

PSMN011-80YS

N-channel LFFPAK 80 V 11 mΩ standard level MOSFET

Rev. 02 — 28 October 2010

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel MOSFET in LFFPAK 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

- Advanced TrenchMOS provides low RD_{DSon} and low gate charge
- High efficiency gains in switching power converters
- Improved mechanical and thermal characteristics
- LFFPAK provides maximum power density in a Power SO8 package

1.3 Applications

- DC-to-DC converters
- Lithium-ion battery protection
- 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 ≥ 25 °C; T _j ≤ 175 °C	-	-	80	V
I _D	drain current	T _{mb} = 25 °C; V _{GS} = 10 V; see Figure 1	-	-	67	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; see Figure 2	-	-	117	W
T _j	junction temperature		-55	-	175	°C
Static characteristics						
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 100 °C; see Figure 12	-	-	18	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; see Figure 12 ; see Figure 13	-	8.6	11	mΩ



Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10$ V; $I_D = 25$ A;	-	11	-	nC
$Q_{G(\text{tot})}$	total gate charge	$V_{DS} = 40$ V; see Figure 14 ; see Figure 15	-	45	-	nC
Avalanche ruggedness						
$E_{DS(\text{AL})S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10$ V; $T_{j(\text{init})} = 25$ °C; $I_D = 67$ A; $V_{\text{sup}} \leq 80$ V; $R_{GS} = 50$ Ω; unclamped	-	-	121	mJ

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 (LFPAK)				

3. Ordering information

Table 3. Ordering information

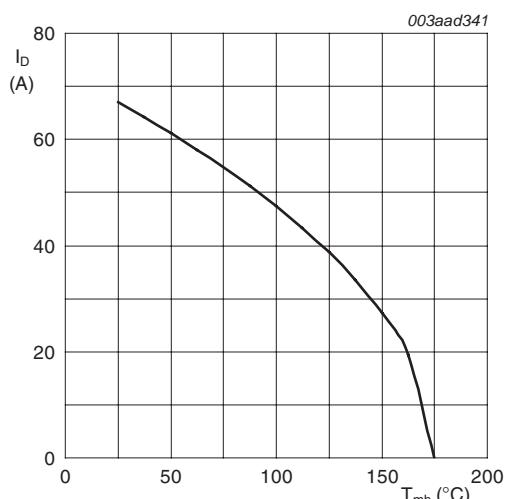
Type number	Package			Version
	Name	Description		
PSMN011-80YS	LFPAK	plastic single-ended surface-mounted package (LFPAK); 4 leads		SOT669

4. Limiting values

Table 4. Limiting values

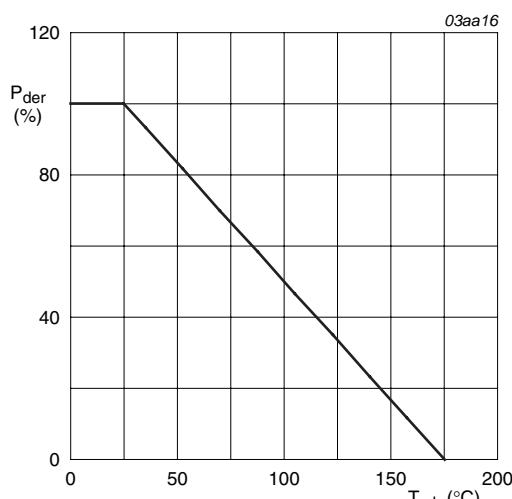
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25^\circ\text{C}; T_j \leq 175^\circ\text{C}$	-	80	V
V_{DGR}	drain-gate voltage	$T_j \geq 25^\circ\text{C}; T_j \leq 175^\circ\text{C}; R_{GS} = 20\text{ k}\Omega$	-	80	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	-	47	A
		$V_{GS} = 10\text{ V}; T_{mb} = 25^\circ\text{C}$; see Figure 1	-	67	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25^\circ\text{C}$; see Figure 3	-	266	A
P_{tot}	total power dissipation	$T_{mb} = 25^\circ\text{C}$; see Figure 2	-	117	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	$T_{mb} = 25^\circ\text{C}$	-	67	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25^\circ\text{C}$	-	266	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25^\circ\text{C}; I_D = 67\text{ A}; V_{sup} \leq 80\text{ V}; R_{GS} = 50\text{ }\Omega$; unclamped	-	121	mJ



