



BUK9606-75B

N-channel TrenchMOS logic level FET

Rev. 4 — 20 July 2011

Product data sheet

1. Product profile

1.1 General description

Logic level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using 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

- AEC Q101 compliant
- Low conduction losses due to low on-state resistance
- Suitable for logic level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

1.3 Applications

- 12 V, 24 V and 42 V loads
- Automotive systems
- General purpose power switching
- 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	$T_j \geq 25 \text{ }^\circ\text{C}; T_j \leq 175 \text{ }^\circ\text{C}$	-	-	75	V
I_D	drain current	$V_{GS} = 5 \text{ V}; T_{mb} = 25 \text{ }^\circ\text{C};$ see Figure 1 ; see Figure 3	[1]	-	75	A
P_{tot}	total power dissipation	$T_{mb} = 25 \text{ }^\circ\text{C}$; see Figure 2	-	-	300	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ }^\circ\text{C}$	-	4.7	5.5	$\text{m}\Omega$
		$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ }^\circ\text{C};$ see Figure 11 ; see Figure 12	-	5.2	6.1	$\text{m}\Omega$

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Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 75 \text{ A}$; $V_{sup} \leq 75 \text{ V}$; $R_{GS} = 50 \Omega$; $V_{GS} = 5 \text{ V}$; $T_{j(init)} = 25 \text{ }^\circ\text{C}$; unclamped	-	-	852	mJ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 5 \text{ V}$; $I_D = 25 \text{ A}$; $V_{DS} = 60 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 13	-	37	-	nC

[1] Continuous current is limited by package.

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain ^[1]		
3	S	source		
mb	D	mounting base; connected to drain		

SOT404 (D2PAK)

[1] It is not possible to make a connection to pin 2.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK9606-75B	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Limiting values

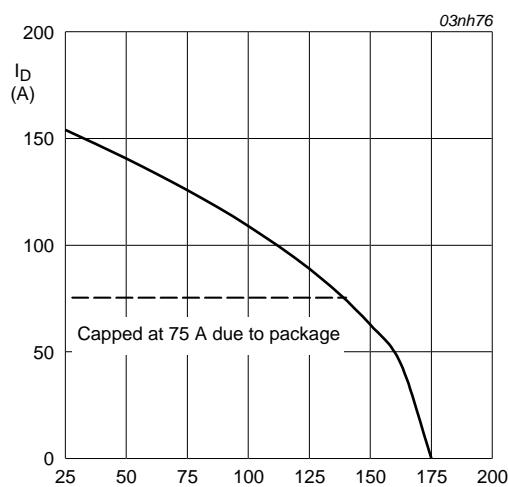
Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25^\circ\text{C}; T_j \leq 175^\circ\text{C}$	-	75	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	75	V
V_{GS}	gate-source voltage		-15	15	V
I_D	drain current	$T_{mb} = 100^\circ\text{C}; V_{GS} = 5\text{ V}$; see Figure 1	[1]	-	75 A
		$T_{mb} = 25^\circ\text{C}; V_{GS} = 5\text{ V}$; see Figure 1 ; Figure 3	[2]	-	153 A
			[1]	-	75 A
I_{DM}	peak drain current	$T_{mb} = 25^\circ\text{C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; see Figure 3	-	612	A
P_{tot}	total power dissipation	$T_{mb} = 25^\circ\text{C}$; see Figure 2	-	300	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25^\circ\text{C}$	[2]	-	153 A
			[1]	-	75 A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25^\circ\text{C}$	-	612	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 75\text{ A}; V_{sup} \leq 75\text{ V}; R_{GS} = 50\text{ }\Omega$; $V_{GS} = 5\text{ V}$; $T_{j(init)} = 25^\circ\text{C}$; unclamped	-	852	mJ

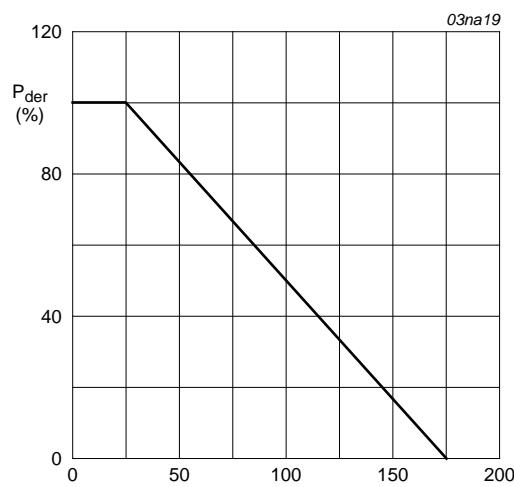
[1] Continuous current is limited by package.

