



BUK7Y20-30B

N-channel TrenchMOS standard level FET

Rev. 04 — 7 April 2010

Product data sheet

1. Product profile

1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using Nexperia High-Performance Automotive (HPA) TrenchMOS technology. This product has been designed and qualified to the appropriate AEC standard for use in automotive critical applications.

1.2 Features and benefits

- Q101 compliant
- Suitable for standard level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

1.3 Applications

- 12 V Loads
- Automotive systems
- General purpose power switch
- Motors, lamps and solenoids

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25 \text{ }^\circ\text{C}; T_j \leq 175 \text{ }^\circ\text{C}$	-	-	30	V
I_D	drain current	$V_{GS} = 10 \text{ V}; T_{mb} = 25 \text{ }^\circ\text{C}$; see Figure 1 ; see Figure 4	-	-	39.5	A
P_{tot}	total power dissipation	$T_{mb} = 25 \text{ }^\circ\text{C}$; see Figure 2	-	-	59	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 20 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$; see Figure 12 ; see Figure 13	-	16	20	$\text{m}\Omega$
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 39.5 \text{ A}; V_{sup} \leq 30 \text{ V}; R_{GS} = 50 \Omega; V_{GS} = 10 \text{ V}; T_{j(init)} = 25 \text{ }^\circ\text{C}$; unclamped	-	-	45	mJ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$I_D = 20 \text{ A}; V_{DS} = 24 \text{ V}; V_{GS} = 10 \text{ V}$; see Figure 14	-	3.84	-	nC

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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 (LFPAK)				

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
BUK7Y20-30B	LFPAK	plastic single-ended surface-mounted package (LFPAK); 4 leads	SOT669

4. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25^\circ\text{C}$; $T_j \leq 175^\circ\text{C}$	-	-	30	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	-	30	V
V_{GS}	gate-source voltage		-20	-	20	V
I_D	drain current	$T_{mb} = 25^\circ\text{C}$; $V_{GS} = 10\text{ V}$; see Figure 1 ; see Figure 4	-	-	39.5	A
		$T_{mb} = 100^\circ\text{C}$; $V_{GS} = 10\text{ V}$; see Figure 1	-	-	28	A
I_{DM}	peak drain current	$T_{mb} = 25^\circ\text{C}$; $t_p \leq 10\text{ }\mu\text{s}$; pulsed; see Figure 4	-	-	158	A
P_{tot}	total power dissipation	$T_{mb} = 25^\circ\text{C}$; see Figure 2	-	-	59	W
T_{stg}	storage temperature		-55	-	175	°C
T_j	junction temperature		-55	-	175	°C
Source-drain diode						
I_S	source current	$T_{mb} = 25^\circ\text{C}$	-	-	39.5	A
I_{SM}	peak source current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25^\circ\text{C}$	-	-	158	A
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 39.5\text{ A}$; $V_{sup} \leq 30\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(init)} = 25^\circ\text{C}$; unclamped	-	-	45	mJ
$E_{DS(AL)R}$	repetitive drain-source avalanche energy	see Figure 3	[1][2][3]	-	-	J

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

[2] Repetitive avalanche rating limited by an average junction temperature of 170°C .

[3] Refer to application note AN10273 for further information.

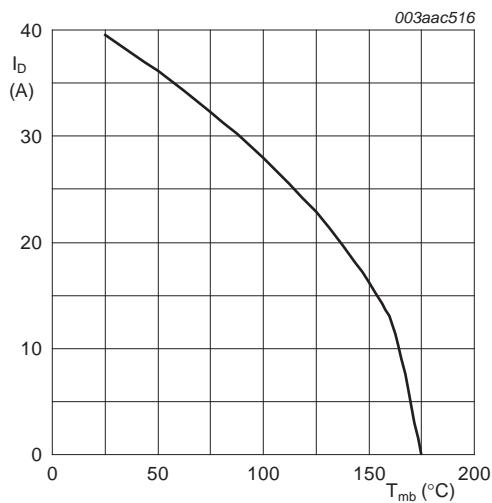


Fig 1. Continuous drain current as a function of mounting base temperature

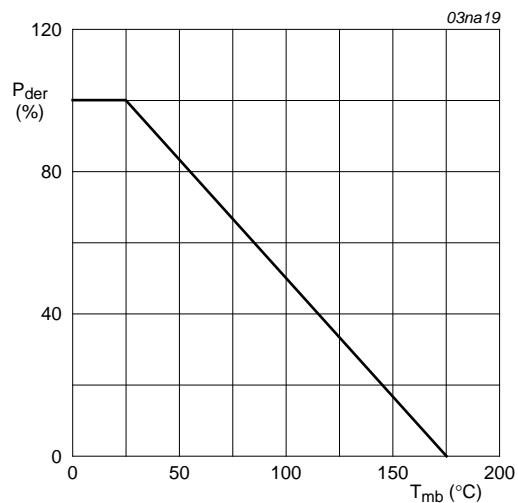


Fig 2. Normalized total power dissipation as a function of mounting base temperature

