

**BC856AW-Q1/BC856BW-Q1/BC857AW-Q1/BC857BW-Q1/BC857CW-Q1
BC858AW-Q1/BC858BW-Q1/BC858CW-Q1****List**

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General Purpose Transistor PNP Silicon

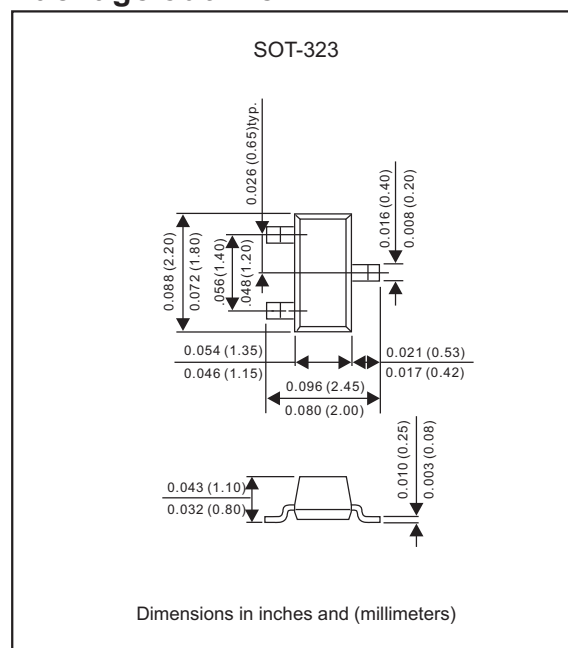
Features

- Ideally suited for automatic insertion
- For switching and AF amplifier applications
- Lead-free parts meet RoHS requirements
- Qualified to AEC-Q101 standards for high reliability
- Suffix "-H" indicates Halogen-free part, ex.BC856AW-Q1-H

Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-323
- Terminals : Solder plated, solderable per
MIL-STD-750, Method 2026
- Mounting Position : Any
- Weight : Approximated 0.006 gram

Package outline



Maximum ratings (AT $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-base voltage	V_{CBO}	-80	V
BC856		-50	
BC857		-30	
BC858			
Collector-emitter voltage	V_{CEO}	-65	V
BC856		-45	
BC857		-30	
BC858			
Emitter-base voltage	V_{EBO}	-5.0	V
BC856		-5.0	
BC857		-5.0	
BC858		-5.0	
Collector current-continuous	I_C	-100	mA

Thermal characteristics

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Total device dissipation FR-5 board $T_A = 25^{\circ}\text{C}$ (1)	P_D			150	mW
Thermal resistance(1) Junction to ambient	$R_{\theta JA}$			833	$^{\circ}\text{C/W}$
Operating junction temperature range	T_J	-55		+150	$^{\circ}\text{C}$
Storage temperature range	T_{STG}	-55		+150	$^{\circ}\text{C}$

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

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Electrical characteristics (AT $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Off characteristics

Parameter	Conditions	Symbol	MIN.	TYP.	MAX.	Unit
Collector-base breakdown voltage BC856 Series BC857 Series BC858 Series	$I_C = -10\mu\text{A}$	$V_{(BR)CBO}$	-80 -50 -30			V
Collector-emitter breakdown voltage BC856 Series BC857 Series BC858 Series	$I_C = -10\text{mA}$	$V_{(BR)CEO}$	-65 -45 -30			V
Emitter-base breakdown voltage BC856 Series BC857 Series BC858 Series	$I_E = -1.0\mu\text{A}$	$V_{(BR)EBO}$	-5.0 -5.0 -5.0			V
Collector-emitter breakdown voltage BC856 Series BC857 Series BC858 Series	$I_C = -10\mu\text{A}$, $V_{EB} = 0$	$V_{(BR)CES}$	-80 -50 -30			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 μA

