

PSMN045-80YS

N-channel LPAK 80 V 45 mΩ standard level MOSFET

Rev. 02 — 25 October 2010

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel MOSFET in LPAK 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
- LPAK 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	-	-	24	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; see Figure 2	-	-	56	W
T _j	junction temperature		-55	-	175	°C
Static characteristics						
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 5 A; T _j = 100 °C; see Figure 13	-	-	72	mΩ
		V _{GS} = 10 V; I _D = 5 A; T _j = 25 °C	-	37	45	mΩ

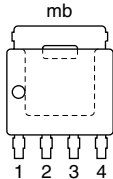
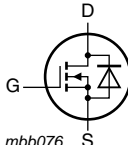


Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}; I_D = 15\text{ A};$	-	3.1	-	nC
$Q_{G(\text{tot})}$	total gate charge	$V_{DS} = 40\text{ V};$ see Figure 14 ; see Figure 15	-	12.5	-	nC
Avalanche ruggedness						
$E_{DS(\text{AL})S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25\text{ °C};$ $I_D = 22\text{ A}; V_{\text{sup}} \leq 80\text{ V};$ $R_{GS} = 50\text{ }\Omega;$ unclamped	-	-	18	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 (LPAK)

3. Ordering information

Table 3. Ordering information

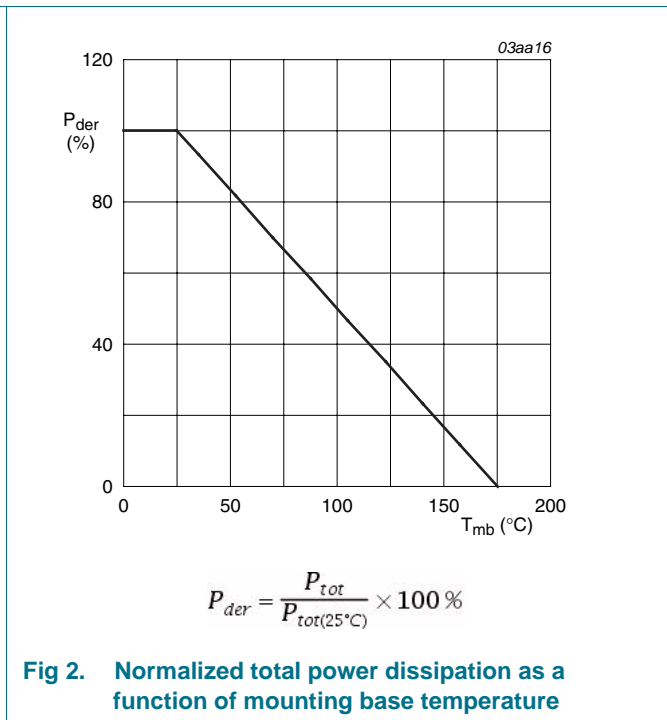
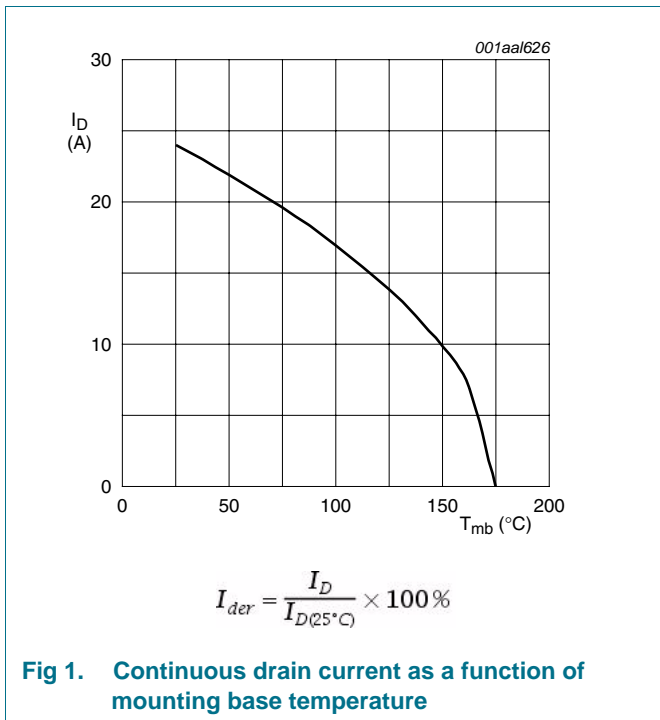
Type number	Package		Version
	Name	Description	
PSMN045-80YS	LPAK	plastic single-ended surface-mounted package (LPAK); 4 leads	SOT669