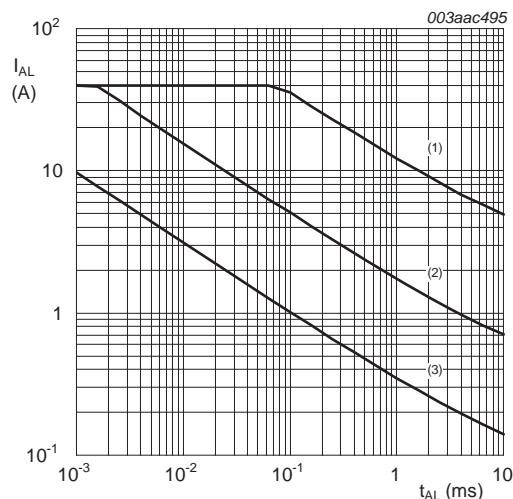
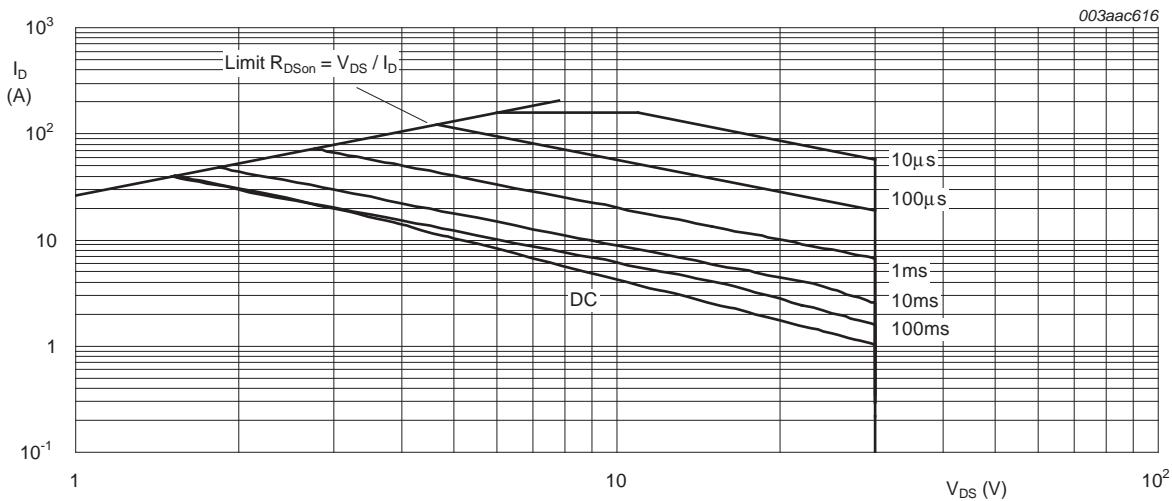


Fig 3. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time



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

Fig 4. 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
$R_{th(j\text{-mb})}$	thermal resistance from junction to mounting base	see Figure 5	-	-	2.53	K/W

