

# PSMN045-80YS

N-channel LFPACK 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 LFPACK 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
- LFPACK 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 <sub>DS</sub>	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	-	80	V
I <sub>D</sub>	drain current	T <sub>mb</sub> = 25 °C; V <sub>GS</sub> = 10 V	-	-	24	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	-	56	W
T <sub>j</sub>	junction temperature		-55	-	175	°C
<b>Static characteristics</b>						
R <sub>DSon</sub>	drain-source on-state resistance	V <sub>GS</sub> = 10 V; I <sub>D</sub> = 5 A; T <sub>j</sub> = 100 °C; see <a href="#">Figure 13</a>	-	-	72	mΩ
		V <sub>GS</sub> = 10 V; I <sub>D</sub> = 5 A; T <sub>j</sub> = 25 °C	-	37	45	mΩ

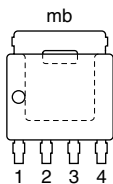
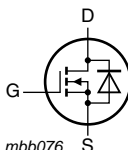


**Table 1. Quick reference data ...continued**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Dynamic characteristics</b>						
$Q_{GD}$	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 <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	12.5	-	nC
<b>Avalanche ruggedness</b>						
$E_{DS(\text{AL})S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25\text{ °C};$ $I_D = 22\text{ A}; V_{\text{sup}} \leq 80\text{ V};$ $R_{GS} = 50\text{ }\Omega; \text{ unclamped}$	-	-	18	mJ

## 2. Pinning information

**Table 2. Pinning information**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p>SOT669 (LPAK)</p>	 <p>mbb076</p>
2	S	source		
3	S	source		
4	G	gate		
mb	D	mounting base; connected to drain		

## 3. Ordering information

**Table 3. Ordering information**

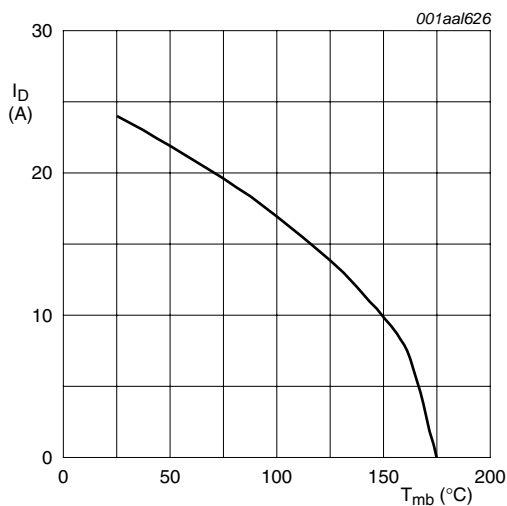
Type number	Package		Version
	Name	Description	
PSMN045-80YS	LPAK	plastic single-ended surface-mounted package (LPAK); 4 leads	SOT669

## 4. Limiting values

**Table 4. Limiting values**

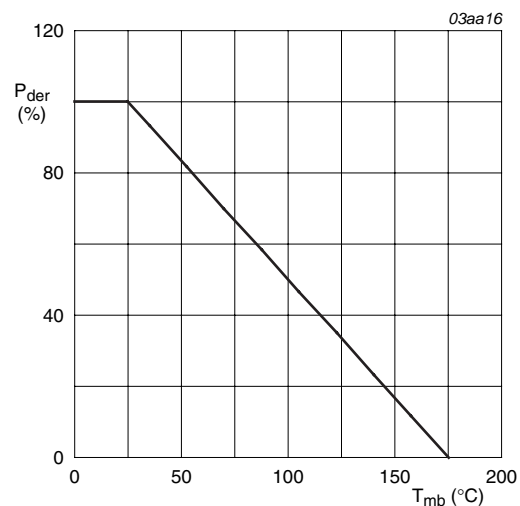
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	80	V
V <sub>DGR</sub>	drain-gate voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C; R <sub>GS</sub> = 20 kΩ	-	80	V
V <sub>GS</sub>	gate-source voltage		-20	20	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 100 °C; see <a href="#">Figure 1</a>	-	17	A
		V <sub>GS</sub> = 10 V; T <sub>mb</sub> = 25 °C	-	24	A
I <sub>DM</sub>	peak drain current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C; see <a href="#">Figure 3</a>	-	86	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>	-	56	W
T <sub>stg</sub>	storage temperature		-55	175	°C
T <sub>j</sub>	junction temperature		-55	175	°C
T <sub>slid(M)</sub>	peak soldering temperature		-	260	°C
<b>Source-drain diode</b>					
I <sub>S</sub>	source current	T <sub>mb</sub> = 25 °C	-	24	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C	-	86	A
<b>Avalanche ruggedness</b>					
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; I <sub>D</sub> = 22 A; V <sub>sup</sub> ≤ 80 V; R <sub>GS</sub> = 50 Ω; unclamped	-	18	mJ



