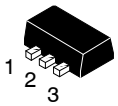
Bipolar Transistor

(-)100 V, (-)2 A, Low V_{CE}(sat), (PNP) NPN Single PCP

2SA1417, 2SC3647



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Features

- Adoption of FBET, MBIT Processes
- High Breakdown Voltage and Large Current Capacity
- Ultrasmall Size Making it Easy to Provide High−density Small−sized Hybrid ICs
- These Devices are Pb−Free and Halide Free

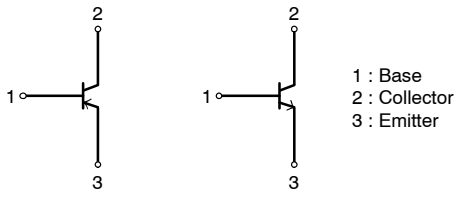
SPECIFICATIONS ( ): 2SA1417

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CBO}	Collector−to−Base Voltage		(−)120	V
V_{CEO}	Collector−to−Emitter Voltage		(−)100	V
V_{EBO}	Emitter−to−Base Voltage		(−)6	V
I_C	Collector Current		(−)2	A
I_{CP}	Collector Current (Pulse)		(−)3	A
P_C	Collector Dissipation	When mounted on ceramic substrate (250 mm^2 x 0.8 mm)	500	mW
			1.5	W
Tj	Junction Temperature		150	°C
Tstg	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.

ELECTRICAL CONNECTION



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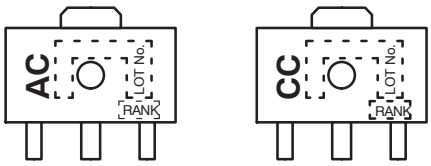
MARKING DIAGRAM



2SA1417 2SC3647

ORDERING INFORMATION

Device	Package	Shipping†
2SA1417S−TD−E	PCP (Pb−Free)	1000 / Tape & Reel
2SA1417T−TD−E	PCP (Pb−Free)	1000 / Tape & Reel
2SC3647S−TD−E	PCP (Pb−Free)	1000 / Tape & Reel
2SC3647T−TD−E	PCP (Pb−Free)	1000 / Tape & Reel

†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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

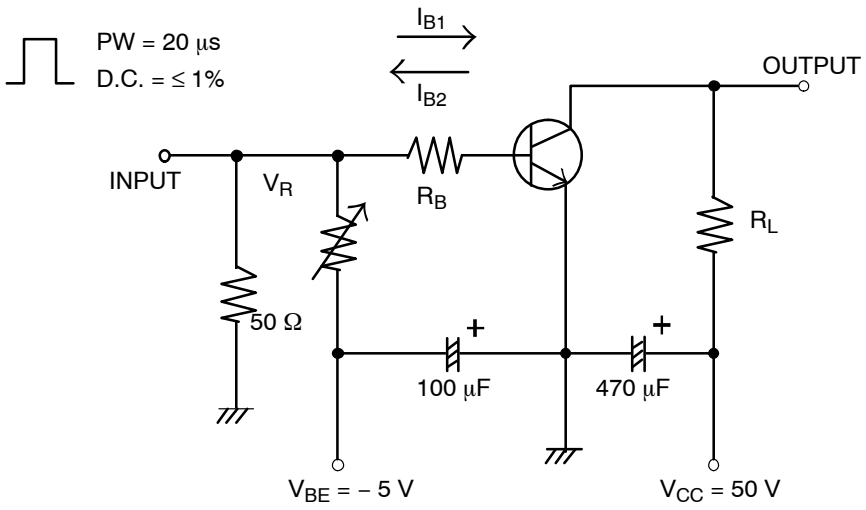
Symbol	Parameter	Conditions	Ratings			Unit
			Min	Typ	Max	
I_{CBO}	Collector Cutoff Current	V_{CB} = (−)100 V, I_E = 0 A	−	−	(−)100	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = (−)4 V I_C = 0 A	−	−	(−)100	nA
h_{FE}	DC Current Gain	V_{CE} = (−)5 V, I_C = (−)100 mA	100*	−	400*	−
f_T	Gain−Bandwidth Product	V_{CE} = (−)10 V, I_C = (−)100 mA	−	120	−	MHz
Cob	Output Capacitance	V_{CB} = (−)10 V, f = 1 MHz	−	(25)16	−	pF
V_{CE}(sat)	Collector−to−Emitter Saturation Voltage	I_C = (−)1 A, I_B= (−)100 mA	−	(−0.22) 0.13	(−0.6) 0.4	V
V_{BE}(sat)	Base−to−Emitter Saturation Voltage	I_C = (−)1 A, I_B= (−)100 mA	−	(−)0.85	(−)1.2	V
$V_{(BR)CBO}$	Collector−to−Base Breakdown Voltage	I_C = (−)10 μA, I_E = 0 A	(−)120	−	−	V
$V_{(BR)CEO}$	Collector−to−Emitter Breakdown Voltage	I_C = (−)1 mA, R_{BE} = ∞	(−)100	−	−	V
$V_{(BR)EBO}$	Emitter−to−Base Breakdown Voltage	I_E = (−)10 μA, I_C = 0 A	(−)6	−	−	V
t_{on}	Turn−On Time	See specified Test Circuit.	−	(80)80	−	ns
t_{stg}	Storage Time		−	(750)1000	−	ns
t_f	Fall Time		−	(40)50	−	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 2SA1417/2SC3647 are Classified by 100 mA h_{FE} as Follows:

