

BUK98180-100A

N-channel TrenchMOS logic level FET

Rev. 03 — 3 June 2010

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
- Suitable for logic level gate drive sources
- Q101 compliant

1.3 Applications

- 12 V, 24 V and 42 V loads
- Motors, lamps and solenoids
- Automotive and general purpose power switching

1.4 Quick reference data

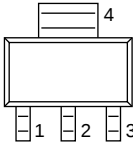
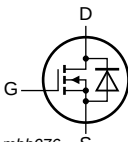
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 150 °C	-	-	100	V
I _D	drain current	V _{GS} = 5 V; T _{sp} = 25 °C; see Figure 1 ; see Figure 3	-	-	4.6	A
P _{tot}	total power dissipation	T _{sp} = 25 °C; see Figure 2	-	-	8	W
Static characteristics						
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 5 A; T _j = 25 °C	-	147	173	mΩ
		V _{GS} = 4.5 V; I _D = 5 A; T _j = 25 °C	-	-	201	mΩ
		V _{GS} = 5 V; I _D = 5 A; T _j = 25 °C; see Figure 12 ; see Figure 13	-	153	180	mΩ
Avalanche ruggedness						
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 4 A; V _{sup} ≤ 100 V; R _{GS} = 50 Ω; V _{GS} = 5 V; T _{j(init)} = 25 °C; unclamped	-	-	16	mJ



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 SOT223 (SC-73)	 mbb076
2	D	drain		
3	S	source		
4	D	drain		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK98180-100A	SC-73	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).

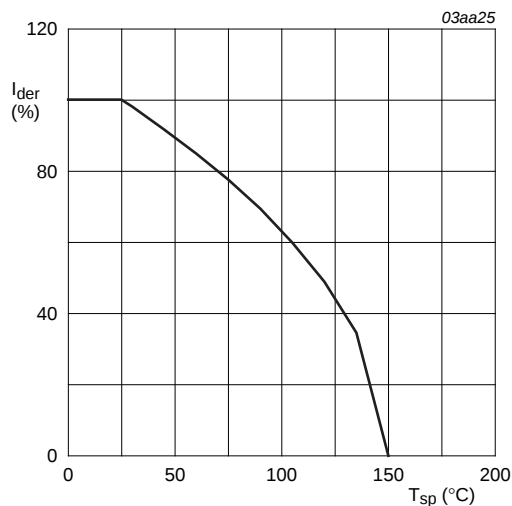
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 150\text{ }^{\circ}\text{C}$	-	-	100	V
V_{DGR}	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	-	100	V
V_{GS}	gate-source voltage		-10	-	10	V
I_D	drain current	$T_{sp} = 25\text{ }^{\circ}\text{C}$; $V_{GS} = 5\text{ V}$; see Figure 1 ; see Figure 3	-	-	4.6	A
		$T_{sp} = 100\text{ }^{\circ}\text{C}$; $V_{GS} = 5\text{ V}$; see Figure 1	-	-	3	A
I_{DM}	peak drain current	$T_{sp} = 25\text{ }^{\circ}\text{C}$; $t_p \leq 10\text{ }\mu\text{s}$; pulsed; see Figure 3	-	-	18	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ }^{\circ}\text{C}$; see Figure 2	-	-	8	W
T_{stg}	storage temperature		-55	-	150	$^{\circ}\text{C}$
T_j	junction temperature		-55	-	150	$^{\circ}\text{C}$
V_{GSM}	peak gate-source voltage	pulsed; $t_p \leq 50\text{ }\mu\text{s}$	-15	-	15	V

Source-drain diode

I_S	source current	$T_{sp} = 25\text{ }^{\circ}\text{C}$	-	-	4.6	A
I_{SM}	peak source current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{sp} = 25\text{ }^{\circ}\text{C}$	-	-	18	A

