

BUK9675-55A

N-channel TrenchMOS logic level FET Rev. 2 — 8 February 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 and 24 V loads
- Automotive and general purpose power switching

Motors, lamps and solenoids

1.4 Quick reference data

Table 1. Quick reference data

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} = 5 V; T _{mb} = 25 °C; see <u>Figure 1</u> ; see <u>Figure 3</u>	-	-	20	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	-	62	W



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Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static chara	acteristics					
R _{DSon}	drain-source on-state	$V_{GS} = 4.5 \text{ V}; I_D = 10 \text{ A};$ $T_j = 25 \text{ °C}$	-	-	81	mΩ
	resistance	$V_{GS} = 10 \text{ V}; I_D = 10 \text{ A};$ $T_j = 25 \text{ °C}$	-	58	68	mΩ
		$V_{GS} = 5 \text{ V}; I_D = 10 \text{ A};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure 12}}{\text{Figure 13}};$	-	64	75	mΩ
Avalanche	ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 12 A; $V_{sup} \le 55$ V; $R_{GS} = 50 \Omega$; $V_{GS} = 5$ V; $T_{j(init)} = 25 ^{\circ}C$; unclamped	-	-	72	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		mbb076 S
			SOT404 (D2PAK)	

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK9675-55A	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	Max	Unit
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		-10	10	V
I _D	drain current	T_{mb} = 25 °C; V_{GS} = 5 V; see <u>Figure 1</u> ; see <u>Figure 3</u>	-	20	Α
		T _{mb} = 100 °C; V _{GS} = 5 V; see <u>Figure 1</u>	-	14	Α
I _{DM}	peak drain current	T_{mb} = 25 °C; pulsed; $t_p \le 10 \mu s$; see <u>Figure 3</u>	-	81	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	62	W
T _{stg}	storage temperature		-55	175	°C
Tj	junction temperature		-55	175	°C
V_{GSM}	peak gate-source voltage	pulsed; t _p ≤ 50 μs	-15	15	V
Source-drain	n diode				
I _S	source current	T _{mb} = 25 °C	-	20	Α
I _{SM}	peak source current	pulsed; $t_p \le 10 \ \mu s$; $T_{mb} = 25 \ ^{\circ}C$	-	81	Α
Avalanche r	uggedness				
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 12 A; $V_{sup} \le 55$ V; $R_{GS} = 50$ Ω; $V_{GS} = 5$ V; $T_{j(init)} = 25$ °C; unclamped	-	72	mJ

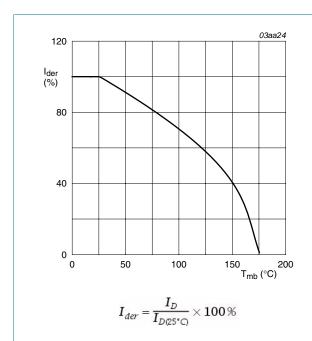


Fig 1. Normalized continuous drain current as a function of mounting base temperature

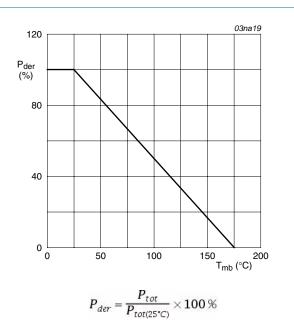
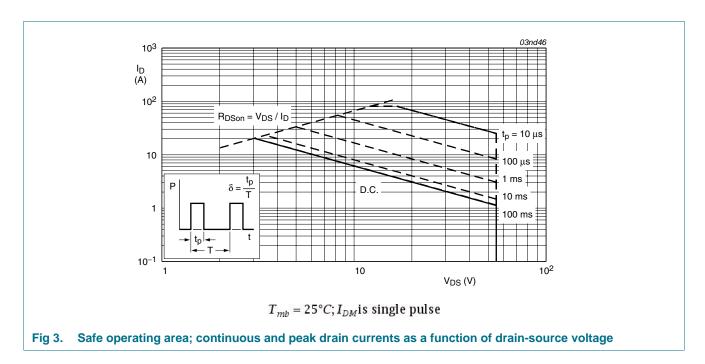


Fig 2. Normalized total power dissipation as a function of mounting base temperature



