

# BC856BWT1 Series, BC857BWT1 Series, BC858AWT1 Series

Preferred Devices

## General Purpose Transistors

### PNP Silicon

These transistors are designed for general purpose amplifier applications. They are housed in the SC-70/SOT-323 which is designed for low power surface mount applications.

#### Features

- Pb-Free Packages are Available

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

Rating	Symbol	Value	Unit	
Collector-Emitter Voltage	BC856 BC857 BC858	$V_{CEO}$	-65 -45 -30	V
Collector-Base Voltage	BC856 BC857 BC858	$V_{CBO}$	-80 -50 -30	V
Emitter-Base Voltage		$V_{EBO}$	-5.0	V
Collector Current – Continuous		$I_C$	-100	mAdc

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board, (Note 1) $T_A = 25^\circ\text{C}$	$P_D$	150	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	883	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

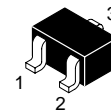
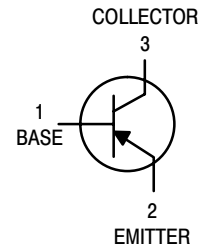
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. FR-5 = 1.0 x 0.75 x 0.062 in.



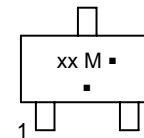
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SC-70/SOT-323  
CASE 419  
STYLE 3

#### MARKING DIAGRAM



xx = Specific Device Code

M = Date Code\*

▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

## BC856BWT1 Series, BC857BWT1 Series, BC858AWT1 Series

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Collector–Emitter Breakdown Voltage ( $I_C = -10\text{ mA}$ )	BC856 Series BC857 Series BC858 Series	$V_{(BR)CEO}$	-65 -45 -30	- - -	- - -	V
Collector–Emitter Breakdown Voltage ( $I_C = -10\ \mu\text{A}$ , $V_{EB} = 0$ )	BC856 Series BC857B Only BC858 Series	$V_{(BR)CES}$	-80 -50 -30	- - -	- - -	V
Collector–Base Breakdown Voltage ( $I_C = -10\ \mu\text{A}$ )	BC856 Series BC857 Series BC858 Series	$V_{(BR)CBO}$	-80 -50 -30	- - -	- - -	V
Emitter–Base Breakdown Voltage ( $I_E = -1.0\ \mu\text{A}$ )	BC856 Series BC857 Series BC858 Series	$V_{(BR)EBO}$	-5.0 -5.0 -5.0	- - -	- - -	V
Collector Cutoff Current ( $V_{CB} = -30\text{ V}$ ) ( $V_{CB} = -30\text{ V}$ , $T_A = 150^\circ\text{C}$ )		$I_{CBO}$	- -	- -	-15 -4.0	nA $\mu\text{A}$
<b>ON CHARACTERISTICS</b>						
DC Current Gain ( $I_C = -10\ \mu\text{A}$ , $V_{CE} = -5.0\text{ V}$ )	BC856A, BC858A BC856B, BC857B, BC858B BC857C	$h_{FE}$	- - -	90 150 270	- - -	-
( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )	BC856A, BC858A BC856B, BC857B, BC858B BC857C		125 220 420	180 290 520	250 475 800	
Collector–Emitter Saturation Voltage ( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ ) ( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ )		$V_{CE(sat)}$	- -	- -	-0.3 -0.65	V
Base–Emitter Saturation Voltage ( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ ) ( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ )		$V_{BE(sat)}$	- -	-0.7 -0.9	- -	V
Base–Emitter On Voltage ( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ ) ( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )		$V_{BE(on)}$	-0.6 -	- -	-0.75 -0.82	V
<b>SMALL–SIGNAL CHARACTERISTICS</b>						
Current–Gain – Bandwidth Product ( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )		$f_T$	100	-	-	MHz
Output Capacitance ( $V_{CB} = -10\text{ V}$ , $f = 1.0\text{ MHz}$ )		$C_{ob}$	-	-	4.5	pF
Noise Figure ( $I_C = -0.2\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )		NF	-	-	10	dB

