PSMN028-100YS

N-channel LFPAK 100V 27.5 mΩ standard level MOSFET

Rev. 02 — 30 March 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

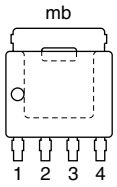
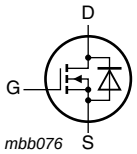
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	-	100	V
I_D	drain current	T_{mb} = 25 °C; V_{GS} = 10 V; see Figure 1	-	-	42	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; see Figure 2	-	-	89	W
T_j	junction temperature		-55	-	175	°C
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 34 A; $V_{sup} \leq 100$ V; unclamped; R_{GS} = 50 Ω	-	-	68	mJ
Dynamic characteristics						
Q_{GD}	gate-drain charge	V_{GS} = 10 V; I_D = 15 A; V_{DS} = 50 V; see Figure 15 and 16	-	10.3	-	nC
$Q_{G(tot)}$	total gate charge		-	33	-	nC

Table 1. Quick reference *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 15 A; T_j = 100 °C; see Figure 13	-	-	52	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 25 °C; see Figure 14	-	21.4	27.5	mΩ

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

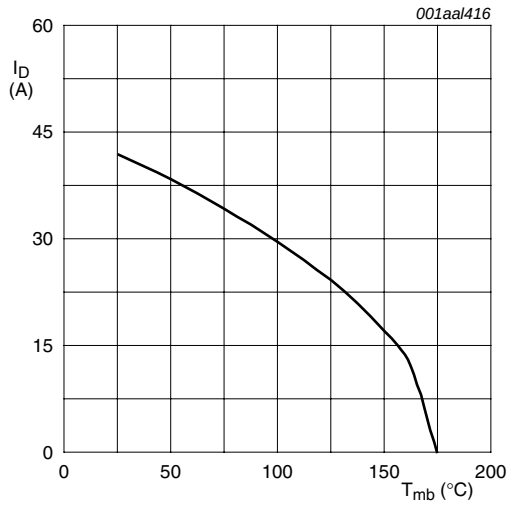
Type number	Package		
	Name	Description	Version
PSMN028-100YS	LFPAK	plastic single-ended surface-mounted package (LFPAK); 4 leads	SOT669

4. Limiting values

Table 4. Limiting values

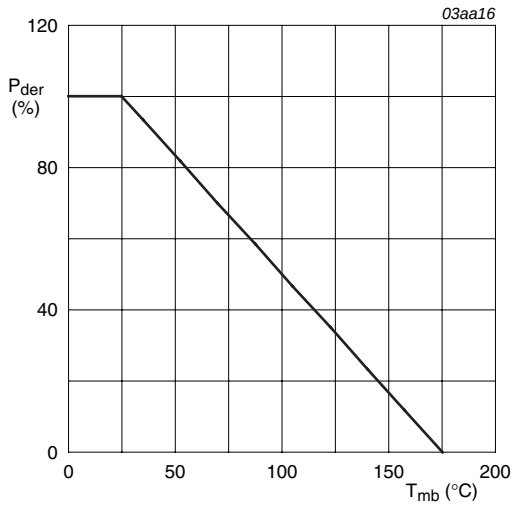
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	100	V
V_{DGR}	drain-gate voltage	$T_j \leq 175$ °C; $T_j \geq 25$ °C; R_{GS} = 20 kΩ	-	100	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	V_{GS} = 10 V; T_{mb} = 100 °C; see Figure 1	-	30	A
		V_{GS} = 10 V; T_{mb} = 25 °C; see Figure 1	-	42	A
I_{DM}	peak drain current	$t_p \leq 10$ µs; pulsed; T_{mb} = 25 °C; see Figure 3	-	137	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; see Figure 2	-	89	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; see Figure 4	-	42	A
I_{SM}	peak source current	$t_p \leq 10$ µs; pulsed; T_{mb} = 25 °C	-	137	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 34 A; $V_{sup} \leq 100$ V; unclamped; R_{GS} = 50 Ω	-	68	mJ