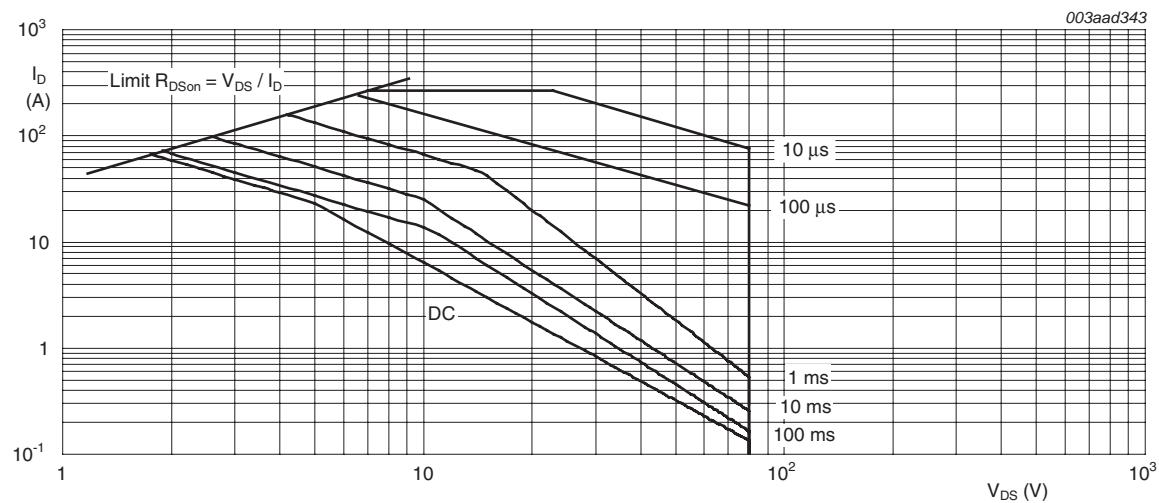
$V_{GS} \geq 10\text{ V}$

Fig 1. 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

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
$R_{th(j\text{-}mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	0.5	1.3	K/W

