

# BC856BDW1T1G, SBC856BDW1T1G Series, BC857BDW1T1G, SBC857BDW1T1G Series, BC858CDW1T1G Series



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## Dual General Purpose Transistors

### PNP Duals

These transistors are designed for general purpose amplifier applications. They are housed in the SOT-363/SC-88 which is designed for low power surface mount applications.

#### Features

- S 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

Rating	Symbol	Value	Unit
Collector-Emmitter Voltage BC856, SBC856 BC857, SBC857 BC858	$V_{CEO}$	-65 -45 -30	V
Collector-Base Voltage BC856, SBC856 BC857, SBC857 BC858	$V_{CBO}$	-80 -50 -30	V
Emitter-Base Voltage	$V_{EBO}$	-5.0	V
Collector Current -Continuous	$I_C$	-100	mAdc
Collector Current - Peak	$I_C$	-200	mAdc

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation Per Device FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	380 250 3.0	mW mW mW/°C
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	328	°C/W
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	°C

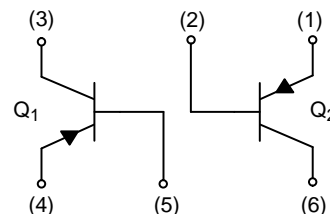
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

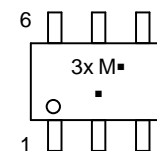
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



SOT-363/SC-88  
CASE 419B  
STYLE 1



#### MARKING DIAGRAM



- 3x = Specific Device Code  
x = B, F, G, or L  
(See Ordering Information)  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

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

**BC856BDW1T1G, SBC856BDW1T1G Series, BC857BDW1T1G,  
SBC857BDW1T1G Series, BC858CDW1T1G 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 Series	$V_{(BR)CEO}$	-65 -45 -30	-	-	V
Collector–Emitter Breakdown Voltage ( $I_C = -10\text{ }\mu\text{A}$ , $V_{EB} = 0$ ) BC856, SBC856 Series BC857B, SBC857B Only BC858 Series	$V_{(BR)CES}$	-80 -50 -30	-	-	V
Collector–Base Breakdown Voltage ( $I_C = -10\text{ }\mu\text{A}$ ) BC856, SBC856 Series BC857, SBC857 Series BC858 Series	$V_{(BR)CBO}$	-80 -50 -30	-	-	V
Emitter–Base Breakdown Voltage ( $I_E = -1.0\text{ }\mu\text{A}$ ) BC856, SBC856 Series BC857, SBC857 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 $\mu\text{A}$

**ON CHARACTERISTICS**

DC Current Gain ( $I_C = -10\text{ }\mu\text{A}$ , $V_{CE} = -5.0\text{ V}$ ) BC856B, SBC856B, BC857B, SBC857B BC857C, SBC857C, BC858C ( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ ) BC856B, SBC856B, BC857B, SBC857B BC857C, SBC857C, BC858C	$h_{FE}$	- - 220 420	150 270 290 520	- - 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 ( $I_C = -0.2\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )	NF	-	-	10	dB

**BC856BDW1T1G, SBC856BDW1T1G Series, BC857BDW1T1G,  
SBC857BDW1T1G Series, BC858CDW1T1G Series**

**TYPICAL CHARACTERISTICS – BC856/SBC856**



**Figure 1. DC Current Gain**



**Figure 2. "On" Voltage**



**Figure 3. Collector Saturation Region**



**Figure 4. Base-Emitter Temperature Coefficient**



**Figure 5. Capacitance**



**Figure 6. Current-Gain - Bandwidth Product**

**BC856BDW1T1G, SBC856BDW1T1G Series, BC857BDW1T1G,  
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**TYPICAL CHARACTERISTICS – BC857/SBC857/BC858**



**Figure 7. Normalized DC Current Gain**



**Figure 8. "Saturation" and "On" Voltages**



**Figure 9. Collector Saturation Region**



**Figure 10. Base-Emitter Temperature Coefficient**



**Figure 11. Capacitances**



**Figure 12. Current-Gain - Bandwidth Product**

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**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.

