

# DATA SHEET

## **PDTC123E series**

NPN resistor-equipped transistors;

$R1 = 2.2\text{ k}\Omega$ ,  $R2 = 2.2\text{ k}\Omega$

Product data sheet  
Supersedes data of 2004 Mar 18

2004 Aug 06

# NPN resistor-equipped transistors; R1 = 2.2 k $\Omega$ , R2 = 2.2 k $\Omega$

## PDTC123E series

### FEATURES

- Built-in bias resistors
- Simplified circuit design
- Reduction of component count
- Reduced pick and place costs.

### APPLICATIONS

- General purpose switching and amplification
- Inverter and interface circuits
- Circuit driver.

### QUICK REFERENCE DATA

| SYMBOL           | PARAMETER                 | TYP. | MAX. | UNIT       |
|------------------|---------------------------|------|------|------------|
| V <sub>CEO</sub> | collector-emitter voltage | –    | 50   | V          |
| I <sub>O</sub>   | output current (DC)       | –    | 100  | mA         |
| R1               | bias resistor             | 2.2  | –    | k $\Omega$ |
| R2               | bias resistor             | 2.2  | –    | k $\Omega$ |

### DESCRIPTION

NPN resistor-equipped transistor (see “Simplified outline, symbol and pinning” for package details).

### PRODUCT OVERVIEW

| TYPE NUMBER | PACKAGE       |        | MARKING CODE       | PNP COMPLEMENT |
|-------------|---------------|--------|--------------------|----------------|
|             | PHILIPS       | EIAJ   |                    |                |
| PDTC123EE   | SOT416        | SC-75  | 5A                 | PDTA123EE      |
| PDTC123EEF  | SOT490        | SC-89  | 6A                 | PDTA123EEF     |
| PDTC123EK   | SOT346        | SC-59  | 48                 | PDTA123EK      |
| PDTC123EM   | SOT883        | SC-101 | G1                 | PDTA123EM      |
| PDTC123ES   | SOT54 (TO-92) | SC-43  | TC123E             | PDTA123ES      |
| PDTC123ET   | SOT23         | –      | *26 <sup>(1)</sup> | PDTA123ET      |
| PDTC123EU   | SOT323        | SC-70  | *48 <sup>(1)</sup> | PDTA123EU      |

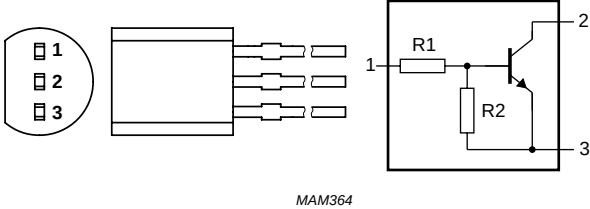
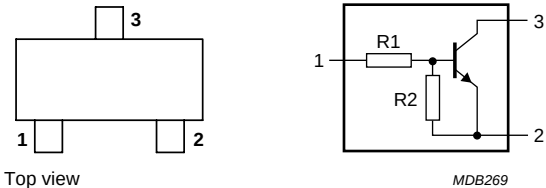
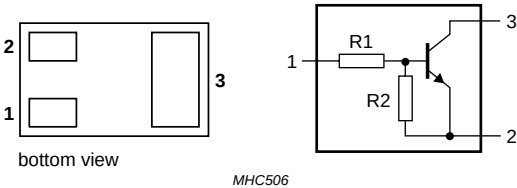
### Note

- \* = p: Made in Hong Kong.  
\* = t: Made in Malaysia.  
\* = W: Made in China.

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SIMPLIFIED OUTLINE, SYMBOL AND PINNING

| TYPE NUMBER                                                    | SIMPLIFIED OUTLINE AND SYMBOL                                                        | PINNING     |                              |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------|------------------------------|
|                                                                |                                                                                      | PIN         | DESCRIPTION                  |
| PDTC123ES                                                      |    | 1<br>2<br>3 | base<br>collector<br>emitter |
| PDTC123EE<br>PDTC123EEF<br>PDTC123EK<br>PDTC123ET<br>PDTC123EU |   | 1<br>2<br>3 | base<br>emitter<br>collector |
| PDTC123EM                                                      |  | 1<br>2<br>3 | base<br>emitter<br>collector |

# NPN resistor-equipped transistors; R1 = 2.2 k $\Omega$ , R2 = 2.2 k $\Omega$

## PDTC123E series

### ORDERING INFORMATION

| TYPE NUMBER | PACKAGE |                                                                       |         |
|-------------|---------|-----------------------------------------------------------------------|---------|
|             | NAME    | DESCRIPTION                                                           | VERSION |
| PDTC123EE   | –       | plastic surface mounted package; 3 leads                              | SOT416  |
| PDTC123EEF  | –       | plastic surface mounted package; 3 leads                              | SOT490  |
| PDTC123EK   | –       | plastic surface mounted package; 3 leads                              | SOT346  |
| PDTC123EM   | –       | leadless ultra small package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm | SOT883  |
| PDTC123ES   | –       | plastic single-ended leaded (through hole) package; 3 leads           | SOT54   |
| PDTC123ET   | –       | plastic surface mounted package; 3 leads                              | SOT23   |
| PDTC123EU   | –       | plastic surface mounted package; 3 leads                              | SOT323  |