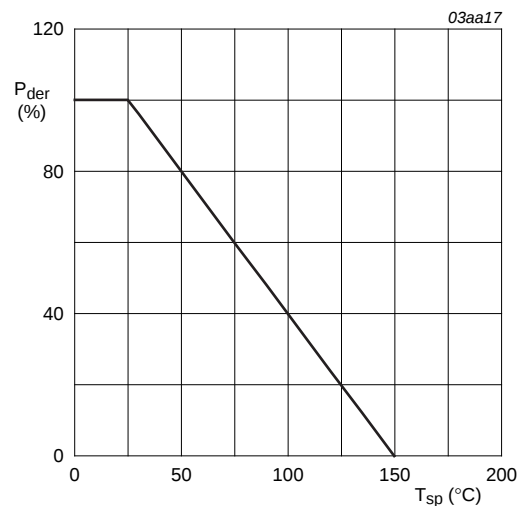
Avalanche ruggedness

$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 4\text{ A}$; $V_{sup} \leq 100\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 5\text{ V}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; unclamped	-	-	16	mJ
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$$I_{der} = \frac{I_D}{I_{D(25^{\circ}\text{C})}} \times 100\%$$

Fig 1. Normalized continuous drain current as a function of solder point temperature



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

Fig 2. Normalized total power dissipation as a function of solder point temperature

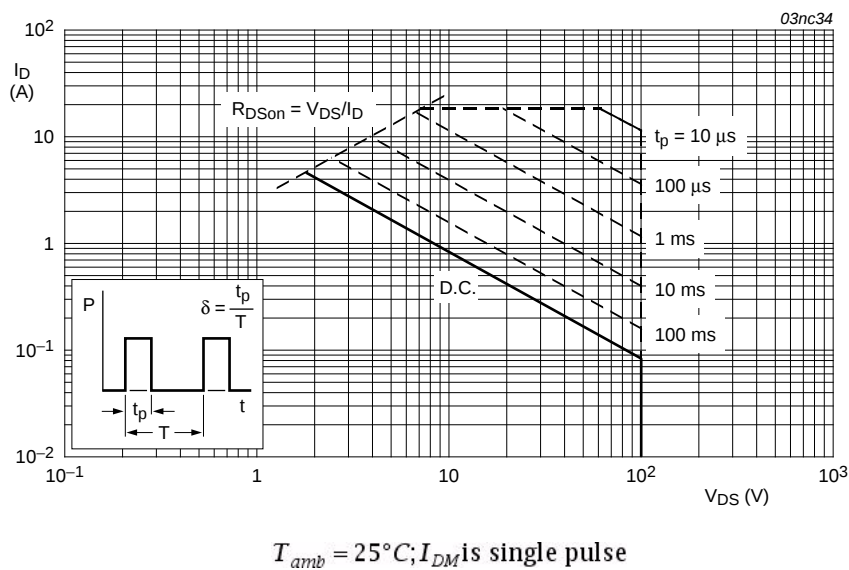


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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	see Figure 4	-	-	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		-	70	-	K/W

