

# DATA SHEET

## **PDTC144E series**

NPN resistor-equipped transistors;

R1 = 47 k $\Omega$ , R2 = 47 k $\Omega$

Product data sheet  
Supersedes data of 2004 Mar 23

2004 Aug 17

# NPN resistor-equipped transistors; R1 = 47 k $\Omega$ , R2 = 47 k $\Omega$

## PDTC144E 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             | 47   | –    | k $\Omega$ |
| R2               | bias resistor             | 47   | –    | 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   |                    |                |
| PDTC144EE   | SOT416        | SC-75  | 08                 | PDTA144EE      |
| PDTC144EEF  | SOT490        | SC-89  | 08                 | PDTA144EEF     |
| PDTC144EK   | SOT346        | SC-59  | 08                 | PDTA144EK      |
| PDTC144EM   | SOT883        | SC-101 | E7                 | PDTA144EM      |
| PDTC144ES   | SOT54 (TO-92) | SC-43  | TC144E             | PDTA144ES      |
| PDTC144ET   | SOT23         | –      | *08 <sup>(1)</sup> | PDTA144ET      |
| PDTC144EU   | SOT323        | SC-70  | *08 <sup>(1)</sup> | PDTA144EU      |

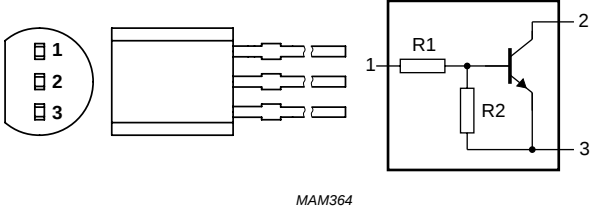
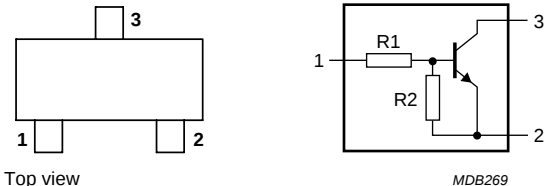
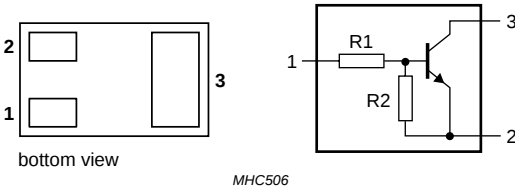
### Note

- \* = 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                  |
| PDTC144ES                                                      |    | 1<br>2<br>3 | base<br>collector<br>emitter |
| PDTC144EE<br>PDTC144EEF<br>PDTC144EK<br>PDTC144ET<br>PDTC144EU |   | 1<br>2<br>3 | base<br>emitter<br>collector |
| PDTC144EM                                                      |  | 1<br>2<br>3 | base<br>emitter<br>collector |

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## ORDERING INFORMATION

| TYPE NUMBER | PACKAGE |                                                                                  |         |
|-------------|---------|----------------------------------------------------------------------------------|---------|
|             | NAME    | DESCRIPTION                                                                      | VERSION |
| PDTC144EE   | –       | plastic surface mounted package; 3 leads                                         | SOT416  |
| PDTC144EEF  | –       | plastic surface mounted package; 3 leads                                         | SOT490  |
| PDTC144EK   | –       | plastic surface mounted package; 3 leads                                         | SOT346  |
| PDTC144EM   | –       | leadless ultra small plastic package; 3 solder lands; body<br>1.0 × 0.6 × 0.5 mm | SOT883  |
| PDTC144ES   | –       | plastic single-ended leaded (through hole) package; 3 leads                      | SOT54   |
| PDTC144ET   | –       | plastic surface mounted package; 3 leads                                         | SOT23   |
| PDTC144EU   | –       | 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                      |                          | –    | +40  | 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.