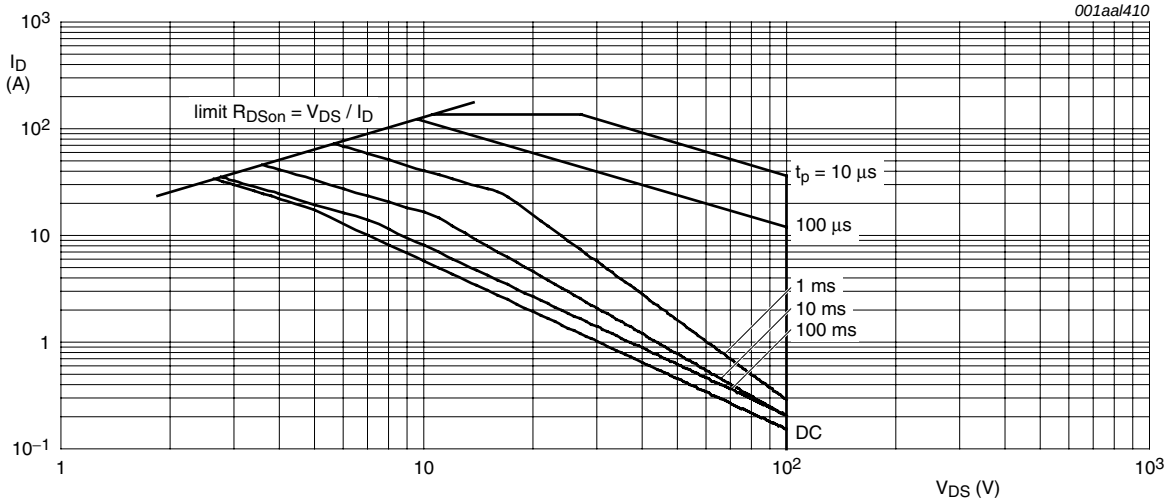
$V_{GS} \geq 10\,V$

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



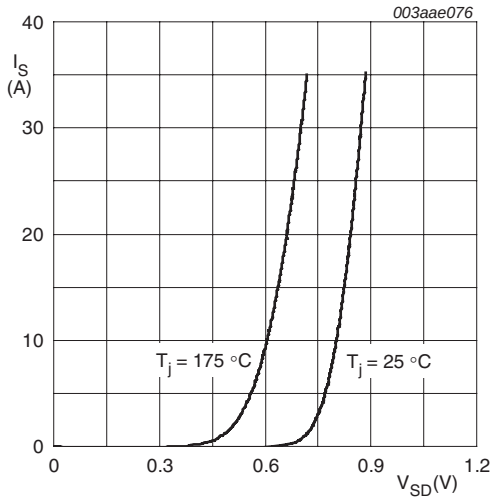
$$P_{der} = \frac{P_{tot}}{P_{tot(25°C)}} \times 100\,\%$$