### LIMITING VALUES

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

| SYMBOL           | PARAMETER                     | CONDITIONS               | MIN. | MAX. | UNIT |
|------------------|-------------------------------|--------------------------|------|------|------|
| V <sub>CBO</sub> | collector-base voltage        | open emitter             | –    | 50   | V    |
| V <sub>CEO</sub> | collector-emitter voltage     | open base                | –    | 50   | V    |
| V <sub>EBO</sub> | emitter-base voltage          | open collector           | –    | 10   | V    |
| V <sub>I</sub>   | input voltage                 |                          |      |      |      |
|                  | positive                      |                          | –    | +12  | V    |
|                  | negative                      |                          | –    | –10  | V    |
| I <sub>O</sub>   | output current (DC)           |                          | –    | 100  | mA   |
| I <sub>CM</sub>  | peak collector current        |                          | –    | 100  | mA   |
| P <sub>tot</sub> | total power dissipation       | T <sub>amb</sub> ≤ 25 °C |      |      |      |
|                  | SOT54                         | note 1                   | –    | 500  | mW   |
|                  | SOT23                         | note 1                   | –    | 250  | mW   |
|                  | SOT346                        | note 1                   | –    | 250  | mW   |
|                  | SOT323                        | note 1                   | –    | 200  | mW   |
|                  | SOT416                        | note 1                   | –    | 150  | mW   |
|                  | SOT490                        | notes 1 and 2            | –    | 250  | mW   |
|                  | SOT883                        | notes 2 and 3            | –    | 250  | mW   |
| T <sub>stg</sub> | storage temperature           |                          | –65  | +150 | °C   |
| T <sub>j</sub>   | junction temperature          |                          | –    | 150  | °C   |
| T <sub>amb</sub> | operating ambient temperature |                          | –65  | +150 | °C   |

### Notes

1. Refer to standard mounting conditions.
2. Reflow soldering is the only recommended soldering method.
3. Refer to SOT883 standard mounting conditions; FR4 with 60  $\mu$ m copper strip line.

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PDTC123E series

#### THERMAL CHARACTERISTICS

| SYMBOL               | PARAMETER                                   | CONDITIONS    | VALUE | UNIT |
|----------------------|---------------------------------------------|---------------|-------|------|
| R <sub>th(j-a)</sub> | thermal resistance from junction to ambient | in free air   |       |      |
|                      | SOT54                                       | note 1        | 250   | K/W  |
|                      | SOT23                                       | note 1        | 500   | K/W  |
|                      | SOT346                                      | note 1        | 500   | K/W  |
|                      | SOT323                                      | note 1        | 625   | K/W  |
|                      | SOT416                                      | note 1        | 833   | K/W  |
|                      | SOT490                                      | notes 1 and 2 | 500   | K/W  |
|                      | SOT883                                      | notes 2 and 3 | 500   | K/W  |

#### Notes

1. Refer to standard mounting conditions.
2. Reflow soldering is the only recommended soldering method.
3. Refer to SOT883 standard mounting conditions; FR4 with 60  $\mu$ m copper strip line.

#### CHARACTERISTICS

T<sub>amb</sub> = 25 °C unless otherwise specified.

| SYMBOL              | PARAMETER                            | CONDITIONS                                                                  | MIN. | TYP. | MAX. | UNIT       |
|---------------------|--------------------------------------|-----------------------------------------------------------------------------|------|------|------|------------|
| I <sub>CBO</sub>    | collector-base cut-off current       | V <sub>CB</sub> = 50 V; I <sub>E</sub> = 0 A                                | –    | –    | 100  | nA         |
| I <sub>CEO</sub>    | collector-emitter cut-off current    | V <sub>CE</sub> = 30 V; I <sub>B</sub> = 0 A                                | –    | –    | 1    | $\mu$ A    |
|                     |                                      | V <sub>CE</sub> = 30 V; I <sub>B</sub> = 0 A; T <sub>j</sub> = 150 °C       | –    | –    | 50   | $\mu$ A    |
| I <sub>EBO</sub>    | emitter-base cut-off current         | V <sub>EB</sub> = 5 V; I <sub>C</sub> = 0 A                                 | –    | –    | 2    | mA         |
| h <sub>FE</sub>     | DC current gain                      | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 20 mA                               | 30   | –    | –    |            |
| V <sub>CEsat</sub>  | collector-emitter saturation voltage | I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA                             | –    | –    | 150  | mV         |
| V <sub>i(off)</sub> | input-off voltage                    | I <sub>C</sub> = 1 mA; V <sub>CE</sub> = 5 V                                | –    | 1.2  | 0.5  | V          |
| V <sub>i(on)</sub>  | input-on voltage                     | I <sub>C</sub> = 20 mA; V <sub>CE</sub> = 0.3 V                             | 2    | 1.6  | –    | V          |
| R1                  | input resistor                       |                                                                             | 1.54 | 2.2  | 2.86 | k $\Omega$ |
| $\frac{R2}{R1}$     | resistor ratio                       |                                                                             | 0.8  | 1    | 1.2  |            |
| C <sub>c</sub>      | collector capacitance                | V <sub>CB</sub> = 10 V; I <sub>E</sub> = i <sub>e</sub> = 0 A;<br>f = 1 MHz | –    | –    | 2.5  | pF         |

