PSMN011-80YS

N-channel LFPAK 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 LFPAK 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 RDSon and low gate charge
- High efficiency gains in switching power converters
- Improved mechanical and thermal characteristics
- LFPAK 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

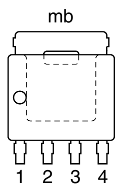
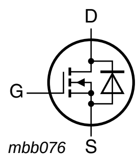
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	-	80	V
I_D	drain current	$T_{mb} = 25$ °C; $V_{GS} = 10$ V; see Figure 1	-	-	67	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °C; see Figure 2	-	-	117	W
T_j	junction temperature		-55	-	175	°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; V_{DS} = 40 V; see Figure 14; see Figure 15	-	11	-	nC
$Q_{G(tot)}$	total gate charge		-	45	-	nC
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 67 A; V_{sup} ≤ 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	 SOT669 (LFPAK)	
2	S	source		
3	S	source		
4	G	gate		
mb	D	mounting base; connected to drain		

3. Ordering information

Table 3. Ordering information

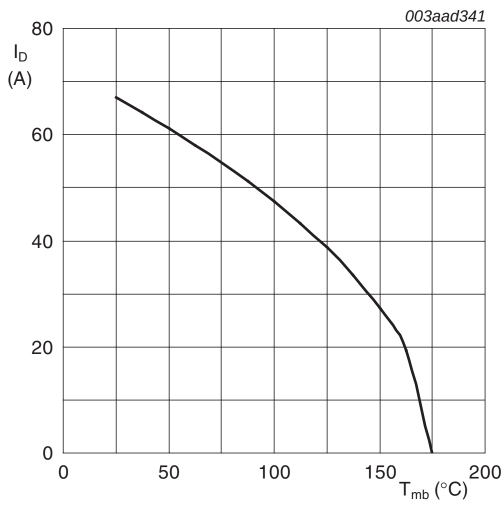
Type number	Package		
	Name	Description	Version
PSMN011-80YS	LFPAK	plastic single-ended surface-mounted package (LFPAK); 4 leads	SOT669

4. Limiting values

Table 4. Limiting values

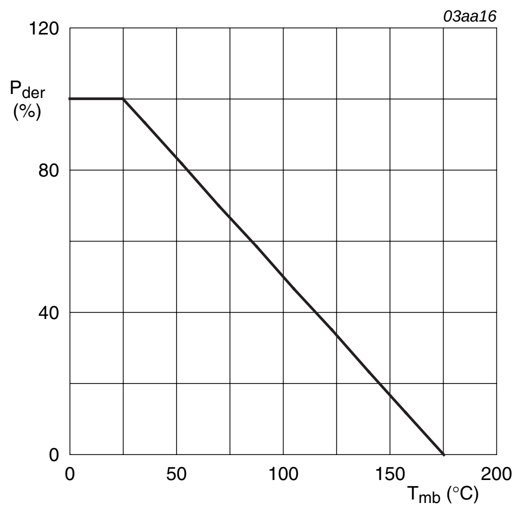
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	80	V
V_{DGR}	drain-gate voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C; $R_{GS} = 20$ kΩ	-	80	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10$ V; $T_{mb} = 100$ °C; see Figure 1	-	47	A
		$V_{GS} = 10$ V; $T_{mb} = 25$ °C; see Figure 1	-	67	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10$ µs; $T_{mb} = 25$ °C; see Figure 3	-	266	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °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	$T_{mb} = 25$ °C	-	67	A
I_{SM}	peak source current	pulsed; $t_p \leq 10$ µs; $T_{mb} = 25$ °C	-	266	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10$ V; $T_{j(init)} = 25$ °C; $I_D = 67$ A; $V_{sup} \leq 80$ V; $R_{GS} = 50$ Ω; unclamped	-	121	mJ