Rank	R	S	T
h_{FE}	100 to 200	140 to 280	200 to 400

SWITCHING TIME TEST CIRCUIT



I_C = 10 I_{B1} = −10 I_{B2} = 0.7 A
For PNP, the polarity is reversed.

Figure 1. Switching Time Test Circuit

TYPICAL CHARACTERISTICS

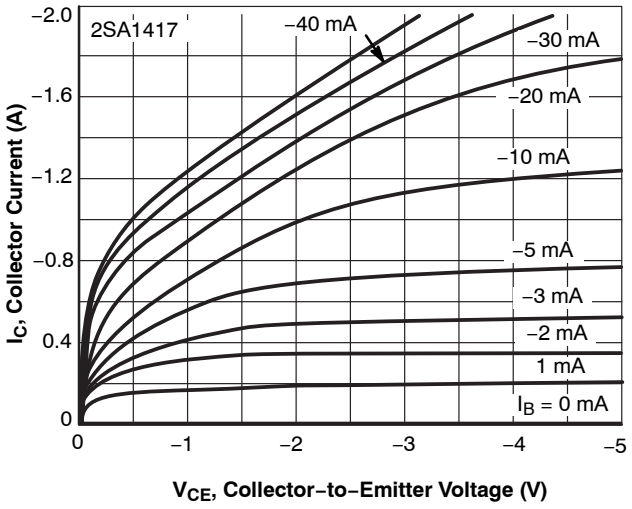


Figure 2. $I_C - V_{CE}$

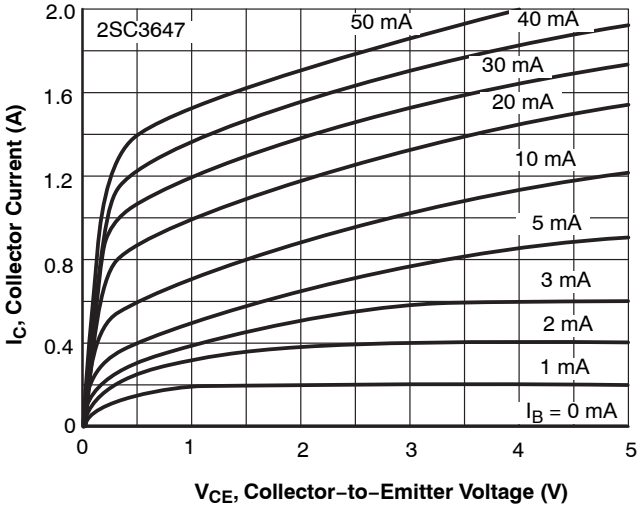


