

**BC846AW-Q1/BC846BW-Q1/BC847AW-Q1/BC847BW-Q1/BC847CW-Q1
BC848AW-Q1/BC848BW-Q1/BC848CW-Q1**

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BC846AW-Q1/BC846BW-Q1/BC847AW-Q1/BC847BW-Q1/BC847CW-Q1 BC848AW-Q1/BC848BW-Q1/BC848CW-Q1

General Purpose Transistor NPN Silicon

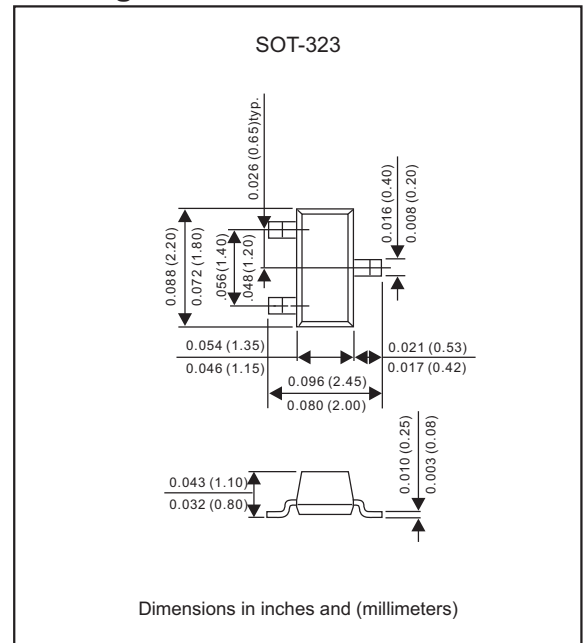
Features

- 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.BC846AW-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
BC846		50	
BC847		30	
BC848			
Collector-emitter voltage	V_{CEO}	65	V
BC846		45	
BC847		30	
BC848			
Emitter-base voltage	V_{EBO}	6.0	V
BC846		6.0	
BC847		5.0	
BC848			
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 BC846 Series BC847 Series BC848 Series	$I_C = 10\mu\text{A}$	$V_{(BR)CBO}$	80 50 30			V
Collector-emitter breakdown voltage BC846 Series BC847 Series BC848 Series	$I_C = 10\text{mA}$	$V_{(BR)CEO}$	65 45 30			V
Emitter-base breakdown voltage BC846 Series BC847 Series BC848 Series	$I_E = 1.0\mu\text{A}$	$V_{(BR)EBO}$	6.0 6.0 5.0			V
Collector-emitter breakdown voltage BC846 Series BC847 Series BC848 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 5.0	nA μA

On characteristics

Parameter	Conditions	Symbol	MIN.	TYP.	MAX.	Unit
DC current gain BC846A, BC847A, BC848A BC846B, BC847B, BC848B BC847C, BC848C	$I_C = 2.0\text{mA}$, $V_{CE} = 5.0\text{V}$	h_{FE}	110 200 420	180 290 520	220 450 800	
Collector-emitter saturation voltage	$I_C = 10\text{mA}$, $I_B = 0.5\text{mA}$ $I_C = 100\text{mA}$, $I_B = 5.0\text{mA}$	$V_{CE(sat)}$			0.25 0.6	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 voltage	$I_C = 2.0\text{mA}$, $V_{CE} = 5.0\text{V}$ $I_C = 10\text{mA}$, $V_{CE} = 5.0\text{V}$	$V_{BE(on)}$	580	660	700 770	mV

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 BC846A, BC847A, BC848A BC846B, BC847B, BC848B BC847C, BC848C	$I_C = 0.2\text{mA}$, $V_{CE} = 5.0\text{V}$, $R_s = 2.0\text{K}\Omega$, $f = 1.0\text{kHz}$, $BW = 200\text{Hz}$	NF			10 10 4	dB

Rating and characteristic curves (BC846A ,BC847A,BC848A)

