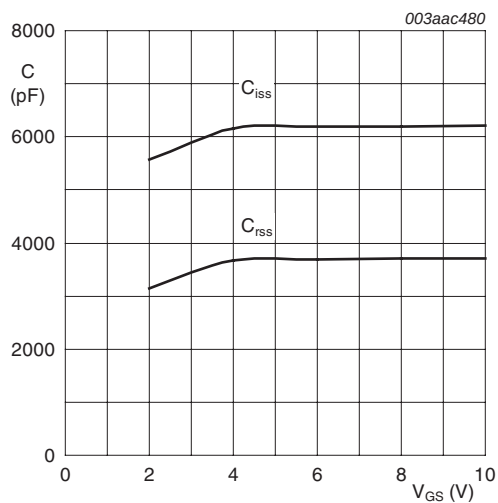


Fig 9. Input and reverse transfer capacitances as a function of gate-source voltage; typical values

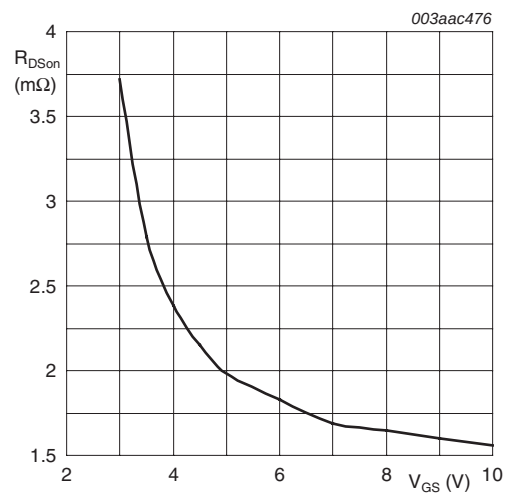


Fig 10. Drain-source on-state resistance as a function of gate-source voltage; typical values

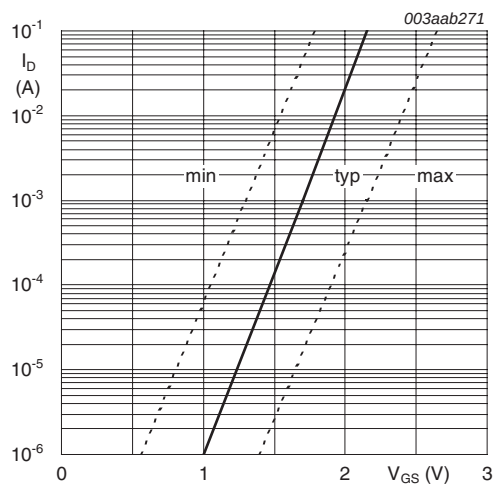


Fig 11. Sub-threshold drain current as a function of gate-source voltage

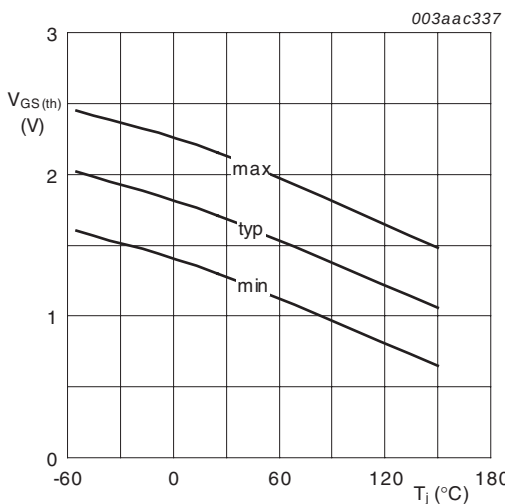
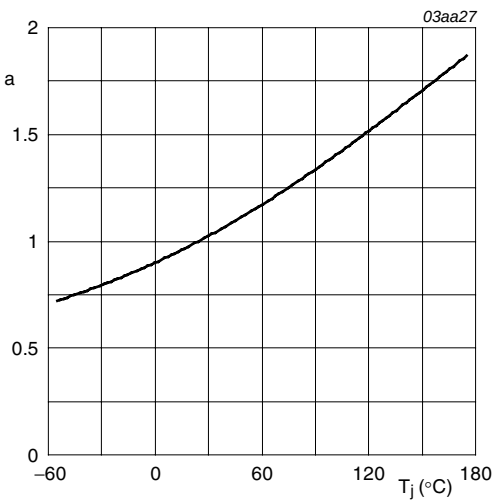


