

# Bipolar Transistor (–)50 V, (–)3 A, Low $V_{CE(sat)}$ , (PNP)NPN Single

## NSVS50030SB3, NSVS50031SB3

This device is bipolar junction transistor featuring high current, low saturation voltage, and high speed switching.

Suitable for motor driver, relay driver, DC–DC converter of automotive applications. AEC–Q101qualified and PPAP capable.

### Features

- Large Current Capacitance
- Low Collector to Emitter Saturation Voltage
- High–Speed Switching
- High Allowable Power Dissipation
- AEC–Q101Qualified and PPAP Capable
- Pb–Free, Halogen Free and RoHS Compliance
- Ultra Small Package Facilitates Miniaturization in End Products (Mounting Height: 0.9 mm)

### Typical Applications

- DC / DC Converter
- Relay Drivers, Lamp Drivers, Motor Drivers
- Camera Flash

### Specifications

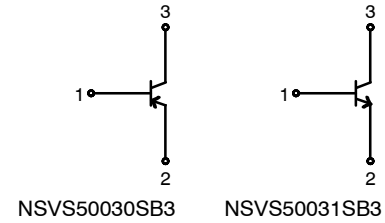
**ABSOLUTE MAXIMUM RATINGS** at  $T_A = 25^\circ\text{C}$

| Parameter                      | Symbol    | Value       | Unit             |
|--------------------------------|-----------|-------------|------------------|
| Collector to Base Voltage      | $V_{CBO}$ | (–50) 100   | V                |
| Collector to Emitter Voltage   | $V_{CES}$ | (–50) 100   | V                |
| Collector to Emitter Voltage   | $V_{CEO}$ | (–)50       | V                |
| Emitter to Base Voltage        | $V_{EBO}$ | (–)6        | V                |
| Collector Current              | $I_C$     | (–)3        | A                |
| Collector Current (Pulse)      | $I_{CP}$  | (–)6        | A                |
| Base Current                   | $I_B$     | (–)600      | mA               |
| Collector Dissipation (Note 1) | $P_C$     | 1.1         | W                |
| Junction Temperature           | $T_j$     | 175         | $^\circ\text{C}$ |
| Storage Temperature            | $T_{stg}$ | –55 to +175 | $^\circ\text{C}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

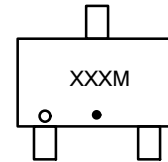
1. Surface mounted on ceramic substrate. (600 mm<sup>2</sup> x 0.8 mm)

### ELECTRICAL CONNECTION



CPH3  
CASE 318BA

### MARKING DIAGRAMS



XXX = HAE: NSVS50030SB3  
= HCE: NSVS50031SB3  
M = Single Digit Date Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# NSVS50030SB3, NSVS50031SB3

## ORDERING INFORMATION

| Device          | Marking | Package                          | Shipping (Qty / Packing) † |
|-----------------|---------|----------------------------------|----------------------------|
| NSVS50030SB3T1G | HAE     | CPH3<br>(Pb-Free / Halogen Free) | 3,000/ Tape & Reel         |
| NSVS50031SB3T1G | HCE     |                                  |                            |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

