



# BUK7K45-100E

Dual N-channel 100 V, 37.6 mΩ standard level MOSFET

2 September 2015

Product data sheet

## 1. General description

Dual Standard level N-channel MOSFET in an LFPAK56D (Dual Power-SO8) package using TrenchMOS technology. This product has been designed and qualified to AEC Q101 standard for use in high performance automotive applications.

## 2. Features and benefits

- Dual MOSFET
- Q101 Compliant
- Repetitive avalanche rated
- Suitable for thermally demanding environments due to 175 °C rating
- True standard level gate with  $V_{GS(th)}$  rating of greater than 1 V at 175 °C

## 3. Applications

- 12 V, 24 V and 48 V Automotive systems
- Motors, lamps and solenoid control
- Transmission control
- Ultra high performance power switching

## 4. Quick reference data

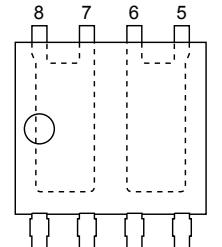
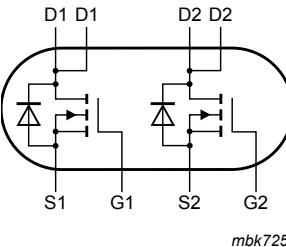
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25 \text{ }^\circ\text{C}$ ; $T_j \leq 175 \text{ }^\circ\text{C}$		-	-	100	V
$I_D$	drain current	$V_{GS} = 10 \text{ V}$ ; $T_{mb} = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 2</a>		-	-	21.4	A
$P_{tot}$	total power dissipation	$T_{mb} = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a>		-	-	53	W
<b>Static characteristics FET1 and FET2</b>							
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}$ ; $I_D = 5 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>		-	30	37.6	mΩ
<b>Dynamic characteristics FET1 and FET2</b>							
$Q_{GD}$	gate-drain charge	$I_D = 5 \text{ A}$ ; $V_{DS} = 80 \text{ V}$ ; $V_{GS} = 10 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 13</a> ; <a href="#">Fig. 14</a>		-	9.7	-	nC

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## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source1		
2	G1	gate1		
3	S2	source2		
4	G2	gate2		
5	D2	drain2		
6	D2	drain2		
7	D1	drain1		
8	D1	drain1	 LFPAK56D (SOT1205)	

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK7K45-100E	LFPAK56D	Plastic single ended surface mounted package (LFPAK56D); 8 leads	SOT1205