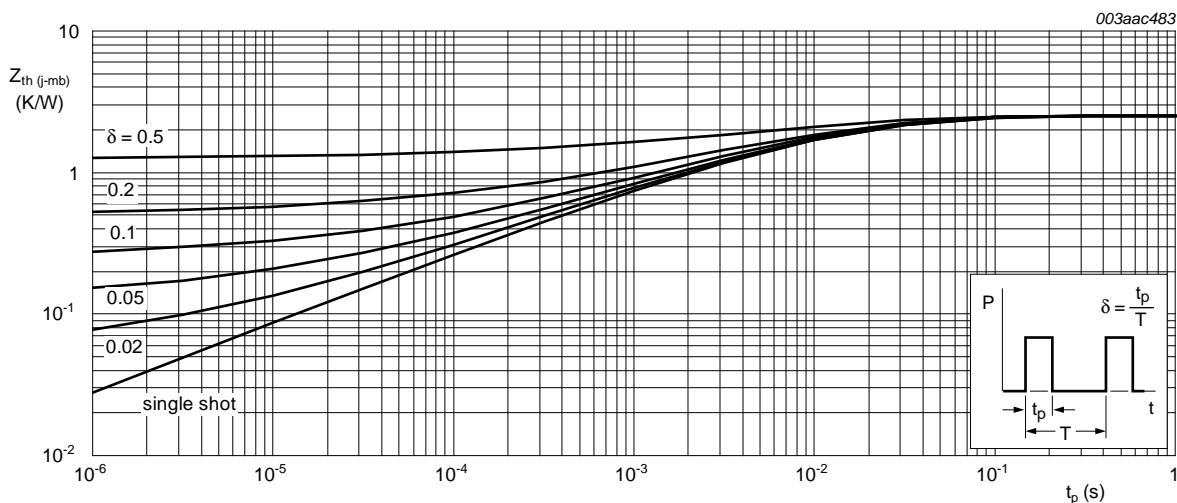
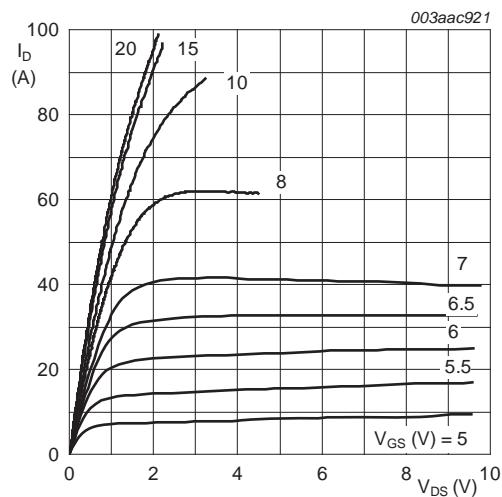


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration.

6. Characteristics

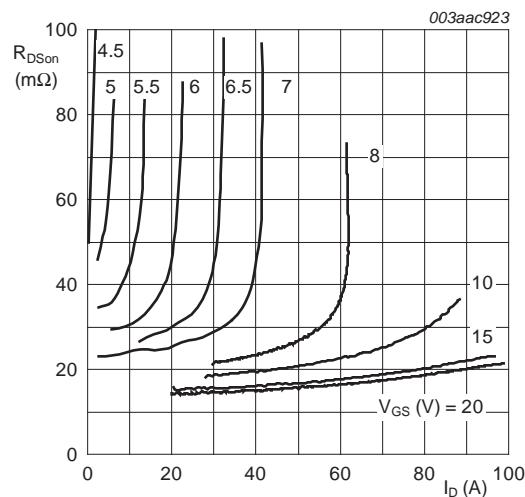
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25^\circ C$ $I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55^\circ C$	30	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25^\circ C$; see Figure 10 ; see Figure 11 $I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55^\circ C$; see Figure 10 $I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175^\circ C$; see Figure 10	2	3	4	V
I_{DSS}	drain leakage current	$V_{DS} = 30 V; V_{GS} = 0 V; T_j = 25^\circ C$ $V_{DS} = 30 V; V_{GS} = 0 V; T_j = 175^\circ C$	-	0.02	1	μA
I_{GSS}	gate leakage current	$V_{DS} = 0 V; V_{GS} = 20 V; T_j = 25^\circ C$ $V_{DS} = 0 V; V_{GS} = -20 V; T_j = 25^\circ C$	-	2	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10 V; I_D = 20 A; T_j = 175^\circ C$; see Figure 12 $V_{GS} = 10 V; I_D = 20 A; T_j = 25^\circ C$; see Figure 12 ; see Figure 13	-	-	38	$m\Omega$
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$I_D = 20 A; V_{DS} = 24 V; V_{GS} = 10 V$; see Figure 14	-	11.2	-	nC
Q_{GS}	gate-source charge		-	3.75	-	nC
Q_{GD}	gate-drain charge		-	3.84	-	nC
C_{iss}	input capacitance	$V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz$	-	516	688	pF
C_{oss}	output capacitance	$T_j = 25^\circ C$; see Figure 15	-	188	226	pF
C_{rss}	reverse transfer capacitance		-	94	129	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 25 V; R_L = 1.25 \Omega; V_{GS} = 10 V$	-	9.5	-	ns
t_r	rise time	$R_{G(ext)} = 10 \Omega$	-	18	-	ns
$t_{d(off)}$	turn-off delay time		-	20.5	-	ns
t_f	fall time		-	10	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 20 A; V_{GS} = 0 V; T_j = 25^\circ C$; see Figure 16	-	0.85	1.2	V
t_{rr}	reverse recovery time	$I_S = 20 A; dI_S/dt = -100 A/\mu s; V_{GS} = 0 V$	-	28	-	ns
Q_r	recovered charge	$V_{DS} = 25 V$	-	27.4	-	nC