$$I_{der} = \frac{I_D}{I_{D(25^\circ\text{C})}} \times 100\%$$

**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**

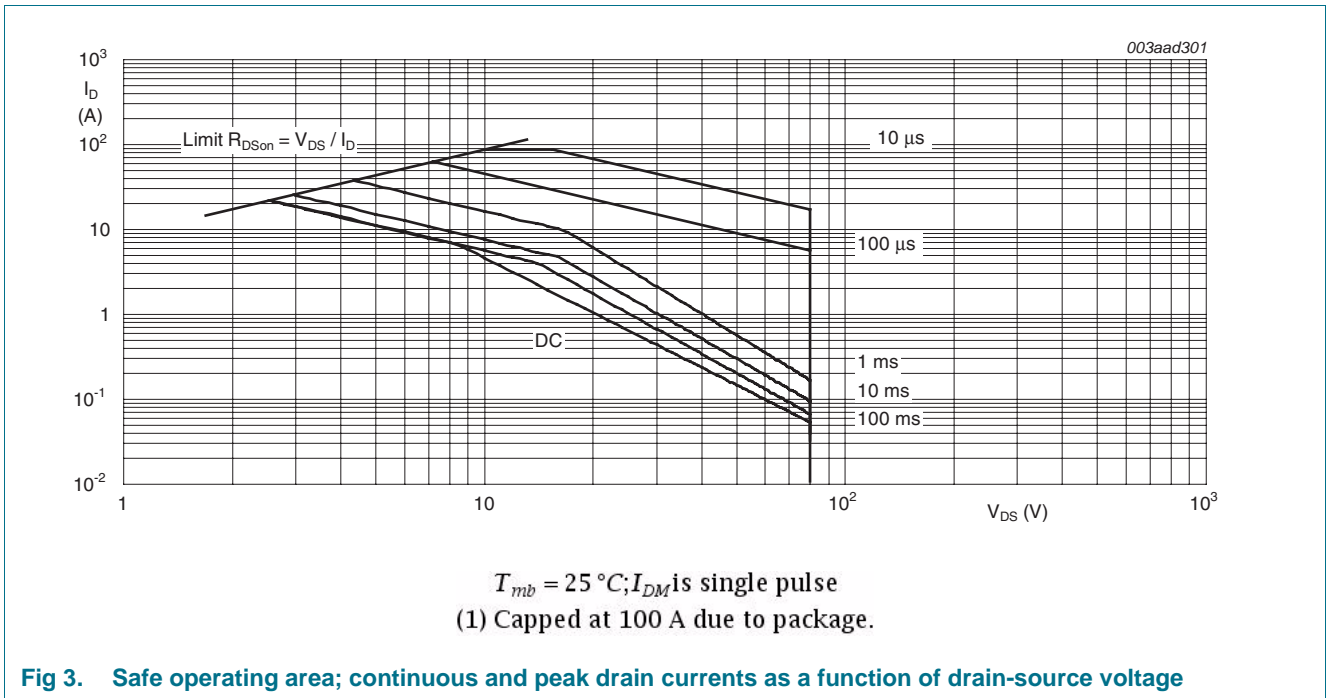
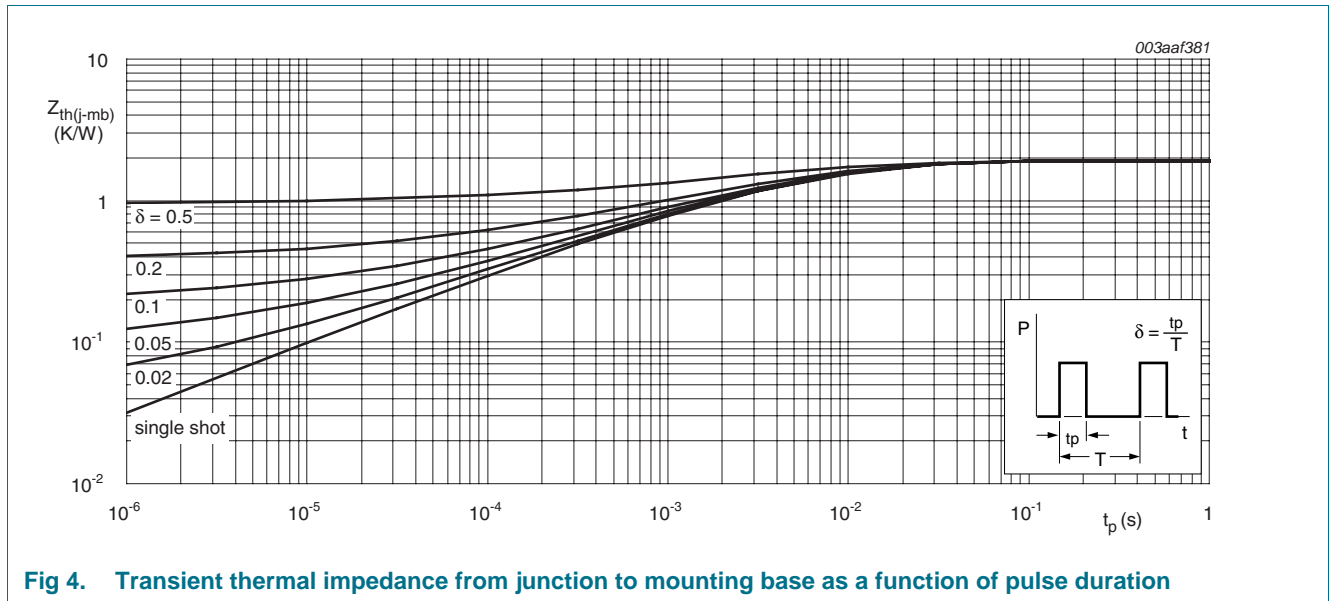


