

# Bipolar Transistor

(–)50 V, (–)1 A, Low  $V_{CE(sat)}$ ,  
(PNP)NPN Single CPH3

## CPH3116, CPH3216

### Features

- Adoption of MBIT Processes
- 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

- Relay Drivers, Lamp Drivers, Motor Drivers, Flash

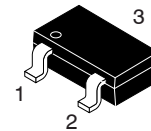
### Specifications

( ): CPH3116

### ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

| Parameter                    | Symbol    | Conditions                                                       | Ratings     | Unit |
|------------------------------|-----------|------------------------------------------------------------------|-------------|------|
| Collector-to-Base Voltage    | $V_{CBO}$ |                                                                  | (–)80       | V    |
| Collector-to-Emitter Voltage | $V_{CES}$ |                                                                  | (–)80       | V    |
| Emitter-to-Base Voltage      | $V_{CEO}$ |                                                                  | (–)50       | V    |
|                              | $V_{EBO}$ |                                                                  | (–)5        | V    |
| Collector Current            | $I_C$     |                                                                  | (–)1.0      | A    |
| Collector Current (Pulse)    | $I_{CP}$  |                                                                  | (–)3        | A    |
| Base Current                 | $I_B$     |                                                                  | (–)200      | mA   |
| Collector Dissipation        | $P_C$     | When mounted on ceramic substrate (600 mm <sup>2</sup> × 0.8 mm) | 0.9         | W    |
| Junction Temperature         | $T_j$     |                                                                  | 150         | °C   |
| Storage Temperature          | $T_{stg}$ |                                                                  | –55 to +150 | °C   |

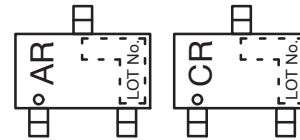
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



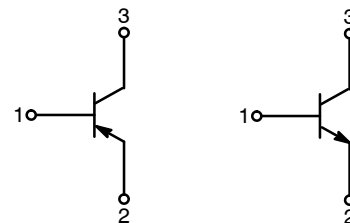
1: Base  
2: Emitter  
3: Collector

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### MARKING DIAGRAMS



### ELECTRICAL CONNECTION



CPH3116

CPH3216

### ORDERING INFORMATION

| Device       | Package           | Shipping <sup>†</sup> |
|--------------|-------------------|-----------------------|
| CPH3116-TL-E | CPH3<br>(Pb-Free) | 3000 /<br>Tape & Reel |
| CPH3216-TL-E | CPH3<br>(Pb-Free) | 3000 /<br>Tape & Reel |

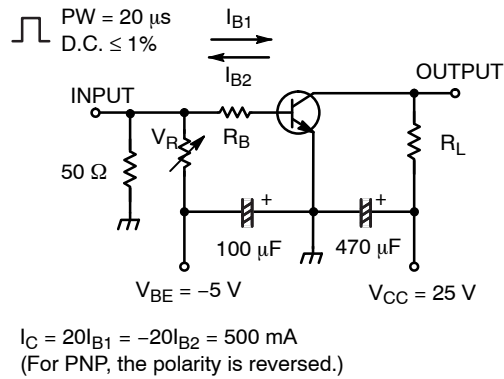
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