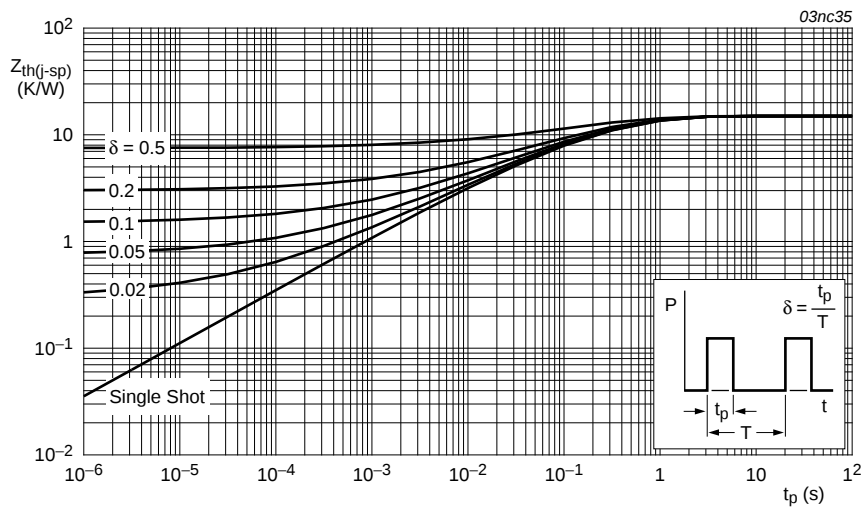


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

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 = 25 °C	100	-	-	V
		I _D = 0.25 mA; V _{GS} = 0 V; T _j = -55 °C	89	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; see Figure 11	1	1.5	2	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C; see Figure 11	-	-	2.3	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 150 °C; see Figure 11	0.6	-	-	V
I _{DSS}	drain leakage current	V _{DS} = 100 V; V _{GS} = 0 V; T _j = 150 °C	-	-	500	μA
		V _{DS} = 100 V; V _{GS} = 0 V; T _j = 25 °C	-	0.05	10	μA
I _{GSS}	gate leakage current	V _{DS} = 0 V; V _{GS} = 10 V; T _j = 25 °C	-	2	100	nA
		V _{DS} = 0 V; V _{GS} = -10 V; T _j = 25 °C	-	2	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 5 A; T _j = 25 °C	-	147	173	mΩ
		V _{GS} = 4.5 V; I _D = 5 A; T _j = 25 °C	-	-	201	mΩ
		V _{GS} = 5 V; I _D = 5 A; T _j = 25 °C; see Figure 12 ; see Figure 13	-	153	180	mΩ
		V _{GS} = 5 V; I _D = 5 A; T _j = 150 °C; see Figure 12 ; see Figure 13	-	-	389	mΩ
Dynamic characteristics						
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 25 V; f = 1 MHz;	-	464	619	pF
C _{oss}	output capacitance	T _j = 25 °C; see Figure 14	-	60	72	pF
C _{rss}	reverse transfer capacitance		-	36	50	pF
t _{d(on)}	turn-on delay time	V _{DS} = 30 V; R _L = 1.2 Ω; V _{GS} = 5 V;	-	7	-	ns
t _r	rise time	R _{G(ext)} = 10 Ω; T _j = 25 °C	-	89	-	ns
t _{d(off)}	turn-off delay time		-	18	-	ns
t _f	fall time		-	25	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 5 A; V _{GS} = 0 V; T _j = 25 °C; see Figure 15	-	0.85	1.2	V
t _{rr}	reverse recovery time	I _S = 20 A; dI _S /dt = -100 A/μs;	-	49	-	ns
Q _r	recovered charge	V _{GS} = -10 V; V _{DS} = 30 V; T _j = 25 °C	-	130	-	nC

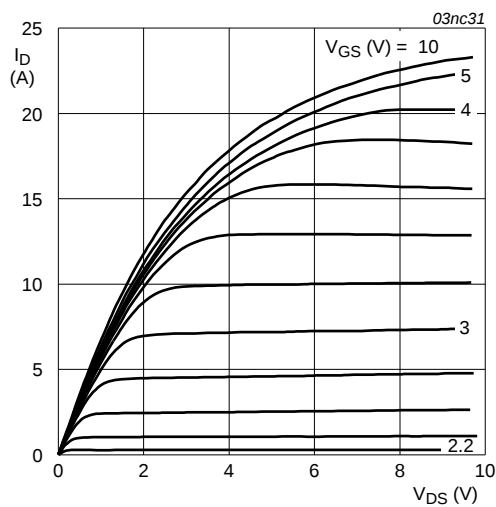


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

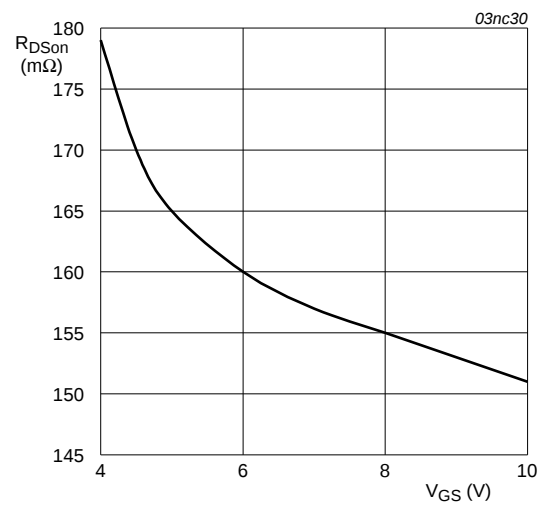


Fig 6. Drain-source on-state resistance as a function of gate-source voltage; typical values

