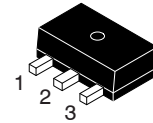


# Bipolar Transistor

(-)160 V, (-)0.7 A, Low  $V_{CE(sat)}$ ,  
(PNP) NPN Single PCP

## 2SA1418, 2SC3648



SOT-89 / PCP-1  
CASE 419AU

### Features

- Adoption of FBET, MBIT Processes
- Fast Switching Speed
- Ultrasmall Size Making it Easy to Provide High-density, Small-sized Hybrid IC's
- High Breakdown Voltage and Large Current Capacity
- This is a Pb-Free Device

### Applications

- Color TV Audio Output, Inverter

### Specifications

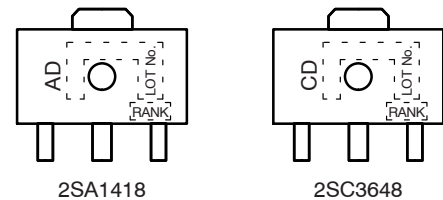
( ): 2SA1418

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

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CBO}$		(-)180	V
Collector-to-Emitter Voltage	$V_{CEO}$		(-)160	V
Emitter-to-Base Voltage	$V_{EBO}$		(-)6	V
Collector Current	$I_C$		(-)0.7	A
Collector Current (Pulse)	$I_{CP}$		(-)1.5	A
Collector Dissipation	$P_C$		500	mW
		When mounted on ceramic substrate (250 mm <sup>2</sup> x 0.8 mm)	1.3	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.

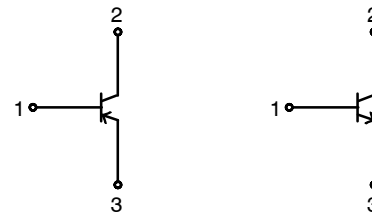
### MARKING DIAGRAM



2SA1418

2SC3648

### ELECTRICAL CONNECTION



2SA1418

2SC3648

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
2SA1418S-TD-E	PCP (Pb-Free)	1000 / Tape & Reel
2SC3648S-TD-E		
2SC3648T-TD-E		

<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](#).

# 2SA1418, 2SC3648

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

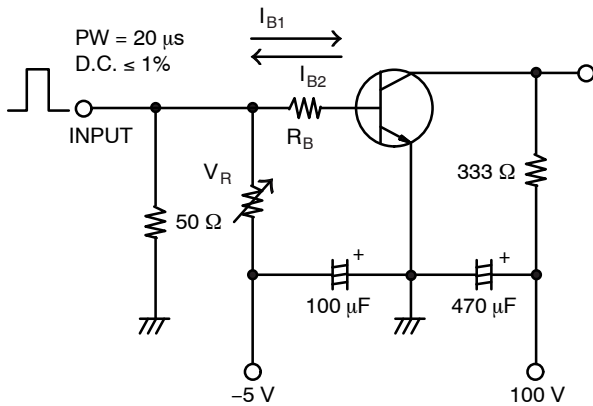
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector Cutoff Current	I <sub>CBO</sub>	V <sub>CB</sub> = (-)120 V, I <sub>E</sub> = 0 A	-	-	(-)0.1	μA
Emitter Cutoff Current	I <sub>EBO</sub>	V <sub>EB</sub> = (-)4 V, I <sub>C</sub> = 0 A	-	-	(-)0.1	μA
DC Current Gain	h <sub>FE1</sub>	V <sub>CE</sub> = (-)5 V, I <sub>C</sub> = (-)100 mA	100*	-	400*	
	h <sub>FE2</sub>	V <sub>CE</sub> = (-)5 V, I <sub>C</sub> = (-)10 mA	90	-	-	
Gain-Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = (-)10 V, I <sub>C</sub> = (-)50 mA	-	120	-	MHz
Output Capacitance	C <sub>ob</sub>	V <sub>CB</sub> = (-)10 V, f = 1 MHz	-	(11)8	-	pF
Collector-to-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = (-)250 mA, I <sub>B</sub> = (-)25 mA	-	(-0.2) 0.12	(-0.5) 0.4	V
Base-to-Emitter Saturation Voltage	V <sub>BE(sat)</sub>	I <sub>C</sub> = (-)250 mA, I <sub>B</sub> = (-)25 mA	-	(-)0.85	(-)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	(-)180	-	-	V
Collector-to-Emitter Breakdown Voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = (-)1 mA, R <sub>BE</sub> = ∞	(-)160	-	-	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 specified Test Circuit	-	(60) 50	-	ns
Storage Time	t <sub>stg</sub>		-	(900) 1000	-	ns
Fall Time	t <sub>f</sub>		-	(60) 60	-	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.