On characteristics

Parameter	Conditions	Symbol	MIN.	TYP.	MAX.	Unit
DC current gain BC856A, BC857A, BC858A BC856B, BC857B, BC858B BC857C, BC858C	$I_C = -2.0\text{mA}$, $V_{CE} = -5.0\text{V}$	h_{FE}	125 220 420	180 290 520	250 475 800	
Collector-emitter saturation voltage	$I_C = -10\text{mA}$, $I_B = -0.5\text{mA}$ $I_C = -100\text{mA}$, $I_B = -5.0\text{mA}$	$V_{CE(sat)}$			-0.30 -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	-1.0 -1.2	V
Base-emitter 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

Parameter	Conditions	Symbol	MIN.	TYP.	MAX.	Unit
Current-gain-bandwidth product	$I_C = -10\text{mA}$, $V_{CE} = -5.0\text{V}$, $f = 100\text{MHz}$	f_T	100			MHz
Output capacitance	$V_{CB} = -10\text{V}$, $f = 1.0\text{MHz}$	C_{obo}			4.5	pF
Noise figure	$I_C = -0.2\text{mA}$, $V_{CE} = -5.0\text{V}$, $R_s = 2.0\text{K}\Omega$, $f = 1.0\text{kHz}$, $B_w = 200\text{Hz}$	N_F			10	dB

Rating and characteristic curves (BC857,BC858)

