

BUK7611-55A

N-channel TrenchMOS standard level FET Rev. 02 — 16 June 2010

Product data sheet

Product profile

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

- Low conduction losses due to low on-state resistance
- Q101 compliant

- 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 and 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	$T_j \ge 25 \text{ °C}; T_j \le 175 \text{ °C}$	-	-	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>	-	-	166	W
Static chara	acteristics					
R _{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A};$ $T_j = 175 ^{\circ}\text{C}; \text{ see } \frac{\text{Figure 12}}{\text{Figure 13}};$	-	-	22	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure } 12}{\text{Figure } 13};$ see Figure 13	-	9	11	mΩ
Avalanche	ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	$\begin{split} I_D &= 65 \text{ A; } V_{sup} \leq 55 \text{ V;} \\ R_{GS} &= 50 \text{ \Omega; } V_{GS} = 10 \text{ V;} \\ T_{j(init)} &= 25 \text{ °C; } unclamped \end{split}$	-	-	211	mJ



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol	
1	G	gate			
2	D	drain	mb	D	
3	S	source			
mb	D	mounting base; connected to drain	1 3	mbb076 S	
			SOT404 (D2PAK)		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK7611-55A	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	Тур	Max	Unit
-			141111	קעי		
V_{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C	-	-	55	V
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 °C; V_{GS} = 10 V; see <u>Figure 1</u> ; see <u>Figure 3</u>	-	-	75	Α
		$T_{mb} = 100 ^{\circ}C; V_{GS} = 10 V; see \underline{Figure 1}$	-	-	61	Α
I _{DM}	peak drain current	T_{mb} = 25 °C; $t_p \le 10 \mu s$; pulsed; see Figure 3	-	-	347	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	-	166	W
T _{stg}	storage temperature		-55	-	175	°C
Tj	junction temperature		-55	-	175	°C
Source-drain	diode					
Is	source current	T _{mb} = 25 °C	-	-	75	Α
I _{SM}	peak source current	$t_p \le 10 \ \mu s$; pulsed; $T_{mb} = 25 \ ^{\circ}C$	-	-	347	Α
Avalanche rug	ggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 65 A; V_{sup} ≤ 55 V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped	-	-	211	mJ

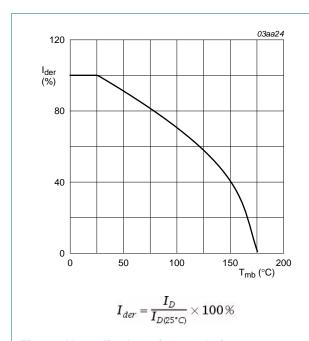
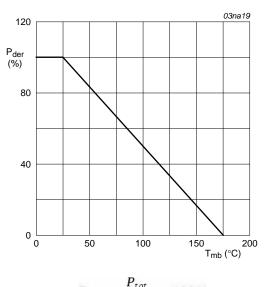
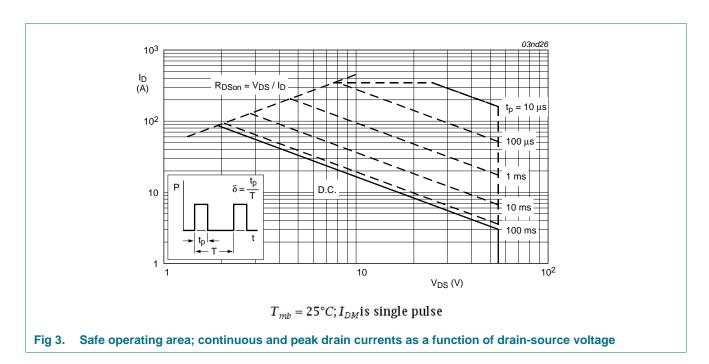


Fig 1. Normalized continuous drain current as a function of mounting base temperature



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

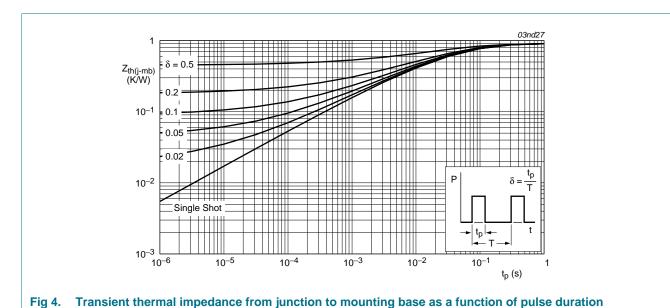
Fig 2. Normalized total power dissipation as a function of mounting base temperature