\* The 2SA1418 / 2SC3648 are classified by 100 mA h<sub>FE</sub> as follows:

Rank	R	S	T
h <sub>FE</sub>	100 to 200	140 to 280	200 to 400

### Switching Time Test Circuit



I<sub>C</sub> = 20I<sub>B1</sub> = -20I<sub>B2</sub> = 300 mA  
(For PNP, the polarity is reversed)

Figure 1. Switching Time Test Circuit

# 2SA1418, 2SC3648

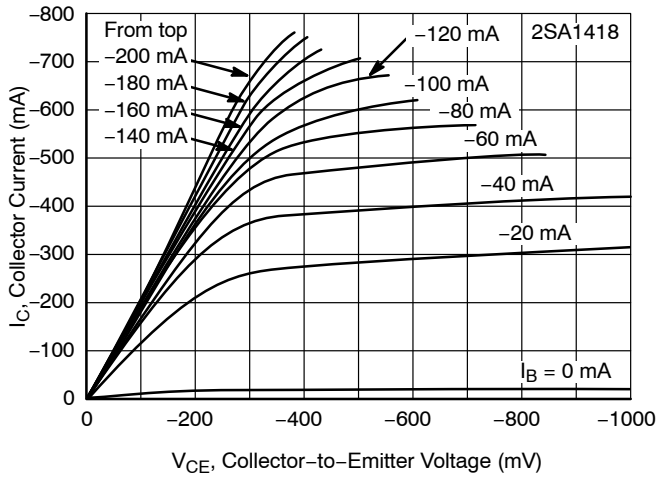


Figure 2.  $I_C - V_{CE}$