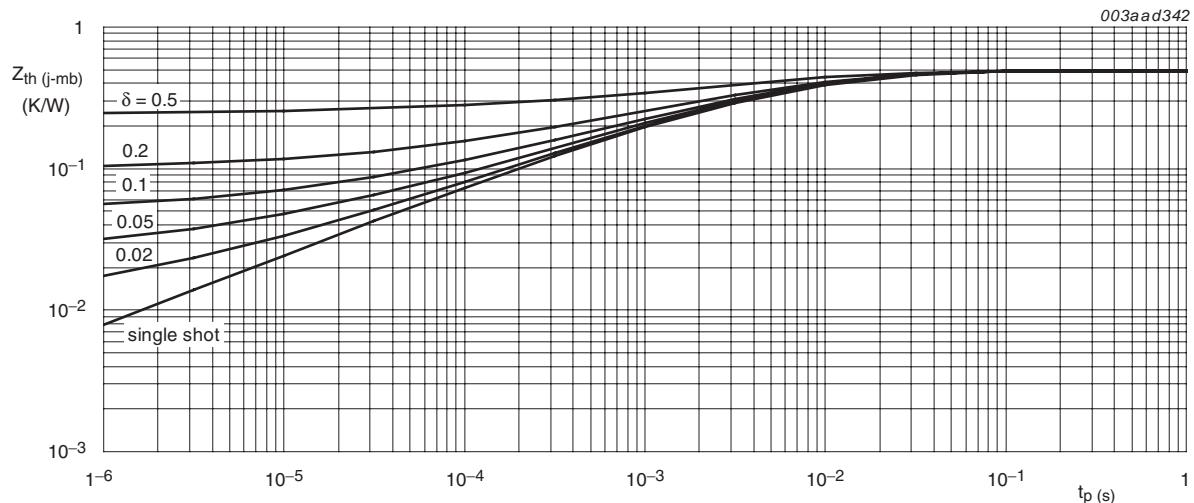


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration; typical values

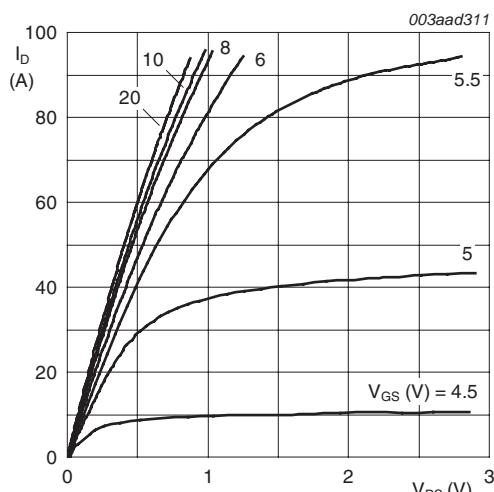
6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55^\circ C$ $I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25^\circ C$	73	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175^\circ C$; see Figure 10 $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55^\circ C$; see Figure 10 $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25^\circ C$; see Figure 11 ; see Figure 10	1	-	-	V
I_{DSS}	drain leakage current	$V_{DS} = 80 V; V_{GS} = 0 V; T_j = 25^\circ C$ $V_{DS} = 80 V; V_{GS} = 0 V; T_j = 125^\circ C$	-	0.02	1	μA
I_{GSS}	gate leakage current	$V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25^\circ C$ $V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25^\circ C$	-	-	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 $V_{GS} = 10 V; I_D = 25 A; T_j = 100^\circ C$; see Figure 12 $V_{GS} = 10 V; I_D = 25 A; T_j = 25^\circ C$; see Figure 12 ; see Figure 13	-	19	26	$m\Omega$
R_G	internal gate resistance (AC)	$f = 1 \text{ MHz}$	-	0.7	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V$ $I_D = 25 A; V_{DS} = 40 V; V_{GS} = 10 V$	-	38	-	nC
Q_{GS}	gate-source charge	see Figure 14 ; see Figure 15	-	45	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge	$I_D = 25 A; V_{DS} = 40 V; V_{GS} = 10 V$; see Figure 14	-	13	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	8	-	nC
Q_{GD}	gate-drain charge	$I_D = 25 A; V_{DS} = 40 V; V_{GS} = 10 V$; see Figure 14 ; see Figure 15	-	5	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 25 A; V_{DS} = 40 V$; see Figure 14 ; see Figure 15	-	4.9	-	V
C_{iss}	input capacitance	$V_{DS} = 40 V; V_{GS} = 0 V; f = 1 \text{ MHz}$	-	2800	-	pF
C_{oss}	output capacitance	$T_j = 25^\circ C$; see Figure 16	-	270	-	pF
C_{rss}	reverse transfer capacitance		-	146	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 40 V; R_L = 1.6 \Omega; V_{GS} = 10 V$	-	23	-	ns
t_r	rise time	$R_{G(ext)} = 4.7 \Omega$	-	20	-	ns
$t_{d(off)}$	turn-off delay time		-	40	-	ns
t_f	fall time		-	12	-	ns