Figure 1. Normalized DC Current Gain

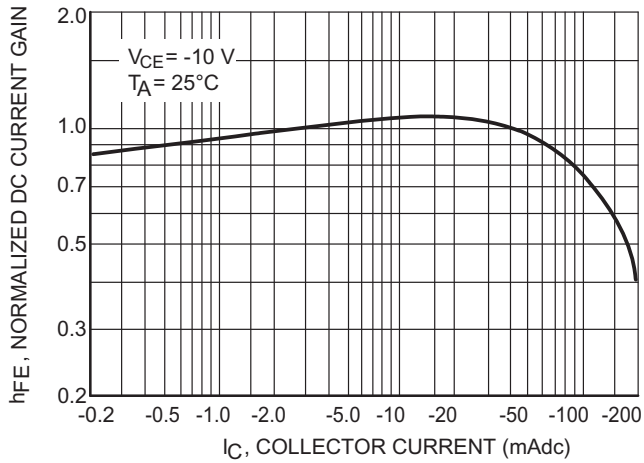


Figure 2. "Saturation" and "On" Voltages

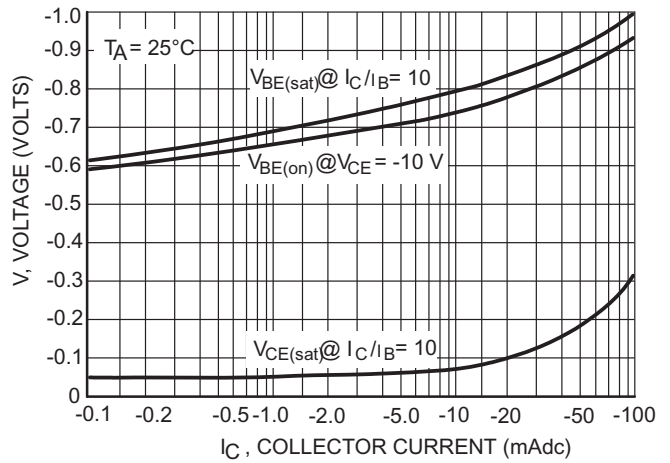


Figure 3. Collector Saturation Region

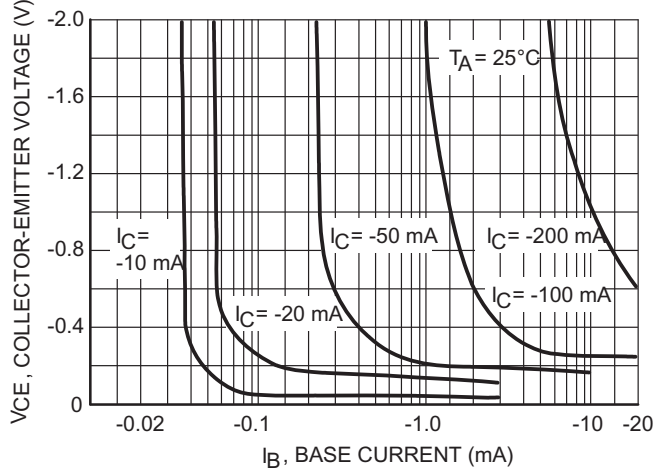