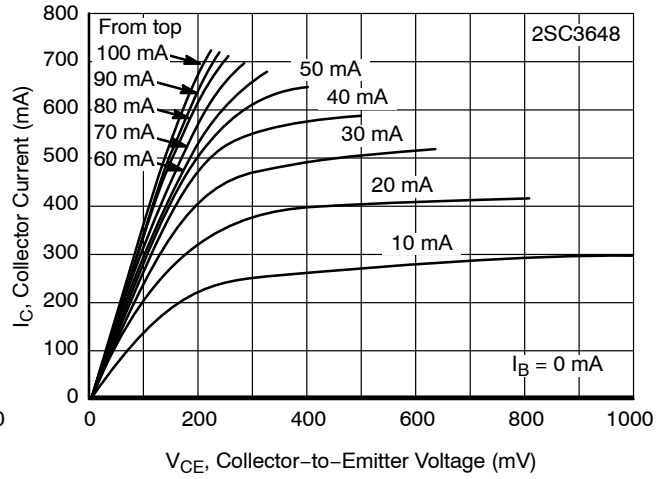


Figure 3.  $I_C - V_{CE}$

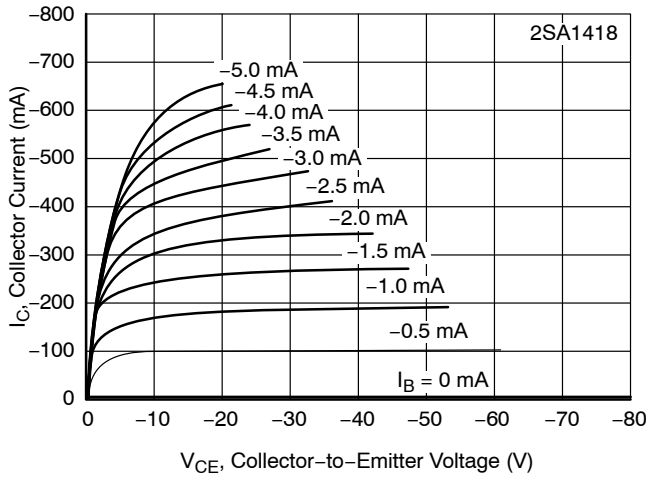


Figure 4.  $I_C - V_{CE}$

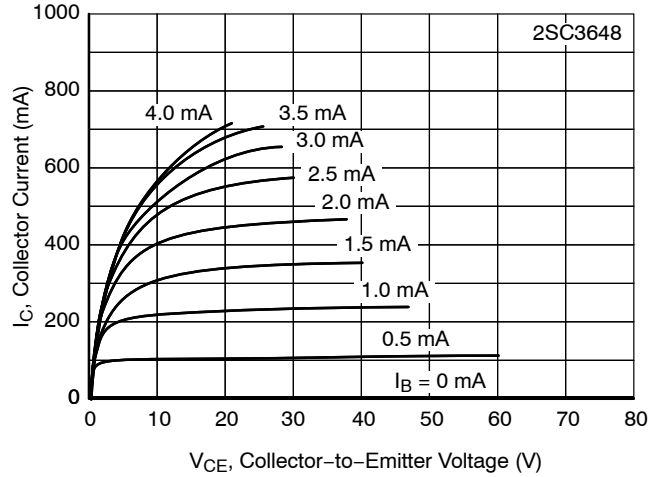


Figure 5.  $I_C - V_{CE}$

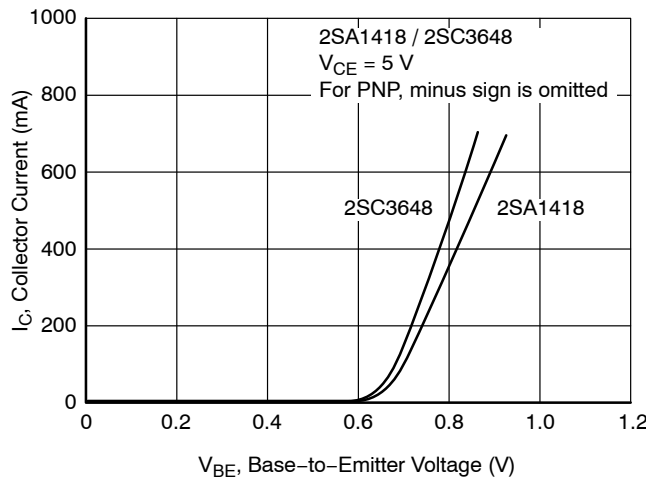


Figure 6.  $I_C - V_{BE}$

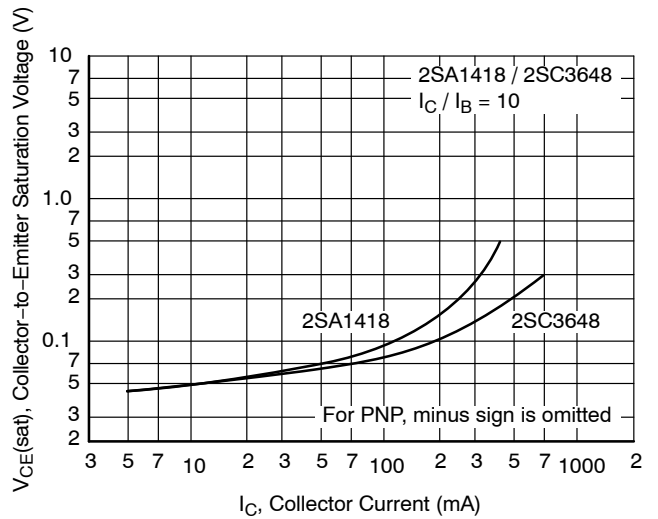
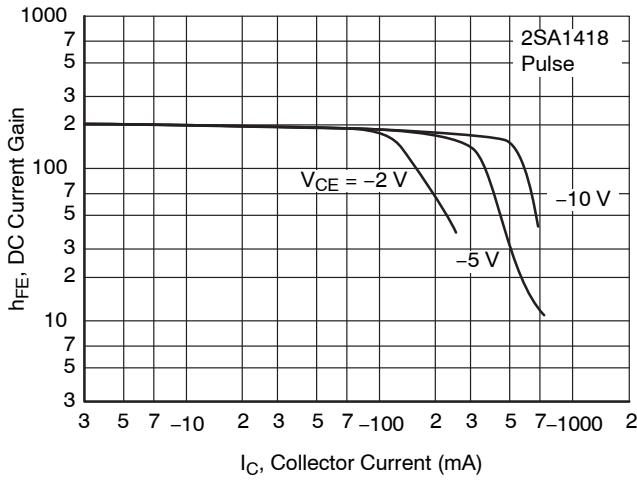
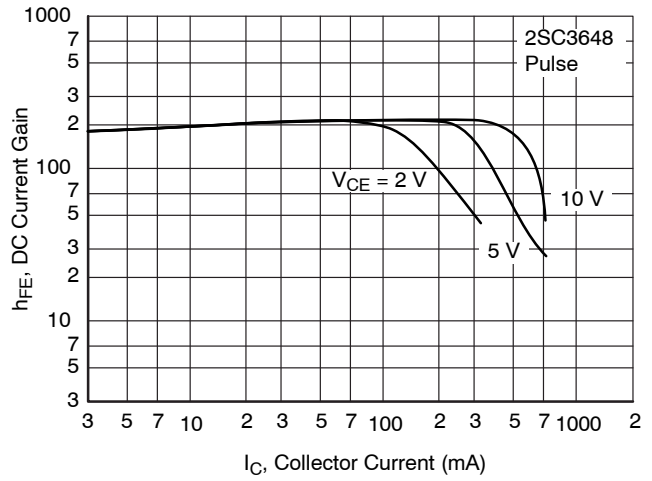


