

# DATA SHEET

**PDTC144W series**  
NPN resistor-equipped transistors;  
 $R1 = 47 \text{ k}\Omega$ ,  $R2 = 22 \text{ k}\Omega$

Product specification  
Supersedes data of 2002 Mar 14

2003 Apr 14

**NPN resistor-equipped transistors;**  
**R1 = 47 kΩ, R2 = 22 kΩ**
**PDTC144W 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 |
|-----------|---------------------------|------|------|------|
| $V_{CEO}$ | collector-emitter voltage | –    | 50   | V    |
| $I_o$     | output current (DC)       | –    | 100  | mA   |
| R1        | bias resistor             | 47   | –    | kΩ   |
| R2        | open                      | 22   | –    | kΩ   |

**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   |                    |                |
| PDTC144WEF  | SOT490        | SC-89  | 34                 | PDTA144WEF     |
| PDTC144WK   | SOT346        | SC-59  | 41                 | PDTA144WK      |
| PDTC144WM   | SOT883        | SC-101 | DD                 | –              |
| PDTC144WS   | SOT54 (TO-92) | SC-43  | TC144W             | PDTA144WS      |
| PDTC144WT   | SOT23         | –      | *20 <sup>(1)</sup> | PDTA144WT      |
| PDTC144WU   | SOT323        | SC-70  | *20 <sup>(1)</sup> | PDTA144WU      |

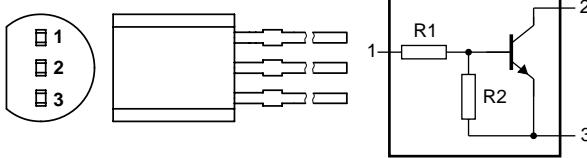
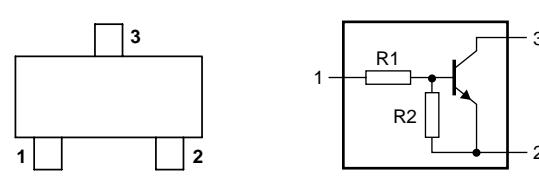
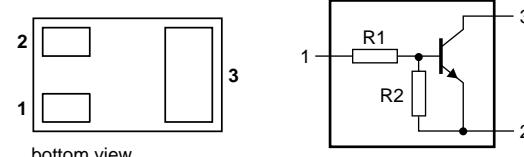
**Note**

1. \* = 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                  |
| PDTC124WS   |  <p>MAM364</p>                      | 1<br>2<br>3 | base<br>collector<br>emitter |
| PDTC144WEF<br>PDTC144WK<br>PDTC144WT<br>PDTC144WU |  <p>Top view</p> <p>MDB269</p>     | 1<br>2<br>3 | base<br>emitter<br>collector |
| PDTC144WM   |  <p>bottom view</p> <p>MHC506</p> | 1<br>2<br>3 | base<br>emitter<br>collector |

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**LIMITING VALUES**

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

| SYMBOL    | PARAMETER                     | CONDITIONS                      | MIN. | MAX. | UNIT |
|-----------|-------------------------------|---------------------------------|------|------|------|
| $V_{CBO}$ | collector-base voltage        | open emitter                    | –    | 50   | V    |
| $V_{CEO}$ | collector-emitter voltage     | open base                       | –    | 50   | V    |
| $V_{EBO}$ | emitter-base voltage          | open collector                  | –    | 10   | V    |
| $V_i$     | input voltage                 |                                 |      |      |      |
|           | positive                      |                                 | –    | +40  | V    |
|           | negative                      |                                 | –    | -10  | V    |
| $I_o$     | output current (DC)           |                                 | –    | 100  | mA   |
| $I_{CM}$  | peak collector current        |                                 | –    | 100  | mA   |
| $P_{tot}$ | total power dissipation       | $T_{amb} \leq 25^\circ\text{C}$ |      |      |      |
|           | SOT54                         | note 1                          | –    | 500  | mW   |
|           | SOT23                         | note 1                          | –    | 250  | mW   |
|           | SOT346                        | note 1                          | –    | 250  | mW   |
|           | SOT323                        | note 1                          | –    | 200  | mW   |
|           | SOT490                        | notes 1 and 2                   | –    | 250  | mW   |
|           | SOT883                        | notes 2 and 3                   | –    | 250  | mW   |
| $T_{stg}$ | storage temperature           |                                 | -65  | +150 | °C   |
| $T_j$     | junction temperature          |                                 | –    | 150  | °C   |
| $T_{amb}$ | 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 µm copper strip line.

