



# PSMN014-80YL

N-channel 80 V, 14 mΩ logic level MOSFET in LFPAK56

14 April 2016

Product data sheet

## 1. General description

Logic level N-channel MOSFET in an LFPAK56 (Power SO8) package using TrenchMOS technology. This product is designed and qualified for use in a wide range of power supply & motor control equipment.

## 2. Features and benefits

- Advanced TrenchMOS provides low  $R_{DSon}$  and low gate charge
- Logic level gate operation
- Avalanche rated, 100% tested
- LFPAK provides maximum power density in a Power SO8 package

## 3. Applications

- Synchronous rectification in power supply equipment
- Chargers & adaptors with  $V_{out} < 10$  V
- Fast charge & USB-PD applications
- Battery powered motor control
- LED lighting & TV backlight

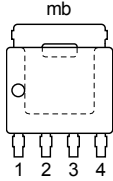
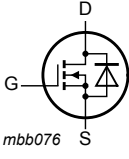
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	-	80	V
$I_D$	drain current	$V_{GS} = 5\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 1</a>	-	-	62	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; <a href="#">Fig. 2</a>	-	-	147	W
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 5\text{ V}$ ; $I_D = 15\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	12.2	15	mΩ
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$I_D = 15\text{ A}$ ; $V_{DS} = 64\text{ V}$ ; $V_{GS} = 5\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>	-	8.7	-	nC

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p><b>LFAK56; Power-SO8 (SOT669)</b></p>	
2	S	source		
3	S	source		
4	G	gate		
mb	D	mounting base; connected to drain		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN014-80YL	LFAK56; Power-SO8	Plastic single-ended surface-mounted package (LFAK56; Power-SO8); 4 leads	SOT669

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN014-80YL	014L80

## 8. Limiting values

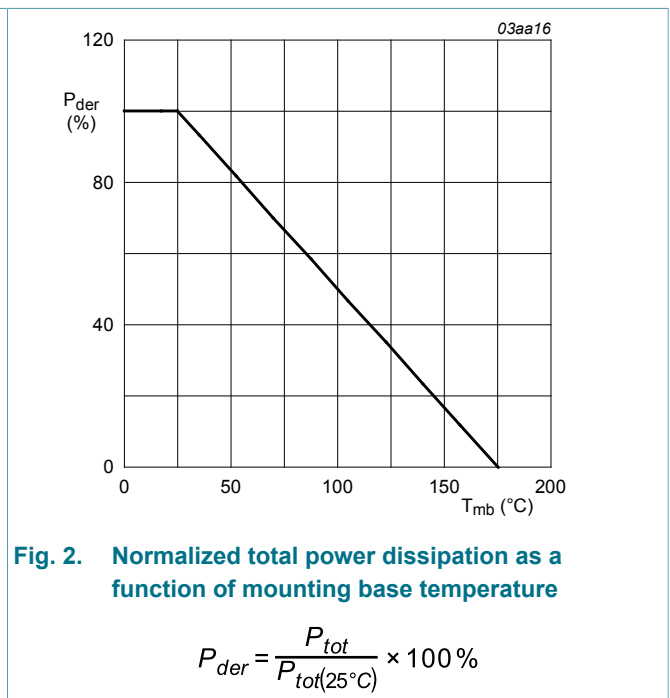
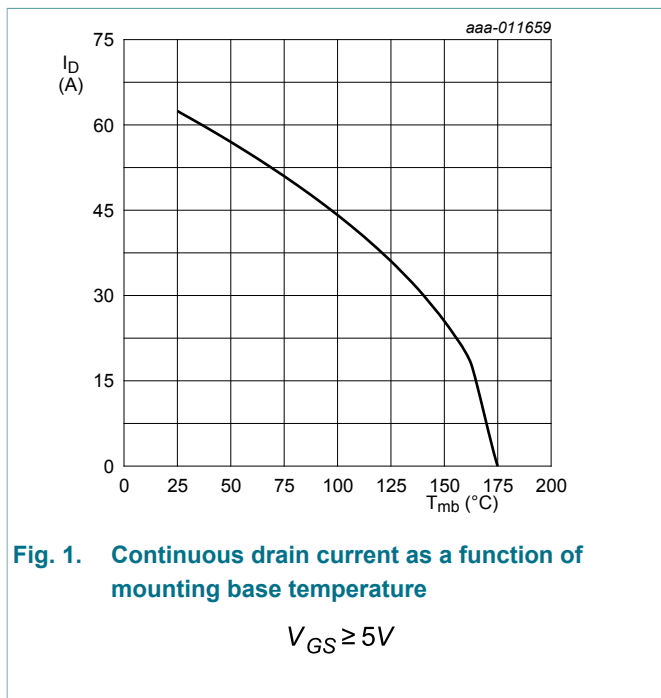
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	80	V
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	80	V
$V_{GS}$	gate-source voltage		-20	20	V
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; Fig. 2	-	147	W
$I_D$	drain current	$V_{GS} = 5\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; Fig. 1	-	62	A
		$V_{GS} = 5\text{ V}$ ; $T_{mb} = 100\text{ °C}$ ; Fig. 1	-	44	A
$I_{DM}$	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$ ; Fig. 4	-	250	A
$T_{stg}$	storage temperature		-55	175	°C

