

# Bipolar Transistor

(-50 V, (-)3 A, Low  $V_{CE(sat)}$ ,  
(PNP)NPN Single CPH6

## CPH6123, CPH6223

### Features

- Adoption of MBIT Process
- Large Current Capacity
- Low Collector-to-Emitter Saturation Voltage
- High-Speed Switching
- Ultrasmall Package Facilitates Miniaturization in End Products (Mounting Height: 0.9 mm)
- High Allowable Power Dissipation
- These are Pb-Free Devices

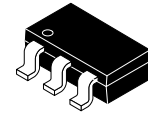
### Applications

- DC-DC Converters, Relay Drivers, Lamp Drivers, Motor Drivers, Strobe

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

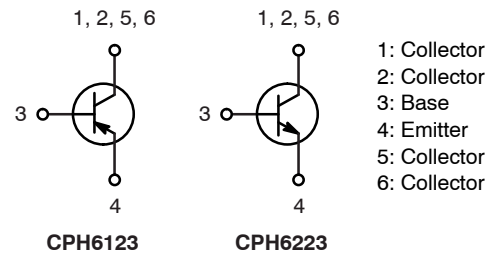
| Symbol    | Parameter                    | Conditions                                                       | Ratings     | Unit |
|-----------|------------------------------|------------------------------------------------------------------|-------------|------|
| $V_{CBO}$ | Collector-to-Base Voltage    |                                                                  | (-50)100    | V    |
| $V_{CES}$ | Collector-to-Emitter Voltage |                                                                  | (-50)100    | V    |
| $V_{CEO}$ | Collector-to-Emitter Voltage |                                                                  | (-)50       | V    |
| $V_{EBO}$ | Emitter-to-Base Voltage      |                                                                  | (-)6        | V    |
| $I_C$     | Collector Current            |                                                                  | (-)3        | A    |
| $I_{CP}$  | Collector Current (Pulse)    |                                                                  | (-)6        | A    |
| $I_B$     | Base Current                 |                                                                  | (-)600      | mA   |
| $P_C$     | Collector Dissipation        | When mounted on ceramic substrate (600 mm <sup>2</sup> × 0.8 mm) | 1.3         | W    |
| $T_j$     | Junction Temperature         |                                                                  | 150         | °C   |
| $T_{stg}$ | Storage Temperature          |                                                                  | -55 to +150 | °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.

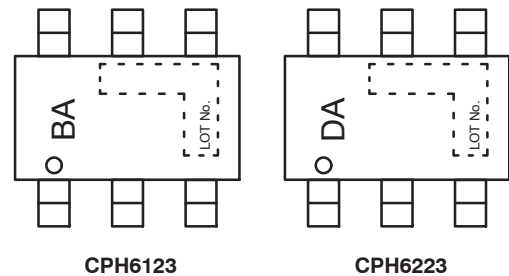


CPH6  
CASE 318BD

### ELECTRICAL CONNECTION



### MARKING DIAGRAMS



### ORDERING INFORMATION

| Device       | Package        | Shipping <sup>†</sup> |
|--------------|----------------|-----------------------|
| CPH6123-TL-E | CPH6 (Pb-Free) | 3 000 / Tape & Reel   |
| CPH6223-TL-E | CPH6 (Pb-Free) | 3 000 / Tape & Reel   |

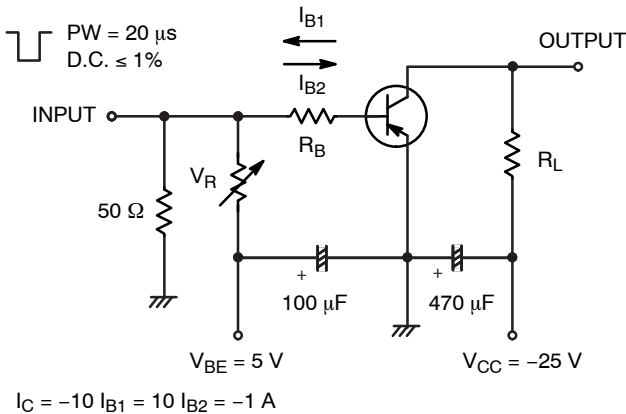
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](http://BRD8011/D).