# CPH3116, CPH3216

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| Parameter                               | Symbol         | Conditions                                                  | Ratings |           |           | Unit          |
|-----------------------------------------|----------------|-------------------------------------------------------------|---------|-----------|-----------|---------------|
|                                         |                |                                                             | Min     | Typ       | Max       |               |
| Collector Cutoff Current                | $I_{CBO}$      | $V_{CB} = (-)40\text{ V}, I_E = 0\text{ A}$                 | –       | –         | $(-)0.1$  | $\mu\text{A}$ |
| Emitter Cutoff Current                  | $I_{EBO}$      | $V_{EB} = (-)4\text{ V}, I_C = 0\text{ A}$                  | –       | –         | $(-)0.1$  | $\mu\text{A}$ |
| DC Current Gain                         | $h_{FE}$       | $V_{CE} = (-)2\text{ V}, I_C = (-)100\text{ mA}$            | 200     | –         | 560       |               |
| Gain–Bandwidth Product                  | $f_T$          | $V_{CE} = (-)10\text{ V}, I_C = (-)300\text{ mA}$           | –       | 420       | –         | MHz           |
| Output Capacitance                      | $C_{ob}$       | $V_{CB} = (-)10\text{ V}, f = 1\text{ MHz}$                 | –       | (9)6      | –         | pF            |
| Collector–to–Emitter Saturation Voltage | $V_{CE(sat)1}$ | $I_C = (-)500\text{ mA}, I_B = (-)10\text{ mA}$             | –       | (–280)130 | (–430)190 | mV            |
|                                         | $V_{CE(sat)2}$ | $I_C = (-)300\text{ mA}, I_B = (-)6\text{ mA}$              | –       | (–145)90  | (–220)135 | mV            |
| Base–to–Emitter Saturation Voltage      | $V_{BE(sat)}$  | $I_C = (-)500\text{ mA}, I_B = (-)10\text{ mA}$             |         | (–)0.81   | (–)1.2    | V             |
| Collector–to–Base Breakdown Voltage     | $V_{(BR)CBO}$  | $I_C = (-)10\text{ }\mu\text{A}, I_E = 0\text{ A}$          | (–50)80 | –         | –         | V             |
| Collector–to–Emitter Breakdown Voltage  | $V_{(BR)CES}$  | $I_C = (-)100\text{ }\mu\text{A}, R_{BE} = 0\text{ }\Omega$ | (–50)80 | –         | –         | V             |
|                                         | $V_{(BR)CEO}$  | $I_C = (-)1\text{ mA}, R_{BE} = \infty$                     | (–)50   | –         | –         | V             |
| Emitter–to–Base Breakdown Voltage       | $V_{(BR)EBO}$  | $I_E = (-)10\text{ }\mu\text{A}, I_C = 0\text{ A}$          | (–)5    | –         | –         | V             |
| Turn–On Time                            | $t_{on}$       | See specified Test Circuit                                  | –       | 35        | –         | ns            |
| Storage Time                            | $t_{stg}$      |                                                             | –       | (170)330  | –         | ns            |
| Fall Time                               | $t_f$          |                                                             | –       | (30)40    | –         | 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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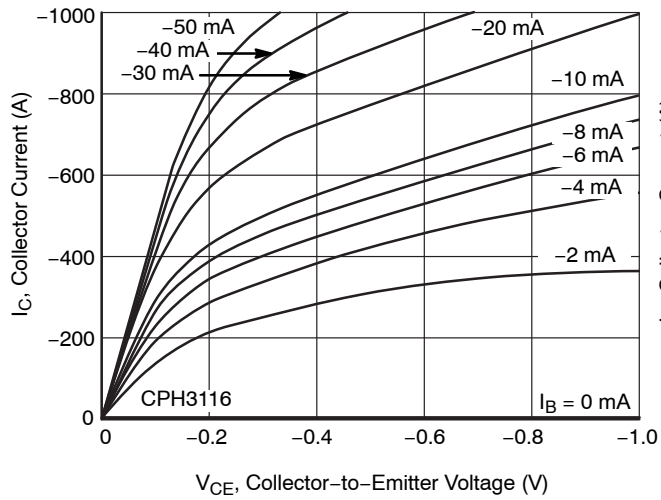