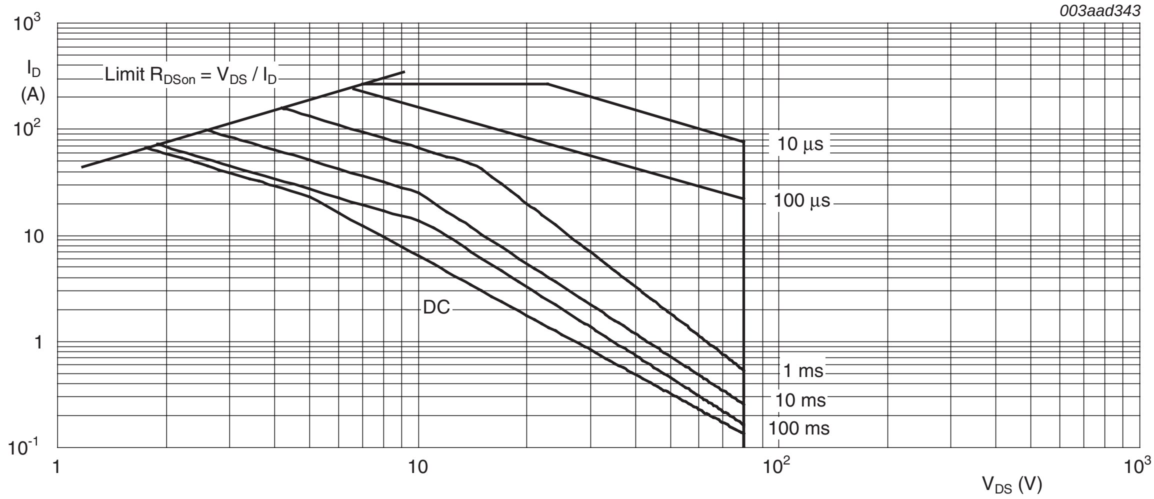
$$V_{GS} \geq 10\,V$$

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



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

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



$T_{mb} = 25\,°C; I_{DM}$ 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
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	0.5	1.3	K/W