# CPH6123, CPH6223

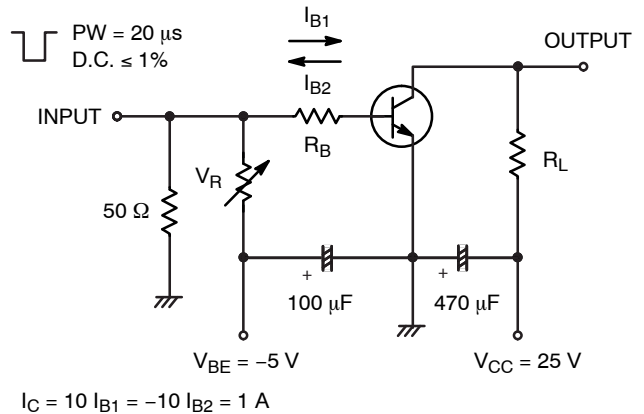
## ELECTRICAL CHARACTERISTICS (at $T_A = 25^\circ\text{C}$ )

| Symbol         | Parameter                               | Test Conditions                                             | Min       | Typ        | Max        | Unit          |
|----------------|-----------------------------------------|-------------------------------------------------------------|-----------|------------|------------|---------------|
| $I_{CBO}$      | Collector Cutoff Current                | $V_{CB} = (-)40\text{ V}, I_E = 0\text{ A}$                 |           |            | $(-)1$     | $\mu\text{A}$ |
| $I_{EBO}$      | Emitter Cutoff Current                  | $V_{EB} = (-)4\text{ V}, I_C = 0\text{ A}$                  |           |            | $(-)1$     | $\mu\text{A}$ |
| $h_{FE}$       | DC Current Gain                         | $V_{CE} = (-)2\text{ V}, I_C = (-)100\text{ mA}$            | 200       |            | 560        |               |
| $f_T$          | Gain-Bandwidth Product                  | $V_{CE} = (-)10\text{ V}, I_C = (-)500\text{ mA}$           |           | (390) 380  |            | MHz           |
| $C_{ob}$       | Output Capacitance                      | $V_{CB} = (-)10\text{ V}, f = 1\text{ MHz}$                 |           | (24) 13    |            | pF            |
| $V_{CE(sat)1}$ | Collector-to-Emitter Saturation Voltage | $I_C = (-)1\text{ A}, I_B = (-)50\text{ mA}$                |           | (-115) 90  | (-230) 130 | mV            |
| $V_{CE(sat)2}$ |                                         | $I_C = (-)2\text{ A}, I_B = (-)100\text{ mA}$               |           | (-240) 160 | (-650) 240 | mV            |
| $V_{BE(sat)}$  | Base-to-Emitter Saturation Voltage      | $I_C = (-)2\text{ A}, I_B = (-)100\text{ mA}$               |           | (-)0.88    | (-)1.2     | V             |
| $V_{(BR)CBO}$  | Collector-to-Base Breakdown Voltage     | $I_C = (-)10\text{ }\mu\text{A}, I_E = 0\text{ A}$          | (-50) 100 |            |            | V             |
| $V_{(BR)CES}$  | Collector-to-Emitter Breakdown Voltage  | $I_C = (-)100\text{ }\mu\text{A}, R_{BE} = 0\text{ }\Omega$ | (-50) 100 |            |            | V             |
| $V_{(BR)CEO}$  | Collector-to-Emitter Breakdown Voltage  | $I_C = (-)1\text{ mA}, R_{BE} = \infty$                     | (-)50     |            |            | V             |
| $V_{(BR)EBO}$  | Emitter-to-Base Breakdown Voltage       | $I_E = (-)10\text{ }\mu\text{A}, I_C = 0\text{ A}$          | (-)6      |            |            | V             |
| $t_{on}$       | Turn-On Time                            | See specified Test Circuit.                                 |           | (30) 35    |            | ns            |
| $t_{stg}$      | Storage Time                            |                                                             |           | (230) 300  |            | ns            |
| $t_f$          | Fall Time                               |                                                             |           | (18) 25    |            | 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.