| Parameter                               | Symbol               | Conditions                                               | Value     |            |            | Unit |
|-----------------------------------------|----------------------|----------------------------------------------------------|-----------|------------|------------|------|
|                                         |                      |                                                          | Min       | Typ        | Max        |      |
| Collector Cutoff Current                | I <sub>CBO</sub>     | V <sub>CB</sub> = (-)40 V, I <sub>E</sub> = 0 A          |           |            | (-)1       | μA   |
| Emitter Cutoff Current                  | I <sub>EBO</sub>     | V <sub>EB</sub> = (-)4 V, I <sub>C</sub> = 0 A           |           |            | (-)1       | μA   |
| DC Current Gain                         | h <sub>FE</sub>      | V <sub>CE</sub> = (-)2 V,<br>I <sub>C</sub> = (-)100 mA  | 200       |            | 560        |      |
| Gain-Bandwidth Product                  | f <sub>T</sub>       | V <sub>CE</sub> = (-)10 V,<br>I <sub>C</sub> = (-)500 mA |           | (360) 380  |            | MHz  |
| Output Capacitance                      | C <sub>ob</sub>      | V <sub>CB</sub> = (-)10 V,<br>f = 1 MHz                  |           | (24) 13    |            | pF   |
| Collector to Emitter Saturation Voltage | V <sub>CE(sat)</sub> | I <sub>C</sub> = (-)1 A,<br>I <sub>B</sub> = (-)50 mA    |           | (-100) 80  | (-200) 120 | mV   |
|                                         |                      | I <sub>C</sub> = (-)2 A,<br>I <sub>B</sub> = (-)100 mA   |           | (-185) 140 | (-500) 210 | mV   |
| Base to Emitter Saturation Voltage      | V <sub>BE(sat)</sub> | I <sub>C</sub> = (-)2 A,<br>I <sub>B</sub> = (-)100 mA   |           | (-)0.88    | (-)1.2     | V    |
| Collector to Base Breakdown Voltage     | V <sub>(BR)CBO</sub> | I <sub>C</sub> = (-)10 μA, I <sub>E</sub> = 0 A          | (-50) 100 |            |            | V    |
| Collector to Emitter Breakdown Voltage  | V <sub>(BR)CES</sub> | I <sub>C</sub> = (-)100 μA,<br>R <sub>BE</sub> = 0 Ω     | (-50) 100 |            |            | V    |
| Collector to Emitter Breakdown Voltage  | V <sub>(BR)CEO</sub> | I <sub>C</sub> = (-)1 mA, R <sub>BE</sub> = ∞            | (-)50     |            |            | V    |
| Emitter to Base Breakdown Voltage       | V <sub>(BR)EBO</sub> | I <sub>E</sub> = (-)10 μA,<br>I <sub>C</sub> = 0 A       | (-)6      |            |            | V    |
| Turn-On Time                            | t <sub>on</sub>      | See Fig.1                                                |           | (30) 35    |            | ns   |
| Storage Time                            | t <sub>stg</sub>     |                                                          |           | (230) 300  |            | ns   |
| Fall Time                               | t <sub>f</sub>       |                                                          |           | (15) 22    |            | ns   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