## 7. Marking

Table 4. Marking codes

Type number	Marking code
BUK7K45-100E	74510E

## 8. Limiting values

Table 5. Limiting values

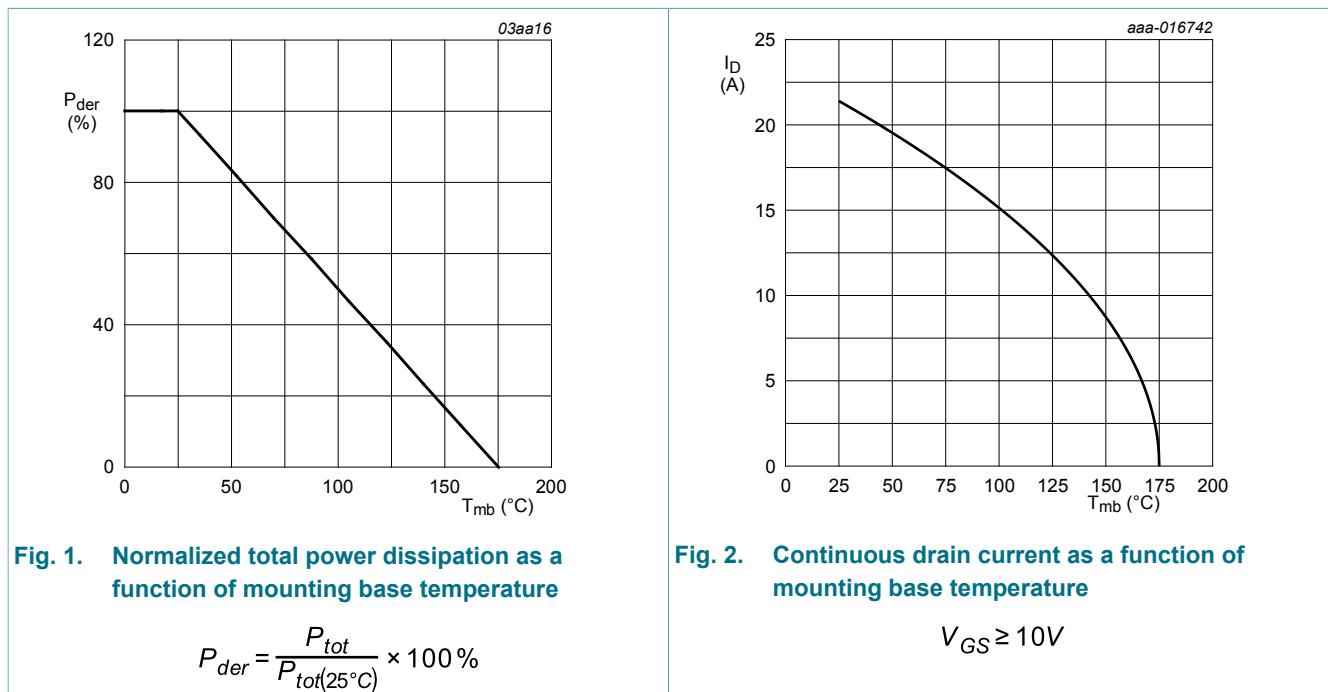
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25^\circ\text{C}$ ; $T_j \leq 175^\circ\text{C}$	-	100	V
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	100	V
$V_{GS}$	gate-source voltage	$T_j \leq 175^\circ\text{C}$ ; DC	-20	20	V
$P_{tot}$	total power dissipation	$T_{mb} = 25^\circ\text{C}$ ; <a href="#">Fig. 1</a>	-	53	W
$I_D$	drain current		-	21.4	A
	$T_{mb} = 100^\circ\text{C}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Fig. 2</a>	-	15	A	
$I_{DM}$	peak drain current	$T_{mb} = 25^\circ\text{C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; <a href="#">Fig. 3</a>	-	84	A

Symbol	Parameter	Conditions		Min	Max	Unit
T <sub>stg</sub>	storage temperature			-55	175	°C
T <sub>j</sub>	junction temperature			-55	175	°C
T <sub>sld(M)</sub>	peak soldering temperature			-	260	°C
<b>Source-drain diode FET1 and FET2</b>						
I <sub>S</sub>	source current	T <sub>mb</sub> = 25 °C		-	21.4	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 µs; T <sub>mb</sub> = 25 °C		-	84	A
<b>Avalanche Ruggedness FET1 and FET2</b>						
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	I <sub>D</sub> = 21.4 A; V <sub>sup</sub> ≤ 100 V; R <sub>GS</sub> = 50 Ω; V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; unclamped; <a href="#">Fig. 4</a>	[1][2]	-	46	mJ

