



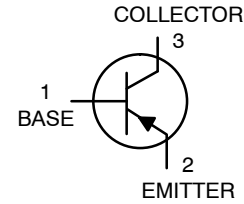
**THE DATASHEET OF  
SBC857BLT1G**



# General Purpose Transistors

## PNP Silicon

### BC856ALT1G Series



#### 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<sub>A</sub> = 25°C unless otherwise noted)

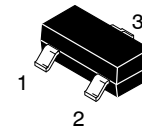
Rating	Symbol	Value	Unit
Collector-Emitter Voltage BC856, SBC856 BC857, SBC857 BC858, NSVBC858, BC859	V <sub>CEO</sub>	-65 -45 -30	V
Collector-Base Voltage BC856, SBC856 BC857, SBC857 BC858, NSVBC858, BC859	V <sub>CBO</sub>	-80 -50 -30	V
Emitter-Base Voltage	V <sub>EBO</sub>	-5.0	V
Collector Current – Continuous	I <sub>C</sub>	-100	mAdc
Collector Current – Peak	I <sub>C</sub>	-200	mAdc

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board, (Note 1) T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	225 1.8	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	556	°C/W
Total Device Dissipation Alumina Substrate, (Note 2) T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	300 2.4	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	417	°C/W
Junction and Storage Temperature	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

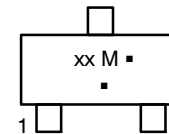
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in 99.5% alumina.



SOT-23 (TO-236)  
CASE 318  
STYLE 6

#### MARKING DIAGRAM



- xx = Device Code  
xx = (Refer to page 6)
- M = Date Code\*
- = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

## BC856ALT1G 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, SBC856 Series BC857, SBC857 Series BC858, NSVBC858 BC859 Series	$V_{(BR)CEO}$	-65 -45 -30	- - -	V
Collector – Emitter Breakdown Voltage ( $I_C = -10\ \mu\text{A}$ , $V_{EB} = 0$ )	BC856 S, SBC856series BC857A, SBC857A, BC857B, SBC857B Only BC858, NSVB858, BC859 Series	$V_{(BR)CES}$	-80 -50 -30	- - -	V
Collector – Base Breakdown Voltage ( $I_C = -10\ \mu\text{A}$ )	BC856, SBC856 Series BC857, SBC857 Series BC858, NSVBC858, BC859 Series	$V_{(BR)CBO}$	-80 -50 -30	- - -	V
Emitter – Base Breakdown Voltage ( $I_E = -1.0\ \mu\text{A}$ )	BC856, SBC856 Series BC857, SBC857 Series BC858, NSVBC858, BC859 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 $\mu\text{A}$

### ON CHARACTERISTICS

DC Current Gain ( $I_C = -10\ \mu\text{A}$ , $V_{CE} = -5.0\text{ V}$ )	BC856A, SBC856A, BC857A, SBC857A, BC858A BC856B, SBC856B, BC857B, SBC857B, BC858B, BC858B, NSVBC858B BC857C, SBC857C BC858C	$h_{FE}$	- - -	90 150 270	- - -	-
( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )	BC856A, SBC856A, BC857A, SBC857A, BC858A BC856B, SBC856B, BC857B, SBC857B, BC858B, NSVBC858B, BC859B BC857C, SBC857C, BC858C, BC859C		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

### SMALL-SIGNAL CHARACTERISTICS

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 ( $I_C = -0.2\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ ) BC856, SBC856, BC857, SBC857, BC858, NSVBC858 Series BC859 Series		NF	- -	- -	10 4.0	dB

### SWITCHING CHARACTERISTICS

Delay Time ( $V_{CC} = -3.0\text{ Vdc}$ , $I_C = -10\text{ mA}$ , $I_E = -1\text{ mA}$ )		$t_d$	-	35	-	ns
Rise Time ( $V_{CC} = -3.0\text{ Vdc}$ , $I_C = -10\text{ mA}$ , $I_E = -1\text{ mA}$ )		$t_r$	-	25	-	ns
Storage Time ( $V_{CC} = -3.0\text{ Vdc}$ , $I_C = -10\text{ mA}$ , $I_E = -1\text{ mA}$ )		$t_s$	-	310	-	ns
Fall Time ( $V_{CC} = -3.0\text{ Vdc}$ , $I_C = -10\text{ mA}$ , $I_E = -1\text{ mA}$ )		$t_f$	-	40	-	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.