Figure 4. Base-Emitter Temperature Coefficient

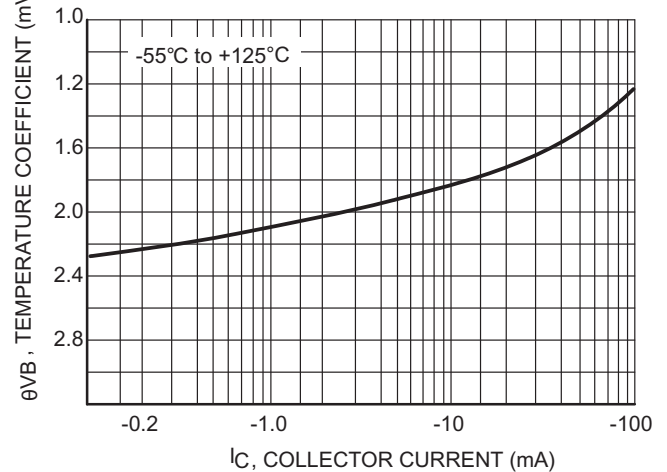


Figure 5. Capacitances

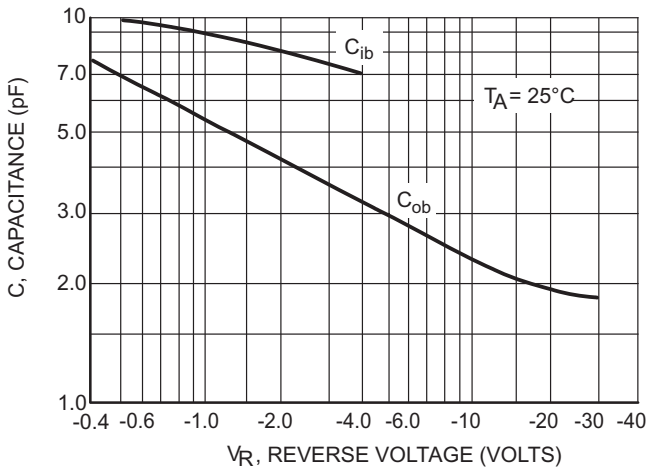
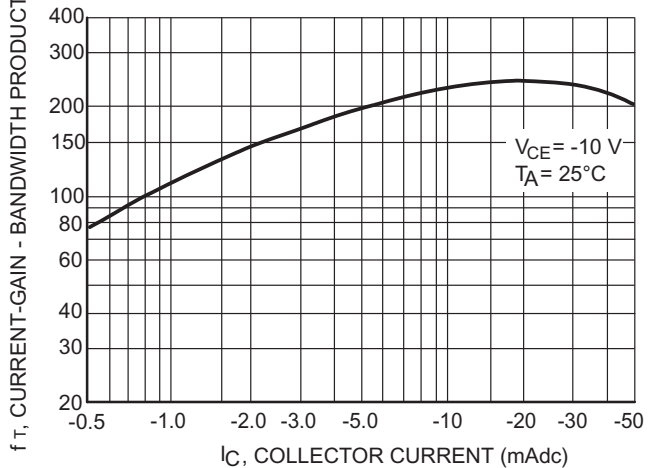


Figure 6. Current-Gain-Bandwidth Product



Rating and characteristic curves (BC856)