[1] Refer to application note AN10273 for further information

[2] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C



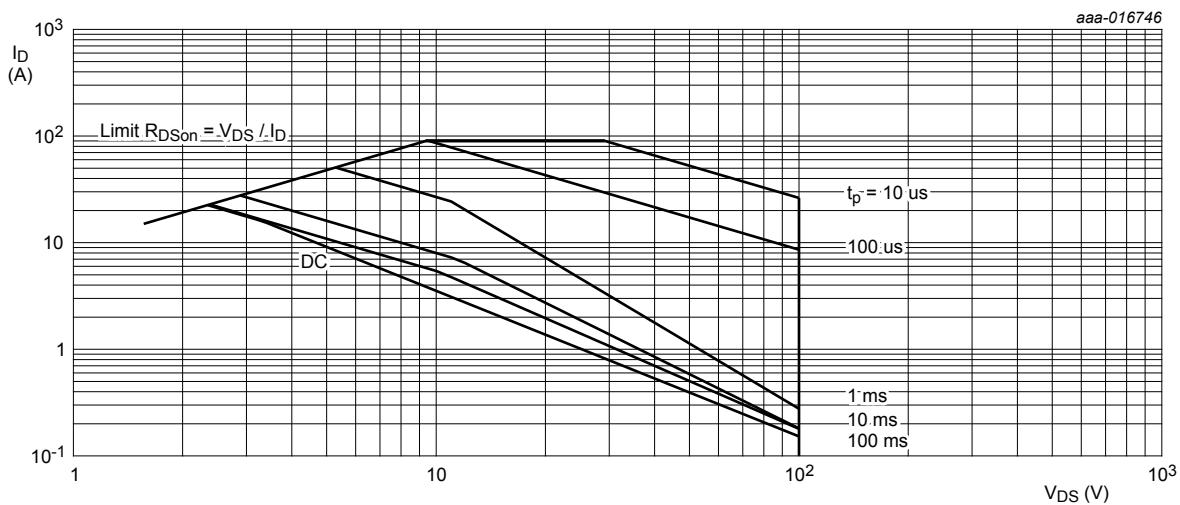


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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

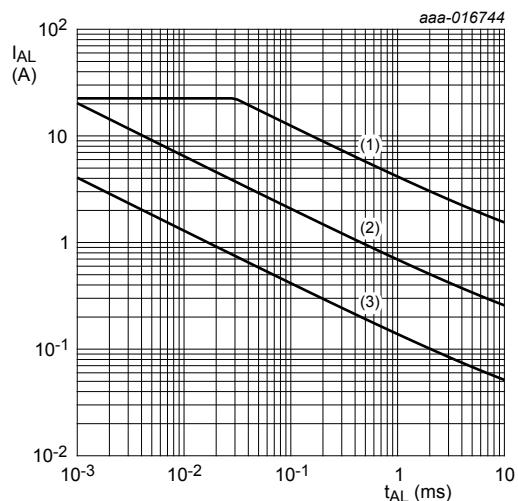


Fig. 4. Avalanche rating; avalanche current as a function of avalanche time

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

## 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	<a href="#">Fig. 5</a>	-	-	2.84	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Minimum footprint; mounted on a printed circuit board	-	95	-	K/W