CPH6123



CPH6223

Figure 1. Switching Time Test Circuit

TYPICAL PERFORMANCE CHARACTERISTICS

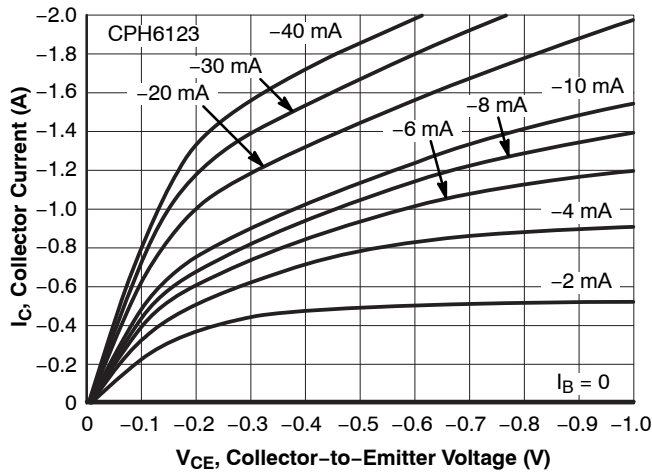


Figure 2.  $I_C - V_{CE}$

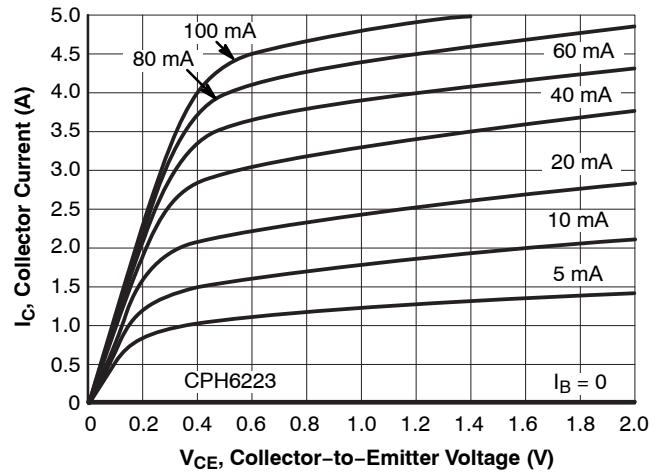