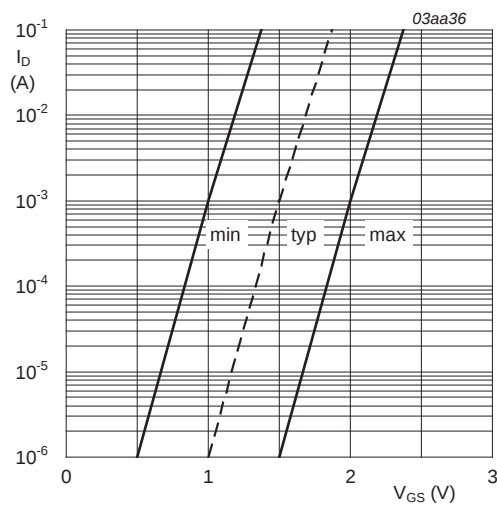


Fig 7. Sub-threshold drain current as a function of gate-source voltage

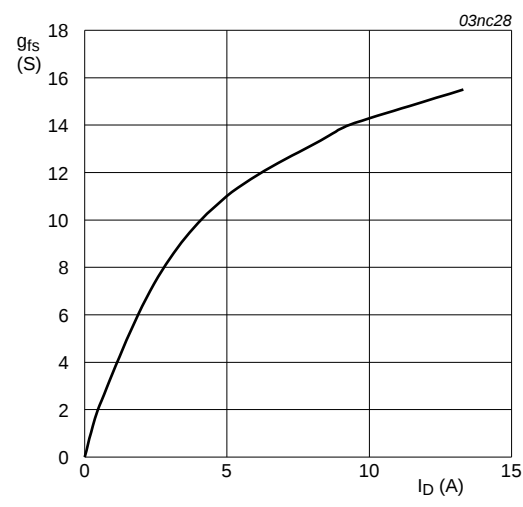


Fig 8. Forward transconductance as a function of drain current; typical values

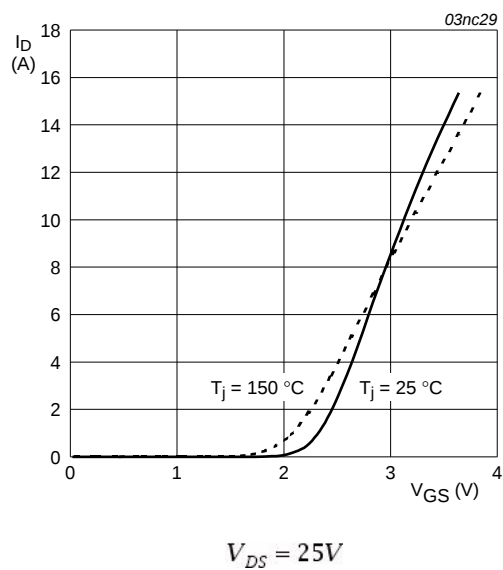


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

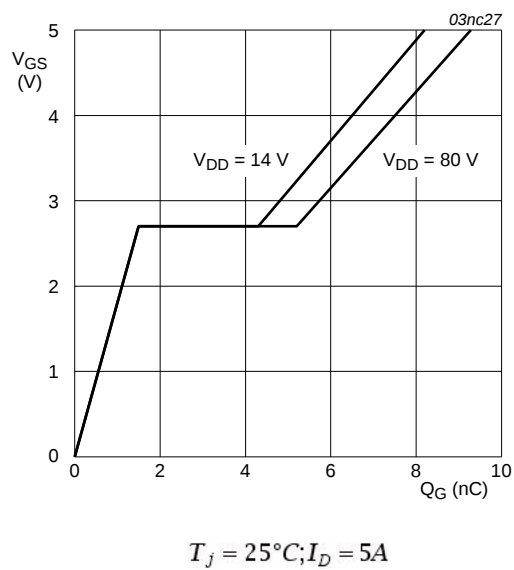


Fig 10. Gate-source voltage as a function of turn-on gate charge; typical values

