



BUK9K22-80E

Dual N-channel 80 V, 22 mΩ logic level MOSFET

11 May 2018

Product data sheet

1. General description

Dual Logic 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
- AEC-Q101 compliant
- Repetitive avalanche rated
- Suitable for thermally demanding environments due to 175 °C rating
- True logic level gate with $V_{GS(th)}$ rating of greater than 0.5 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

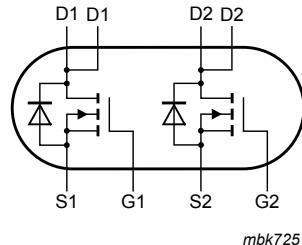
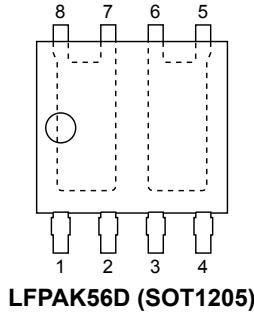
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Limiting values FET1 and FET2							
V_{DS}	drain-source voltage	$25\text{ }^{\circ}\text{C} \leq T_j \leq 175\text{ }^{\circ}\text{C}$		-	-	80	V
I_D	drain current	$V_{GS} = 5\text{ V}; T_{mb} = 25\text{ }^{\circ}\text{C}$; Fig. 2		-	-	21	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}$; Fig. 1		-	-	64	W
T_j	junction temperature			-55	-	175	$^{\circ}\text{C}$
Static characteristics FET1 and FET2							
R_{DSon}	drain-source on-state resistance	$V_{GS} = 5\text{ V}; I_D = 10\text{ A}; T_j = 175\text{ }^{\circ}\text{C}$; Fig. 12		-	-	54.5	$\text{m}\Omega$
		$V_{GS} = 5\text{ V}; I_D = 10\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$; Fig. 11		-	15.7	21.7	$\text{m}\Omega$
Dynamic characteristics FET1 and FET2							
Q_{GD}	gate-drain charge	$I_D = 10\text{ A}; V_{DS} = 64\text{ V}; V_{GS} = 5\text{ V};$ $T_j = 25\text{ }^{\circ}\text{C}$; Fig. 13 ; Fig. 14		-	8.4	-	nC
$Q_{G(tot)}$	total gate charge			-	23.1	-	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		



6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK9K22-80E	LFPAK56D	plastic, single ended surface mounted package (LFPAK56D); 8 leads	SOT1205

7. Marking

Table 4. Marking codes

Type number	Marking code
BUK9K22-80E	92280E

8. Limiting values

Table 5. Limiting values

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

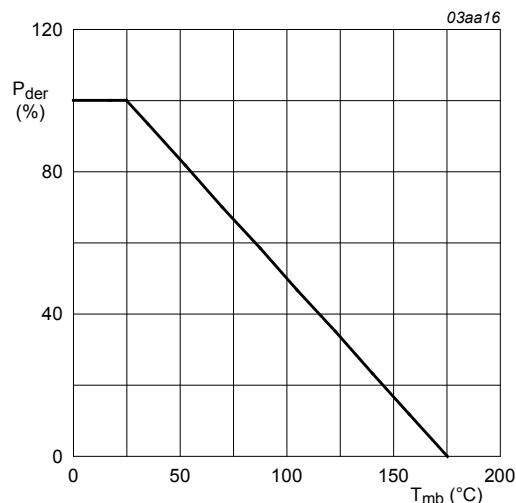
Symbol	Parameter	Conditions		Min	Max	Unit
Limiting values FET1 and FET2						
V_{DS}	drain-source voltage	$25^{\circ}\text{C} \leq T_j \leq 175^{\circ}\text{C}$		-	80	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20 \text{ k}\Omega$		-	80	V
V_{GS}	gate-source voltage	DC; $T_j \leq 175^{\circ}\text{C}$		-10	10	V
		Pulsed; $T_j \leq 175^{\circ}\text{C}$	[1] [2]	-15	15	V
P_{tot}	total power dissipation	$T_{mb} = 25^{\circ}\text{C}$; Fig. 1		-	64	W
I_D	drain current	$V_{GS} = 5 \text{ V}$; $T_{mb} = 25^{\circ}\text{C}$; Fig. 2		-	21	A
		$V_{GS} = 5 \text{ V}$; $T_{sp} = 100^{\circ}\text{C}$; Fig. 2		-	15	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^{\circ}\text{C}$; Fig. 3		-	84	A
T_{stg}	storage temperature			-55	175	°C
T_j	junction temperature			-55	175	°C
Source-drain diode FET1 and FET2						
I_S	source current	$T_{mb} = 25^{\circ}\text{C}$		-	21	A
I_{SM}	peak source current	pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^{\circ}\text{C}$		-	84	A
Avalanche ruggedness FET1 and FET2						
$E_{DS(\text{AL})S}$	non-repetitive drain-source avalanche energy	$I_D = 21 \text{ A}$; $V_{\text{sup}} \leq 80 \text{ V}$; $R_{GS} = 50 \Omega$; $V_{GS} = 5 \text{ V}$; $T_{j(\text{init})} = 25^{\circ}\text{C}$; unclamped; Fig. 4	[3] [4]	-	116	mJ