Figure 7. DC Current Gain

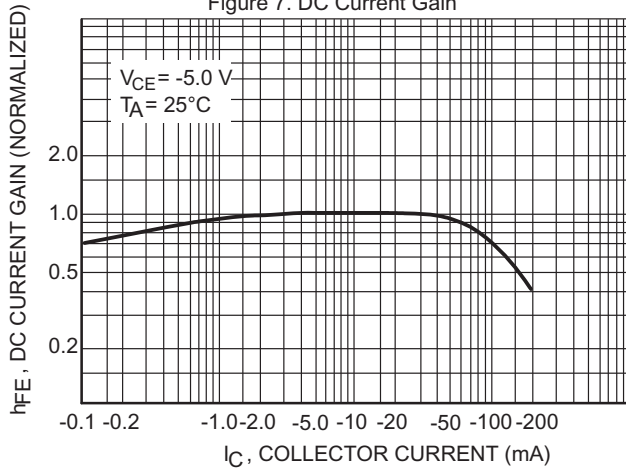


Figure 8. "On" Voltage

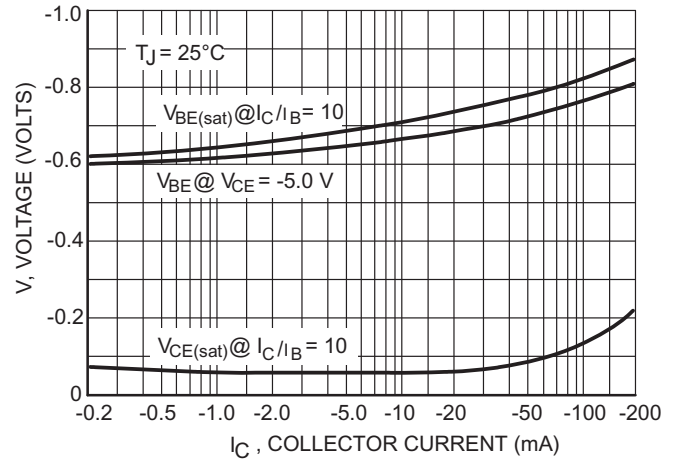


Figure 9. Collector Saturation Region

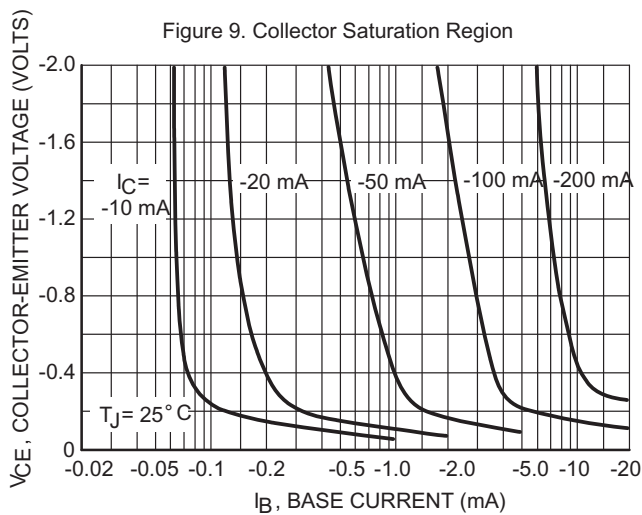


Figure 10. Base-Emitter Temperature Coefficient

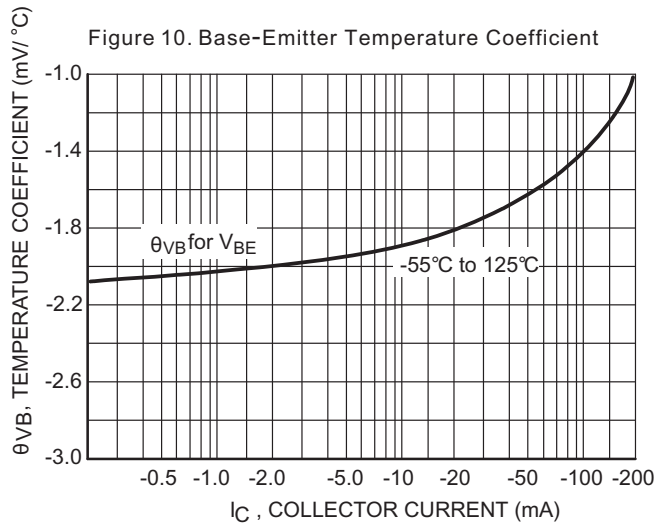