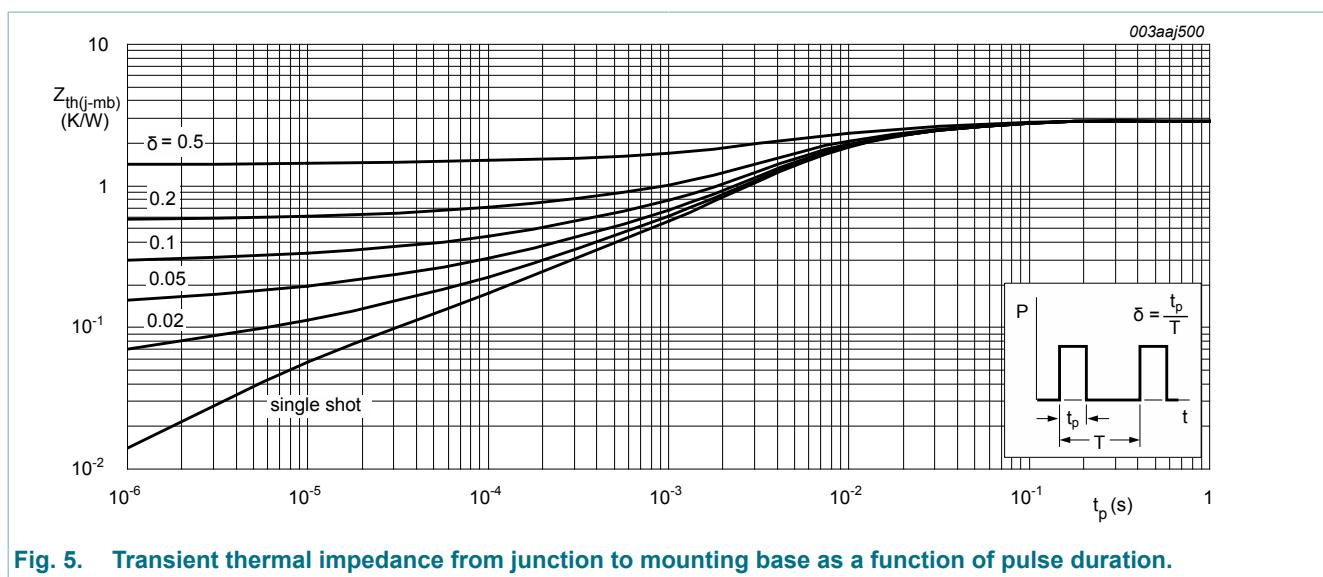


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration.