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	-	80	V
V _{DGR}	drain-gate voltage	T _j ≥ 25 °C; T _j ≤ 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	-	17	A
		V _{GS} = 10 V; T _{mb} = 25 °C	-	24	A
I _{DM}	peak drain current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C; see Figure 3	-	86	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; see Figure 2	-	56	W
T _{stg}	storage temperature		-55	175	°C
T _j	junction temperature		-55	175	°C
T _{slid(M)}	peak soldering temperature		-	260	°C
Source-drain diode					
I _S	source current	T _{mb} = 25 °C	-	24	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C	-	86	A
Avalanche ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	V _{GS} = 10 V; T _{j(init)} = 25 °C; I _D = 22 A; V _{sup} ≤ 80 V; R _{GS} = 50 Ω; unclamped	-	18	mJ



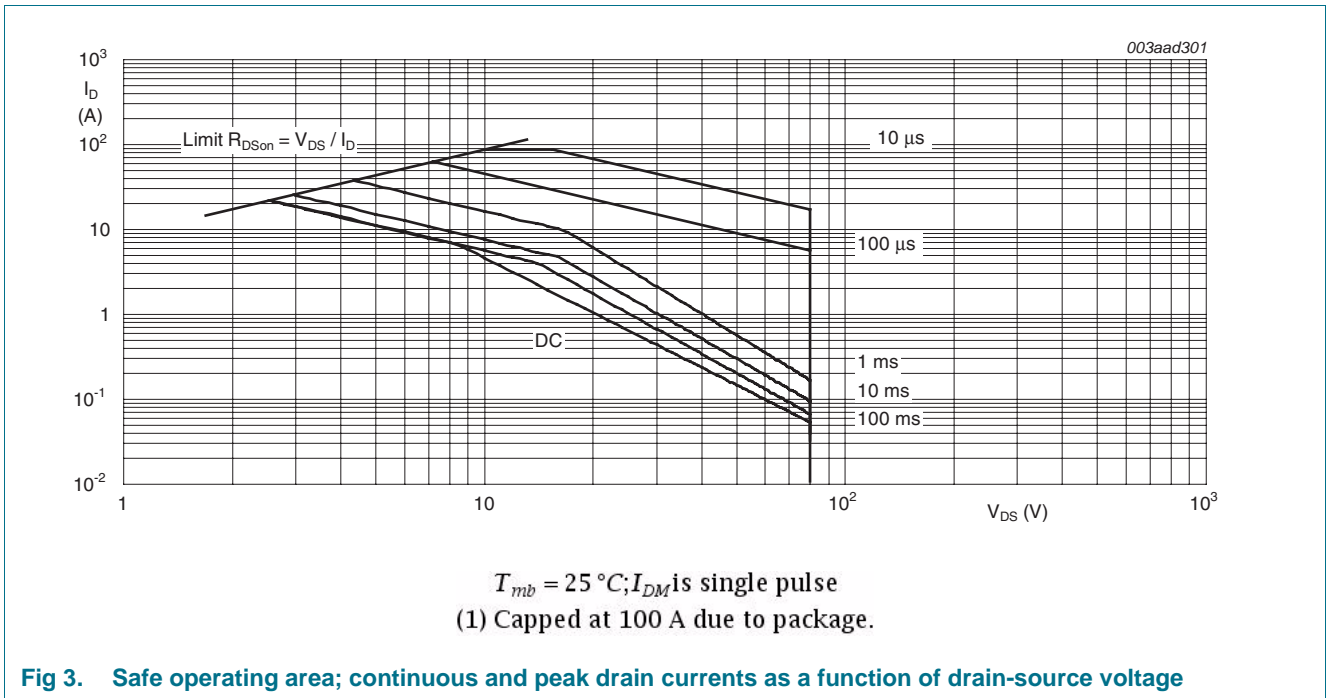
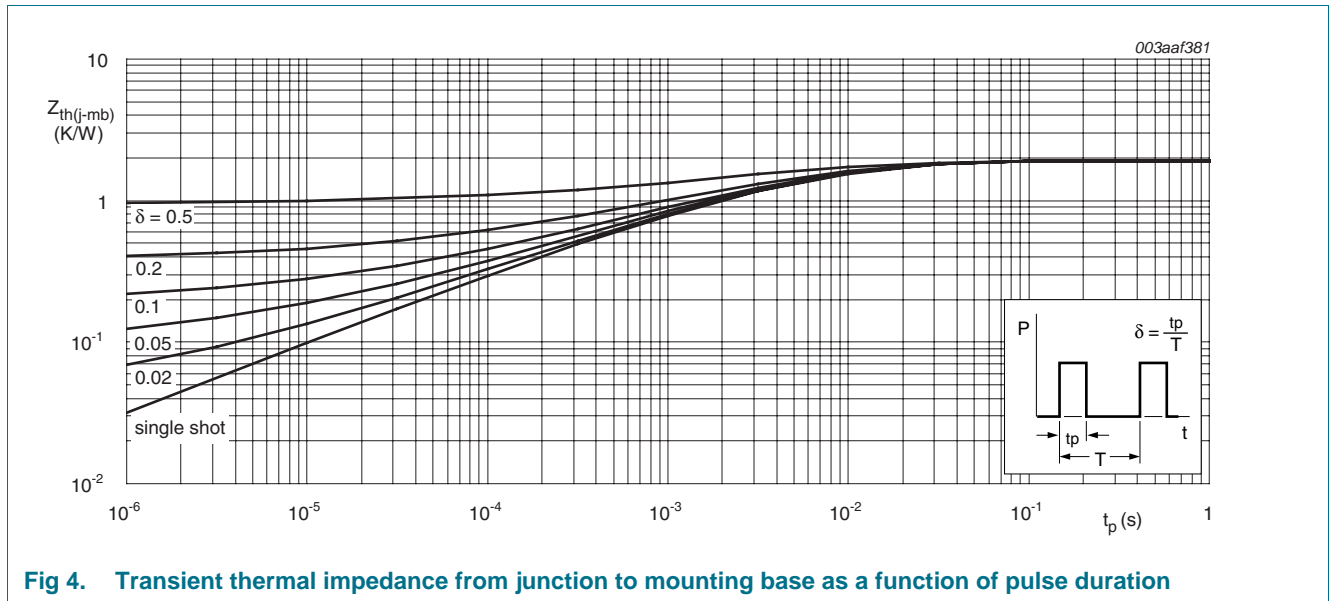