Figure 7.  $V_{CE(sat)} - I_C$

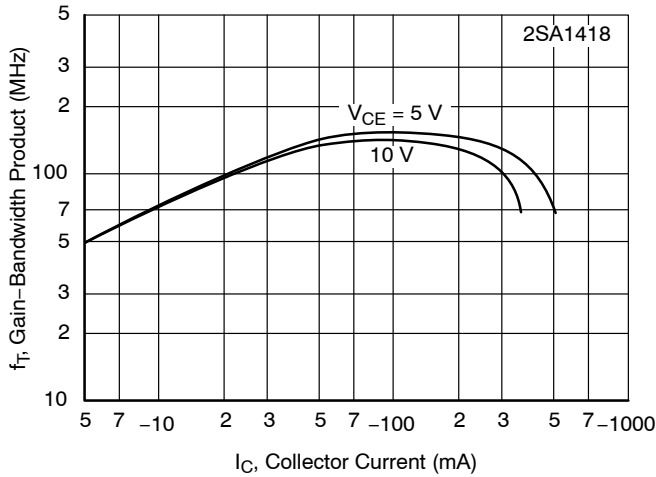
## 2SA1418, 2SC3648



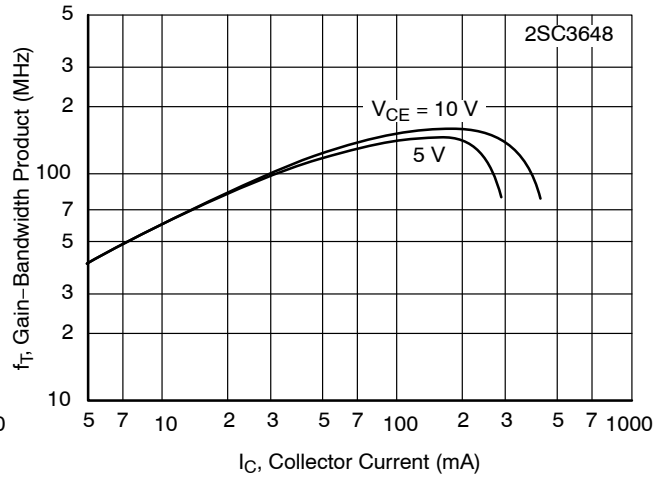
**Figure 8.  $h_{FE} - I_C$**



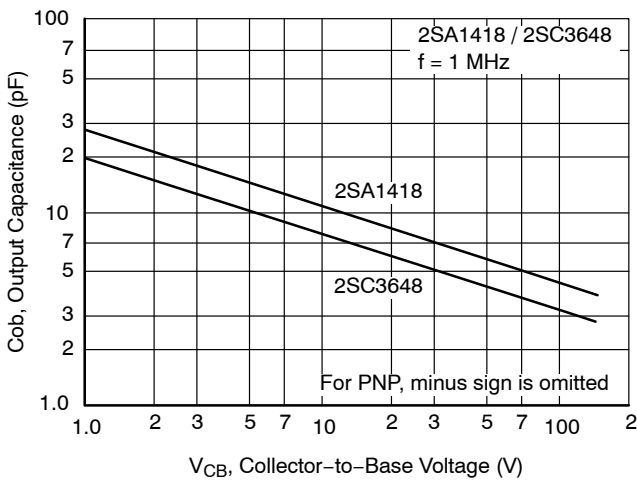