**THERMAL CHARACTERISTICS**

| SYMBOL        | PARAMETER                                   | CONDITIONS    | VALUE | UNIT |
|---------------|---|---------------|-------|------|
| $R_{th\ j-a}$ | 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  |
|               | SOT490                                      | notes 1 and 2 | 500   | K/W  |
|               | SOT883                                      | notes 2 and 3 | 500   | K/W  |

**Notes**

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2. Reflow soldering is the only recommended soldering method.
3. Refer to SOT883 standard mounting conditions; FR4 with 60 µm copper strip line.

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**CHARACTERISTICS**

$T_{amb} = 25^\circ C$  unless otherwise specified.

| <b>SYMBOL</b>   | <b>PARAMETER</b>                     | <b>CONDITIONS</b>                                 | <b>MIN.</b> | <b>TYP.</b> | <b>MAX.</b> | <b>UNIT</b> |
|-----------------|--------------------------------------|---|-------------|-------------|-------------|-------------|
| $I_{CBO}$       | collector-base cut-off current       | $V_{CB} = 50 V$ ; $I_C = 0$                       | —           | —           | 100         | nA          |
| $I_{CEO}$       | collector-emitter cut-off current    | $V_{CE} = 30 V$ ; $I_B = 0$                       | —           | —           | 1           | μA          |
|                 |                                      | $V_{CE} = 30 V$ ; $I_B = 0$ ; $T_j = 150^\circ C$ | —           | —           | 50          | μA          |
| $I_{EBO}$       | emitter-base cut-off current         | $V_{EB} = 5 V$ ; $I_C = 0$                        | —           | —           | 110         | μA          |
| $h_{FE}$        | DC current gain                      | $V_{CE} = 5 V$ ; $I_C = 5 mA$                     | 60          | —           | —           |             |
| $V_{CEsat}$     | collector-emitter saturation voltage | $I_C = 10 mA$ ; $I_B = 0.5 mA$                    | —           | —           | 150         | mV          |
| $V_{i(off)}$    | input-off voltage                    | $I_C = 100 \mu A$ ; $V_{CE} = 5 V$                | —           | 1.7         | 1.2         | V           |
| $V_{i(on)}$     | input-on voltage                     | $I_C = 2 mA$ ; $V_{CE} = 0.3 V$                   | 4           | 2.7         | —           | V           |
| $R1$            | input resistor                       |   | 33          | 47          | 61          | kΩ          |
| $\frac{R2}{R1}$ | resistor ratio                       |   | 0.37        | 0.47        | 0.57        |             |
| $C_c$           | collector capacitance                | $I_E = i_e = 0$ ; $V_{CB} = 10 V$ ; $f = 1 MHz$   | —           | —           | 2.5         | pF          |

