

BUK9222-55A

N-channel TrenchMOS logic level FET Rev. 02 — 1 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>	-	-	48	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	-	103	W



N-channel TrenchMOS logic level FET

Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static chara	acteristics					
R _{DSon}	drain-source on-state	$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}$	-	-	24	mΩ
	resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}$	-	17	20	mΩ
		$V_{GS} = 5 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure 12}}{\text{see } \frac{\text{Figure 13}}{\text{Figure 13}}}$	-	19	22	mΩ
Avalanche	ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	$\begin{split} I_D &= 48 \text{ A; } V_{sup} \leq 55 \text{ V;} \\ R_{GS} &= 50 \text{ \Omega; } V_{GS} = 5 \text{ V;} \\ T_{j(init)} &= 25 \text{ °C; } nk; unclamped \end{split}$	-	-	160	mJ

2. Pinning information

Table 2. Pinning information

	•			
Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		_
2	D	drain	mb	D D
3	S	source		G (EX)
mb	D	mounting base; connected to drain	1 3	mbb076 S
			SOT428 (DPAK)	

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK9222-55A	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

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 °C; V_{GS} = 5 V; see <u>Figure 1</u> ; see <u>Figure 3</u>	-	48	Α
		T _{mb} = 100 °C; V _{GS} = 5 V; see <u>Figure 1</u>	-	34	Α
I _{DM}	peak drain current	T_{mb} = 25 °C; pulsed; $t_p \le 10 \mu s$; see Figure 3	-	193	Α
P _{tot}	total power dissipation	T _{mb} = 25 °C; see <u>Figure 2</u>	-	103	W
T _{stg}	storage temperature		-55	175	°C
T _j	junction temperature		-55	175	°C
Source-drain	n diode				
Is	source current	T _{mb} = 25 °C	-	48	Α
I _{SM}	peak source current	pulsed; $t_p \le 10 \ \mu s$; $T_{mb} = 25 \ ^{\circ}C$	-	193	Α
Avalanche r	uggedness				
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I_D = 48 A; V_{sup} ≤ 55 V; R_{GS} = 50 Ω; V_{GS} = 5 V; $T_{j(init)}$ = 25 °C; nk; unclamped	-	160	mJ

[1] peak drain current is limited by chip, not package.

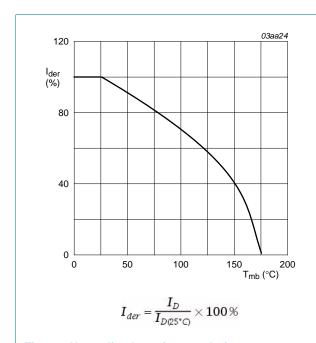
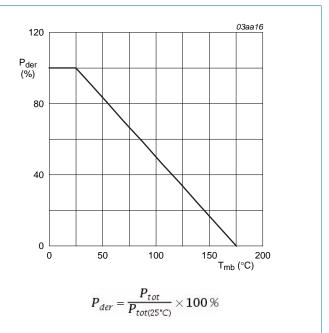
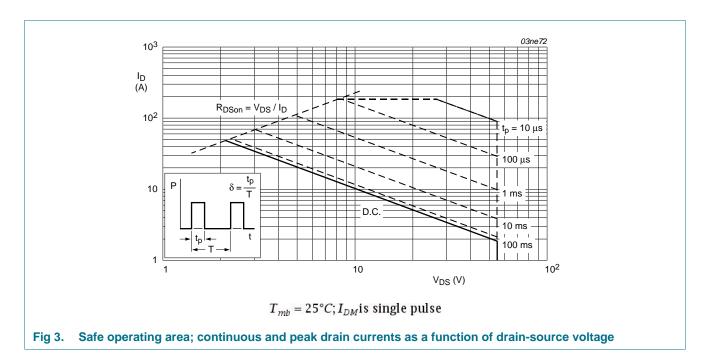


Fig 1. Normalized continuous drain current as a function of mounting base temperature



