

# General Purpose Transistors

## PNP Silicon

### BC856B, BC857B, BC858A

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

- S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

| Rating                                               | Symbol    | Value             | Unit |
|------------------------------------------------------|-----------|-------------------|------|
| Collector-Emitter Voltage<br>BC856<br>BC857<br>BC858 | $V_{CEO}$ | -65<br>-45<br>-30 | V    |
| Collector-Base Voltage<br>BC856<br>BC857<br>BC858    | $V_{CBO}$ | -80<br>-50<br>-30 | V    |
| Emitter-Base Voltage                                 | $V_{EBO}$ | -5.0              | V    |
| Collector Current – Continuous                       | $I_C$     | -100              | mAdc |
| Collector Current – Peak (1 ms pulse)                | $I_{CM}$  | -130              | mA   |

#### THERMAL CHARACTERISTICS

| Characteristic                                                            | Symbol          | Max         | Unit               |
|---------------------------------------------------------------------------|-----------------|-------------|--------------------|
| Total Device Dissipation FR-5 Board,<br>(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 | $^\circ\text{C}$   |

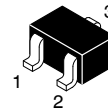
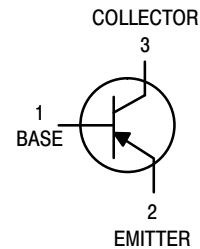
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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



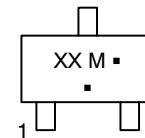
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**SC-70/SOT-323  
CASE 419  
STYLE 3**

#### 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 on page 5 of this data sheet.

# BC856B, BC857B, BC858A

## 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<br>( $I_C = -10\text{ mA}$ )                                                | BC856<br>BC857<br>BC858 | $V_{(BR)CEO}$ | -65<br>-45<br>-30    | –<br>–<br>– | –<br>–<br>– | V                   |
| Collector–Emitter Breakdown Voltage<br>( $I_C = -10\text{ }\mu\text{A}$ , $V_{EB} = 0$ )                        | BC856<br>BC857<br>BC858 | $V_{(BR)CES}$ | -80<br>-50<br>-30    | –<br>–<br>– | –<br>–<br>– | V                   |
| Collector–Base Breakdown Voltage<br>( $I_C = -10\text{ }\mu\text{A}$ )                                          | BC856<br>BC857<br>BC858 | $V_{(BR)CBO}$ | -80<br>-50<br>-30    | –<br>–<br>– | –<br>–<br>– | V                   |
| Emitter–Base Breakdown Voltage<br>( $I_E = -1.0\text{ }\mu\text{A}$ )                                           | BC856<br>BC857<br>BC858 | $V_{(BR)EBO}$ | -5.0<br>-5.0<br>-5.0 | –<br>–<br>– | –<br>–<br>– | V                   |
| Collector Cutoff Current ( $V_{CB} = -30\text{ V}$ )<br>( $V_{CB} = -30\text{ V}$ , $T_A = 150^\circ\text{C}$ ) |                         | $I_{CBO}$     | –<br>–               | –<br>–      | -15<br>-4.0 | nA<br>$\mu\text{A}$ |

## ON CHARACTERISTICS

|                                                                                                                                                   |                                                                                                              |               |                                      |                                           |                                      |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------|-------------------------------------------|--------------------------------------|---|
| DC Current Gain<br>( $I_C = -10\text{ }\mu\text{A}$ , $V_{CE} = -5.0\text{ V}$ )<br><br>( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )     | BC856A, BC585A<br>BC856B, BC857B, BC858B<br>BC857C<br><br>BC856A, BC858A<br>BC856B, BC857B, BC858B<br>BC857C | $h_{FE}$      | –<br>–<br>–<br><br>125<br>220<br>420 | 90<br>150<br>270<br><br>180<br>290<br>520 | –<br>–<br>–<br><br>250<br>475<br>800 | – |
| Collector–Emitter Saturation Voltage<br>( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ )<br>( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ ) |                                                                                                              | $V_{CE(sat)}$ | –<br>–                               | –<br>–                                    | -0.3<br>-0.65                        | V |
| Base–Emitter Saturation Voltage<br>( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ )<br>( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ )      |                                                                                                              | $V_{BE(sat)}$ | –<br>–                               | -0.7<br>-0.9                              | –<br>–                               | V |
| Base–Emitter On Voltage<br>( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )<br>( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )          |                                                                                                              | $V_{BE(on)}$  | -0.6<br>–                            | –<br>–                                    | -0.75<br>-0.82                       | V |

