

Bipolar Transistor

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

2SA1417, 2SC3647

Features

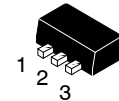
- Adoption of FBET, MBIT Processes
- High Breakdown Voltage and Large Current Capacity
- Ultrasmall Size Making it Easy to Provide High-density Small-sized Hybrid ICs
- These Devices are Pb-Free and Halide Free

SPECIFICATIONS (): 2SA1417

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

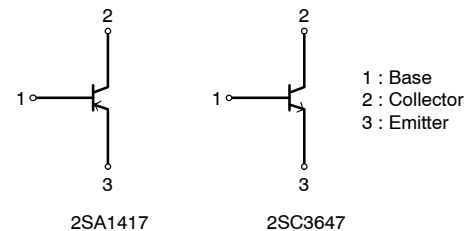
Symbol	Parameter	Conditions	Ratings	Unit
V_{CBO}	Collector-to-Base Voltage		(-)120	V
V_{CEO}	Collector-to-Emitter Voltage		(-)100	V
V_{EBO}	Emitter-to-Base Voltage		(-)6	V
I_C	Collector Current		(-)2	A
I_{CP}	Collector Current (Pulse)		(-)3	A
P_C	Collector Dissipation	When mounted on ceramic substrate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

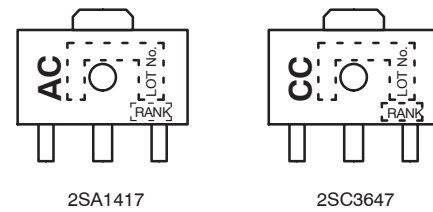


SOT-89-3
CASE 419AU

ELECTRICAL CONNECTION



MARKING DIAGRAM



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 ($T_A = 25^\circ\text{C}$)

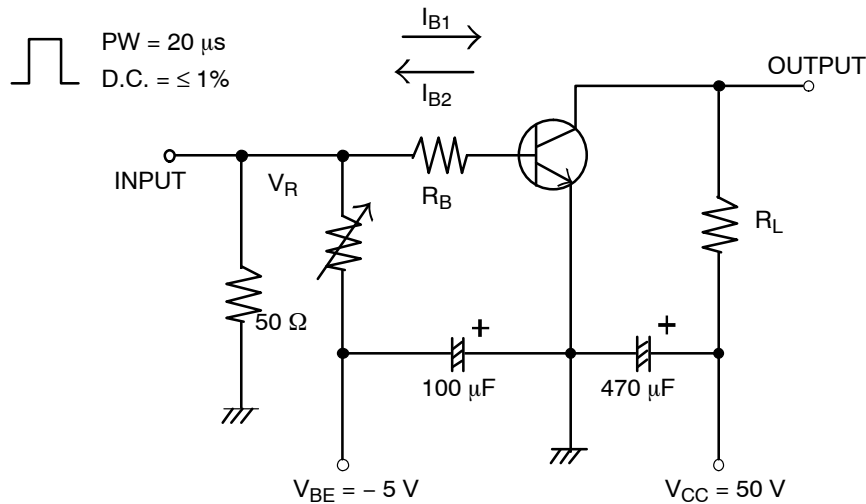
Symbol	Parameter	Conditions	Ratings			Unit
			Min	Typ	Max	
I_{CBO}	Collector Cutoff Current	$V_{CB} = (-)100\text{ V}$, $I_E = 0\text{ A}$	–	–	$(-)100$	nA
I_{EBO}	Emitter Cutoff Current	$V_{EB} = (-)4\text{ V}$, $I_C = 0\text{ A}$	–	–	$(-)100$	nA
h_{FE}	DC Current Gain	$V_{CE} = (-)5\text{ V}$, $I_C = (-)100\text{ mA}$	100*	–	400*	–
f_T	Gain–Bandwidth Product	$V_{CE} = (-)10\text{ V}$, $I_C = (-)100\text{ mA}$	–	120	–	MHz
C_{ob}	Output Capacitance	$V_{CB} = (-)10\text{ V}$, $f = 1\text{ MHz}$	–	(25)16	–	pF
$V_{CE(sat)}$	Collector–to–Emitter Saturation Voltage	$I_C = (-)1\text{ A}$, $I_B = (-)100\text{ mA}$	–	(–0.22) 0.13	(–0.6) 0.4	V
$V_{BE(sat)}$	Base–to–Emitter Saturation Voltage	$I_C = (-)1\text{ A}$, $I_B = (-)100\text{ mA}$	–	(–)0.85	(–)1.2	V
$V_{(BR)CBO}$	Collector–to–Base Breakdown Voltage	$I_C = (-)10\text{ }\mu\text{A}$, $I_E = 0\text{ A}$	(–)120	–	–	V
$V_{(BR)CEO}$	Collector–to–Emitter Breakdown Voltage	$I_C = (-)1\text{ mA}$, $R_{BE} = \infty$	(–)100	–	–	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.	–	(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



$I_C = 10\text{ I}_{B1} = -10\text{ I}_{B2} = 0.7\text{ A}$
For PNP, the polarity is reversed.

