

BUK9840-55

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

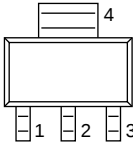
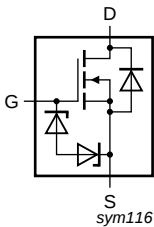
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 150\text{ °C}$	-	-	55	V
I_D	drain current	$T_{sp} = 25\text{ °C}$	-	-	10.7	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$	-	-	1.8	W
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 5\text{ V}$; $I_D = 5\text{ A}$; $T_j = 25\text{ °C}$	-	30	40	mΩ
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 3.6\text{ A}$; $V_{sup} \leq 25\text{ V}$; $R_{GS} = 50\text{ Ω}$; $V_{GS} = 5\text{ V}$; $T_{j(init)} = 25\text{ °C}$; unclamped	-	-	60	mJ



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SOT223 (SOT223)	 sym116
2	D	drain		
3	S	source		
4	D	drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK9840-55	SOT223	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

4. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
BUK9840-55	94055

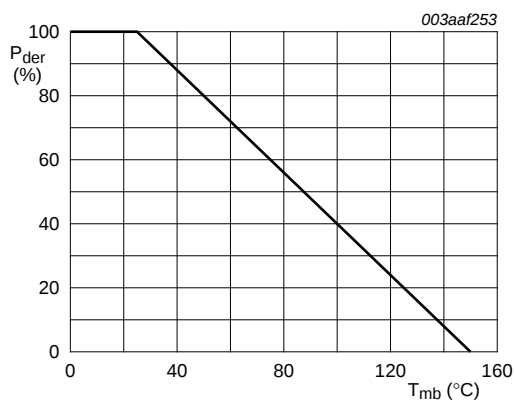
[1] % = placeholder for manufacturing site code

5. Limiting values

Table 5. Limiting values

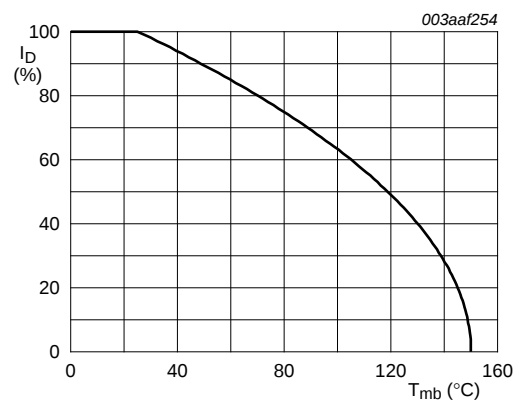
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 150\text{ }^{\circ}\text{C}$	-	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	$T_{sp} = 25\text{ }^{\circ}\text{C}$	-	10.7	A
		$T_{amb} = 25\text{ }^{\circ}\text{C}$	-	5	A
		$T_{amb} = 100\text{ }^{\circ}\text{C}$	-	3.1	A
I_{DM}	peak drain current	$T_{sp} = 25\text{ }^{\circ}\text{C}$; pulsed	-	40	A
P_{tot}	total power dissipation	$T_{amb} = 25\text{ }^{\circ}\text{C}$	-	1.8	W
		$T_{sp} = 25\text{ }^{\circ}\text{C}$	-	8.3	W
T_{stg}	storage temperature		-55	150	$^{\circ}\text{C}$
T_j	junction temperature		-55	150	$^{\circ}\text{C}$
Source-drain diode					
I_S	source current	$T_{sp} = 25\text{ }^{\circ}\text{C}$	-	10.7	A
I_{SM}	peak source current	pulsed; $T_{sp} = 25\text{ }^{\circ}\text{C}$	-	40	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 3.6\text{ A}$; $V_{sup} \leq 25\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 5\text{ V}$; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; unclamped	-	60	mJ
Electrostatic discharge					
V_{esd}	electrostatic discharge voltage	HBM; $C = 100\text{ pF}$; $R = 1.5\text{ k}\Omega$	-	2	kV