## SMALL–SIGNAL CHARACTERISTICS

|                                                                                                                                                       |  |          |     |   |     |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------|-----|---|-----|-----|
| Current–Gain – Bandwidth Product<br>( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )                                     |  | $f_T$    | 100 | – | –   | MHz |
| Output Capacitance<br>( $V_{CB} = -10\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                              |  | $C_{ob}$ | –   | – | 4.5 | pF  |
| Noise Figure<br>( $I_C = -0.2\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ ,<br>$f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ ) |  | NF       | –   | – | 10  | dB  |

# BC856B, BC857B, BC858A

## BC857/BC858

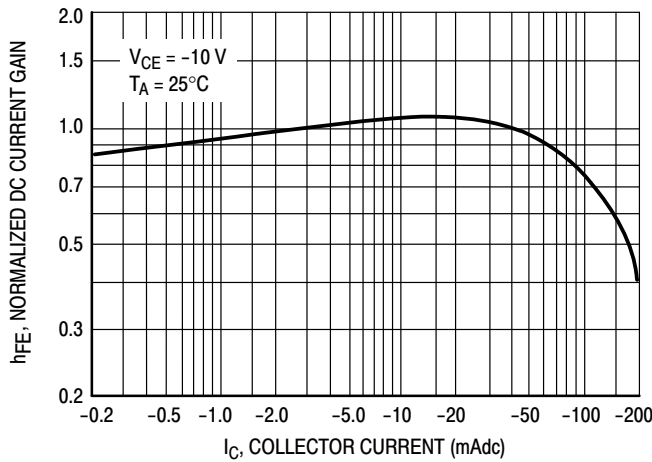


Figure 1. Normalized DC Current Gain

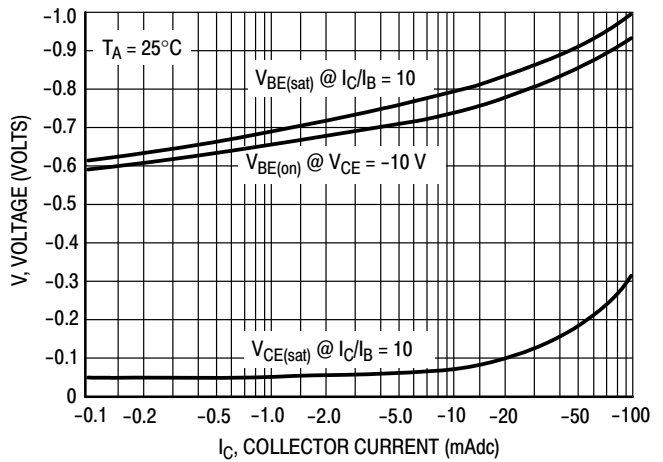


Figure 2. "Saturation" and "On" Voltages