[1] Accumulated pulse duration up to 50 hours delivers zero defect ppm

[2] Significantly longer life times are achieved by lowering T_j and or V_{GS}

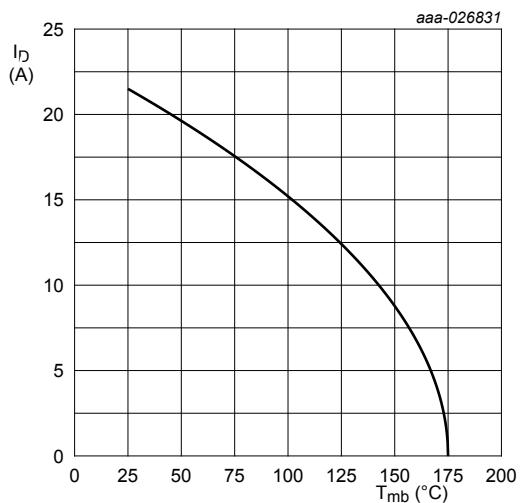
[3] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C

[4] Refer to application note AN10273 for further information



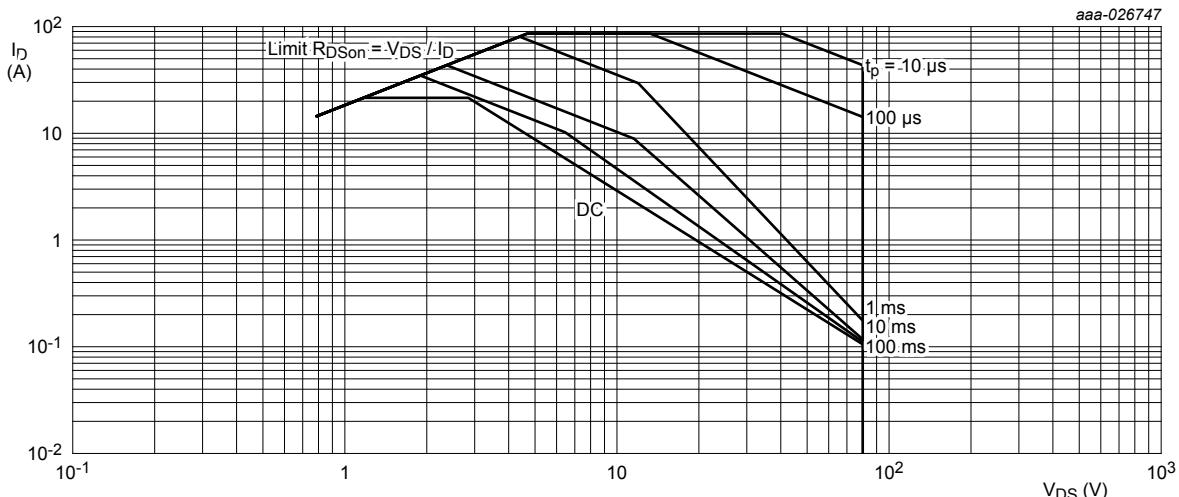
$$P_{der} = \frac{P_{tot}}{P_{tot}(25^\circ\text{C})} \times 100 \%$$

Fig. 1. Normalized total power dissipation as a function of mounting base temperature