Figure 3. $I_C - V_{CE}$

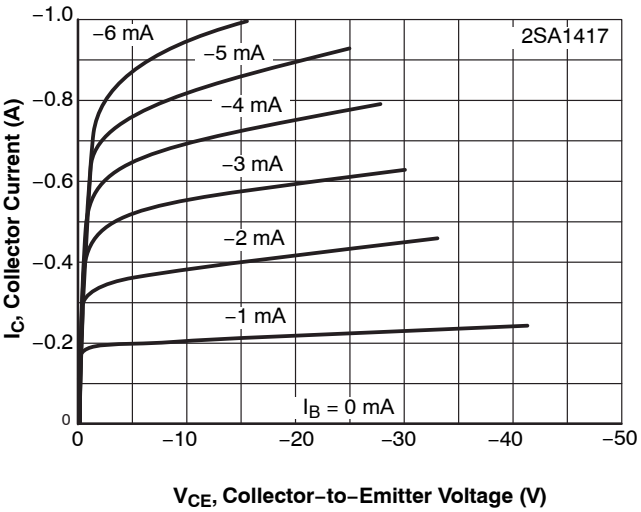


Figure 4. $I_C - V_{CE}$

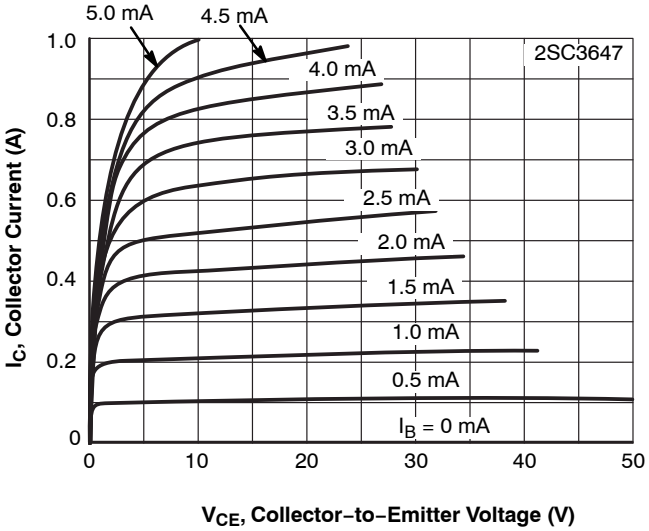


Figure 5. $I_C - V_{CE}$

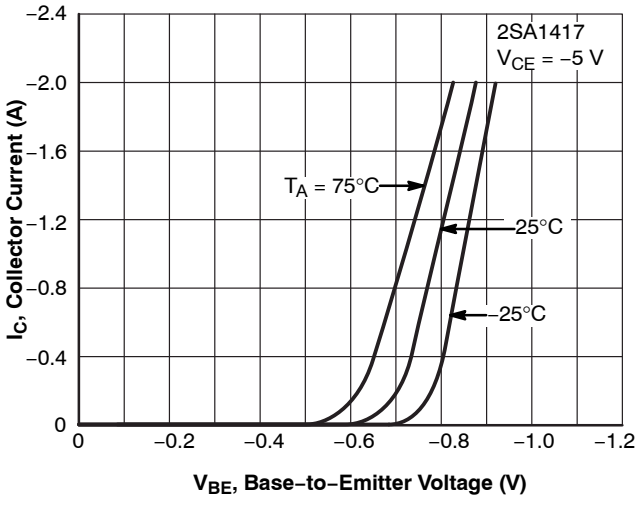


Figure 6. $I_C - V_{BE}$

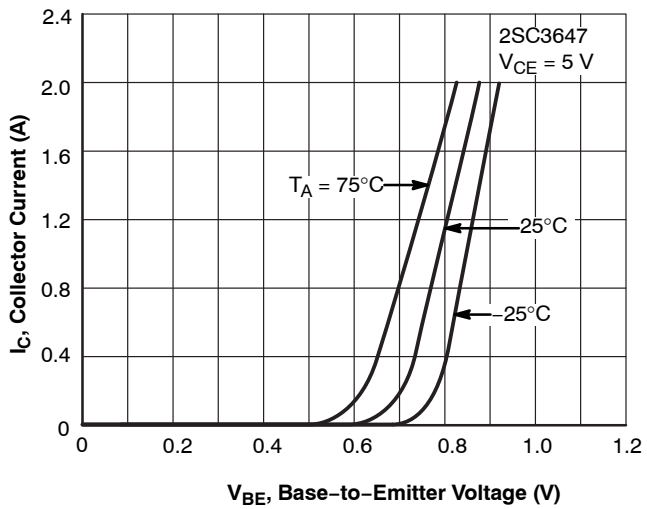


Figure 7. $I_C - V_{BE}$

TYPICAL CHARACTERISTICS (continued)