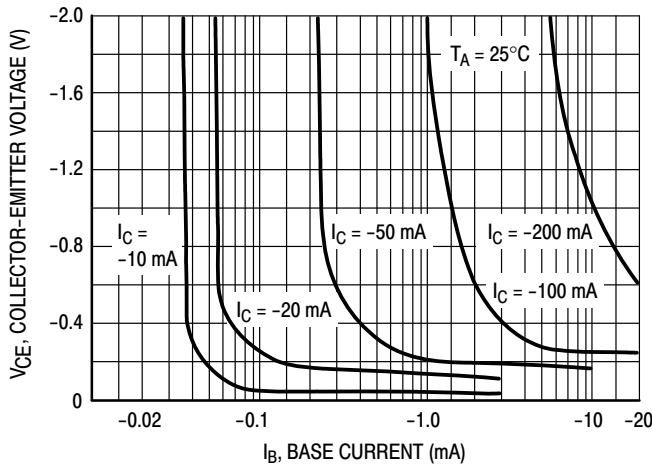


Figure 3. Collector Saturation Region

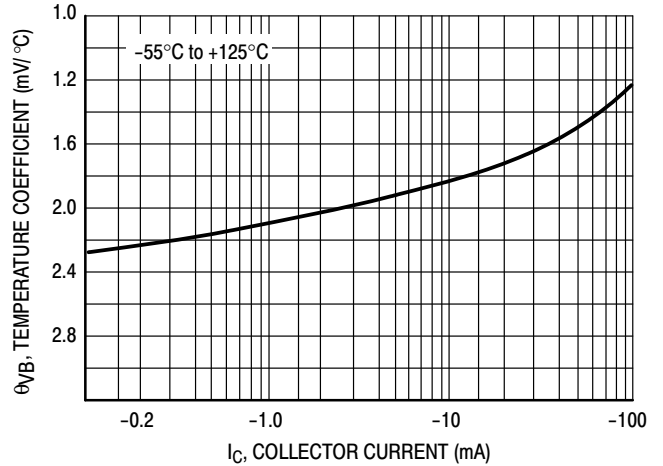


Figure 4. Base-Emitter Temperature Coefficient

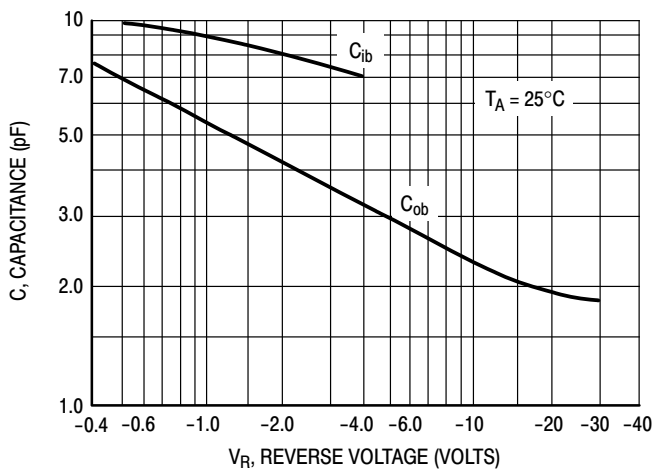


Figure 5. Capacitances

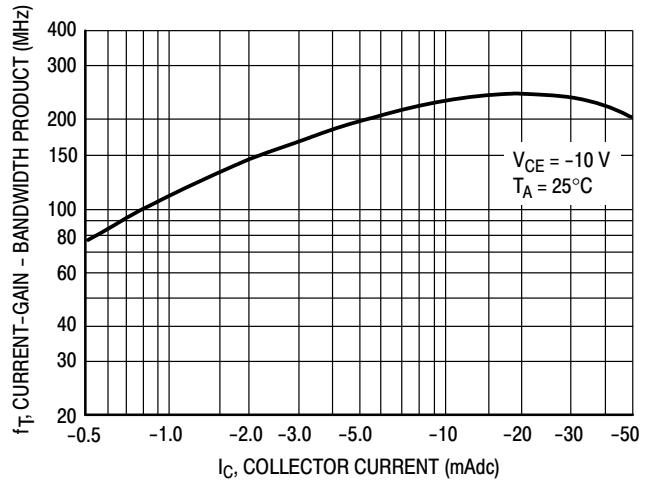


Figure 6. Current-Gain - Bandwidth Product

BC856

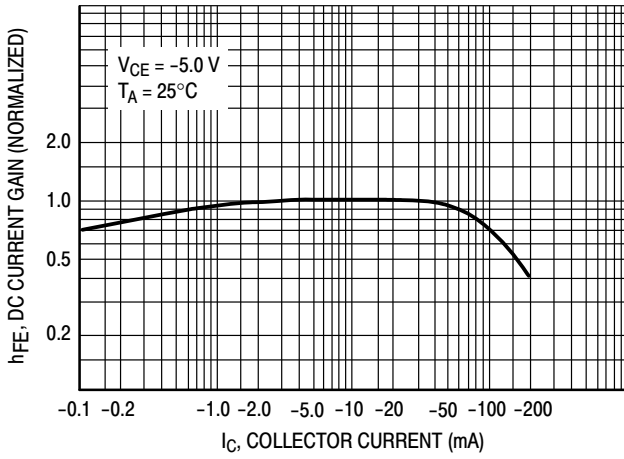


Figure 7. DC Current Gain

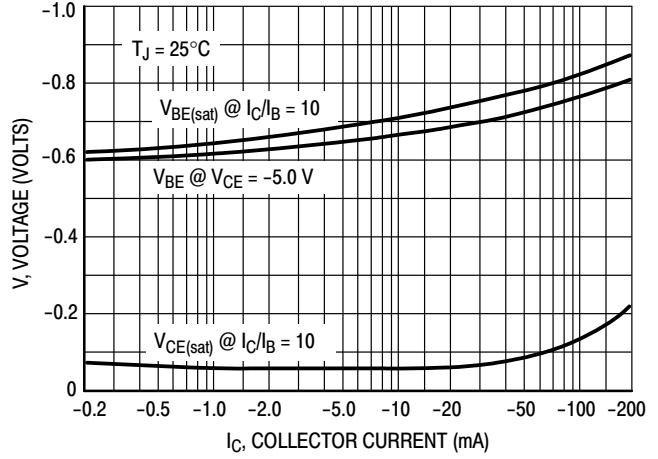


Figure 8. "On" Voltage

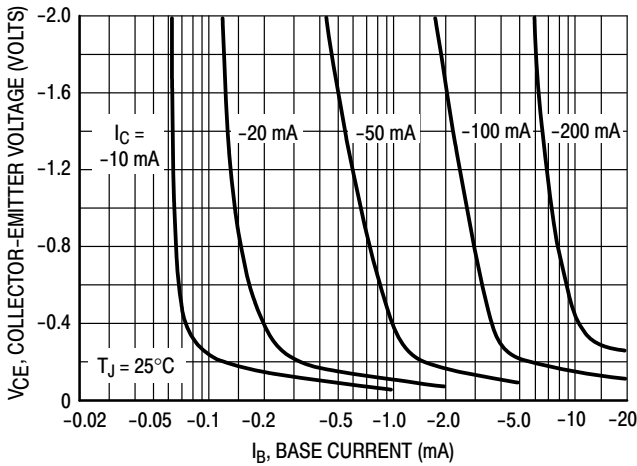