Symbol	Parameter	Conditions	Min	Max	Unit
$T_j$	junction temperature		-55	175	°C
<b>Source-drain diode</b>					
$I_S$	source current	$T_{mb} = 25\text{ °C}$	-	62	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; $T_{mb} = 25\text{ °C}$	-	250	A
<b>Avalanche ruggedness</b>					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 62\text{ A}$ ; $V_{sup} \leq 80\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ ; $V_{GS} = 5\text{ V}$ ; $T_{j(\text{init})} = 25\text{ °C}$ ; unclamped; <a href="#">Fig. 3</a>	[1][2]	-	79.6 mJ

- [1] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.
- [2] Refer to application note AN10273 for further information.



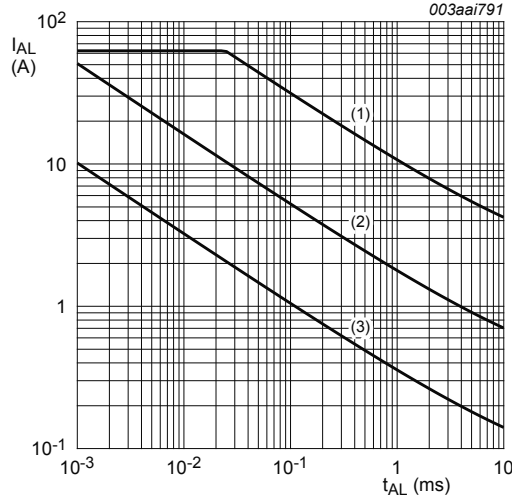


Fig. 3. Avalanche rating; avalanche current as a function of avalanche time

(1)  $T_{j(init)} = 25^{\circ}\text{C}$ ; (2)  $T_{j(init)} = 150^{\circ}\text{C}$ ; (3) Repetitive Avalanche