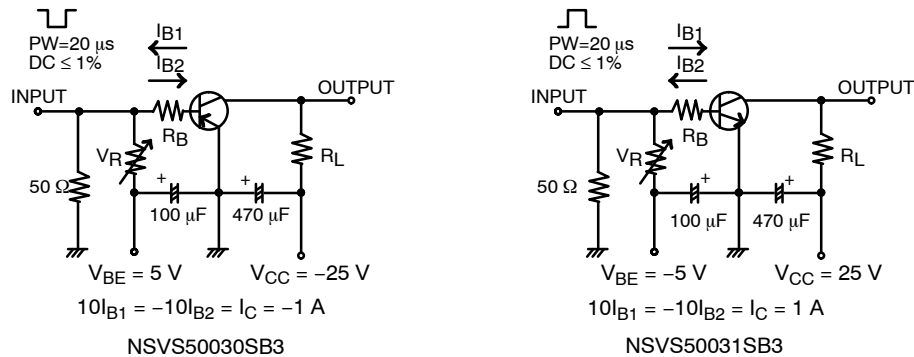


Figure 1. Switching Time Test Circuit

# NSVS50030SB3, NSVS50031SB3

## TYPICAL PERFORMANCE CHARACTERISTICS

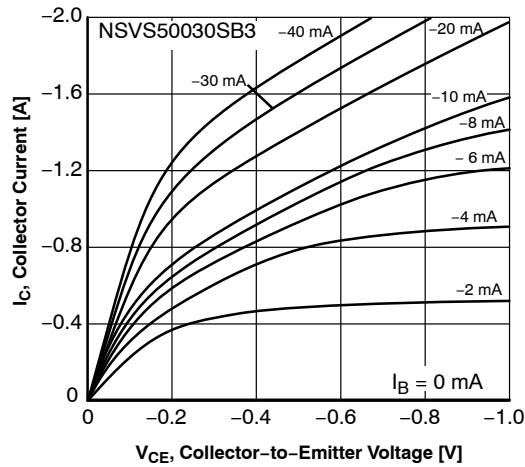


Figure 2.  $I_C - V_{CE}$

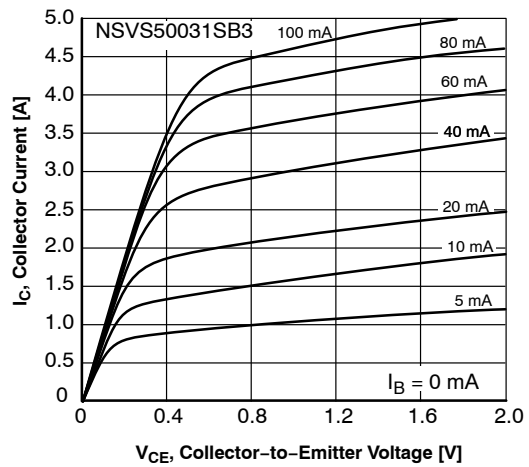


Figure 3.  $I_C - V_{CE}$

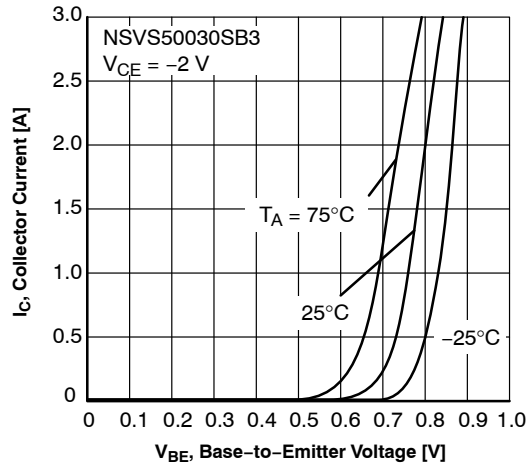


Figure 4.  $I_C - V_{BE}$