# BC856ALT1G Series

## BC857/BC858/BC859/SBC857/NSVBC858

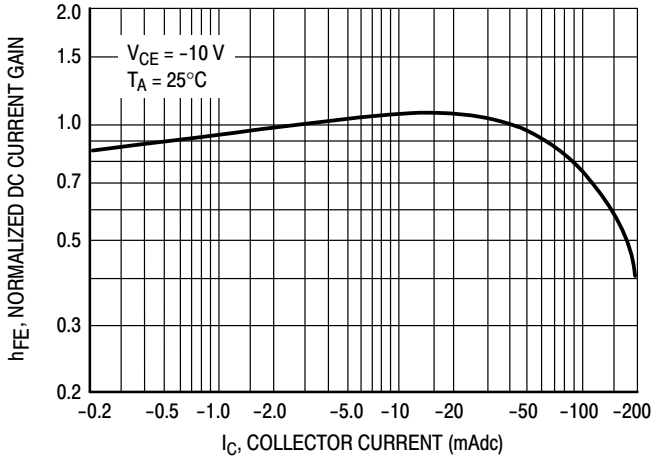


Figure 1. Normalized DC Current Gain

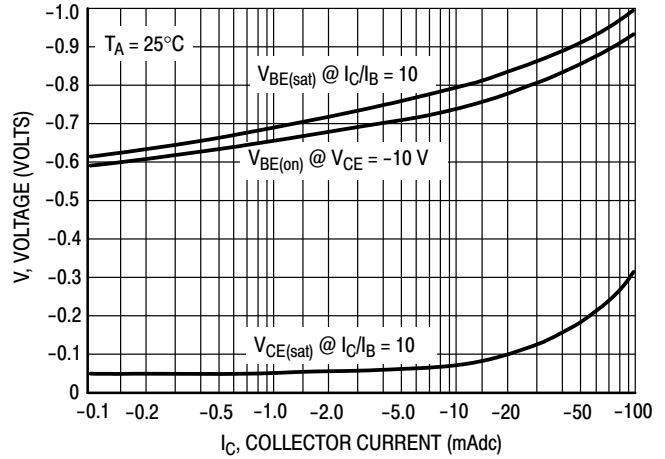


Figure 2. "Saturation" and "On" Voltages

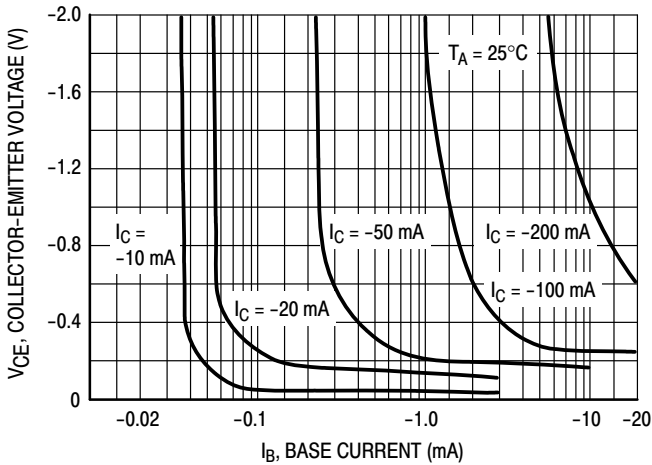


Figure 3. Collector Saturation Region

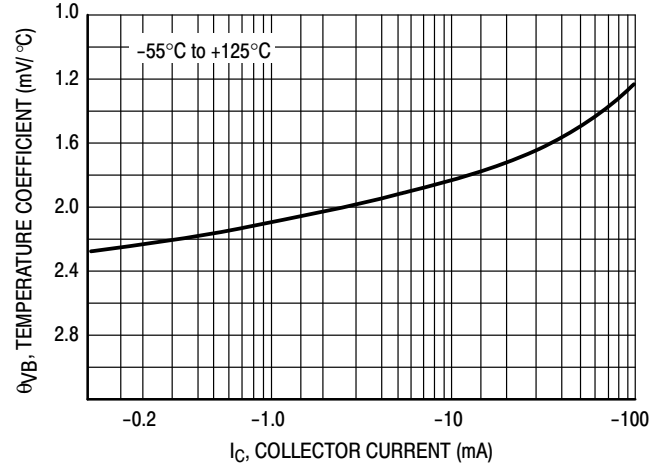


Figure 4. Base-Emitter Temperature Coefficient

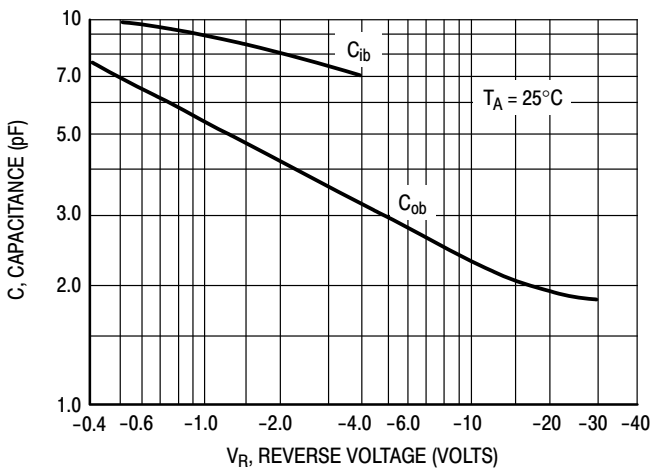


Figure 5. Capacitances

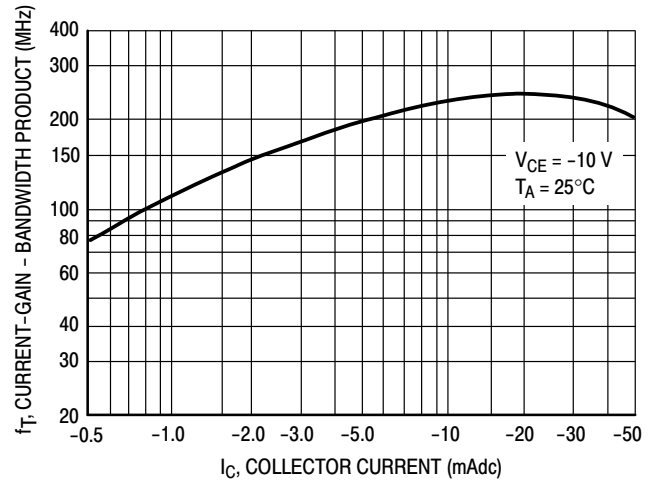


Figure 6. Current-Gain - Bandwidth Product

# BC856ALT1G Series

## BC856/SBC856

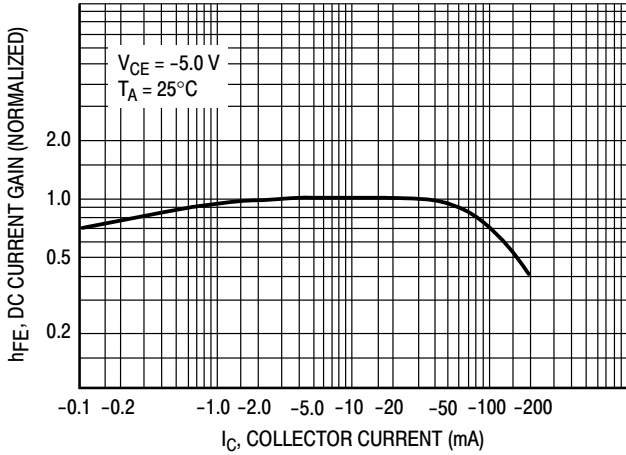


Figure 7. DC Current Gain

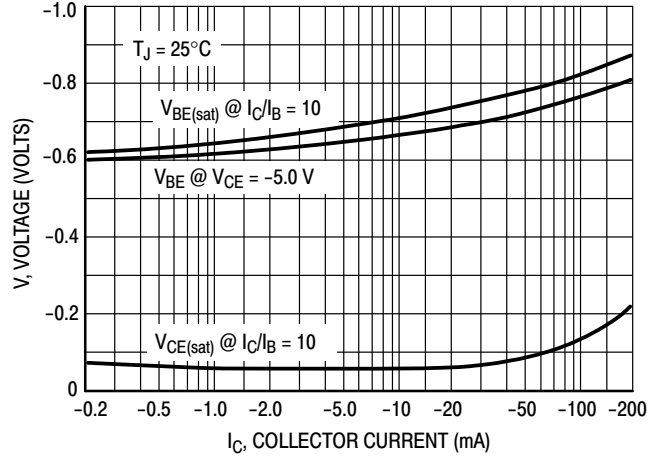


Figure 8. "On" Voltage

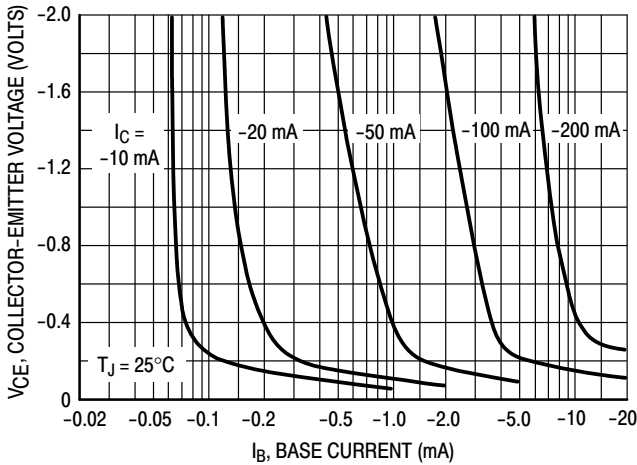


Figure 9. Collector Saturation Region