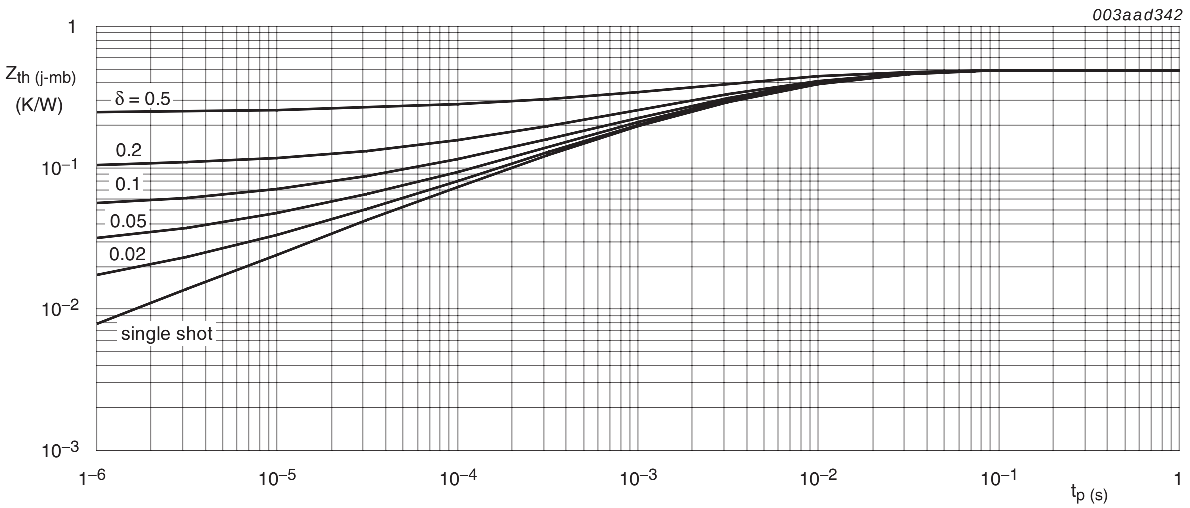


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration; typical values

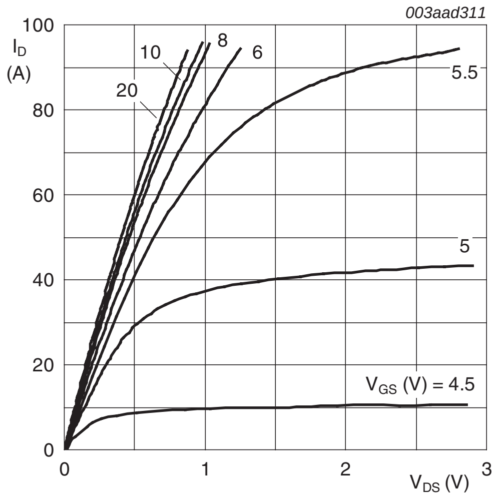
6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 250 µA; V_{GS} = 0 V; T_j = -55 °C	73	-	-	V
		I_D = 250 µA; V_{GS} = 0 V; T_j = 25 °C	80	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; see Figure 10	1	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 10	-	-	4.6	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 11; see Figure 10	2	3	4	V
I_{DSS}	drain leakage current	V_{DS} = 80 V; V_{GS} = 0 V; T_j = 25 °C	-	0.02	1	µA
		V_{DS} = 80 V; V_{GS} = 0 V; T_j = 125 °C	-	-	100	µA
I_{GSS}	gate leakage current	V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C	-	-	100	nA
		V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C	-	-	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; see Figure 12	-	19	26	mΩ
		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
R_G	internal gate resistance (AC)	f = 1 MHz	-	0.7	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V	-	38	-	nC
		I_D = 25 A; V_{DS} = 40 V; V_{GS} = 10 V; see Figure 14; see Figure 15	-	45	-	nC
Q_{GS}	gate-source charge		-	13	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge	I_D = 25 A; V_{DS} = 40 V; V_{GS} = 10 V; see Figure 14	-	8	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	5	-	nC
Q_{GD}	gate-drain charge	I_D = 25 A; V_{DS} = 40 V; V_{GS} = 10 V; see Figure 14; see Figure 15	-	11	-	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 MHz; T_j = 25 °C; see Figure 16	-	2800	-	pF
C_{oss}	output capacitance		-	270	-	pF
C_{rss}	reverse transfer capacitance		-	146	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 40 V; R_L = 1.6 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 4.7 Ω	-	23	-	ns
t_r	rise time		-	20	-	ns
$t_{d(off)}$	turn-off delay time		-	40	-	ns
t_f	fall time		-	12	-	ns