NPN resistor-equipped transistors;  
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PDTC144E 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                                 | –    | –    | 90   | $\mu$ A    |
| h <sub>FE</sub>     | DC current gain                      | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 5 mA                                | 80   | –    | –    |            |
| 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> = 100 $\mu$ A; V <sub>CE</sub> = 5 V                         | –    | 1.2  | 0.8  | V          |
| V <sub>i(on)</sub>  | input-on voltage                     | I <sub>C</sub> = 2 mA; V <sub>CE</sub> = 0.3 V                              | 3    | 1.6  | –    | V          |
| R1                  | input resistor                       |                                                                             | 33   | 47   | 61   | k $\Omega$ |
| $\frac{R2}{R1}$     | resistor ratio                       |                                                                             | 0.8  | 1    | 1.2  |            |
| C <sub>c</sub>      | collector capacitance                | I <sub>E</sub> = I <sub>e</sub> = 0 A; V <sub>CB</sub> = 10 V;<br>f = 1 MHz | –    | –    | 2.5  | pF         |

NPN resistor-equipped transistors;  
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PDTC144E series

PACKAGE OUTLINES

Plastic surface-mounted package; 3 leads

SOT416

The technical drawing illustrates the SOT416 package in three views: top, side, and a detailed view of the lead (labeled 'detail X'). The top view shows a rectangular body with three leads, labeled with dimensions D (body width), B (lead width), and E (lead pitch). The side view shows the package height A, lead height H<sub>E</sub>, and lead thickness v. The detailed view of the lead shows dimensions A<sub>1</sub> (lead thickness), c (lead width), L<sub>p</sub> (lead length), and Q (lead height). A scale bar indicates 0, 0.5, and 1 mm.

| UNIT | A            | A <sub>1</sub><br>max | b <sub>p</sub> | c            | D          | E          | e | e <sub>1</sub> | H <sub>E</sub> | L <sub>p</sub> | 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 |

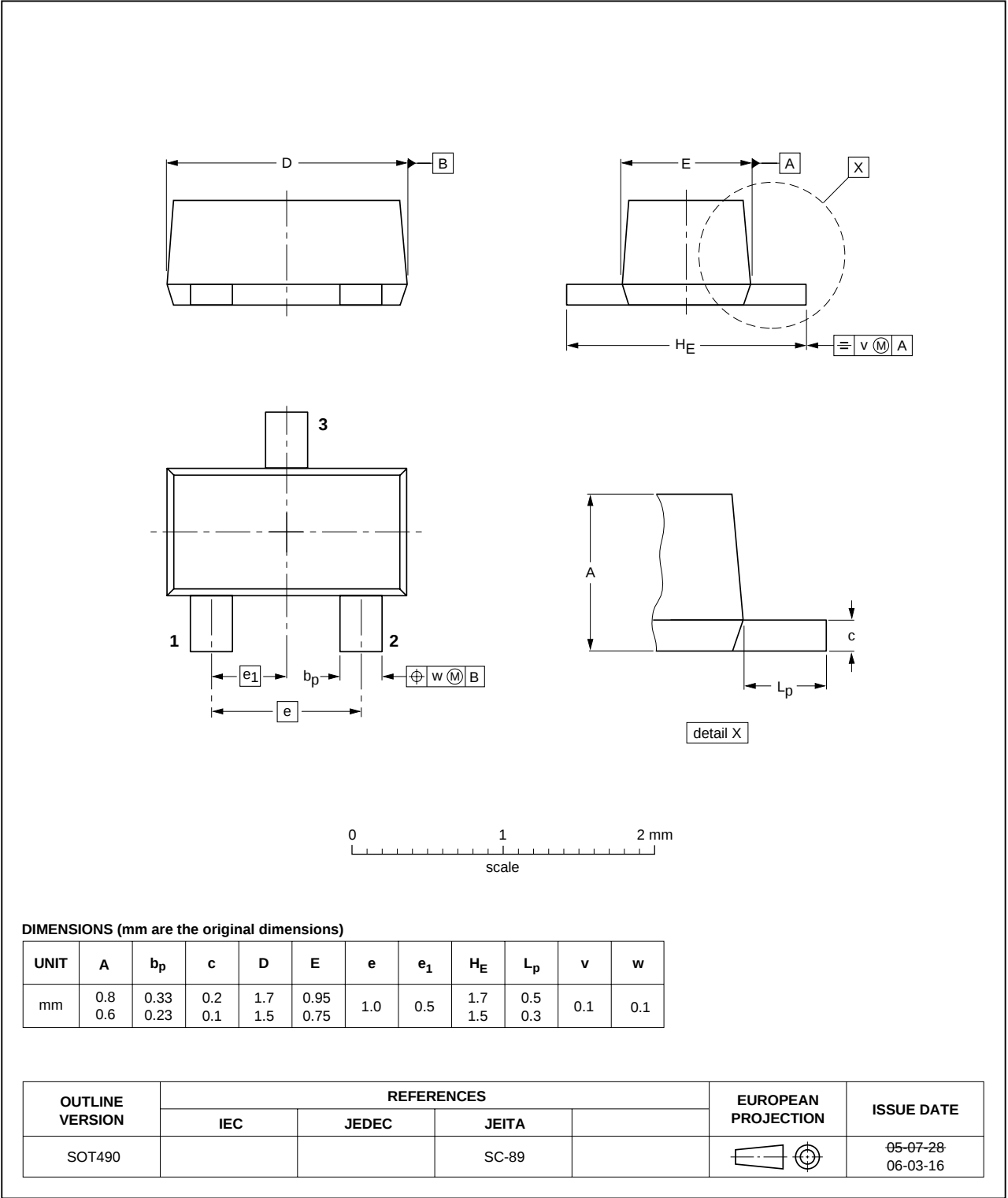
| OUTLINE<br>VERSION | REFERENCES |       |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE                       |
|--------------------|------------|-------|-------|--|------------------------|----------------------------------|
|                    | IEC        | JEDEC | JEITA |  |                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

