



# BUK7880-55A

N-channel TrenchMOS standard level FET

19 June 2015

Product data sheet

## 1. General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using Nexperia General Purpose Automotive (GPA) TrenchMOS technology. This product has been designed and qualified to the appropriate AEC standard for use in automotive critical applications.

## 2. Features and benefits

- AEC Q101 compliant
- Low conduction losses due to low on-state resistance
- Suitable for standard level gate drive sources

## 3. Applications

- 12 V and 24 V loads
- Automotive systems
- General purpose power switching
- Motors, lamps and solenoids

## 4. Quick reference data

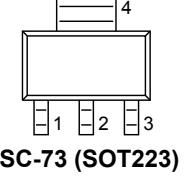
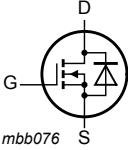
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25^\circ\text{C}$ ; $T_j \leq 150^\circ\text{C}$		-	-	55	V
$I_D$	drain current	$V_{GS} = 10\text{ V}$ ; $T_{sp} = 25^\circ\text{C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		-	-	7	A
$P_{tot}$	total power dissipation	$T_{sp} = 25^\circ\text{C}$ ; <a href="#">Fig. 1</a>		-	-	8	W
<b>Static characteristics</b>							
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$ ; $I_D = 10\text{ A}$ ; $T_j = 25^\circ\text{C}$ ; <a href="#">Fig. 9</a> ; <a href="#">Fig. 10</a>		-	68	80	$\text{m}\Omega$
<b>Avalanche ruggedness</b>							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 7\text{ A}$ ; $V_{sup} \leq 55\text{ V}$ ; $R_{GS} = 50\ \Omega$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(init)} = 25^\circ\text{C}$ ; unclamped		-	-	53	$\text{mJ}$

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## 5. Pinning information

Table 2. Pinning information

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

## 6. Ordering information

Table 3. Ordering information

Type number	Package			Version
	Name	Description	Version	
BUK7880-55A	SC-73	plastic surface-mounted package with increased heatsink; 4 leads		SOT223
BUK7880-55A/CU	SC-73	plastic surface-mounted package with increased heatsink; 4 leads		SOT223

## 7. Marking

Table 4. Marking codes

Type number	Marking code
BUK7880-55A	788055A
BUK7880-55A/CU	788055

## 8. 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	$T_j \geq 25^\circ\text{C}$ ; $T_j \leq 150^\circ\text{C}$	-	55	V
$V_{DGR}$	drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	55	V
$V_{GS}$	gate-source voltage		-20	20	V
$P_{tot}$	total power dissipation	$T_{sp} = 25^\circ\text{C}$ ; <a href="#">Fig. 1</a>	-	8	W
$I_D$	drain current	$T_{sp} = 100^\circ\text{C}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Fig. 2</a>	-	5	A
		$T_{sp} = 25^\circ\text{C}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	7	A
$I_{DM}$	peak drain current	$T_{sp} = 25^\circ\text{C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; <a href="#">Fig. 3</a>	-	30	A

