

# 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-Q101 qualified and PPAP capable.

### Features

- Large Current Capacitance
- Low Collector to Emitter Saturation Voltage
- High-Speed Switching
- High Allowable Power Dissipation
- AEC-Q101 Qualified 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

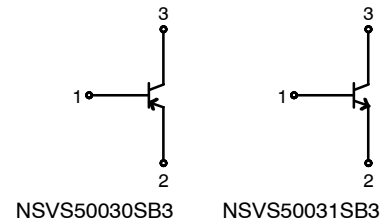
ABSOLUTE MAXIMUM RATINGS at  $T_A = 25^\circ\text{C}$

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.

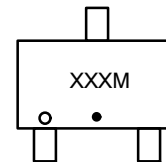
1. Surface mounted on ceramic substrate. (600 mm<sup>2</sup> x 0.8 mm)

### 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

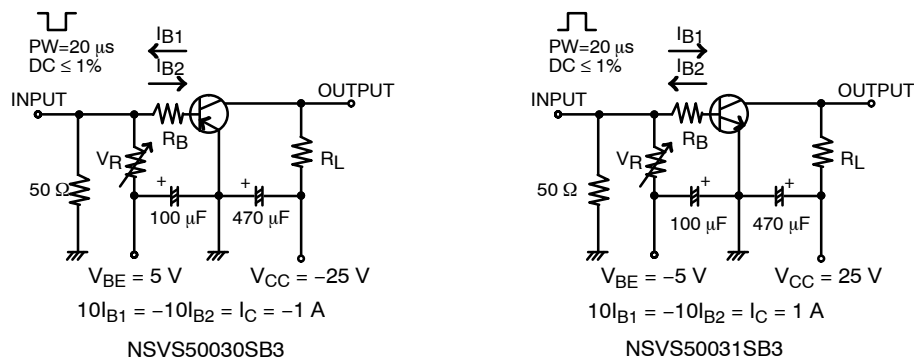
Device	Marking	Package	Shipping (Qty / Packing) †
NSVS50030SB3T1G	HAE	CPH3 (Pb-Free / Halogen Free)	3,000/ Tape & Reel
NSVS50031SB3T1G	HCE		

†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, I <sub>C</sub> = (-)100 mA	200		560	
Gain-Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = (-)10 V, I <sub>C</sub> = (-)500 mA		(360) 380		MHz
Output Capacitance	C <sub>ob</sub>	V <sub>CB</sub> = (-)10 V, f = 1 MHz		(24) 13		pF
Collector to Emitter Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = (-)1 A, I <sub>B</sub> = (-)50 mA		(-100) 80	(-200) 120	mV
		I <sub>C</sub> = (-)2 A, 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, 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, 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, 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**

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## TYPICAL PERFORMANCE CHARACTERISTICS