Figure 2.  $I_C - V_{CE}$

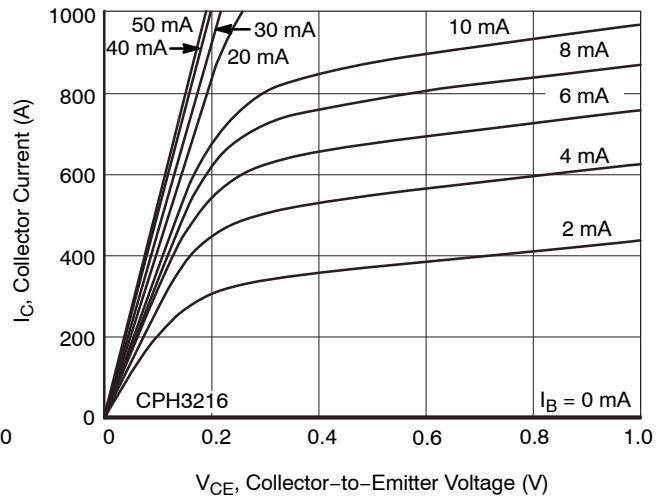


Figure 3.  $I_C - V_{CE}$

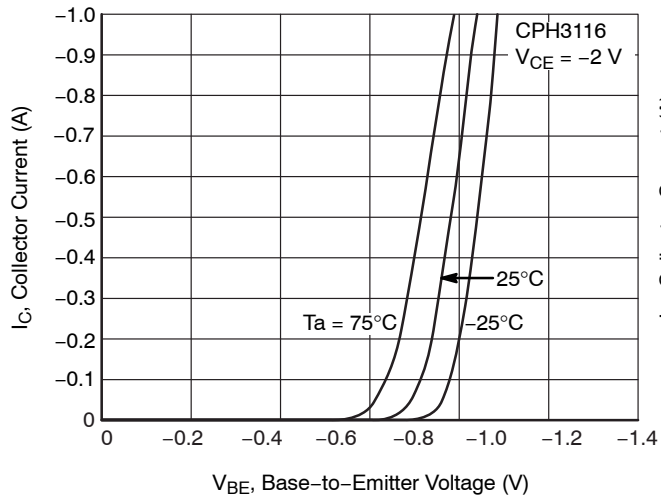


Figure 4.  $I_C - V_{BE}$

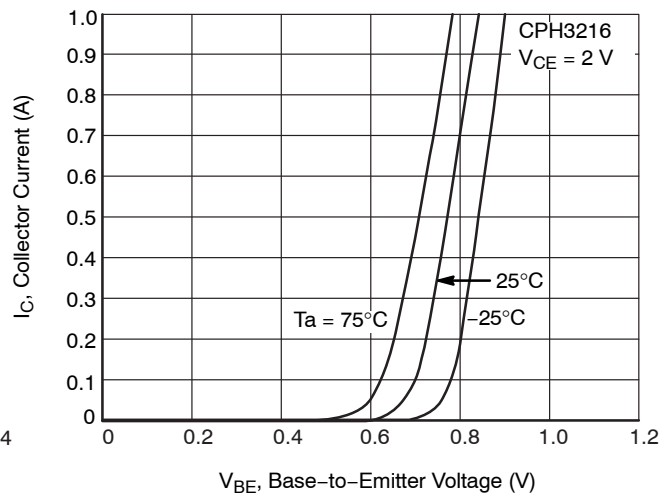


Figure 5.  $I_C - V_{BE}$