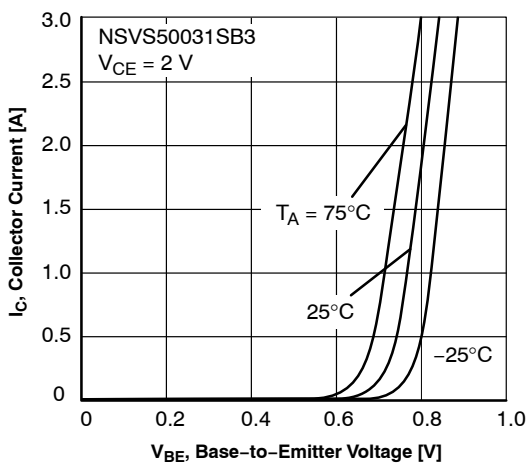


Figure 5.  $I_C - V_{BE}$

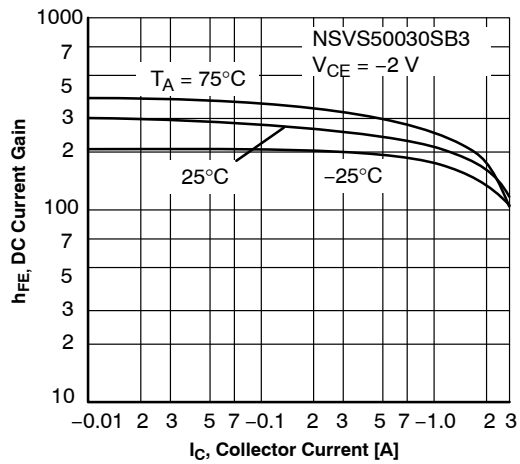


Figure 6.  $h_{FE} - I_C$

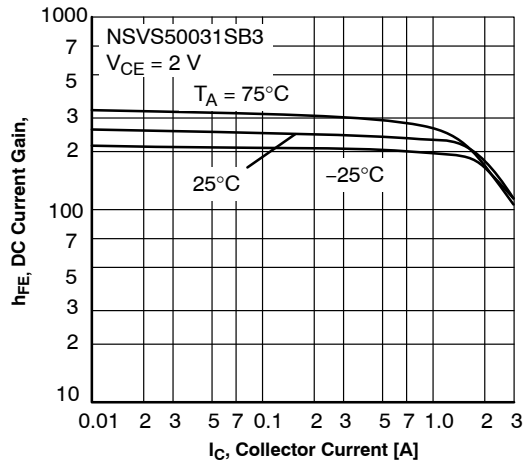


Figure 7.  $h_{FE} - I_C$

# NSVS50030SB3, NSVS50031SB3

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

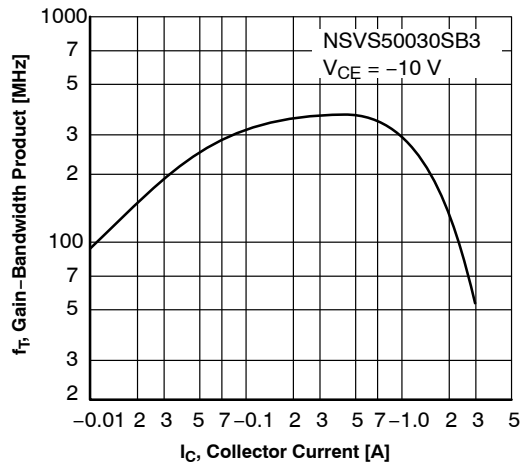


Figure 8.  $f_T - I_C$