BC857/BC858

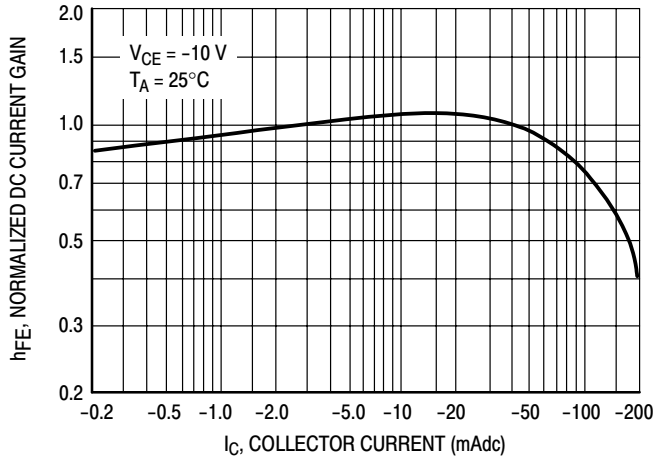


Figure 1. Normalized DC Current Gain

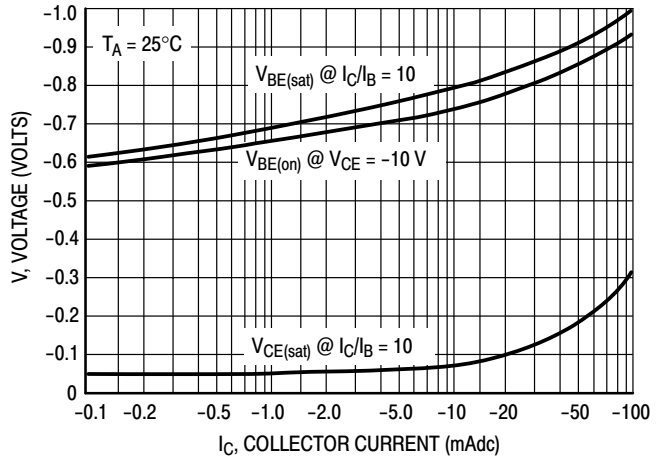


Figure 2. "Saturation" and "On" Voltages

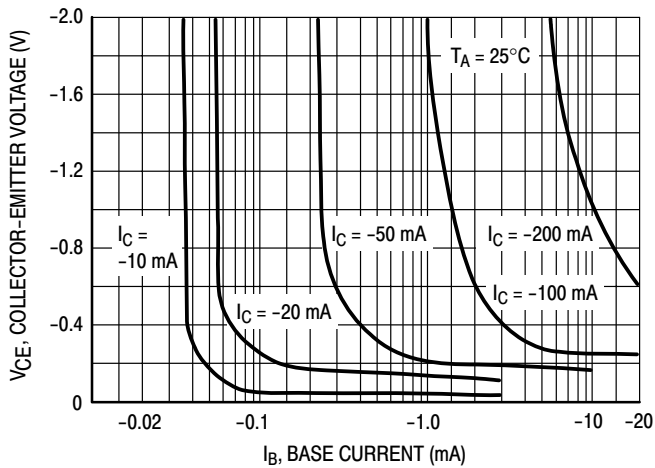


Figure 3. Collector Saturation Region

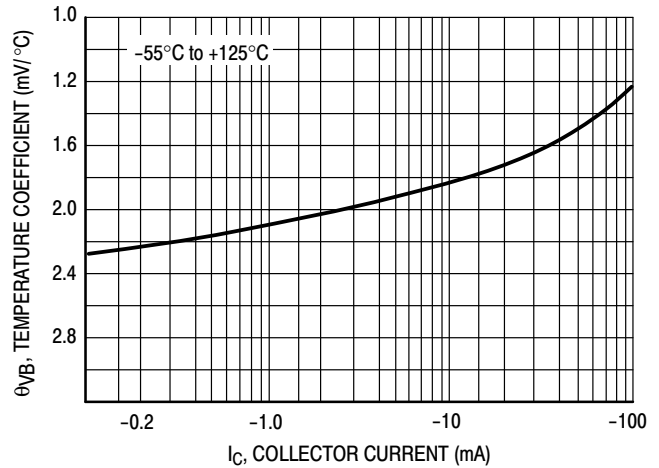


Figure 4. Base-Emitter Temperature Coefficient