[2] Current is limited by power dissipation chip rating.



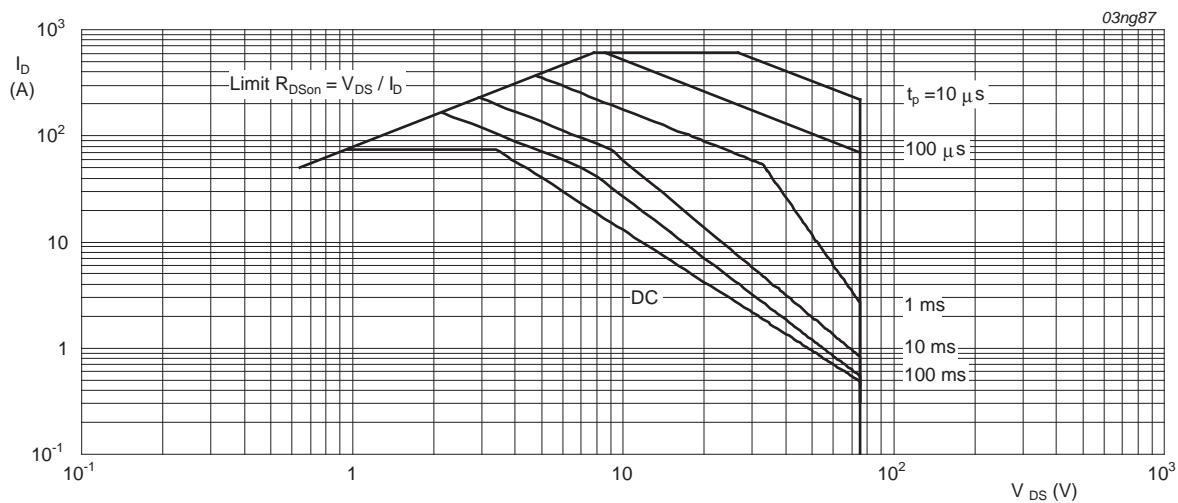
$V_{GS} \geq 5\text{ V}$

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



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

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 Figure 4	-	-	0.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on a printed circuit board; minimum footprint	-	50	-	K/W