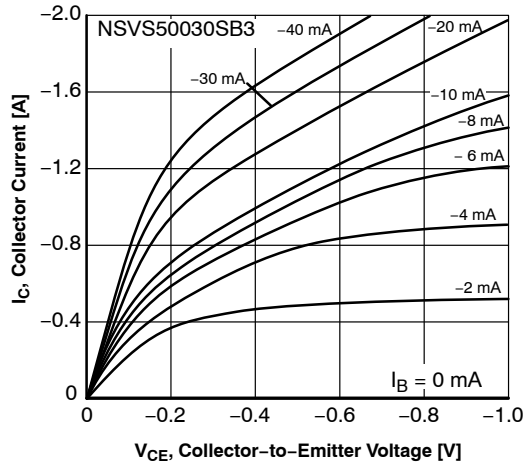


Figure 2.  $I_C - V_{CE}$

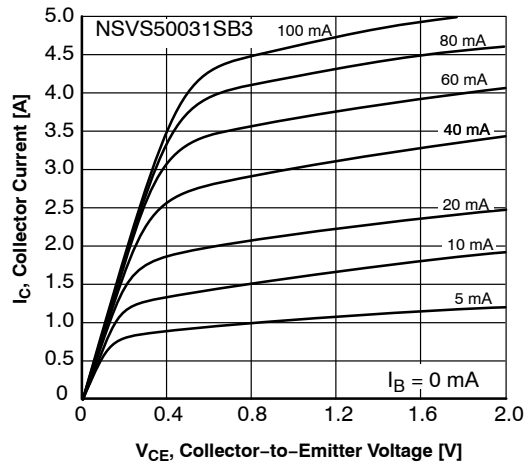


Figure 3.  $I_C - V_{CE}$

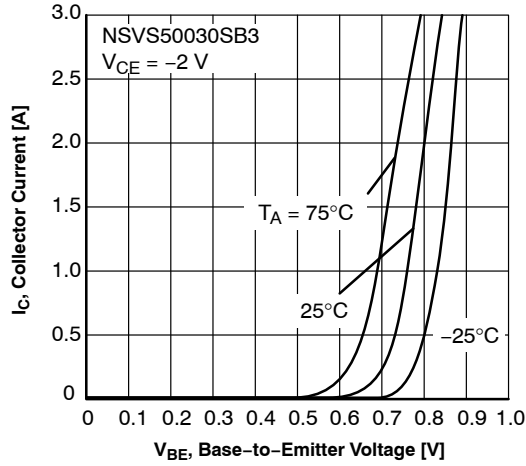


Figure 4.  $I_C - V_{BE}$

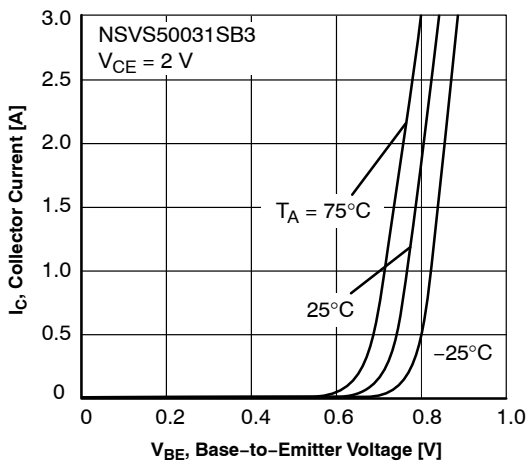


Figure 5.  $I_C - V_{BE}$

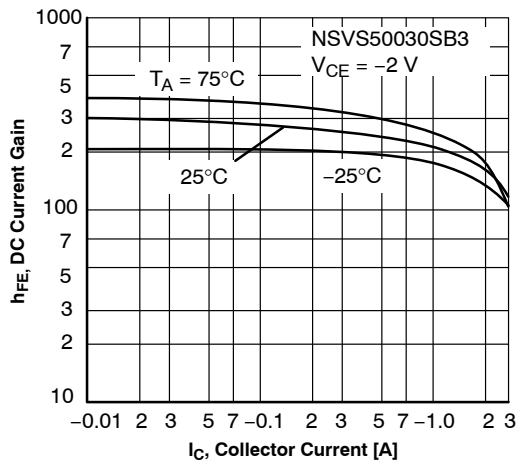


Figure 6.  $h_{FE} - I_C$

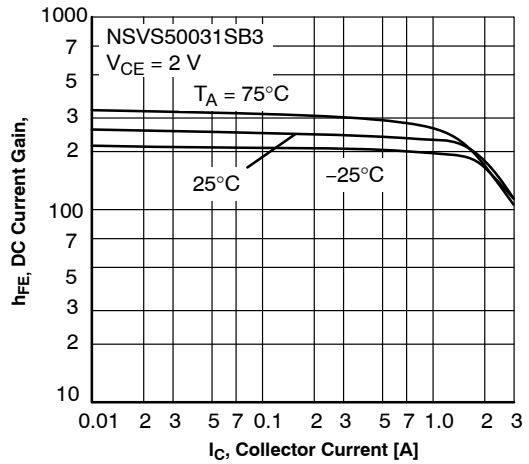