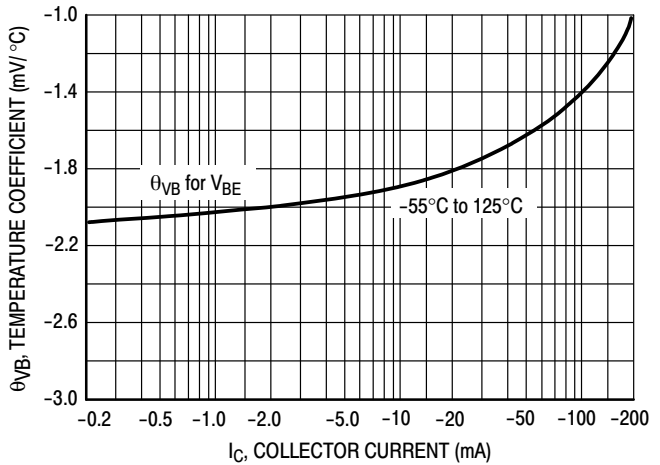


Figure 10. Base-Emitter Temperature Coefficient

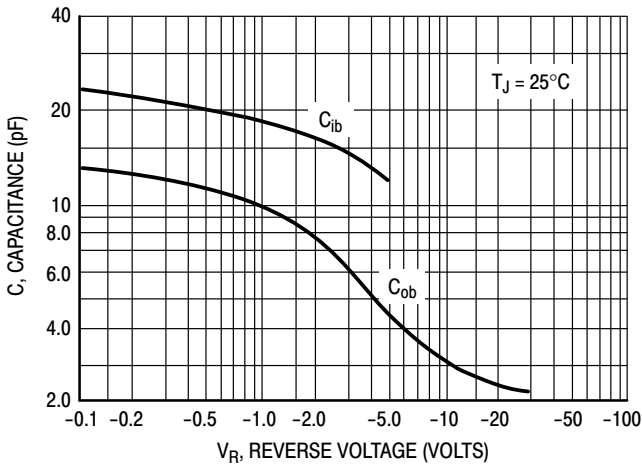


Figure 11. Capacitance

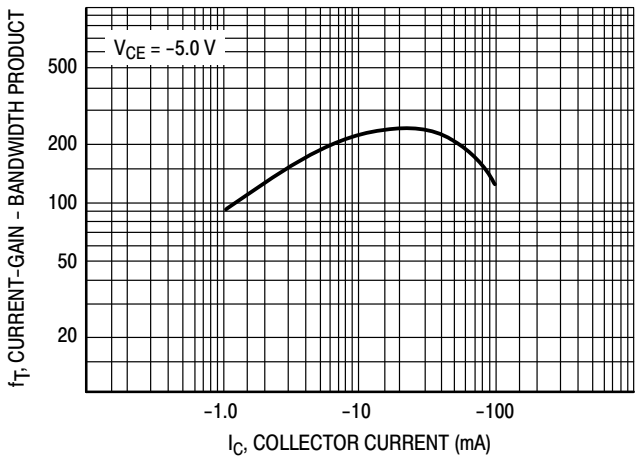
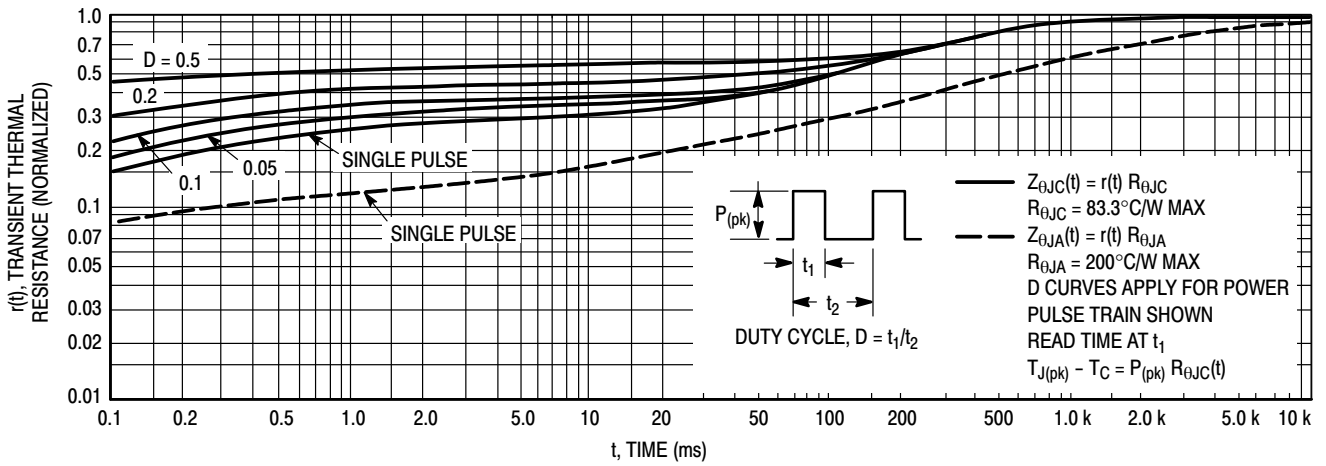
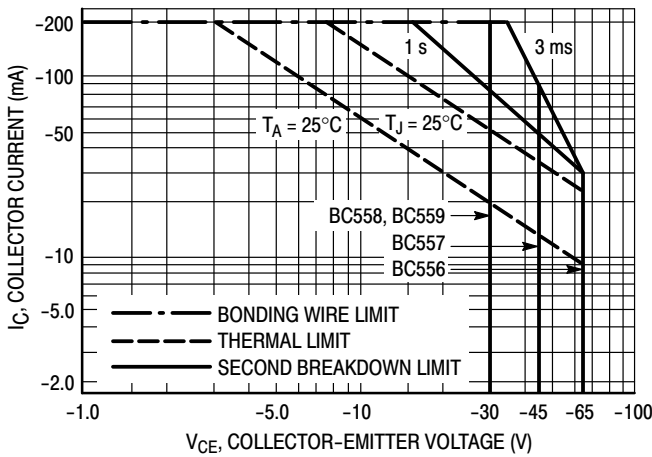


Figure 12. Current-Gain - Bandwidth Product

## BC856ALT1G 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.

## BC856ALT1G Series

### ORDERING INFORMATION

Device	Marking	Package	Shipping†
BC856ALT1G	3A	SOT-23 (Pb-Free)	3,000 / Tape & Reel
SBC856ALT1G*			
BC856ALT3G			10,000 / Tape & Reel
BC856BLT1G	3B	SOT-23 (Pb-Free)	3,000 / Tape & Reel
SBC856BLT1G*			
BC856BLT3G			10,000 / Tape & Reel
SBC856BLT3G*			
BC857ALT1G	3E	SOT-23 (Pb-Free)	3,000 / Tape & Reel
SBC857ALT1G*			