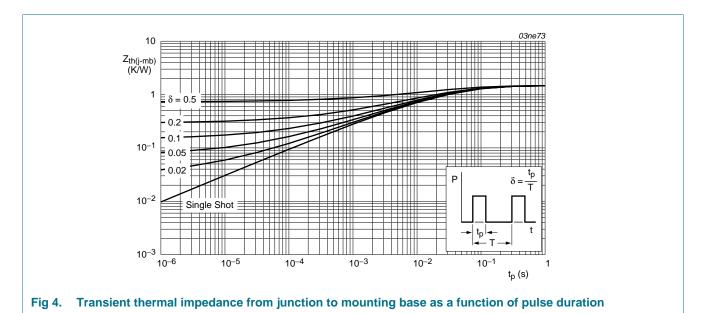
g 2. Normalized total power dissipation as a function of mounting base temperature



5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$R_{th(j\text{-}mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	1.5	K/W
R _{th(j-a)}	thermal resistance from junction to ambient		-	71.4	-	K/W



6. Characteristics

Table 6. Characteristics

Table 6.	Characteristics					
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static cha	aracteristics					
$V_{(BR)DSS}$	drain-source	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	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	$I_D = 1$ 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
		$I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 175$ °C; see Figure 11	0.5	-	-	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
		$V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	2	100	nΑ
Doon	drain-source on-state resistance	$V_{GS} = 5 \text{ V}$; $I_D = 25 \text{ A}$; $T_j = 175 \text{ °C}$; see Figure 12; see Figure 13	-	-	44	mΩ
		$V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 ^{\circ}\text{C}$	-	-	24	$m\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ °C}$	-	17	20	mΩ
		$V_{GS} = 5 \text{ V}$; $I_D = 25 \text{ A}$; $T_j = 25 \text{ °C}$; see Figure 12; see Figure 13	-	19	22	mΩ
Dynamic	characteristics					
C _{iss}	input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$	-	1660	2210	pF
C_{oss}	output capacitance	T _j = 25 °C; see <u>Figure 14</u>	-	290	346	pF
C _{rss}	reverse transfer capacitance		-	194	266	pF
t _{d(on)}	turn-on delay time	$V_{DS} = 30 \text{ V}; R_L = 1.2 \Omega; V_{GS} = 5 \text{ V};$	-	19	-	ns
t _r	rise time	$R_{G(ext)} = 10 \Omega; T_j = 25 °C$	-	124	-	ns
$t_{d(off)}$	turn-off delay time		-	92	-	ns
t _f	fall time		-	93	-	ns
L _D	internal drain inductance	measured from drain to centre of die; $T_j = 25 ^{\circ}\text{C}$	-	2.5	-	nΗ
L _S	internal source inductance	measured 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	$I_S = 25 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ °C}$; see Figure 15	-	0.85	1.2	V
t _{rr}	reverse recovery time	$I_S = 20 \text{ A}$; $dI_S/dt = -100 \text{ A/}\mu\text{s}$;	-	52	-	ns
Q _r	recovered charge	$V_{GS} = -10 \text{ V}; V_{DS} = 30 \text{ V}; T_j = 25 \text{ °C}$	-	81	-	nC

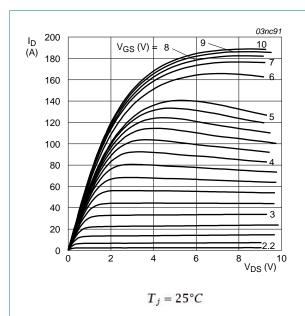


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

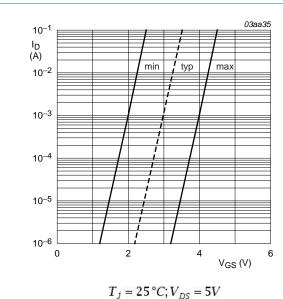
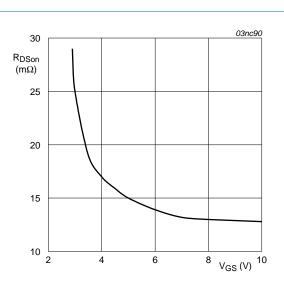
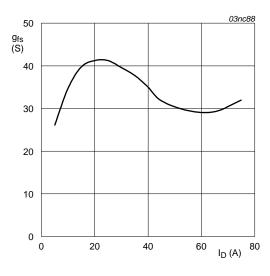