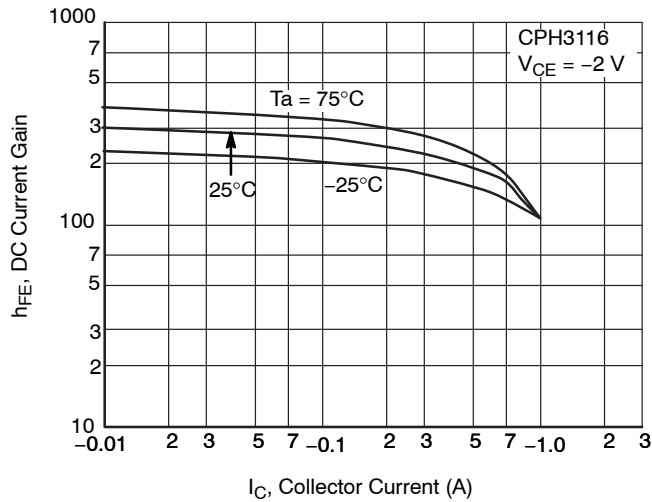


Figure 6.  $h_{FE} - I_C$

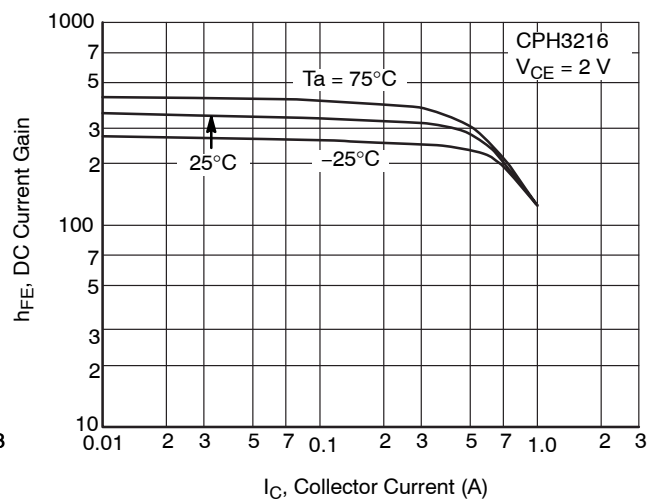


Figure 7.  $h_{FE} - I_C$

# CPH3116, CPH3216

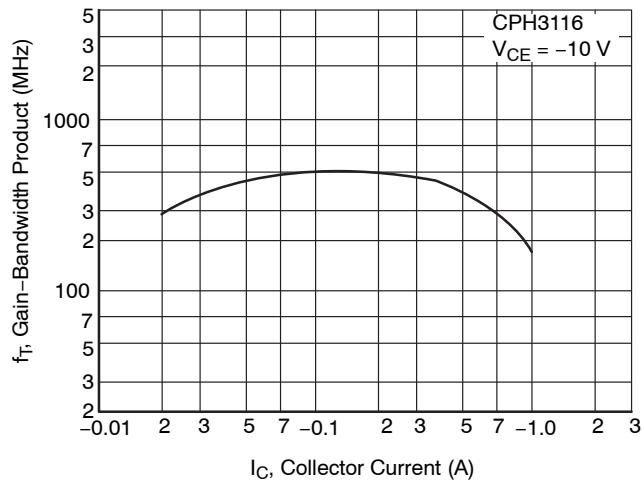


Figure 8.  $f_T - I_C$