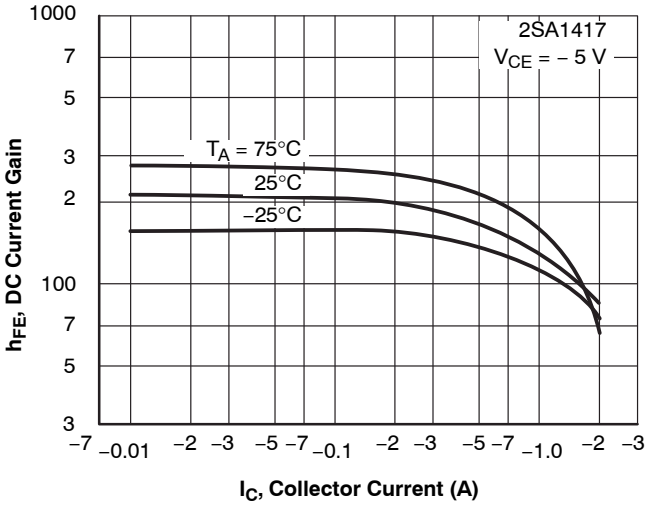


Figure 8. h_{FE} – I_C

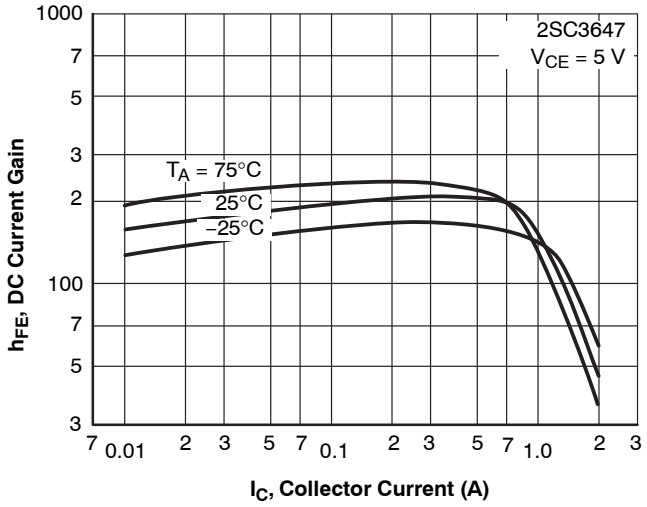


Figure 9. h_{FE} – I_C

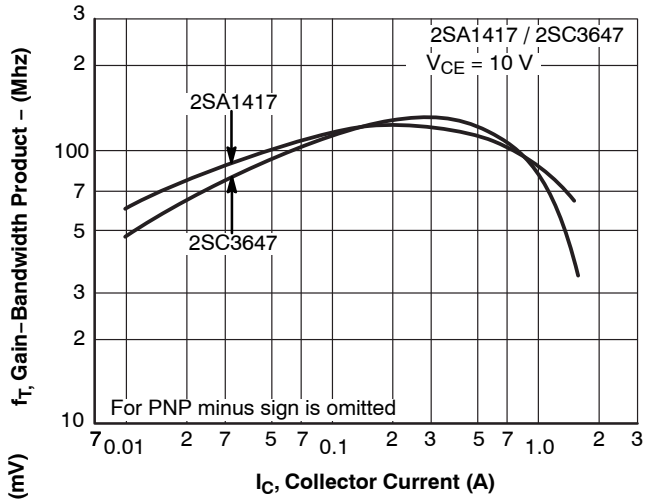


Figure 10. f_T – I_C

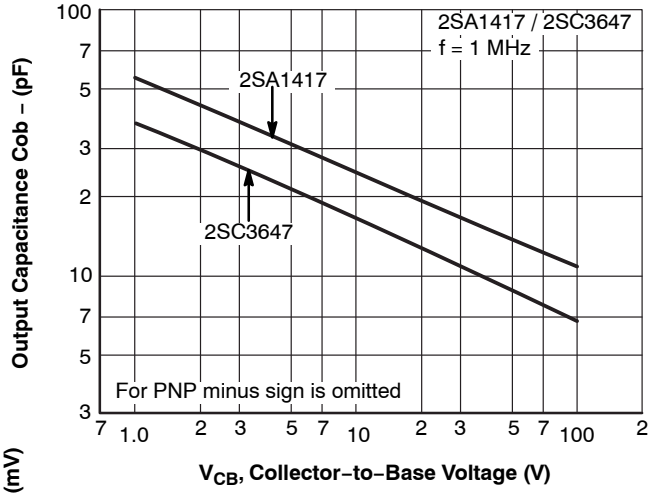