Figure 11. Capacitance

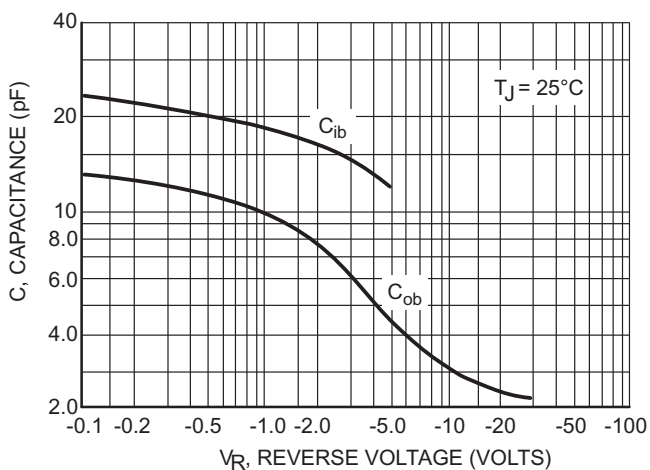
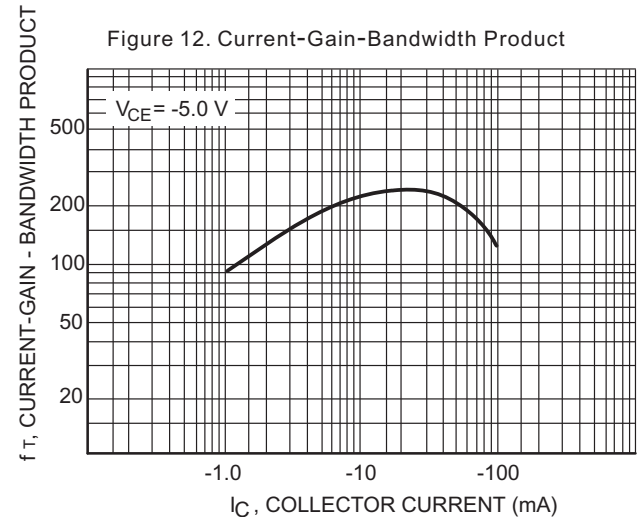


Figure 12. Current-Gain-Bandwidth Product



Rating and characteristic curves

Figure13. Thermal Response

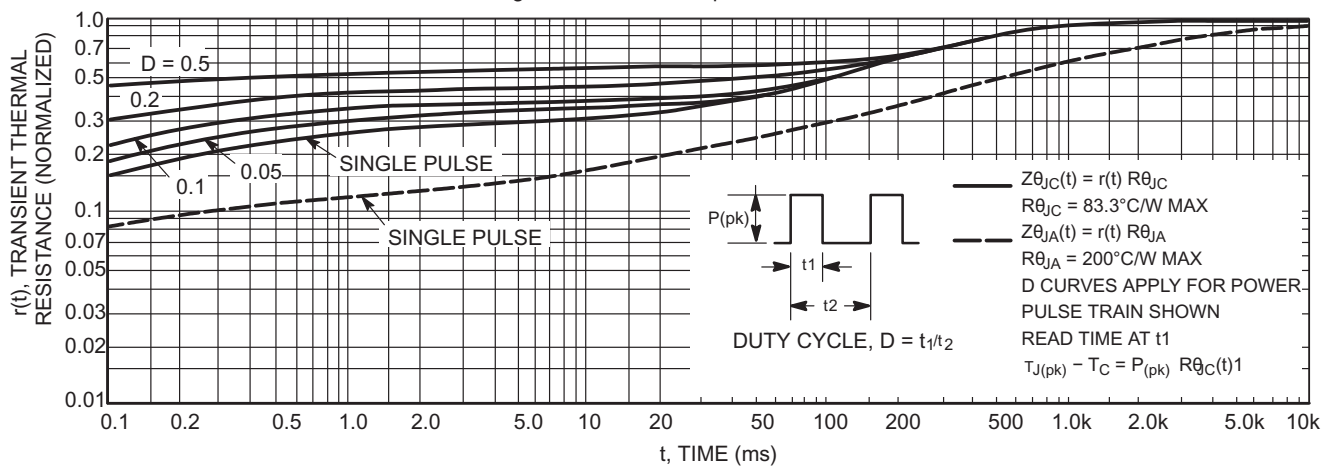
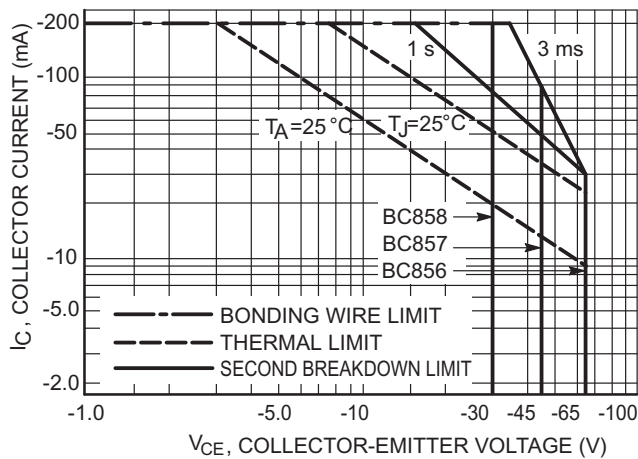