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

### 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 <a href="#">Figure 4</a>	-	1.9	2.7	K/W



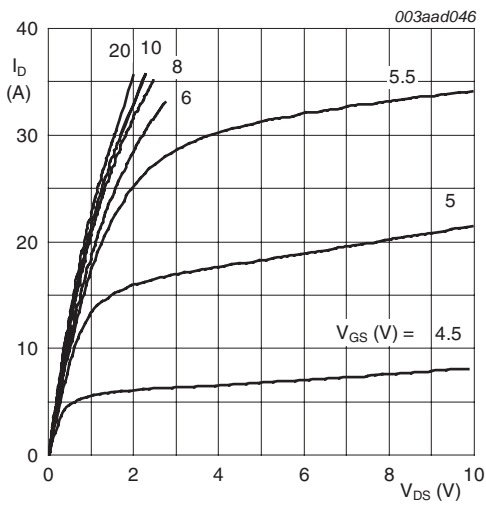
## 6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	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 <a href="#">Figure 11</a> ; see <a href="#">Figure 12</a>	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ C$ ; see <a href="#">Figure 11</a> ; see <a href="#">Figure 12</a>	-	-	4.6	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$ ; see <a href="#">Figure 12</a> ; see <a href="#">Figure 11</a>	2	3	4	V
$I_{DSS}$	drain leakage current	$V_{DS} = 80 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
		$V_{DS} = 80 V; V_{GS} = 0 V; T_j = 125 \text{ }^\circ C$	-	-	50	$\mu A$
$I_{GSS}$	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
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 V; I_D = 5 A; T_j = 175 \text{ }^\circ C$ ; see <a href="#">Figure 13</a>	-	-	103	mΩ
		$V_{GS} = 10 V; I_D = 5 A; T_j = 100 \text{ }^\circ C$ ; see <a href="#">Figure 13</a>	-	-	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
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	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 <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	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 <a href="#">Figure 14</a>	-	1.9	-	nC
$Q_{GD}$	gate-drain charge	$I_D = 15 A; V_{DS} = 40 V; V_{GS} = 10 V$ ; see <a href="#">Figure 14</a> ; see <a href="#">Figure 15</a>	-	3.1	-	nC
$V_{GS(pl)}$	gate-source plateau voltage	$I_D = 15 A; V_{DS} = 40 V$ ; see <a href="#">Figure 14</a>	-	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 <a href="#">Figure 17</a>	-	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