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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	-	1.9	2.7	K/W



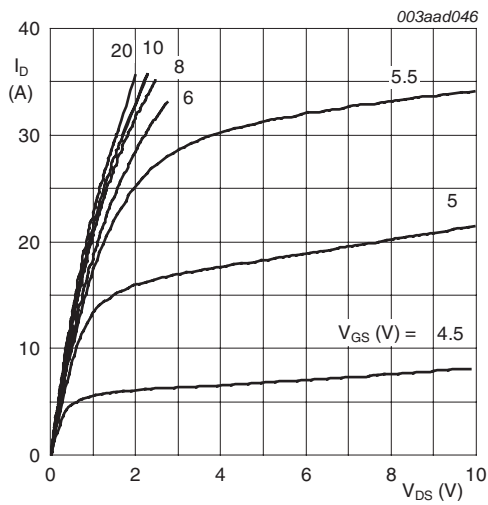
6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	73	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	80	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ C$; see Figure 11 ; see Figure 12	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ C$; see Figure 11 ; see Figure 12	-	-	4.6	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$; see Figure 12 ; see Figure 11	2	3	4	V
I_{DSS}	drain leakage current	$V_{DS} = 80 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	μA
		$V_{DS} = 80 V; V_{GS} = 0 V; T_j = 125 \text{ }^\circ C$	-	-	50	μA
I_{GSS}	gate leakage current	$V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	100	nA
		$V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10 V; I_D = 5 A; T_j = 175 \text{ }^\circ C$; see Figure 13	-	-	103	mΩ
		$V_{GS} = 10 V; I_D = 5 A; T_j = 100 \text{ }^\circ C$; see Figure 13	-	-	72	mΩ
		$V_{GS} = 10 V; I_D = 5 A; T_j = 25 \text{ }^\circ C$	-	37	45	mΩ
R_G	internal gate resistance (AC)	$f = 1 \text{ MHz}$	-	0.73	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 0 A; V_{DS} = 0 V; V_{GS} = 10 V$	-	9	-	nC
		$I_D = 15 A; V_{DS} = 40 V; V_{GS} = 10 V$; see Figure 14 ; see Figure 15	-	12.5	-	nC
Q_{GS}	gate-source charge		-	3.8	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge		-	1.9	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge	$I_D = 15 A; V_{DS} = 40 V; V_{GS} = 10 V$; see Figure 14	-	1.9	-	nC
Q_{GD}	gate-drain charge	$I_D = 15 A; V_{DS} = 40 V; V_{GS} = 10 V$; see Figure 14 ; see Figure 15	-	3.1	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 15 A; V_{DS} = 40 V$; see Figure 14	-	4.9	-	V
C_{iss}	input capacitance	$V_{DS} = 40 V; V_{GS} = 0 V; f = 1 \text{ MHz}$;	-	675	-	pF
C_{oss}	output capacitance	$T_j = 25 \text{ }^\circ C$; see Figure 17	-	79	-	pF
C_{rss}	reverse transfer capacitance		-	48	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 40 V; R_L = 2.7 \text{ } \Omega; V_{GS} = 10 V$;	-	9.2	-	ns
t_r	rise time	$R_{G(ext)} = 4.7 \text{ } \Omega$	-	4.6	-	ns
$t_{d(off)}$	turn-off delay time		-	18	-	ns
t_f	fall time		-	4.4	-	ns