NPN resistor-equipped transistors;  
R1 = 47 kΩ, R2 = 47 kΩ

PDTC144E series

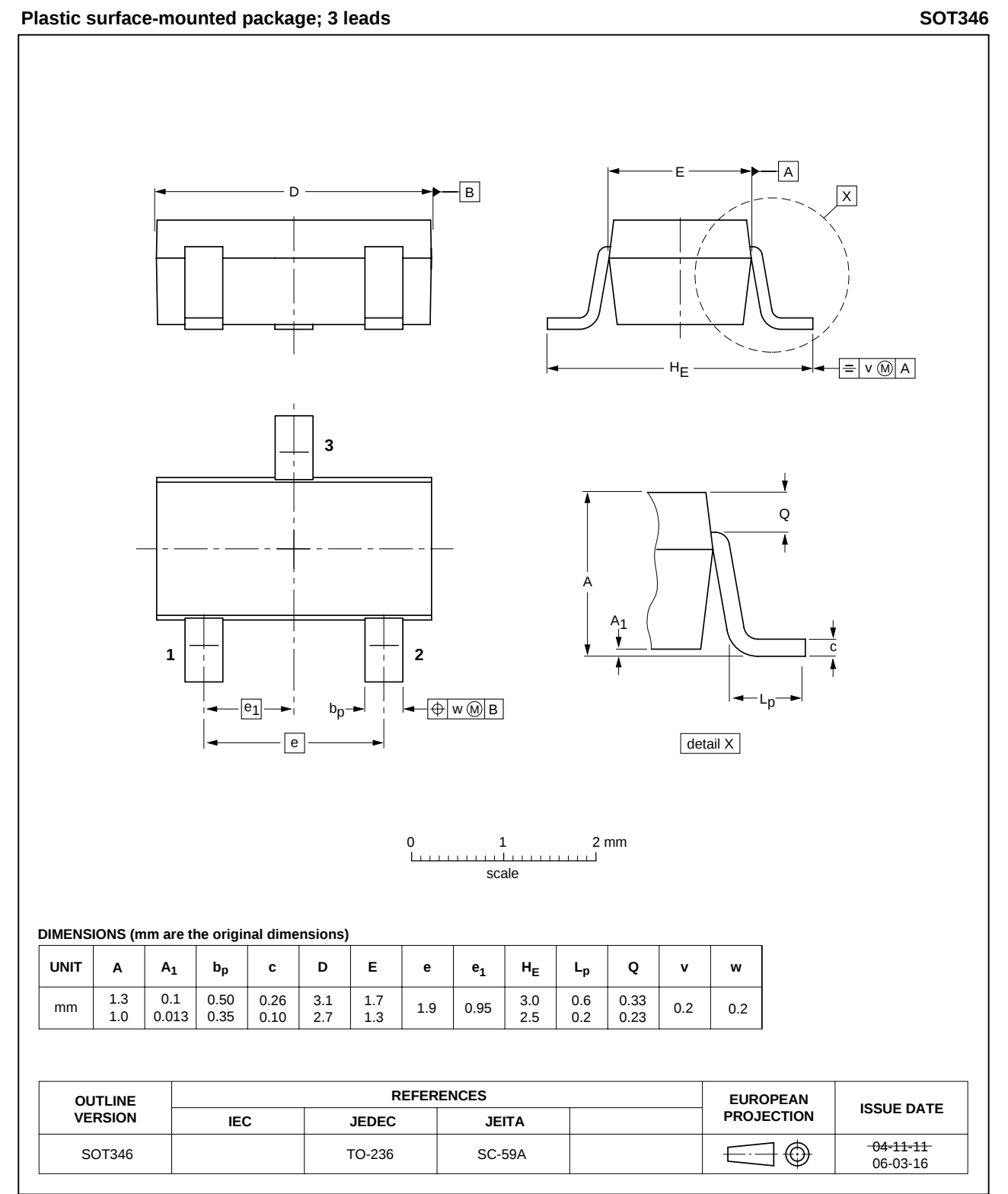
Plastic surface-mounted package; 3 leads