**BC856BDW1T1G, SBC856BDW1T1G Series, BC857BDW1T1G,  
SBC857BDW1T1G Series, BC858CDW1T1G Series**

**ORDERING INFORMATION**

Device	Device Marking	Package	Shipping <sup>†</sup>
BC856BDW1T1G	3B	SOT-363 (Pb-Free)	3,000 / Tape & Reel
SBC856BDW1T1G	3B	SOT-363 (Pb-Free)	3,000 / Tape & Reel
BC856BDW1T3G	3B	SOT-363 (Pb-Free)	10,000 / Tape & Reel
SBC856BDW1T3G	3B	SOT-363 (Pb-Free)	10,000 / Tape & Reel
BC857BDW1T1G	3F	SOT-363 (Pb-Free)	3,000 / Tape & Reel
SBC857BDW1T1G	3F	SOT-363 (Pb-Free)	3,000 / Tape & Reel
BC857CDW1T1G	3G	SOT-363 (Pb-Free)	3,000 / Tape & Reel
SBC857CDW1T1G	3G	SOT-363 (Pb-Free)	3,000 / Tape & Reel
BC858CDW1T1G	3L	SOT-363 (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.

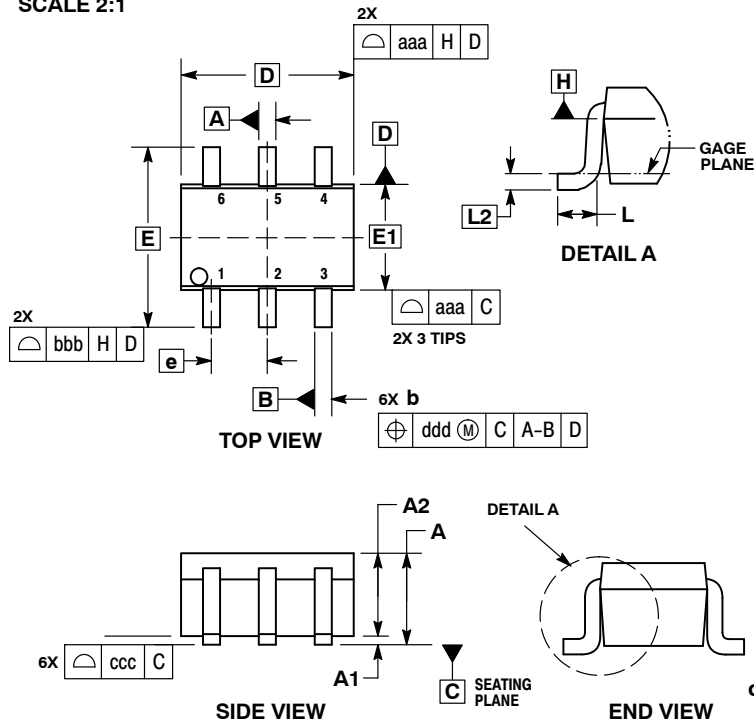
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



1  
SCALE 2:1

SC-88/SC70-6/SOT-363  
CASE 419B-02  
ISSUE Y

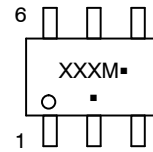
DATE 11 DEC 2012



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
  4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
  5. DATUMS A AND B ARE DETERMINED AT DATUM H.
  6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
  7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.10	---	---	0.043
A1	0.00	---	0.10	0.000	---	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

### GENERIC MARKING DIAGRAM\*



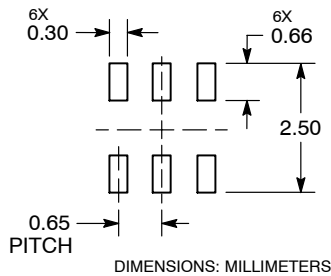
- XXX = Specific Device Code
- M = Date Code\*
- = Pb-Free Package

(Note: Microdot may be in either location)

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

\*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 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.

