

# 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

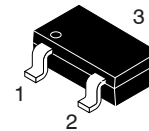
### Specifications

( ): 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

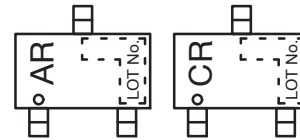
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



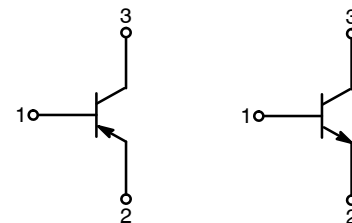
1: Base  
2: Emitter  
3: Collector

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### MARKING DIAGRAMS



### ELECTRICAL CONNECTION



CPH3116

CPH3216

### ORDERING INFORMATION

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

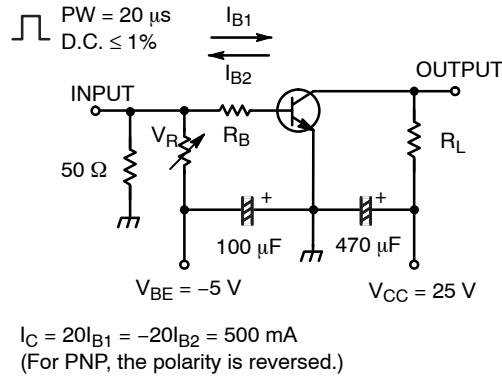
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

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## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

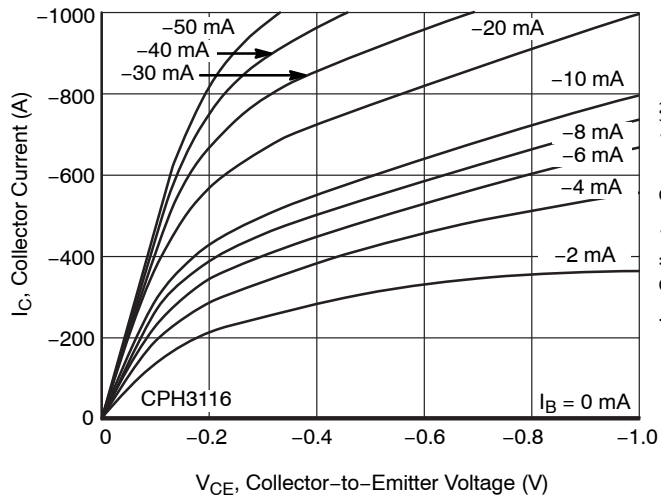
Parameter	Symbol	Conditions	Ratings			Unit
			Min	Typ	Max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB} = (-)40\text{ V}, I_E = 0\text{ A}$	–	–	(–)0.1	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = (-)4\text{ V}, I_C = 0\text{ A}$	–	–	(–)0.1	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE} = (-)2\text{ V}, I_C = (-)100\text{ mA}$	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.