Figure 1. Switching Time Test Circuit

TYPICAL CHARACTERISTICS

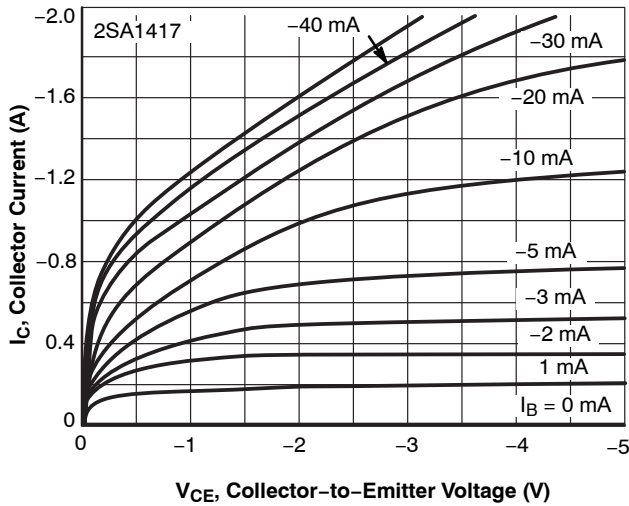


Figure 2. $I_C - V_{CE}$

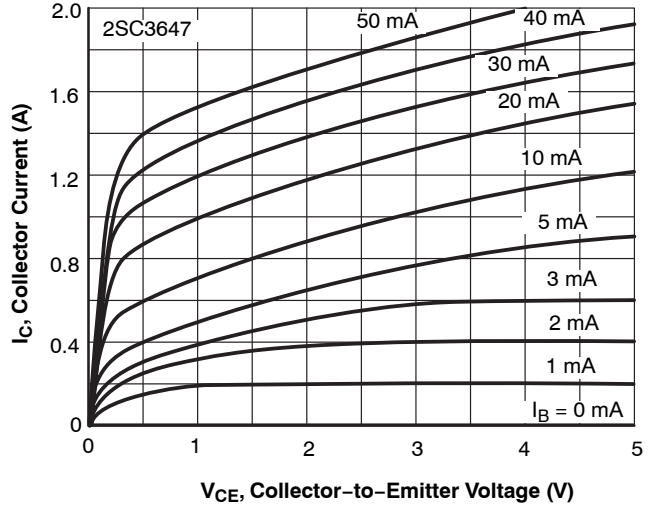


Figure 3. $I_C - V_{CE}$

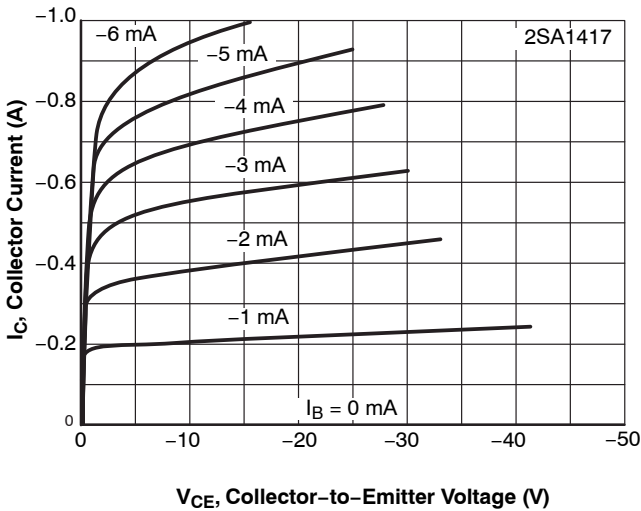