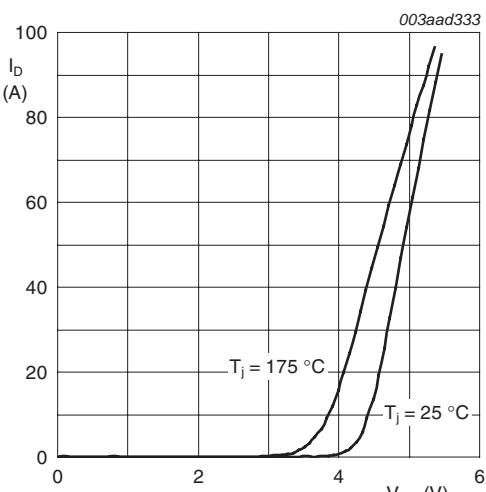
Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 17	-	0.8	1.2	V
t_{rr}	reverse recovery time	$I_S = 40 \text{ A}$; $dI_S/dt = 100 \text{ A}/\mu\text{s}$	-	54	-	ns
Q_r	recovered charge	$V_{GS} = 0 \text{ V}$; $V_{DS} = 40 \text{ V}$	-	98	-	nC



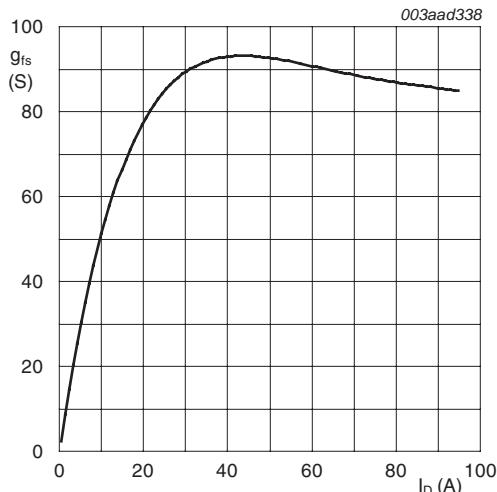
$T_j = 25 \text{ }^\circ\text{C}$

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



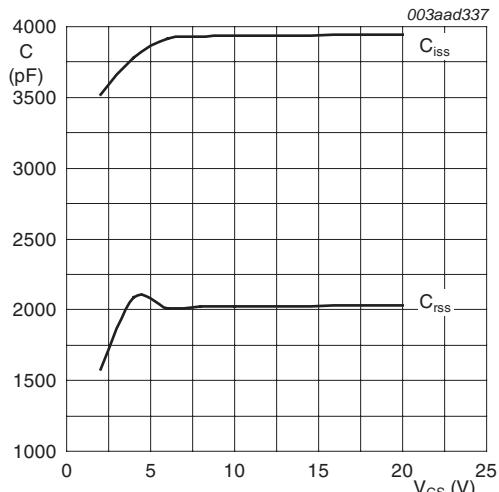
$V_{DS} > I_D \times R_{DSon}$

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



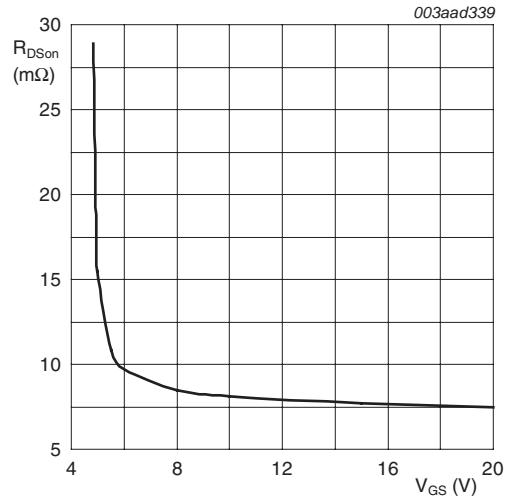
$T_j = 25 \text{ }^\circ\text{C}; V_{DS} = 25 \text{ V}$