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

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



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

$V_{GS} \geq 10\text{ V}$

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

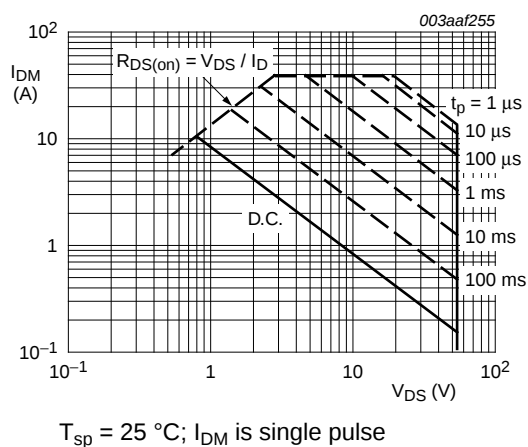


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

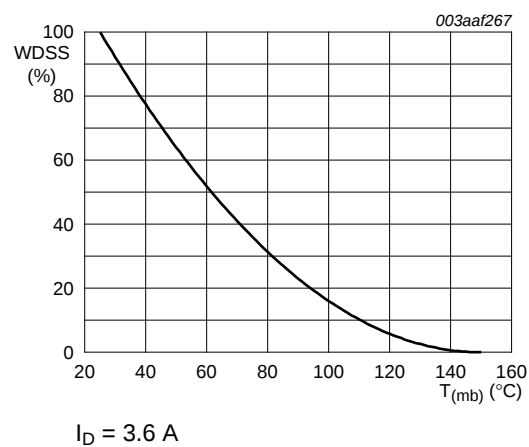


Fig 4. Normalised drain-source non-repetitive avalanche energy rating; avalanche energy as a function of mounting base temperature

6. Thermal characteristics

Table 6. 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 a printed-circuit	-	-	70	K/W

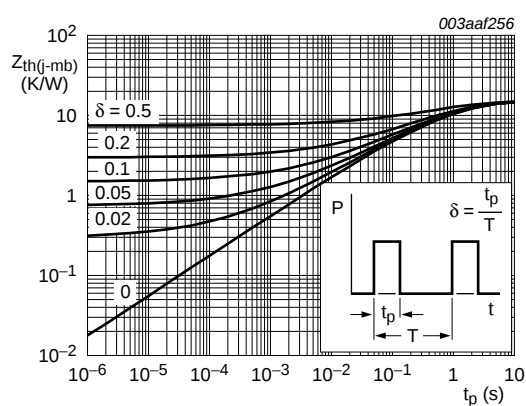


Fig 5. Transient thermal impedance from junction to solder point as a function of pulse duration

7. Characteristics

Table 7. 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 = 25 °C	55	-	-	V
		I _D = 0.25 mA; V _{GS} = 0 V; T _j = -55 °C	50	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 150 °C	0.6	-	-	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 = 25 °C	1	1.5	2	V
I _{DSS}	drain leakage current	V _{DS} = 55 V; V _{GS} = 0 V; T _j = 150 °C	-	-	100	μA
		V _{DS} = 55 V; V _{GS} = 0 V; T _j = 25 °C	-	0.05	10	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	-	-	74	mΩ
		V _{GS} = 5 V; I _D = 5 A; T _j = 25 °C	-	30	40	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	-	1050	1400	pF
C _{oss}	output capacitance		-	205	245	pF
C _{rss}	reverse transfer capacitance		-	110	150	pF
t _{d(on)}	turn-on delay time	V _{DS} = 30 V; R _L = 3.3 Ω; V _{GS} = 5 V; R _{G(ext)} = 10 Ω; T _j = 25 °C; I _D = 9 A	-	17	25	ns
t _r	rise time		-	65	100	ns
t _{d(off)}	turn-off delay time		-	70	105	ns
t _f	fall time		-	70	105	ns
g _{fs}	transfer conductance	V _{DS} = 25 V; I _D = 5 A; T _j = 25 °C	11	19	-	S
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 5 A; V _{GS} = 0 V; T _j = 25 °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 = 25 °C	-	45	-	ns
Q _r	recovered charge		-	0.3	-	μC

