

BUK9608-55A

N-channel TrenchMOS logic level FET Rev. 04 — 31 January 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

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

- 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 ≥ 25 °C; T _j ≤ 175 °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>	<u>[1]</u>	-	-	75	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>		-	-	253	W
Static chara	acteristics						
R _{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}$		-	6.4	7.5	mΩ
		$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}$		-	-	8.5	mΩ
		$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure 11}}{\text{see Figure 12}};$		-	6.8	8	mΩ



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} = 5 V; $T_{j(init)}$ = 25 °C; unclamped	-	-	670	mJ
Dynamic c	Dynamic characteristics					
Q_{GD}	gate-drain charge	$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A};$ $V_{DS} = 44 \text{ V}; T_j = 25 ^{\circ}\text{C};$ see Figure 13	-	43	-	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		$G \longrightarrow A$
mb				mbb076 S
			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
BUK9608-55A	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			-15	15	V
I _D	drain current	$T_{mb} = 25 ^{\circ}C; V_{GS} = 5 V; \text{ see } \frac{\text{Figure 1}}{};$	[1]	-	125	Α
		see Figure 3	[2]	-	75	Α
		$T_{mb} = 100 ^{\circ}\text{C}; V_{GS} = 5 ^{\circ}\text{V}; \text{see} \frac{\text{Figure 1}}{}$	[2]	-	75	Α
I _{DM}	peak drain current	T_{mb} = 25 °C; pulsed; $t_p \le 10 \mu s$; see Figure 3		-	503	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>		-	253	W
T _{stg}	storage temperature			-55	175	°C
Tj	junction temperature			-55	175	°C
Source-drain	n diode					
Is	source current	T _{mb} = 25 °C	[1]	-	125	Α
			[2]	-	75	Α
I _{SM}	peak source current	pulsed; $t_p \le 10 \ \mu s$; $T_{mb} = 25 \ ^{\circ}C$		-	503	Α
Avalanche ru	uggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 75 A; V_{sup} ≤ 55 V; R_{GS} = 50 Ω; V_{GS} = 5 V; $T_{j(init)}$ = 25 °C; unclamped		-	670	mJ

- [1] Current is limited by power dissipation chip rating.
- [2] Continuous current is limited by package.

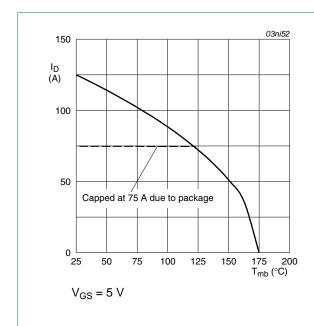


Fig 1. Normalized total power dissipation as a function of mounting base temperature

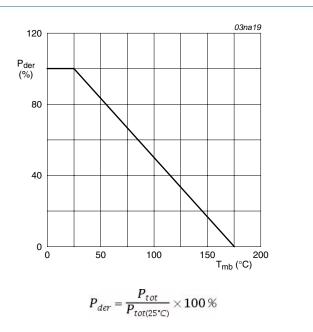
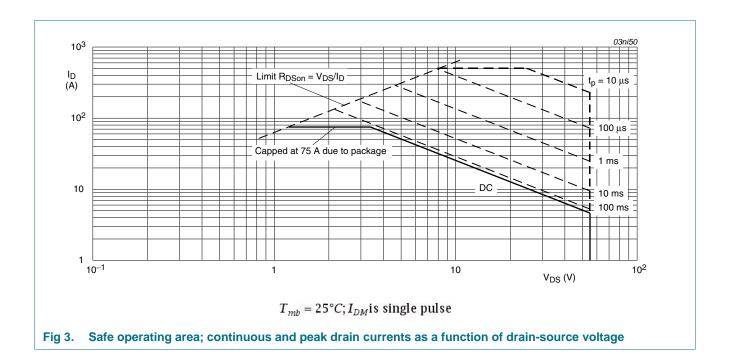


Fig 2. Normalized total power dissipation as a function of mounting base temperature