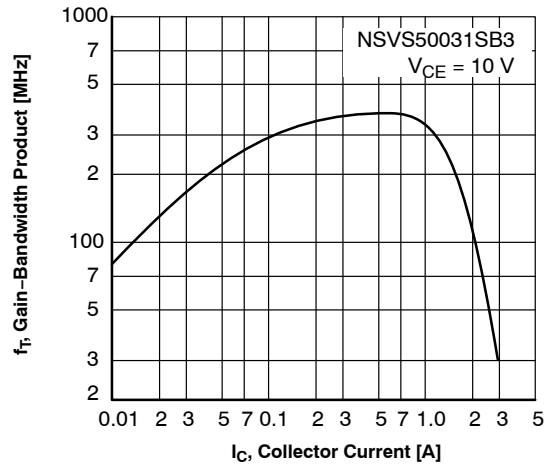


Figure 9.  $f_T - I_C$

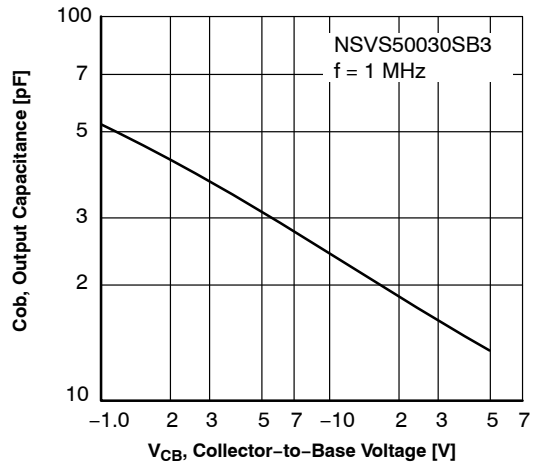


Figure 10.  $C_{ob} - V_{CB}$

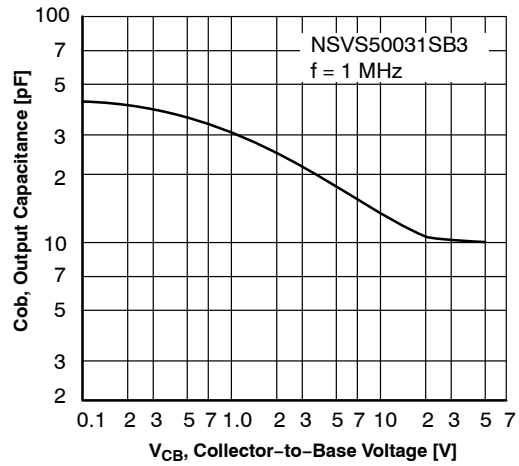


Figure 11.  $C_{ob} - V_{CB}$

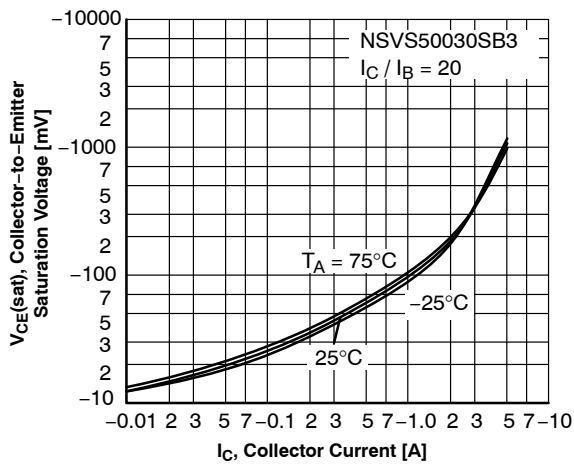


Figure 12.  $V_{CE(sat)} - I_C$

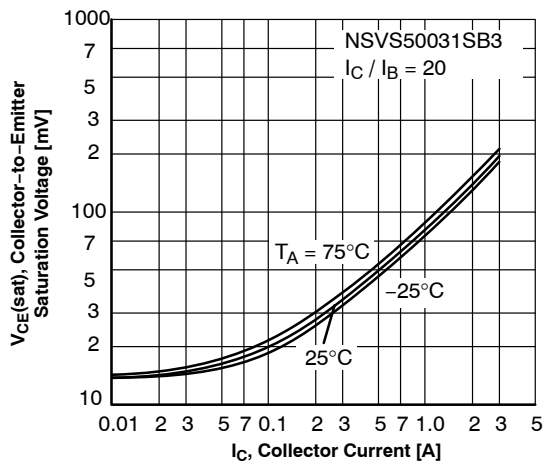


Figure 13.  $V_{CE(sat)} - I_C$