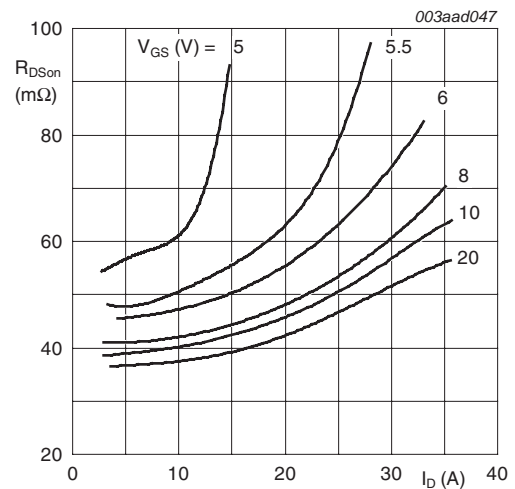
Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 15\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ °C}$; see Figure 16	-	0.82	1.2	V
t_{rr}	reverse recovery time	$I_S = 5\text{ A}$; $di_S/dt = 100\text{ A}/\mu\text{s}$;	-	32	-	ns
Q_r	recovered charge	$V_{GS} = 0\text{ V}$; $V_{DS} = 40\text{ V}$	-	42	-	nC



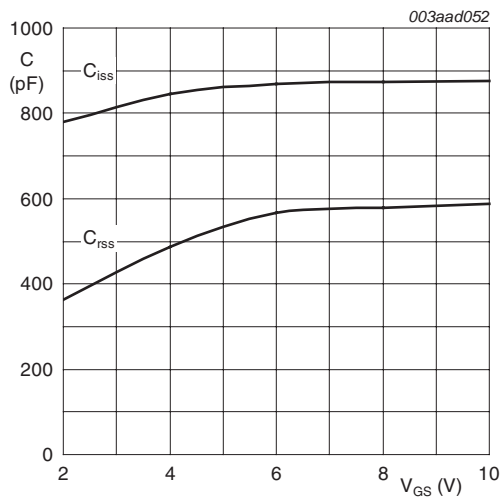
$T_j = 25\text{ °C}$; $t_p = 300\mu\text{s}$

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



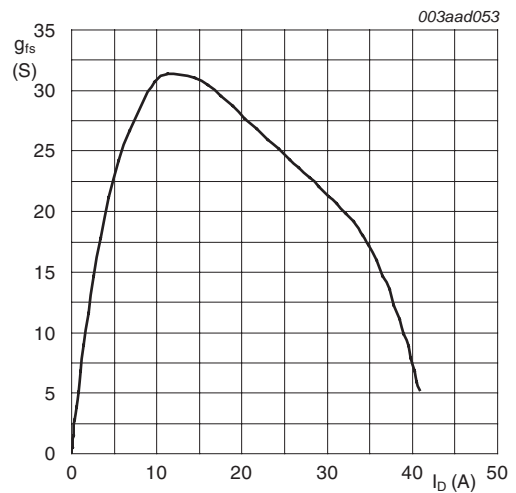
$T_j = 25\text{ °C}$; $t_p = 300\mu\text{s}$