Figure 11. Cob – V_{CB}

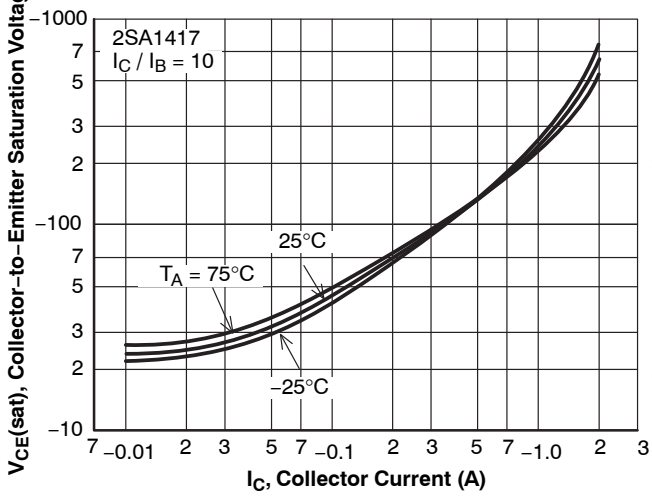


Figure 12. V_{CE} (sat) – I_C

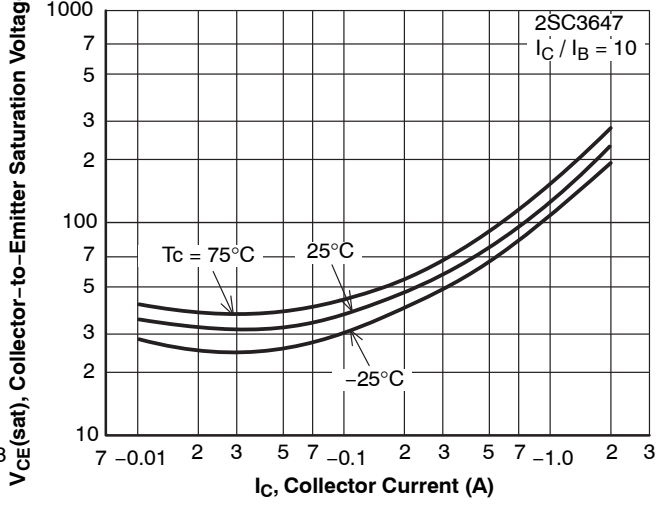


Figure 13. V_{CE} (sat) – I_C

TYPICAL CHARACTERISTICS (continued)