# NSVS50030SB3, NSVS50031SB3

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

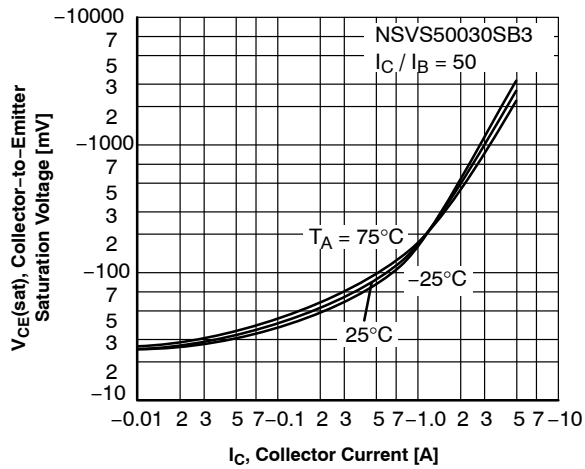


Figure 14.  $V_{CE(sat)} - I_C$

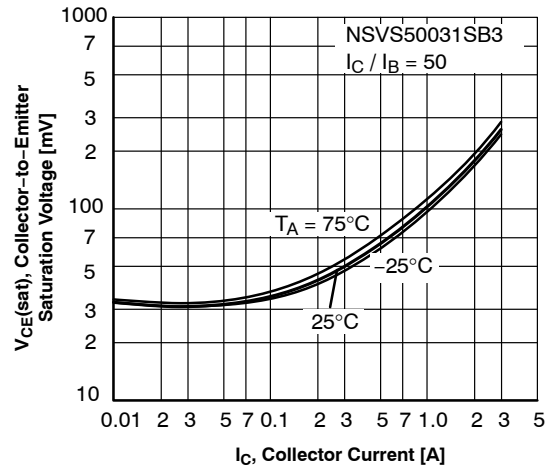


Figure 15.  $V_{CE(sat)} - I_C$

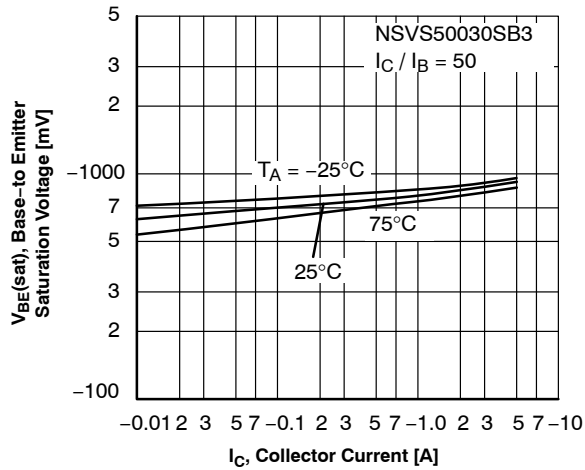


Figure 16.  $V_{BE(sat)} - I_C$

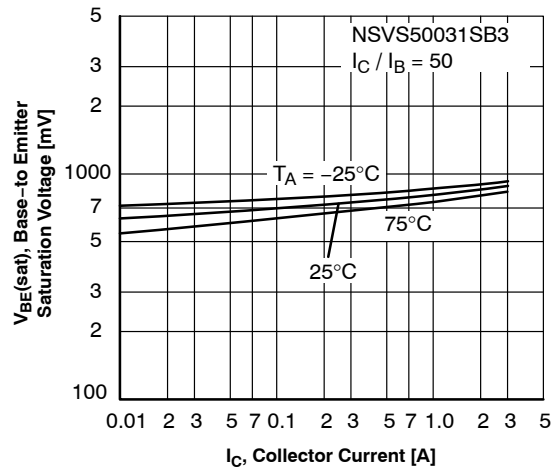


Figure 17.  $V_{BE(sat)} - I_C$