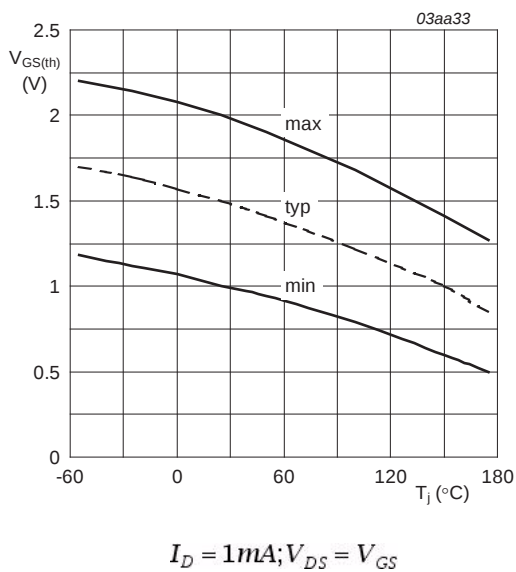


Fig 11. Gate-source threshold voltage as a function of junction temperature

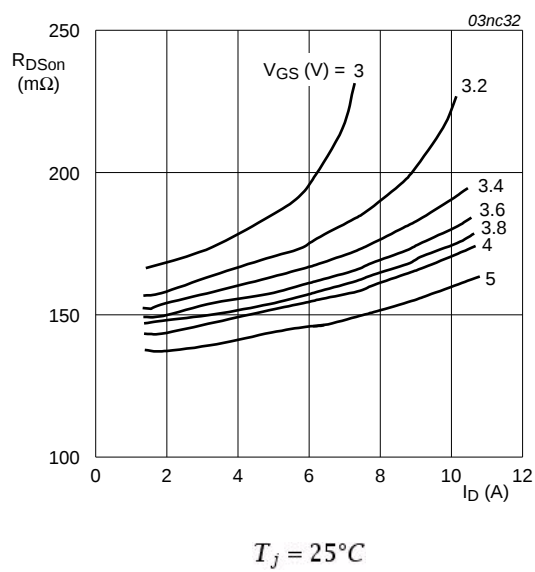
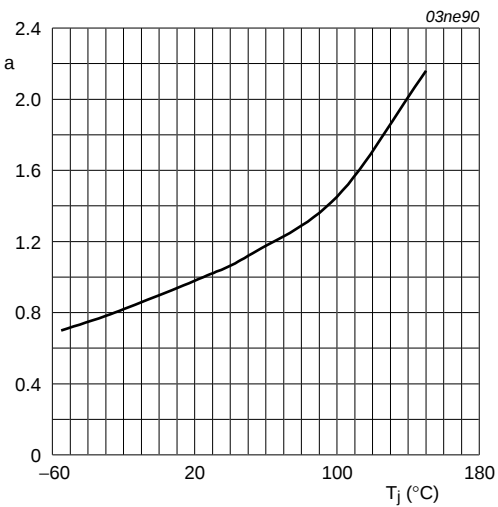
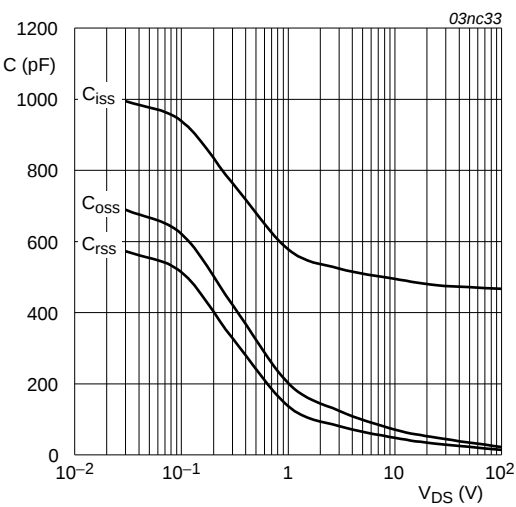


Fig 12. Drain-source on-state resistance as a function of drain current; typical values



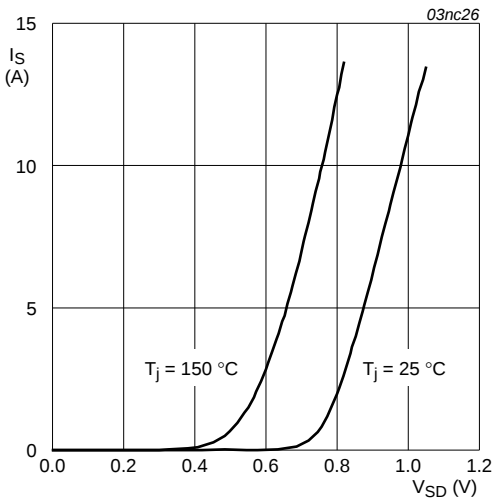
$$a = \frac{R_{DSon}}{R_{DSon(25^{\circ}\text{C})}}$$