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

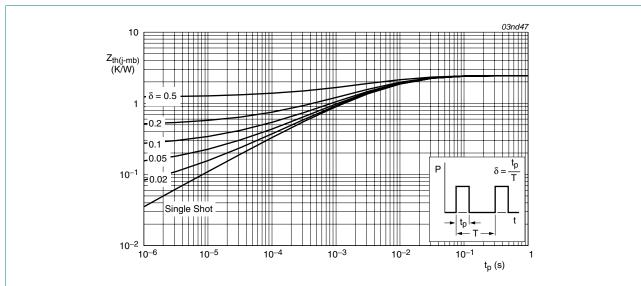


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Table 6.	Characteristics					
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static cha	aracteristics					
V _{(BR)DSS}	drain-source	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ °C}$	50	-	-	V
	breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	55	-	-	V
V _{GS(th)}	gate-source threshold voltage	$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 175$ °C; see Figure 11	0.5	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS} ; T_j = 25 °C; see <u>Figure 11</u>	1	1.5	2	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = -55$ °C; see <u>Figure 11</u>	-	-	2.3	V
I _{DSS}	drain leakage current	$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	0.05	10	μΑ
		$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ °C}$	-	-	500	μΑ
I _{GSS}	gate leakage current	$V_{GS} = 10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nΑ
		$V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 ^{\circ}\text{C}$	-	2	100	nΑ
R _{DSon}	drain-source on-state resistance	$V_{GS} = 5 \text{ V}; I_D = 10 \text{ A}; T_j = 175 ^{\circ}\text{C};$ see <u>Figure 12</u> ; see <u>Figure 13</u>	-	-	150	mΩ
		$V_{GS} = 4.5 \text{ V}; I_D = 10 \text{ A}; T_j = 25 ^{\circ}\text{C}$	-	-	81	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 25 \text{ °C}$	-	58	68	mΩ
		$V_{GS} = 5 \text{ V}; I_D = 10 \text{ A}; T_j = 25 ^{\circ}\text{C};$ see Figure 12; see Figure 13	-	64	75	mΩ
Dynamic	characteristics					
C _{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	440	643	pF
C _{oss}	output capacitance	T _j = 25 °C; see <u>Figure 14</u>	-	90	111	pF
C _{rss}	reverse transfer capacitance		-	60	93	pF
t _{d(on)}	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \Omega; V_{GS} = 5 \text{ V};$	-	10	-	ns
t _r	rise time	$R_{G(ext)} = 10 \Omega$; $T_j = 25 °C$	-	47	-	ns
t _{d(off)}	turn-off delay time		-	28	-	ns
t _f	fall time		-	33	-	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; $T_j = 25$ °C	-	4.5	-	nΗ
L _S	internal source inductance	from source lead to source bond pad; $T_j = 25 ^{\circ}\text{C}$	-	7.5	-	nΗ
Source-d	rain diode					
V_{SD}	source-drain voltage	$I_S = 15 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 ^{\circ}\text{C};$ see Figure 15	-	0.85	1.2	V
t _{rr}	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A/}\mu\text{s};$	-	33	-	ns
Q _r	recovered charge	$V_{GS} = -10 \text{ V}; V_{DS} = 30 \text{ V}; T_j = 25 \text{ °C}$	-	60	-	nC

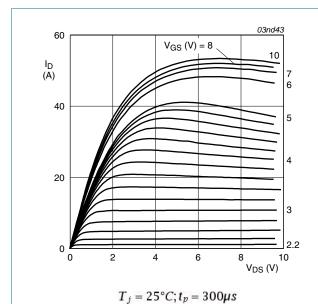


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

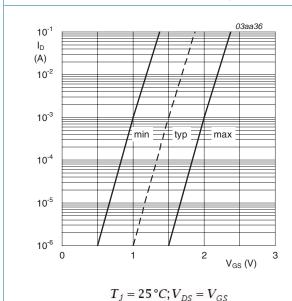
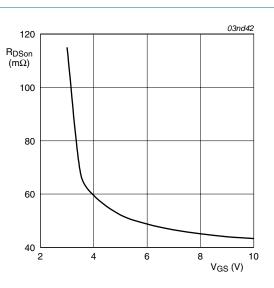
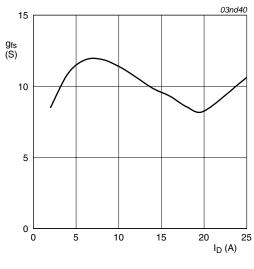