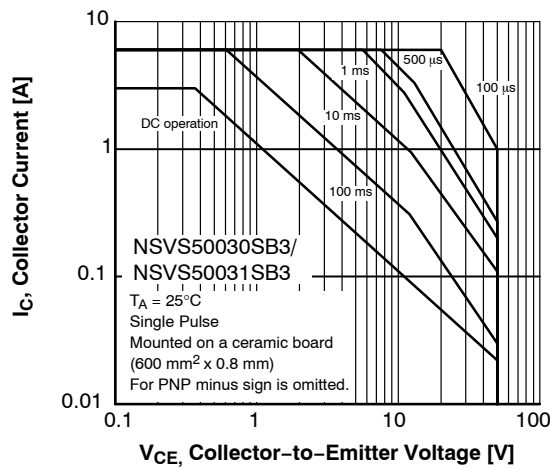


Figure 18. ASO

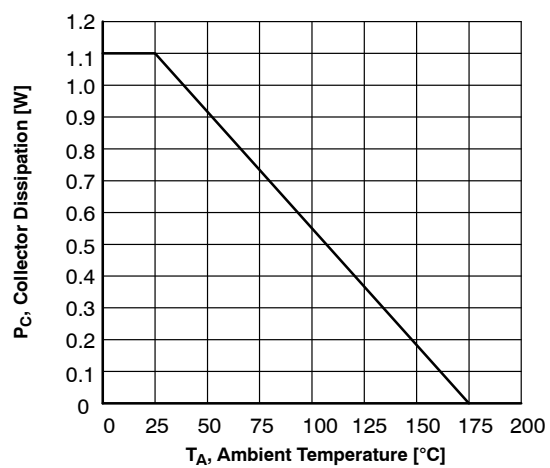


Figure 19.  $P_C - T_A$

# MECHANICAL CASE OUTLINE

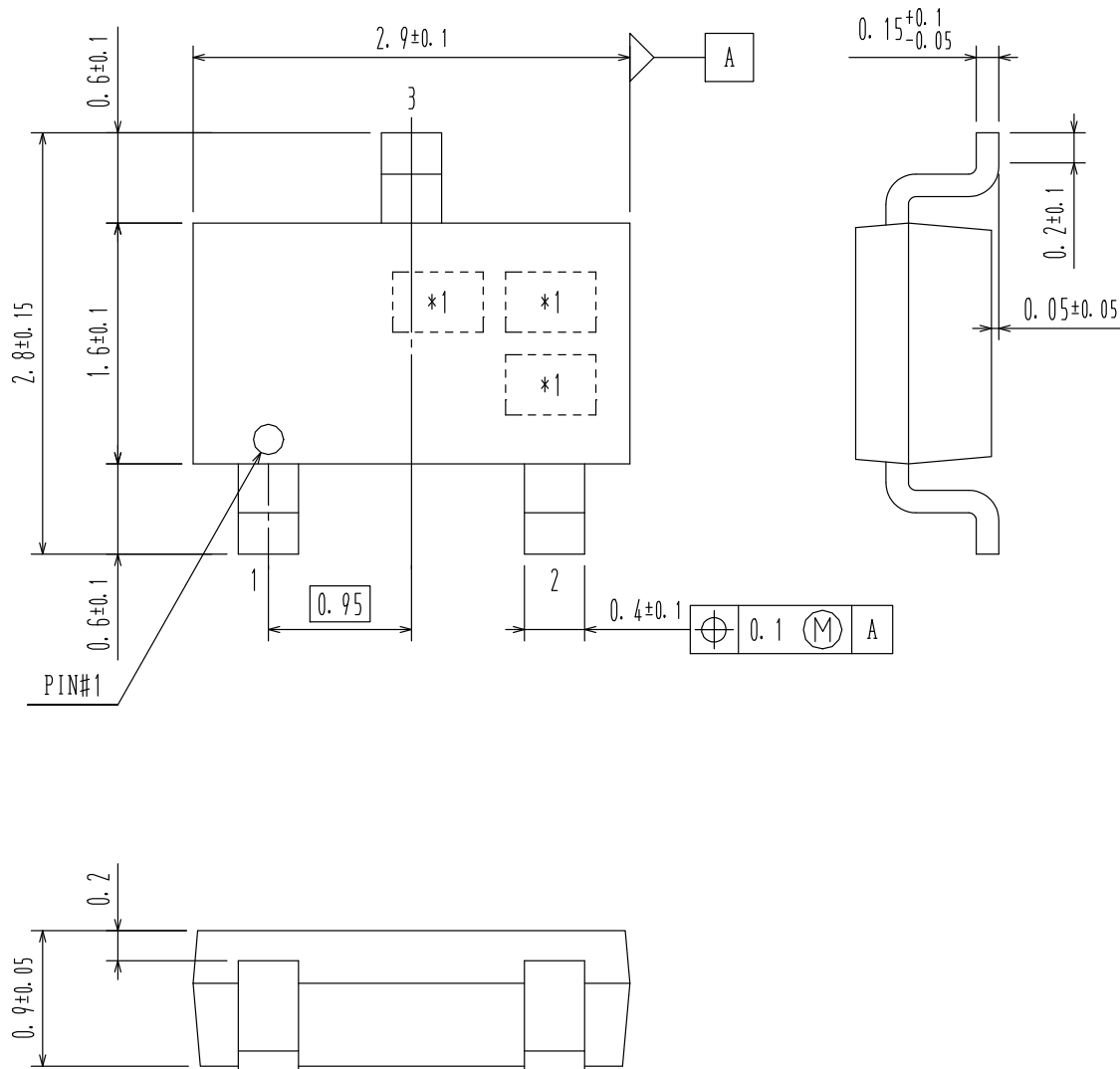
## PACKAGE DIMENSIONS

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### CPH3 CASE 318BA ISSUE O

DATE 30 NOV 2011



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