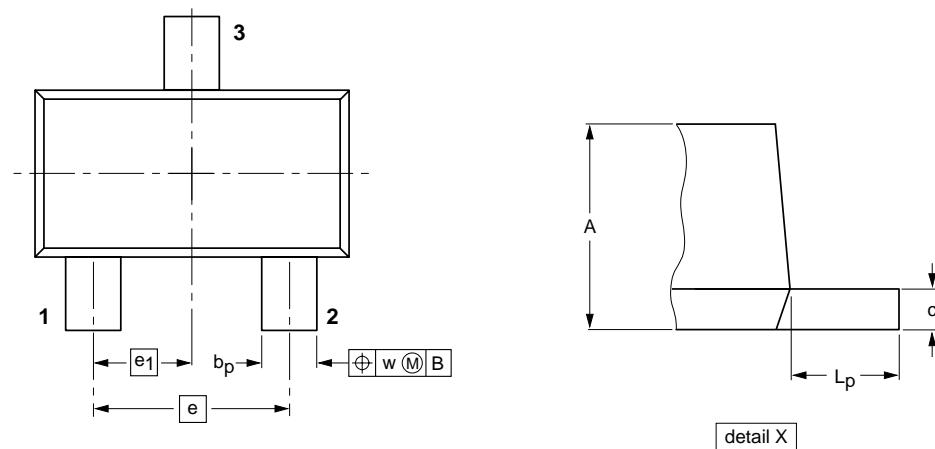
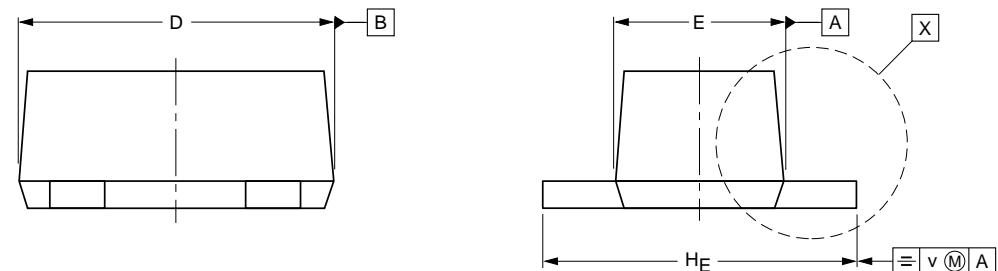
NPN resistor-equipped transistors;  
 R1 = 47 k $\Omega$ , R2 = 22 k $\Omega$

PDTC144W series

## PACKAGE OUTLINES

Plastic surface mounted package; 3 leads

SOT490



0 1 2 mm  
 scale

## DIMENSIONS (mm are the original dimensions)

| UNIT | A          | $b_p$        | c          | D          | E            | e   | $e_1$ | $H_E$      | $L_p$      | v   | w   |
|------|------------|--------------|------------|------------|--------------|-----|-------|------------|------------|-----|-----|
| mm   | 0.8<br>0.6 | 0.33<br>0.23 | 0.2<br>0.1 | 1.7<br>1.5 | 0.95<br>0.75 | 1.0 | 0.5   | 1.7<br>1.5 | 0.5<br>0.3 | 0.1 | 0.1 |

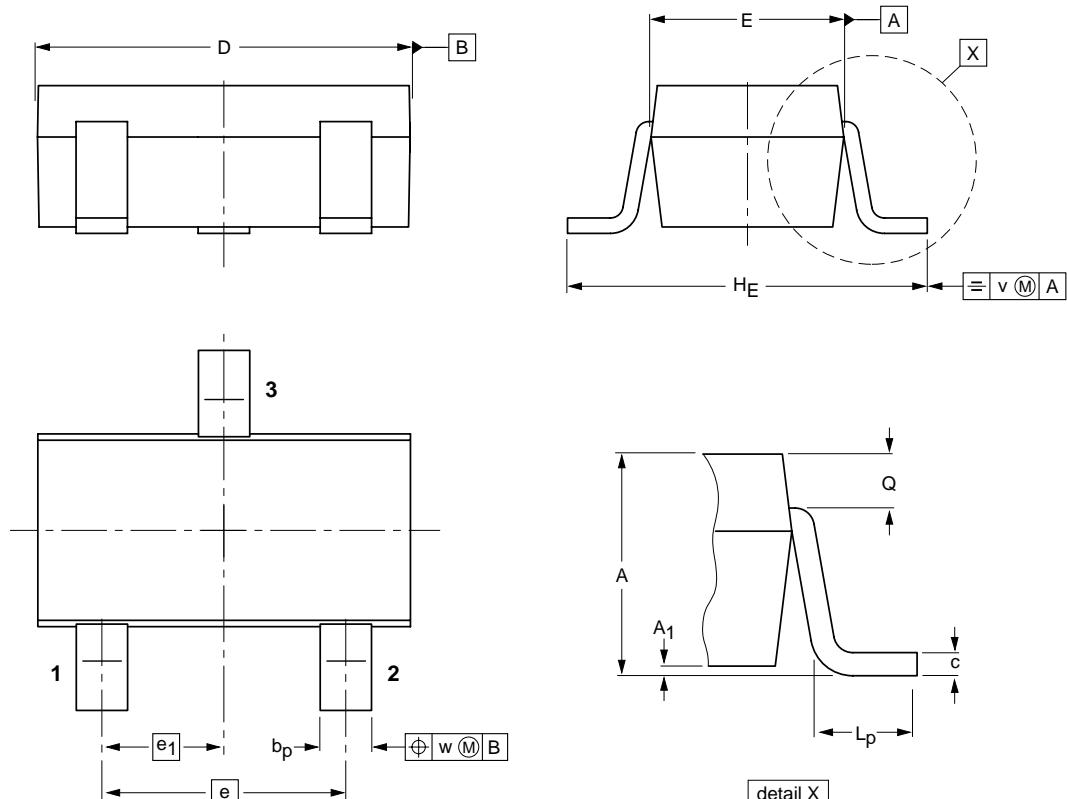
| OUTLINE<br>VERSION | REFERENCES |       |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE |
|--------------------|------------|-------|-------|--|------------------------|------------|
|                    | IEC        | JEDEC | EIAJ  |  |                        |            |
| SOT490             |            |       | SC-89 |  |                        | 98-10-23   |