Figure 3.  $I_C - V_{CE}$

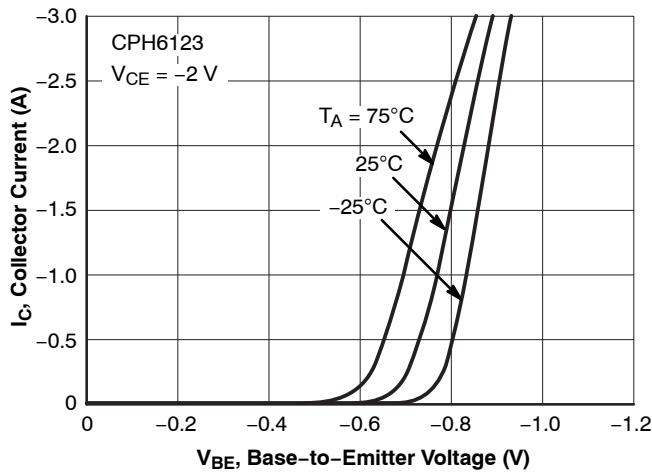


Figure 4.  $I_C - V_{BE}$

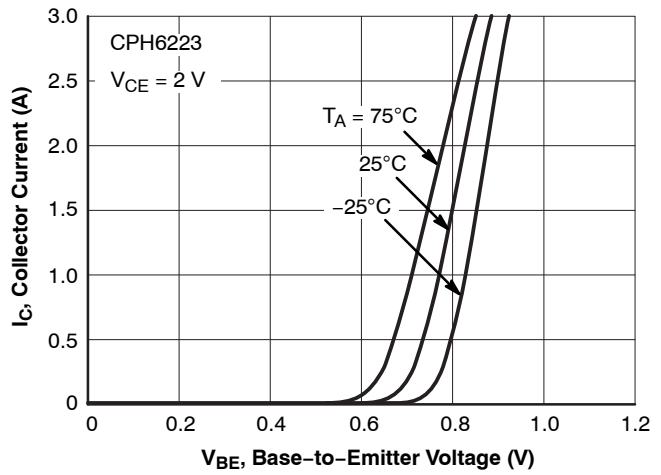


Figure 5.  $I_C - V_{BE}$