Figure 7.  $h_{FE} - I_C$

# NSVS50030SB3, NSVS50031SB3

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

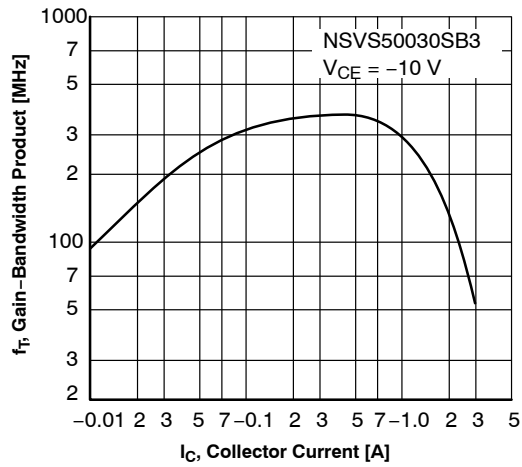


Figure 8.  $f_T - I_C$

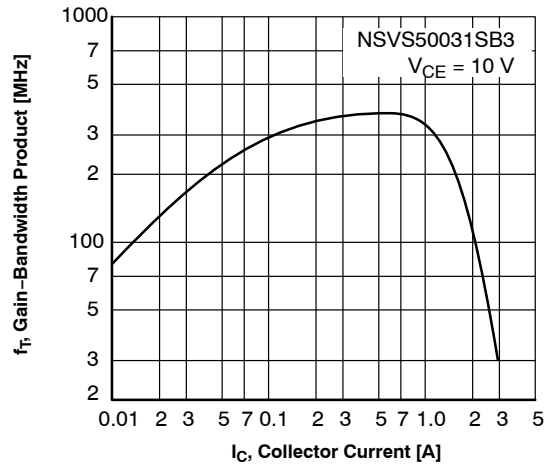


Figure 9.  $f_T - I_C$

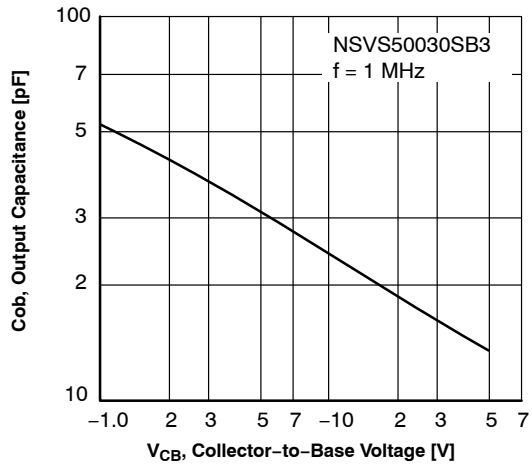


Figure 10.  $C_{ob} - V_{CB}$

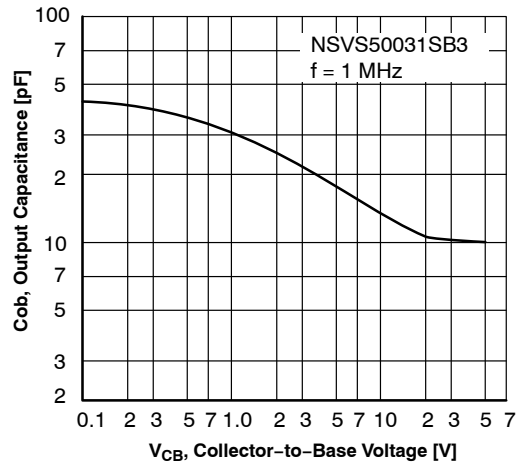


Figure 11.  $C_{ob} - V_{CB}$