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



$V_{GS} = 0\,V$

Fig 4. Source current as a function of source-drain voltage; typical values

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 5	-	0.81	1.68	K/W

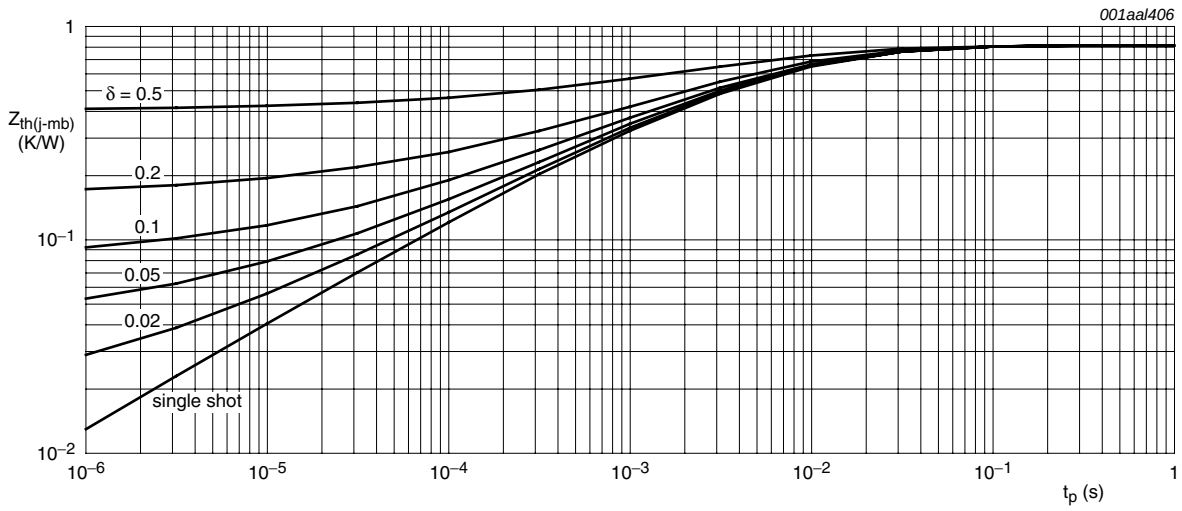


Fig 5. Transient termal impedance from junction to mounting base as a function of pulse duration

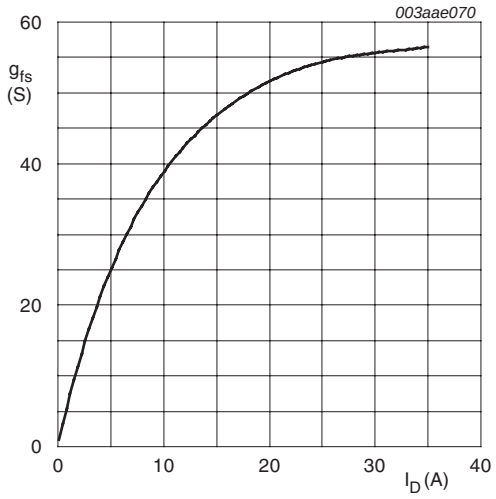
6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 0.25 mA; V_{GS} = 0 V; T_j = -55 °C	90	-	-	V
		I_D = 0.25 mA; V_{GS} = 0 V; T_j = 25 °C	100	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; see Figure 11	1	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 12 and 11	2	3	4	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 11	-	-	4.7	V
I_{DSS}	drain leakage current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 125 °C	-	-	50	µA
		V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 °C	-	0.02	2	µA
I_{GSS}	gate leakage current	V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C	-	2	100	nA
		V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C	-	2	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 15 A; T_j = 100 °C; see Figure 13	-	-	52	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 175 °C; see Figure 13	-	49.9	74.3	mΩ
		V_{GS} = 10 V; I_D = 15 A; T_j = 25 °C; see Figure 14	-	21.4	27.5	mΩ
R_G	internal gate resistance (AC)	f = 1 MHz	-	0.5	1.5	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 15 A; V_{DS} = 50 V; V_{GS} = 10 V; see Figure 15 and 16	-	33	-	nC
		I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V	-	25	-	nC
Q_{GS}	gate-source charge	I_D = 15 A; V_{DS} = 50 V; V_{GS} = 10 V; see Figure 15 and 16	-	7.2	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge	I_D = 15 A; V_{DS} = 50 V; V_{GS} = 10 V; see Figure 15	-	5	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge		-	2.2	-	nC
Q_{GD}	gate-drain charge	I_D = 15 A; V_{DS} = 50 V; V_{GS} = 10 V; see Figure 15 and 16	-	10.3	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	V_{DS} = 50 V; see Figure 15 and 16	-	4.1	-	V
C_{iss}	input capacitance	V_{DS} = 50 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; see Figure 17	-	1634	-	pF
C_{oss}	output capacitance		-	132	-	pF
C_{rss}	reverse transfer capacitance		-	85	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 50 V; R_L = 3.3 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 4.7 Ω; T_j = 25 °C	-	15	-	ns
t_r	rise time		-	14	-	ns
$t_{d(off)}$	turn-off delay time		-	33	-	ns
t_f	fall time		-	12	-	ns
Source-drain diode						