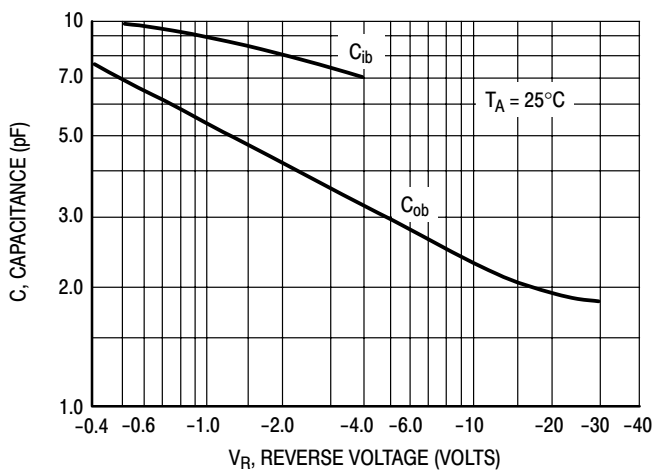


Figure 5. Capacitances

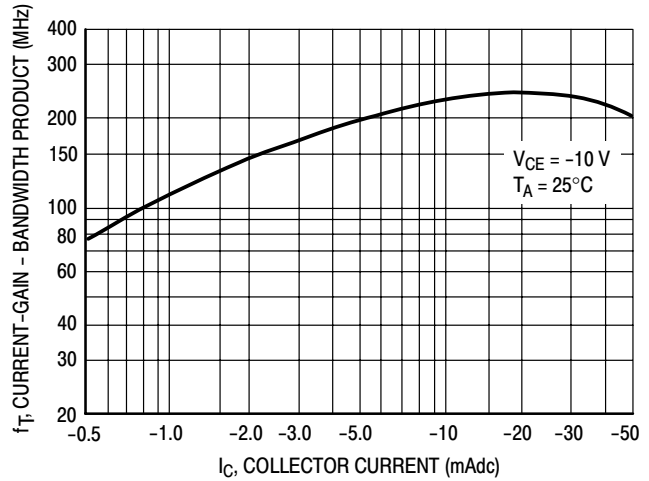


Figure 6. Current-Gain - Bandwidth Product

BC856

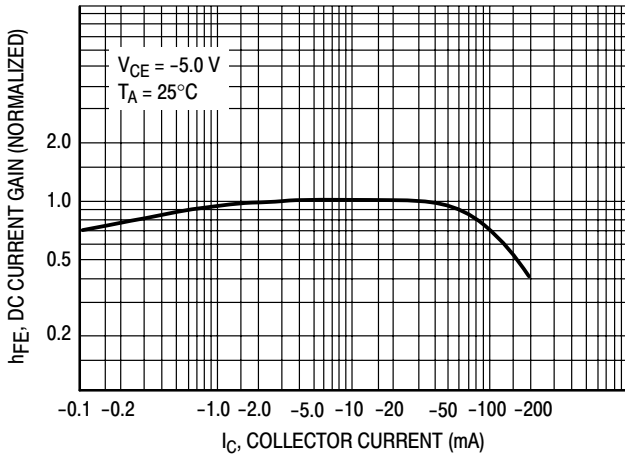


Figure 7. DC Current Gain

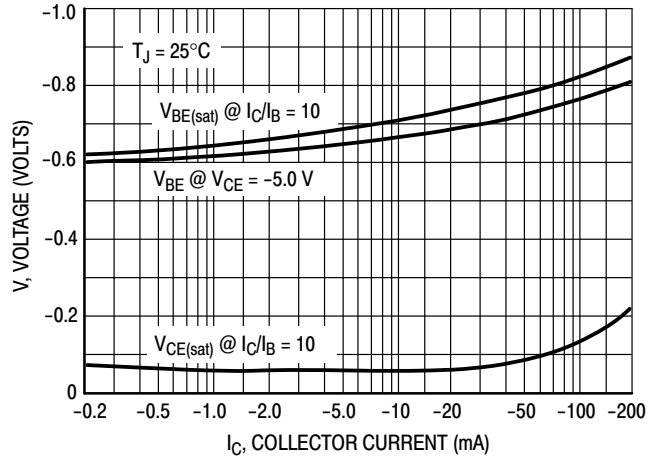


Figure 8. "On" Voltage

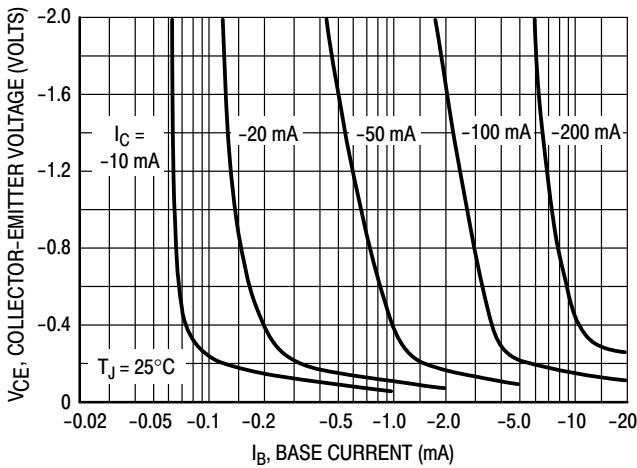