Figure 9. Collector Saturation Region

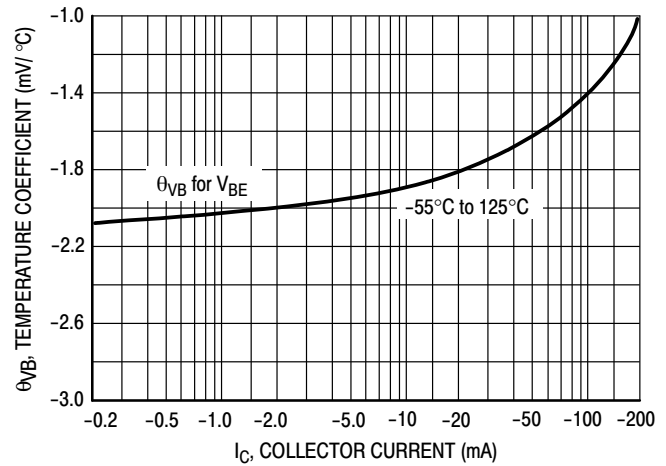


Figure 10. Base-Emitter Temperature Coefficient

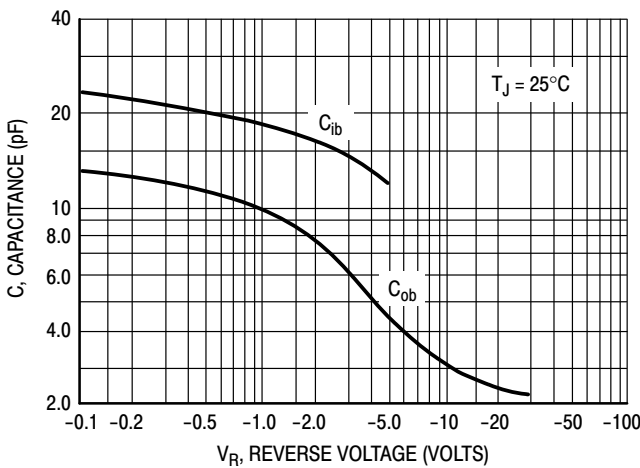


Figure 11. Capacitance

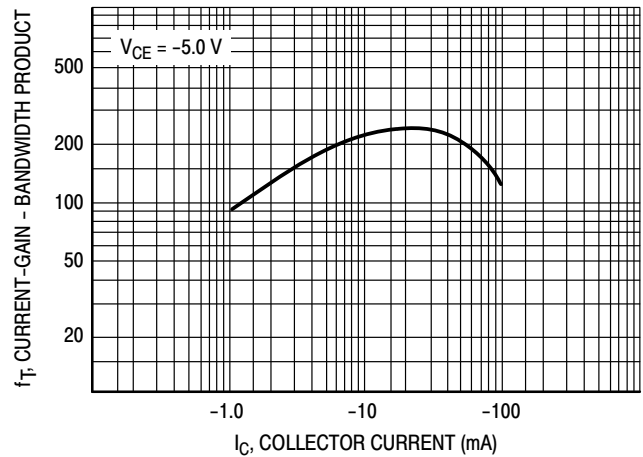


Figure 12. Current-Gain - Bandwidth Product

## BC856B, BC857B, BC858A

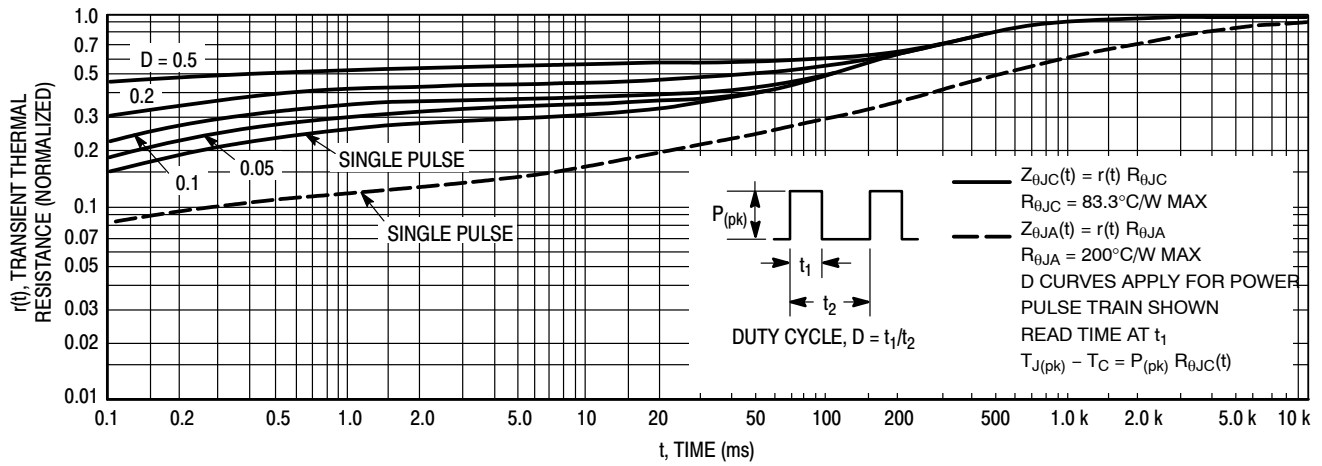


Figure 13. Thermal Response

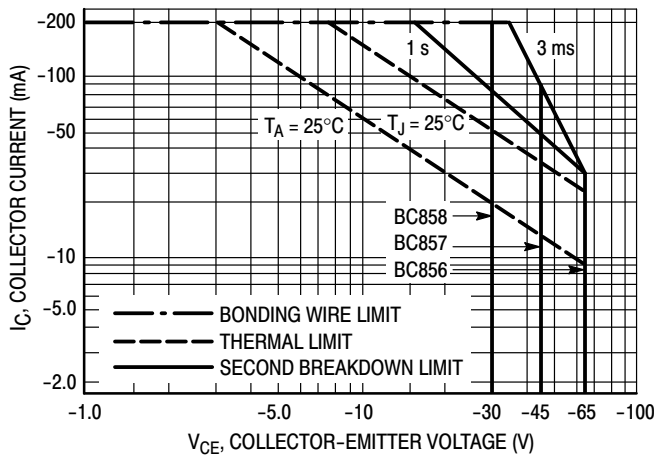


Figure 14. Active Region Safe Operating Area

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.