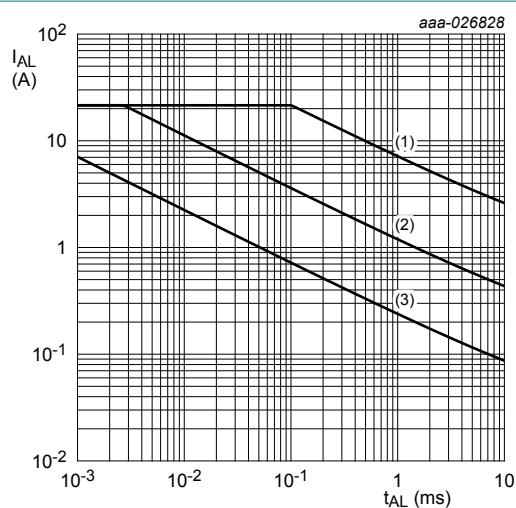
$V_{GS} \geq 5 \text{ V}$

Fig. 2. Continuous drain current as a function of mounting base temperature, FET1 and FET2



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

Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage, FET1 and FET2



(1) T_j (init) = 25°C; (2) T_j (init) = 150°C; (3) Repetitive Avalanche

Fig. 4. Avalanche rating; avalanche current as a function of avalanche time, FET1 and FET2

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		-	-	2.36	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Minimum footprint; mounted on a printed circuit board		-	95	-	K/W

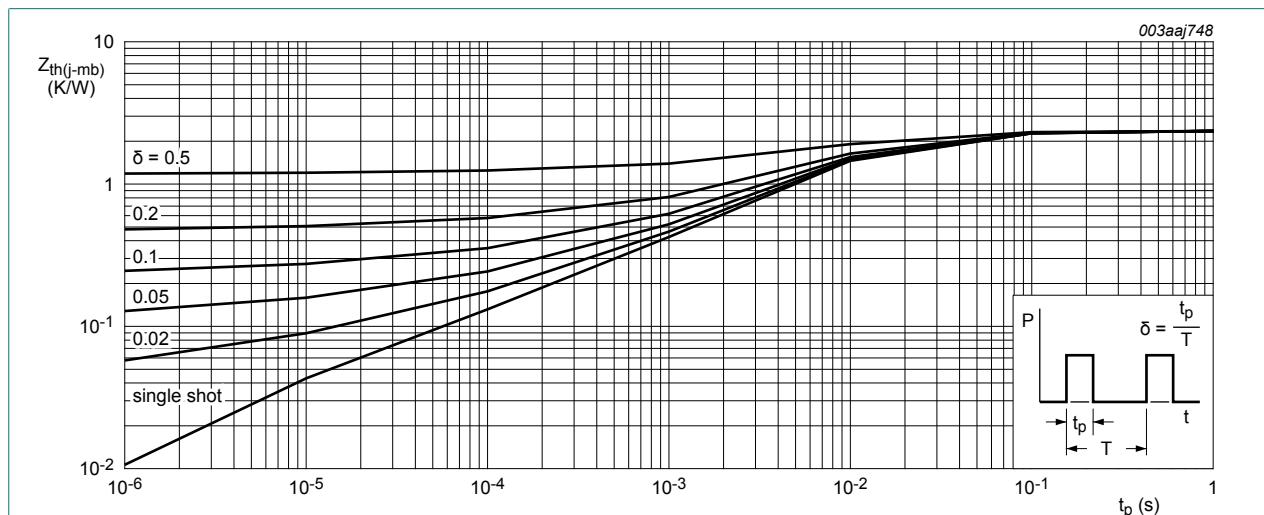
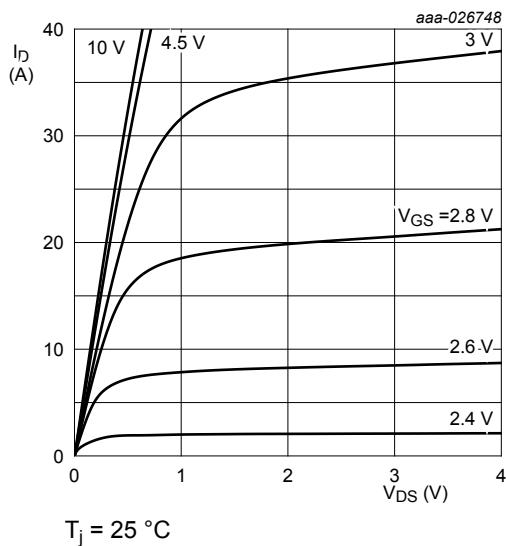


