



# 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

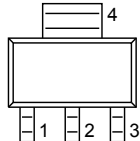
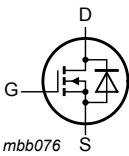
Table 1. Quick reference data

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

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## 5. Pinning information

Table 2. Pinning information

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

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	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	$T_j \geq 25\text{ °C}$ ; $T_j \leq 150\text{ °C}$	-	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	$T_{sp} = 25\text{ °C}$ ; <a href="#">Fig. 1</a>	-	8	W
$I_D$	drain current	$T_{sp} = 100\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Fig. 2</a>	-	5	A
		$T_{sp} = 25\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	7	A
$I_{DM}$	peak drain current	$T_{sp} = 25\text{ °C}$ ; pulsed; $t_p \leq 10\text{ }\mu\text{s}$ ; <a href="#">Fig. 3</a>	-	30	A

Symbol	Parameter	Conditions	Min	Max	Unit
T <sub>stg</sub>	storage temperature		-55	150	°C
T <sub>j</sub>	junction temperature		-55	150	°C
<b>Source-drain diode</b>					
I <sub>S</sub>	source current	T <sub>sp</sub> = 25 °C	-	7	A
I <sub>SM</sub>	peak source current	pulsed; t <sub>p</sub> ≤ 10 μs; T <sub>sp</sub> = 25 °C	-	30	A
<b>Avalanche ruggedness</b>					
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	I <sub>D</sub> = 7 A; V <sub>sup</sub> ≤ 55 V; R <sub>GS</sub> = 50 Ω; V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; unclamped	-	53	mJ
E <sub>DS(AL)R</sub>	repetitive drain-source avalanche energy	<a href="#">Fig. 4</a>	<a href="#">[1][2][3][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.

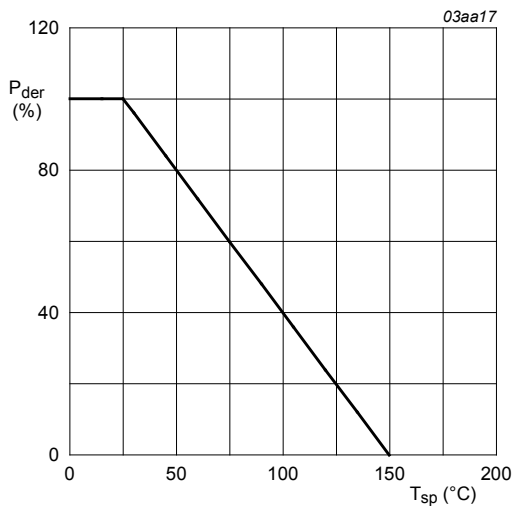


Fig. 1. Normalized total power dissipation as a function of solder point temperature