## 10. Characteristics

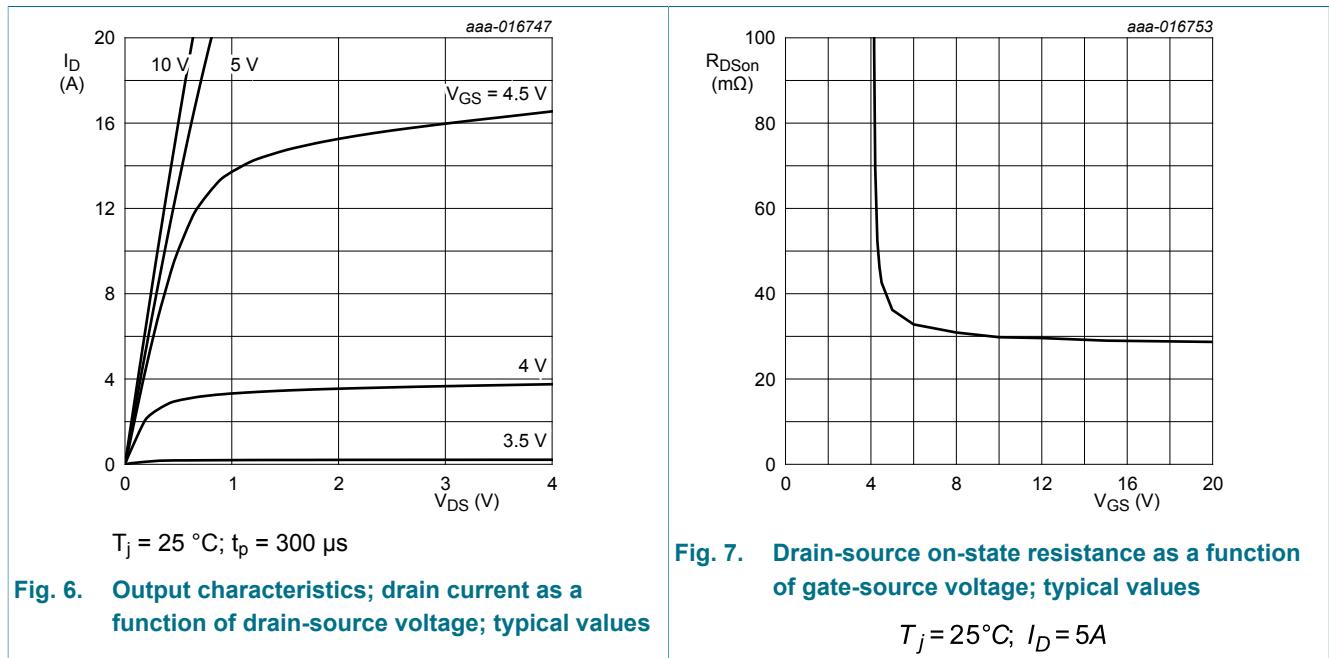
Table 7. Characteristics

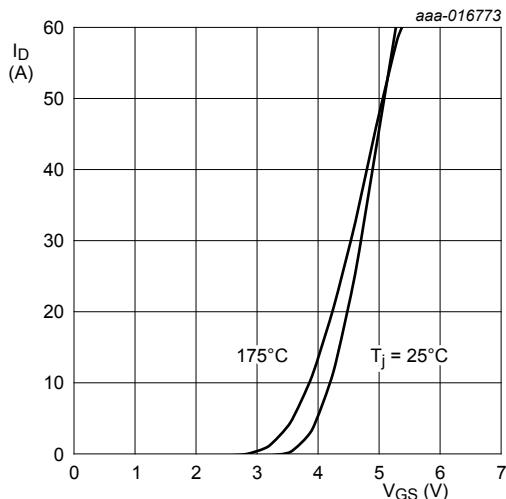
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Static characteristics FET1 and FET2</b>							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55^\circ C$		90	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25^\circ C$		100	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25^\circ C$ <a href="#">Fig. 9; Fig. 10</a>		2.4	3	4	V
		$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175^\circ C$ <a href="#">Fig. 10</a>		1	-	-	V
		$I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55^\circ C$ <a href="#">Fig. 10</a>		-	-	4.5	V
$I_{DSS}$	drain leakage current	$V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25^\circ C$		-	0.02	1	$\mu A$
		$V_{DS} = 100 V; V_{GS} = 0 V; T_j = 175^\circ C$		-	-	500	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25^\circ C$		-	2	100	nA
		$V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25^\circ C$		-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 V; I_D = 5 A; T_j = 25^\circ C$ <a href="#">Fig. 11; Fig. 12</a>		-	30	37.6	$m\Omega$
		$V_{GS} = 10 V; I_D = 5 A; T_j = 175^\circ C$ <a href="#">Fig. 11; Fig. 12</a>		-	80	104	$m\Omega$
<b>Dynamic characteristics FET1 and FET2</b>							
$Q_{G(tot)}$	total gate charge	$I_D = 5 A; V_{DS} = 80 V; V_{GS} = 10 V$ $T_j = 25^\circ C$ <a href="#">Fig. 13; Fig. 14</a>		-	25.9	-	nC
$Q_{GS}$	gate-source charge			-	4.3	-	nC
$Q_{GD}$	gate-drain charge			-	9.7	-	nC

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$C_{iss}$	input capacitance	$V_{GS} = 0 \text{ V}$ ; $V_{DS} = 25 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 15</a>		-	1150	1533	pF
$C_{oss}$	output capacitance			-	122	147	pF
$C_{rss}$	reverse transfer capacitance			-	84	115	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 80 \text{ V}$ ; $R_L = 16 \Omega$ ; $V_{GS} = 10 \text{ V}$ ; $R_{G(ext)} = 5 \Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	6.2	-	ns
$t_r$	rise time			-	11.2	-	ns
$t_{d(off)}$	turn-off delay time			-	20.3	-	ns
$t_f$	fall time	$V_{DS} = 80 \text{ V}$ ; $R_L = 16 \Omega$ ; $V_{GS} = 10 \text{ V}$ ; $R_{G(ext)} = 5 \Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	13.9	-	ns