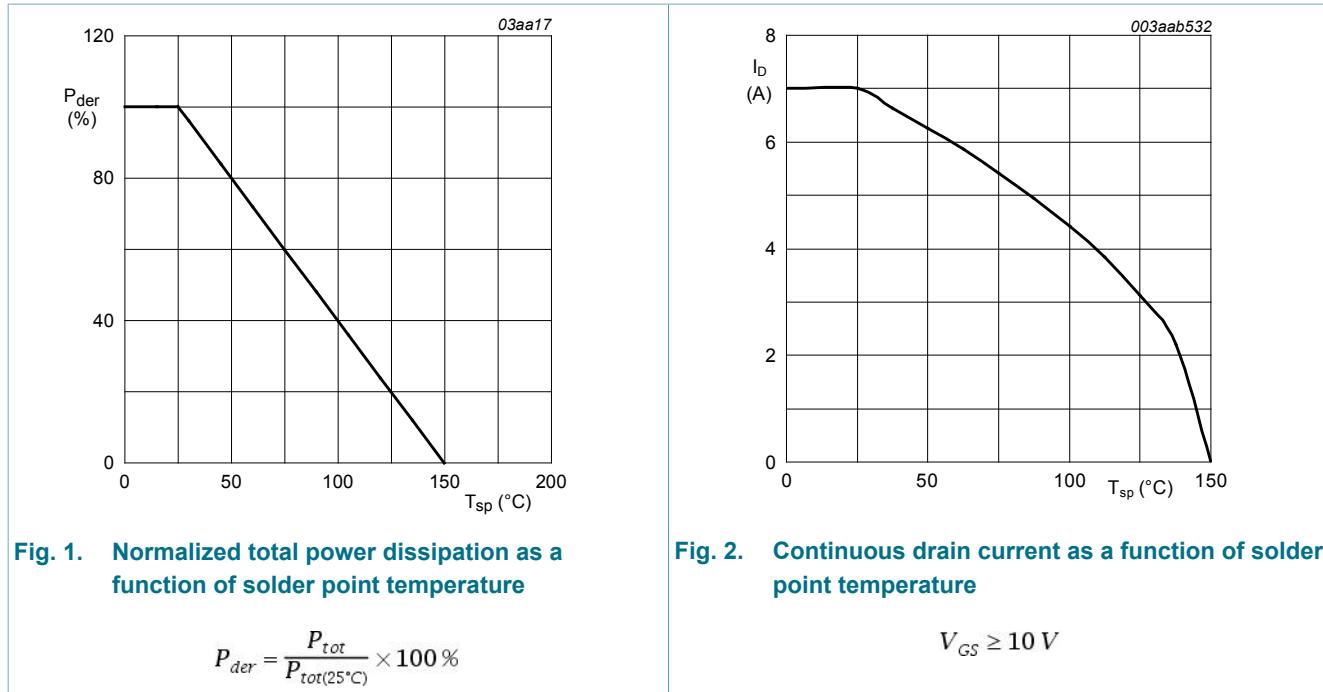
Symbol	Parameter	Conditions	Min	Max	Unit
$T_{stg}$	storage temperature		-55	150	°C
$T_j$	junction temperature		-55	150	°C
<b>Source-drain diode</b>					
$I_S$	source current	$T_{sp} = 25 \text{ }^\circ\text{C}$	-	7	A
$I_{SM}$	peak source current	pulsed; $t_p \leq 10 \mu\text{s}$ ; $T_{sp} = 25 \text{ }^\circ\text{C}$	-	30	A
<b>Avalanche ruggedness</b>					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 7 \text{ A}$ ; $V_{sup} \leq 55 \text{ V}$ ; $R_{GS} = 50 \Omega$ ; $V_{GS} = 10 \text{ V}$ ; $T_{j(init)} = 25 \text{ }^\circ\text{C}$ ; unclamped	-	53	mJ
$E_{DS(AL)R}$	repetitive drain-source avalanche energy	<a href="#">Fig. 4</a>	<a href="#">[1]</a> <a href="#">[2]</a> <a href="#">[3]</a> <a href="#">[4]</a>	-	J

[1] Maximum value not quoted. Repetitive rating defined in avalanche rating figure.

[2] Single-pulse avalanche rating limited by maximum junction temperature of 150 °C.

[3] Repetitive avalanche rating limited by an average junction temperature of 150 °C

[4] Refer to application note AN10273 for further information.