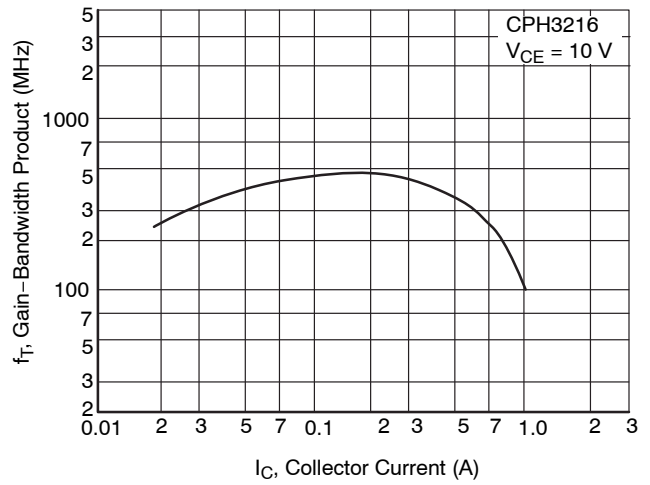


Figure 9.  $f_T - I_C$

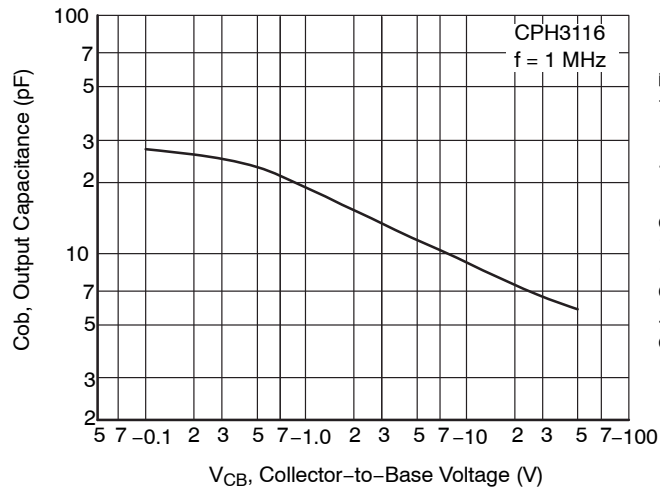


Figure 10.  $C_{ob} - V_{CB}$

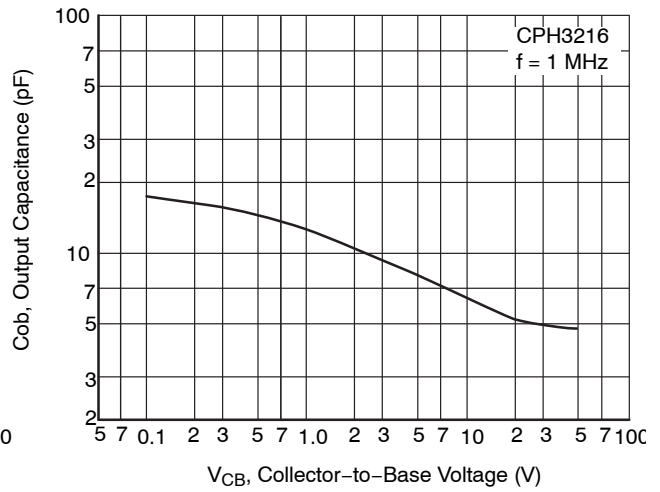


Figure 11.  $C_{ob} - V_{CB}$

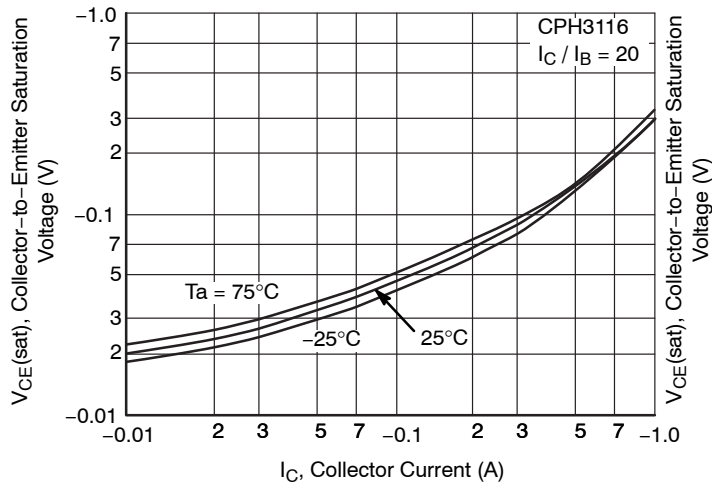