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

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223

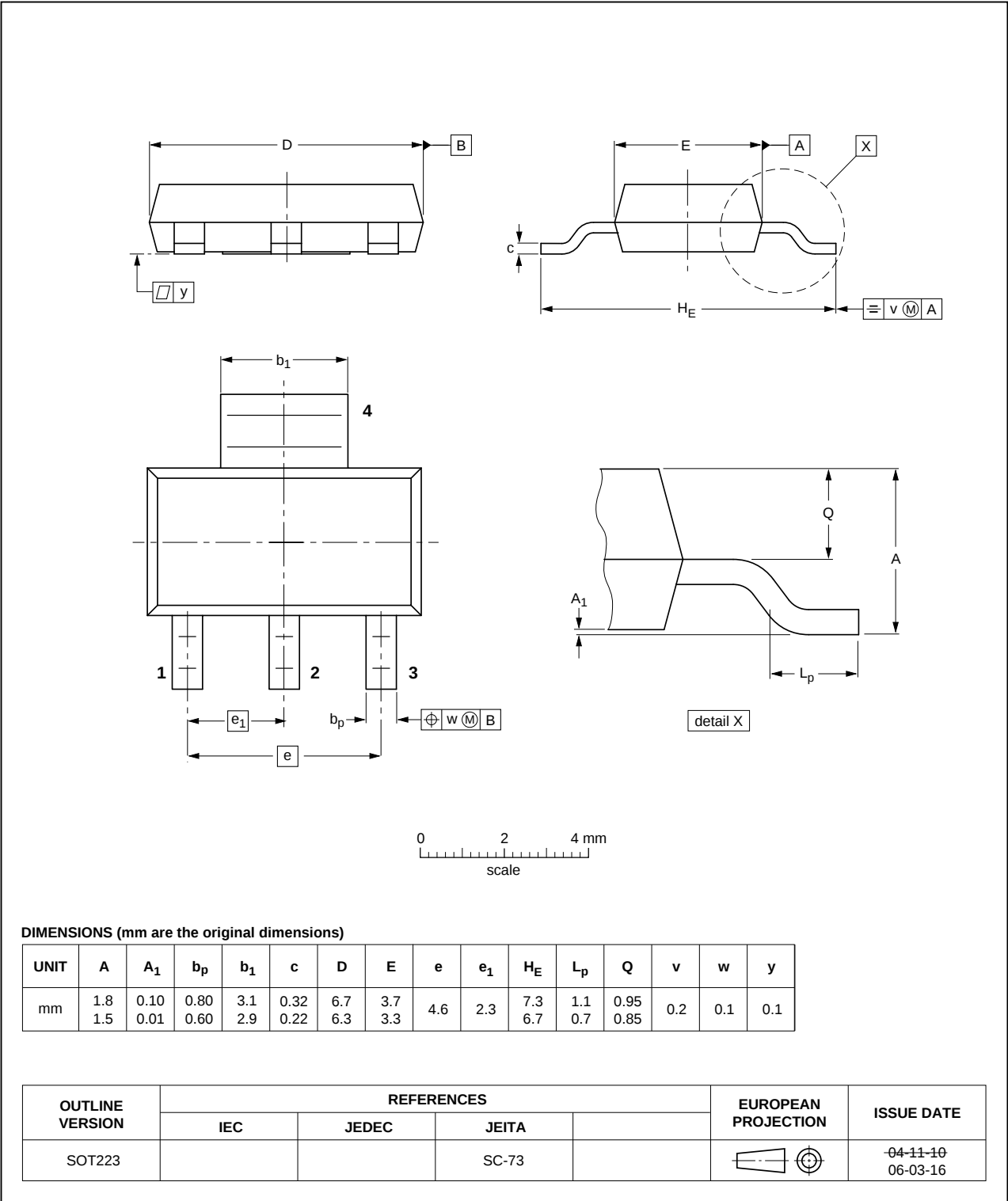


Fig 16. Package outline SOT223 (SC-73)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUK98180-100A v.3	20100603	Product data sheet	-	BUK98180-100A-02
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.			
BUK98180-100A-02 (9397 750 08277)	20010518	Product data	-	-

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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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