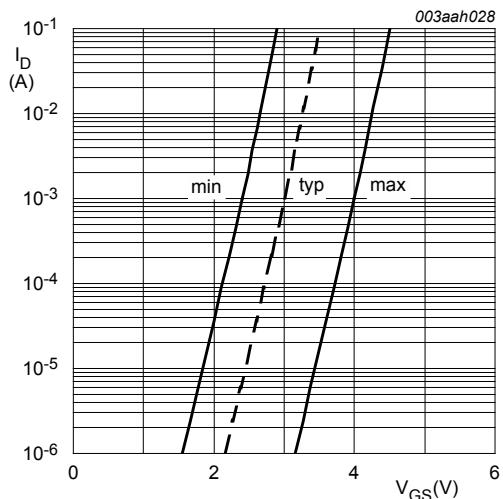
Source-drain diode FET1 and FET2							
$V_{SD}$	source-drain voltage	$I_S = 5 \text{ A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 16</a>		-	0.78	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 5 \text{ A}$ ; $dI_S/dt = -100 \text{ A}/\mu\text{s}$ ; $V_{GS} = 0 \text{ V}$ ;		-	32.9	-	ns
$Q_r$	recovered charge	$V_{DS} = 50 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	44	-	nC





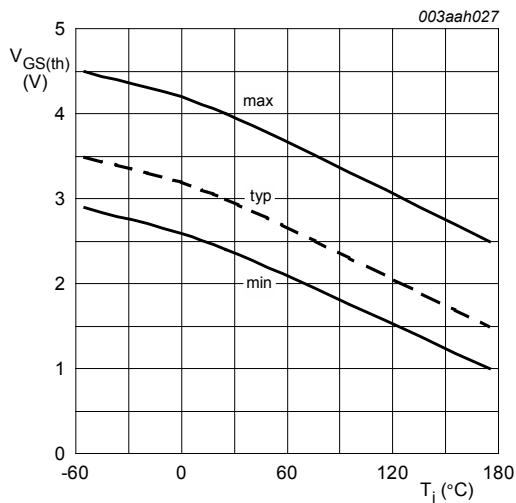
**Fig. 8. Transfer characteristics; drain current as a function of gate-source voltage; typical values**

$V_{DS} = 10V$



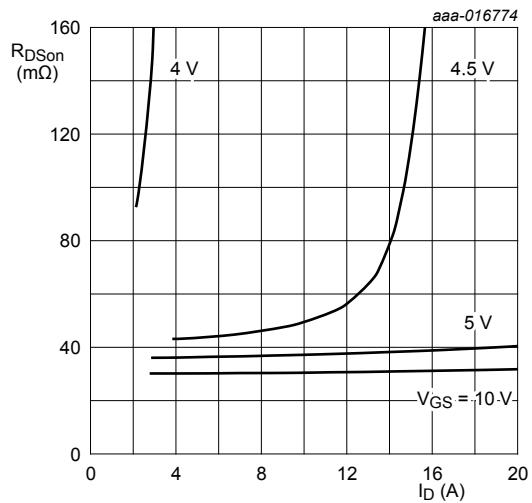
**Fig. 9. Sub-threshold drain current as a function of gate-source voltage**

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



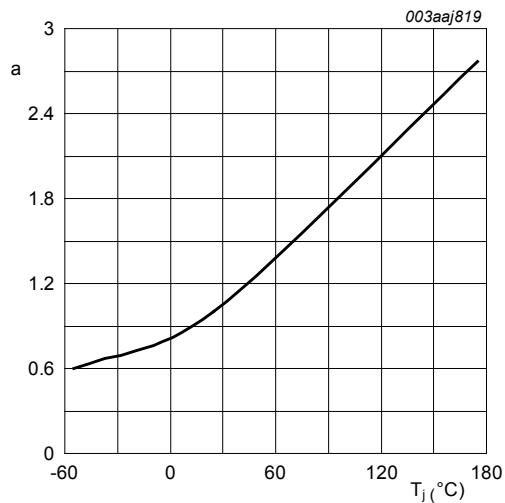
**Fig. 10. Gate-source threshold voltage as a function of junction temperature**