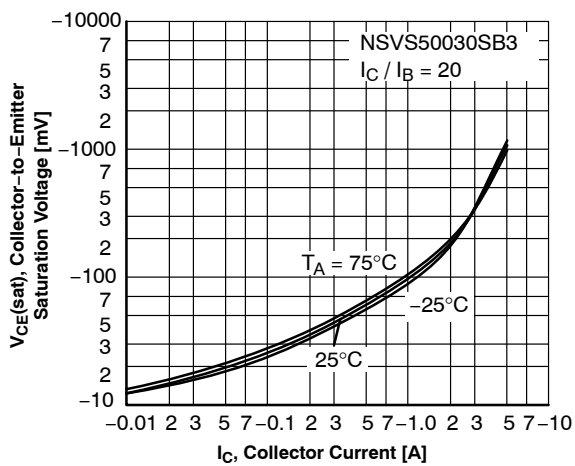


Figure 12.  $V_{CE(sat)} - I_C$

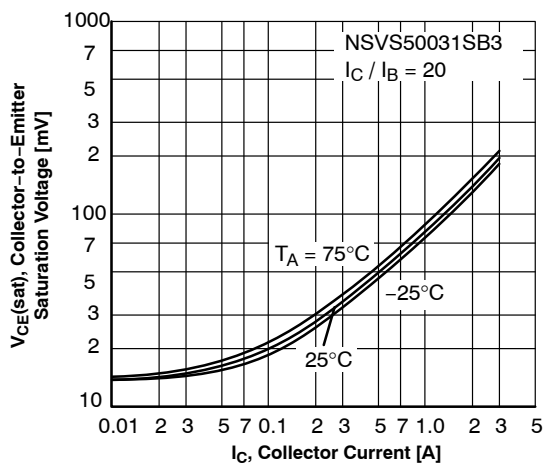


Figure 13.  $V_{CE(sat)} - I_C$

# NSVS50030SB3, NSVS50031SB3

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

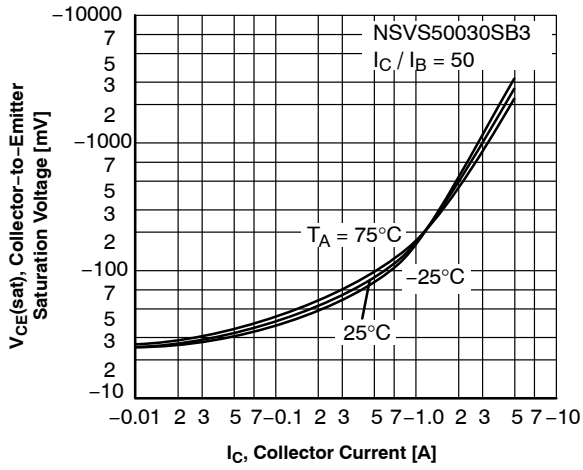


Figure 14.  $V_{CE(sat)} - I_C$

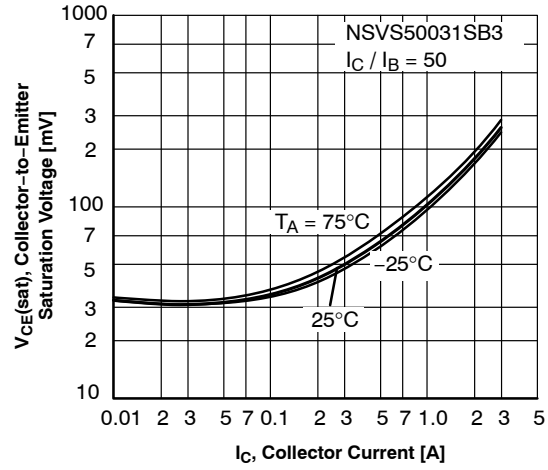


Figure 15.  $V_{CE(sat)} - I_C$

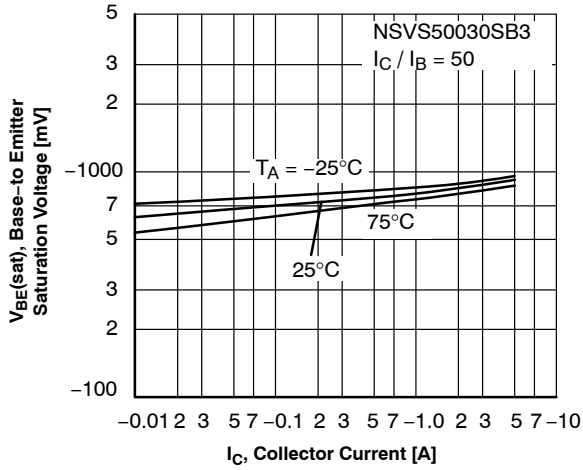