Figure 4. $I_C - V_{CE}$

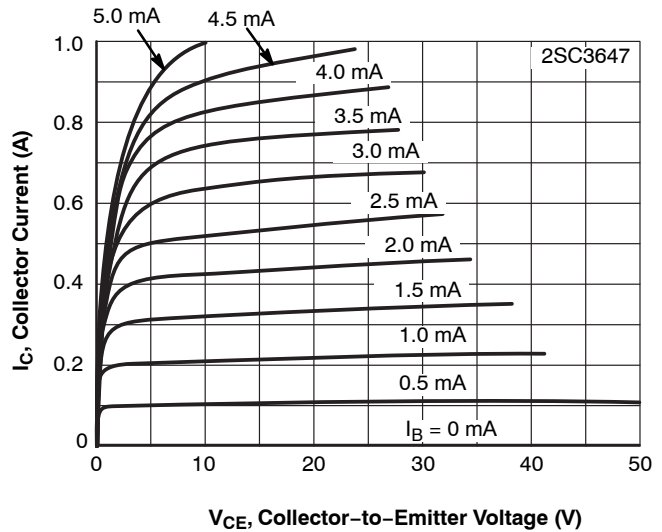


Figure 5. $I_C - V_{CE}$

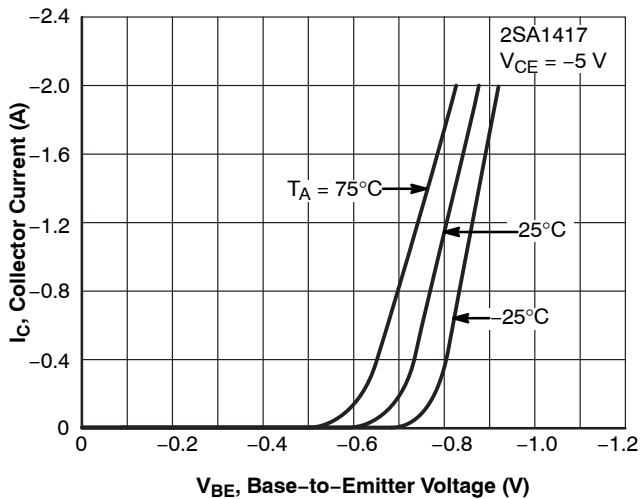


Figure 6. $I_C - V_{BE}$

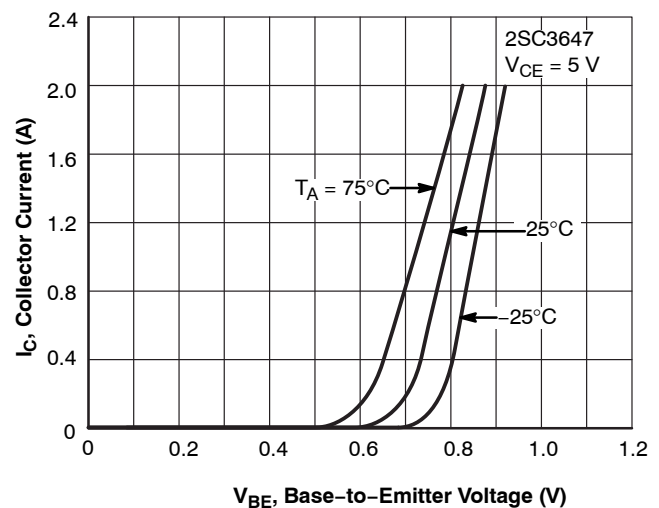