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

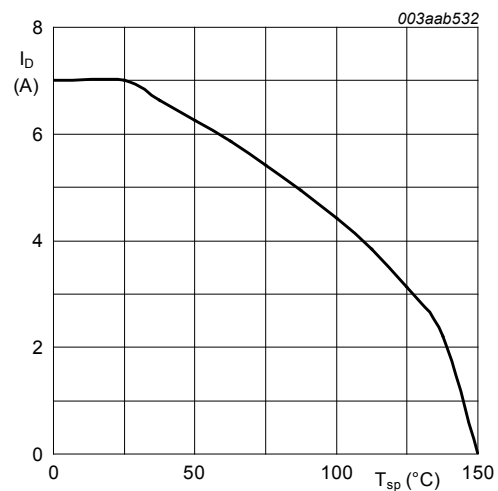


Fig. 2. Continuous drain current as a function of solder point temperature

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

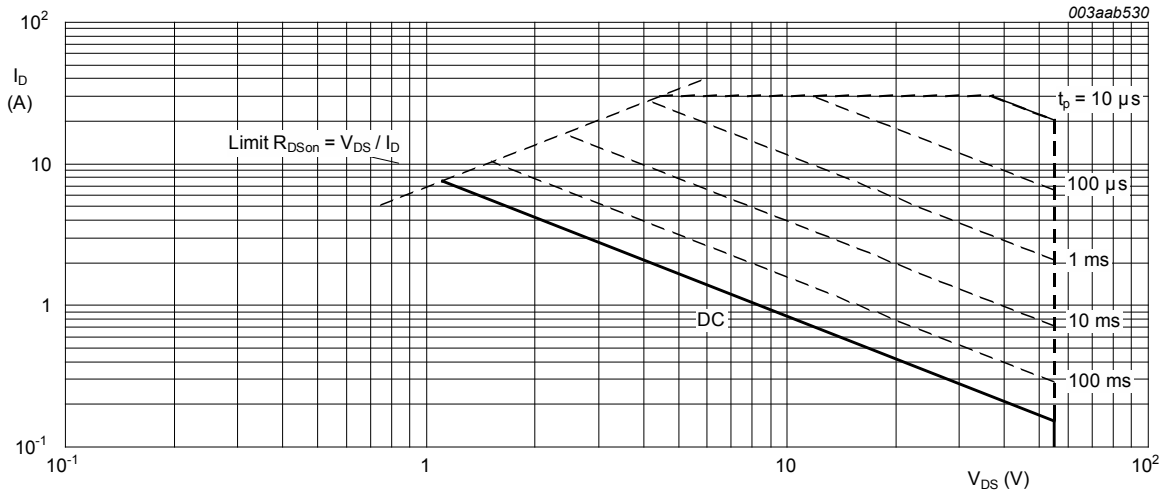


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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

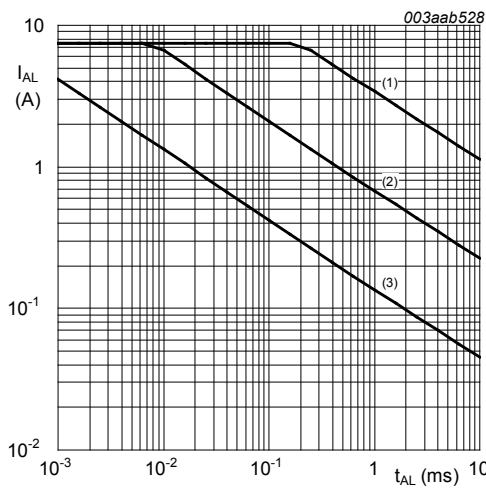


Fig. 4. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time

## 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	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	55	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	50	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$ ; <a href="#">Fig. 8</a>	2	3	4	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ C$ ; <a href="#">Fig. 8</a>	-	-	4.4	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 150 \text{ }^\circ C$ ; <a href="#">Fig. 8</a>	1.2	-	-	V
$I_{DSS}$	drain leakage current	$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.05	10	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
		$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 150 \text{ }^\circ C$ ; <a href="#">Fig. 9</a> ; <a href="#">Fig. 10</a>	-	-	148	m $\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 10 \text{ A}; T_j = 25 \text{ }^\circ C$ ; <a href="#">Fig. 9</a> ; <a href="#">Fig. 10</a>	-	68	80	m $\Omega$
$I_{DSS}$	drain leakage current	$V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 150 \text{ }^\circ C$	-	-	500	$\mu A$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 10 \text{ A}; V_{DS} = 44 \text{ V}; V_{GS} = 10 \text{ V}$ ; <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	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ C$ ; <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		$V_{DS} = 30 \text{ V}; R_L = 1.2 \text{ } \Omega; V_{GS} = 10 \text{ V}$ ; $R_{G(ext)} = 10 \text{ } \Omega$	-	8	-
$t_r$	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	$I_S = 15 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$ ; <a href="#">Fig. 13</a>	-	0.85	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A}/\mu s$	-	33	-	ns
$Q_r$	recovered charge	$V_{GS} = -10 \text{ V}; V_{DS} = 30 \text{ V}$	-	31	-	nC