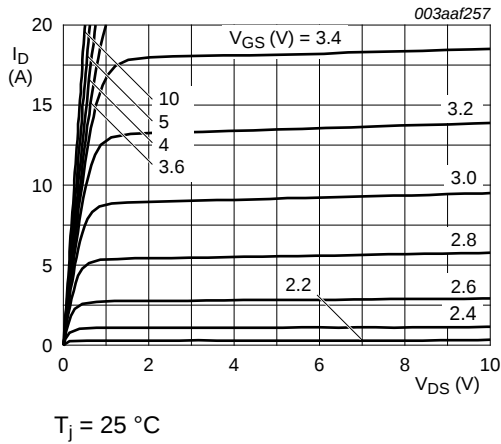


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

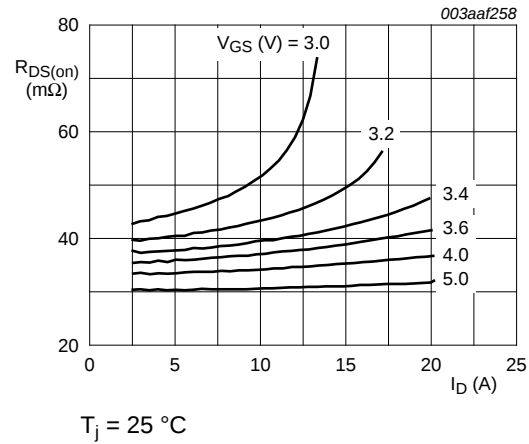


Fig 7. Drain-source on-state resistance as a function of drain current; typical values

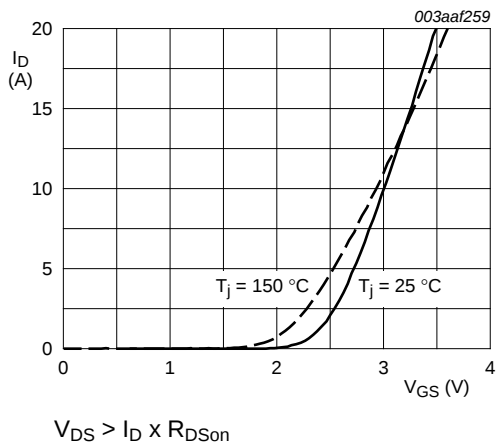


Fig 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

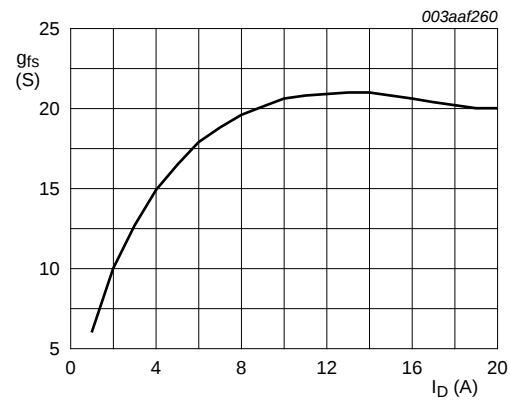


Fig 9. Forward transconductance as a function of drain current; typical values

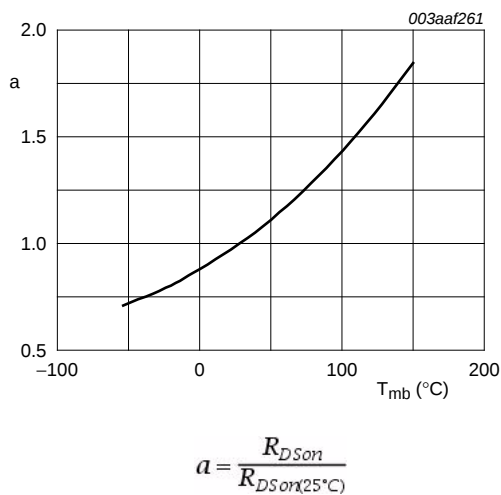


Fig 10. Normalized drain-source on-state resistance factor as a function of junction temperature