**Figure 9.  $h_{FE} - I_C$**



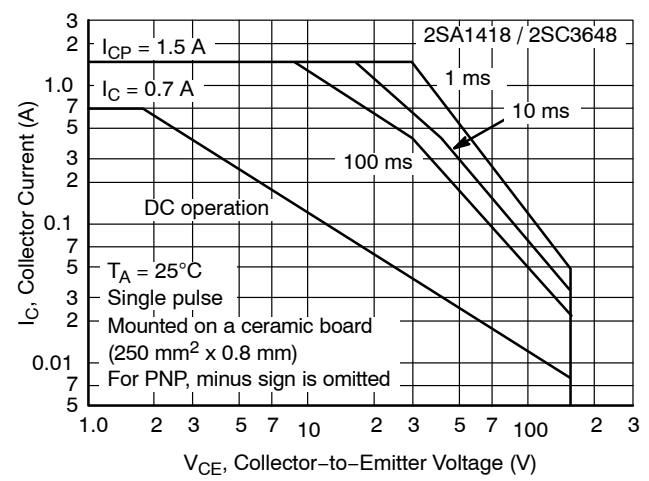
**Figure 10.  $f_T - I_C$**



**Figure 11.  $f_T - I_C$**



**Figure 12.  $C_{ob} - V_{CB}$**



**Figure 13. ASO**

# 2SA1418, 2SC3648

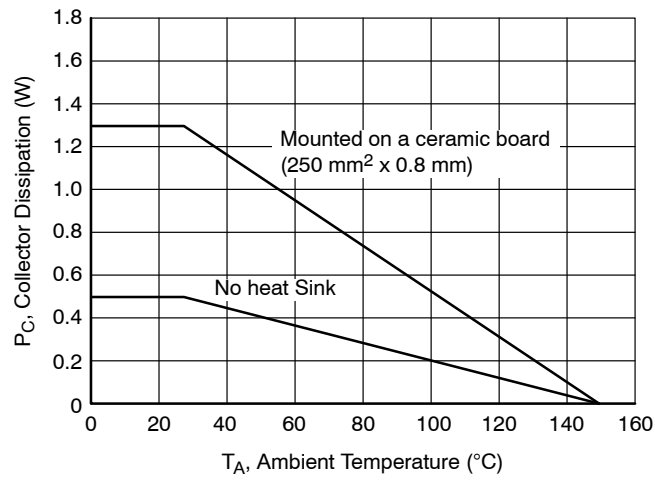


Figure 14.  $P_C - T_A$