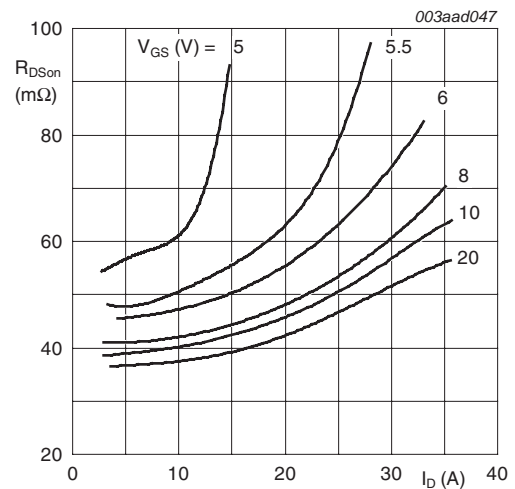
Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 15\text{ A}$ ; $V_{GS} = 0\text{ V}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 16</a>	-	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



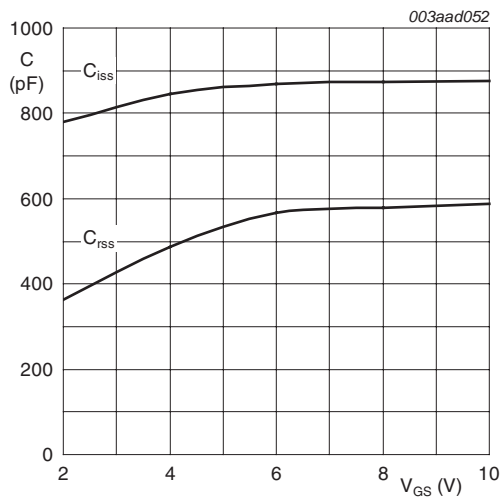
$T_j = 25\text{ °C}$ ;  $t_p = 300\mu\text{s}$

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



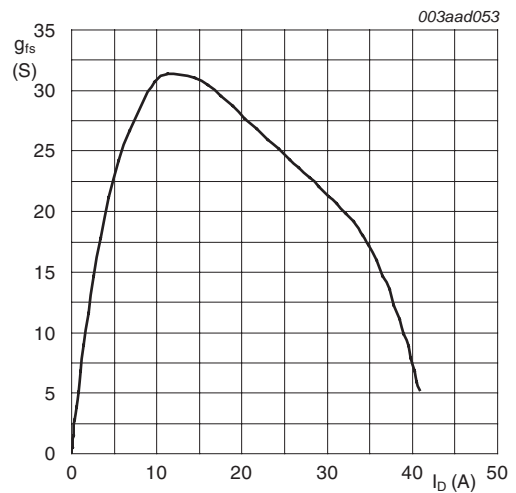
$T_j = 25\text{ °C}$ ;  $t_p = 300\mu\text{s}$