Fig 6. Drain-source on-state resistance as a function of drain current; typical values



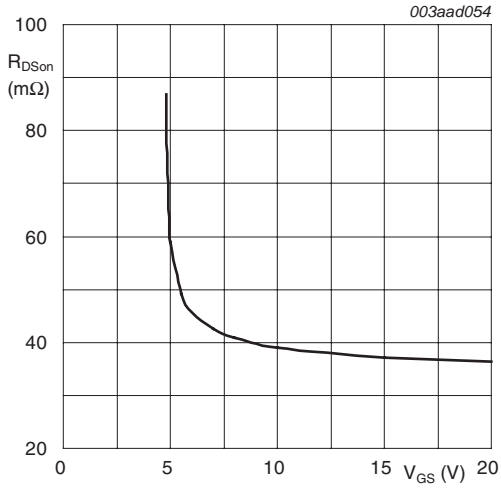
$V_{DS} = 0\text{ V}$; $f = 1\text{ MHz}$

Fig 7. Input and reverse transfer capacitances as a function of gate-source voltage; typical values



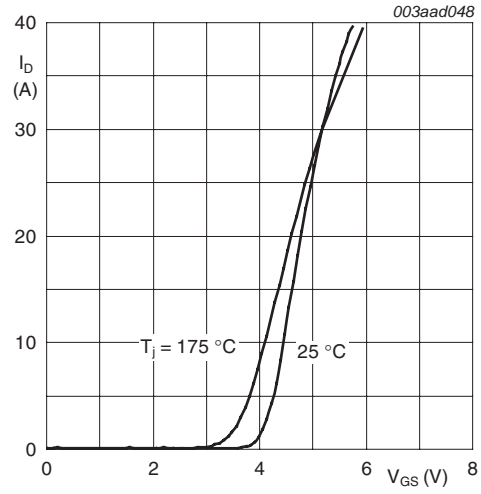
$T_j = 25\text{ °C}$; $V_{DS} = 15\text{ V}$