BUK9608-55A

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

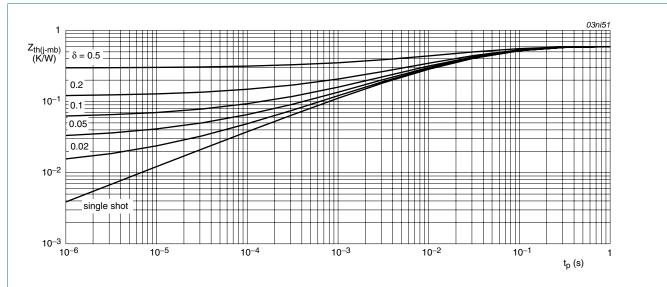


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6 Characteristics

Table 6.	Characteristics					
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static cha	aracteristics					
V _{(BR)DSS}	drain-source breakdown	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	55	-	-	V
	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; $V_{DS} = V_{GS}$; $T_j = 25$ °C; see Figure 10	1	1.5	2	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 175$ °C; see <u>Figure 10</u>	0.5	-	-	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = -55$ °C; see <u>Figure 10</u>	-	-	2.3	V
I _{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	10	μΑ
I _{GSS} g	gate leakage current	$V_{GS} = 10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nΑ
		$V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nΑ
R _{DSon}	drain-source on-state	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ °C}$	-	6.4	7.5	mΩ
resistance	resistance	$V_{GS} = 5 \text{ V}$; $I_D = 25 \text{ A}$; $T_j = 175 \text{ °C}$; see Figure 11; see Figure 12	-	-	16	mΩ
		$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ °C}$	-	-	8.5	mΩ
		$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 ^{\circ}\text{C};$ see Figure 11; see Figure 12	-	6.8	8	mΩ
Dynamic	characteristics					
Q _{G(tot)}	total gate charge	$I_D = 25 \text{ A}; V_{DS} = 44 \text{ V}; V_{GS} = 5 \text{ V};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure } 13}{\text{ Composition}}$	-	92	-	nC
Q_{GS}	gate-source charge		-	11	-	nC
Q_{GD}	gate-drain charge		-	43	-	nC
C _{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	4551	6021	pF
C _{oss}	output capacitance	T _j = 25 °C; see <u>Figure 14</u>	-	760	900	pF
C _{rss}	reverse transfer capacitance		-	500	687	pF
t _{d(on)}	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \Omega; V_{GS} = 5 \text{ V}; R_{G(ext)} = 10 \Omega; T_j = 25 \text{ °C}$	-	40	-	ns
t _r	rise time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \Omega; V_{GS} = 5 \text{ V}; R_{G(ext)} = 10 \Omega; T_j 25 \text{ °C}$	-	175	-	ns
t _{d(off)}	turn-off delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \Omega; V_{GS} = 5 \text{ V};$	-	280	-	ns
t _f	fall time	$R_{G(ext)} = 10 \Omega; T_j = 25 °C$	-	167	-	ns
L _D	internal drain inductance	from drain lead 6 mm from package to centre of die ; $T_j = 25$ °C	-	4.5	-	nΗ
		from upper edge of drain mounting base to centre of die ; $T_j = 25$ °C	-	2.5	-	nΗ
L _S	internal source inductance	from source lead to source bond pad; $T_j = 25$ °C	-	7.5	-	nΗ

Table 6. Characteristics ... continued

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Source-dra	in diode					
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ °C}$; see Figure 15	-	0.85	1.2	V
t _{rr}	reverse recovery time	$I_S = 75 \text{ A}$; $dI_S/dt = -100 \text{ A/}\mu\text{s}$;	-	70	-	ns
Q _r	recovered charge	$V_{GS} = -10 \text{ V}; V_{DS} = 25 \text{ V}; T_j = 25 \text{ °C}$	-	170	-	nC

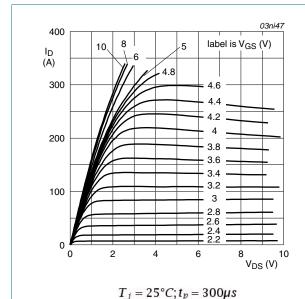


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

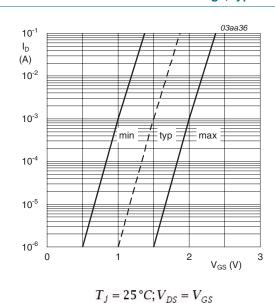
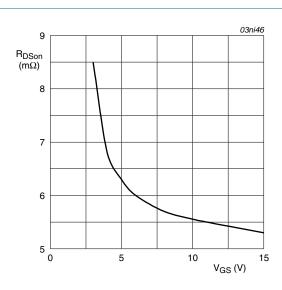
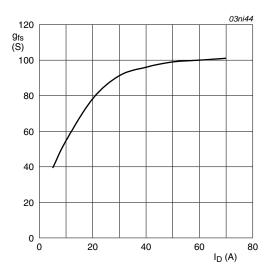