Fig 7. Forward transconductance as a function of drain current; typical values



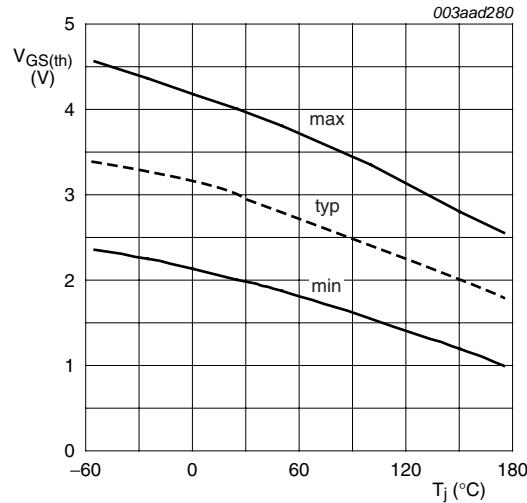
$V_{DS} = 0 \text{ V}; f = 1 \text{ MHz}$

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



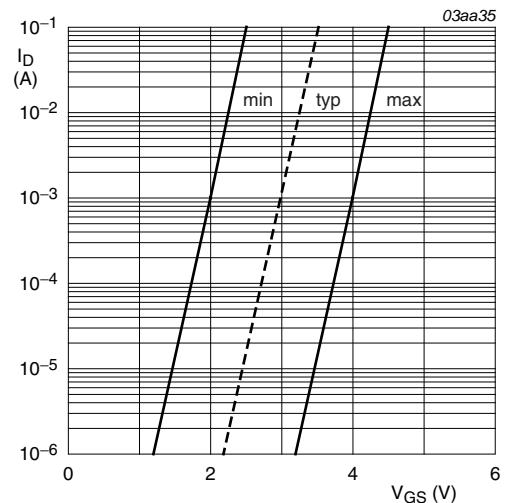
$T_j = 25^\circ\text{C}; I_D = 25\text{A}$

Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



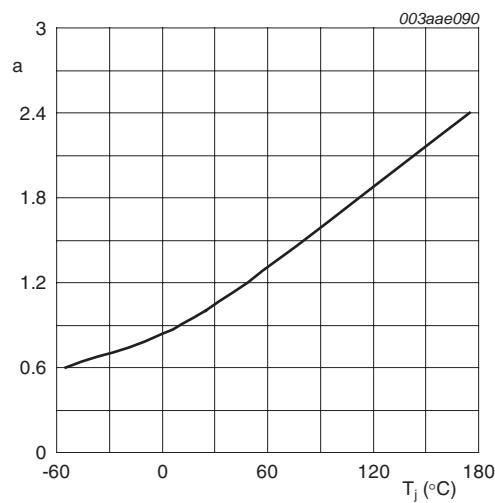
$I_D = 1\text{ mA}; V_{DS} = V_{GS}$

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



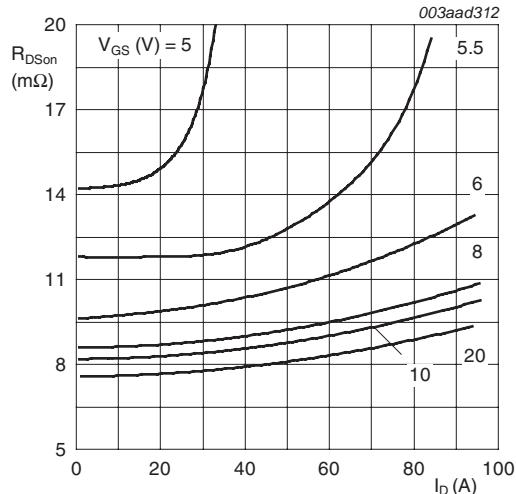
$T_j = 25^\circ\text{C}; V_{DS} = 5\text{V}$