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



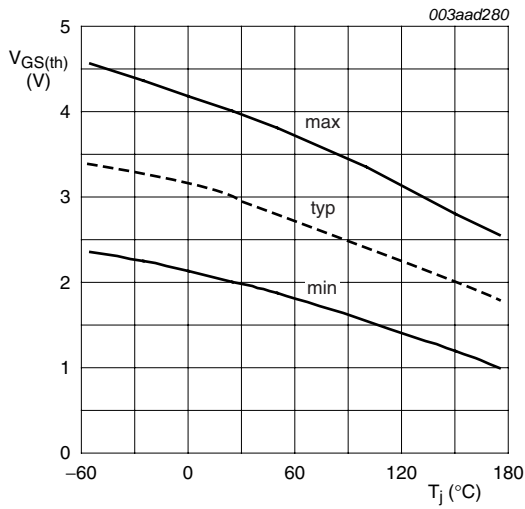
$T_j = 25^\circ C; I_D = 10A$

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



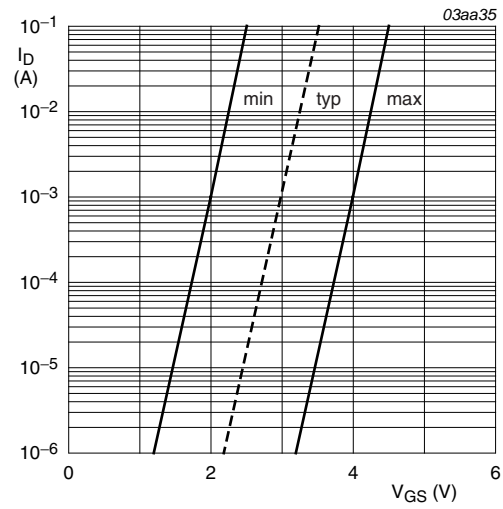
$V_{DS} = 10V$

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



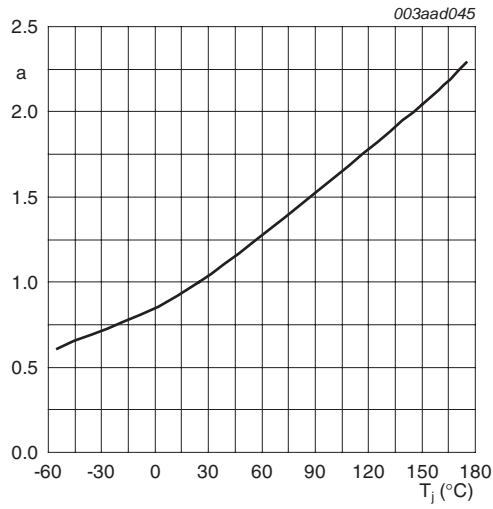
$I_D = 1 mA; V_{DS} = V_{GS}$

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



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

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



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

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

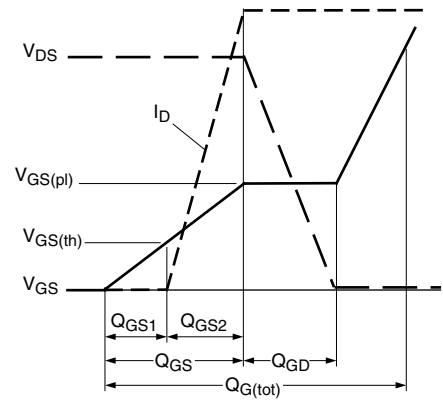
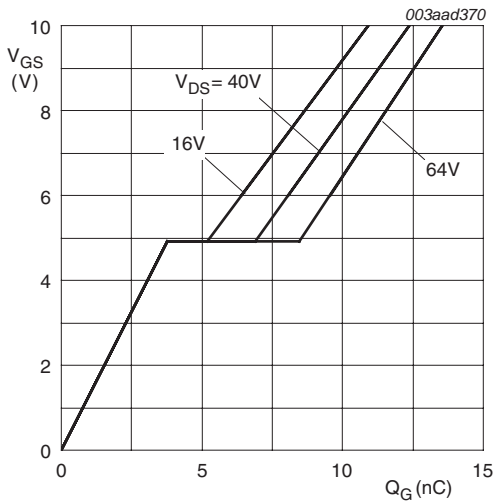
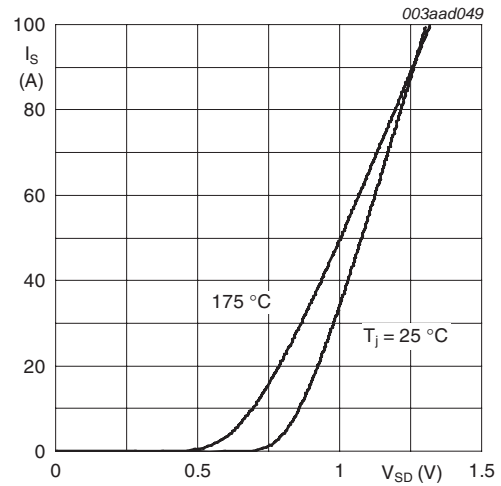


Fig 14. Gate charge waveform definitions



$T_j = 25^{\circ}\text{C}; I_D = 15\text{A}$

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



$V_{GS} = 0\text{V}$

Fig 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

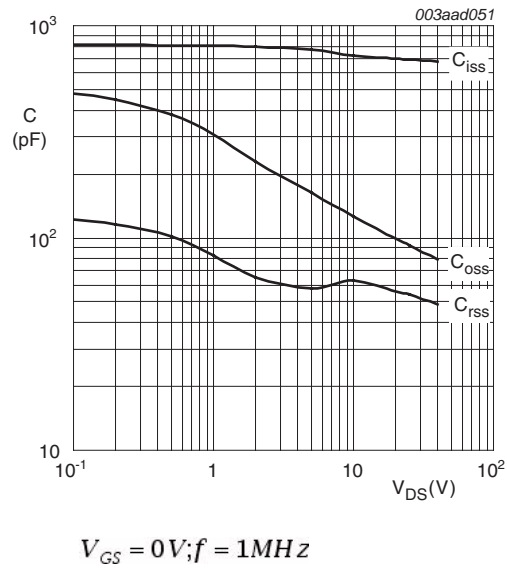


Fig 17. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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
PSMN045-80YS v.2	20101025	Product data sheet	-	PSMN045-80YS v.1
Modifications:	<ul style="list-style-type: none">• Status changed from objective to product.• Various changes to content.			
PSMN045-80YS v.1	20100319	Objective data sheet	-	-

9. Legal information

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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.
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[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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Date of release: 25 October 2010

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