Figure 1. DC Current Gain vs. Collector Current

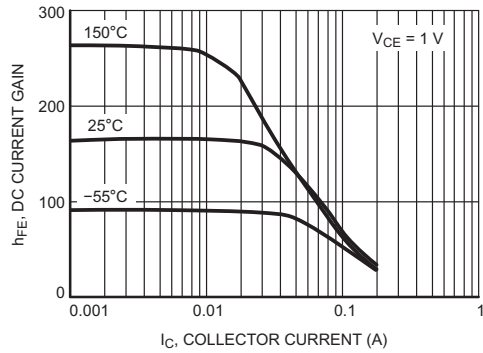


Figure 2. Collector Emitter Saturation Voltage vs. Collector Current

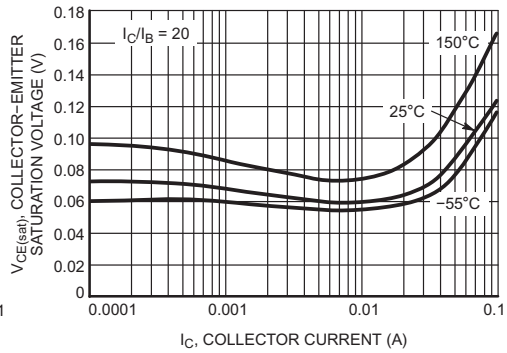


Figure 3. Base Emitter Saturation Voltage vs. Collector Current

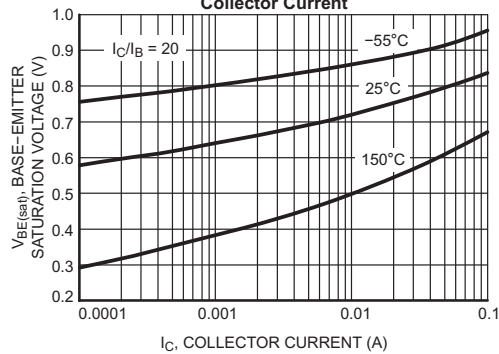


Figure 4. Base Emitter Voltage vs. Collector Current

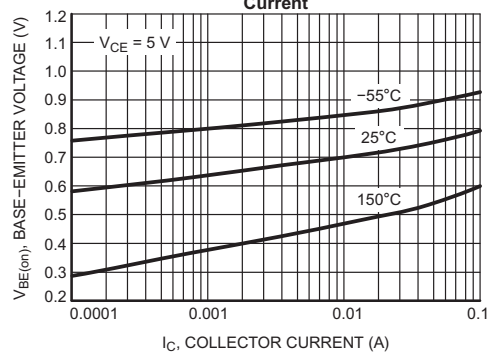


Figure 5. Collector Saturation Region

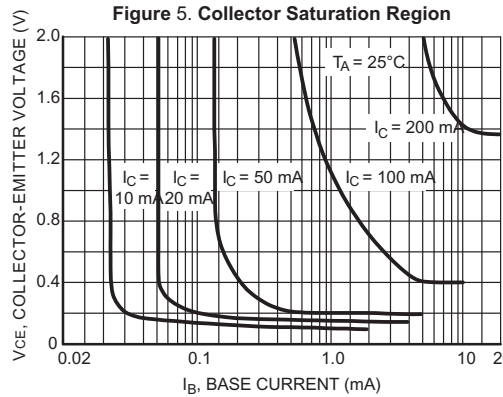


Figure 6. Base-Emitter Temperature Coefficient

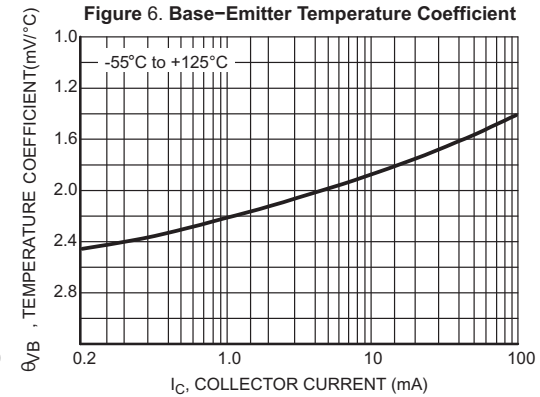


Figure 7. Capacitances

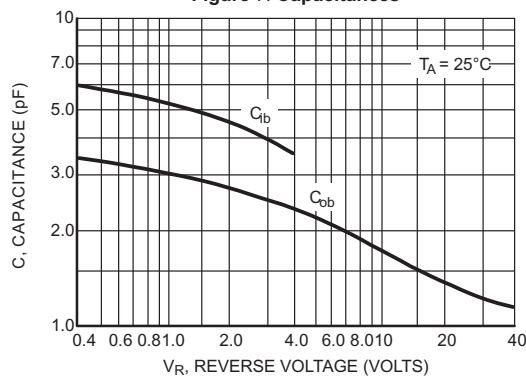
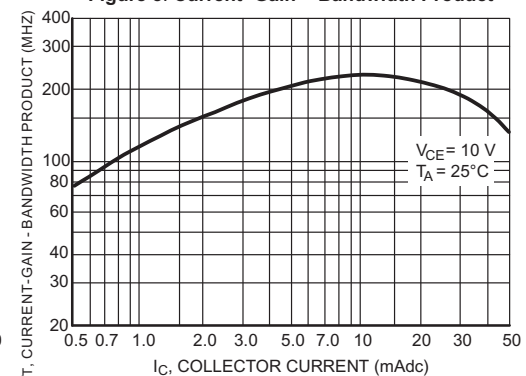