Figure 12.  $V_{CE(sat)} - I_C$

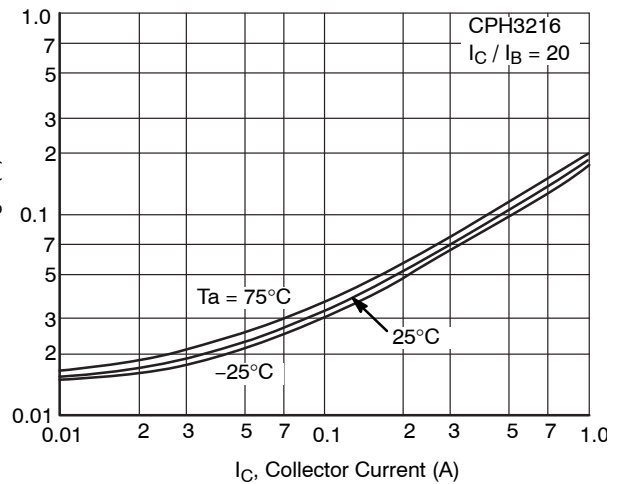


Figure 13.  $V_{CE(sat)} - I_C$

# CPH3116, CPH3216

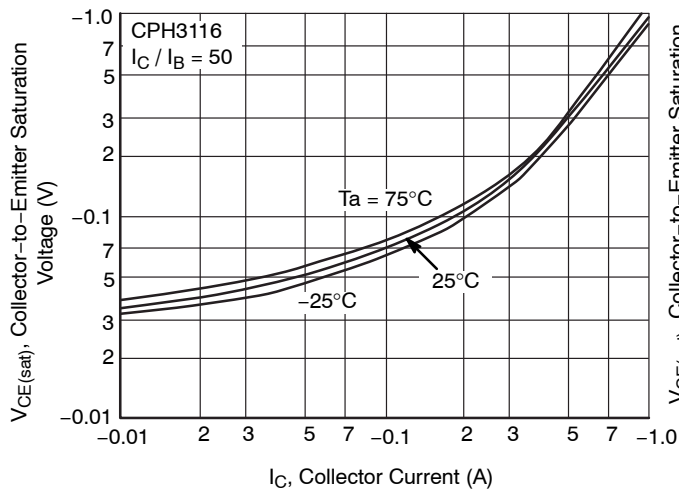


Figure 14.  $V_{CE(sat)} - I_C$

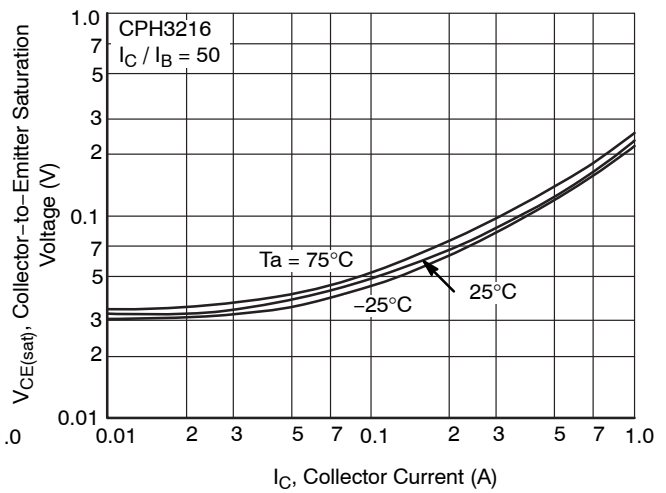