SOT490



NPN resistor-equipped transistors;  
R1 = 47 kΩ, R2 = 47 kΩ

PDTC144E series

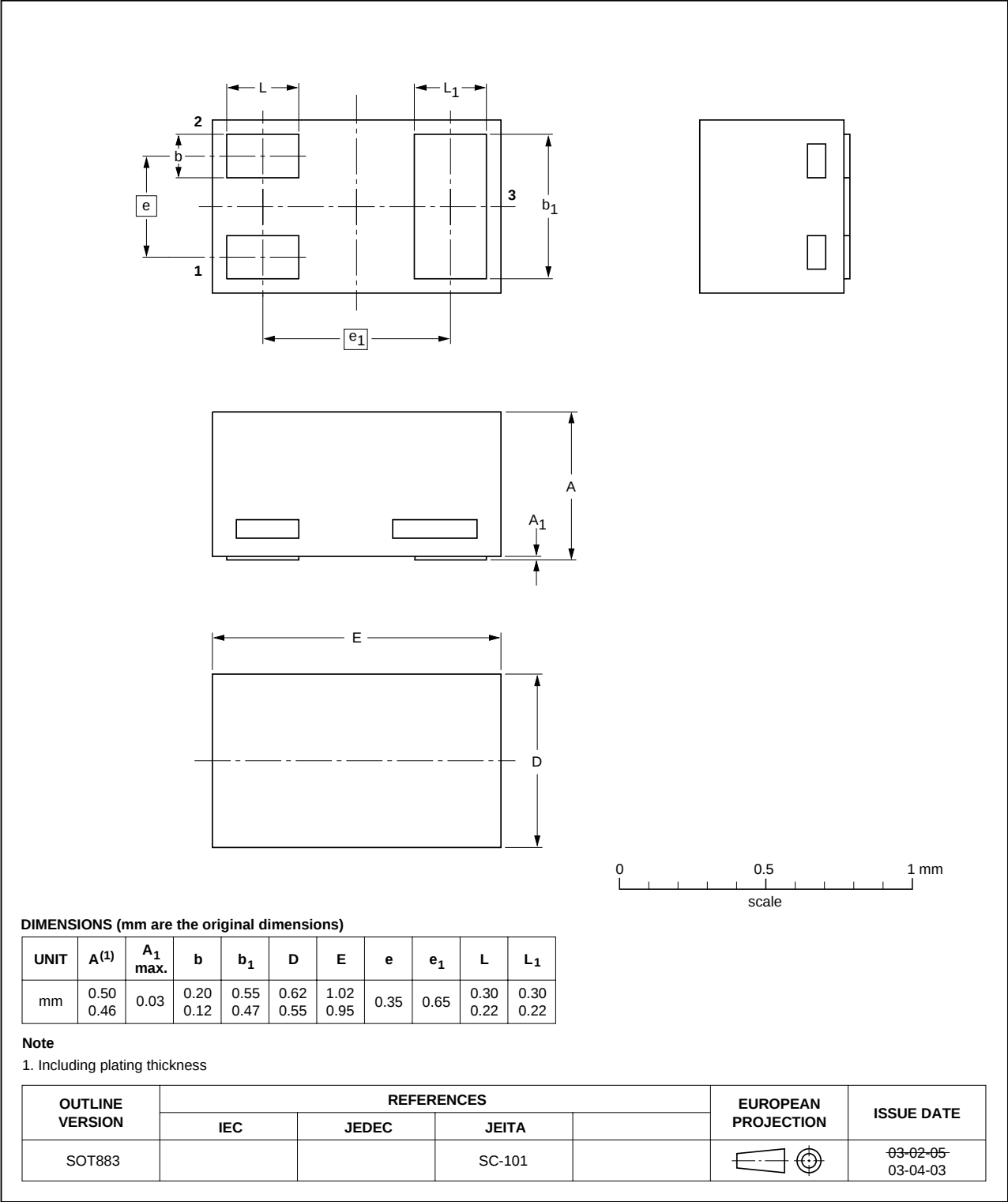


NPN resistor-equipped transistors;  
R1 = 47 kΩ, R2 = 47 kΩ

PDTC144E series

Leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.5 mm

SOT883



NPN resistor-equipped transistors;  
R1 = 47 kΩ, R2 = 47 kΩ

PDTC144E series

Plastic single-ended leaded (through hole) package; 3 leadsSOT54

Technical drawing of the SOT54 package showing top, side, and lead detail views with dimension labels A, b, b<sub>1</sub>, c, D, d, E, e, e<sub>1</sub>, L, L<sub>1</sub>.

0 2.5 5 mm  
scale

**DIMENSIONS (mm are the original dimensions)**

| UNIT | A          | b            | b <sub>1</sub> | c            | D          | d          | E          | e    | e <sub>1</sub> | L            | L <sub>1</sub> <sup>(1)</sup><br>max. |
|------|------------|--------------|----------------|--------------|------------|------------|------------|------|----------------|--------------|---------------------------------------|
| mm   | 5.2<br>5.0 | 0.48<br>0.40 | 0.66<br>0.55   | 0.45<br>0.38 | 4.8<br>4.4 | 1.7<br>1.4 | 4.2<br>3.6 | 2.54 | 1.27           | 14.5<br>12.7 | 2.5                                   |