Fig 12. Gate-source threshold voltage as a function of junction temperature



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

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

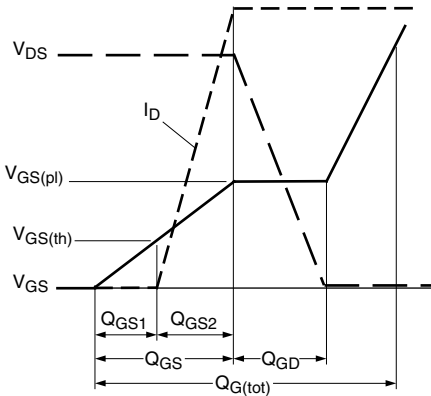
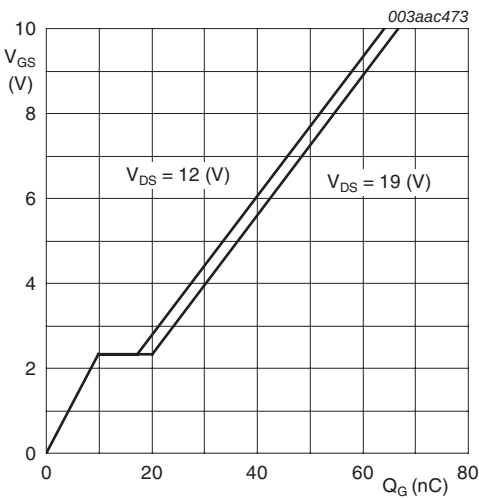
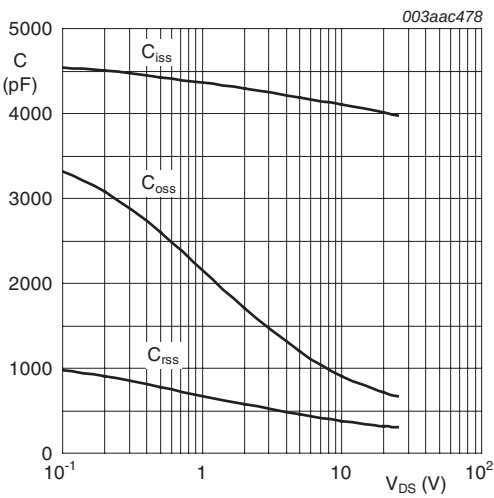