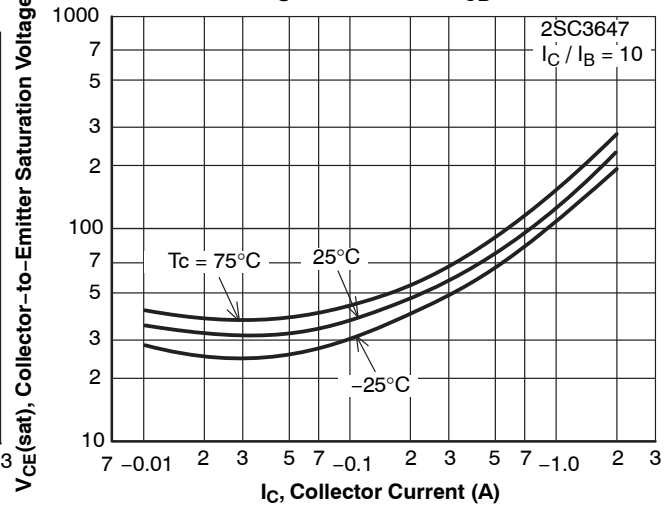
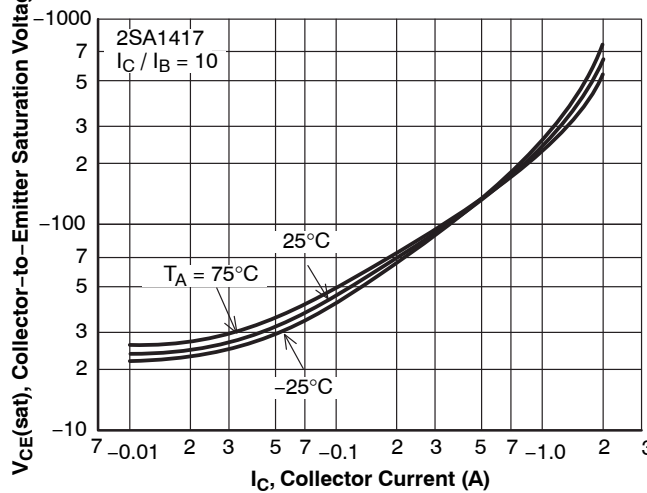
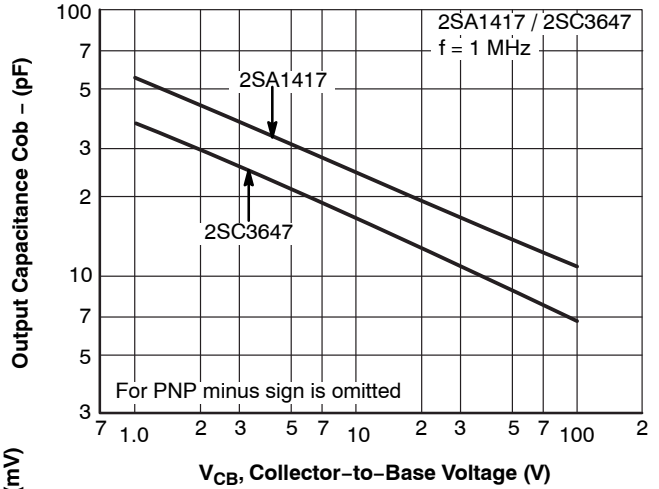
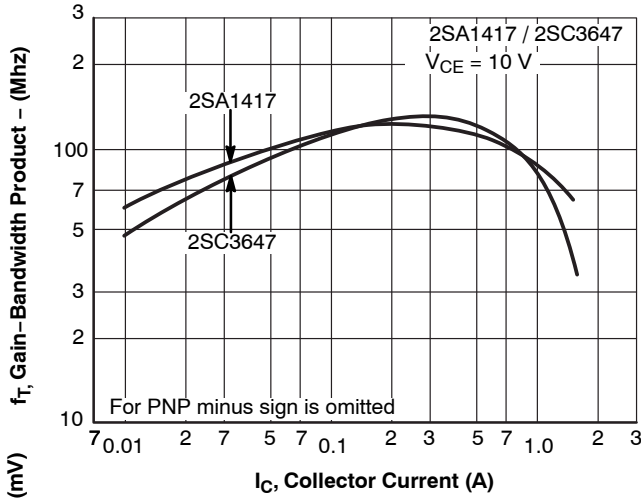
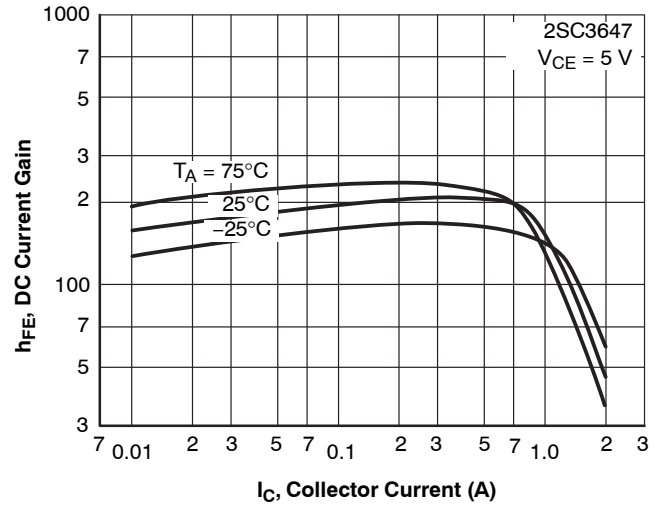
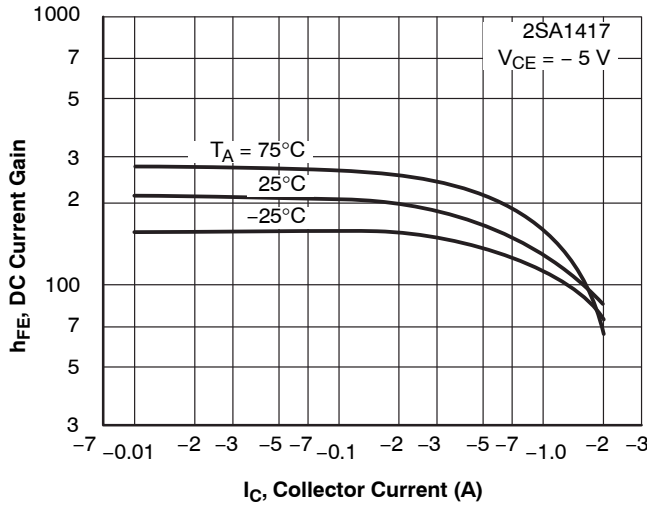