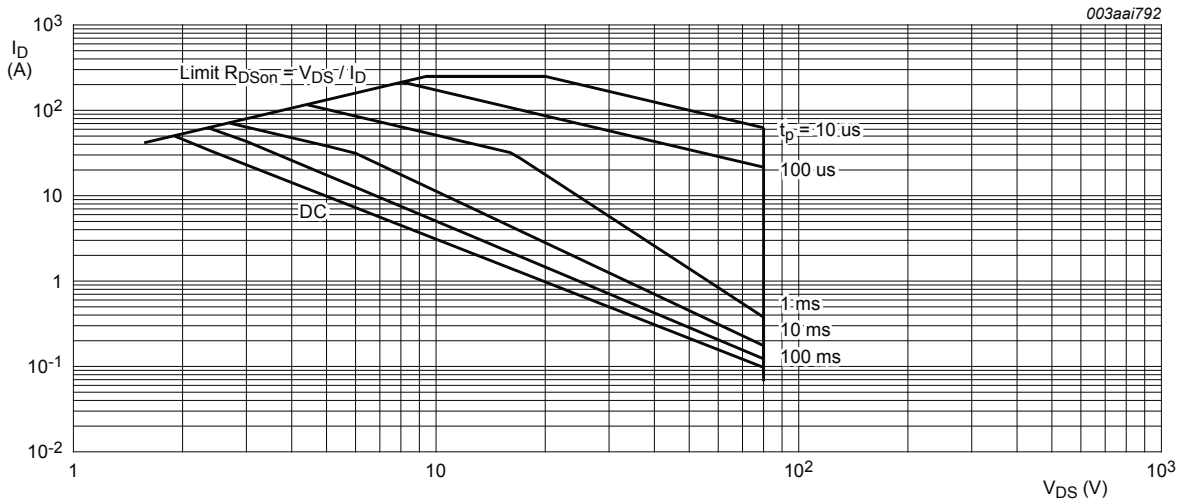


Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25^{\circ}\text{C}$ ;  $I_{DM}$  is a single pulse

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 5	-	-	1.02	K/W

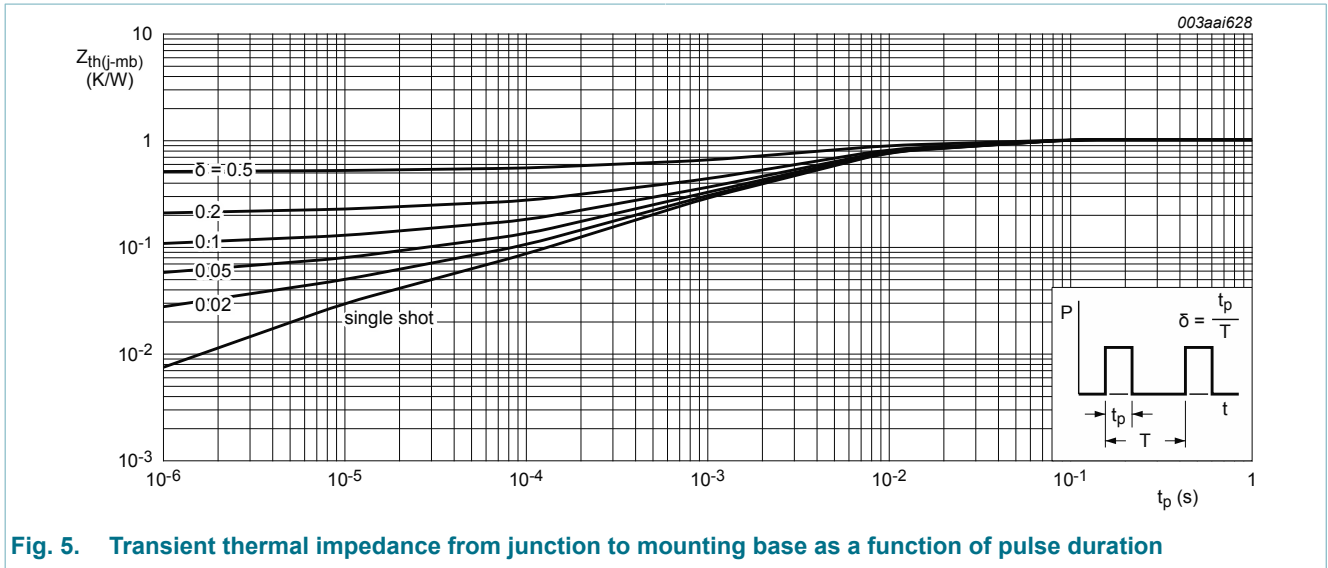


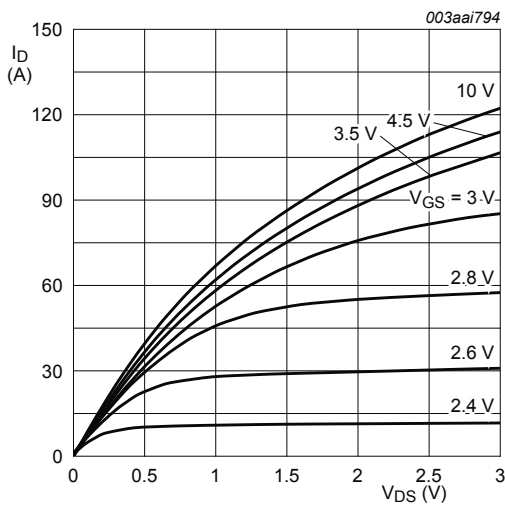
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