NPN resistor-equipped transistors;  
 R1 = 47 k $\Omega$ , R2 = 22 k $\Omega$

PDTC144W series

Plastic surface mounted package; 3 leads

SOT346



## DIMENSIONS (mm are the original dimensions)

| UNIT | A   | A <sub>1</sub> | b <sub>p</sub> | c    | D   | E   | e   | e <sub>1</sub> | H <sub>E</sub> | L <sub>p</sub> | Q    | v   | w   |
|------|-----|----------------|----------------|------|-----|-----|-----|----------------|----------------|----------------|------|-----|-----|
| mm   | 1.3 | 0.1            | 0.50           | 0.26 | 3.1 | 1.7 | 1.9 | 0.95           | 3.0            | 0.6            | 0.33 | 0.2 | 0.2 |
|      | 1.0 | 0.013          | 0.35           | 0.10 | 2.7 | 1.3 |     |                | 2.5            | 0.2            | 0.23 |     |     |

| OUTLINE VERSION | REFERENCES |        |       |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|------------|
|                 | IEC        | JEDEC  | EIAJ  |  |                     |            |
| SOT346          |            | TO-236 | SC-59 |  |                     | 98-07-17   |

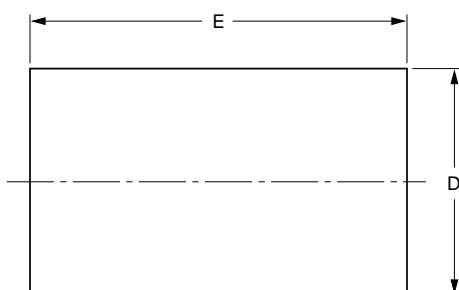
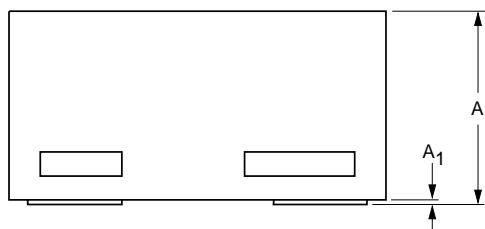
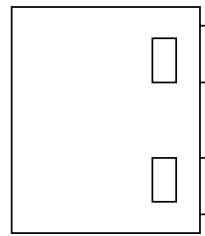
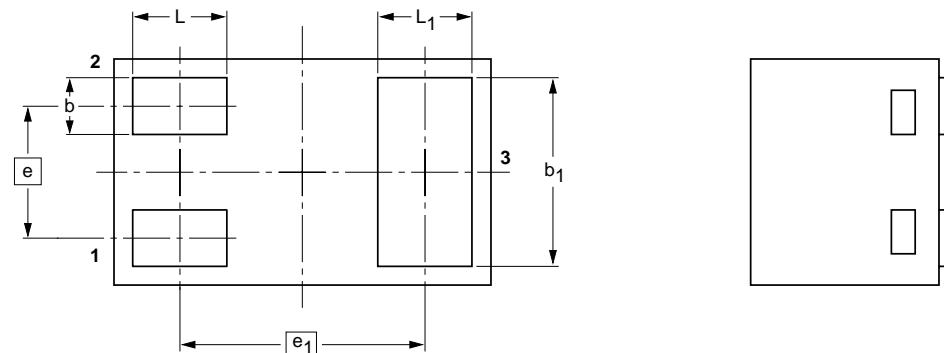
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Leadless ultra small plastic package; 3 solder lands; body  $1.0 \times 0.6 \times 0.5 \text{ mm}$ 