Fig 14. Gate charge waveform definitions



$$T_j = 25^{\circ}C; I_D = 10\text{ A}$$

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

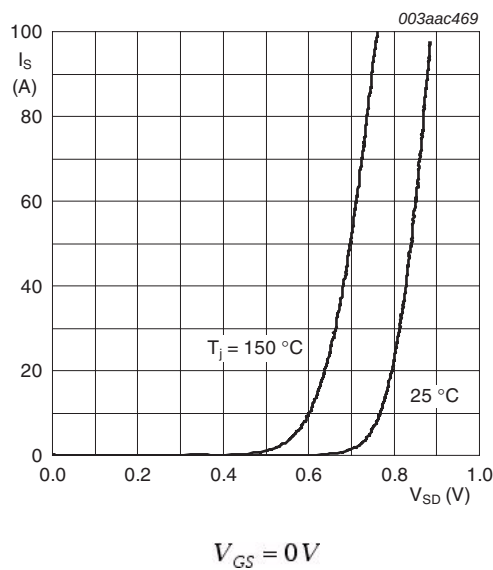


Fig 17. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

7. Package outline

Plastic single-ended surface-mounted package (LPAK); 4 leads

SOT669

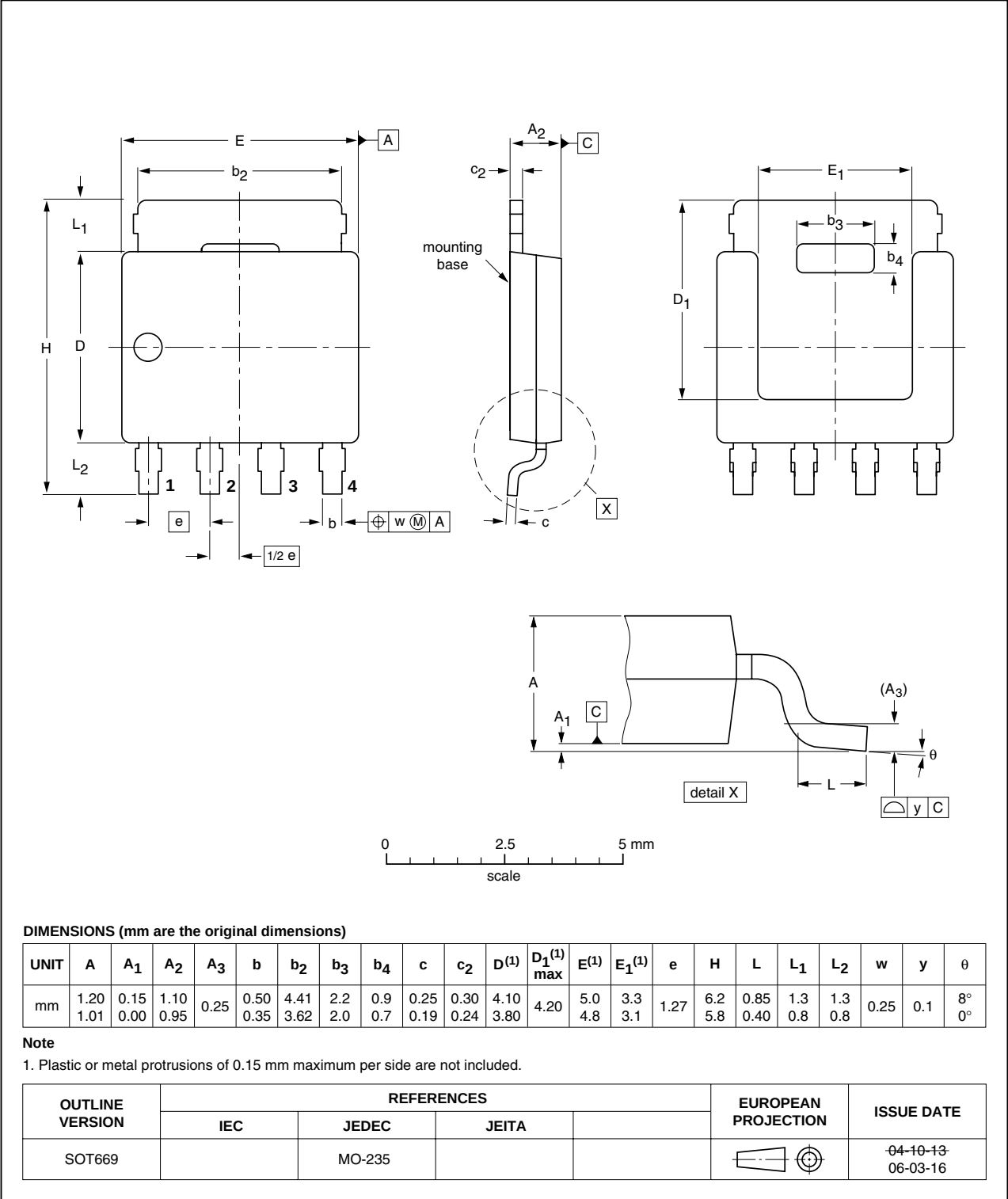


Fig 18. Package outline SOT669 (LPAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN2R0-30YL v.4	20110310	Product data sheet	-	PSMN2R0-30YL_3
Modifications:	• Various changes to content.			
PSMN2R0-30YL_3	20090105	Product data sheet	-	PSMN2R0-30YL_2

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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