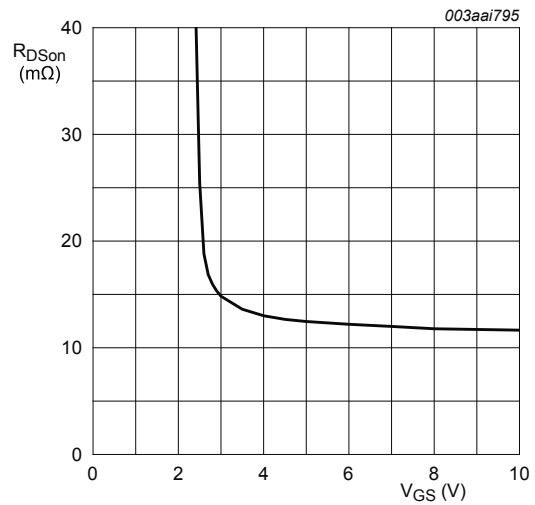
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	80	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	72	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C$ ; <a href="#">Fig. 9</a> ; <a href="#">Fig. 10</a>	1.4	1.7	2.1	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$ ; <a href="#">Fig. 9</a>	-	-	2.45	V
		$I_D = 1 \text{ mA}; V_{DS}=V_{GS}; T_j = 175 \text{ }^\circ C$ ; <a href="#">Fig. 9</a>	0.5	-	-	V
$I_{DSS}$	drain leakage current	$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.25	10	$\mu A$
		$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ C$	-	-	500	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 16 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
		$V_{GS} = -16 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 5 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ }^\circ C$ ; <a href="#">Fig. 11</a>	-	12.2	15	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 15 \text{ A}; T_j = 25 \text{ }^\circ C$ ; <a href="#">Fig. 11</a>	-	11.3	14	mΩ
		$V_{GS} = 5 \text{ V}; I_D = 15 \text{ A}; T_j = 175 \text{ }^\circ C$ ; <a href="#">Fig. 11</a> ; <a href="#">Fig. 12</a>	-	-	38	mΩ
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 15 \text{ A}; V_{DS} = 64 \text{ V}; V_{GS} = 5 \text{ V}; T_j = 25 \text{ }^\circ C$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>	-	28.9	-	nC
		$I_D = 15 \text{ A}; V_{DS} = 64 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ C$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>	-	56.9	-	nC

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$Q_{GS}$	gate-source charge	$I_D = 15\text{ A}; V_{DS} = 64\text{ V}; V_{GS} = 5\text{ V};$	-	8.1	-	nC
$Q_{GD}$	gate-drain charge	$T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>	-	8.7	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 25\text{ V}; V_{GS} = 0\text{ V}; f = 1\text{ MHz};$	-	3479	4640	pF
$C_{oss}$	output capacitance	$T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 15</a>	-	236	283	pF
$C_{rss}$	reverse transfer capacitance		-	114	156	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 60\text{ V}; R_L = 4\text{ }^\Omega; V_{GS} = 5\text{ V};$	-	15.3	-	ns
$t_r$	rise time	$R_{G(ext)} = 5\text{ }^\Omega; T_j = 25\text{ }^\circ\text{C}$	-	24.6	-	ns
$t_{d(off)}$	turn-off delay time		-	45.3	-	ns
$t_f$	fall time		-	24.7	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 15\text{ A}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 16</a>	-	0.8	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20\text{ A}; di/dt = -100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V};$	-	25.8	-	ns
$Q_r$	recovered charge	$V_{DS} = 25\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	29.3	-	nC