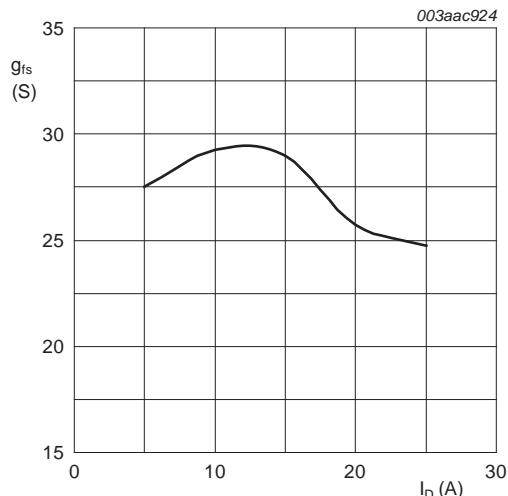
$T_j = 25^\circ C$

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



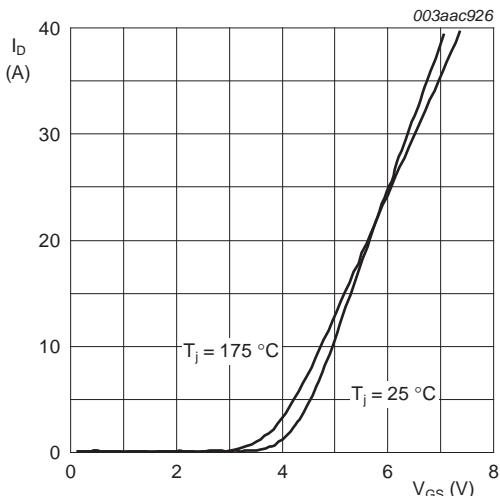
$T_j = 25^\circ C$

Fig 7. Drain-source on-state resistance as a function of drain current; typical values.



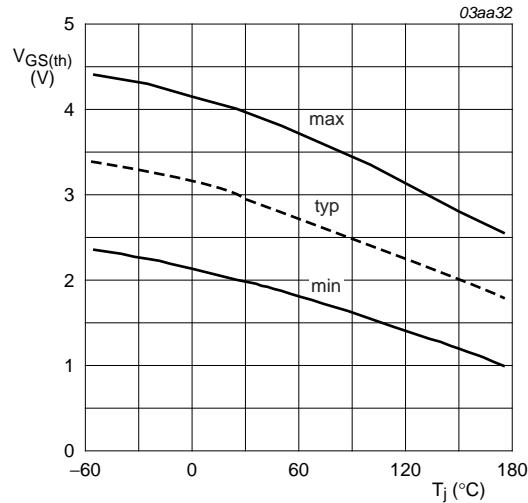
$T_j = 25^\circ C; V_{DS} = 25V$

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



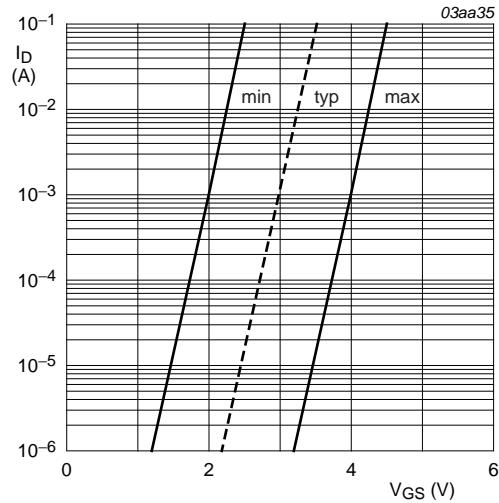
$V_{DS} = 25V$

Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values.