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



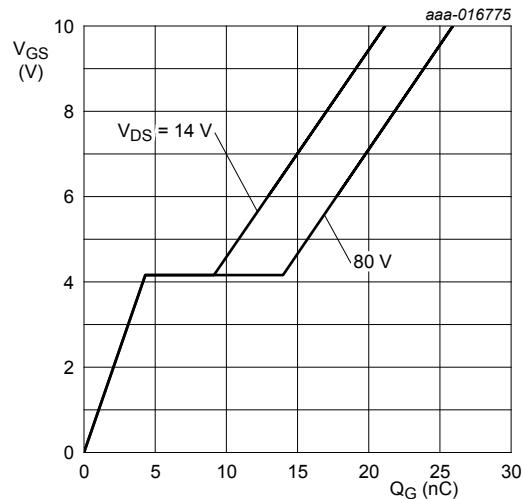
$T_j = 25^\circ C; t_p = 300 \mu s$

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



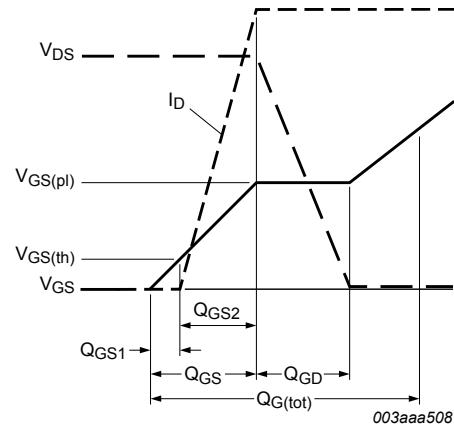
**Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature**

