

BUK7611-55B

N-channel TrenchMOS standard level FET Rev. 3 — 31 January 2011

Product data sheet

Product profile 1.

1.1 General description

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

1.3 Applications

- 12 V and 24 V loads
- Automotive systems

- General purpose power switching
- Motors, lamps and solenoids

1.4 Quick reference data

Quick reference data Table 1.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C	-	-	55	V
I_D	drain current	$V_{GS} = 10 \text{ V}; T_{mb} = 25 \text{ °C};$ see <u>Figure 1</u> ; see <u>Figure 3</u>	-	-	75	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	-	157	W
Static chara	Static characteristics					
R _{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure 11}}{\text{see } \frac{\text{Figure 12}}{\text{Figure 12}}}$	-	9.9	11	mΩ



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Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Avalanche	ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 75 A; $V_{sup} \le$ 55 V; R_{GS} = 50 Ω ; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped	-	-	173	mJ
Dynamic c	haracteristics					
Q_{GD}	gate-drain charge	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A};$ $V_{DS} = 44 \text{ V}; T_j = 25 ^{\circ}\text{C};$ see Figure 13	-	12	-	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]	mb	D
3	S	source		
mb	D	mounting base; connected to drain		mbb076 S
			SOT404 (D2PAK)	

^[1] It is not possible to make connection to pin 2 of the SOT404 package.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK7611-55B	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
-		T _i ≥ 25 °C; T _i ≤ 175 °C			55	V
V _{DS}	drain-source voltage	· · · · · · · · · · · · · · · · · · ·		-		
V_{DGR}	drain-gate voltage	$R_{GS} = 20 \text{ k}\Omega$		-	55	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 <u>Figure 1</u> ; see <u>Figure 3</u>	<u>[1]</u>	-	84	Α
		$T_{mb} = 100 ^{\circ}\text{C}; V_{GS} = 10 \text{V}; \text{see} \frac{\text{Figure 1}}{}$	[1]	-	59	Α
		$T_{mb} = 25 ^{\circ}\text{C}; V_{GS} = 10 \text{V};$ see Figure 1; see Figure 3	[2]	-	75	Α
I _{DM}	peak drain current	T_{mb} = 25 °C; pulsed; $t_p \le 10 \mu s$; see Figure 3		-	338	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>		-	157	W
T _{stg}	storage temperature			-55	175	°C
Tj	junction temperature			-55	175	°C
Source-drai	in diode					
I _S	source current	T _{mb} = 25 °C	[1]	-	84	Α
			[2]	-	75	Α
I _{SM}	peak source current	pulsed; $t_p \le 10 \ \mu s$; $T_{mb} = 25 \ ^{\circ}C$		-	338	Α
Avalanche r	ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 75 A; V_{sup} ≤ 55 V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped		-	173	mJ

^[1] Current is limited by power dissipation chip rating.

^[2] Continuous current is limited by package.

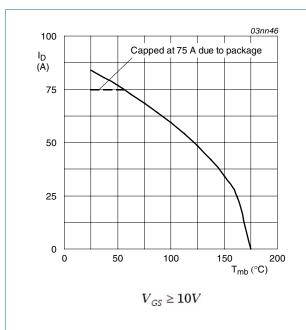


Fig 1. Continuous drain current as a function of mounting base temperature

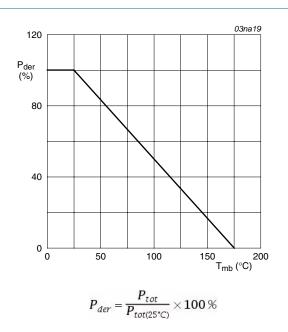
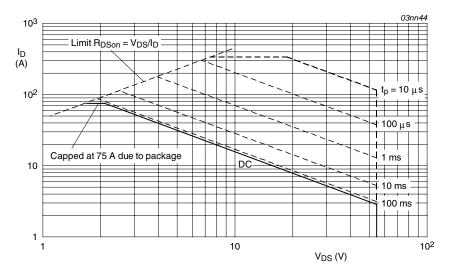


Fig 2. Normalized total power dissipation as a function of mounting base temperature



 $T_{mb} = 25$ °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	Тур	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	0.95	K/W
R _{th(j-a)}	thermal resistance from junction to ambient	minimum footprint; mounted on a printed-circuit board	-	50	-	K/W