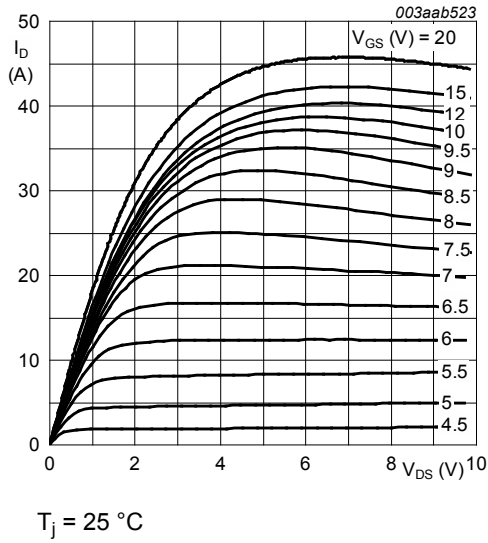


Fig. 5. Output characteristics: drain current as a function of drain-source voltage; typical values

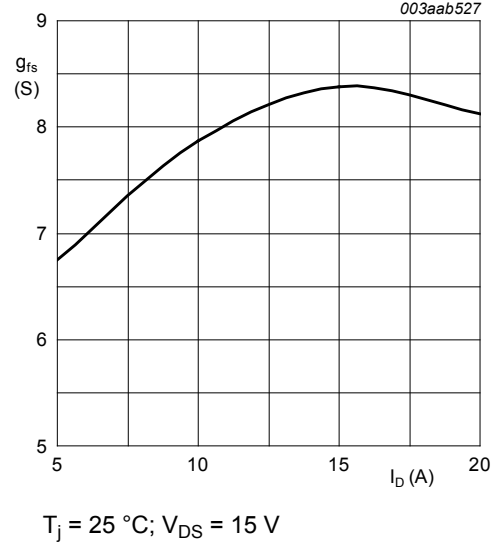


Fig. 6. Forward transconductance as a function of drain current; typical values

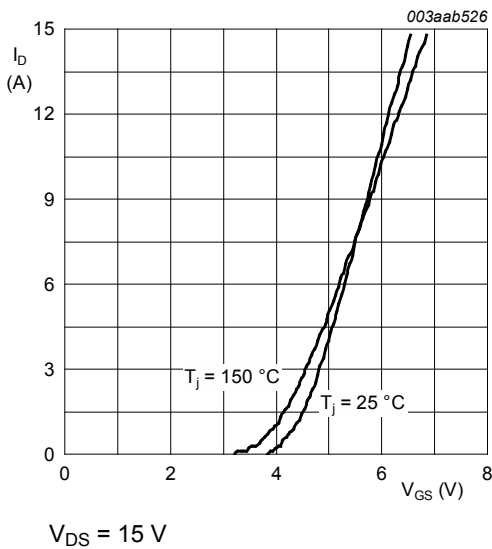


Fig. 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values

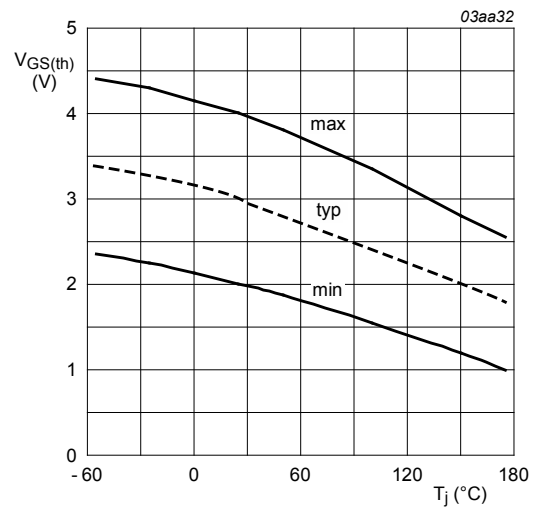
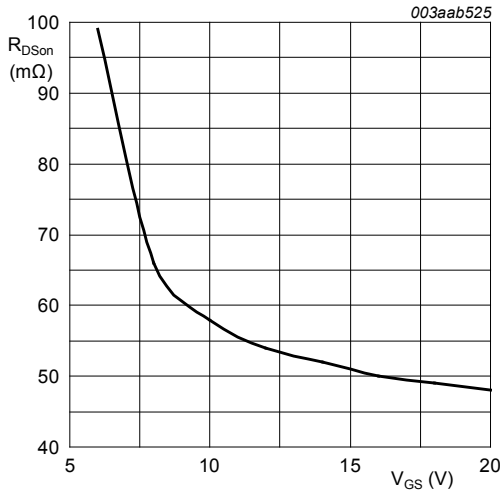