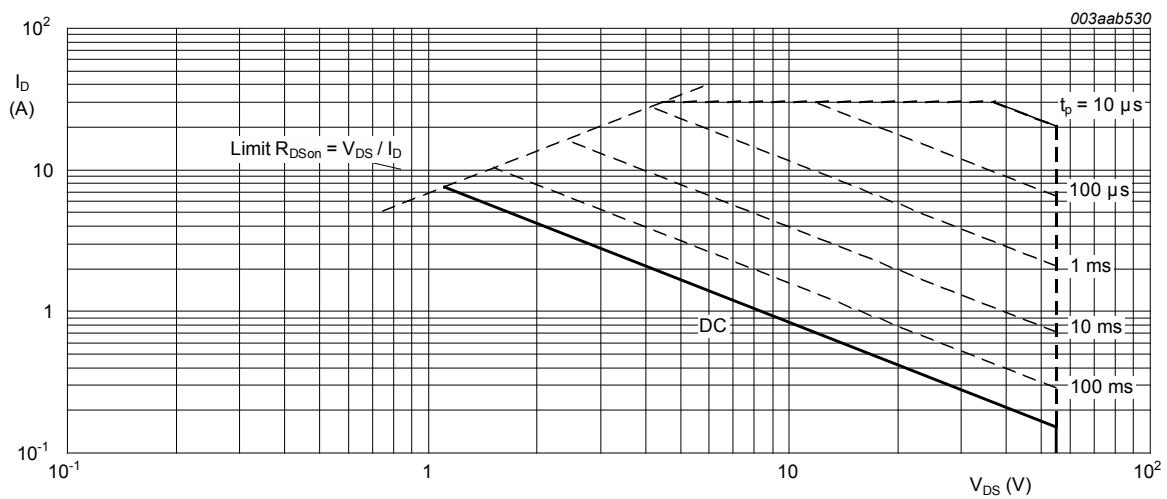


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{sp} = 25^\circ C$ ;  $I_{DM}$  is single pulse

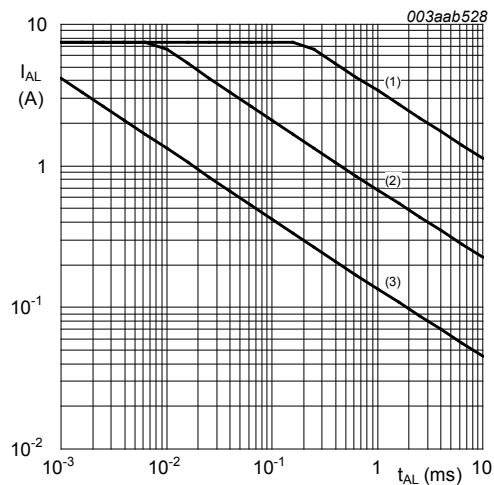


Fig. 4. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		-	120	-	K/W

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25^\circ C$		55	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55^\circ C$		50	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25^\circ C$ ; <a href="#">Fig. 8</a>		2	3	4	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55^\circ C$ ; <a href="#">Fig. 8</a>		-	-	4.4	V
		$I_D = 1 mA; V_{DS} = V_{GS}; T_j = 150^\circ C$ ; <a href="#">Fig. 8</a>		1.2	-	-	V
$I_{DSS}$	drain leakage current	$V_{DS} = 55 V; V_{GS} = 0 V; T_j = 25^\circ C$		-	0.05	10	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25^\circ C$		-	2	100	nA
		$V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25^\circ C$		-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 V; I_D = 10 A; T_j = 150^\circ C$ ; <a href="#">Fig. 9</a> ; <a href="#">Fig. 10</a>		-	-	148	$m\Omega$
		$V_{GS} = 10 V; I_D = 10 A; T_j = 25^\circ C$ ; <a href="#">Fig. 9</a> ; <a href="#">Fig. 10</a>		-	68	80	$m\Omega$
$I_{DSS}$	drain leakage current	$V_{DS} = 55 V; V_{GS} = 0 V; T_j = 150^\circ C$		-	-	500	$\mu A$
<b>Dynamic characteristics</b>							
$Q_{G(tot)}$	total gate charge	$I_D = 10 A; V_{DS} = 44 V; V_{GS} = 10 V$ ; <a href="#">Fig. 11</a>		-	12	-	nC
$Q_{GS}$	gate-source charge			-	2.5	-	nC
$Q_{GD}$	gate-drain charge			-	5	-	nC
$C_{iss}$	input capacitance	$V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz$ ; $T_j = 25^\circ C$ ; <a href="#">Fig. 12</a>		-	374	500	pF
$C_{oss}$	output capacitance			-	92	110	pF
$C_{rss}$	reverse transfer capacitance			-	62	85	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 30 V; R_L = 1.2 \Omega; V_{GS} = 10 V$ ; $R_{G(ext)} = 10 \Omega$		-	8	-	ns
$t_r$	rise time			-	52	-	ns
$t_{d(off)}$	turn-off delay time			-	17	-	ns
$t_f$	fall time			-	9	-	ns
<b>Source-drain diode</b>							
$V_{SD}$	source-drain voltage	$I_S = 15 A; V_{GS} = 0 V; T_j = 25^\circ C$ ; <a href="#">Fig. 13</a>		-	0.85	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20 A; dI_S/dt = -100 A/\mu s$ ; $V_{GS} = -10 V; V_{DS} = 30 V$		-	33	-	ns
$Q_r$	recovered charge			-	31	-	nC