Figure 15.  $V_{CE(sat)} - I_C$

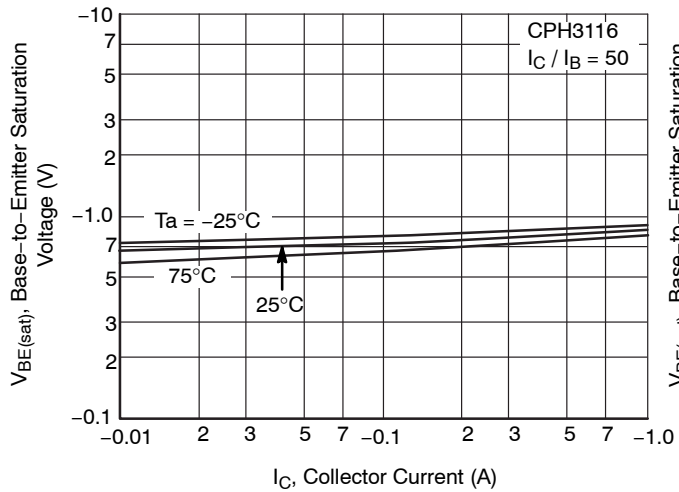


Figure 16.  $V_{BE(sat)} - I_C$

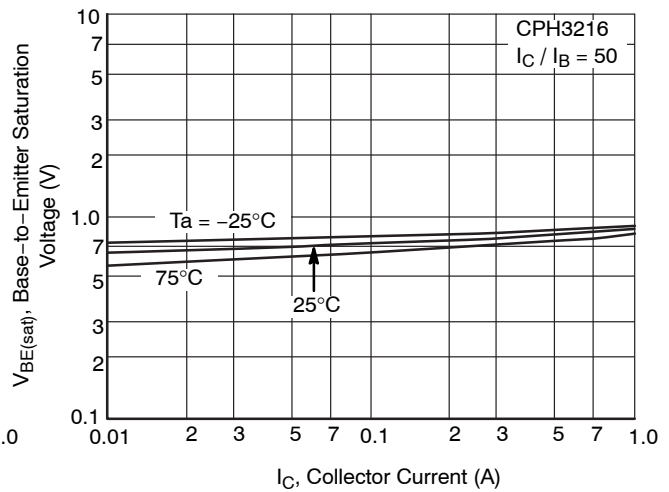


Figure 17.  $V_{BE(sat)} - I_C$

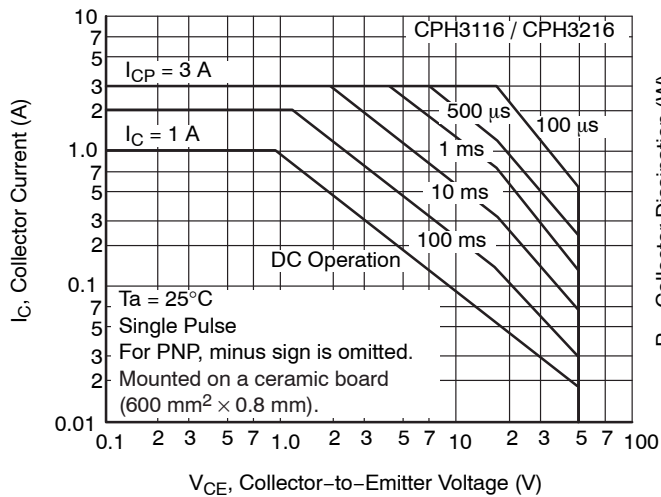


Figure 18. ASO