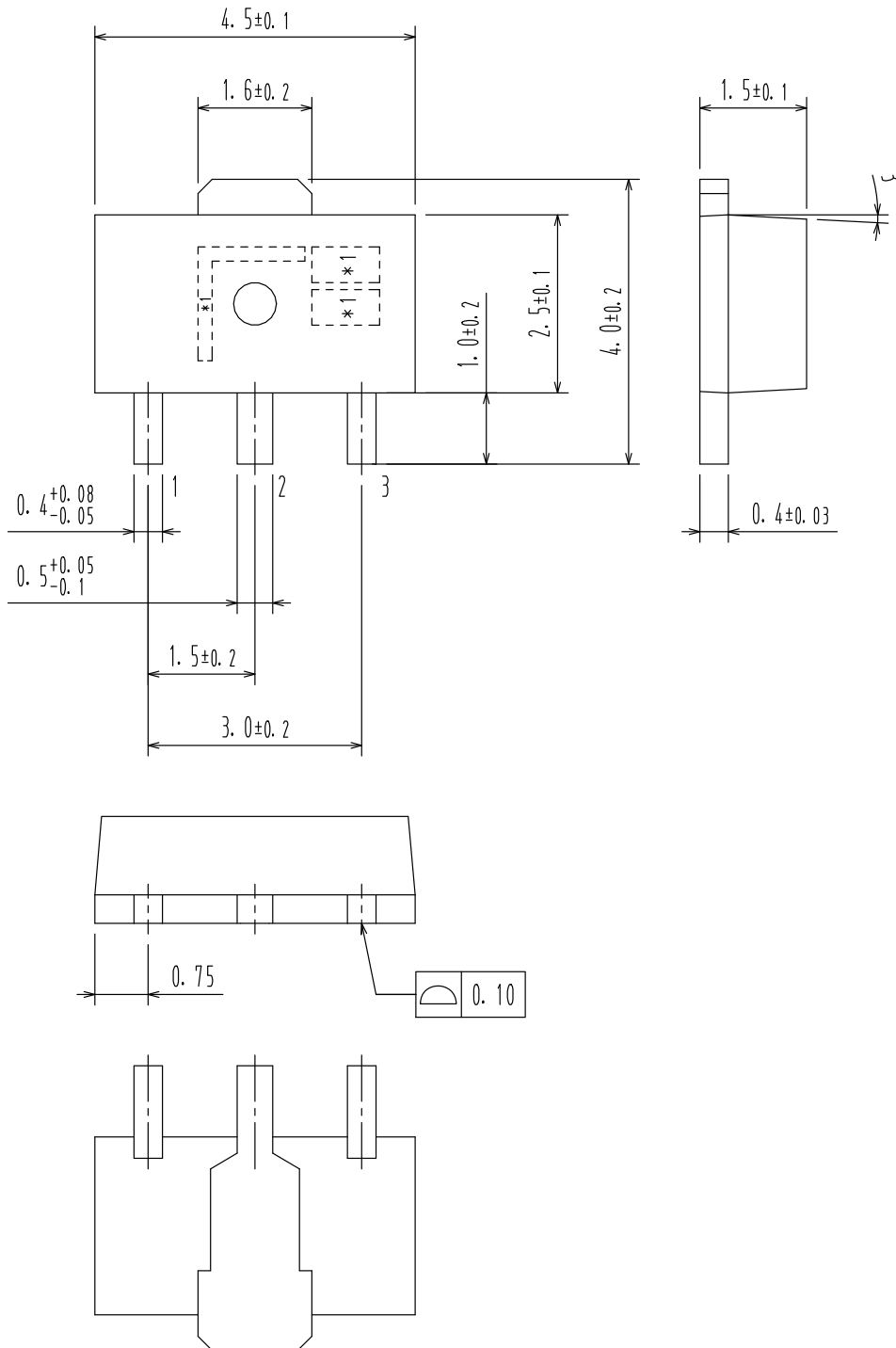
**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

ON Semiconductor®



**SOT-89 / PCP-1**  
**CASE 419AU**  
**ISSUE 0**

DATE 30 APR 2012



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