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	-	-	0.9	K/W
R _{th(j-a)}	thermal resistance from junction to ambient	mounted on a printed-circuit board; minimum footprint	-	50	-	K/W



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	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	$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = -55$ °C; see Figure 11	-	-	4.4	V
		I_D = 1 mA; V_{DS} = V_{GS} ; T_j = 25 °C; see <u>Figure 11</u>	2	3	4	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 175$ °C; see <u>Figure 11</u>	1	-	-	V
DSS	drain leakage current	$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ °C}$	-	-	500	μΑ
		$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	0.05	1	μΑ
I _{GSS}	gate leakage current	V _{DS} = 0 V; V _{GS} = 20 V; T _j = 25 °C	-	2	100	nA
		$V_{DS} = 0 \text{ V}; V_{GS} = -20 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nA
Doon	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; see <u>Figure 12</u> ; see <u>Figure 13</u>	-	-	22	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; see <u>Figure 12</u> ; see <u>Figure 13</u>	-	9	11	mΩ
Dynamic c	haracteristics					
C _{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	2230	3093	pF
C _{oss}	output capacitance	T _j = 25 °C; see <u>Figure 14</u>	-	510	645	pF
C _{rss}	reverse transfer capacitance		-	290	467	pF
td(on)	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \Omega; V_{GS} = 10 \text{ V};$	-	18	-	ns
r	rise time	$R_{G(ext)} = 10 \Omega; T_j = 25 °C$	-	90	-	ns
d(off)	turn-off delay time		-	84	-	ns
i _f	fall time		-	68	-	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 centre of die ; $T_j = 25 ^{\circ}\text{C}$	-	4.5	-	nΗ
-S	internal source inductance	from source lead to source bond pad ; $T_j = 25 ^{\circ}\text{C}$	-	7.5	-	nΗ
Source-dra	ain diode					
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ °C}$; see <u>Figure 15</u>	-	0.85	1.2	V
rr	reverse recovery time	$I_S = 20 \text{ A}$; $dI_S/dt = -100 \text{ A/}\mu\text{s}$;	-	62	-	ns
Q _r	recovered charge	$V_{GS} = -10 \text{ V}; V_{DS} = 30 \text{ V}; T_j = 25 \text{ °C}$	-	140	-	nC

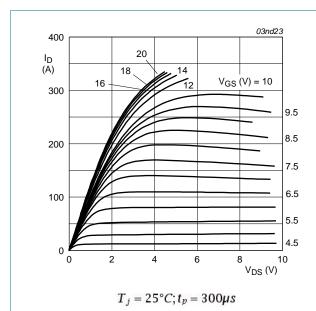


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

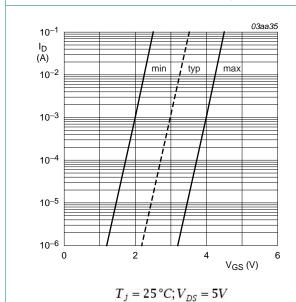
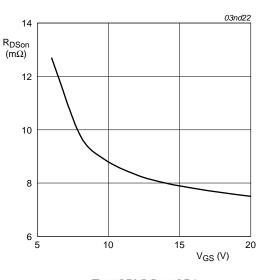


Fig 7. Sub-threshold drain current as a function of gate-source voltage



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

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

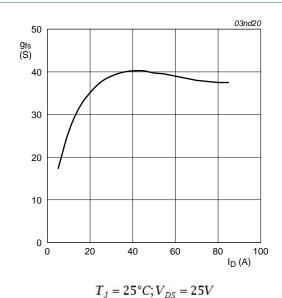


Fig 8. Forward transconductance as a function of drain current; typical values

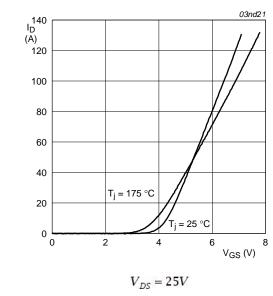
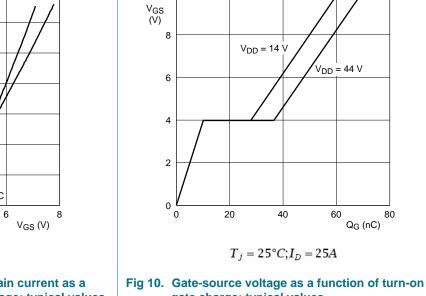