Fig 7. Sub-threshold drain current as a function of gate-source voltage



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

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

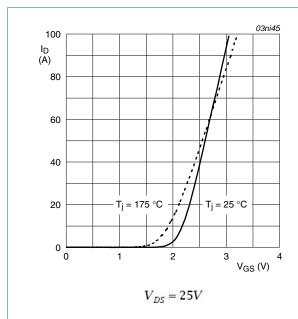


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

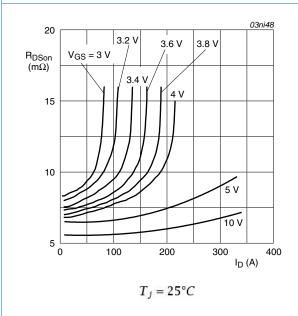
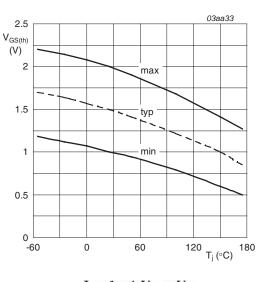


Fig 11. Drain-source on-state resistance as a function of drain current; typical values



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

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

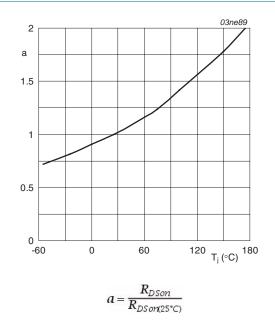


Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature

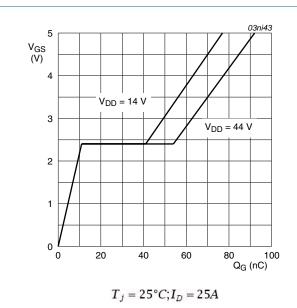
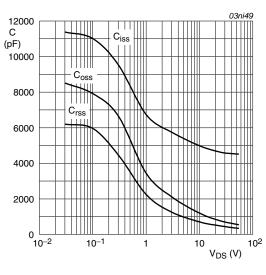


Fig 13. Gate-source voltage as a function of turn-on gate charge; typical values



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

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

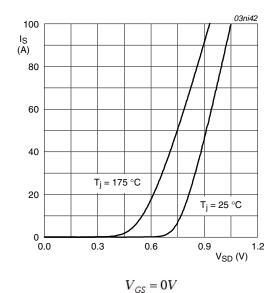


Fig 15. Reverse diode current as a function of reverse diode voltage; typical values

7. Package outline

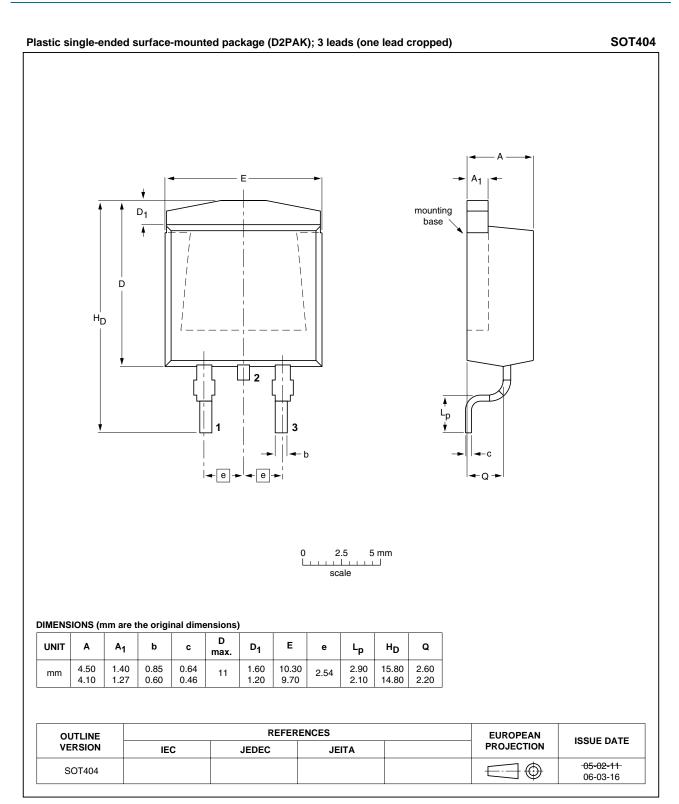


Fig 16. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
BUK9608-55A v.4	20110131	Product data sheet	-	BUK95_9608_55A v.3	
Modifications:	 The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. 				
	 Legal texts 	have been adapted to the	ne new company name	where appropriate.	
	 Type numb 	er BUK9608-55A separa	ited from data sheet Bl	JK95_9608_55A v.3.	
BUK95_9608_55A v.3	20020506	Product data	-	BUK9508_9608-55A v.2	

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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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