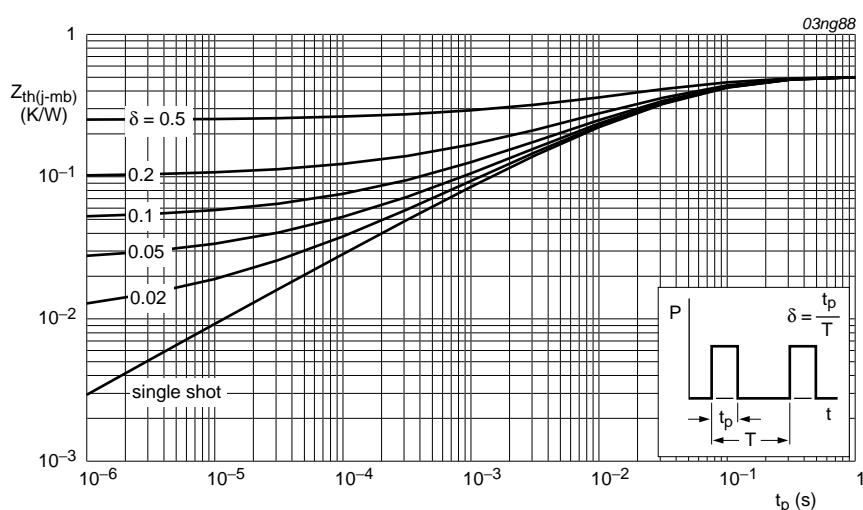


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

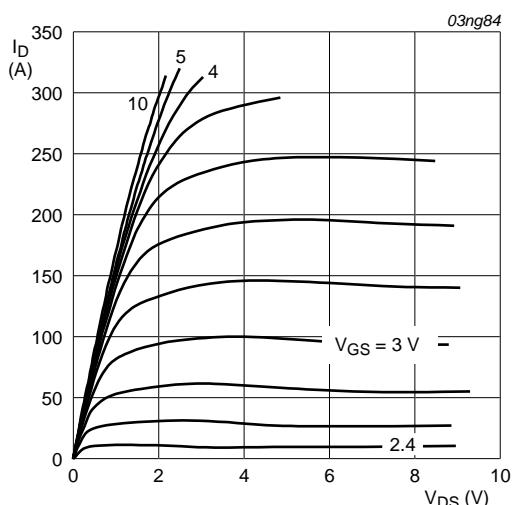
6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ $I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	75	-	-	V
$V_{GS(\text{th})}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 10 $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$ see Figure 10 $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see Figure 10	1.1	1.5	2	V
I_{DSS}	drain leakage current	$V_{DS} = 75 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$ $V_{DS} = 75 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	500	μA
I_{GSS}	gate leakage current	$V_{GS} = 15 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ $V_{GS} = -15 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	2	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ $V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ see Figure 11 ; see Figure 12 $V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ $V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 11 ; see Figure 12	-	-	6.6	$\text{m}\Omega$
Dynamic characteristics						
$Q_{G(\text{tot})}$	total gate charge	$I_D = 25 \text{ A}; V_{DS} = 60 \text{ V}; V_{GS} = 5 \text{ V};$	-	95	-	nC
Q_{GS}	gate-source charge	$T_j = 25 \text{ }^\circ\text{C};$ see Figure 13	-	17	-	nC
Q_{GD}	gate-drain charge		-	37	-	nC
C_{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	8770	11693	pF
C_{oss}	output capacitance	$T_j = 25 \text{ }^\circ\text{C};$ see Figure 14	-	842	1010	pF
C_{rss}	reverse transfer capacitance		-	336	460	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \text{ }\Omega; V_{GS} = 5 \text{ V};$	-	68	-	ns
t_r	rise time	$R_{G(\text{ext})} = 10 \text{ }\Omega; T_j = 25 \text{ }^\circ\text{C}$	-	144	-	ns
$t_{d(off)}$	turn-off delay time		-	273	-	ns
t_f	fall time		-	116	-	ns
L_D	internal drain inductance	from drain lead 6 mm from package to centre of die; $T_j = 25 \text{ }^\circ\text{C}$ from upper edge of drain mounting base to centre of die; $T_j = 25 \text{ }^\circ\text{C}$	-	4.5	-	nH
L_S	internal source inductance	from source lead to source bond pad; $T_j = 25 \text{ }^\circ\text{C}$	-	7.5	-	nH

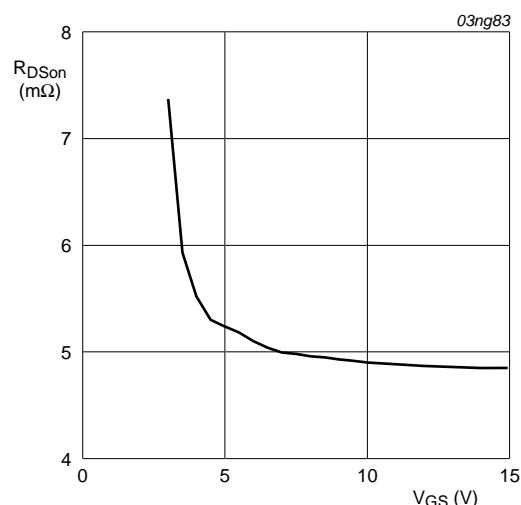
Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 40 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; see Figure 15	-	0.85	1.2	V
t_{rr}	reverse recovery time	$I_S = 20 \text{ A}$; $dI_S/dt = -100 \text{ A}/\mu\text{s}$	-	68	-	ns
Q_r	recovered charge	$V_{GS} = -10 \text{ V}$; $V_{DS} = 25 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$	-	176	-	nC