Figure 8. Current-Gain - Bandwidth Product



Rating and characteristic curves (BC846B)

Figure 9. DC Current Gain vs. Collector Current

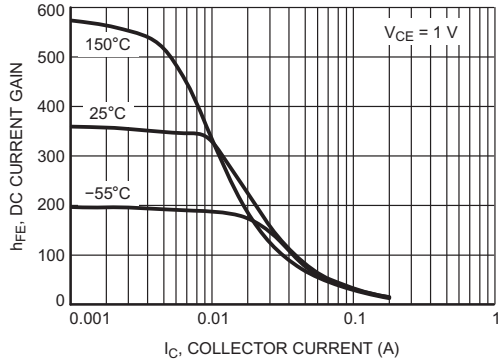


Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

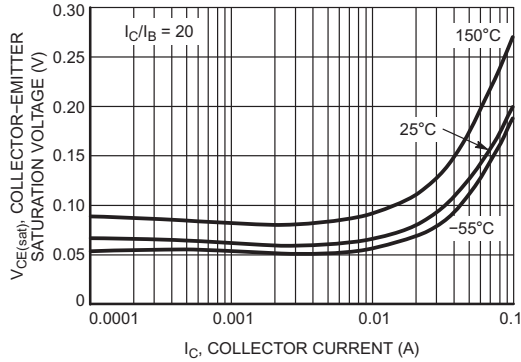


Figure 11. Base Emitter Saturation Voltage vs. Collector Current

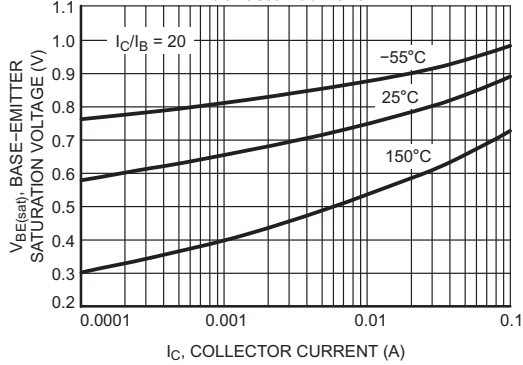


Figure 12. Base Emitter Voltage vs. Collector Current

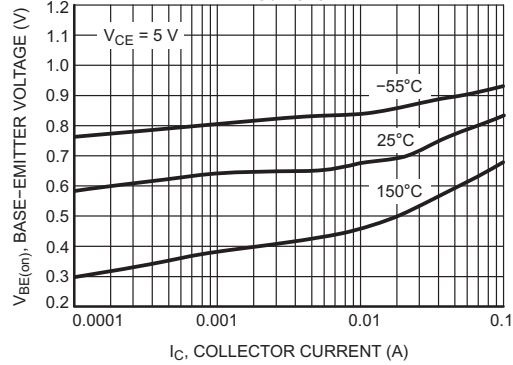


Figure 13. Collector Saturation Region

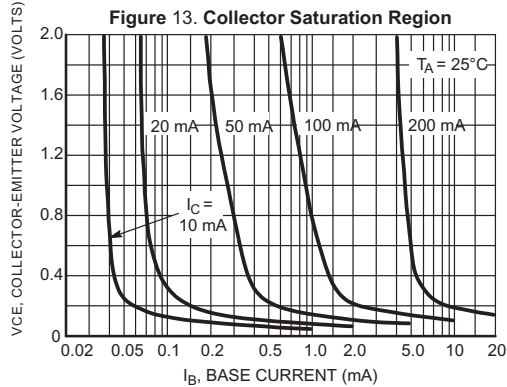


Figure 14. Base-Emitter Temperature Coefficient

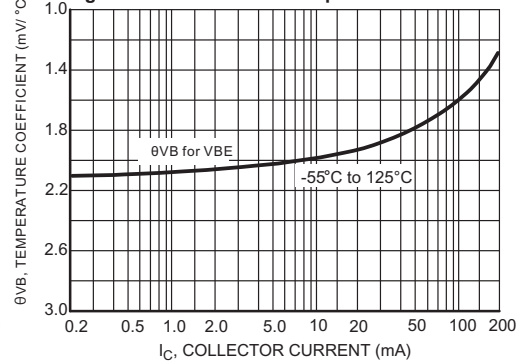


Figure 15. Capacitance

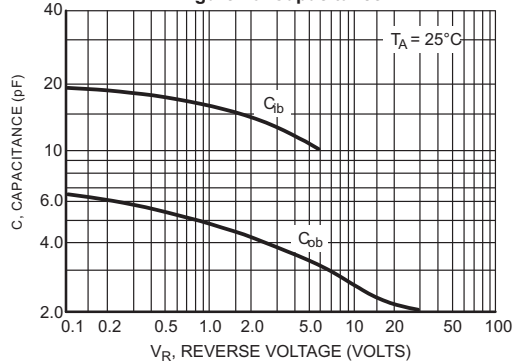
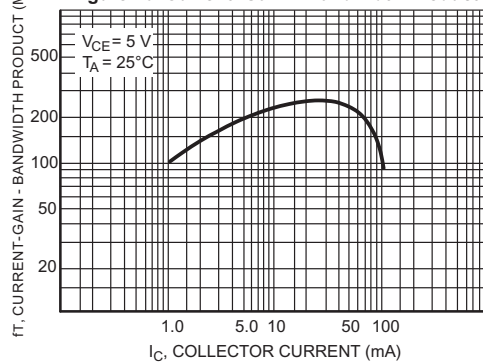


Figure 16. Current-Gain - Bandwidth Product



Rating and characteristic curves (BC847B,BC848B)

