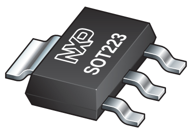


BUK9880-55

N-channel TrenchMOS logic level FET

Rev. 03 — 20 April 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
- Electrostatically robust due to integrated protection diodes
- Low conduction losses due to low on-state resistance

1.3 Applications

- Automotive and general purpose power switching

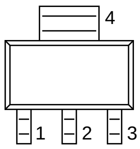
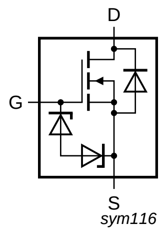
1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	-	55	V
I_D	drain current	$T_{sp} = 25$ °C	-	-	7.5	A
P_{tot}	total power dissipation	$T_{amb} = 25$ °C	-	-	1.8	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 5$ V; $I_D = 5$ A; $T_j = 25$ °C	-	65	80	mΩ
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 2.5$ A; $V_{sup} \leq 25$ V; $R_{GS} = 50$ Ω; $V_{GS} = 5$ V; $T_{j(init)} = 25$ °C; unclamped	-	-	30	mJ

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SOT223 (SOT223)	
2	D	drain		
3	S	source		
4	D	drain		

3. Ordering information

Table 3. Ordering information

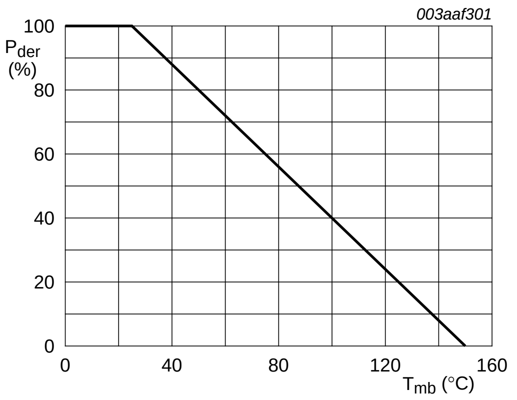
Type number	Package		
	Name	Description	Version
BUK9880-55	SOT223	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

4. Limiting values

Table 4. Limiting values

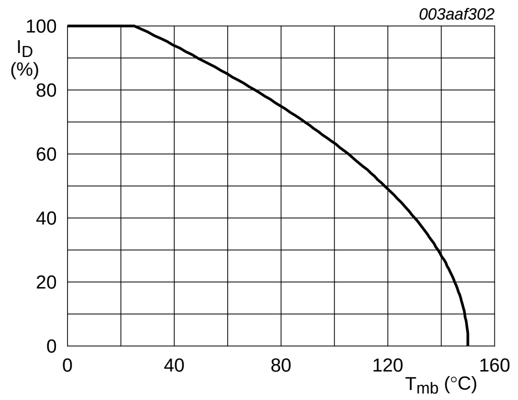
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 150$ °C	-	55	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20$ kΩ	-	55	V
V_{GS}	gate-source voltage		-10	10	V
I_D	drain current	$T_{amb} = 25$ °C	-	3.5	A
		$T_{sp} = 25$ °C	-	7.5	A
		$T_{amb} = 100$ °C	-	2.2	A
I_{DM}	peak drain current	$T_{sp} = 25$ °C; pulsed	-	40	A
P_{tot}	total power dissipation	$T_{amb} = 25$ °C	-	1.8	W
		$T_{sp} = 25$ °C	-	8.3	W
T_{stg}	storage temperature		-55	150	°C
T_j	junction temperature		-55	150	°C
V_{esd}	electrostatic discharge voltage	HBM; C = 100 pF; R = 1.5 kΩ	-	2	kV
Source-drain diode					
I_S	source current	$T_{sp} = 25$ °C	-	7.5	A
I_{SM}	peak source current	pulsed; $T_{sp} = 25$ °C	-	40	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 2.5$ A; $V_{sup} \leq 25$ V; $R_{GS} = 50$ Ω; $V_{GS} = 5$ V; $T_{j(init)} = 25$ °C; unclamped	-	30	mJ