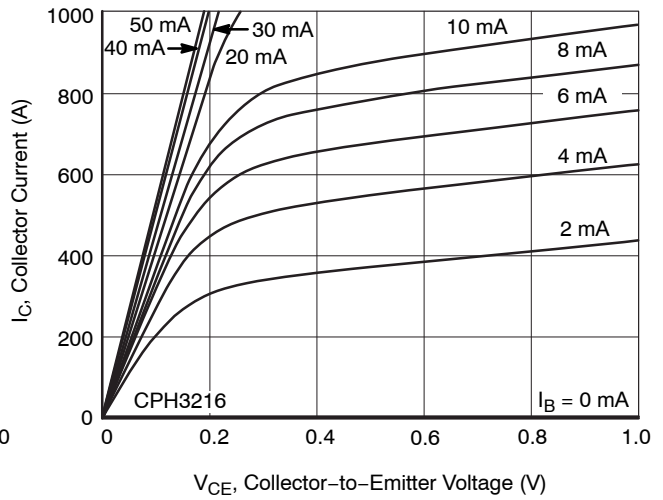


**Figure 1. Switching Time Test Circuit**

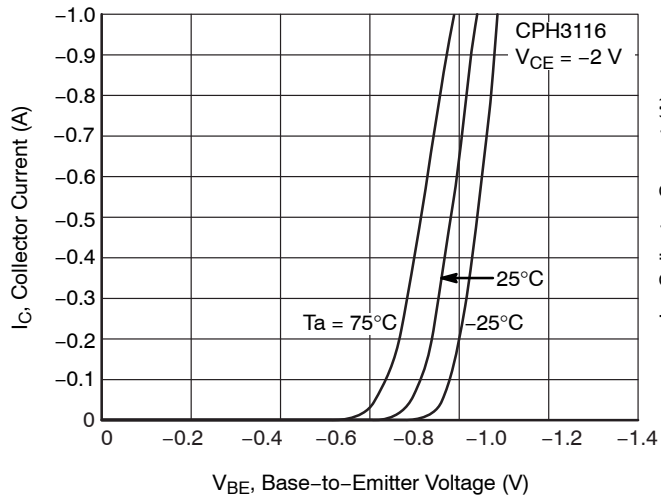
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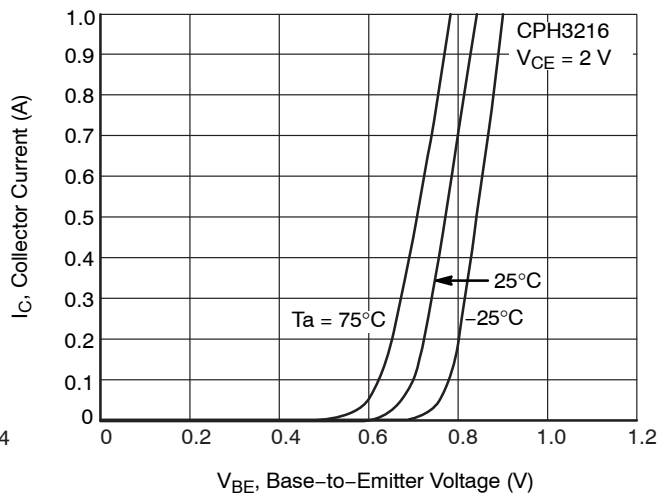
**Figure 2.  $I_C - V_{CE}$**