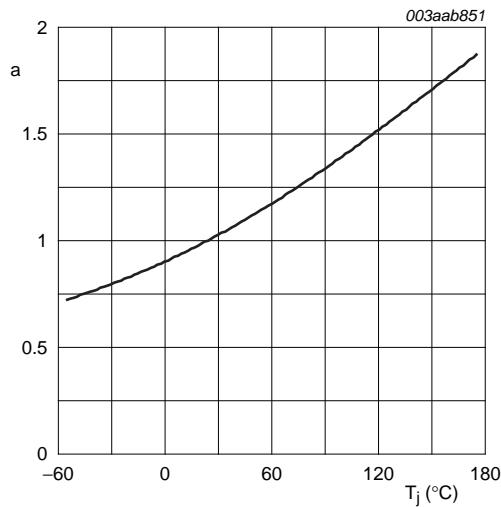
$$I_D = 1mA; V_{DS} = V_{GS}$$

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



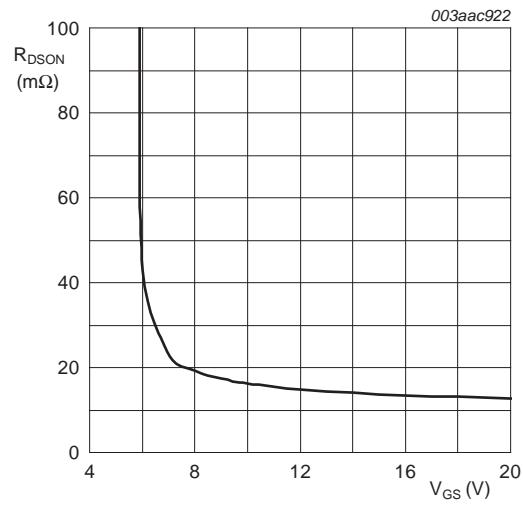
$$T_j = 25^\circ C; V_{DS} = 5V$$

Fig 11. Sub-threshold drain current as a function of gate-source voltage



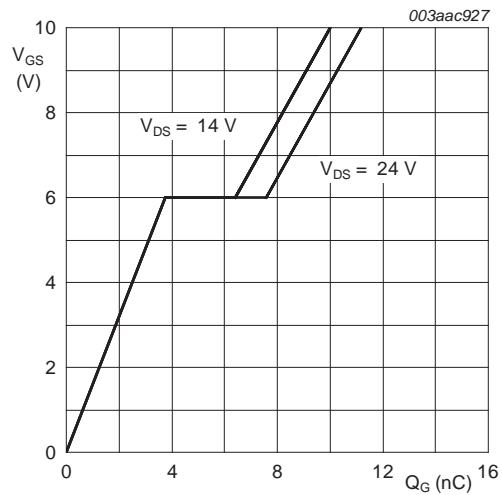
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ C)}}$$

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



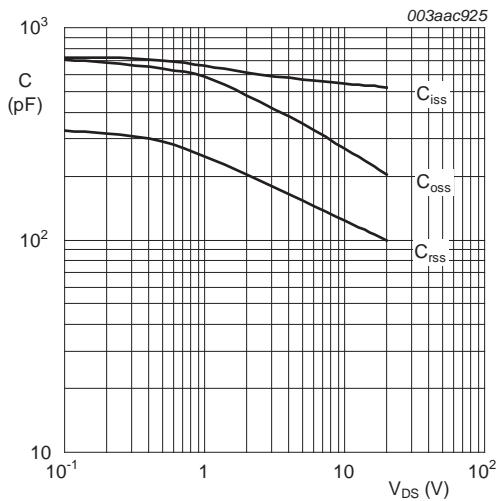
$$T_j = 25^\circ C; I_D = 20A$$

Fig 13. Drain-source on-state resistance as a function of gate-source voltage; typical values.



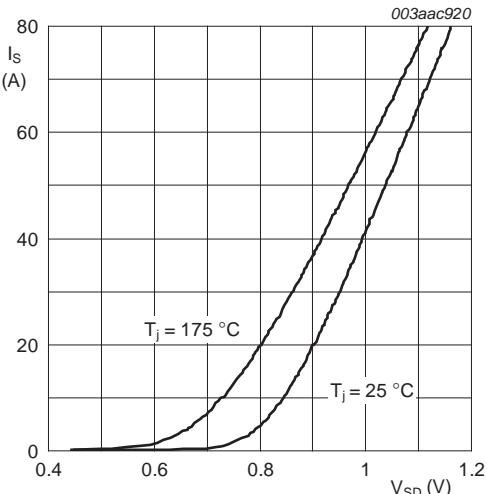
$T_j = 25^\circ\text{C}; I_D = 20\text{A}$