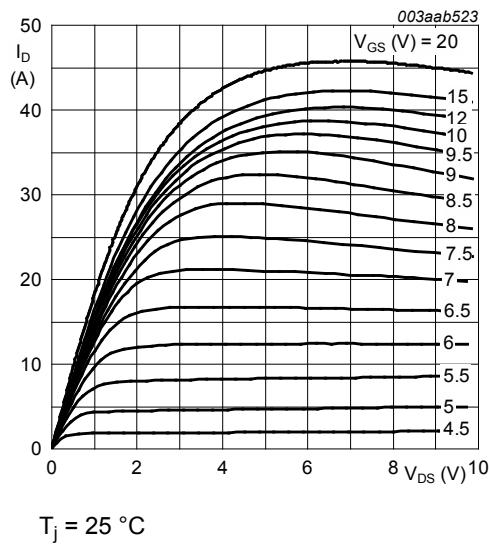


Fig. 5. Output characteristics: drain current as a function of drain-source voltage; typical values

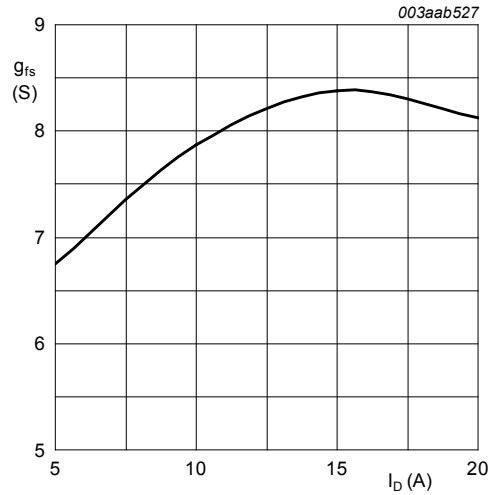


Fig. 6. Forward transconductance as a function of drain current; typical values

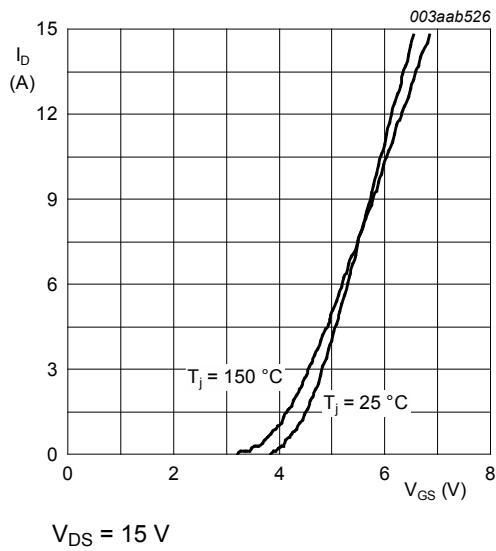


Fig. 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values

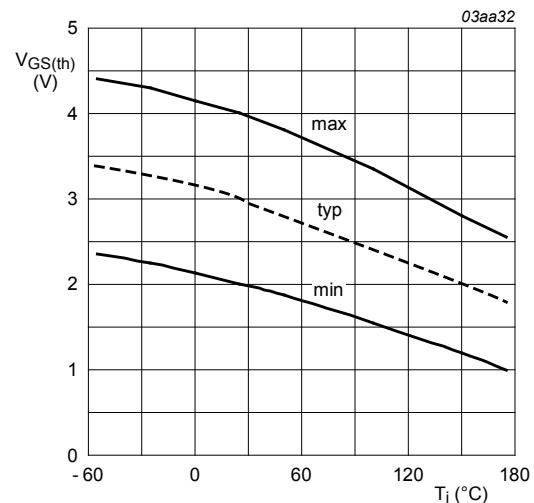
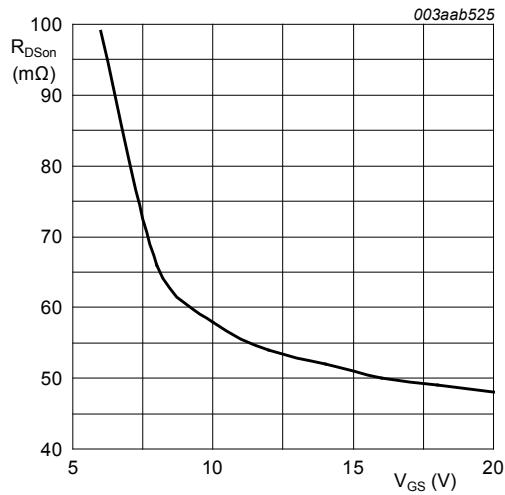