Fig 7. Sub-threshold drain current as a function of gate-source voltage



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

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



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

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

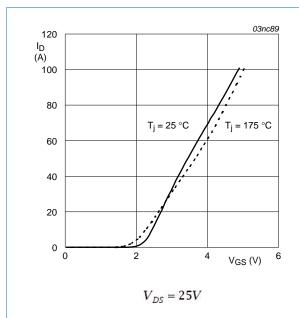


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

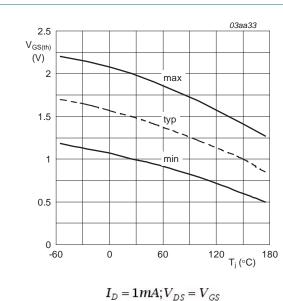


Fig 11. Gate-source threshold voltage as a function of junction temperature

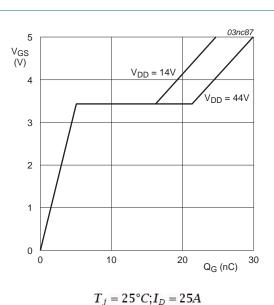


Fig 10. Gate-source voltage as a function of gate charge; typical values

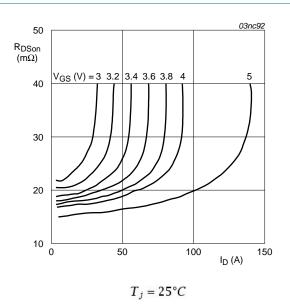


Fig 12. Drain-source on-state resistance as a function of drain current; typical values

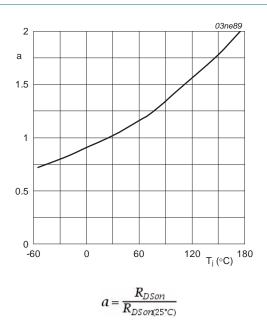
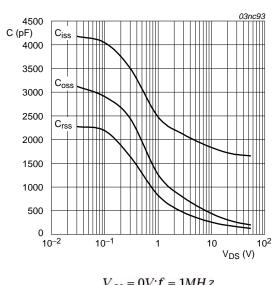
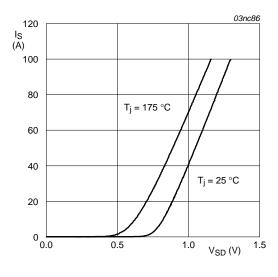


Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature



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

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



 $V_{GS} = 0V$

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

7. Package outline

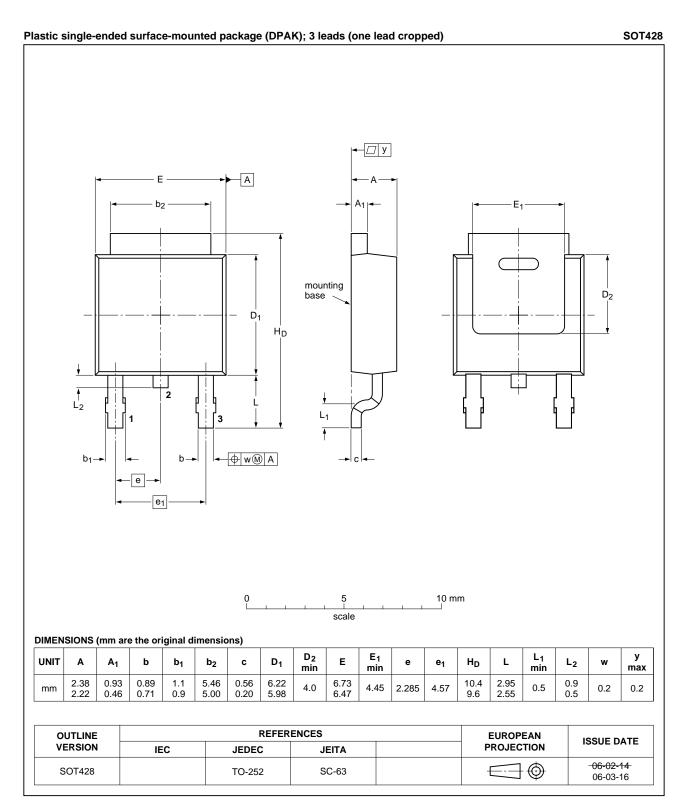


Fig 16. Package outline SOT428 (DPAK)

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8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9222-55A v.2	20110201	Product data sheet	-	BUK9222-55A v.1
Modifications:	 The format of of NXP Semic 	this data sheet has been red onductors.	lesigned to comply with	the new identity guidelines
	 Legal texts ha 	ve been adapted to the new	company name where	appropriate.
	 Various chang 	es to content.		
BUK9222-55A v.1	20010417	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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