Figure 9. Collector Saturation Region

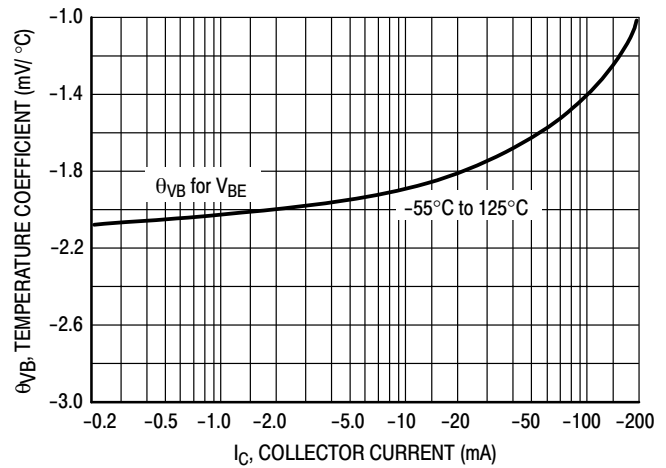


Figure 10. Base-Emitter Temperature Coefficient

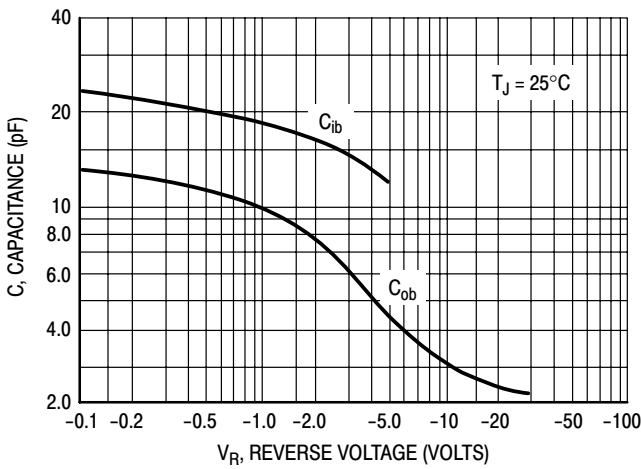


Figure 11. Capacitance

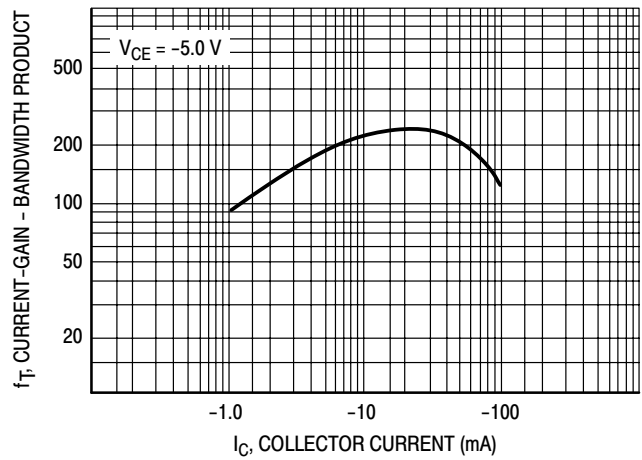
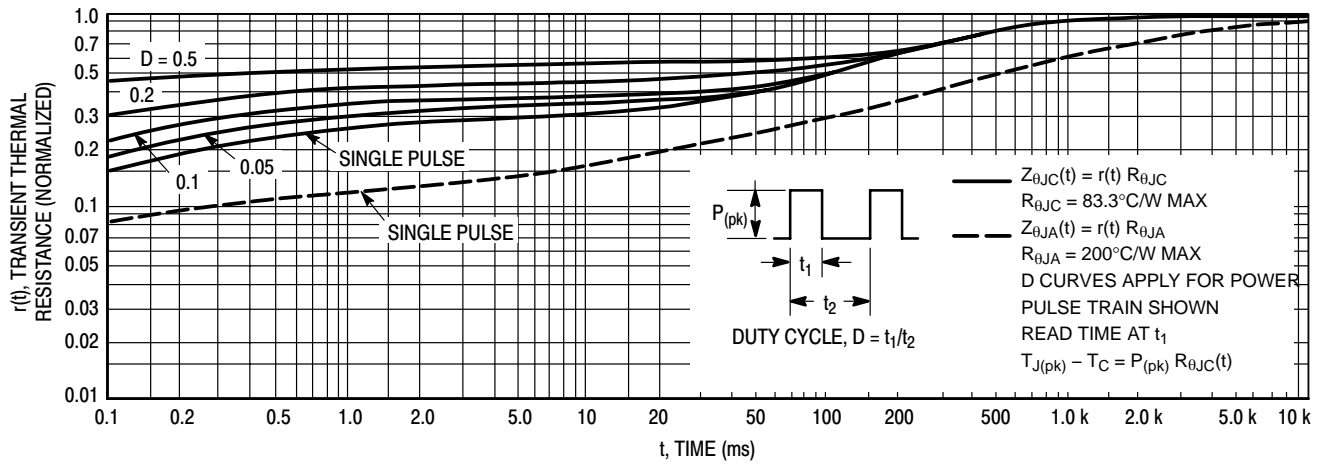
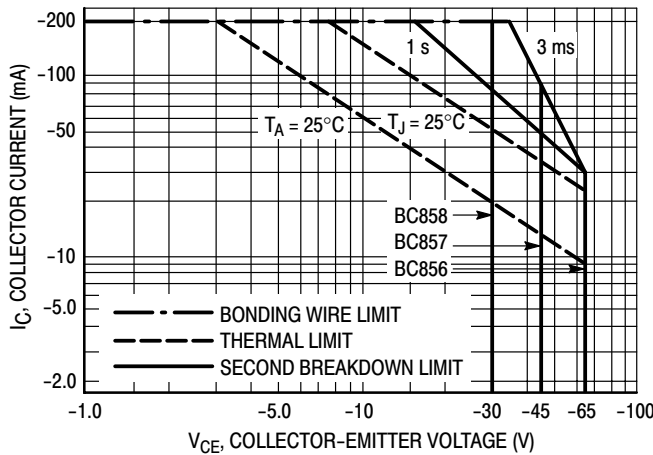