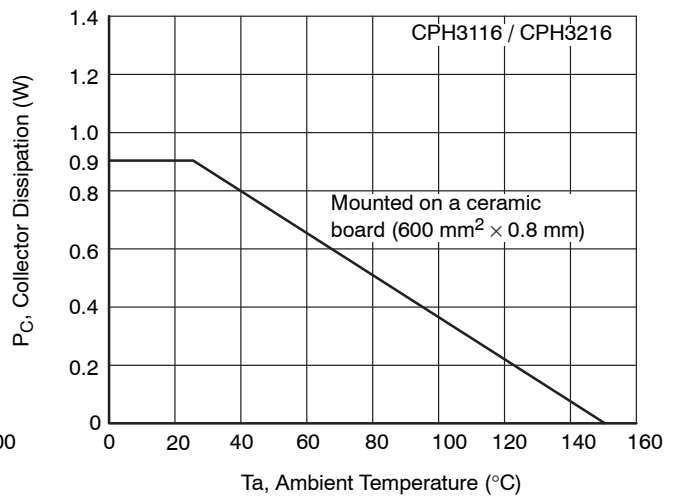
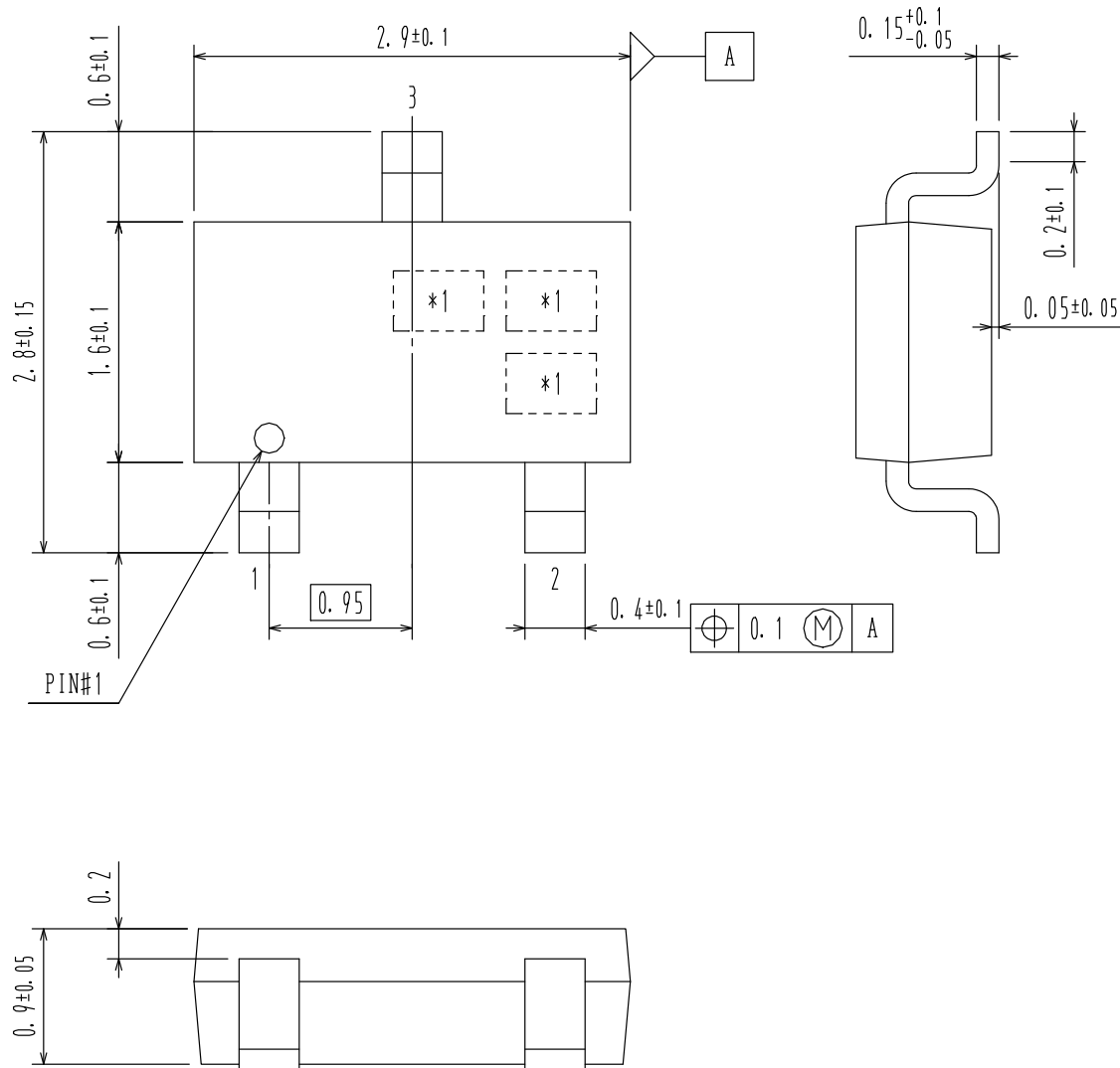


Figure 19.  $P_C - T_a$

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CASE 318BA  
ISSUE O

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