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

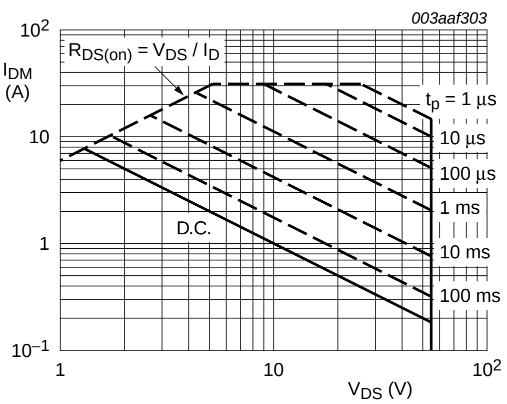
Fig 1. Normalized total power dissipation as a function of solder point temperature



$$I_{der} = \frac{I_D}{I_{D(25^{\circ}C)}} \times 100\,\%$$

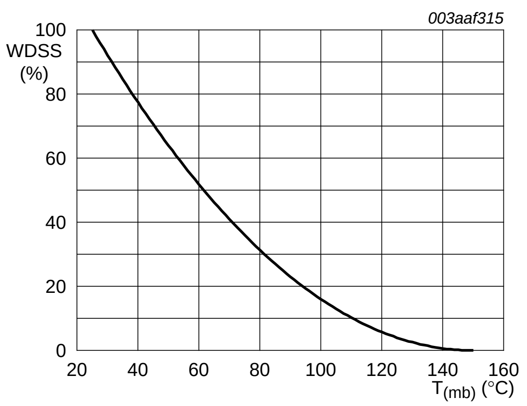
$V_{GS} \geq 5$ V

Fig 2. Normalized continuous drain current as a function of solder point temperature



$T_{sp} = 25$ °C

Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage



$I_D = 2.5$ A

Fig 4. Normalised drain-source non-repetitive avalanche energy as a function of mounting-base temperature

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	mounted on any printed-circuit board	-	12	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on printed-circuit board	-	-	70	K/W

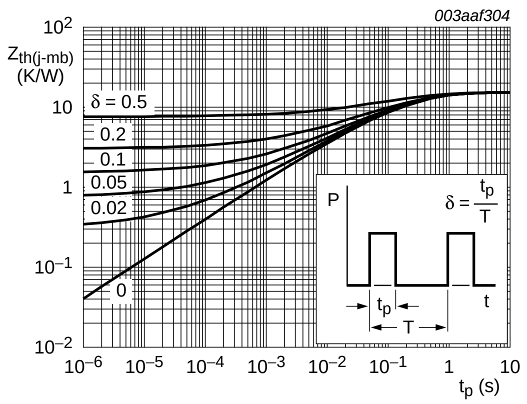
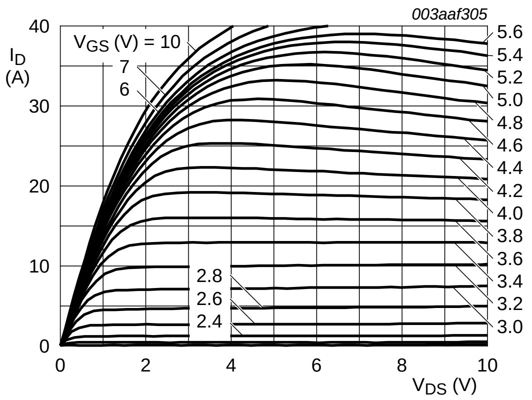


Fig 5. Transient thermal impedance from junction to solder point as a function of pulse duration