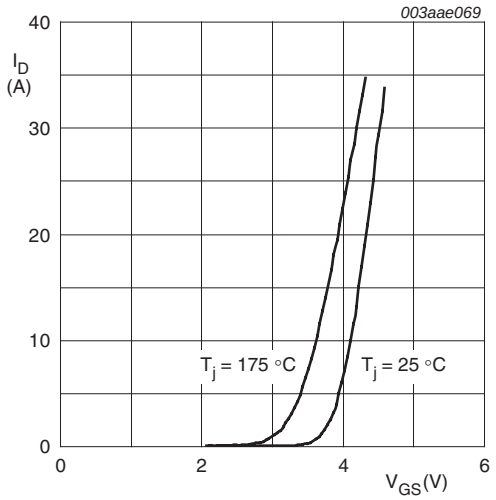
Table 6. Characteristics *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{SD}	source-drain voltage	I_S = 15 A; V_{GS} = 0 V; T_j = 25 °C; see Figure 4	-	0.8	1.2	V
t_{rr}	reverse recovery time	I_S = 5 A; dI_S/dt = 100 A/µs; V_{GS} = 0 V; V_{DS} = 50 V	-	48.7	-	ns
Q_r	recovered charge		-	95.7	-	nC



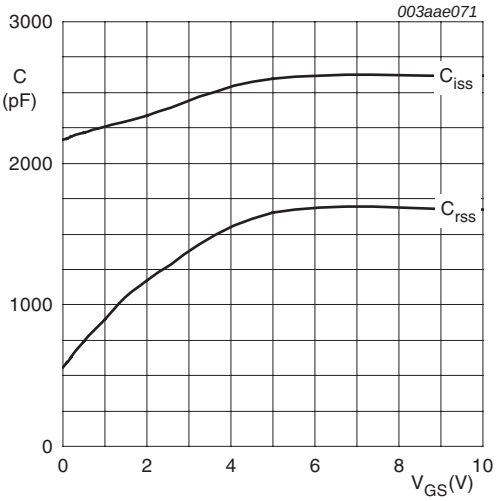
$T_j = 25\,°C; V_{DS} = 10\,V$

Fig 6. Forward transconductance as a function of drain current; typical values



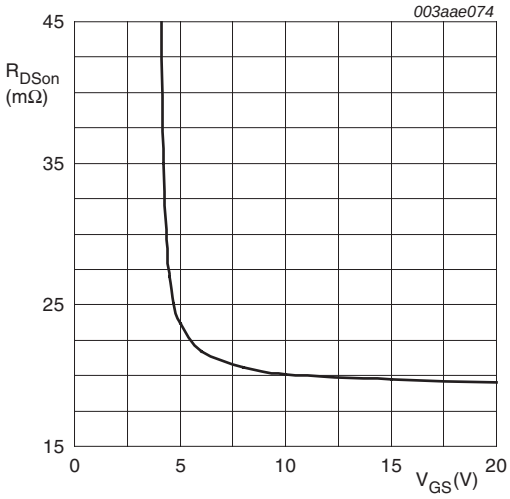
$V_{DS} > I_D \times R_{DSon}$

Fig 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values



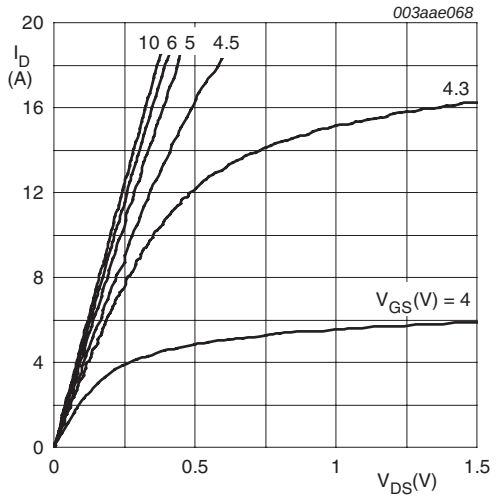
$V_{DS} = 0\,V; f = 1\,MHz$

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