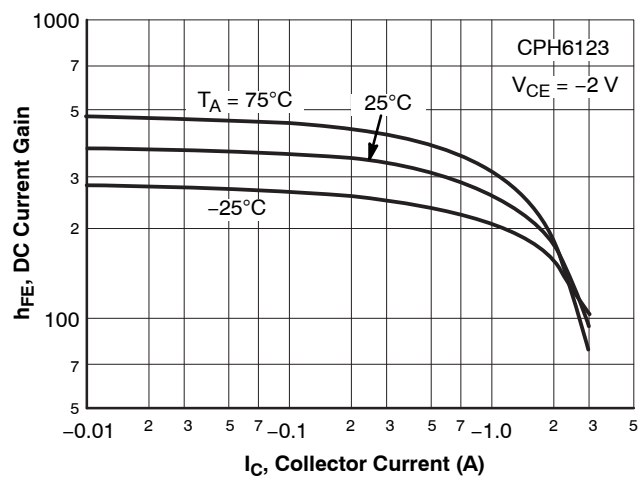


Figure 6.  $h_{FE} - I_C$

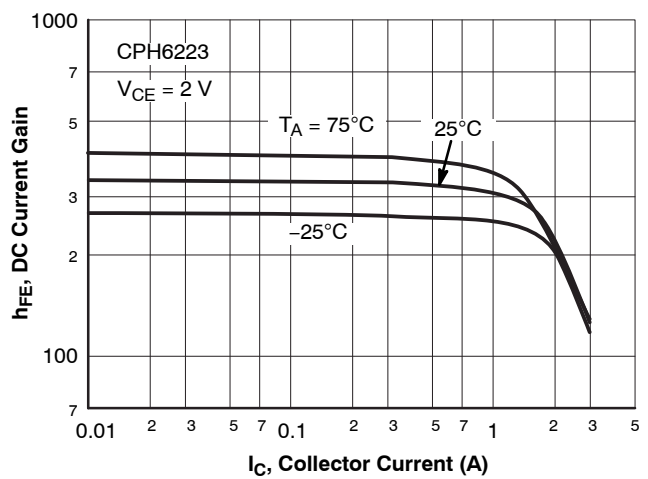
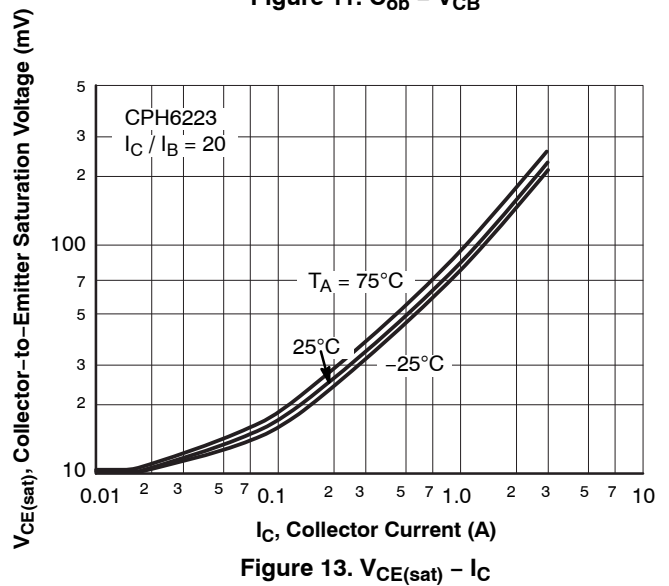
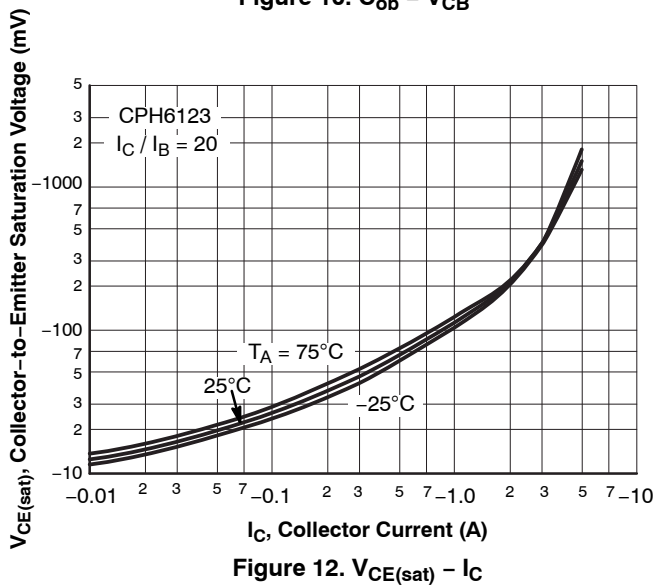