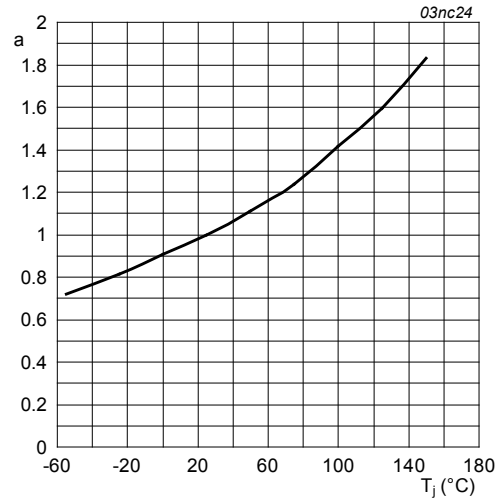
Fig. 8. Gate-source threshold voltage as a function of junction temperature

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



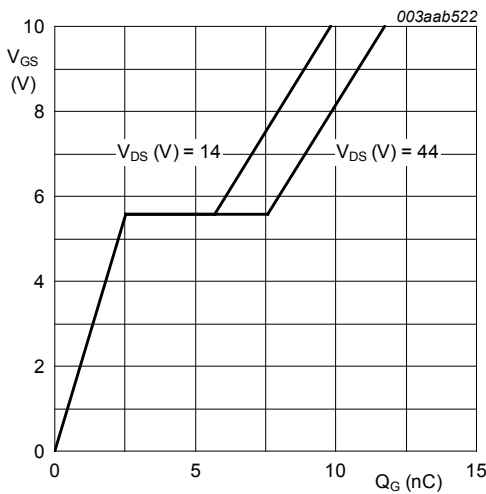
**Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values**

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



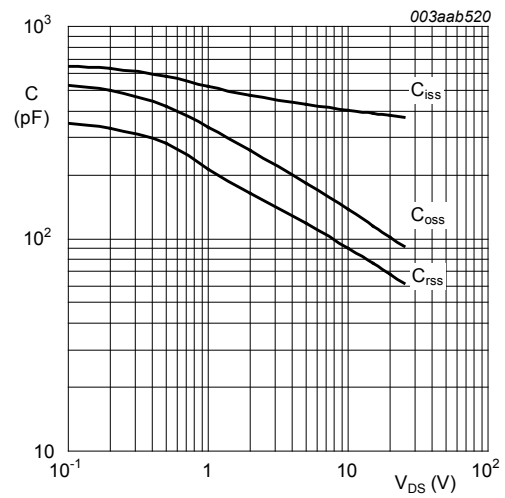
**Fig. 10. Normalized drain source on-state resistance factor as a function of junction temperature**