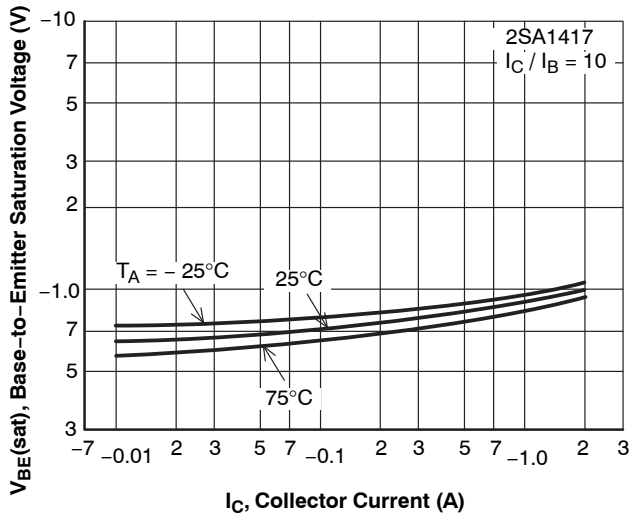


Figure 14. V_{BE} (sat) − I_C

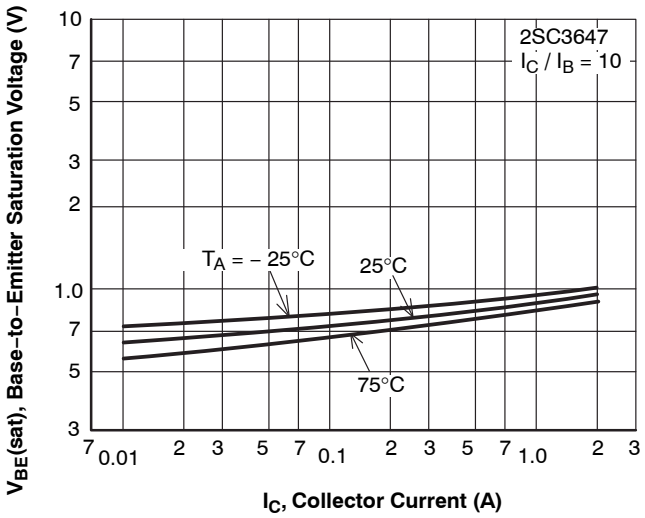


Figure 15. V_{BE} (sat) − I_C

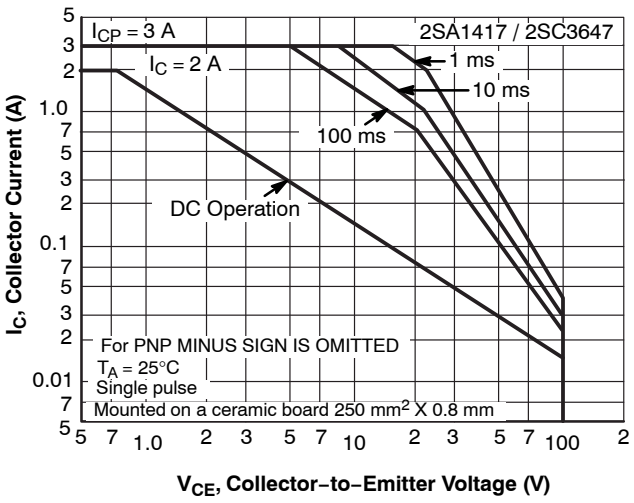


Figure 16. A S O