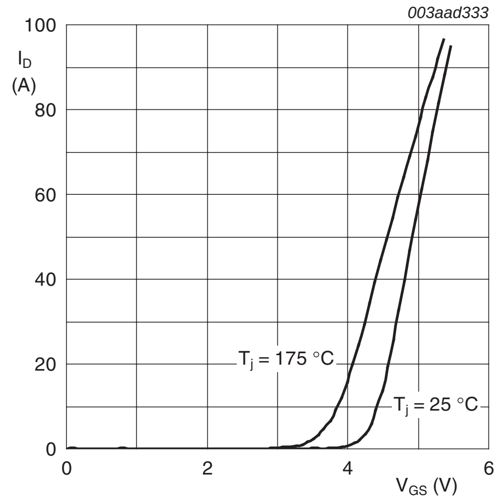
Table 6. Characteristics *...continued*

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



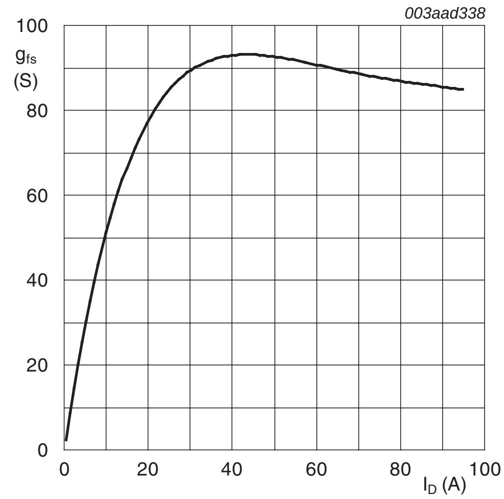
$T_j = 25°C$

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



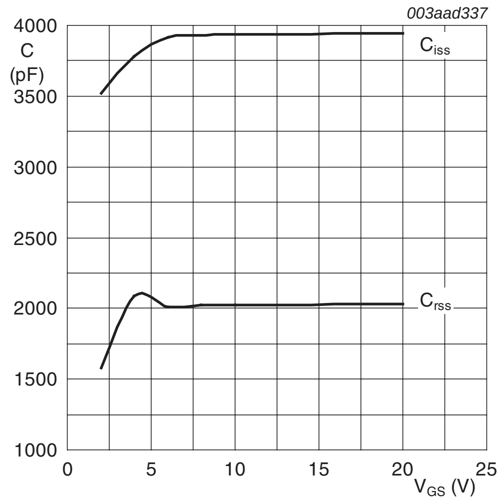
$V_{DS} > I_D \times R_{DSon}$

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



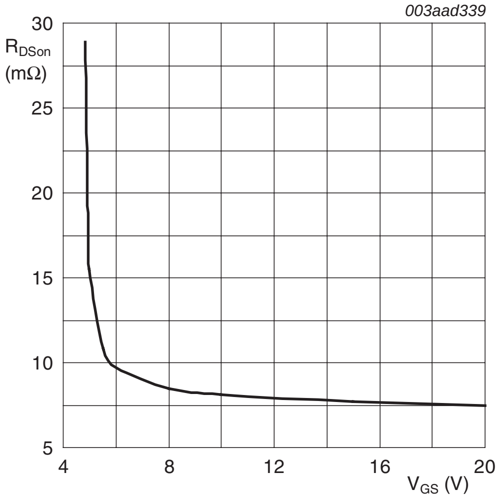
$T_j = 25°C; V_{DS} = 25V$

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



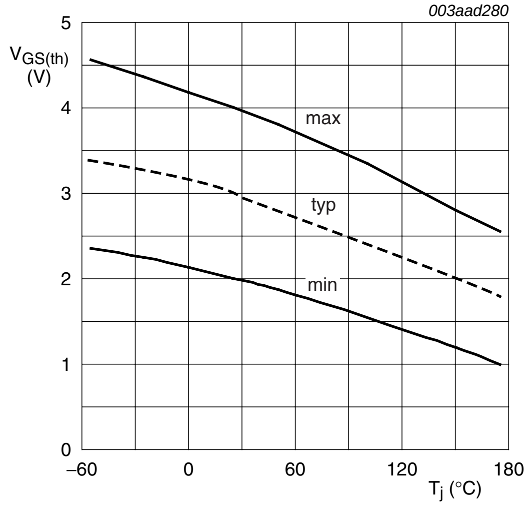
$V_{DS} = 0V; f = 1MHz$

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



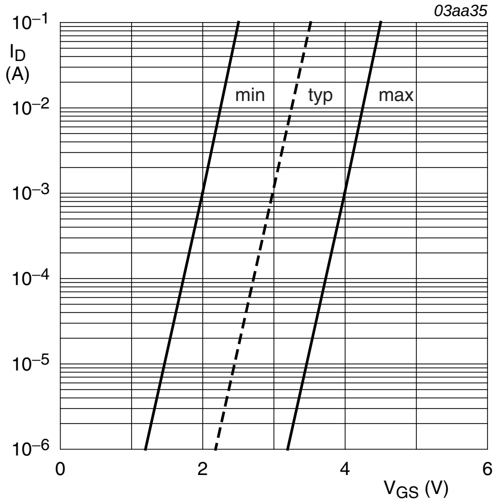