Figure 12. Current-Gain - Bandwidth Product

## BC856BWT1 Series, BC857BWT1 Series, BC858AWT1 Series



**Figure 13. Thermal Response**



**Figure 14. Active Region Safe Operating Area**

The safe operating area curves indicate  $I_C$ – $V_{CE}$  limits of the transistor that must be observed for reliable operation. Collector load lines for specific circuits must fall below the limits indicated by the applicable curve.

The data of Figure 14 is based upon  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  or  $T_A$  is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 13. At high case or ambient temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by the secondary breakdown.

### ORDERING INFORMATION

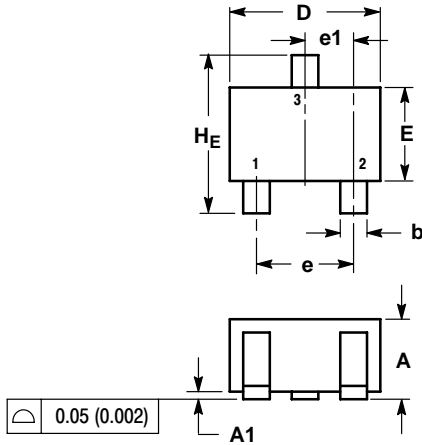
Device	Marking	Package	Shipping†
BC856BWT1	3B	SC-70/SOT-323	3,000 / Tape & Reel
BC856BWT1G		SC-70/SOT-323 (Pb-Free)	
BC857BWT1	3F	SC-70/SOT-323	3,000 / Tape & Reel
BC857BWT1G		SC-70/SOT-323 (Pb-Free)	
BC857CWT1	3G	SC-70/SOT-323	3,000 / Tape & Reel
BC857CWT1G		SC-70/SOT-323 (Pb-Free)	
BC858AWT1	3J	SC-70/SOT-323	3,000 / Tape & Reel
BC858AWT1G		SC-70/SOT-323 (Pb-Free)	
BC858BWT1	3K	SC-70/SOT-323	3,000 / Tape & Reel
BC858BWT1G		SC-70/SOT-323 (Pb-Free)	

†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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## PACKAGE DIMENSIONS

### SC-70 (SOT-323) CASE 419-04 ISSUE M

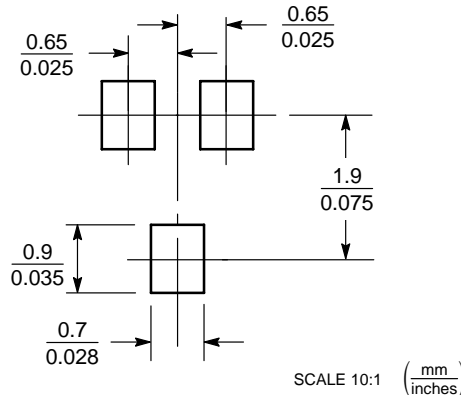


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.7 REF			0.028 REF		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.10	2.20	0.071	0.083	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.425 REF			0.017 REF		
HE	2.00	2.10	2.40	0.079	0.083	0.095

- STYLE 3:  
PIN 1: BASE  
2: EMITTER  
3: COLLECTOR

### SOLDERING FOOTPRINT\*



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

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