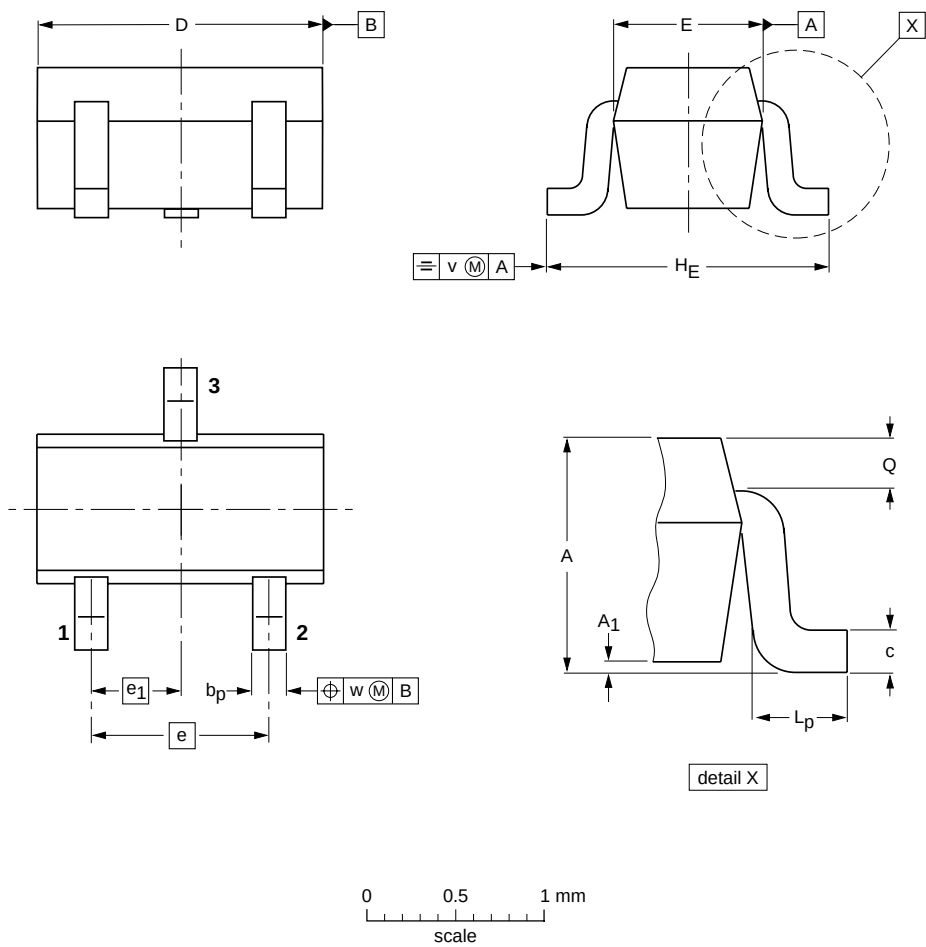
NPN resistor-equipped transistors;  
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PACKAGE OUTLINES