SOT883



0 0.5 1 mm  
scale

## DIMENSIONS (mm are the original dimensions)

| UNIT | $A^{(1)}$    | $A_1$<br>max. | $b$          | $b_1$        | $D$          | $E$          | $e$          | $e_1$        | $L$          | $L_1$        |
|------|--------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| mm   | 0.50<br>0.46 | 0.03<br>0.12  | 0.20<br>0.47 | 0.55<br>0.47 | 0.62<br>0.55 | 1.02<br>0.95 | 0.35<br>0.35 | 0.65<br>0.65 | 0.30<br>0.22 | 0.30<br>0.22 |

## Note

1. Including plating thickness

| OUTLINE<br>VERSION | REFERENCES |       |       |        | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|-------|-------|--------|------------------------|----------------------|
|                    | IEC        | JEDEC | JEITA | SC-101 |                        |                      |
| SOT883             |            |       |       |        |                        | 03-02-05<br>03-04-03 |

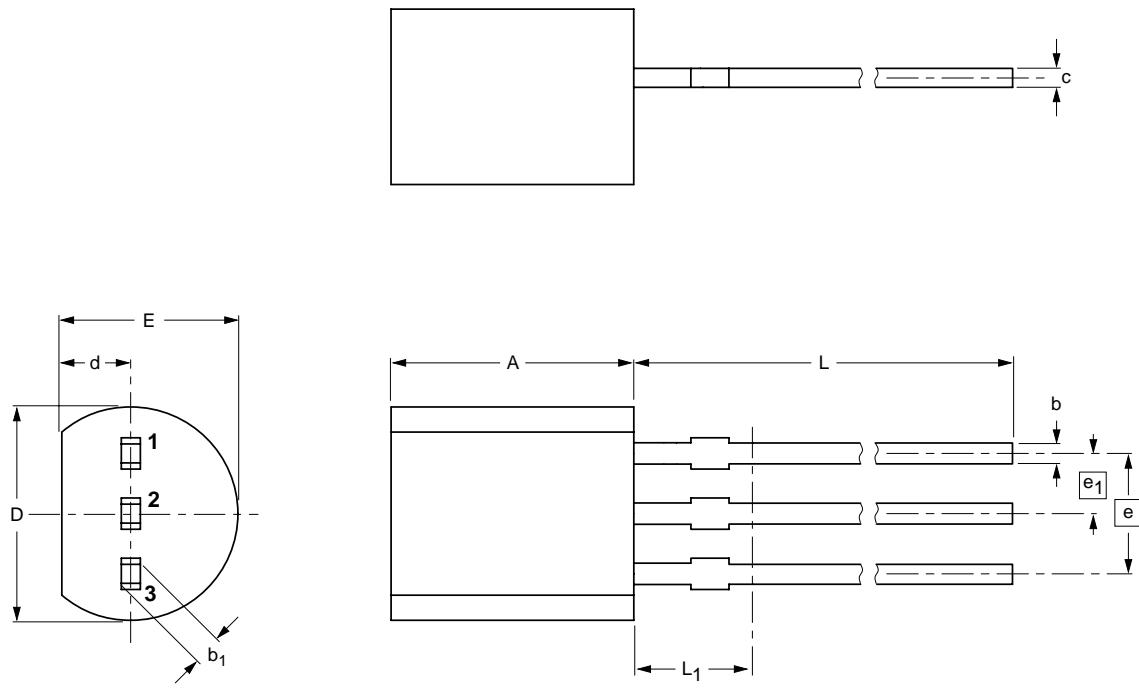
## NPN resistor-equipped transistors;