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration, FET1 and FET2

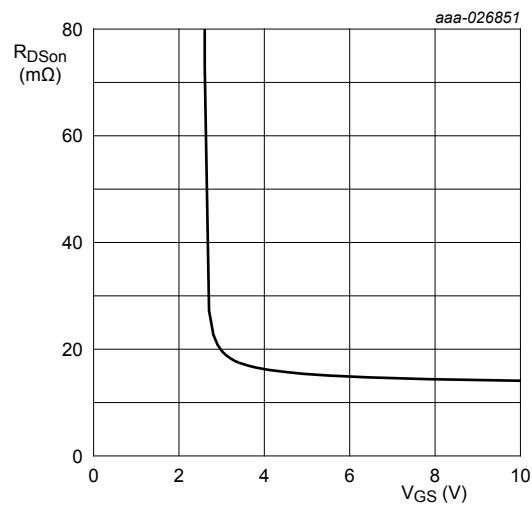
10. Characteristics

Table 7. Characteristics

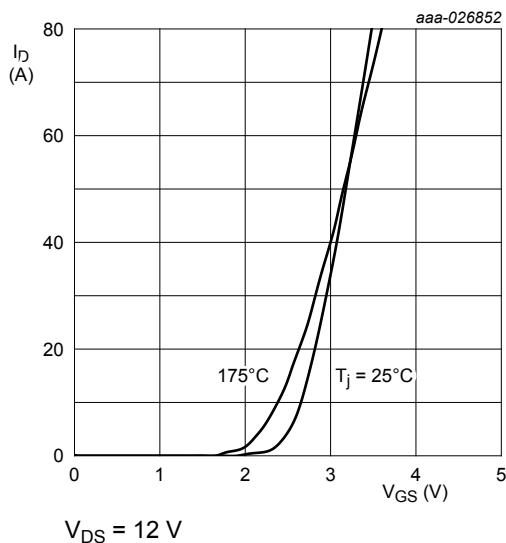
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics FET1 and FET2							
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 µA; V _{GS} = 0 V; T _j = 25 °C		80	-	-	V
		I _D = 250 µA; V _{GS} = 0 V; T _j = -55 °C		72	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} =V _{GS} ; T _j = 25 °C; Fig. 9 ; Fig. 10		1.4	1.7	2.1	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _j = -55 °C; Fig. 10		-	-	2.45	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _j = 175 °C; Fig. 10		0.5	-	-	V
I _{DSS}	drain leakage current	V _{DS} = 80 V; V _{GS} = 0 V; T _j = 25 °C		-	0.01	1	µA
		V _{DS} = 80 V; V _{GS} = 0 V; T _j = 175 °C		-	-	500	µA
I _{GSS}	gate leakage current	V _{GS} = 10 V; V _{DS} = 0 V; T _j = 25 °C		-	2	100	nA
		V _{GS} = -10 V; V _{DS} = 0 V; T _j = 25 °C		-	2	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 5 V; I _D = 10 A; T _j = 25 °C; Fig. 11		-	15.7	21.7	mΩ
		V _{GS} = 10 V; I _D = 10 A; T _j = 25 °C; Fig. 11		-	14.4	19	mΩ
		V _{GS} = 5 V; I _D = 10 A; T _j = 175 °C; Fig. 12		-	-	54.5	mΩ
Dynamic characteristics FET1 and FET2							
Q _{G(tot)}	total gate charge	I _D = 10 A; V _{DS} = 64 V; V _{GS} = 5 V; T _j = 25 °C; Fig. 13 ; Fig. 14		-	23.1	-	nC
Q _{GS}	gate-source charge			-	5.4	-	nC
Q _{GD}	gate-drain charge			-	8.4	-	nC
C _{iss}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 15		-	2342	3115	pF
C _{oss}	output capacitance			-	170	204	pF
C _{rss}	reverse transfer capacitance			-	89	122	pF
t _{d(on)}	turn-on delay time	V _{DS} = 60 V; R _L = 5 Ω; V _{GS} = 5 V; R _{G(ext)} = 5 Ω; T _j = 25 °C		-	13.9	-	ns
t _r	rise time			-	24.9	-	ns
t _{d(off)}	turn-off delay time			-	28.6	-	ns
t _f	fall time			-	20.6	-	ns
Source-drain diode FET1 and FET2							
V _{SD}	source-drain voltage	I _S = 10 A; V _{GS} = 0 V; T _j = 25 °C; Fig. 16		-	0.8	1.2	V
t _{rr}	reverse recovery time	I _S = 10 A; dI _S /dt = -100 A/µs; V _{GS} = 0 V; V _{DS} = 25 V; T _j = 25 °C		-	28.4	-	ns
Q _r	recovered charge			-	33	-	nC