6. Characteristics

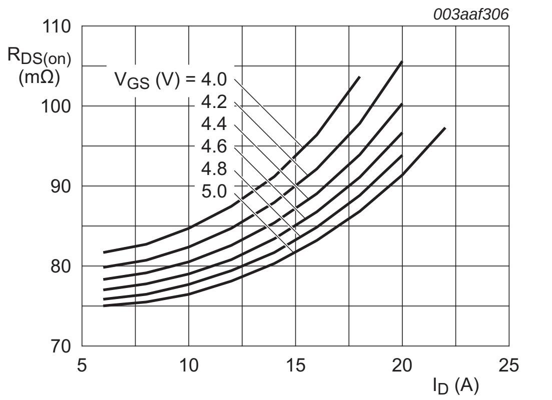
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 0.25 mA; V_{GS} = 0 V; T_j = -55 °C	50	-	-	V
		I_D = 0.25 mA; V_{GS} = 0 V; T_j = 25 °C	55	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C	1	1.5	2	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C	-	-	2.3	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 150 °C	0.6	-	-	V
I_{DSS}	drain leakage current	V_{DS} = 55 V; V_{GS} = 0 V; T_j = 25 °C	-	0.05	10	µA
		V_{DS} = 55 V; V_{GS} = 0 V; T_j = 150 °C	-	-	100	µA
I_{GSS}	gate leakage current	V_{GS} = 5 V; V_{DS} = 0 V; T_j = 25 °C	-	0.02	1	µA
		V_{GS} = -5 V; V_{DS} = 0 V; T_j = 25 °C	-	0.02	1	µA
		V_{GS} = 5 V; V_{DS} = 0 V; T_j = 150 °C	-	-	5	µA
		V_{GS} = -5 V; V_{DS} = 0 V; T_j = 150 °C	-	-	5	µA
R_{DSon}	drain-source on-state resistance	V_{GS} = 5 V; I_D = 5 A; T_j = 150 °C	-	-	148	mΩ
		V_{GS} = 5 V; I_D = 5 A; T_j = 25 °C	-	65	80	mΩ
$V_{(BR)GSS}$	gate-source breakdown voltage	V_{DS} = 0 V; T_j = 25 °C; I_G = 1 mA	10	-	-	V
		V_{DS} = 0 V; T_j = 25 °C; I_G = -1 mA	10	-	-	V
Dynamic characteristics						
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz; T_j = 25 °C	-	500	650	pF
C_{oss}	output capacitance		-	110	135	pF
C_{rss}	reverse transfer capacitance		-	60	85	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 30 V; R_L = 4.29 Ω; V_{GS} = 5 V; $R_{G(ext)}$ = 10 Ω; T_j = 25 °C; I_D = 7 A	-	10	15	ns
t_r	rise time		-	30	50	ns
$t_{d(off)}$	turn-off delay time		-	30	45	ns
t_f	fall time		-	30	40	ns
g_{fs}	transfer conductance	V_{DS} = 25 V; I_D = 5 A; T_j = 25 °C	4	8	-	S
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 5 A; V_{GS} = 0 V; T_j ≥ -55 °C; T_j ≤ 175 °C	-	0.85	1.1	V
t_{rr}	reverse recovery time	I_S = 5 A; dI_S/dt = -100 A/µs; V_{GS} = -10 V; V_{DS} = 30 V; T_j ≤ 175 °C	-	38	-	ns
Q_r	recovered charge		-	0.2	-	µC



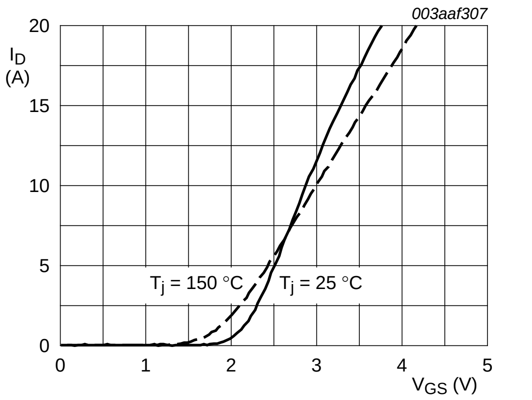
T_j = 25 °C

Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values



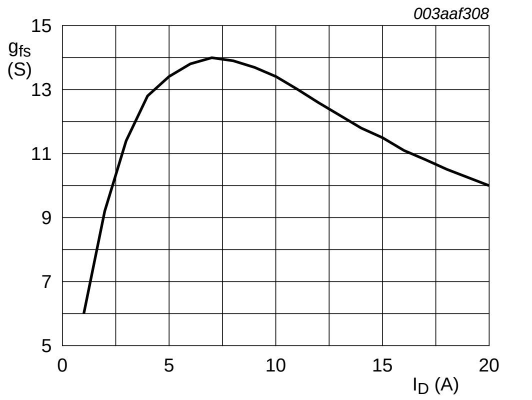
T_j = 25 °C.