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

**Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values**



**Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values**

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

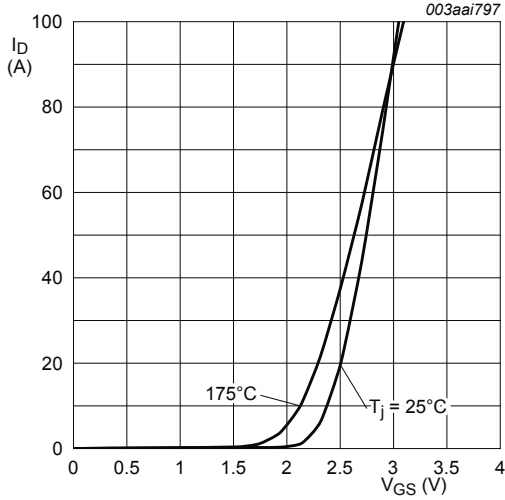


Fig. 8. Transfer characteristics; drain current as a function of gate-source voltage; typical values

$V_{DS} = 10V$

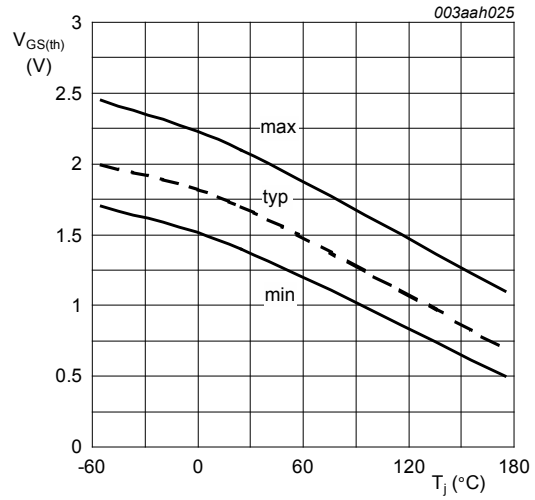


Fig. 9. Gate-source threshold voltage as a function of junction temperature

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

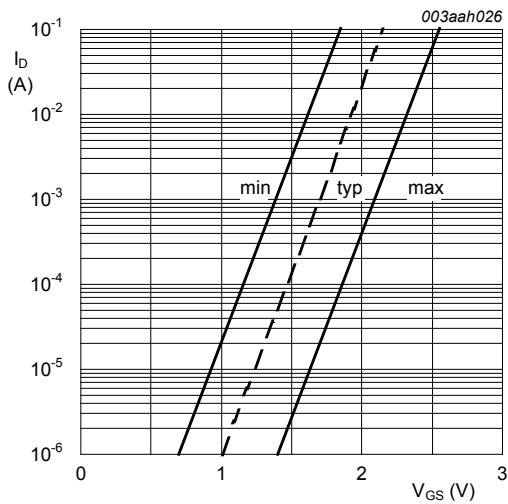


Fig. 10. Sub-threshold drain current as a function of gate-source voltage

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

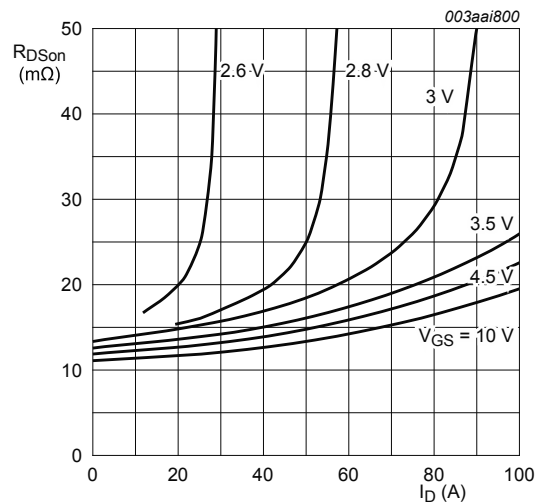


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

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

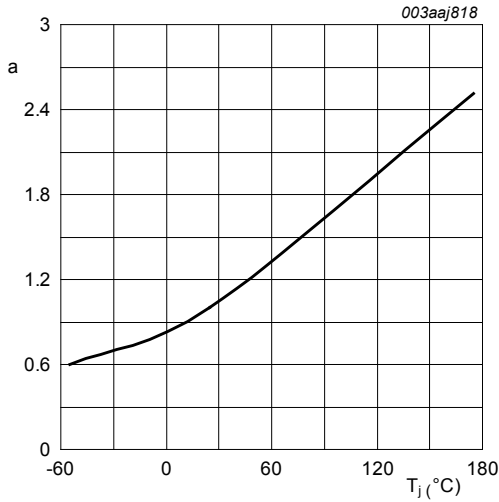


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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