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



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

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



$T_j = 25^\circ C$

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

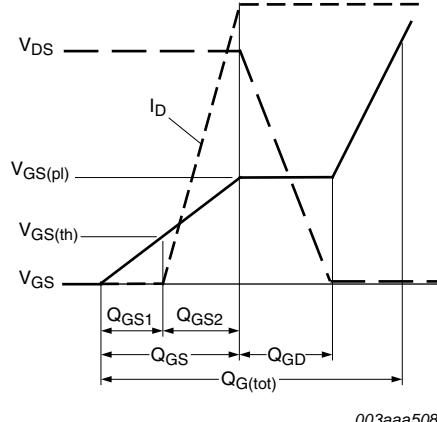
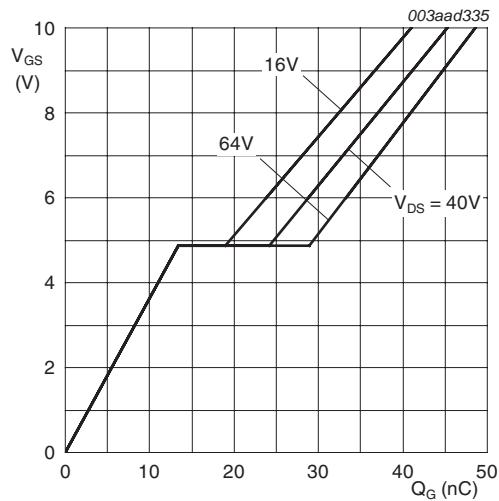
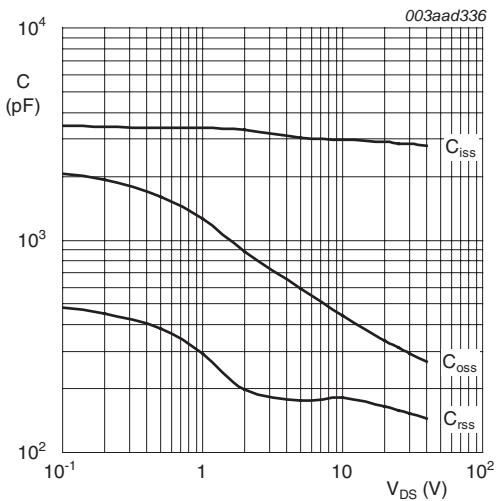