Fig 7. Drain-source on-state resistance as a function of drain current; typical values



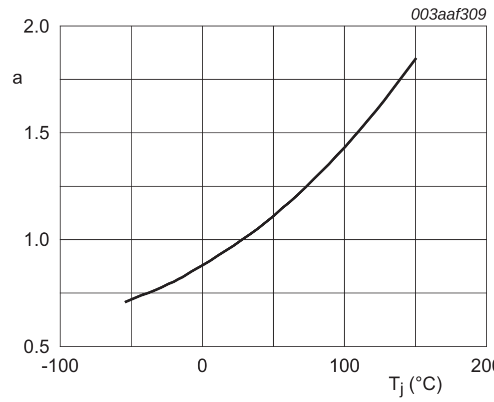
$V_{DS} > I_D \times R_{DSon}$

Fig 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values



$V_{DS} > I_D \times R_{DSon}$

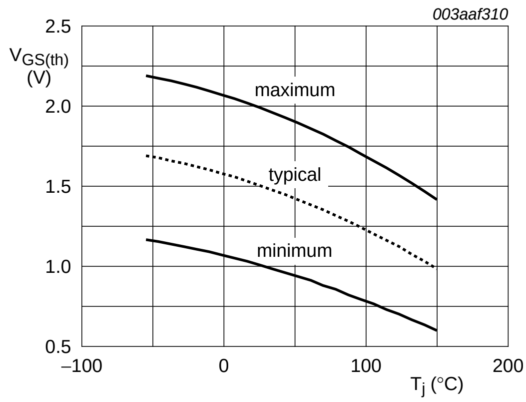
Fig 9. Forward transconductance as a function of drain current; typical values



$$a = \frac{R_{DSon}}{R_{DSon(25^{\circ}C)}}$$

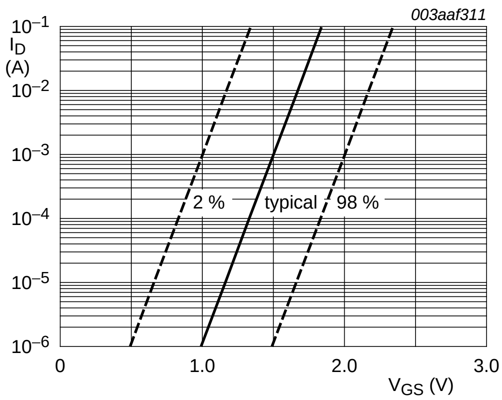
I_D = 5 A; V_{GS} = 5 V

Fig 10. Normalized drain-source on-state resistance factor as a function of junction temperature