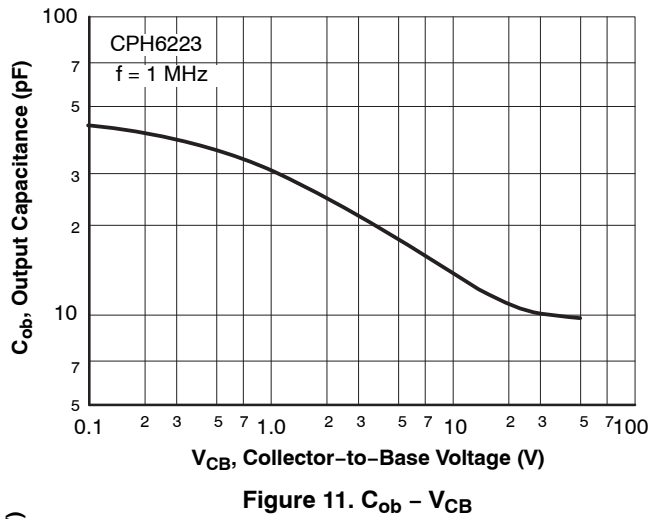
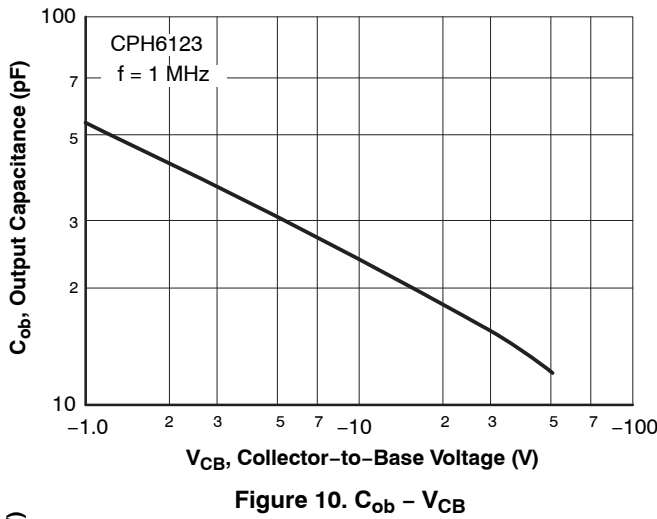
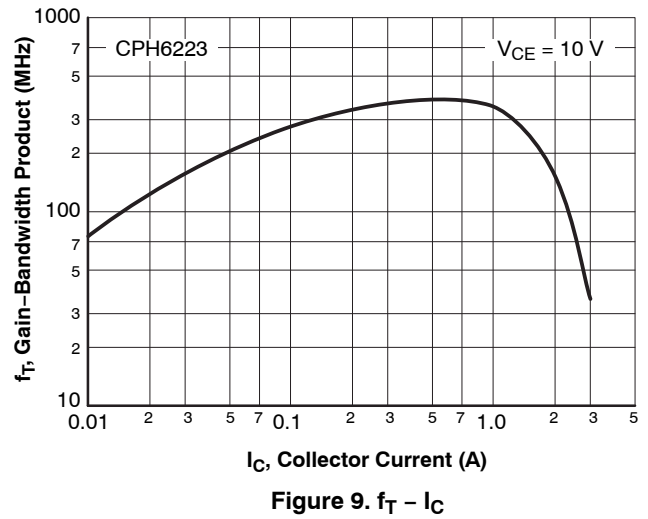
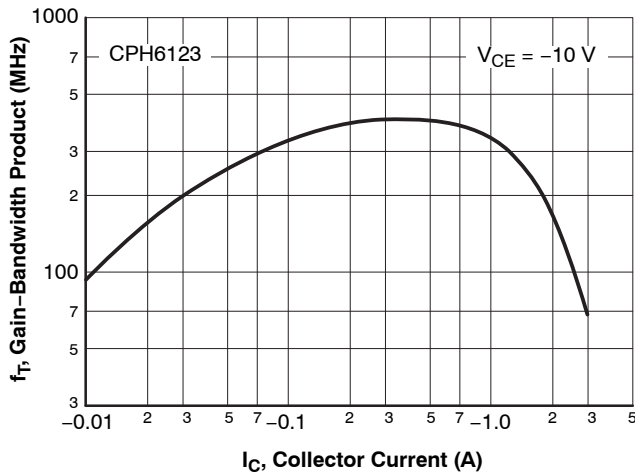
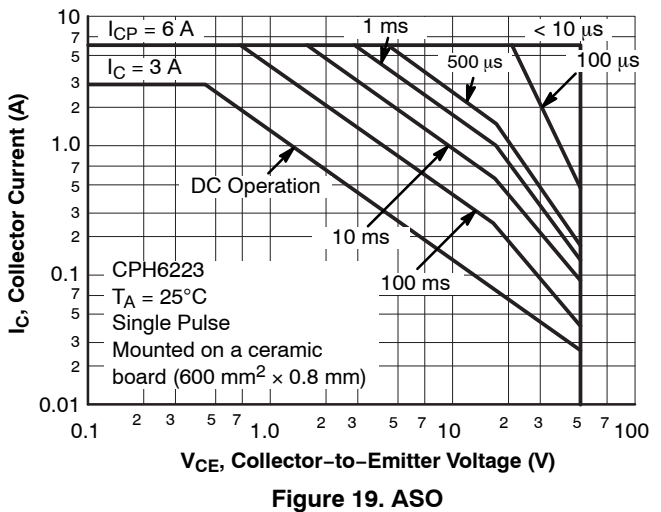