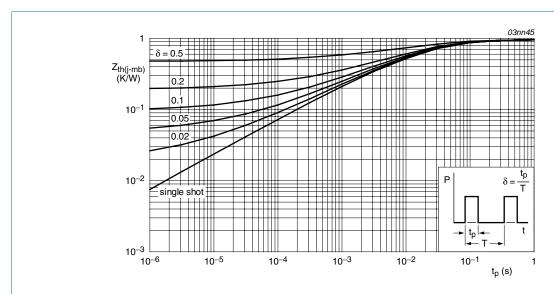


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Table 6.	Characteristics					
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static cha	racteristics					
V _{(BR)DSS}	drain-source	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	55	-	-	V
	breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ °C}$	50	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ °C}$; see <u>Figure 10</u>	2	3	4	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 175$ °C; see <u>Figure 10</u>	1	-	-	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = -55$ °C; see <u>Figure 10</u>	-	-	4.4	V
I _{DSS}	drain leakage current	$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	0.02	1	μΑ
		$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ °C}$	-	-	500	μΑ
I _{GSS}	gate leakage current	$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nA
		$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nA
R _{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; see <u>Figure 11</u> ; see <u>Figure 12</u>	-	-	22	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; see <u>Figure 11</u> ; see <u>Figure 12</u>	-	9.9	11	mΩ
Dynamic (characteristics					
Q _{G(tot)}	total gate charge	$I_D = 25 \text{ A}; V_{DS} = 44 \text{ V}; V_{GS} = 10 \text{ V};$	-	37	-	nC
Q_{GS}	gate-source charge	T _j = 25 °C; see <u>Figure 13</u>	-	9	-	nC
Q_{GD}	gate-drain charge		-	12	-	nC
C _{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	1953	2604	pF
C _{oss}	output capacitance	T _j = 25 °C; see <u>Figure 14</u>	-	375	450	pF
C _{rss}	reverse transfer capacitance		-	167	230	pF
t _{d(on)}	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \Omega; V_{GS} = 10 \text{ V};$	-	11	-	ns
t _r	rise time	$R_{G(ext)} = 10 \Omega; T_j = 25 °C$	-	45	-	ns
t _{d(off)}	turn-off delay time		-	41	-	ns
t _f	fall time		-	27	-	ns
L _D	internal drain inductance	from upper edge of drain mounting base to centre of die; $T_j = 25$ °C	-	2.5	-	nΗ
		from drain lead 6 mm from package to center of die; $T_j = 25$ °C	-	4.5	-	nΗ
L _S	internal source inductance	from source lead 6 mm from package to source bond pad; $T_j = 25 ^{\circ}\text{C}$	-	7.5	-	nΗ
Source-dr	rain diode					
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 ^{\circ}\text{C};$ see <u>Figure 15</u>	-	0.85	1.2	V
t _{rr}	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A/}\mu\text{s};$	-	60	-	ns
Q _r	recovered charge	$V_{GS} = -10 \text{ V}; V_{DS} = 30 \text{ V}; T_j = 25 \text{ °C}$	-	58	-	nC

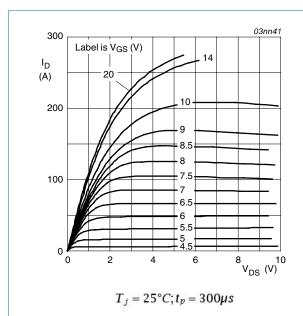


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

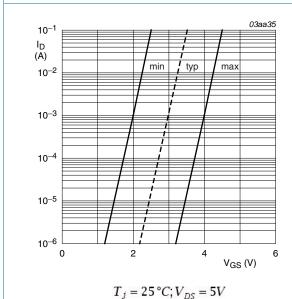
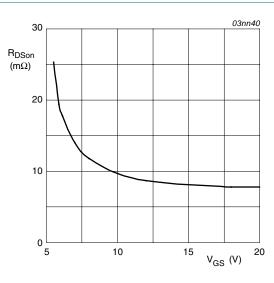
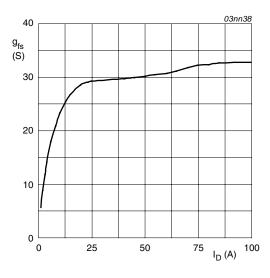