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

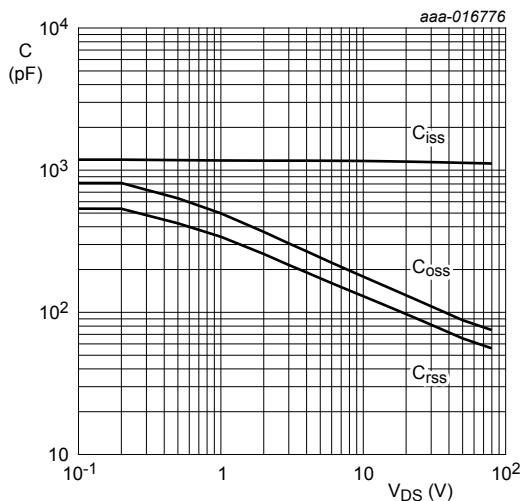


**Fig. 14. Gate-source voltage as a function of gate charge; typical values**

$$T_j = 25^\circ\text{C}; I_D = 5\text{A}$$



**Fig. 13. Gate charge waveform definitions**



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

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

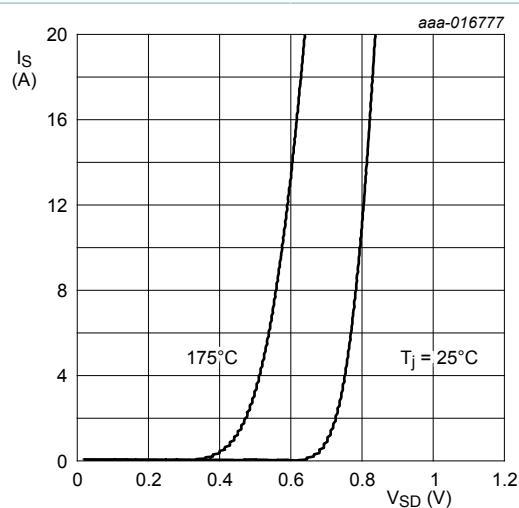
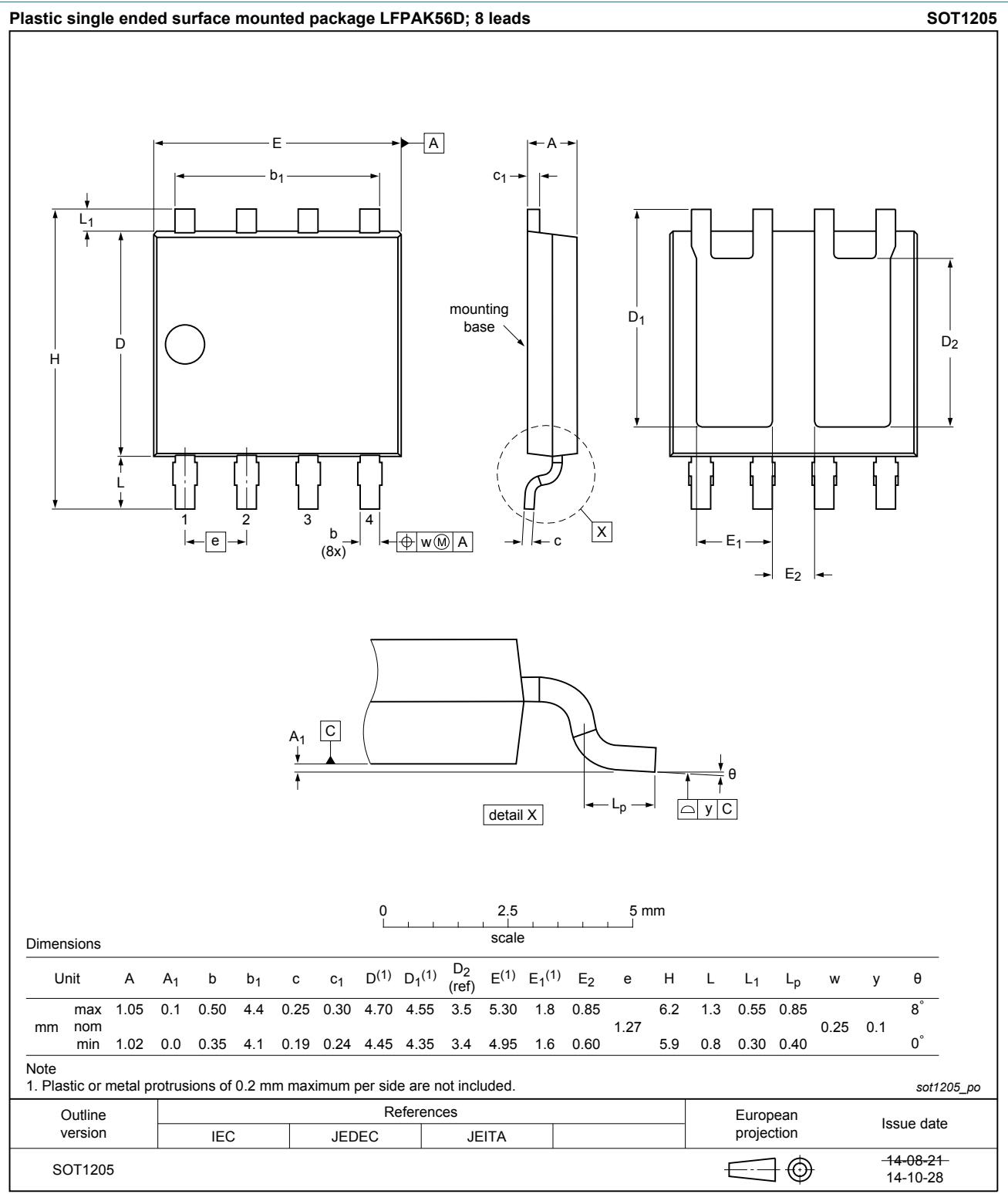


Fig. 16. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

$$V_{GS} = 0V$$

## 11. Package outline



## 12. 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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Date of release: 02 September 2015

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