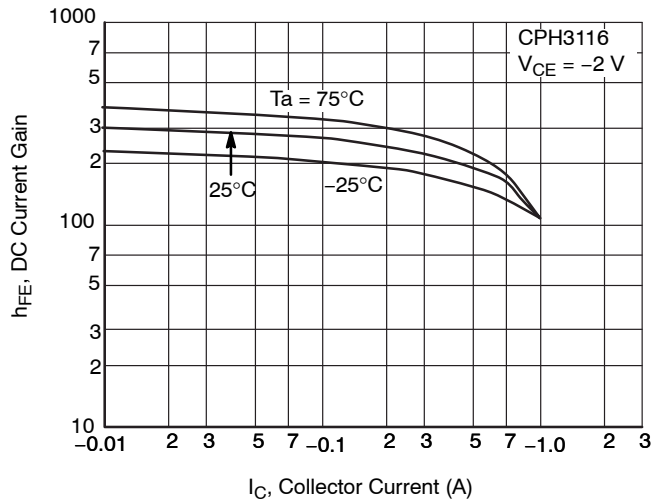
**Figure 3.  $I_C - V_{CE}$**



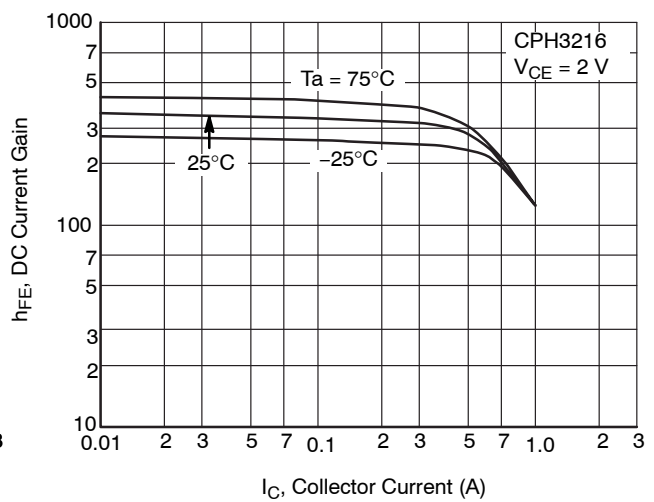
**Figure 4.  $I_C - V_{BE}$**



**Figure 5.  $I_C - V_{BE}$**



**Figure 6.  $h_{FE} - I_C$**



**Figure 7.  $h_{FE} - I_C$**

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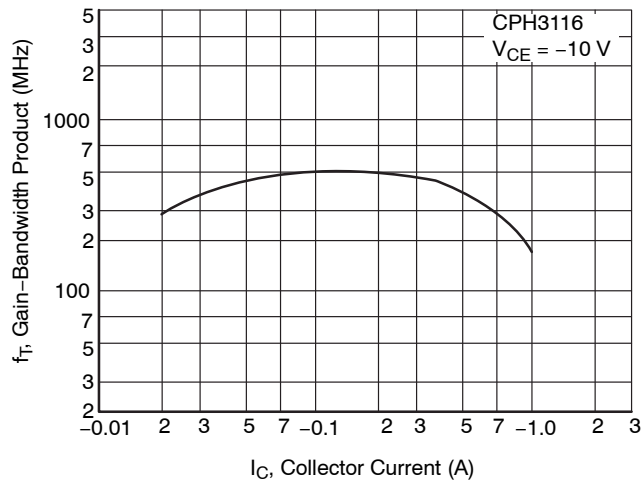