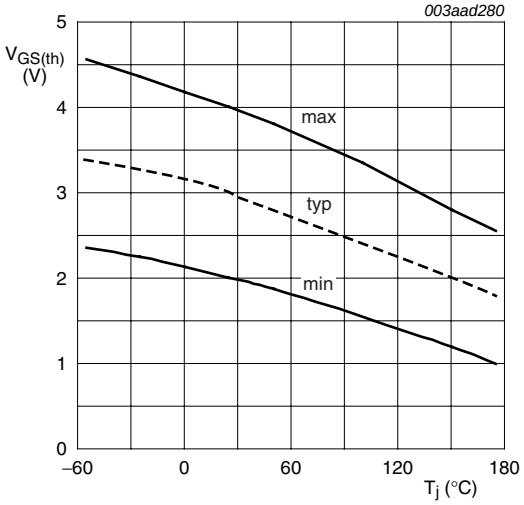
$T_j = 25\,°C; I_D = 5A$

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



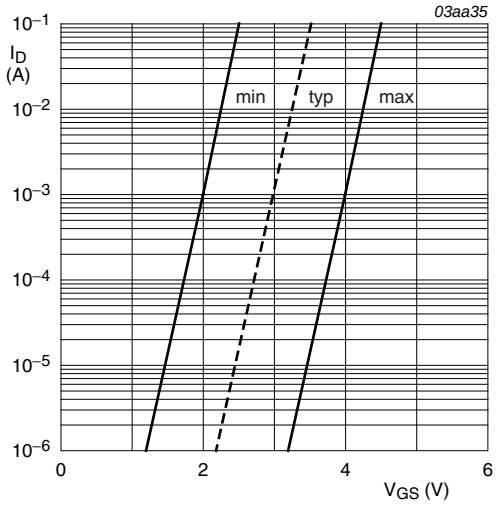
$T_j = 25\,°C$

Fig 10. Output characteristics: drain current as a function of drain-source voltage; typical values



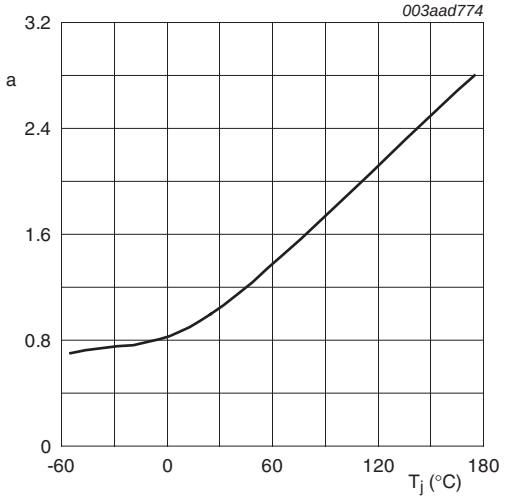
$I_D = 1\ \text{mA};\ V_{DS} = V_{GS}$

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



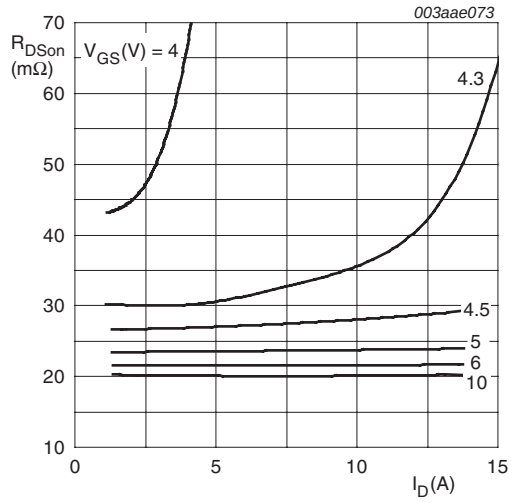
$T_j = 25\,°C; V_{DS} = 5V$

Fig 12. Sub-threshold drain current as a function of gate-source voltage



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

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



$T_j = 25\,°C$

Fig 14. Drain-source on-state resistance as a function of drain current; typical values