Plastic surface-mounted package; 3 leads

SOT416



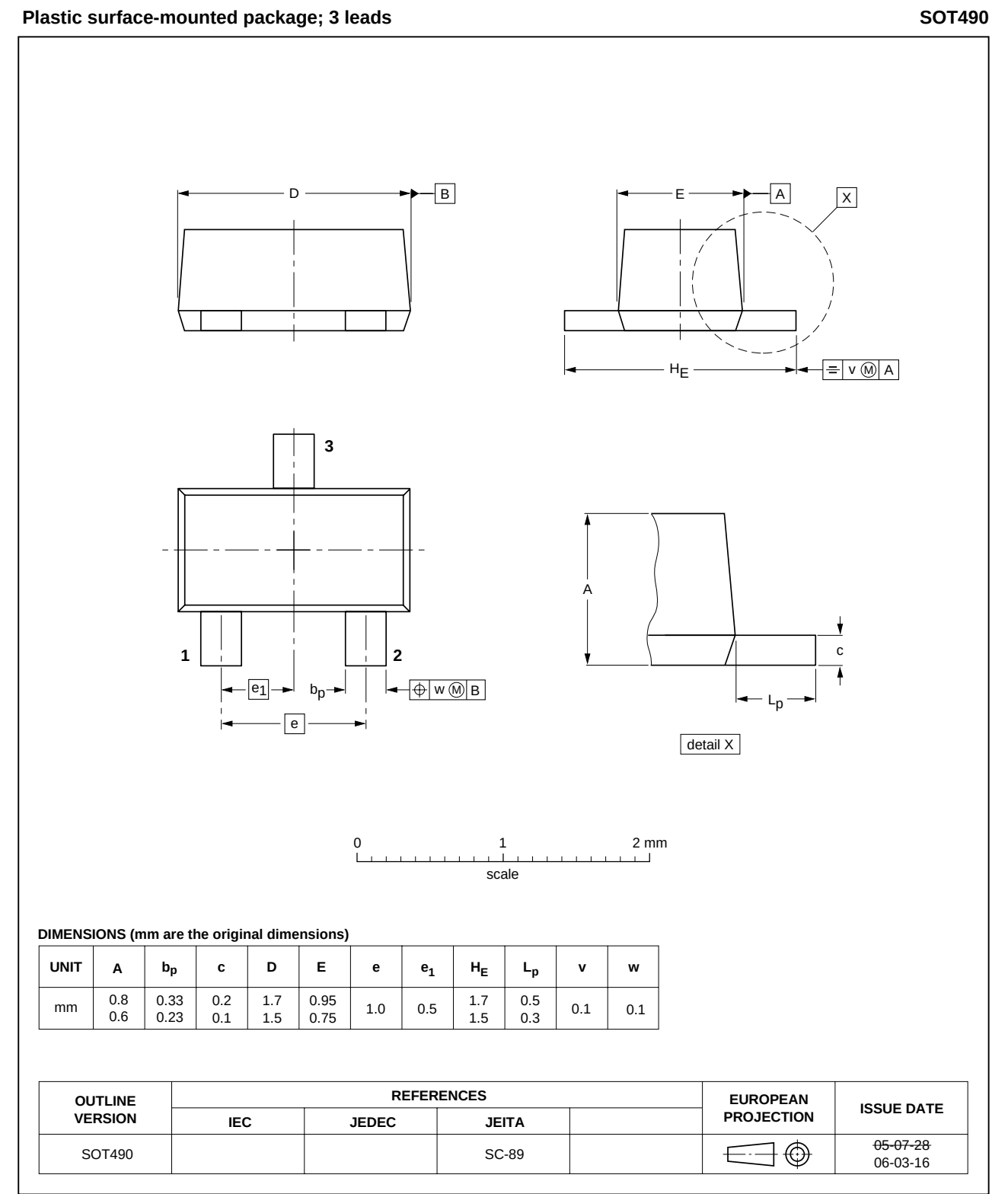
DIMENSIONS (mm are the original dimensions)

| UNIT | A            | A1<br>max | bp           | c            | D          | E          | e | e1  | HE           | Lp           | Q            | v   | w   |
|------|--------------|-----------|--------------|--------------|------------|------------|---|-----|--------------|--------------|--------------|-----|-----|
| mm   | 0.95<br>0.60 | 0.1       | 0.30<br>0.15 | 0.25<br>0.10 | 1.8<br>1.4 | 0.9<br>0.7 | 1 | 0.5 | 1.75<br>1.45 | 0.45<br>0.15 | 0.23<br>0.13 | 0.2 | 0.2 |

| OUTLINE<br>VERSION | REFERENCES |       |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE                      |
|--------------------|------------|-------|-------|--|---------------------------------------------------------------------------------------|---------------------------------|
|                    | IEC        | JEDEC | JEITA |  |                                                                                       |                                 |
| SOT416             |            |       | SC-75 |  |  | <del>04-11-04</del><br>06-03-16 |