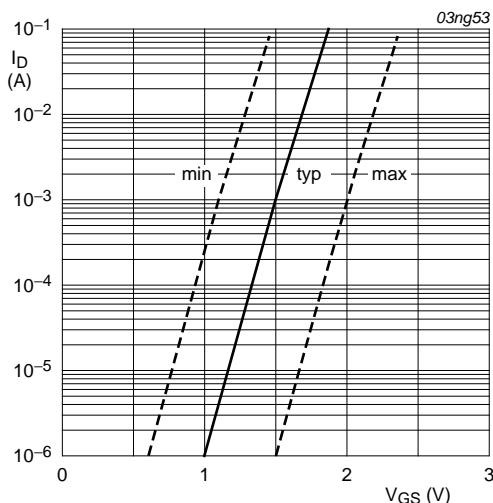
$T_j = 25 \text{ }^\circ\text{C}; t_p = 300 \mu\text{s}$

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



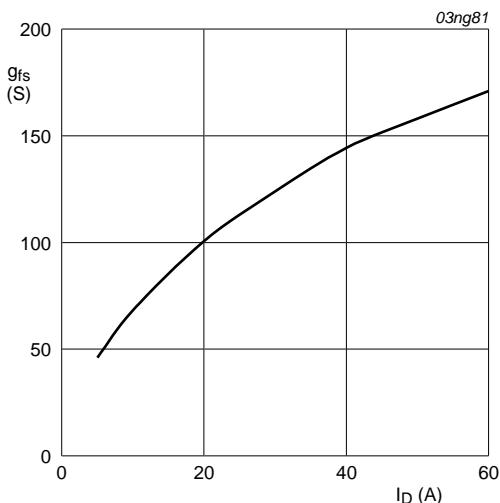
$T_j = 25 \text{ }^\circ\text{C}; I_D = 25 \text{ A}$

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



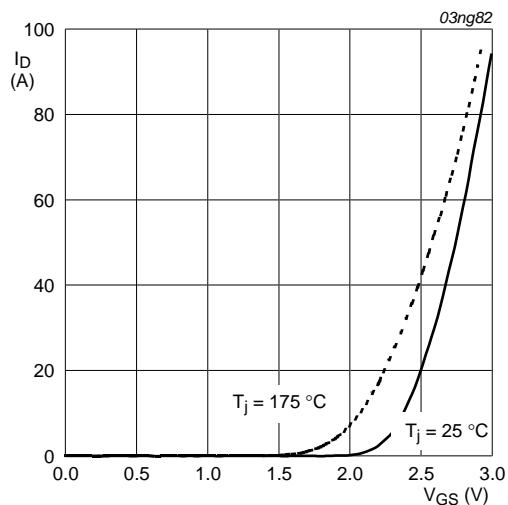
$T_j = 25 \text{ }^\circ\text{C}; V_{DS} = V_{GS}$

Fig 7. Sub-threshold drain current as a function of gate-source voltage



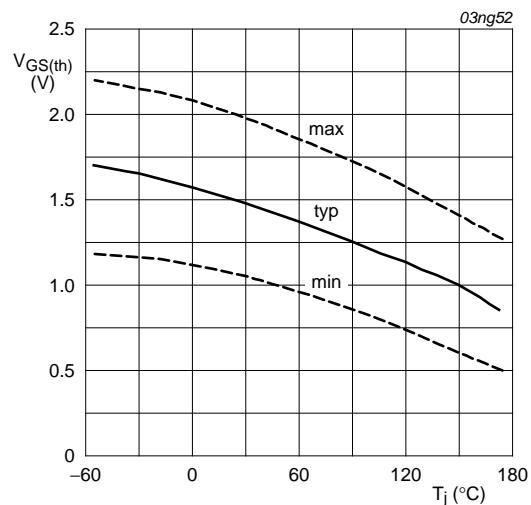
$T_j = 25 \text{ }^\circ\text{C}; V_{DS} = 25 \text{ V}$