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



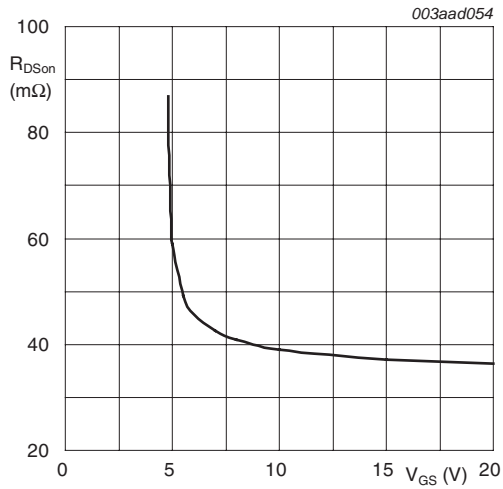
$V_{DS} = 0\text{ V}$ ;  $f = 1\text{ MHz}$

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



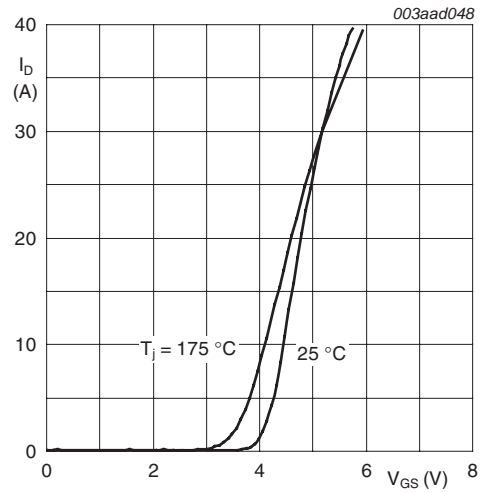
$T_j = 25\text{ °C}$ ;  $V_{DS} = 15\text{ V}$

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



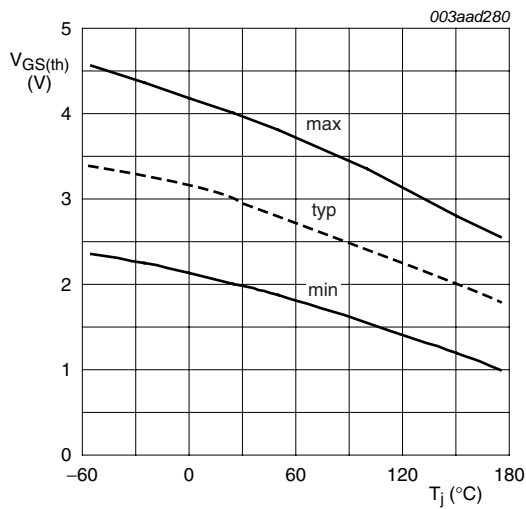
$T_j = 25\text{ }^\circ\text{C}; I_D = 10\text{ A}$

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



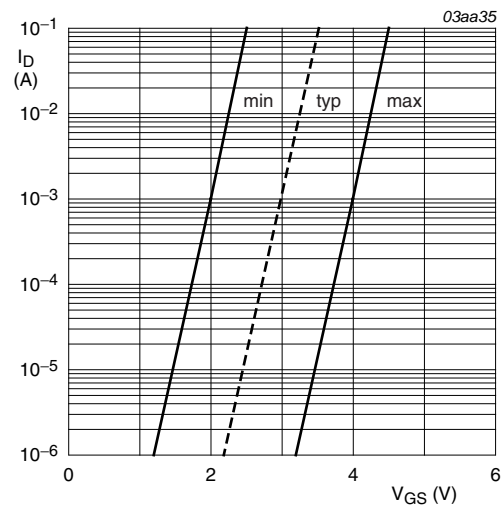
$V_{DS} = 10\text{ V}$

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



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

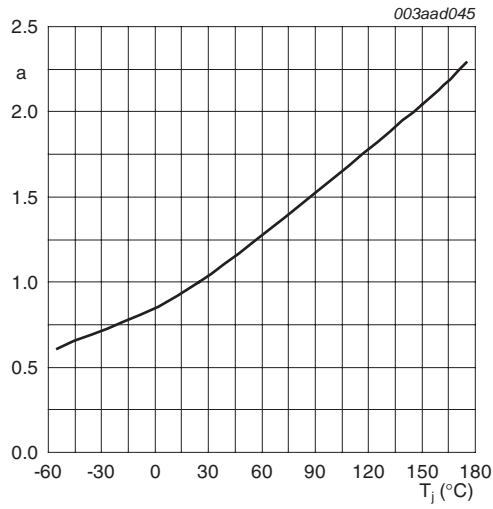
Fig 11. Gate-source threshold voltage as a function of junction temperature