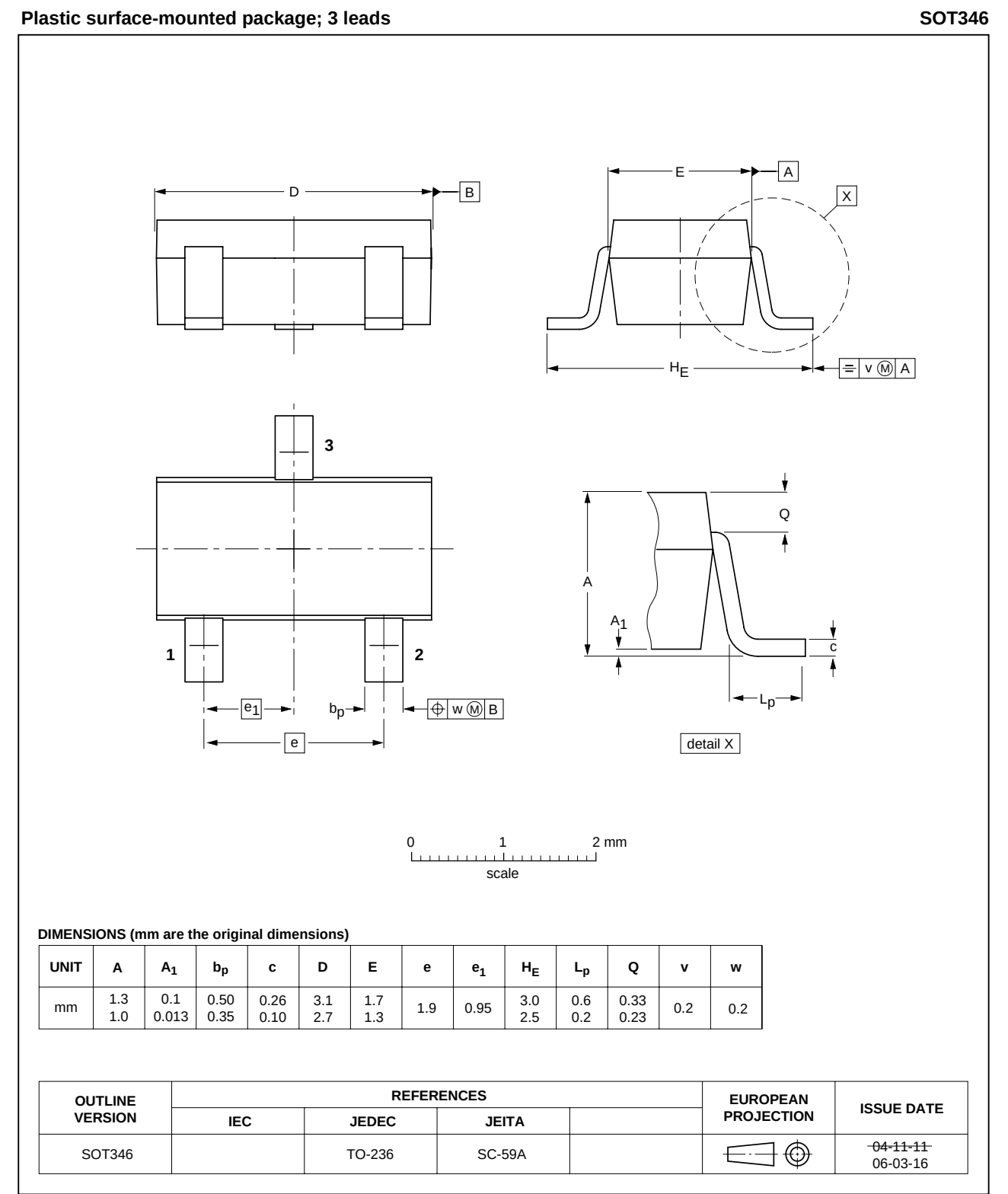
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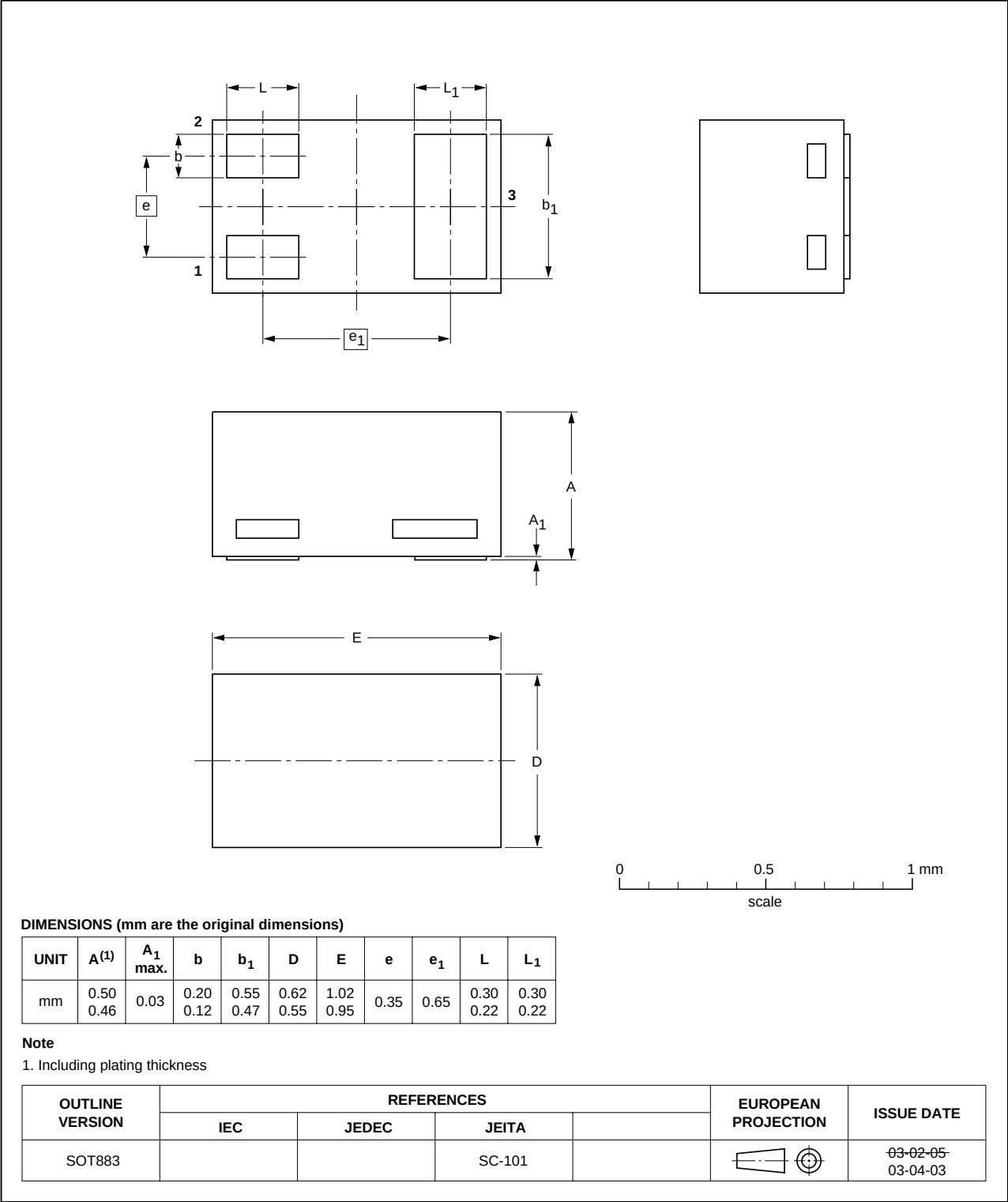