Figure 8.  $f_T - I_C$

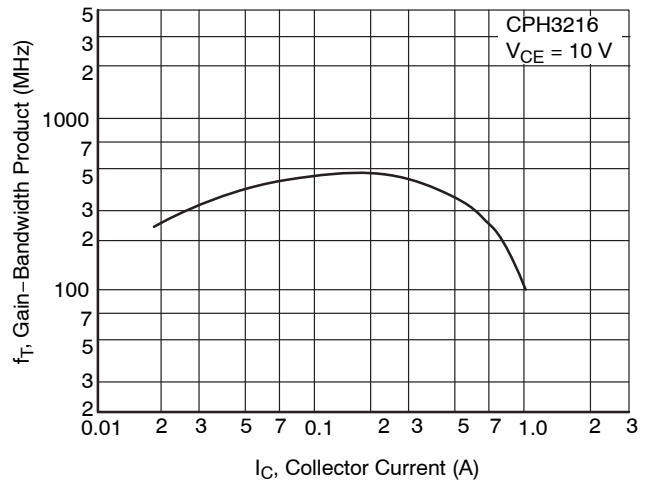


Figure 9.  $f_T - I_C$

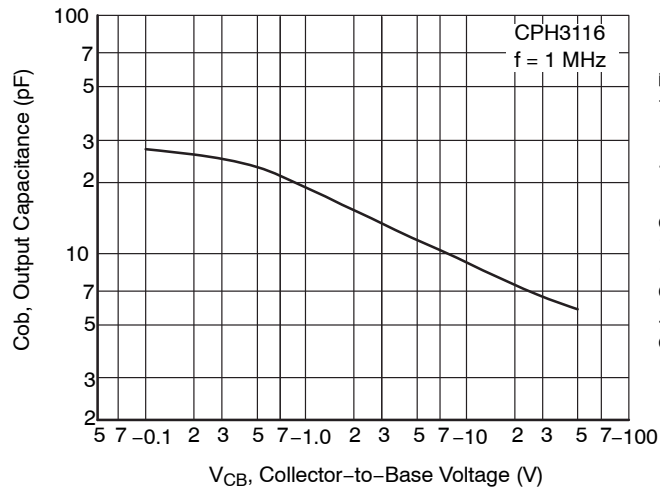


Figure 10.  $C_{ob} - V_{CB}$

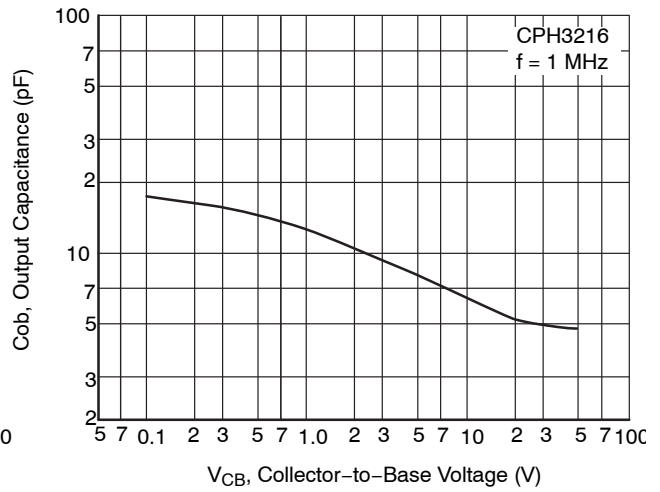


Figure 11.  $C_{ob} - V_{CB}$

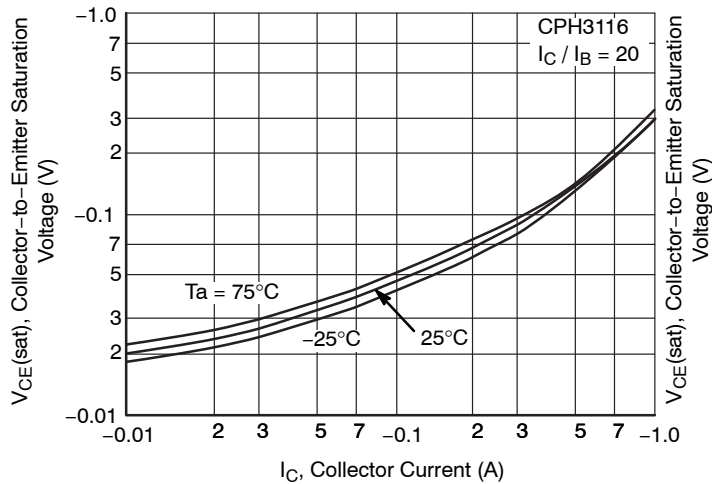


Figure 12.  $V_{CE(sat)} - I_C$

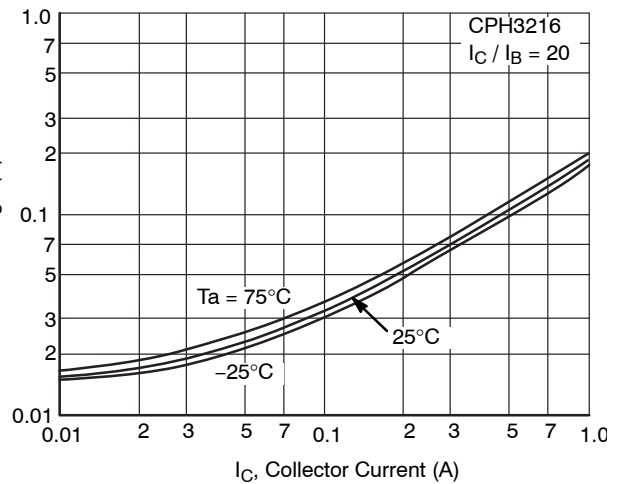


Figure 13.  $V_{CE(sat)} - I_C$

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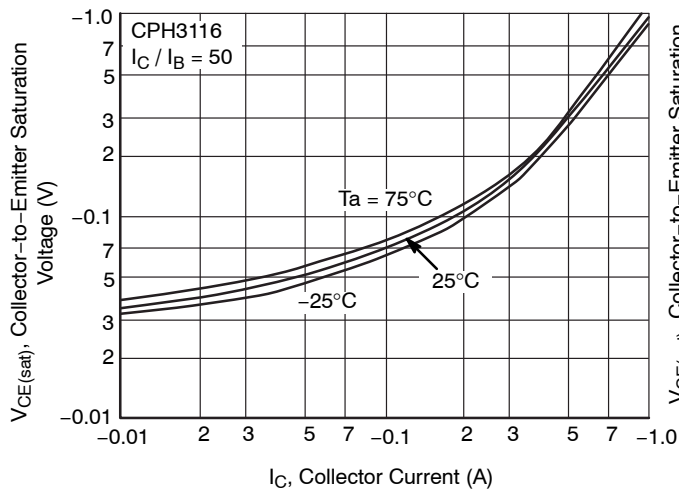