 $R1 = 47 \text{ k}\Omega, R2 = 22 \text{ k}\Omega$ 

PDTC144W series

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

SOT54



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> |
|------|-----|------|----------------|------|-----|-----|-----|------|----------------|------|-------------------------------|
| mm   | 5.2 | 0.48 | 0.66           | 0.45 | 4.8 | 1.7 | 4.2 | 2.54 | 1.27           | 14.5 |                               |
|      | 5.0 | 0.40 | 0.56           | 0.40 | 4.4 | 1.4 | 3.6 |      |                | 12.7 | 2.5                           |

## Note

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

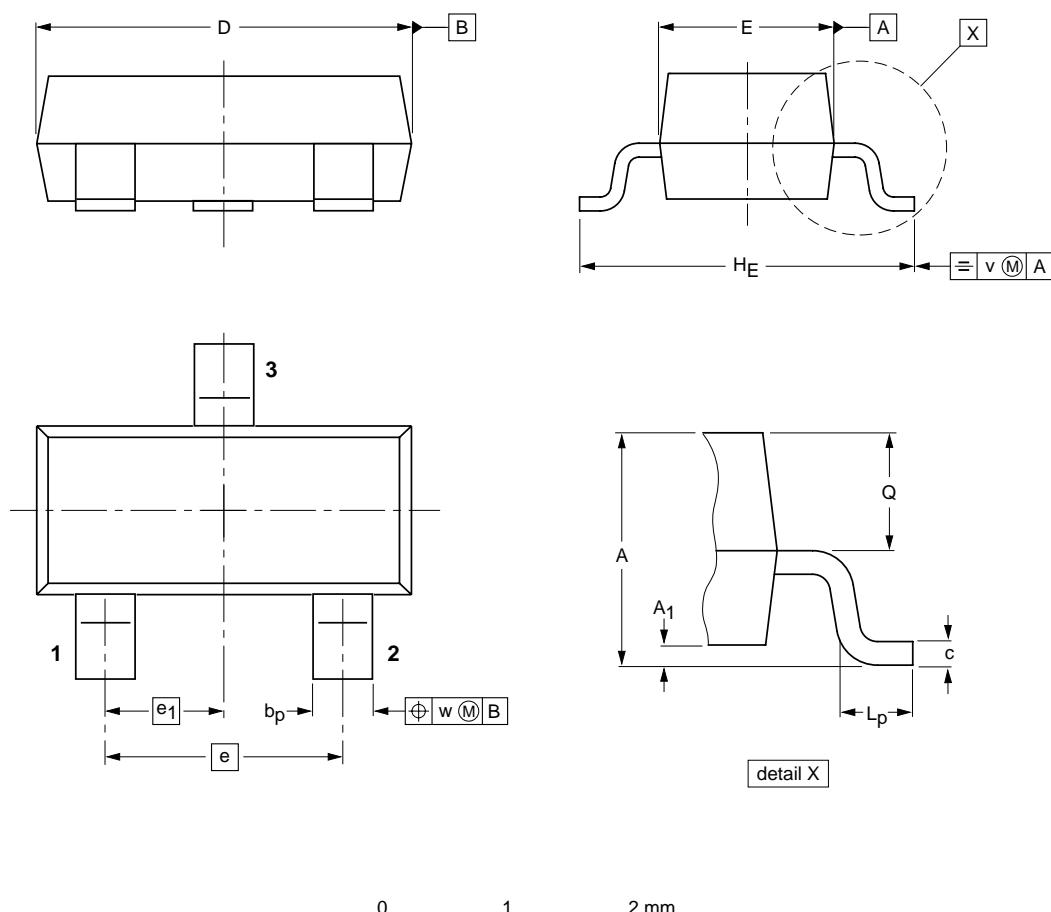
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|-----------------|------------|-------|-------|--|---------------------|------------|
|                 | IEC        | JEDEC | EIAJ  |  |                     |            |
| SOT54           |            | TO-92 | SC-43 |  |                     | 97-02-28   |