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PDTC123E series

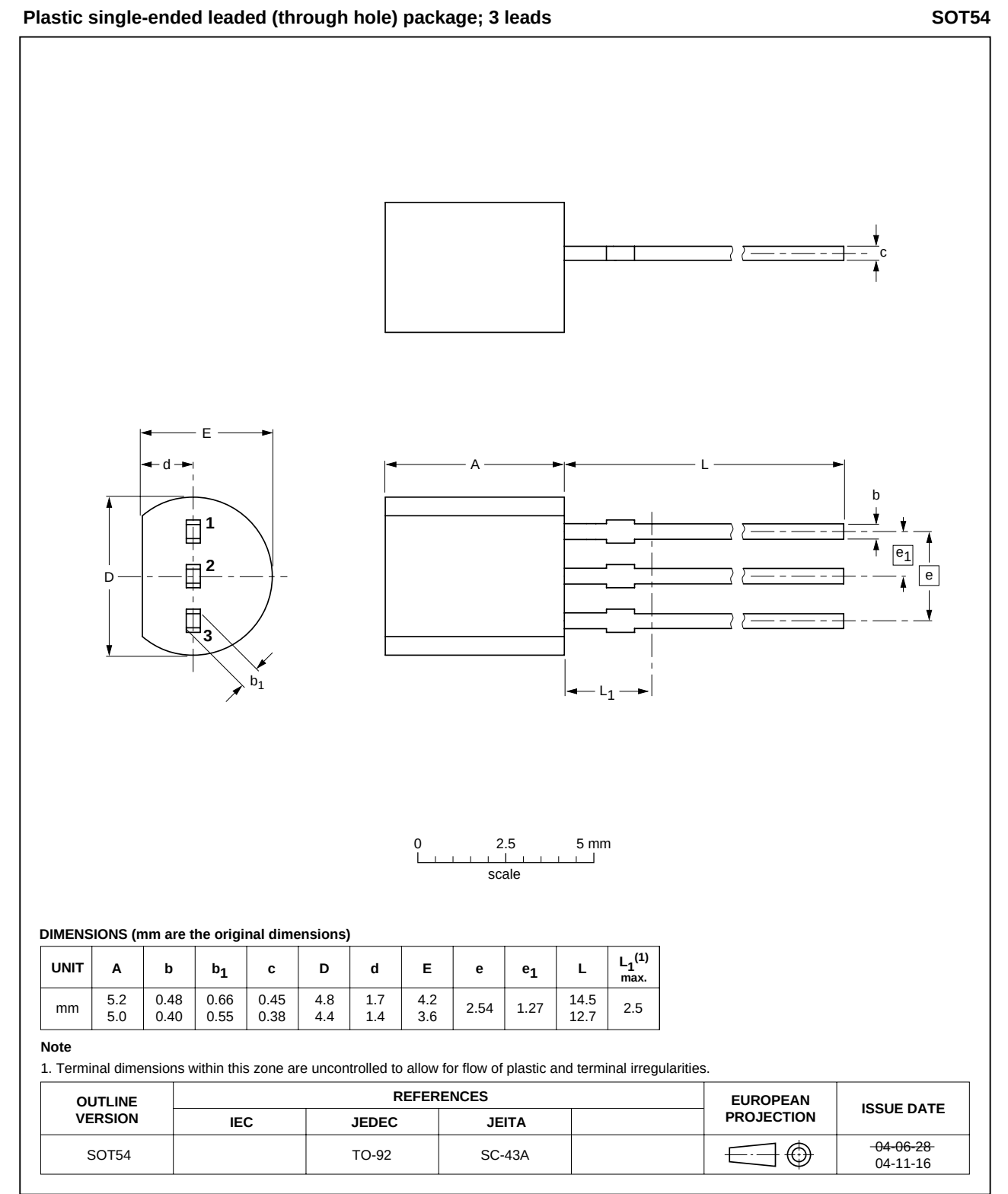
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SOT883