Figure 14.  $V_{CE(sat)} - I_C$

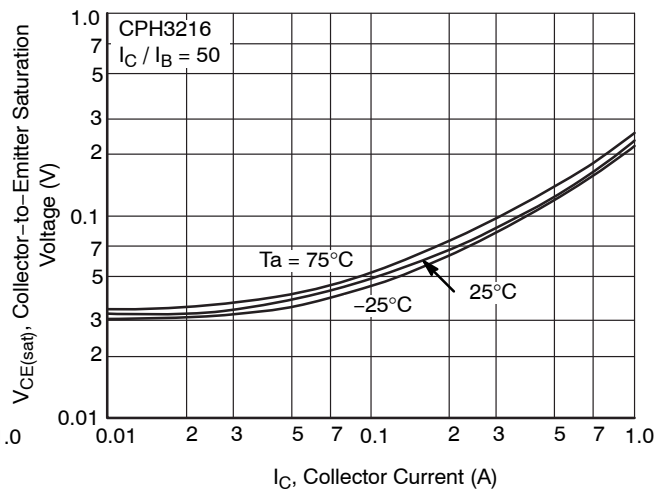


Figure 15.  $V_{CE(sat)} - I_C$

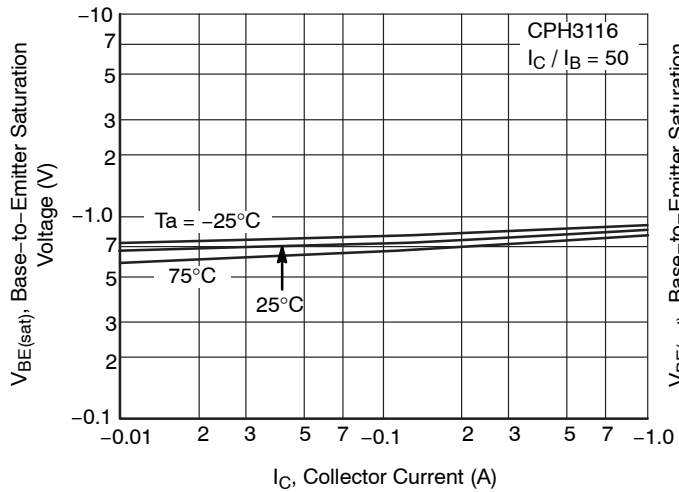


Figure 16.  $V_{BE(sat)} - I_C$

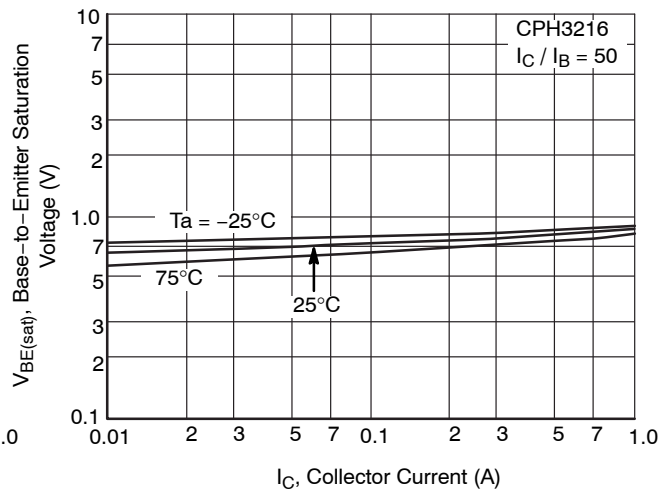


Figure 17.  $V_{BE(sat)} - I_C$

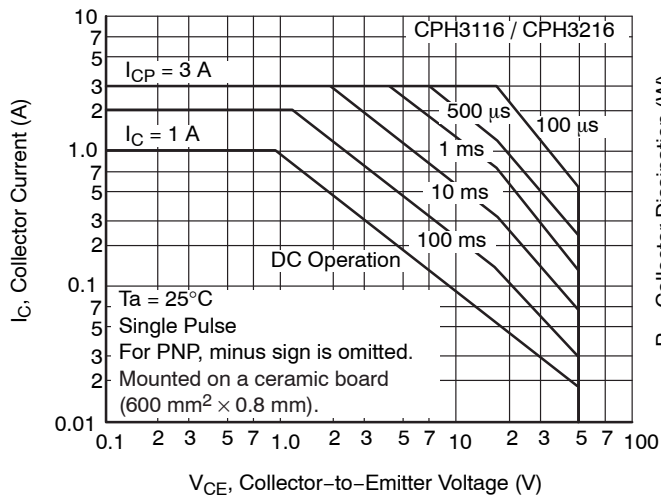