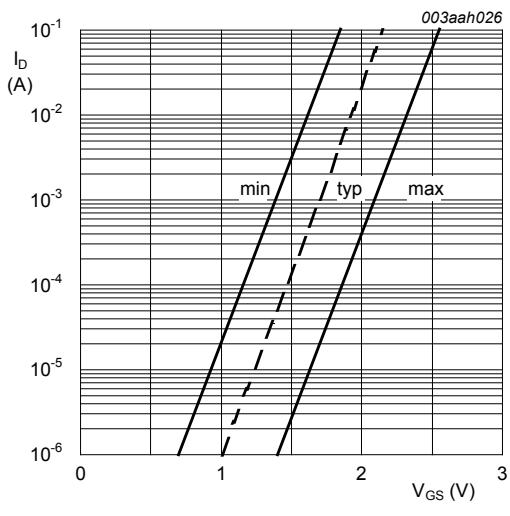
$T_j = 25^\circ\text{C}$



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



$V_{DS} = 12 \text{ V}$



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

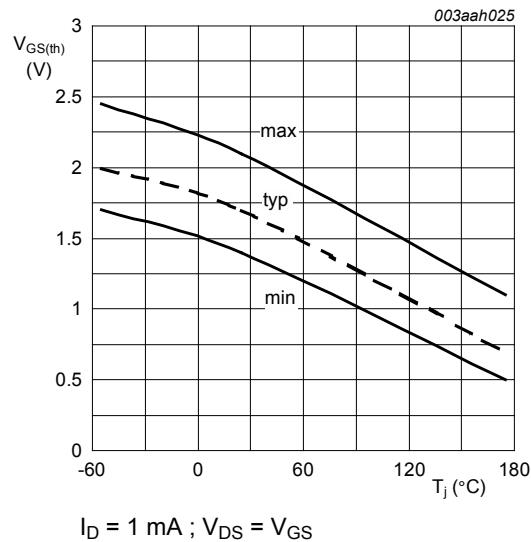


Fig. 10. Gate-source threshold voltage as a function of junction temperature, FET1 and FET2