Figure 17. DC Current Gain vs. Collector Current

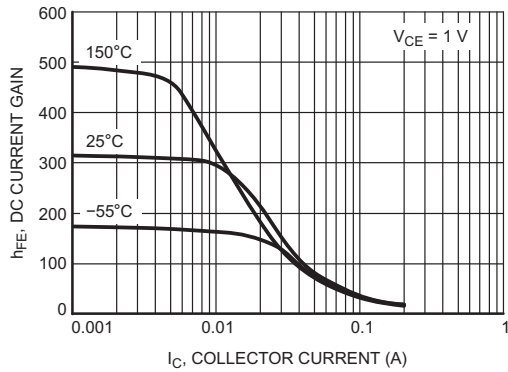


Figure 18. Collector Emitter Saturation Voltage vs. Collector Current

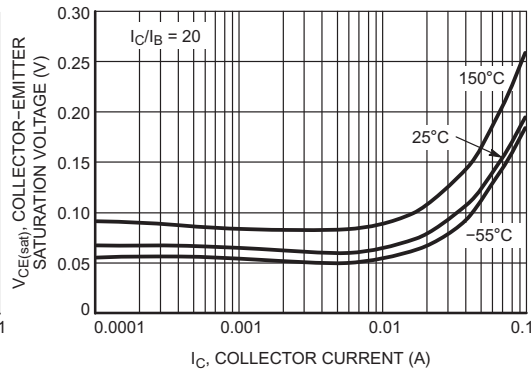


Figure 19. Base Emitter Saturation Voltage vs. Collector Current

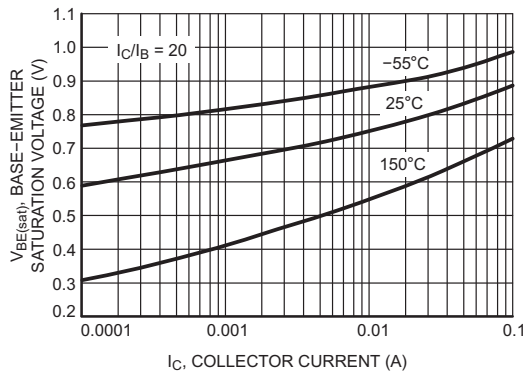


Figure 20. Base Emitter Voltage vs. Collector Current

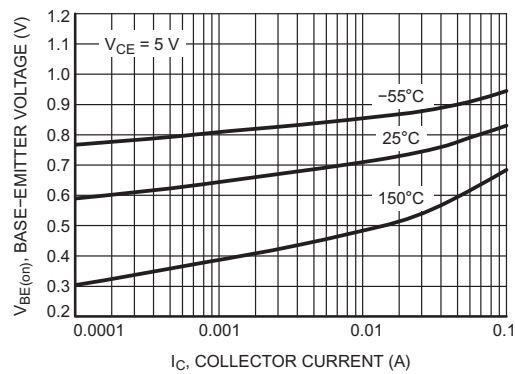


Figure 21. Collector Saturation Region

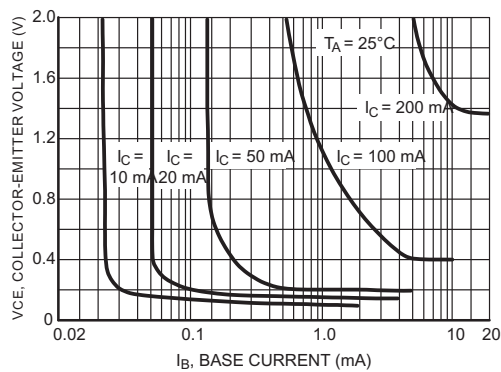


Figure 22. Base-Emitter Temperature Coefficient