$T_j = 25\,°C; I_D = 25A$

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



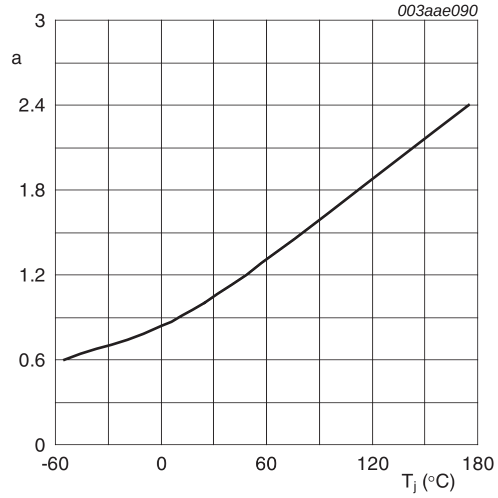
$I_D = 1\text{ mA}; V_{DS} = V_{GS}$

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



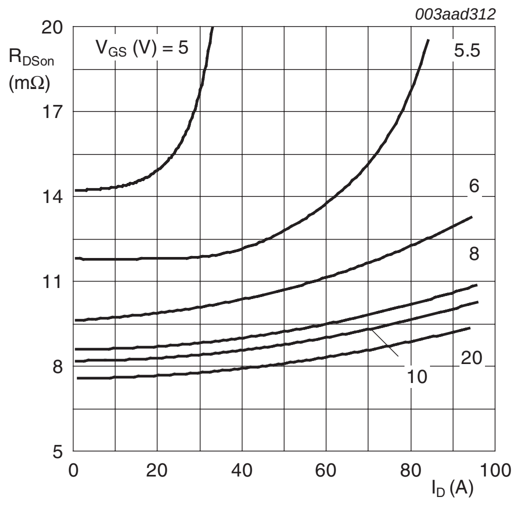
$T_j = 25\,°C; V_{DS} = 5V$

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



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

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



$T_j = 25\,°C$

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

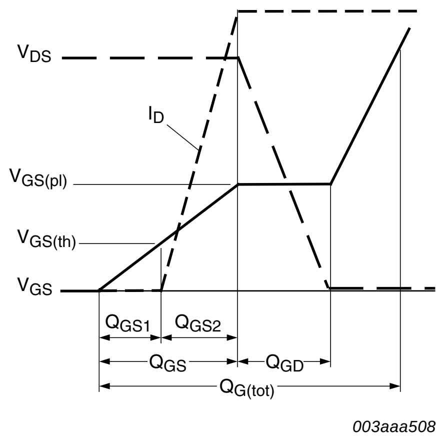
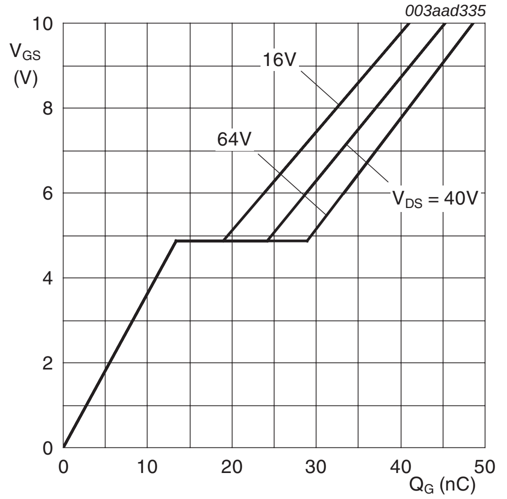
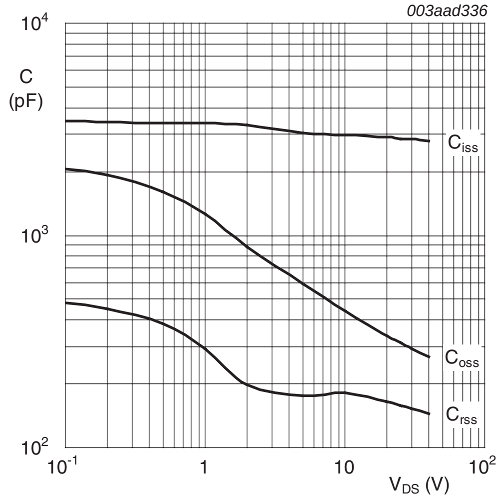