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



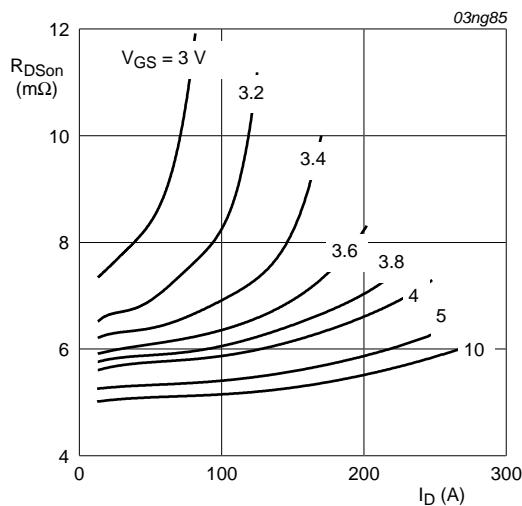
$V_{DS} = 25V$

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



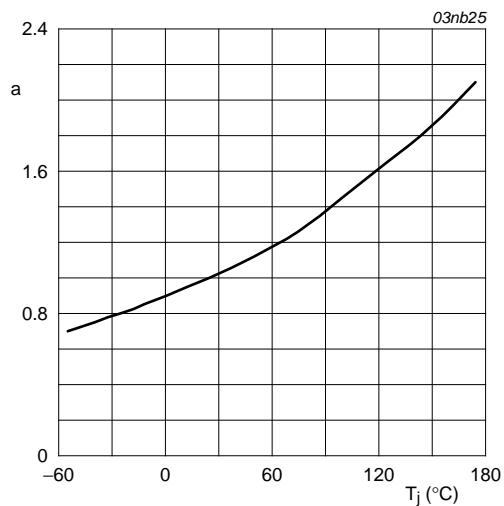
$I_D = 1mA; V_{DS} = V_{GS}$

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



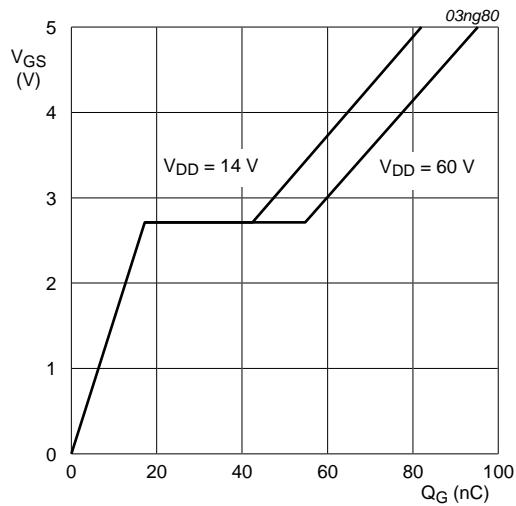
$T_j = 25^{\circ}C$

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



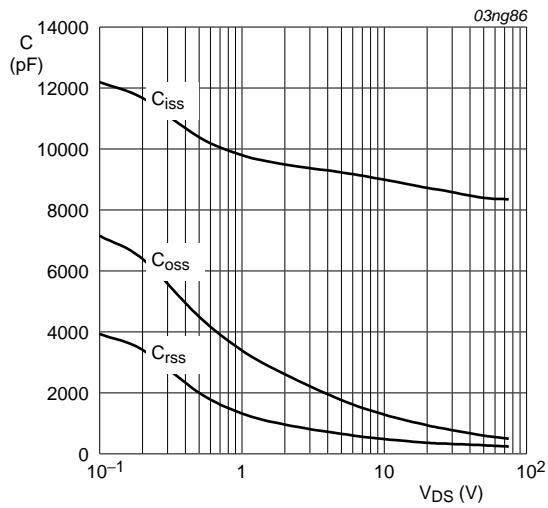
$$a = \frac{R_{DSon}}{R_{DSon}(25^{\circ}C)}$$