$$a = \frac{R_{DS(on)}}{R_{DS(on)@25\text{ °C}}}$$



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

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



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

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

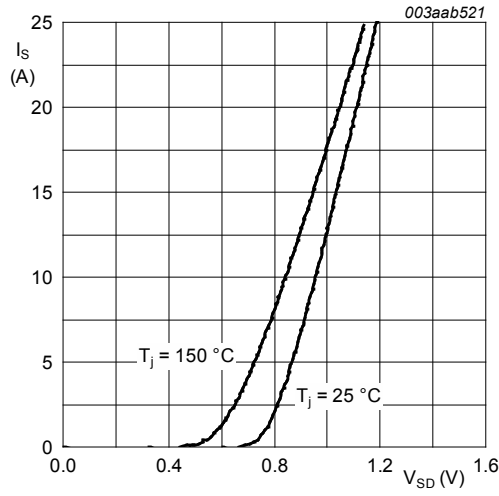


Fig. 13. Source current as a function of source-drain voltage; typical values

$$V_{GS} = 0V$$



### 11. Package outline

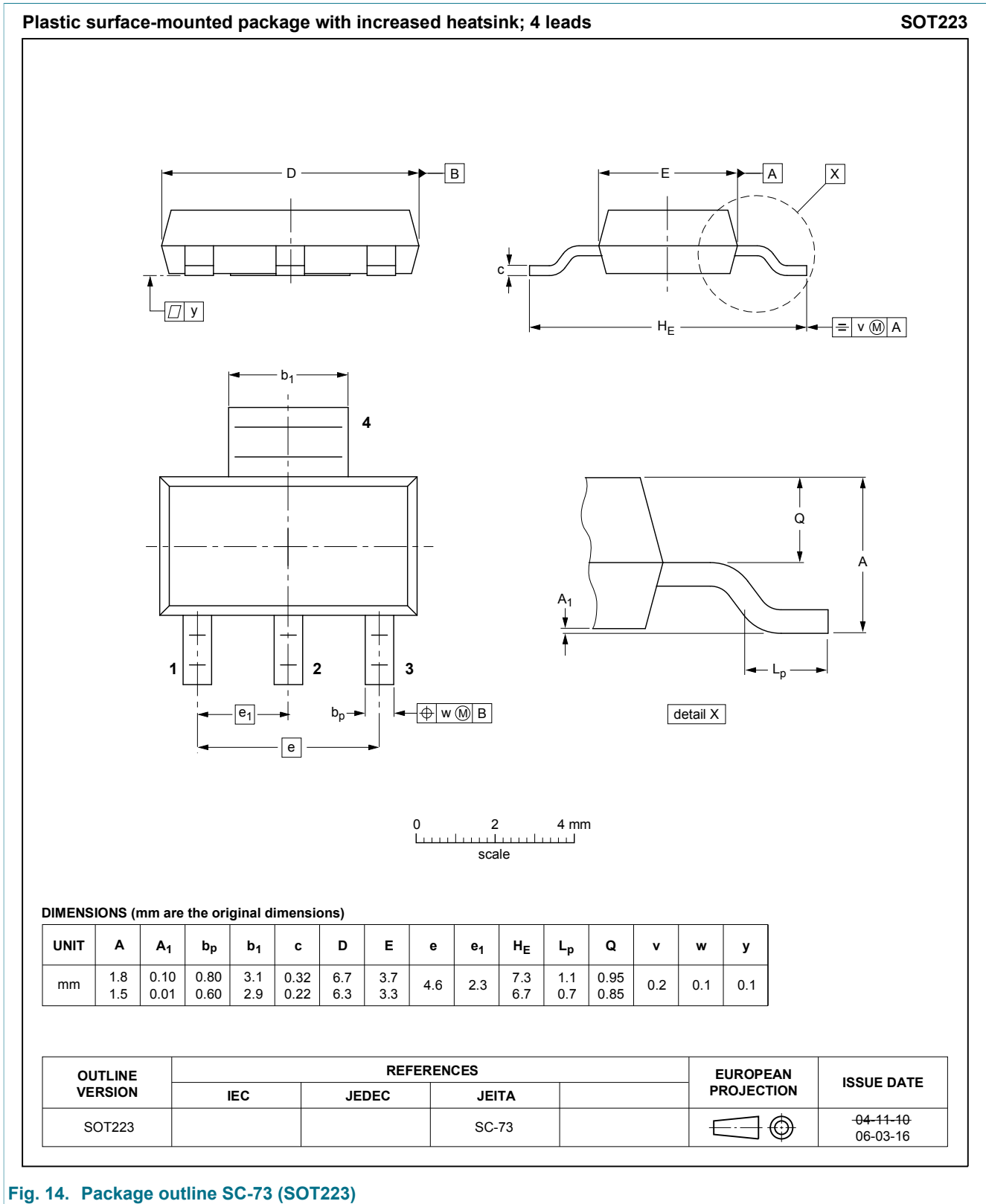


Fig. 14. Package outline SC-73 (SOT223)

## 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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