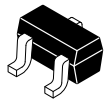
The data of Figure 14 is based upon  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  or  $T_A$  is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 13. At high case or ambient 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 <sup>†</sup> |
|----------------|---------|----------------------------|-----------------------|
| BC856BWT1G     | 3B      | SC-70/SOT-323<br>(Pb-Free) | 3,000 / Tape & Reel   |
| SBC856BWT1G*   |         |                            |                       |
| BC857BWT1G     | 3F      | SC-70/SOT-323<br>(Pb-Free) | 3,000 / Tape & Reel   |
| SBC857BWT1G*   |         |                            |                       |
| BC857CWT1G     | 3G      | SC-70/SOT-323<br>(Pb-Free) | 3,000 / Tape & Reel   |
| NSVBC857CWT1G* |         |                            |                       |
| BC858AWT1G     | 3J      | SC-70/SOT-323<br>(Pb-Free) | 3,000 / Tape & Reel   |
| BC858BWT1G     | 3K      | SC-70/SOT-323<br>(Pb-Free) | 3,000 / 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.

\*S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.



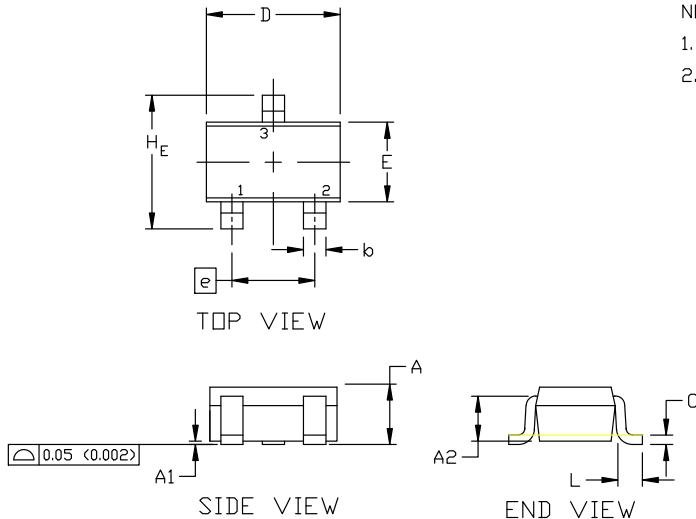
SCALE 4:1

### SC-70 (SOT-323)

#### CASE 419

#### ISSUE R

DATE 11 OCT 2022

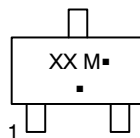


#### NOTES:

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

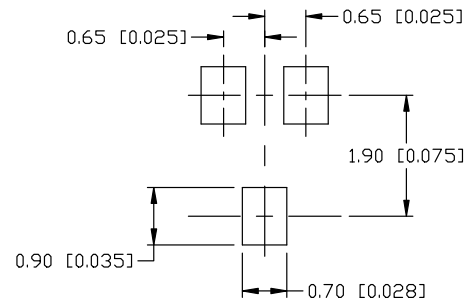
| DIM            | MILLIMETERS |      |      | INCHES    |       |       |
|----------------|-------------|------|------|-----------|-------|-------|
|                | MIN.        | NOM. | MAX. | MIN.      | NOM.  | MAX.  |
| A              | 0.80        | 0.90 | 1.00 | 0.032     | 0.035 | 0.040 |
| A1             | 0.00        | 0.05 | 0.10 | 0.000     | 0.002 | 0.004 |
| A2             | 0.70 REF    |      |      | 0.028 BSC |       |       |
| 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        | 2.00 | 2.20 | 0.071     | 0.080 | 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              | 0.20        | 0.38 | 0.56 | 0.008     | 0.015 | 0.022 |
| H <sub>E</sub> | 2.00        | 2.10 | 2.40 | 0.079     | 0.083 | 0.095 |

#### GENERIC MARKING DIAGRAM



XX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



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

#### SOLDERING FOOTPRINT

STYLE 1:  
CANCELLED

STYLE 2:  
PIN 1. ANODE  
2. N.C.  
3. CATHODE

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

STYLE 4:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 5:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 6:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

STYLE 7:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 8:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

STYLE 9:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 10:  
PIN 1. CATHODE  
2. ANODE  
3. ANODE-CATHODE

STYLE 11:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE

|                  |                 |                                                                                                                                                                                     |
|------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| DESCRIPTION:     | SC-70 (SOT-323) | PAGE 1 OF 1                                                                                                                                                                         |

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