Fig 7. Sub-threshold drain current as a function of gate-source voltage



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

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



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

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

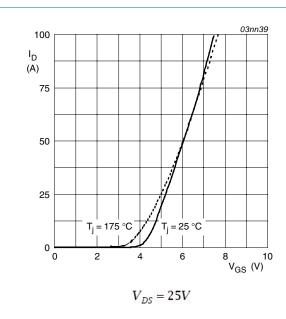


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

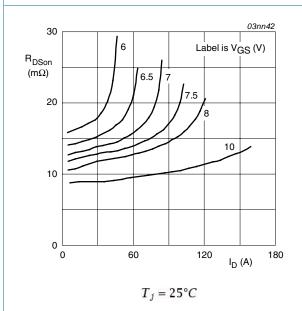
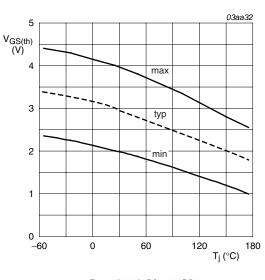


Fig 11. Drain-source on-state resistance as a function of drain current; typical values



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

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

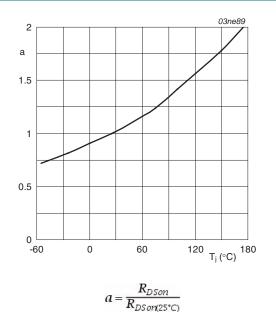


Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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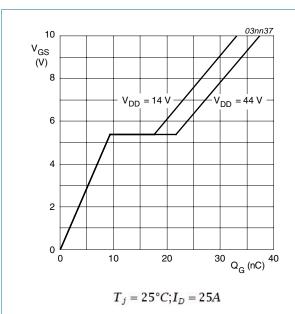
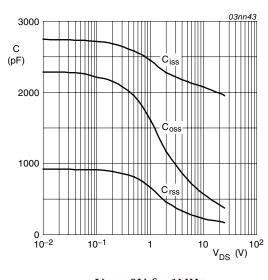
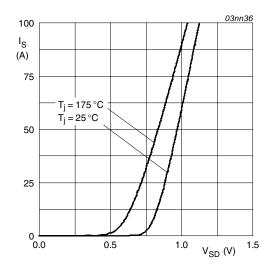


Fig 13. Gate-source voltage as a function of gate charge; typical values



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

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



 $V_{GS} = 0V$

Fig 15. Source current as a function of source-drain voltage; typical values

7. Package outline

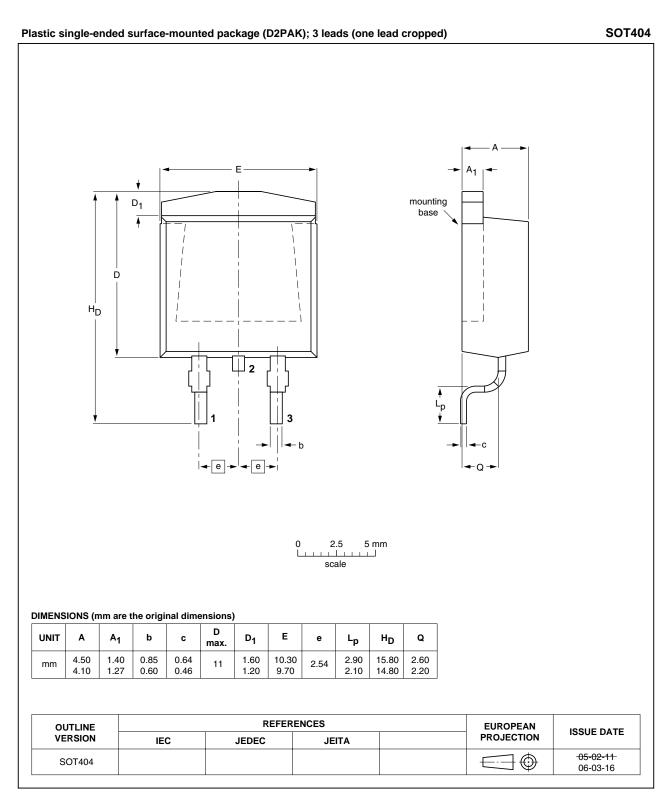


Fig 16. Package outline SOT404 (D2PAK)

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8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
BUK7611-55B v.3	20110131	Product data sheet	-	BUK75_76_7E11_55B-02	
Modifications: • The format of this data sheet has been redesigned to comply with the new i guidelines of NXP Semiconductors.			nply with the new identity		
	 Legal texts have been adapted to the new company name where appropriate. 				
	 Type number 	er BUK7611-55B separate	ed from data sheet E	BUK75_76_7E11_55B-02.	
BUK75_76_7E11_55B-02 (9397 750 12053)	20031111	Product data	-	BUK75_76_7E11_55B-01	

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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.

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