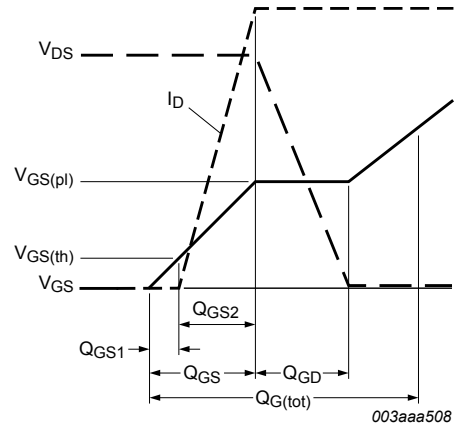


Fig. 13. Gate charge waveform definitions

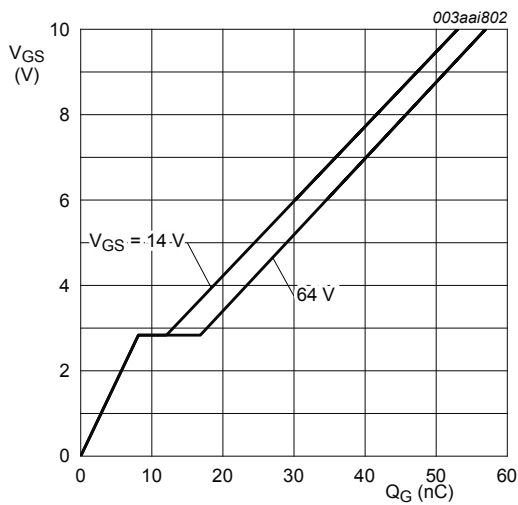


Fig. 14. Gate-source voltage as a function of gate charge; typical values

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

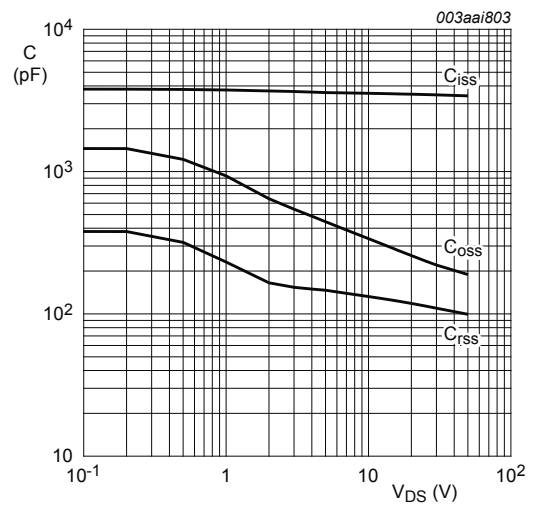


Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

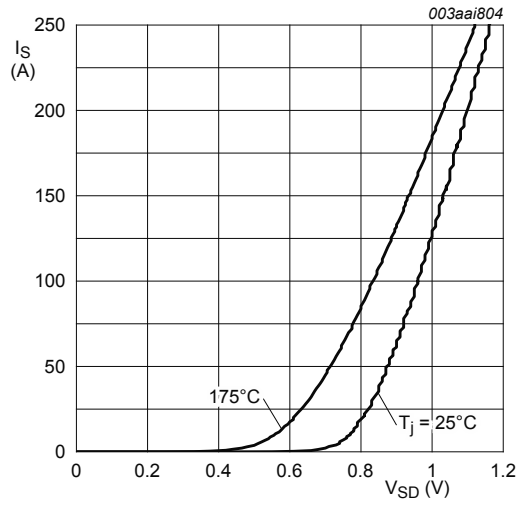


Fig. 16. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