Fig 14. Gate charge waveform definitions



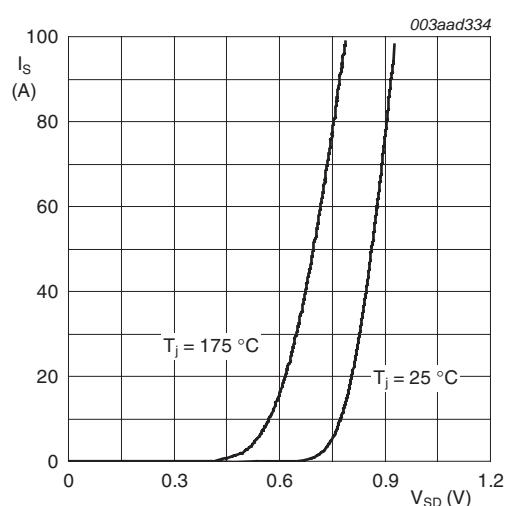
$T_j = 25^\circ C; I_D = 25A$

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



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

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 (LFPAK); 4 leads

SOT669

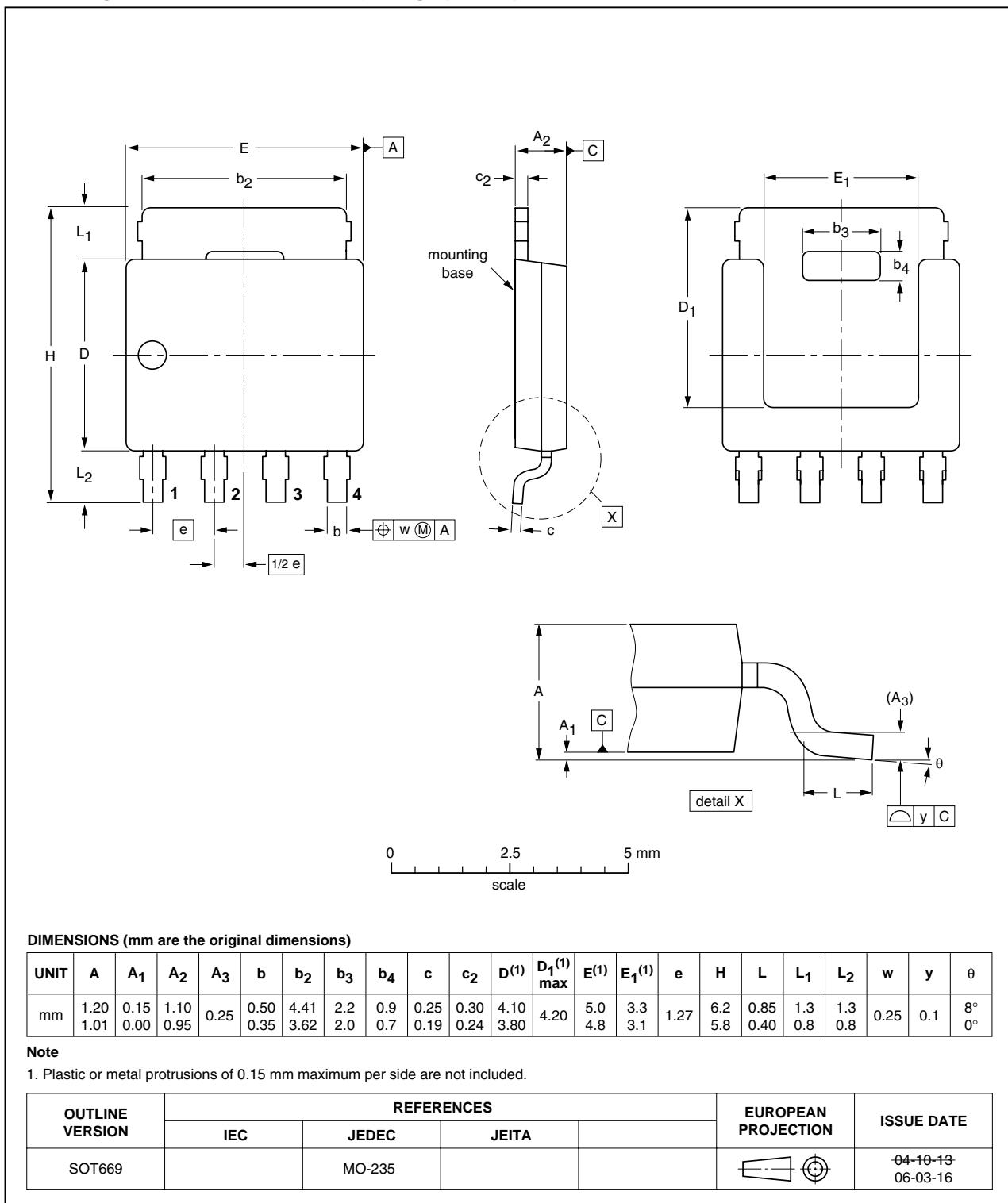


Fig 18. Package outline SOT669 (LFPAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN011-80YS v.2	20101028	Product data sheet	-	PSMN011-80YS v.1
Modifications:		<ul style="list-style-type: none">• Status changed from objective to product.• Various changes to content.		
PSMN011-80YS v.1	20100226	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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11. 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	Limiting values	3
5	Thermal characteristics	5
6	Characteristics	6
7	Package outline	11
8	Revision history	12
9	Legal information	13
9.1	Data sheet status	13
9.2	Definitions	13
9.3	Disclaimers	13
9.4	Trademarks	14
10	Contact information	14

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