Figure 18. ASO

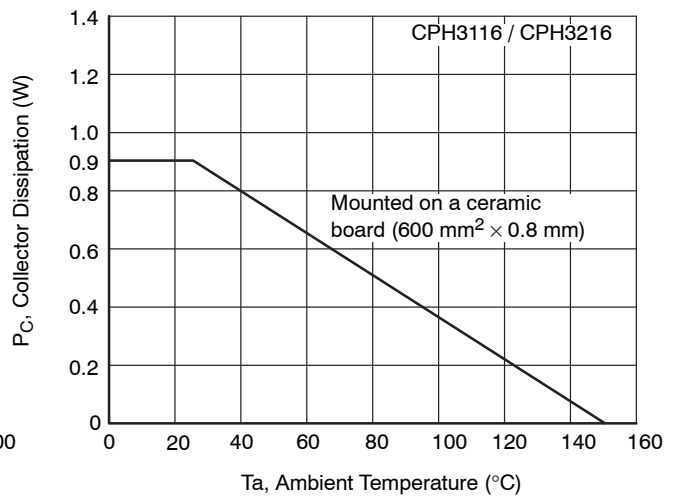
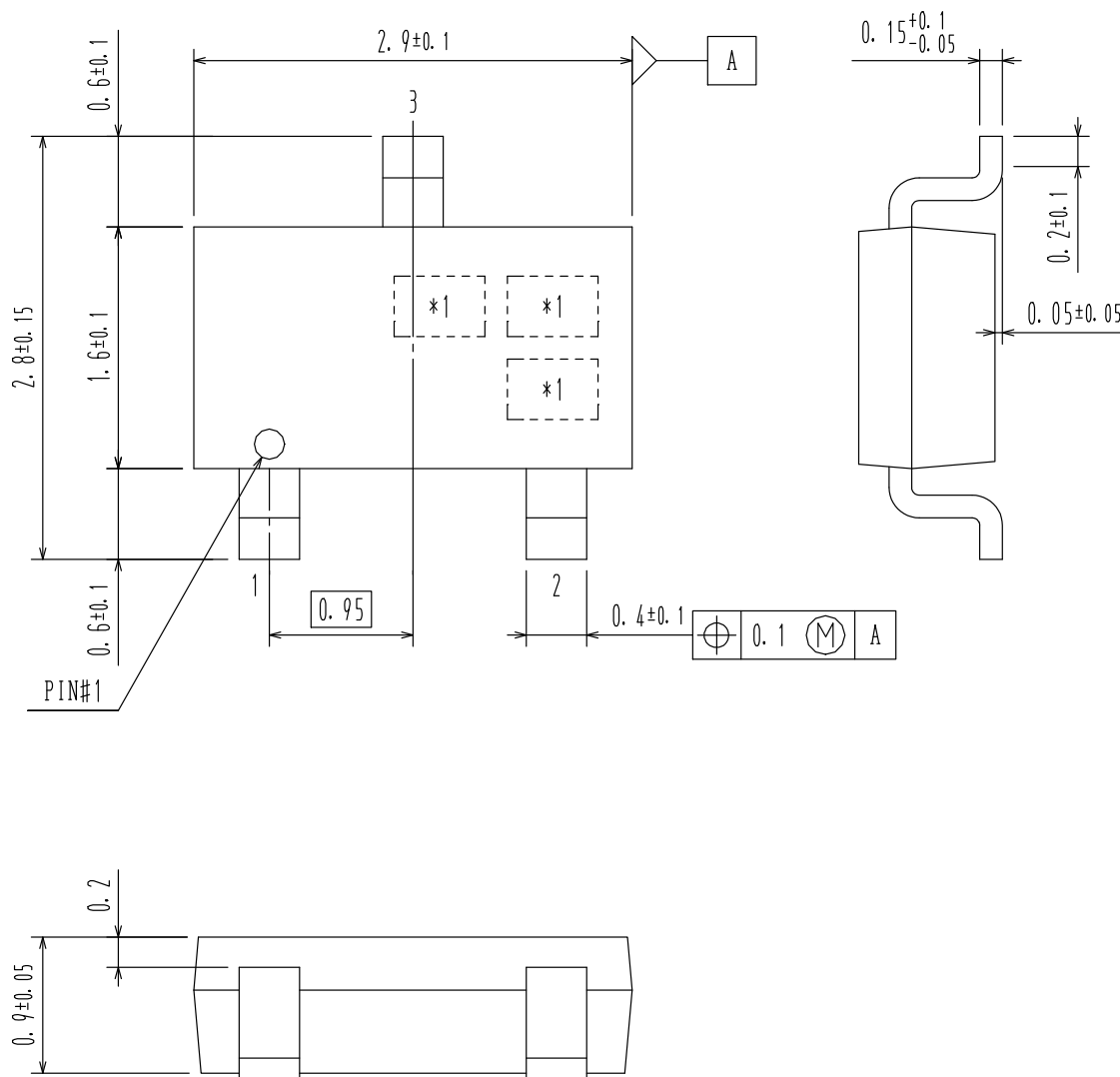


Figure 19.  $P_C - T_a$

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**ISSUE O**

DATE 30 NOV 2011



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