BC857BLT1G	3F	SOT-23 (Pb-Free)	3,000 / Tape & Reel
SBC857BLT1G*			
BC857BLT3G			10,000 / Tape & Reel
NSVBC857BLT3G*			
BC857CLT1G	3G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
SBC857CLT1G*			
BC857CLT3G			10,000 / Tape & Reel
BC858ALT1G	3J	SOT-23 (Pb-Free)	3,000 / Tape & Reel
BC858BLT1G	3K	SOT-23 (Pb-Free)	
NSVBC858BLT1G*			
BC858BLT3G		SOT-23 (Pb-Free)	10,000 / Tape & Reel
BC858CLT1G	3L	SOT-23 (Pb-Free)	3,000 / Tape & Reel
BC858CLT3G		SOT-23 (Pb-Free)	10,000 / Tape & Reel
BC859BLT1G	4B	SOT-23 (Pb-Free)	3,000 / Tape & Reel
BC859BLT3G		SOT-23 (Pb-Free)	10,000 / Tape & Reel
BC859CLT1G	4C	SOT-23 (Pb-Free)	3,000 / Tape & Reel
BC859CLT3G		SOT-23 (Pb-Free)	10,000 / 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.

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

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



**SOT-23 (TO-236)**  
CASE 318  
ISSUE AT

DATE 01 MAR 2023

SCALE 4:1



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H <sub>E</sub>	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

**GENERIC MARKING DIAGRAM\***



- XXX = 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.



**RECOMMENDED MOUNTING 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.

**STYLES ON PAGE 2**

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



**SOT-23 (TO-236)**  
**CASE 318**  
**ISSUE AT**

DATE 01 MAR 2023

- |   |   |   |   |   |   |
|---|---|---|---|---|---|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |   |   |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |   |   |   |   |

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