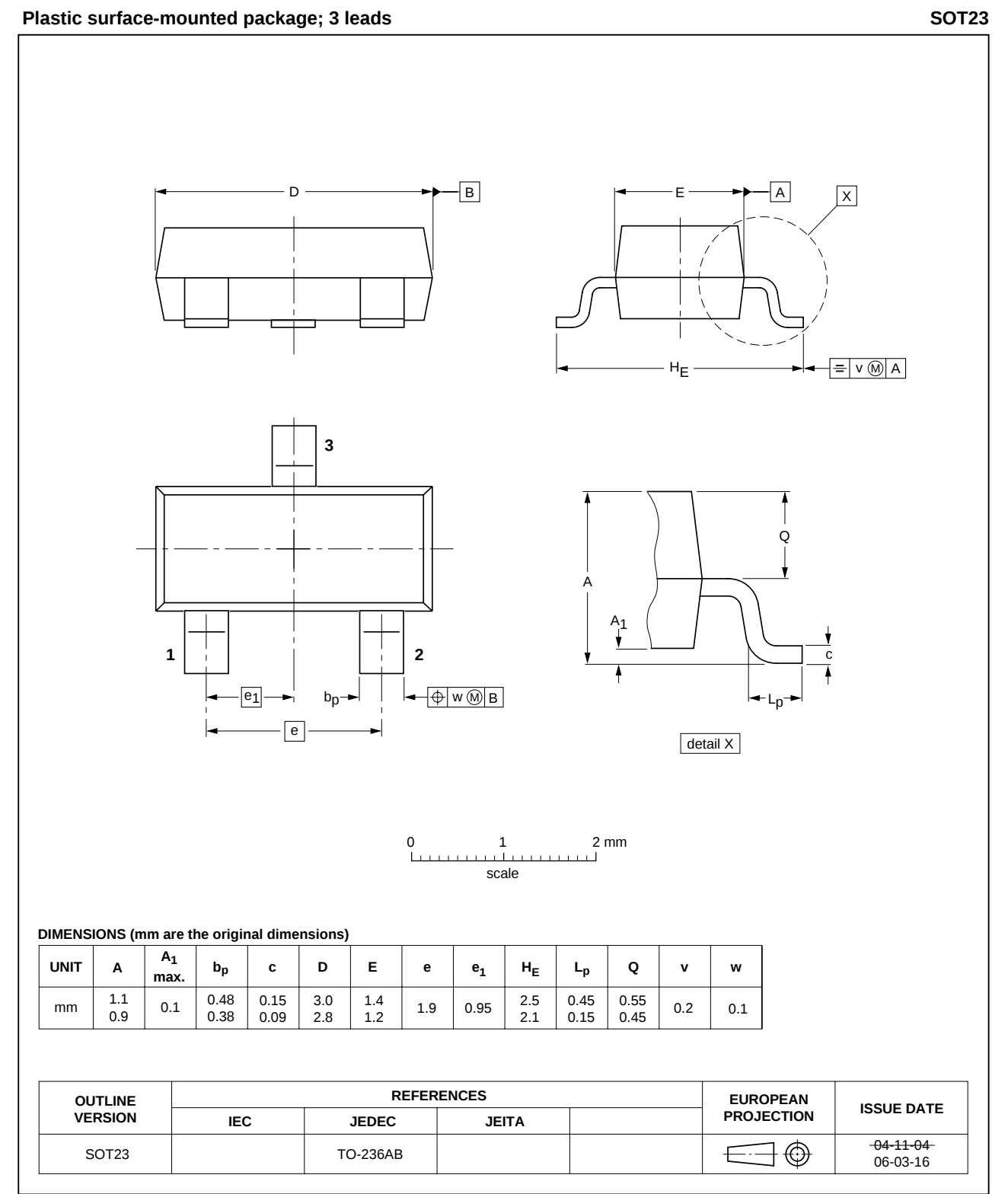
**Note**

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

| OUTLINE<br>VERSION | REFERENCES |       |        |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|-------|--------|--|------------------------|----------------------|
|                    | IEC        | JEDEC | JEITA  |  |                        |                      |
| SOT54              |            | TO-92 | SC-43A |  |                        | 04-06-28<br>04-11-16 |