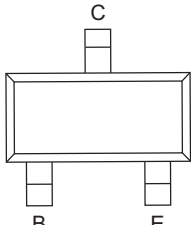
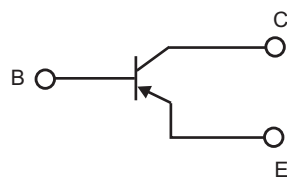
Figure14. Active Region Safe Operating Area



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.

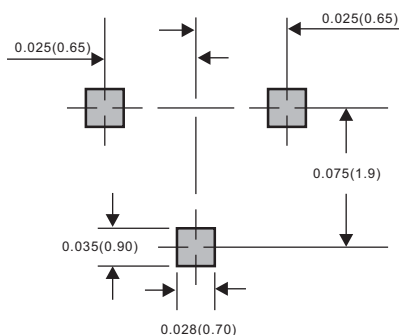
The data of Figure 14 is based upon $T_J(pk) = 150^\circ\text{C}$; T_C or T_A is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided $T_J(pk) \leq 150^\circ\text{C}$. $T_J(pk)$ may be calculated from the data in Figure 13. At high case or ambient temperatures, thermal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

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Pinning information

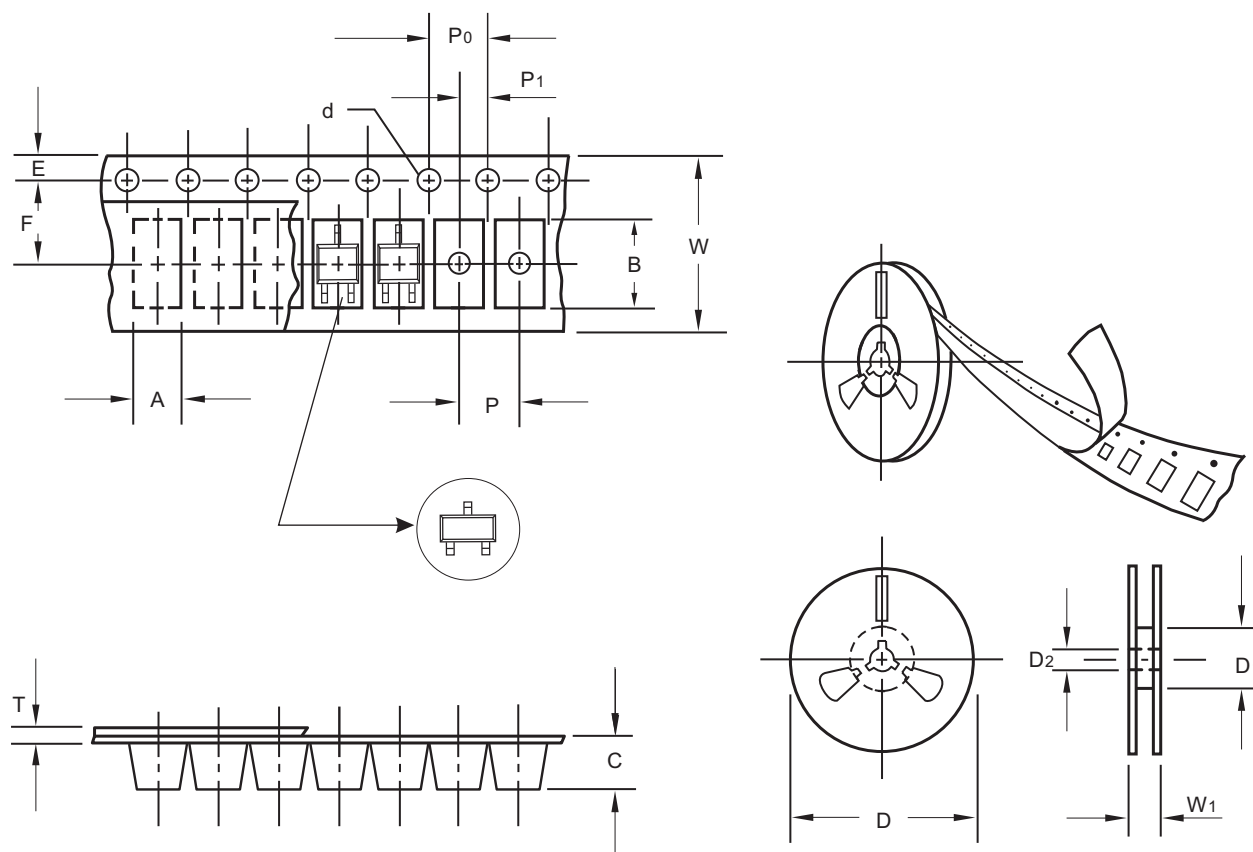
Pin	Simplified outline	Symbol
PinB Base PinC Collector PinE Emitter		

Marking

Type number	Marking code
BC856AW-Q1	3A
BC856BW-Q1	3B
BC857AW-Q1	3E
BC857BW-Q1	3F
BC857CW-Q1	3G
BC858AW-Q1	3J
BC858BW-Q1	3K
BC858CW-Q1	3L

Suggested solder pad layout
SOT-323


Dimensions in inches and (millimeters)

**BC856AW-Q1/BC856BW-Q1/BC857AW-Q1/BC857BW-Q1/BC857CW-Q1
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Packing information


unit:mm

Item	Symbol	Tolerance	SOT-323
Carrier width	A	0.1	2.25
Carrier length	B	0.1	2.55
Carrier depth	C	0.1	1.19
Sprocket hole	d	0.1	1.55
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D1	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D1	min	62.00
Feed hole diameter	D2	0.5	13.00
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.1	3.50
Punch hole pitch	P	0.1	4.00
Sprocket hole pitch	P0	0.1	4.00
Embossment center	P1	0.1	2.00
Overall tape thickness	T	0.1	0.23
Tape width	W	0.3	8.00
Reel width	W1	1.0	11.40