Figure 7. $I_C - V_{BE}$

TYPICAL CHARACTERISTICS (continued)



TYPICAL CHARACTERISTICS (continued)

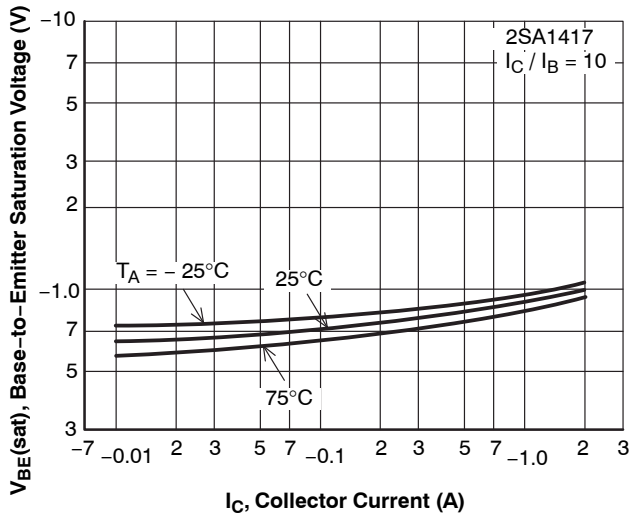


Figure 14. $V_{BE}(\text{sat}) - I_C$

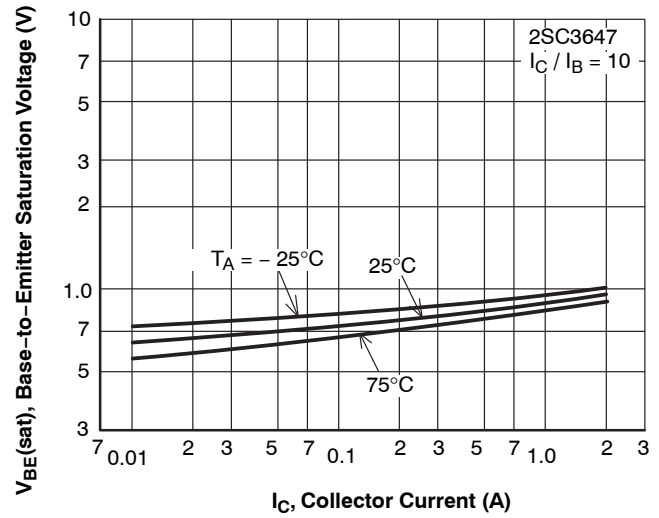


Figure 15. $V_{BE}(\text{sat}) - I_C$

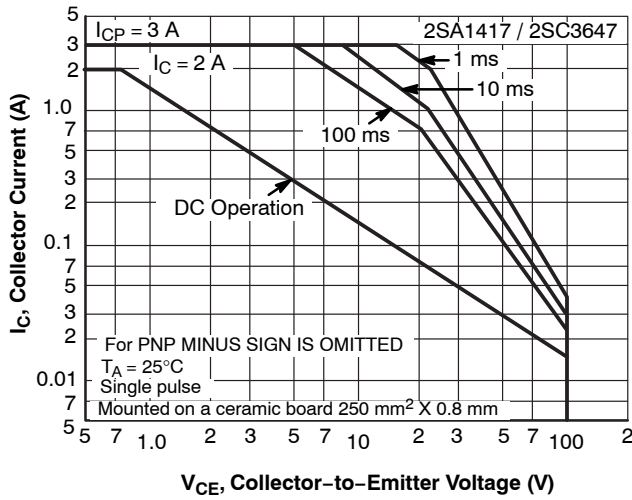


Figure 16. A S O

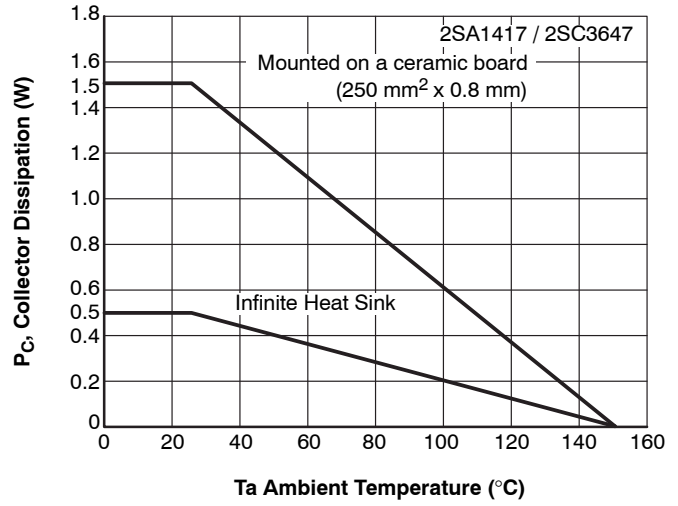
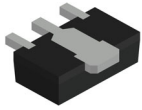
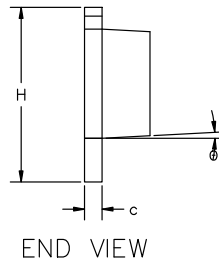
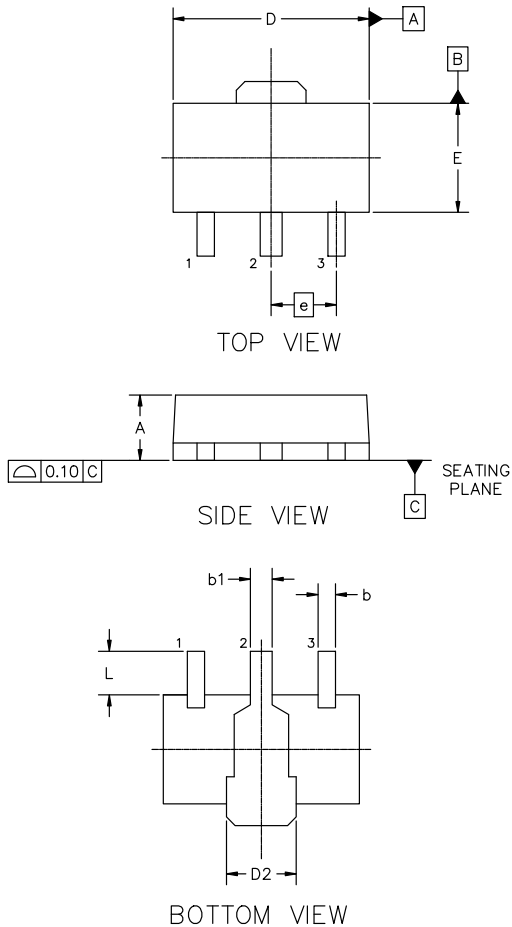


Figure 17. $P_C - T_a$



SOT-89 4.50x2.50x1.50 1.50P
CASE 419AU
ISSUE A

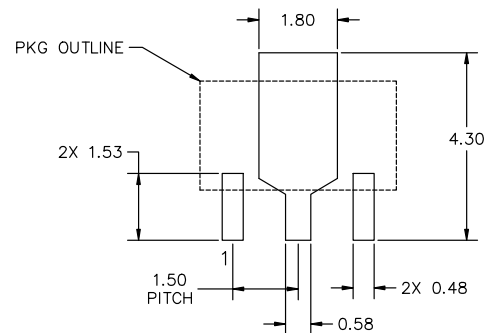
DATE 21 MAY 2025



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. LEAD THICKNESS INCLUDES LEAD FINISH.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	1.40	1.50	1.60
b	0.35	0.40	0.48
b1	0.40	0.50	0.55
c	0.37	0.40	0.43
D	4.40	4.50	4.60
D2	1.40	1.60	1.80
E	2.40	2.50	2.60
e	1.50 BSC		
H	3.80	4.00	4.20
L	0.80	1.00	1.20
θ	0°	---	3°



RECOMMENDED MOUNTING FOOTPRINT

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

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DESCRIPTION:	SOT-89 4.50x2.50x1.50 1.50P	PAGE 1 OF 1

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