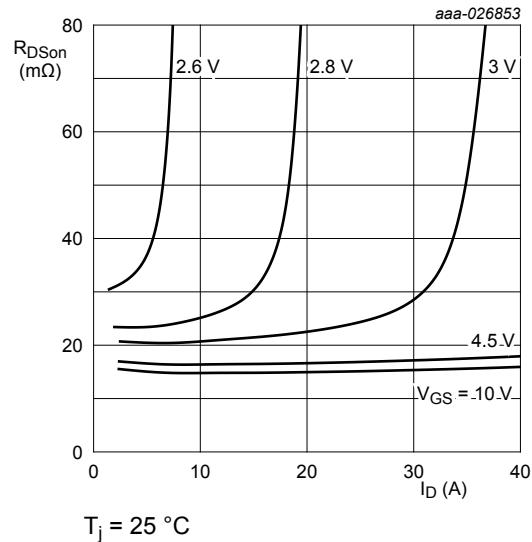


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values, FET1 and FET2

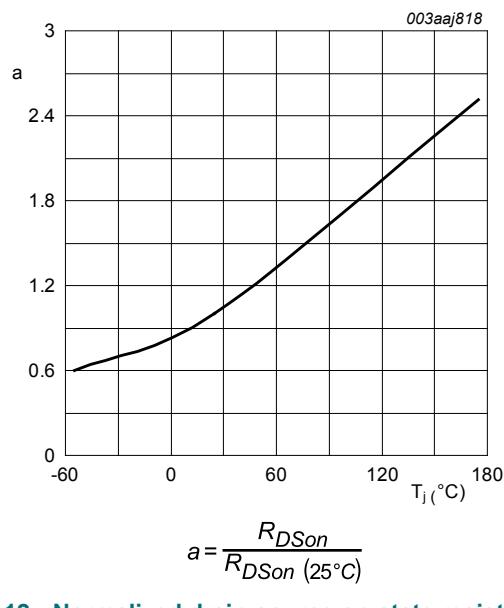


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature, FET1 and FET2

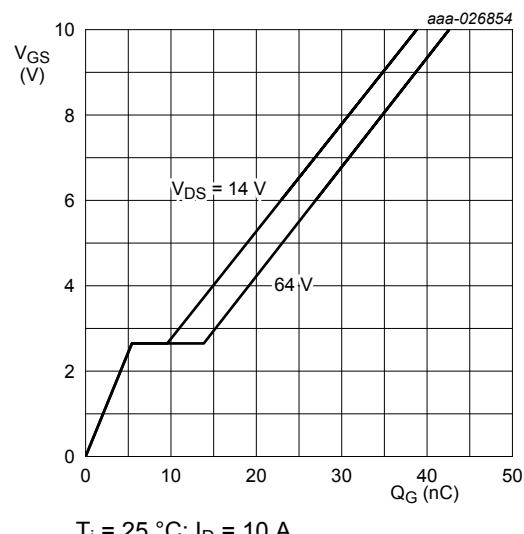


Fig. 13. Gate-source voltage as a function of gate charge; typical values, FET1 and FET2

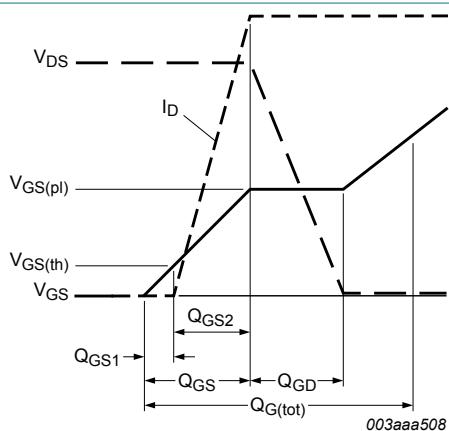


Fig. 14. Gate charge waveform definitions

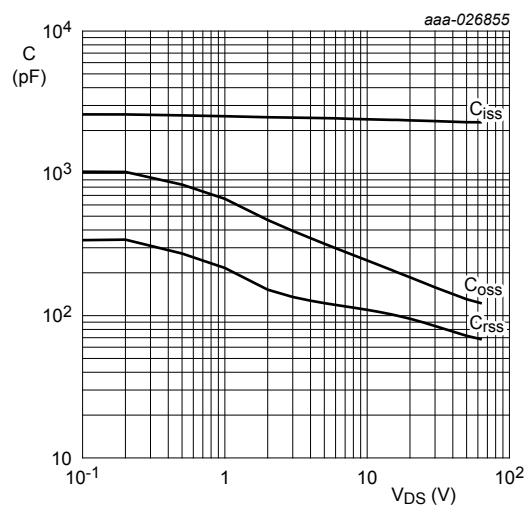
 $V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values, FET1 and FET2