### STYLES ON PAGE 2

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**SC-88/SC70-6/SOT-363**  
**CASE 419B-02**  
**ISSUE Y**

DATE 11 DEC 2012

<b>STYLE 1:</b> PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2	<b>STYLE 2:</b> CANCELLED	<b>STYLE 3:</b> CANCELLED	<b>STYLE 4:</b> PIN 1. CATHODE 2. CATHODE 3. COLLECTOR 4. EMITTER 5. BASE 6. ANODE	<b>STYLE 5:</b> PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	<b>STYLE 6:</b> PIN 1. ANODE 2 2. N/C 3. CATHODE 1 4. ANODE 1 5. N/C 6. CATHODE 2
<b>STYLE 7:</b> PIN 1. SOURCE 2 2. DRAIN 2 3. GATE 1 4. SOURCE 1 5. DRAIN 1 6. GATE 2	<b>STYLE 8:</b> CANCELLED	<b>STYLE 9:</b> PIN 1. EMITTER 2 2. EMITTER 1 3. COLLECTOR 1 4. BASE 1 5. BASE 2 6. COLLECTOR 2	<b>STYLE 10:</b> PIN 1. SOURCE 2 2. SOURCE 1 3. GATE 1 4. DRAIN 1 5. DRAIN 2 6. GATE 2	<b>STYLE 11:</b> PIN 1. CATHODE 2 2. CATHODE 2 3. ANODE 1 4. CATHODE 1 5. CATHODE 1 6. ANODE 2	<b>STYLE 12:</b> PIN 1. ANODE 2 2. ANODE 2 3. CATHODE 1 4. ANODE 1 5. ANODE 1 6. CATHODE 2
<b>STYLE 13:</b> PIN 1. ANODE 2. N/C 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	<b>STYLE 14:</b> PIN 1. VREF 2. GND 3. GND 4. IOUT 5. VEN 6. VCC	<b>STYLE 15:</b> PIN 1. ANODE 1 2. ANODE 2 3. ANODE 3 4. CATHODE 3 5. CATHODE 2 6. CATHODE 1	<b>STYLE 16:</b> PIN 1. BASE 1 2. EMITTER 2 3. COLLECTOR 2 4. BASE 2 5. EMITTER 1 6. COLLECTOR 1	<b>STYLE 17:</b> PIN 1. BASE 1 2. EMITTER 1 3. COLLECTOR 2 4. BASE 2 5. EMITTER 2 6. COLLECTOR 1	<b>STYLE 18:</b> PIN 1. VIN1 2. VCC 3. VOUT2 4. VIN2 5. GND 6. VOUT1
<b>STYLE 19:</b> PIN 1. IOUT 2. GND 3. GND 4. V CC 5. V EN 6. V REF	<b>STYLE 20:</b> PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR	<b>STYLE 21:</b> PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. N/C 6. CATHODE 1	<b>STYLE 22:</b> PIN 1. D1 (i) 2. GND 3. D2 (i) 4. D2 (c) 5. VBUS 6. D1 (c)	<b>STYLE 23:</b> PIN 1. Vn 2. CH1 3. Vp 4. N/C 5. CH2 6. N/C	<b>STYLE 24:</b> PIN 1. CATHODE 2. ANODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE
<b>STYLE 25:</b> PIN 1. BASE 1 2. CATHODE 3. COLLECTOR 2 4. BASE 2 5. EMITTER 6. COLLECTOR 1	<b>STYLE 26:</b> PIN 1. SOURCE 1 2. GATE 1 3. DRAIN 2 4. SOURCE 2 5. GATE 2 6. DRAIN 1	<b>STYLE 27:</b> PIN 1. BASE 2 2. BASE 1 3. COLLECTOR 1 4. EMITTER 1 5. EMITTER 2 6. COLLECTOR 2	<b>STYLE 28:</b> PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN	<b>STYLE 29:</b> PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE/ANODE 6. CATHODE	<b>STYLE 30:</b> PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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