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

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

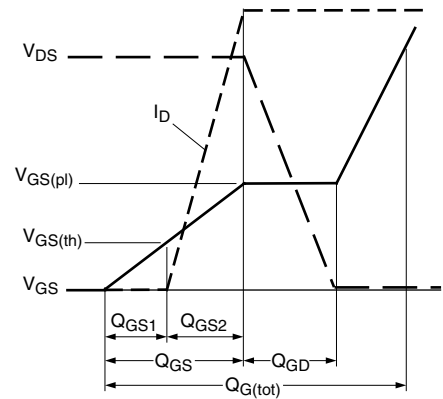
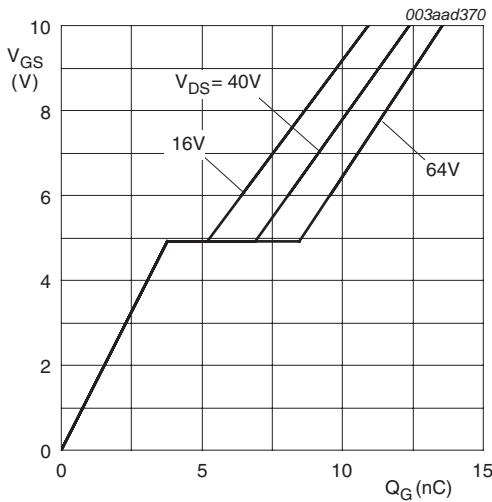
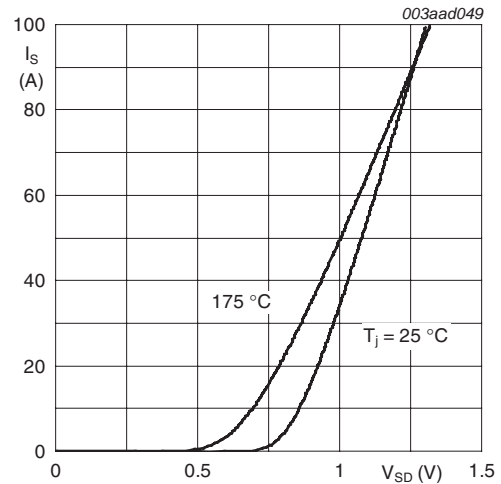


Fig 14. Gate charge waveform definitions



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

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

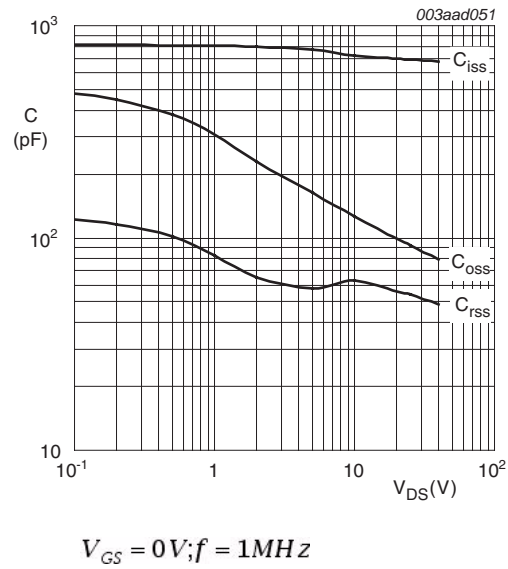


Fig 17. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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"><li>• Status changed from objective to product.</li><li>• Various changes to content.</li></ul>			
PSMN045-80YS v.1	20100319	Objective data sheet	-	-

## 9. Legal information

### 9.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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