Fig 7. Sub-threshold drain current as a function of gate-source voltage



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

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

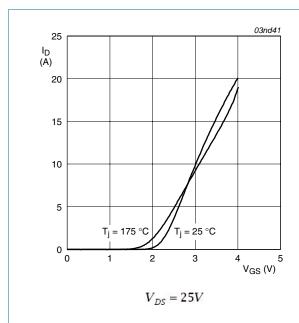


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

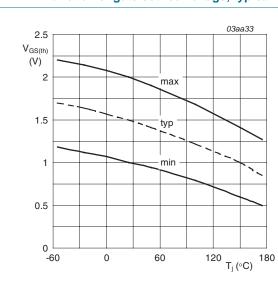


Fig 11. Gate-source threshold voltage as a function of junction temperature

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

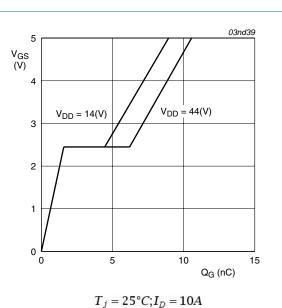


Fig 10. Gate-source voltage as a function of turn-on gate charge; typical values

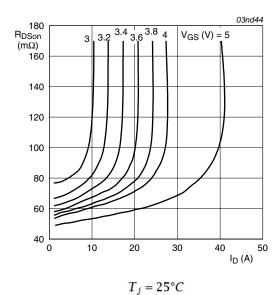


Fig 12. Drain-source on-state resistance as a function of drain current; typical values

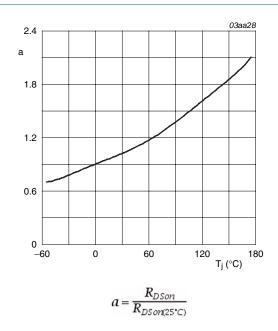


Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature

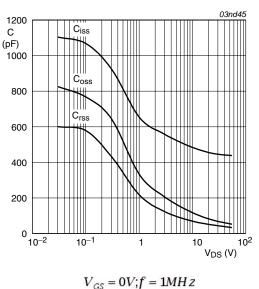


Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

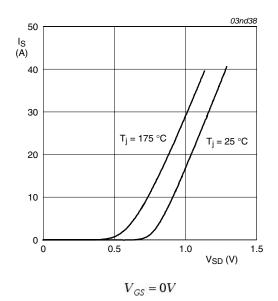


Fig 15. Reverse diode current as a function of reverse diode voltage; typical values

7. Package outline

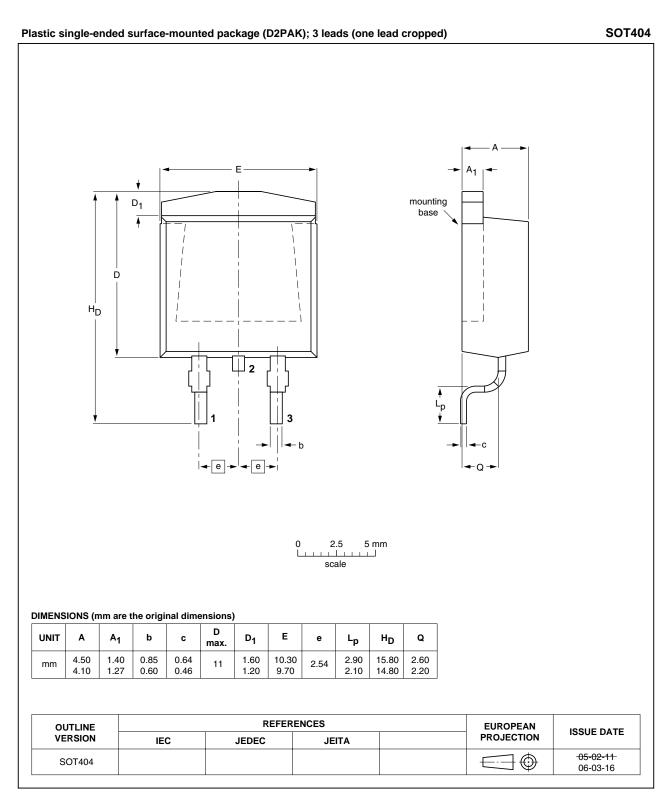


Fig 16. Package outline SOT404 (D2PAK)

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8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9675-55A v.2	20110208	Product data sheet	-	BUK9575_9675_55A v.1
Modifications:	 The format of this data sheet has been redesigned to comply with the new ider guidelines of NXP Semiconductors. 			
	 Legal texts have 	ave been adapted to the i	new company nam	e where appropriate.
	 Type number 	BUK9675-55A separated	d from data sheet E	BUK9575_9675_55A v.1.
BUK9575_9675_55A v.1	20010209	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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многоканальный

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