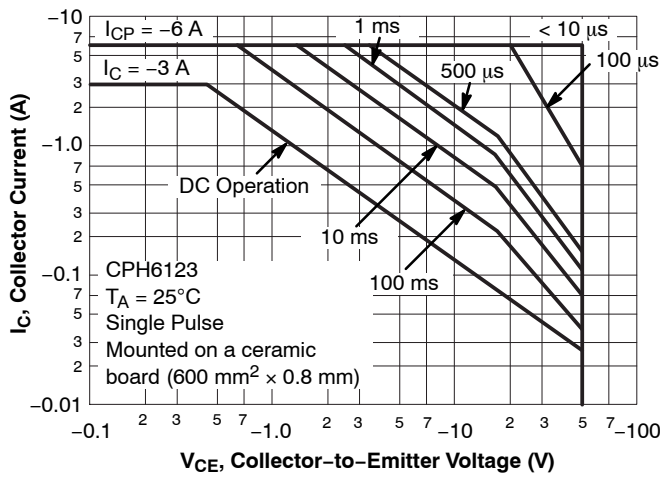
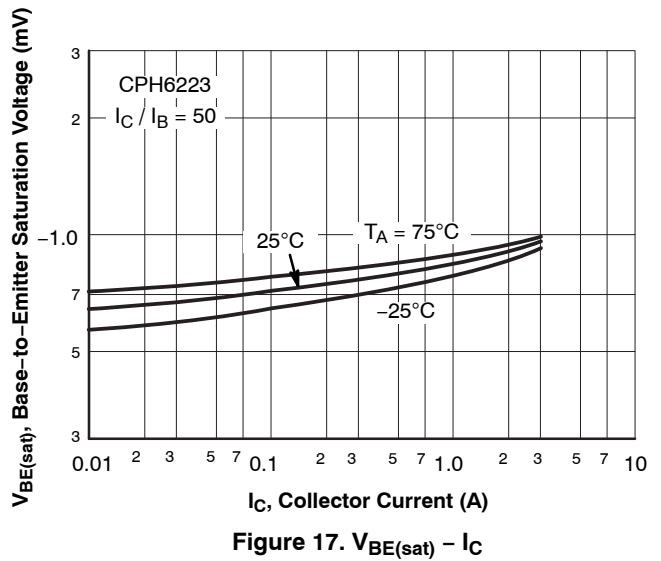
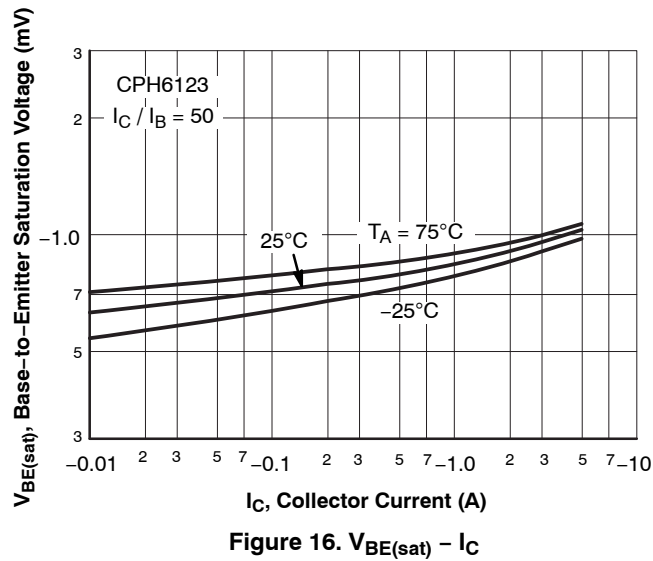
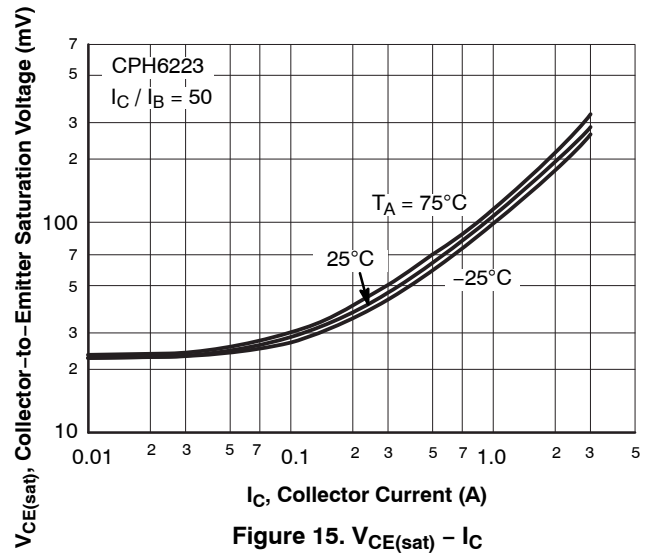
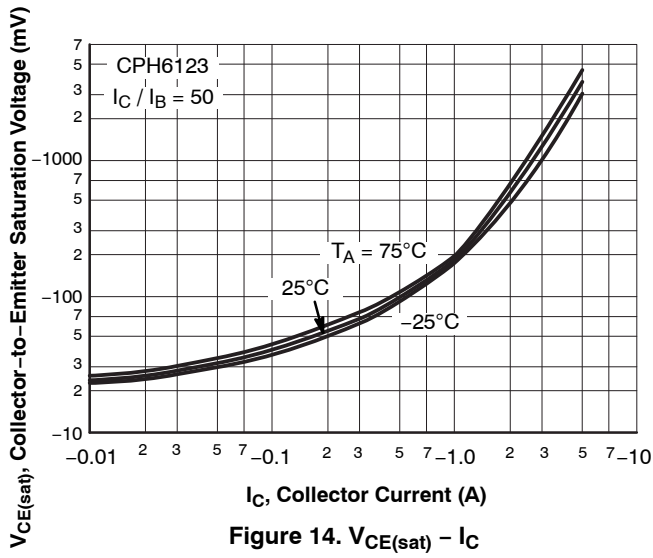