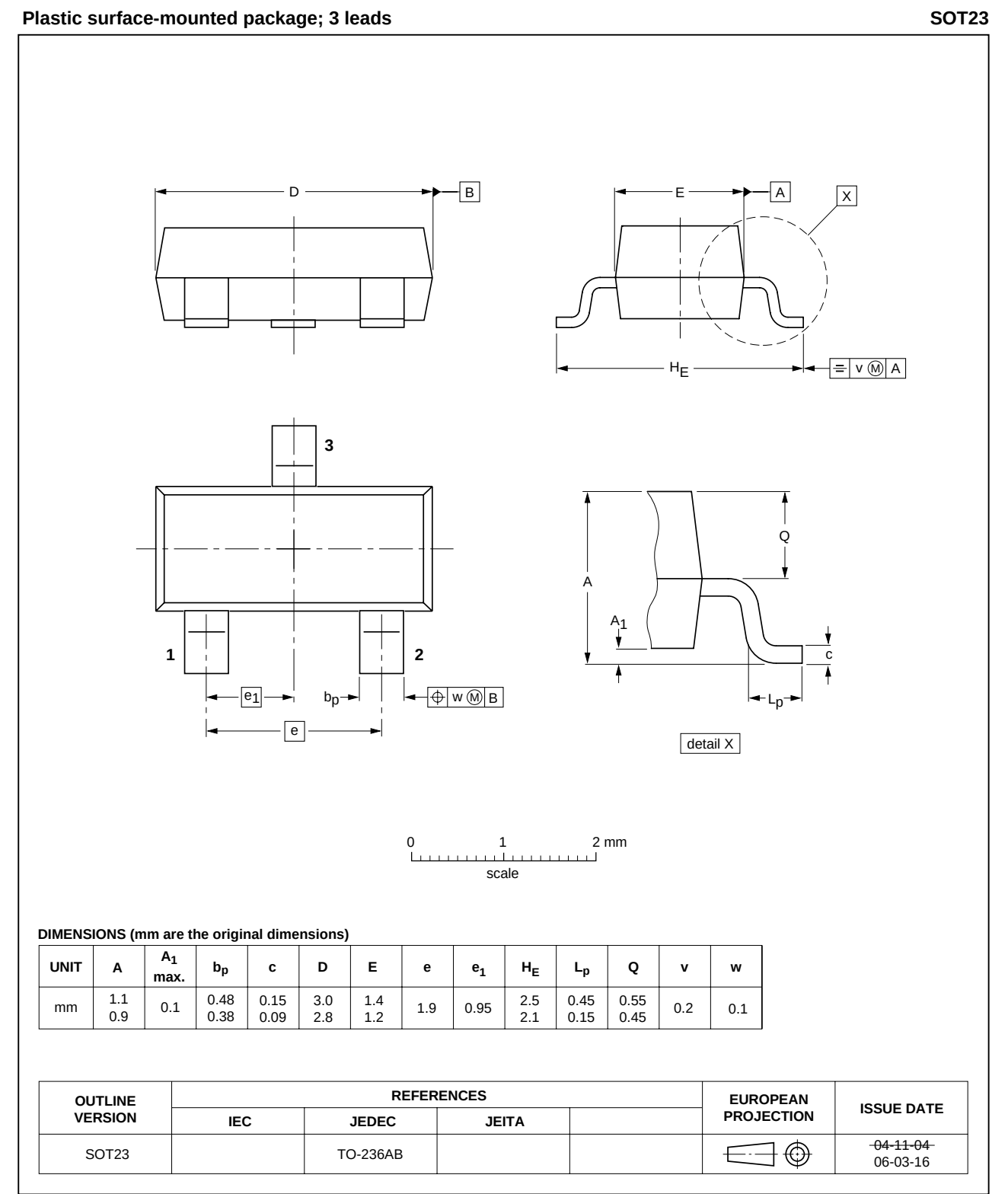
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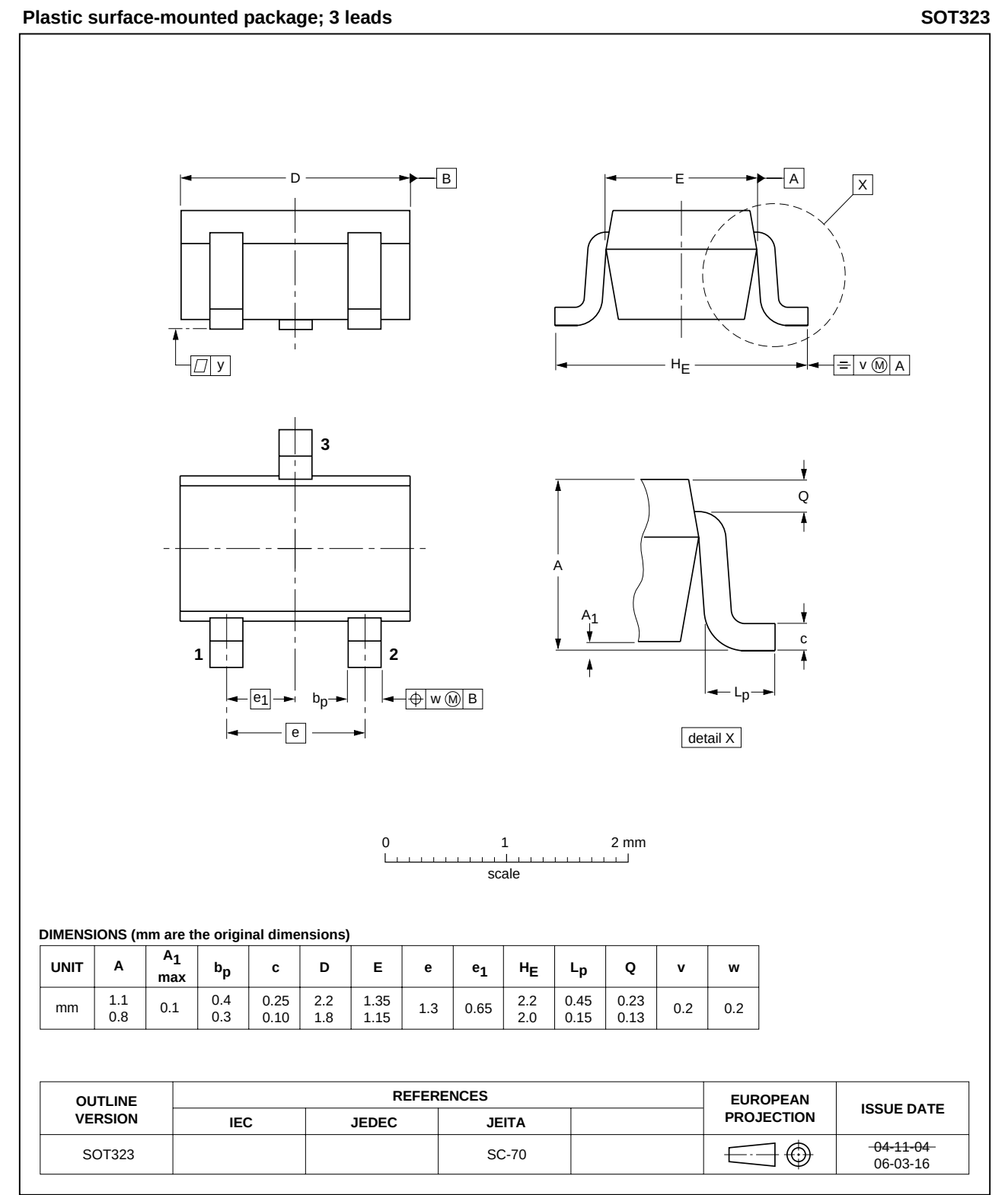
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## DATA SHEET STATUS

| DOCUMENT STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)</sup> | DEFINITION                                                                            |
|--------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective data sheet           | Development                   | This document contains data from the objective specification for product development. |
| Preliminary data sheet         | Qualification                 | This document contains data from the preliminary specification.                       |
| Product data sheet             | Production                    | This document contains the product specification.                                     |

## Notes

1. Please consult the most recently issued document before initiating or completing a design.
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## **Contact information**

For additional information please visit: <http://www.nxp.com>

For sales offices addresses send e-mail to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

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