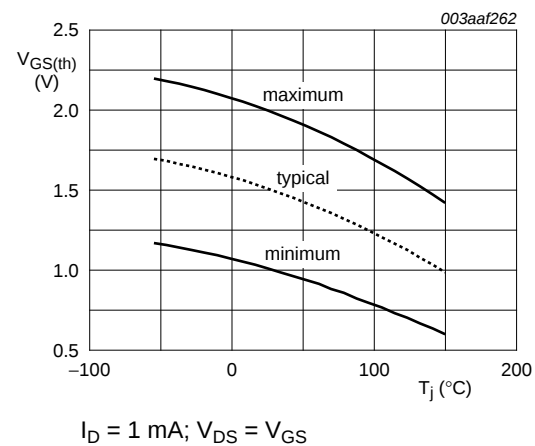


Fig 11. Gate-source threshold voltage as a function of junction temperature

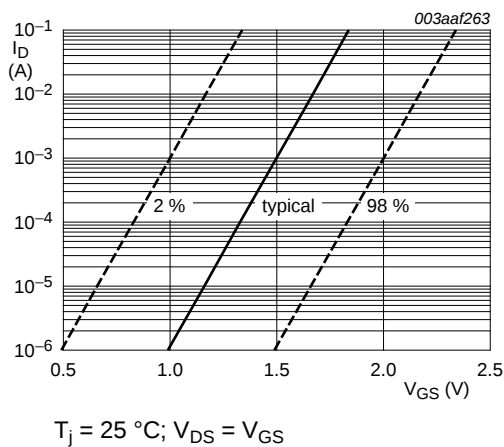


Fig 12. Sub-threshold drain current as a function of gate-source voltage

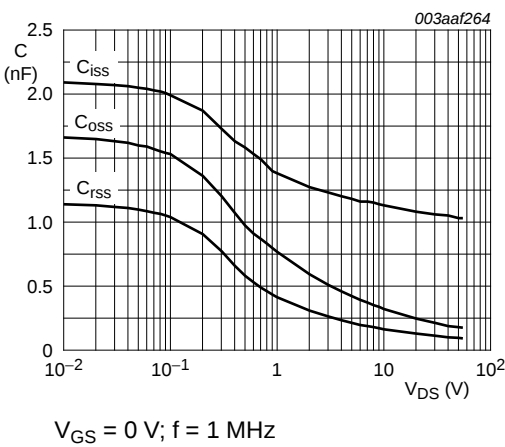


Fig 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

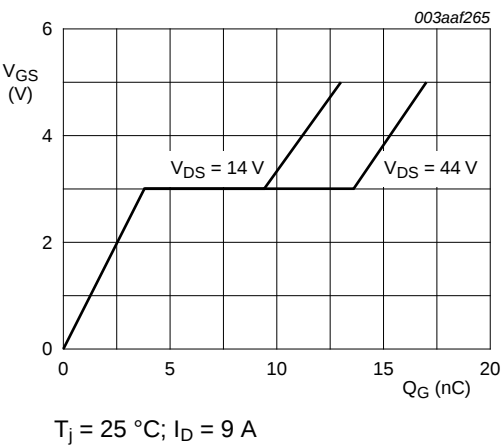


Fig 14. Gate-source voltage as a function of gate charge; typical values

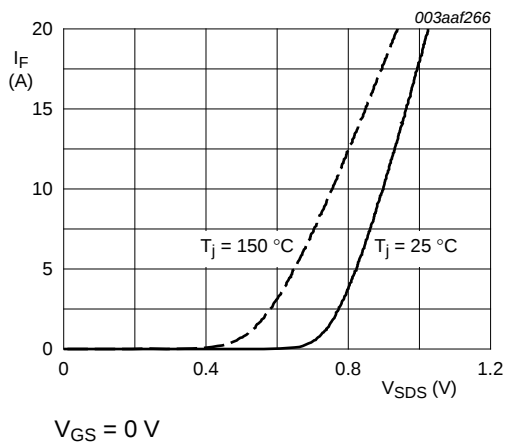


Fig 15. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

8. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223

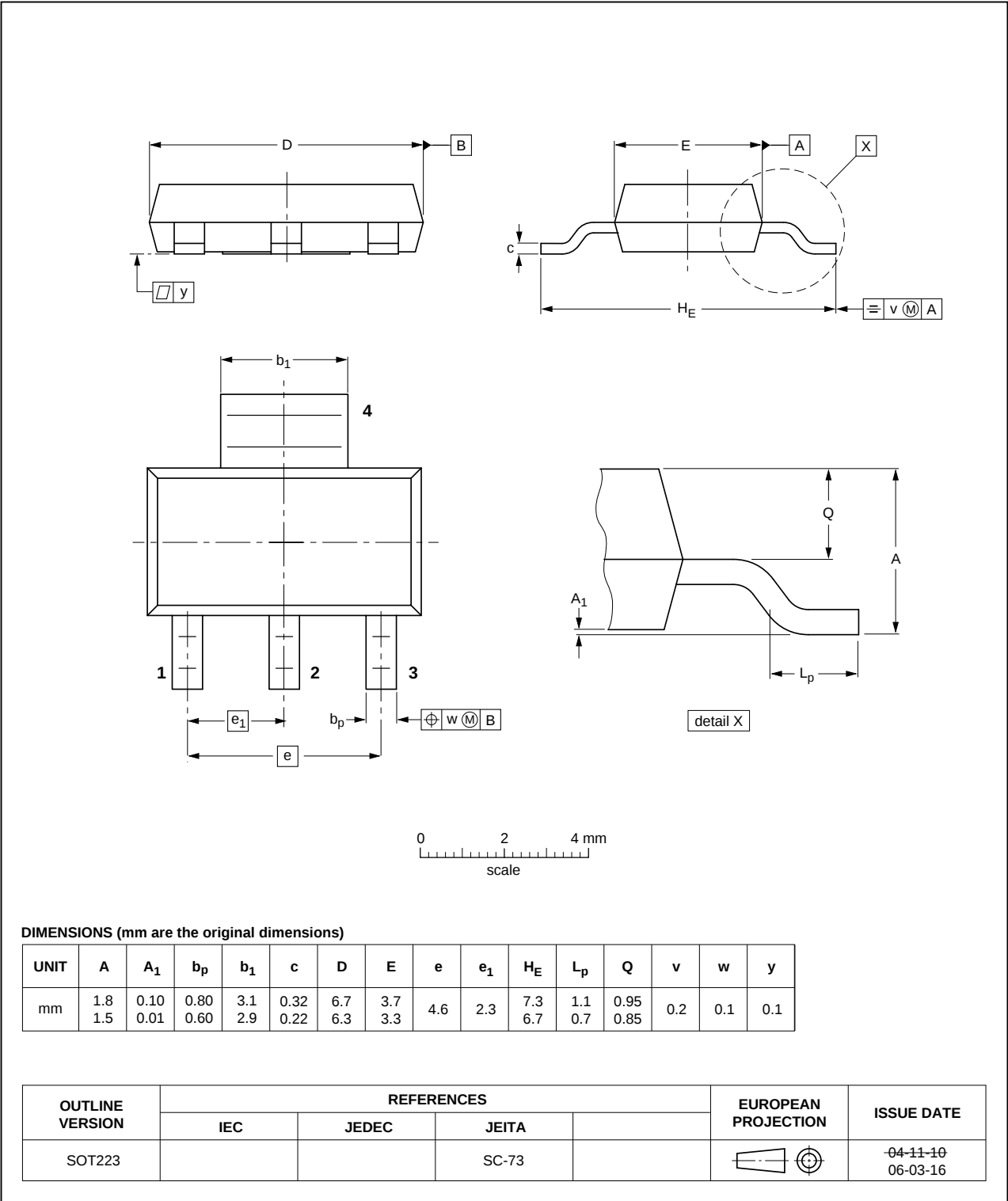


Fig 16. Package outline SOT223 (SOT223)

9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK9840-55 v.3	20110420	Product data sheet	-	BUK9840-55 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.			
BUK9840-55 v.2	19980101	Product specification	-	BUK9840-55 v.1

10. Legal information

10.1 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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