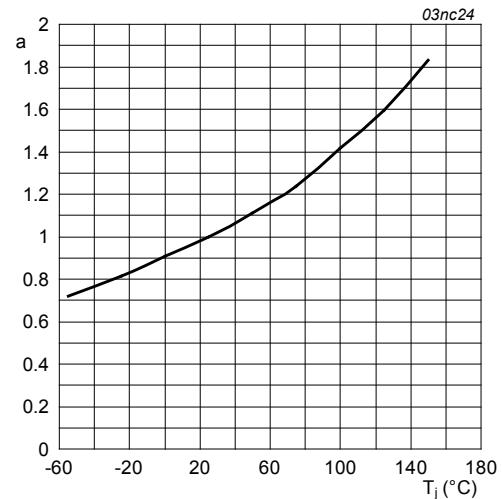
Fig. 8. Gate-source threshold voltage as a function of junction temperature

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



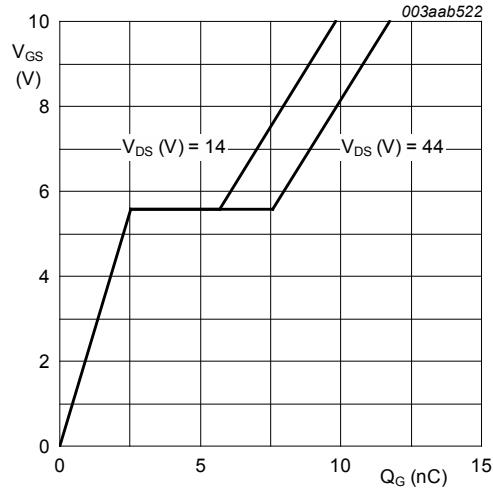
**Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values**

$T_j = 25^\circ\text{C}; I_D = 10\text{ A}$



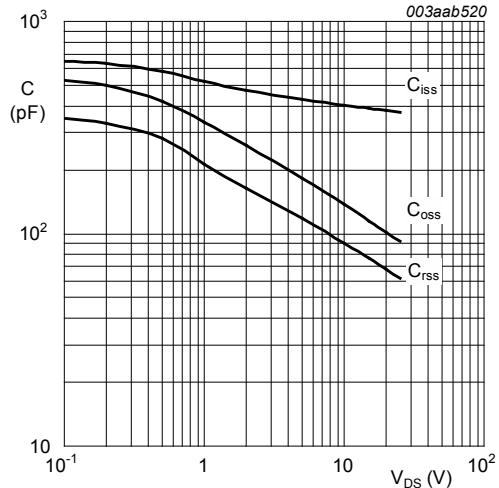
**Fig. 10. Normalized drain source on-state resistance factor as a function of junction temperature**