$$V_{GS} = 0V$$

### 11. Package outline

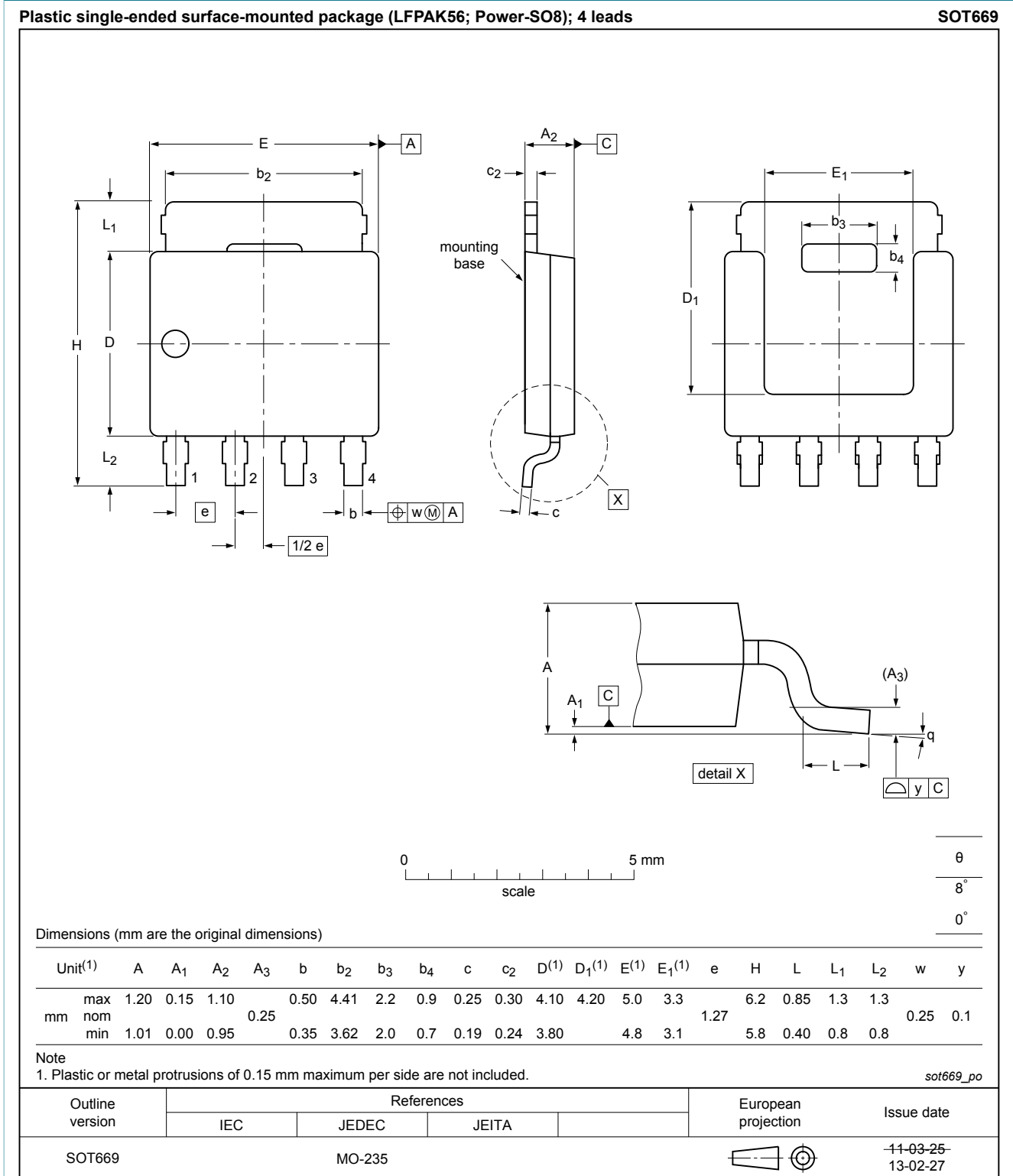


Fig. 17. Package outline LPAK56; Power-SO8 (SOT669)

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Document status [1][2]	Product status [3]	Definition
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Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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Date of release: 14 April 2016