Fig 14. Gate charge waveform definitions



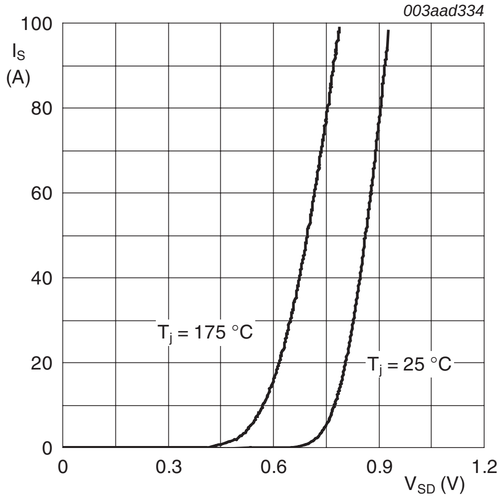
$T_j = 25\,°C; I_D = 25\,A$

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



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

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

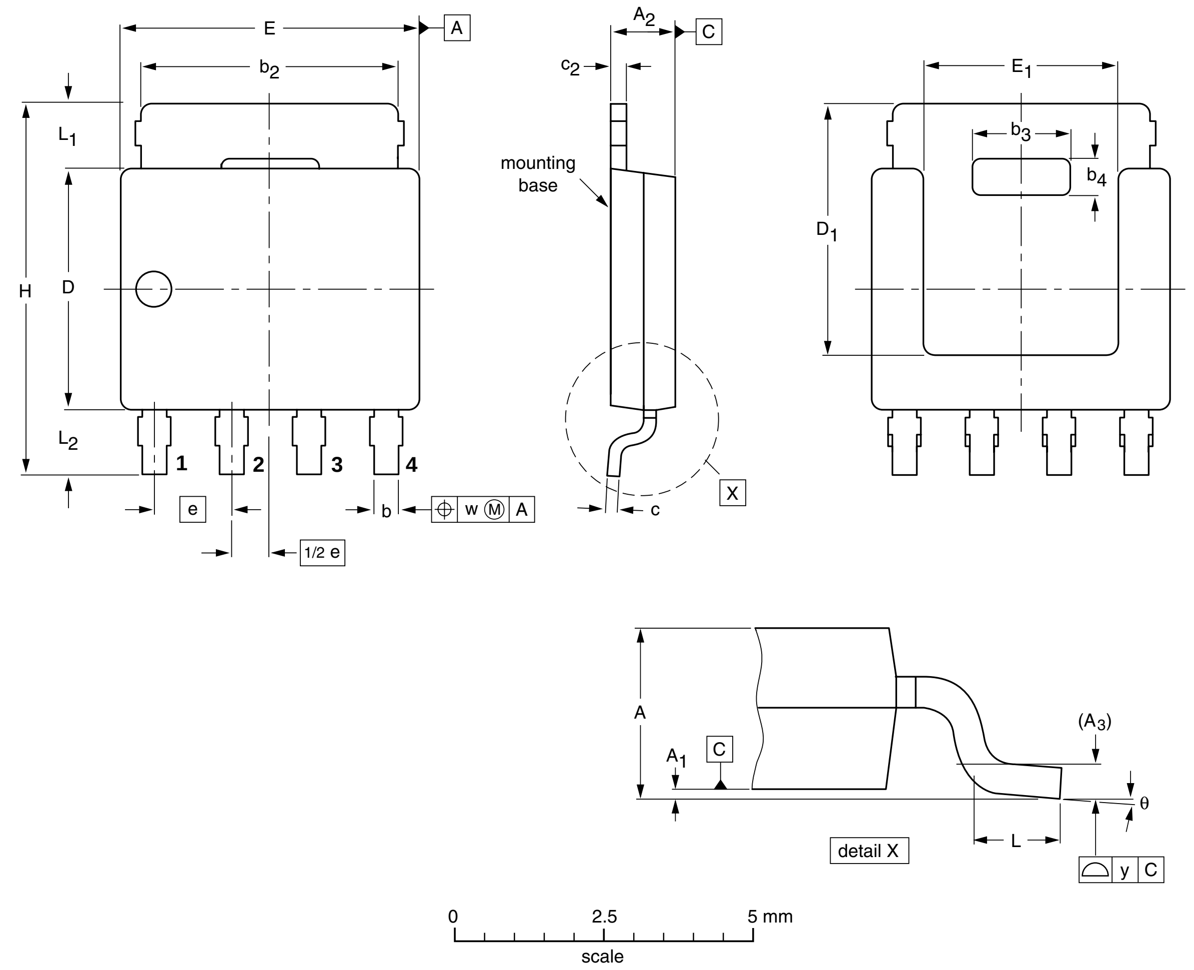


$V_{GS} = 0V$

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**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	A_2	A_3	b	b_2	b_3	b_4	c	c_2	D(1)	D_1(1) max	E(1)	E_1(1)	e	H	L	L_1	L_2	w	y	θ
mm	1.20 1.01	0.15 0.00	1.10 0.95	0.25	0.50 0.35	4.41 3.62	2.2 2.0	0.9 0.7	0.25 0.19	0.30 0.24	4.10 3.80	4.20	5.0 4.8	3.3 3.1	1.27	6.2 5.8	0.85 0.40	1.3 0.8	1.3 0.8	0.25	0.1	8° 0°

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT669		MO-235				~~04-10-13~~ 06-03-16

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:	• 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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For sales office addresses, please send an email to: salesaddresses@nexperia.com

11. Contents

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Date of release: 28 October 2010