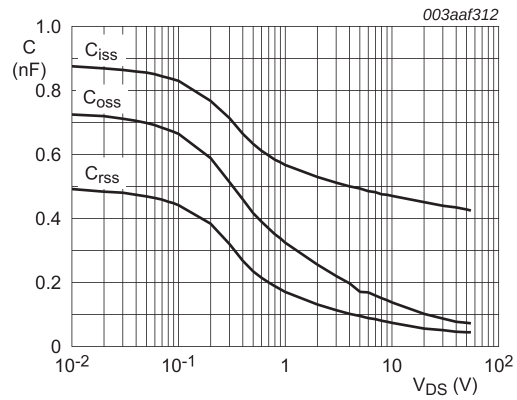
I_D = 1 mA; V_{DS} = V_{GS}

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



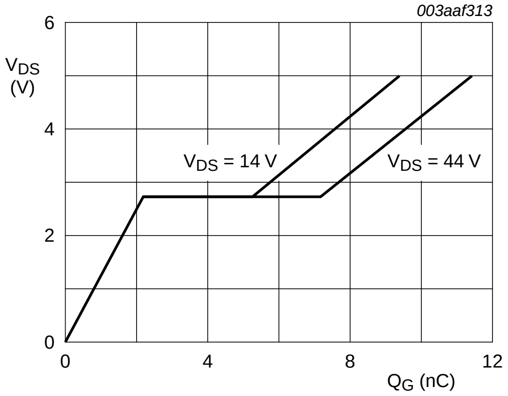
T_j = 25 °C; V_{DS} = V_{GS}

Fig 12. Sub-threshold drain current as a function of gate-source voltage



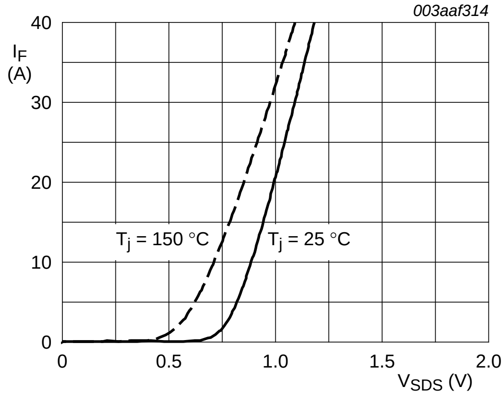
V_{GS} = 0 V; f = 1 MHz

Fig 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



T_j = 25 °C; I_D = 7 A

Fig 14. Gate-source voltage as a function of gate charge; typical values

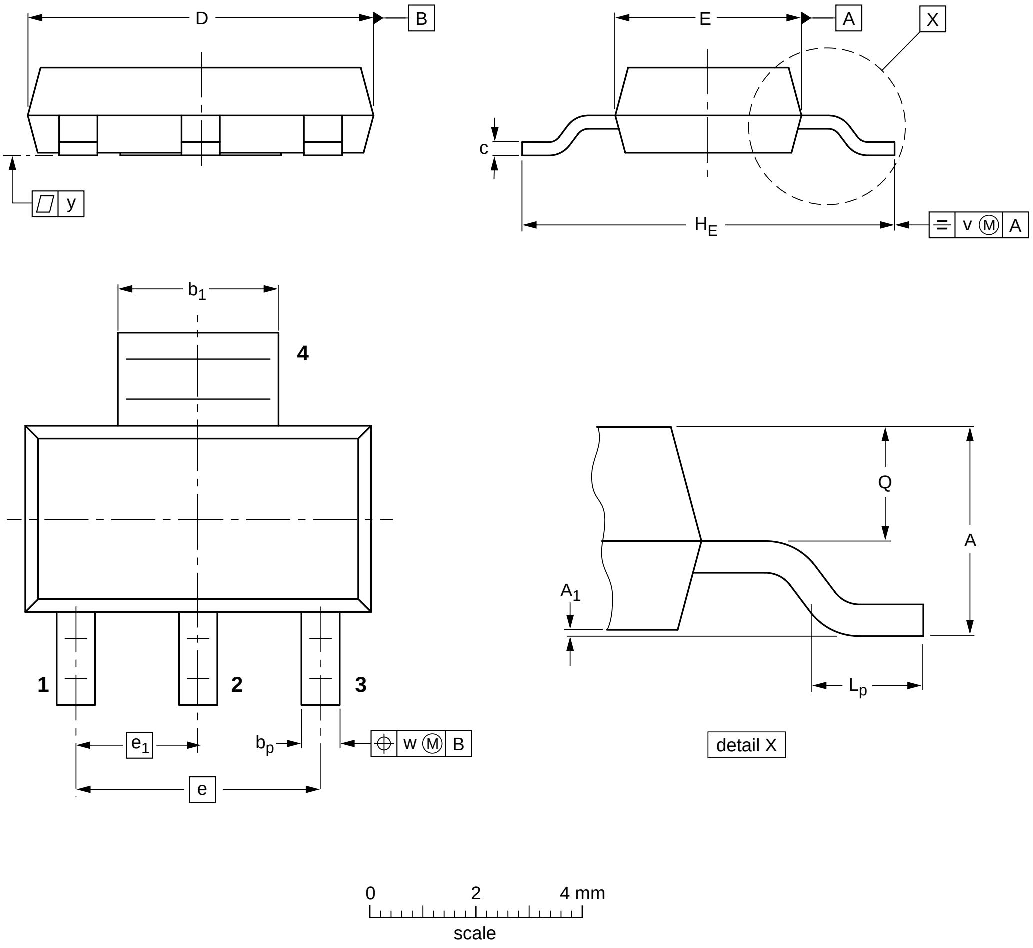


V_{GS} = 0 V

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

7. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads **SOT223**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	b_1	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.8 1.5	0.10 0.01	0.80 0.60	3.1 2.9	0.32 0.22	6.7 6.3	3.7 3.3	4.6	2.3	7.3 6.7	1.1 0.7	0.95 0.85	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT223			SC-73			~~04-11-10~~ 06-03-16

Fig 16. Package outline SOT223 (SOT223)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9880-55 v.3	20110420	Product data sheet	-	BUK9880-55 v.2
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 new company name where appropriate. • Various changes to content.			
BUK9880-55 v.2	19980401	Product specification	-	-

9. Legal information

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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