Figure 7.  $h_{FE} - I_C$

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

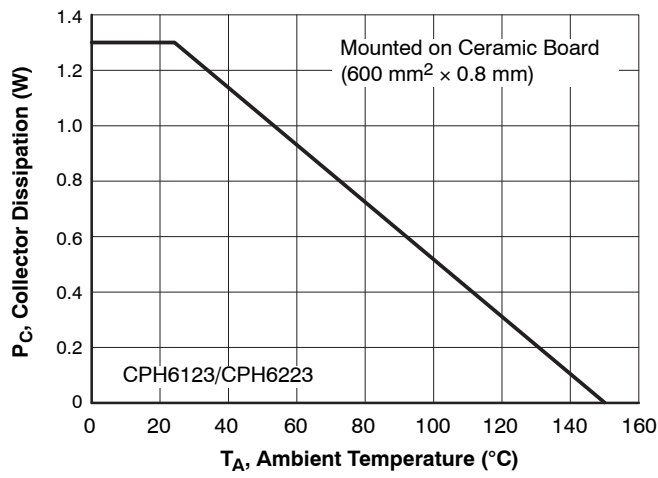
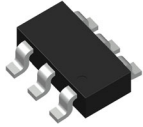
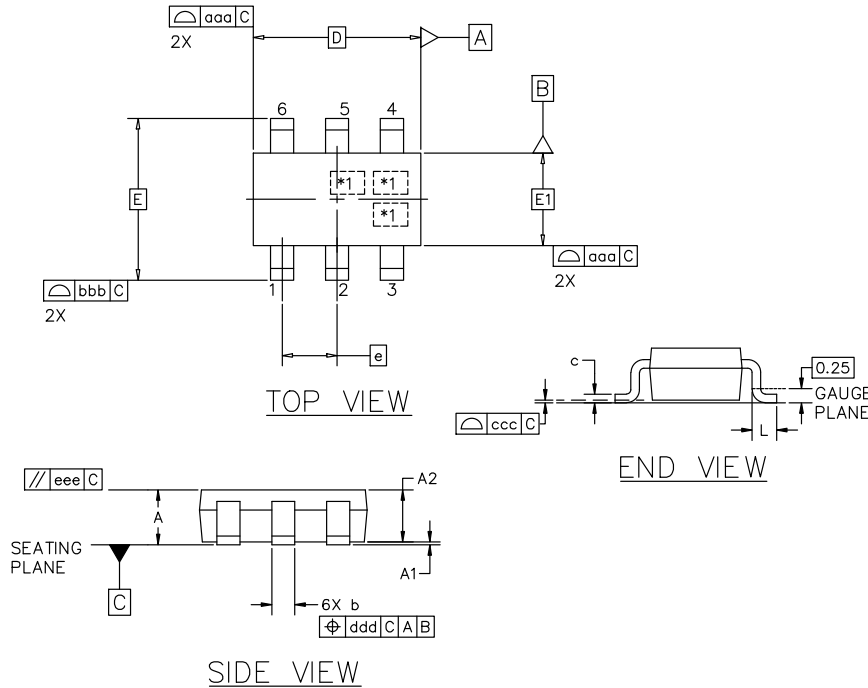


Figure 20. P<sub>C</sub> – T<sub>A</sub>



CPH6 2.90x1.60x0.90, 0.95P  
CASE 318BD  
ISSUE A

DATE 20 SEPT 2024

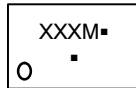


| MILLIMETERS                 |          |      |      |
|-----------------------------|----------|------|------|
| DIM                         | MIN      | NOM  | MAX  |
| A                           | 0.85     | 0.95 | 1.05 |
| A1                          | 0.00     | 0.05 | 0.10 |
| A2                          | 0.85     | 0.90 | 0.95 |
| b                           | 0.30     | 0.40 | 0.50 |
| c                           | 0.10     | 0.15 | 0.25 |
| D                           | 2.90 BSC |      |      |
| E                           | 2.80 BSC |      |      |
| E1                          | 1.60 BSC |      |      |
| e                           | 0.95 BSC |      |      |
| L                           | 0.10     | 0.20 | 0.30 |
| TOLERANCE FORM AND POSITION |          |      |      |
| aaa                         | 0.10     |      |      |
| bbb                         | 0.15     |      |      |
| ccc                         | 0.05     |      |      |
| ddd                         | 0.10     |      |      |
| eee                         | 0.10     |      |      |

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS
3. \*1 IS FOR LOT INDICATION

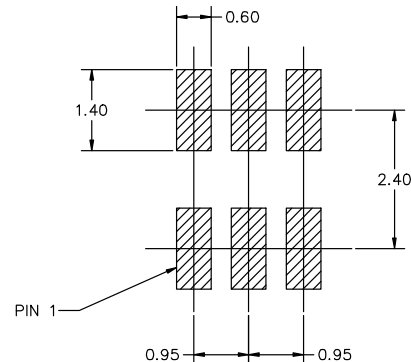
GENERIC  
MARKING DIAGRAM\*



XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



RECOMMENDED MOUNTING FOOTPRINT

\* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

|                  |                            |                                                                                                                                                                                  |
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