NPN resistor-equipped transistors;  
 R1 = 47 k $\Omega$ , R2 = 22 k $\Omega$

PDTC144W series

Plastic surface mounted package; 3 leads

SOT23



## 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>0.9 | 0.1                    | 0.48<br>0.38   | 0.15<br>0.09 | 3.0<br>2.8 | 1.4<br>1.2 | 1.9 | 0.95           | 2.5<br>2.1     | 0.45<br>0.15   | 0.55<br>0.45 | 0.2 | 0.1 |

| OUTLINE<br>VERSION | REFERENCES |          |      |  |  | EUROPEAN<br>PROJECTION | ISSUE DATE            |
|--------------------|------------|----------|------|--|--|------------------------|-----------------------|
|                    | IEC        | JEDEC    | EIAJ |  |  |                        |                       |
| SOT23              |            | TO-236AB |      |  |  |                        | -97-02-28<br>99-09-13 |

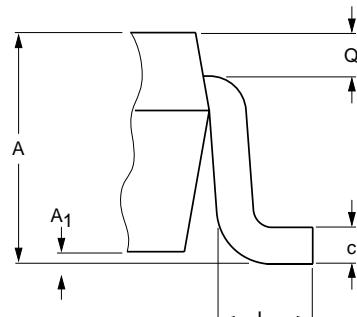
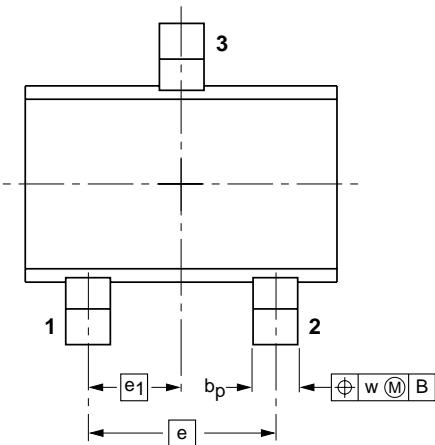
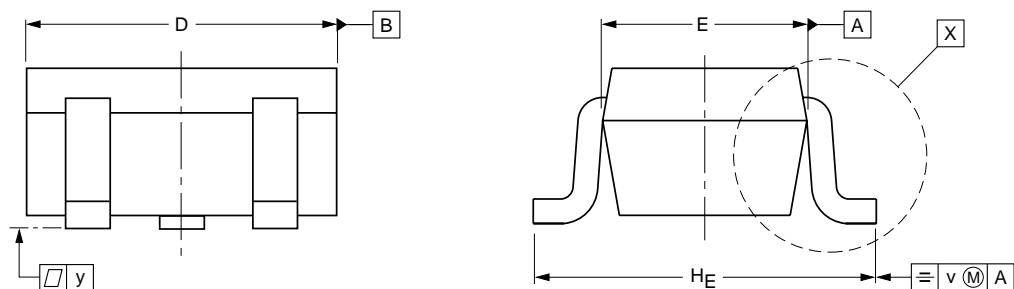
## NPN resistor-equipped transistors;

 $R1 = 47 \text{ k}\Omega, R2 = 22 \text{ k}\Omega$ 

PDTC144W series

Plastic surface mounted package; 3 leads

SOT323



0 1 2 mm  
scale

## DIMENSIONS (mm are the original dimensions)

| UNIT | A          | $A_1$<br>max | $b_p$      | c            | D          | E            | e   | $e_1$ | $H_E$      | $L_p$        | 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 | EIAJ | SC-70 |  |                        |            |
| SOT323             |            |       |      |       |  |                        | 97-02-28   |

**NPN resistor-equipped transistors;  
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**PDTC144W series**

**DATA SHEET STATUS**

| LEVEL | DATA SHEET STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)(3)</sup> | DEFINITION   |
|-------|----------------------------------|----------------------------------|--|
| I     | Objective data                   | Development                      | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.  |
| II    | Preliminary data                 | Qualification                    | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.             |
| III   | Product data                     | Production                       | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

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1. Please consult the most recently issued data sheet before initiating or completing a design.
2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.
3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

**DEFINITIONS**

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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**NOTES**

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**PDTC144W series**

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**NOTES**

# **Philips Semiconductors – a worldwide company**

## **Contact information**

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Printed in The Netherlands

613514/04/04/16

Date of release: 2003 Apr 14

Document order number: 9397 750 11028

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