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



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

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



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

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

7. Package outline

Plastic single-ended surface-mounted package (LFPAK); 4 leads

SOT669

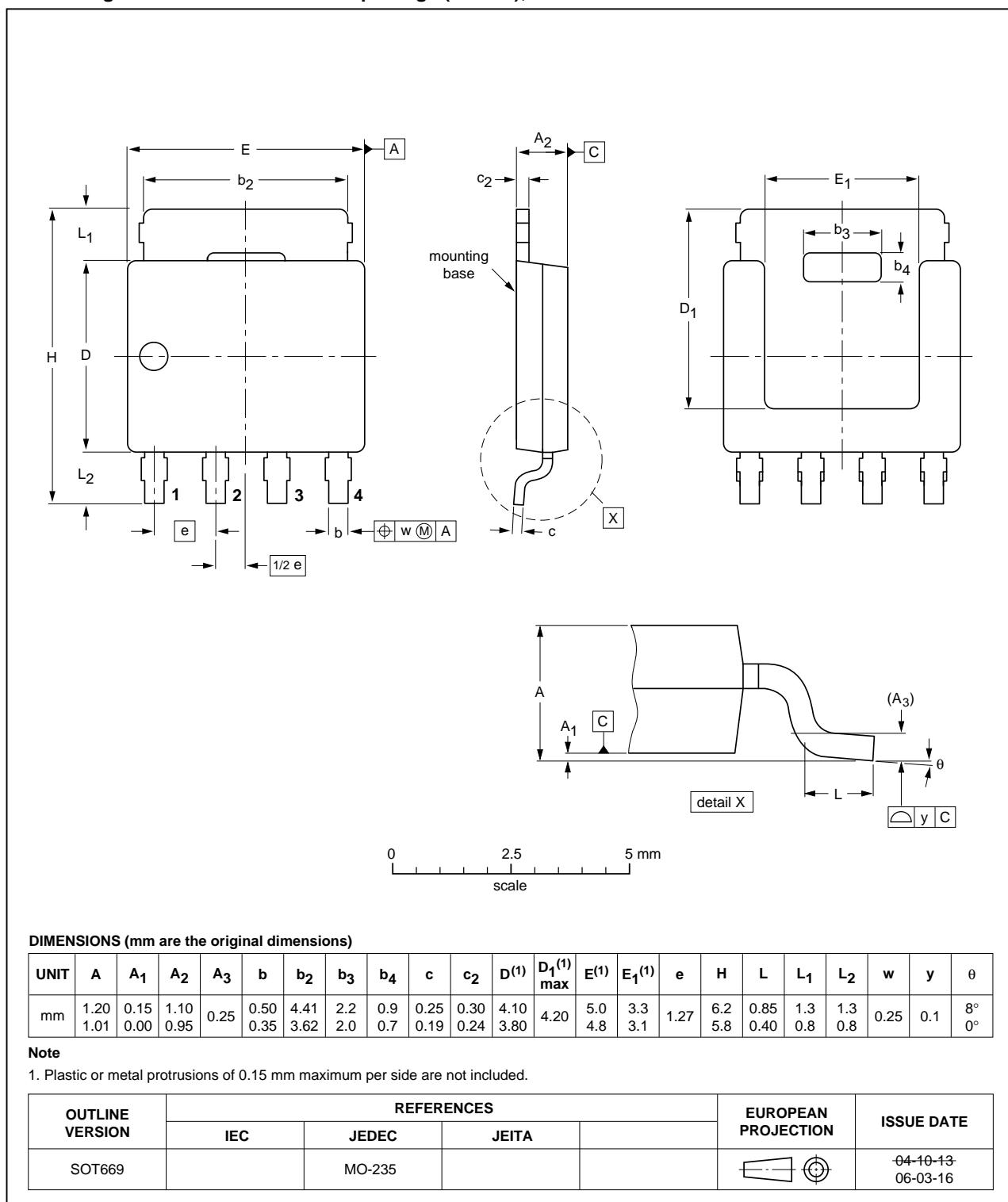


Fig 17. Package outline SOT669 (LFPAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK7Y20-30B_4	20100407	Product data sheet	-	BUK7Y20-30B_3
Modifications:		• Status changed from objective to product		
BUK7Y20-30B_3	20100217	Objective data sheet	-	BUK7Y20-30B_2

9. Legal information

9.1 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.

[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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