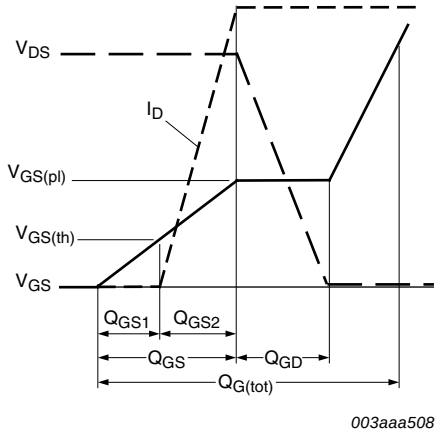
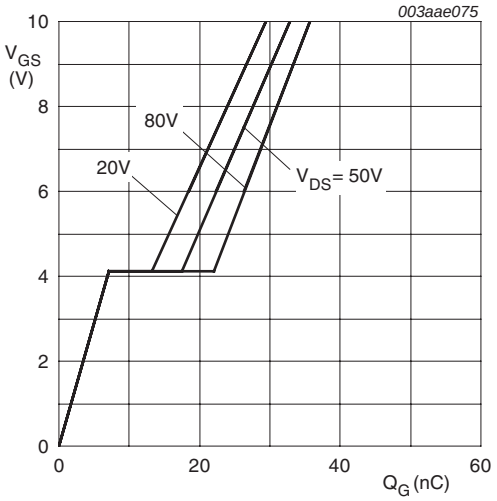
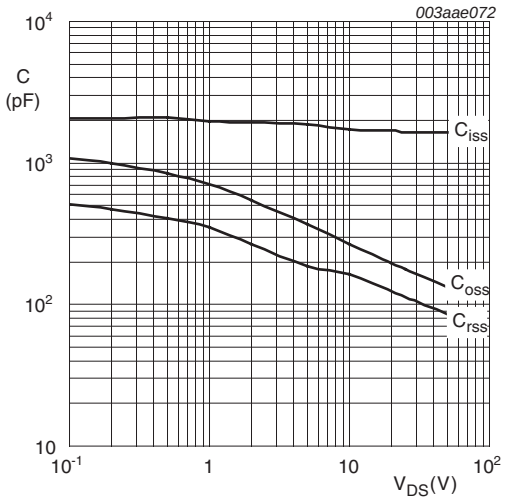