NPN resistor-equipped transistors;  
R1 = 47 kΩ, R2 = 47 kΩ

PDTC144E series

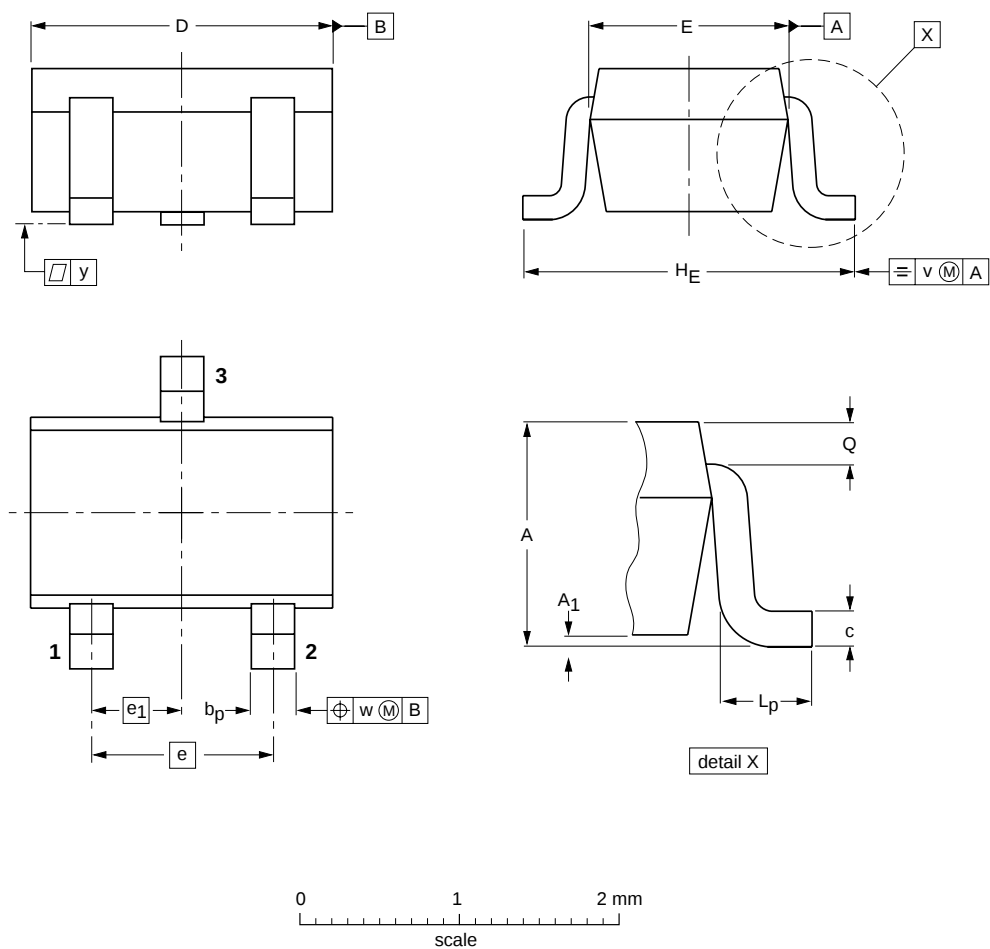


NPN resistor-equipped transistors;  
R1 = 47 kΩ, R2 = 47 kΩ

PDTC144E series

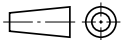
Plastic surface-mounted package; 3 leads

SOT323



DIMENSIONS (mm are the original dimensions)

| UNIT | A          | A <sub>1</sub><br>max | b <sub>p</sub> | c            | D          | E            | e   | e <sub>1</sub> | H <sub>E</sub> | L <sub>p</sub> | Q            | v   | w   |
|------|------------|-----------------------|----------------|--------------|------------|--------------|-----|----------------|----------------|----------------|--------------|-----|-----|
| mm   | 1.1<br>0.8 | 0.1                   | 0.4<br>0.3     | 0.25<br>0.10 | 2.2<br>1.8 | 1.35<br>1.15 | 1.3 | 0.65           | 2.2<br>2.0     | 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 |  |                                                                                       |                                 |
| SOT323             |            |       | SC-70 |  |  | <del>04-11-04</del><br>06-03-16 |

# NPN resistor-equipped transistors; R1 = 47 kΩ, R2 = 47 kΩ

## PDTC144E series

### 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.
2. The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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## **Customer notification**

This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

## **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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