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values



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gate charge; typical values

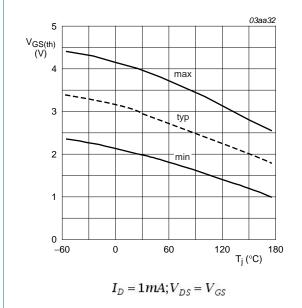


Fig 11. Gate-source threshold voltage as a function of junction temperature

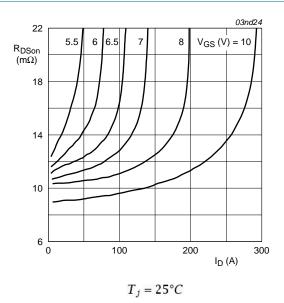
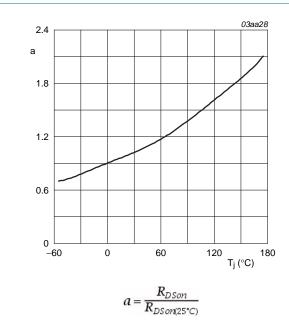


Fig 12. Drain-source on-state resistance as a function of drain current; typical values



4500 (pF) Ciss 4000 \prod 3500 3000 2500 C_{rss} 2000 1500 1000 500 0 10-2 10^{-1} V_{DS} (V) $V_{GS} = 0V; f = 1MHz$

Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature

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

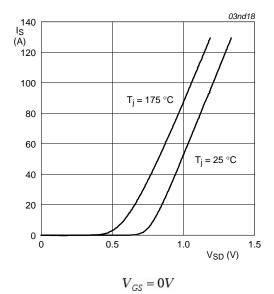


Fig 15. Reverse diode current as a function of reverse diode voltage; typical values

7. Package outline

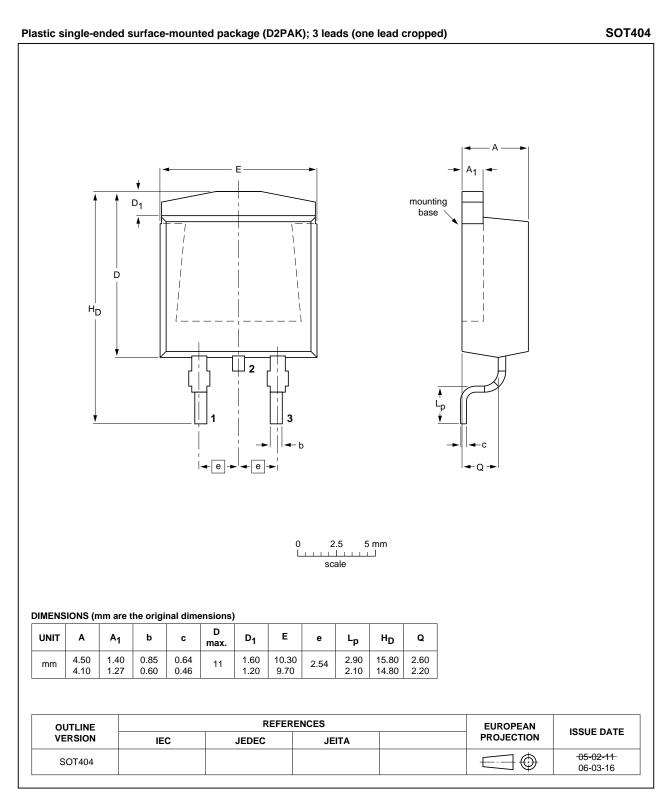


Fig 16. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK7611-55A v.2	20100616	Product data sheet	-	BUK7511_7611_55A v.1
Modifications: • The format of this data sheet has been redesigned to comply with the of NXP Semiconductors.				the new identity guidelines
	 Legal texts 	have been adapted to the r	new company name where	appropriate.
	 Type number 	er BUK7611-55A separated	I from data sheet BUK7511	_7611_55A v.1.
BUK7511_7611_55A v.1 (9397 750 07817)	20010201	Product Specification	-	-

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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.

- [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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N-channel TrenchMOS standard level FET

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