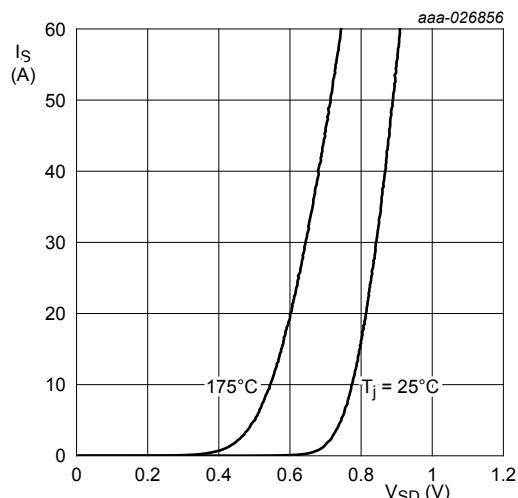
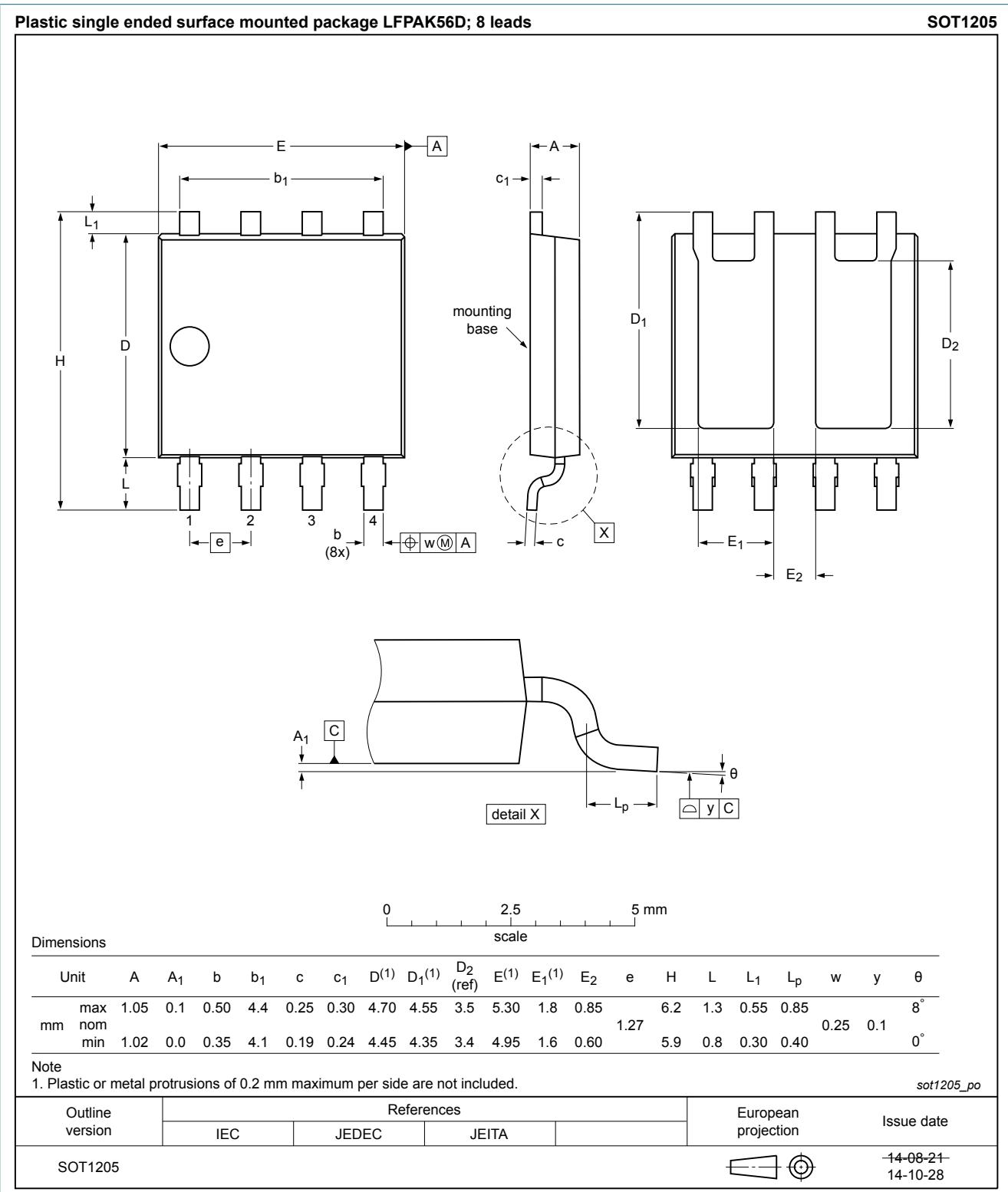
 $V_{GS} = 0 \text{ V}$

Fig. 16. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values, FET1 and FET2

11. Package outline



12. Legal information

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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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