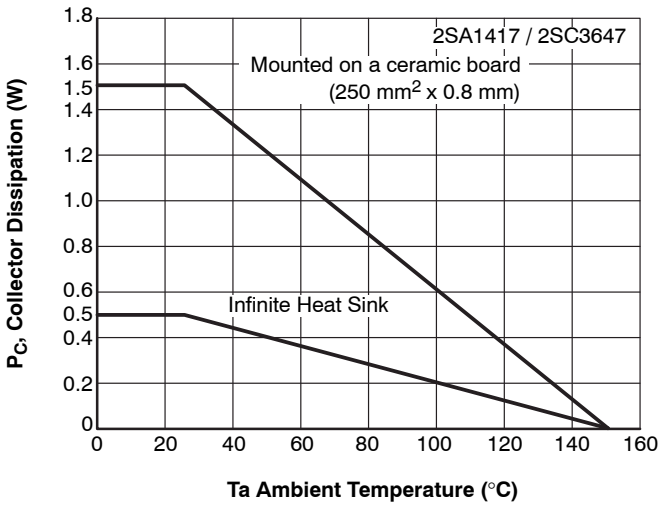


Figure 17. P_C − Ta

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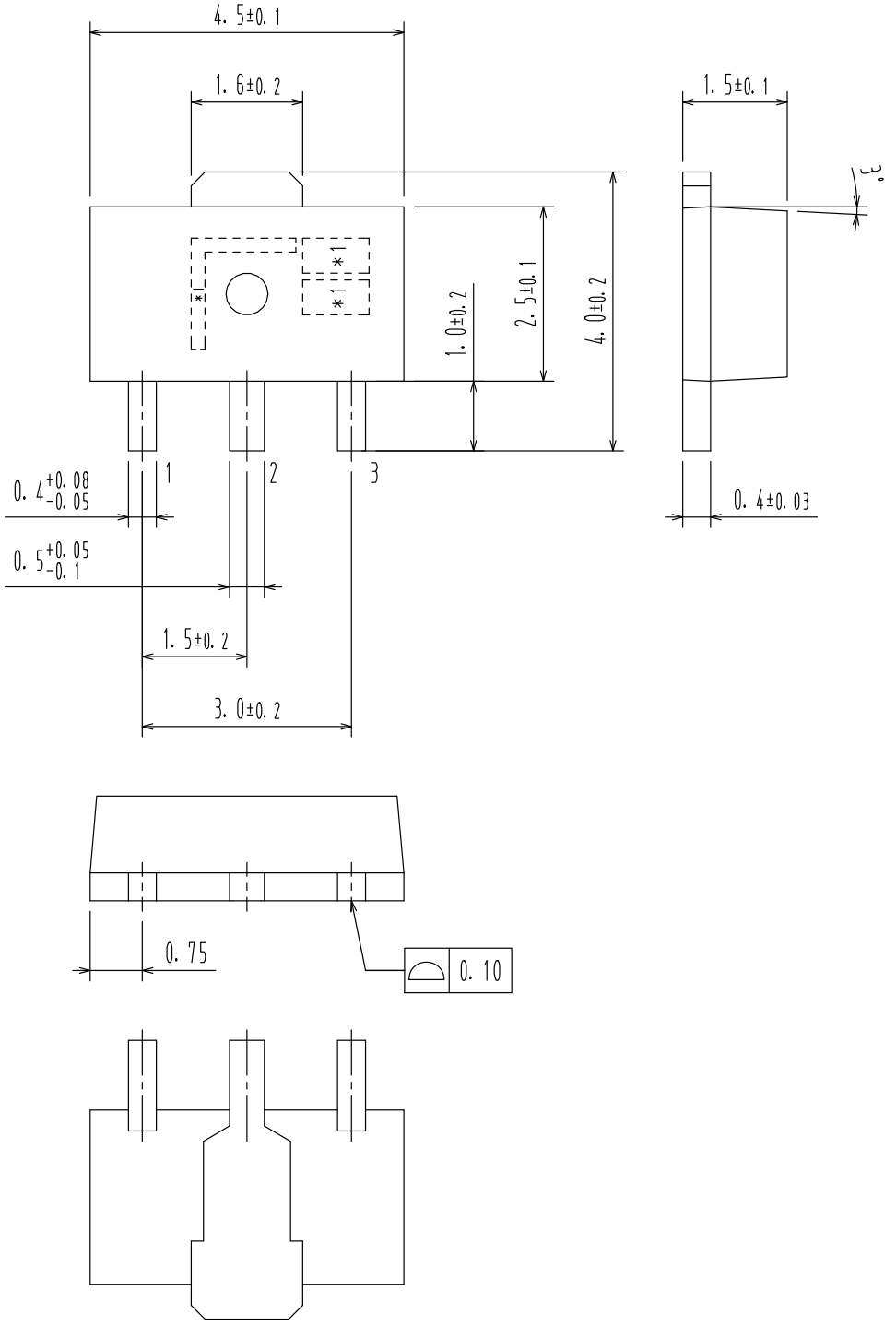

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