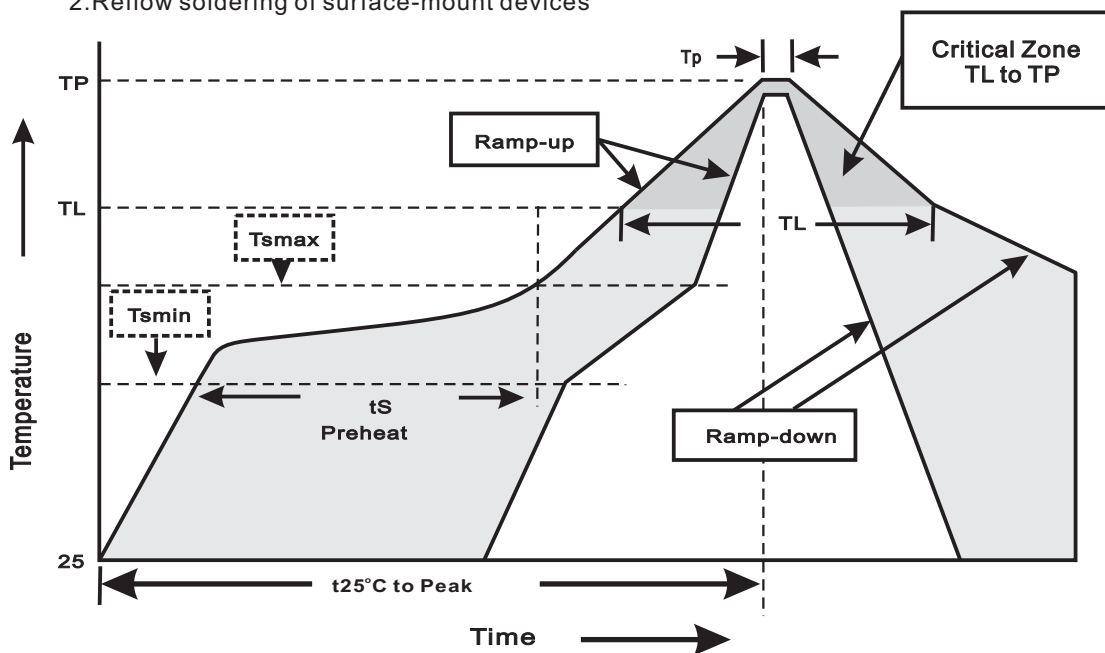
Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

**BC856AW-Q1/BC856BW-Q1/BC857AW-Q1/BC857BW-Q1/BC857CW-Q1
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Reel packing

PACKAGE	REEL SIZE	REEL (pcs)	COMPONENT SPACING (m/m)	BOX (pcs)	INNER BOX (m/m)	REEL DIA, (m/m)	CARTON SIZE (m/m)	CARTON (pcs)	APPROX. GROSS WEIGHT (kg)
SOT-323	7"	3,000	4.0	30,000	183*123*183	178	382*257*387	240,000	9.50

Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices


3.Reflow soldering

Profile Feature	Soldering Condition
Average ramp-up rate(T _L to T _P)	<3°C/sec
Preheat -Temperature Min(T _{smmin}) -Temperature Max(T _{smmax}) -Time(min to max)(t _s)	150°C 200°C 60~120sec
T _{smmax} to T _L -Ramp-upRate	<3°C/sec
Time maintained above: -Temperature(T _L) -Time(t _L)	217°C 60~260sec
Peak Temperature(T _P)	255°C-0/+5°C
Time within 5°C of actual Peak Temperature(t _P)	10~30sec
Ramp-down Rate	<6°C/sec
Time 25°C to Peak Temperature	<6minutes

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High reliability test capabilities

Item Test	Conditions	Reference
1. MSL Preconditioning	24hr bake@125°C+168hrs@85°C /85%RH+3xIR@260°C+1flux immersion+alcohol+DI H2O rinse	JESD22-A113
2. Intermittent Operating Life	Ta=25°C, ΔTj≥100°C On/Off=2min Test Duration:1000hrs	MIL-STD-750E METHOD 1037
3. High Temperature Reverse Bias	VCE=80%BVCEO (Tj=150°C)Test Duration:1000hrs	JESD22-A108
4. High Temperature Storage Life	Ta=125°C Test Duration:1000hrs	JESD22 A-103
5. Temperature Cycle	-55°C(15min) to 150°C(15min)Test Cycles:1000cycles	JESD22 A-104
6. Autoclave	P=2atm Ta=121°C RH=100% Test Duration:96hrs	JESD22 A-102
7. Solderability	245±5°C for 5sec	J-STD-002
8. Moisture Resistance	Ta=85°C/85% Relative humidity Test Duration:1000hrs	MIL-STD-750E METHOD 1021.2
9. Resistance To Solder Heat	260±5°C for 10sec	JESD22 B-106
10. High Temperature High Humidity Reverse Bias	Ta=85°C, 85%RH, VCE=80%BVCEO Test Duration:1000hrs	JESD22-A101