Figure 16.  $V_{BE(sat)} - I_C$

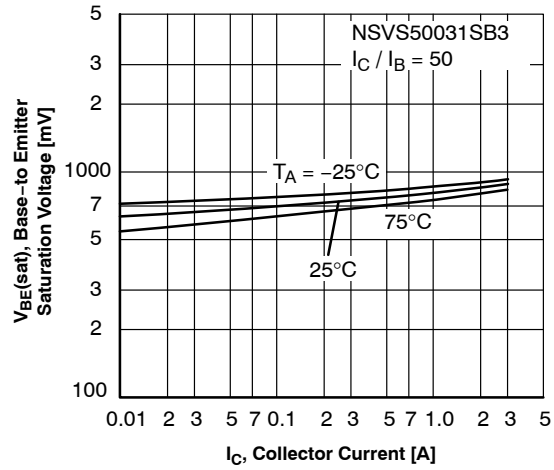


Figure 17.  $V_{BE(sat)} - I_C$

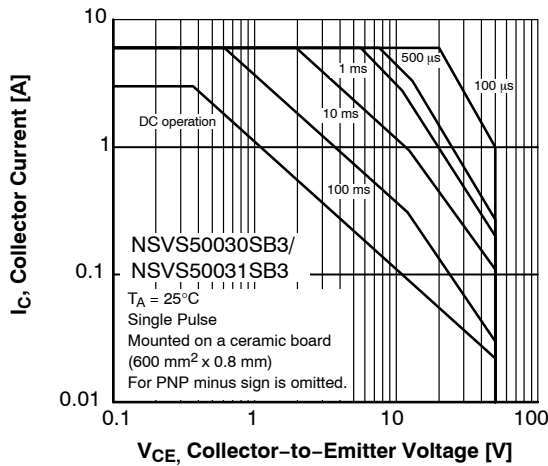


Figure 18. ASO

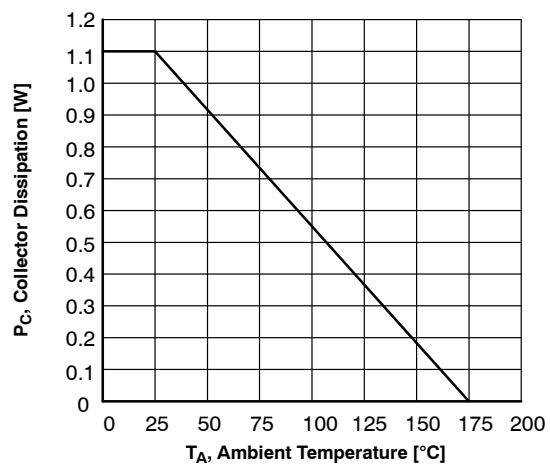
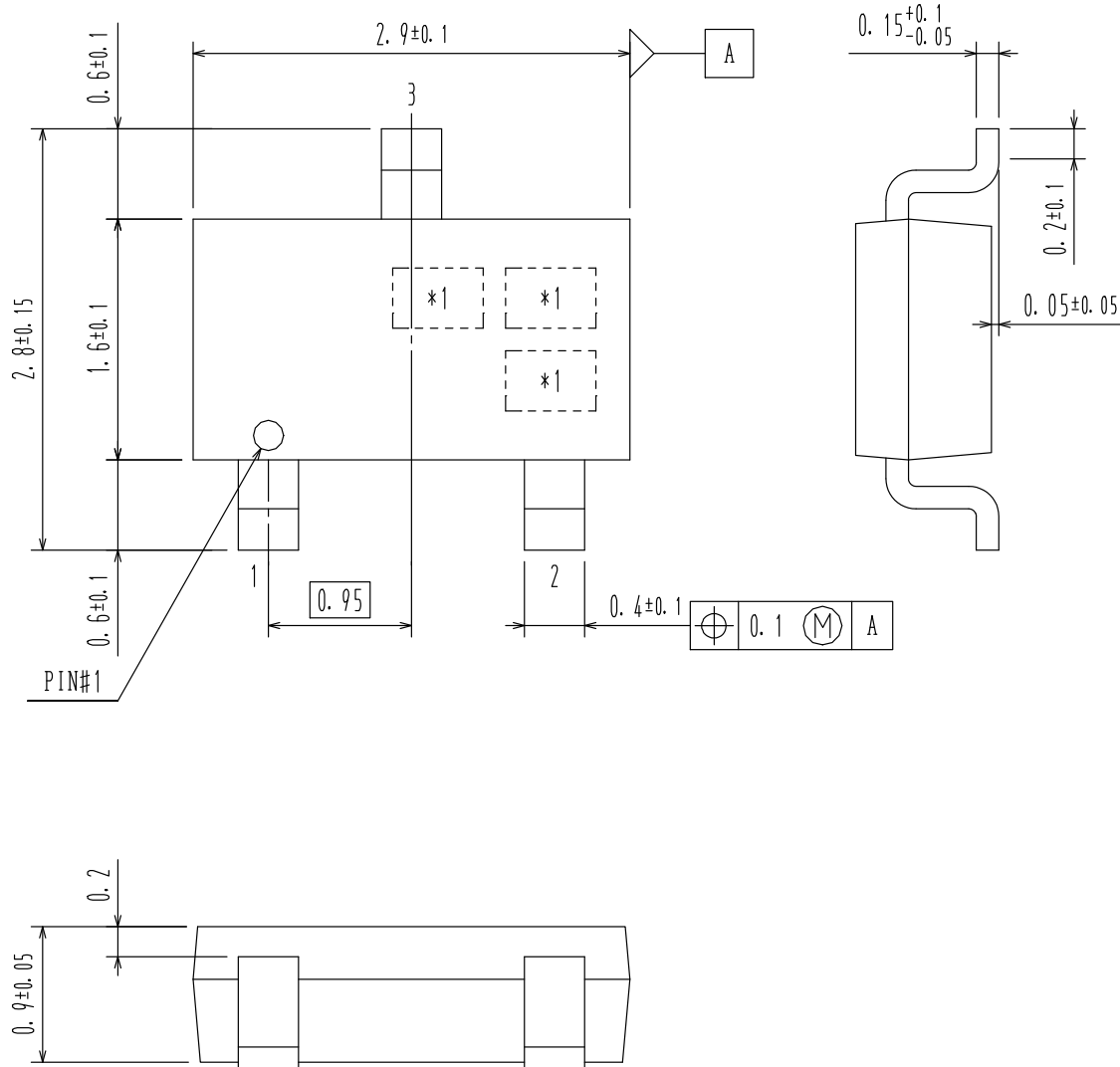


Figure 19.  $P_C - T_A$

**CPH3**  
**CASE 318BA**  
**ISSUE O**

DATE 30 NOV 2011



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