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



**Fig. 11. Gate-source voltage as a function of gate charge; typical values**

$T_j = 25^\circ\text{C}; I_D = 10\text{ A}$



**Fig. 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**

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

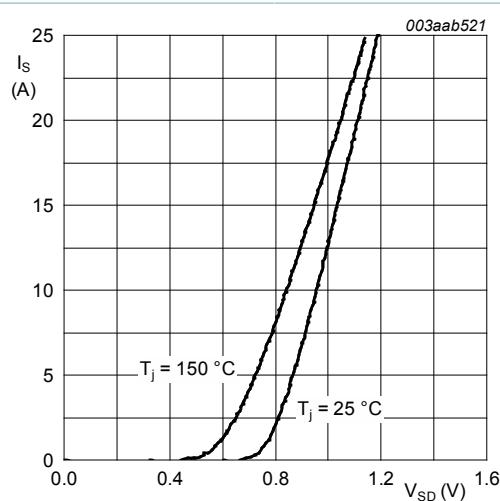


Fig. 13. Source current as a function of source-drain voltage; typical values

$V_{GS} = 0V$

## 11. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223

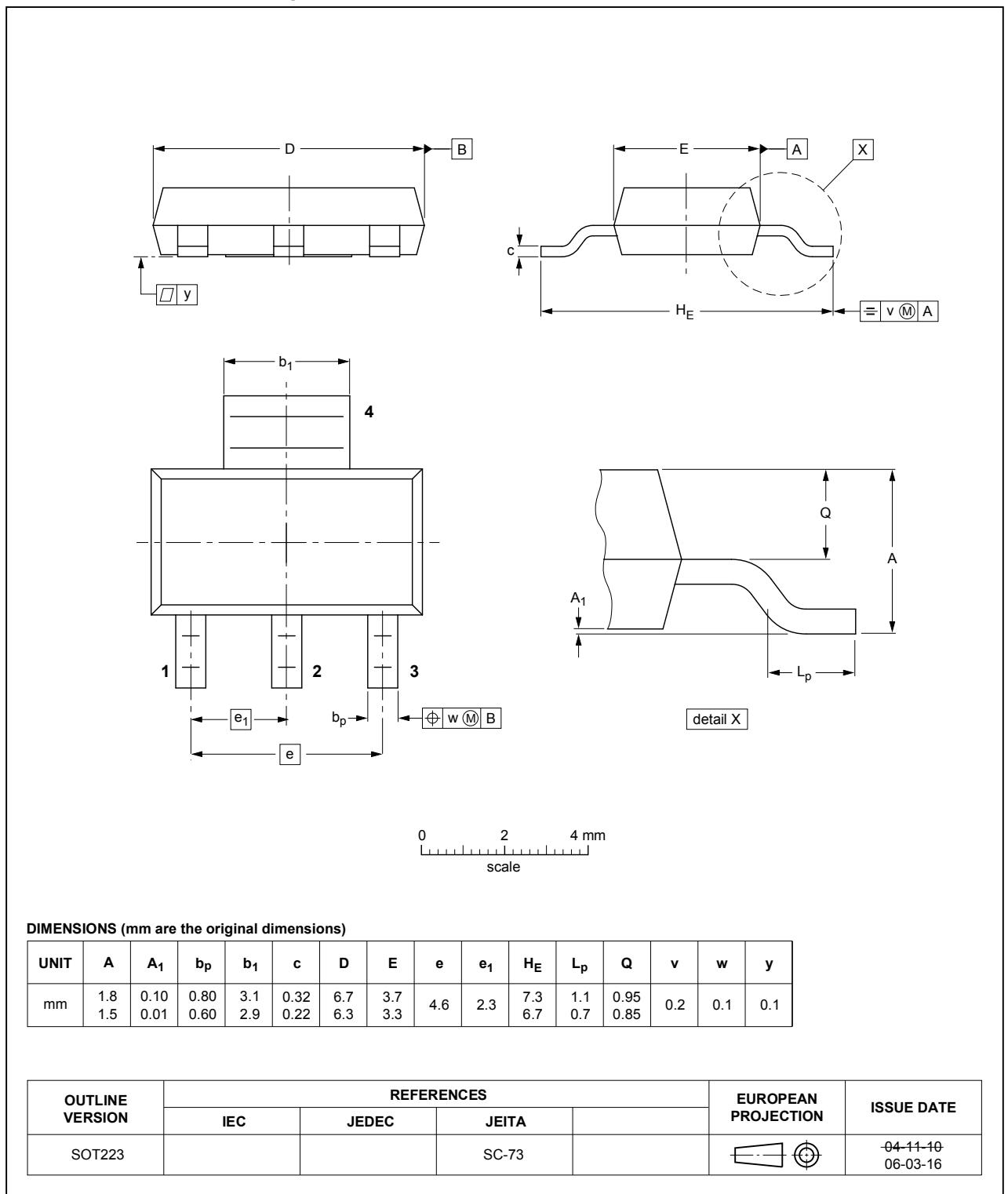


Fig. 14. Package outline SC-73 (SOT223)

## 12. Legal information

### 12.1 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.
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## 13. Contents

1	General description .....	1
2	Features and benefits .....	1
3	Applications .....	1
4	Quick reference data .....	1
5	Pinning information .....	2
6	Ordering information .....	2
7	Marking .....	2
8	Limiting values .....	2
9	Thermal characteristics .....	4
10	Characteristics .....	5
11	Package outline .....	9
12	Legal information .....	10
12.1	Data sheet status .....	10
12.2	Definitions .....	10
12.3	Disclaimers .....	10
12.4	Trademarks .....	11

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