Fig 15. Gate charge waveform definitions



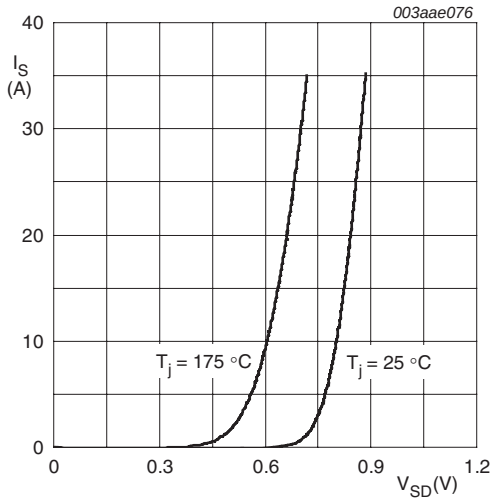
$T_j = 25\,°C; I_D = 15A$

Fig 16. Gate-source voltage as a function of gate charge; typical values



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

Fig 17. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

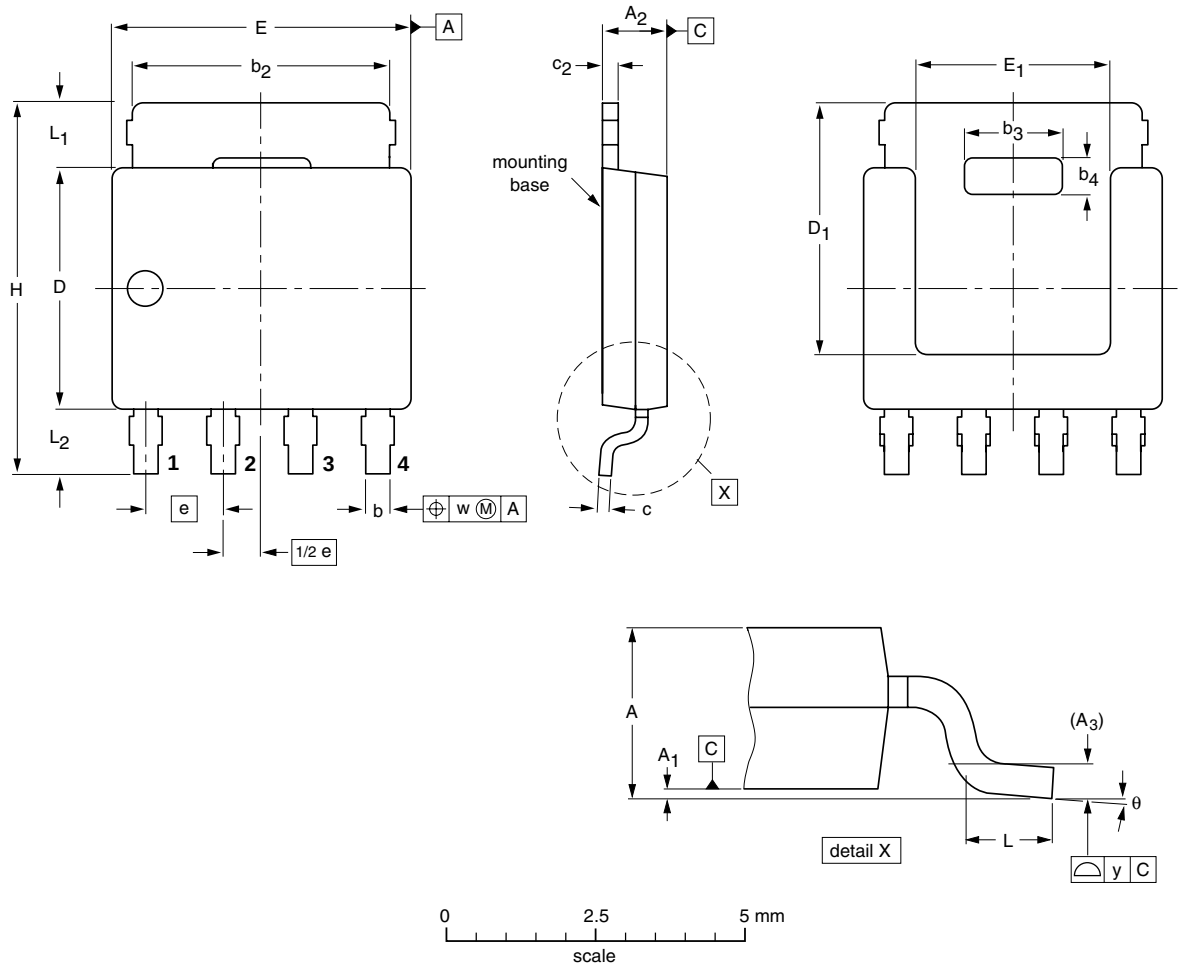


$V_{GS} = 0\,V$

Fig 18. Source current as a function of source-drain 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 19. Package outline SOT669 (LFPAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN028-100YS_2	20100330	Product data sheet	-	PSMN028-100YS_1
Modifications:	• Status changed from objective to product. • Various changes to content.			
PSMN028-100YS_1	20100210	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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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

11. Contents

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