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



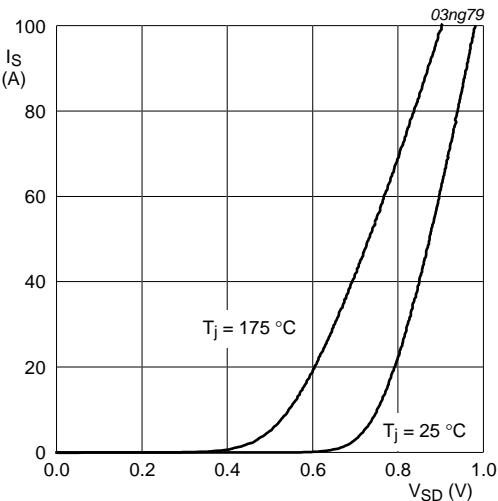
$T_j = 25^\circ\text{C}; I_D = 25\text{A}$

Fig 13. Gate-source voltage as a function of turn-on gate charge; typical values



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

Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



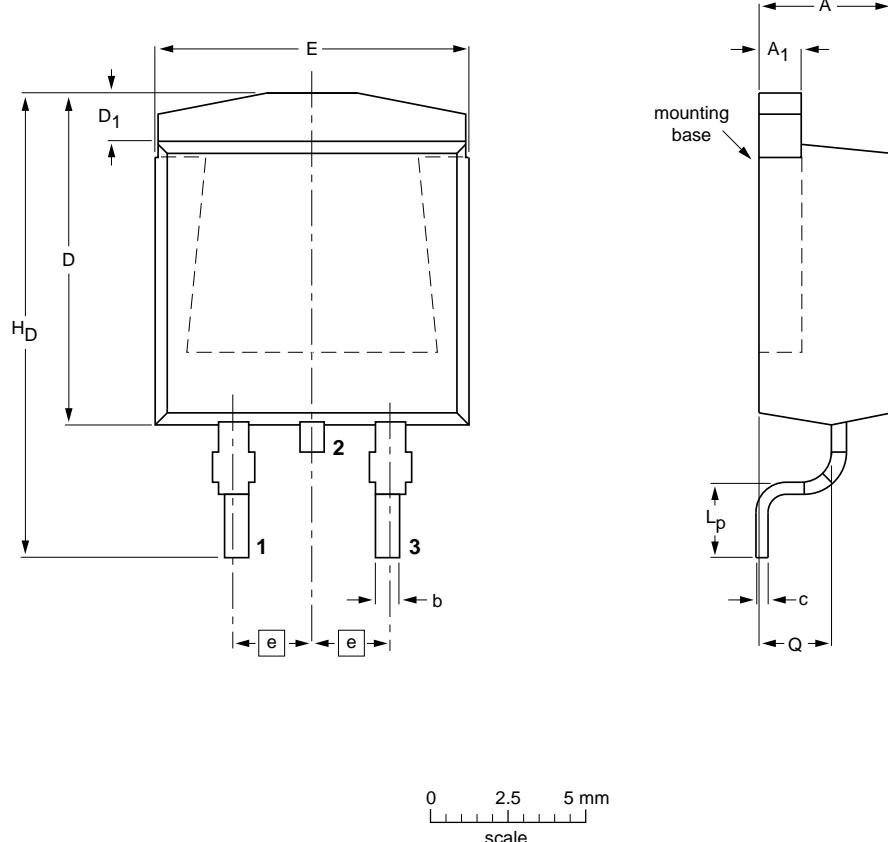
$V_{GS} = 0\text{V}$

Fig 15. Reverse diode current as a function of reverse diode voltage; typical values

7. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)

SOT404



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	c	D _{max.}	D ₁	E	e	L _p	H _D	Q
mm	4.50 4.10	1.40 1.27	0.85 0.60	0.64 0.46	11	1.60 1.20	10.30 9.70	2.54	2.90 2.10	15.80 14.80	2.60 2.20

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT404						-05-02-11 06-03-16

Fig 16. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9606-75B v.4	20110720	Product data sheet	-	BUK9606-75B v.3
Modifications:		• Various changes to content.		
BUK9606-75B v.3	20110207	Product data sheet	-	BUK95_9606_75B v.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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11. Contents

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JONHON

«JONHON» (основан в 1970 г.)

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«FORSTAR» (основан в 1998 г.)

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(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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