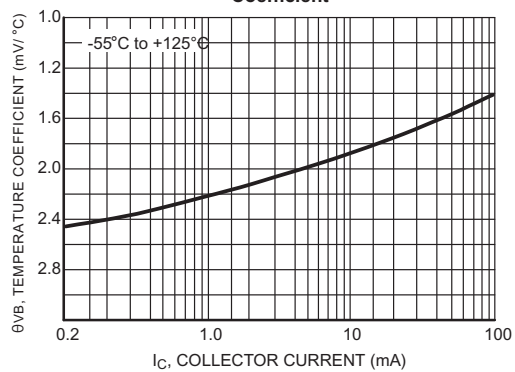


Figure 23. Capacitances

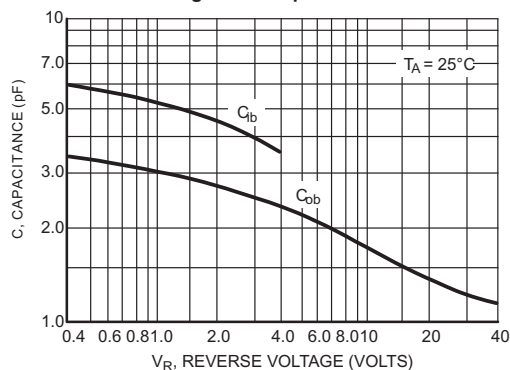
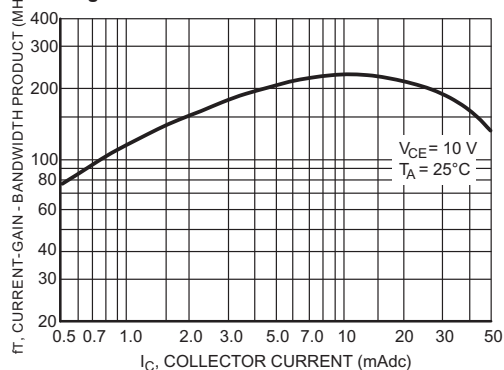


Figure 24. Current-Gain - Bandwidth Product



Rating and characteristic curves (BC847C,BC848C)

Figure 25. DC Current Gain vs. Collector Current

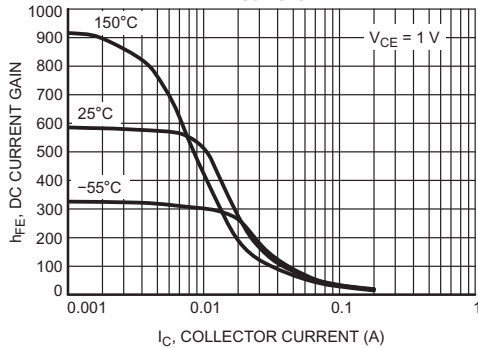


Figure 26. Collector Emitter Saturation Voltage vs. Collector Current

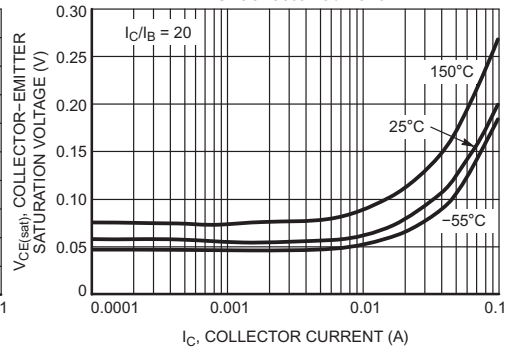


Figure 27. Base Emitter Saturation Voltage vs. Collector Current

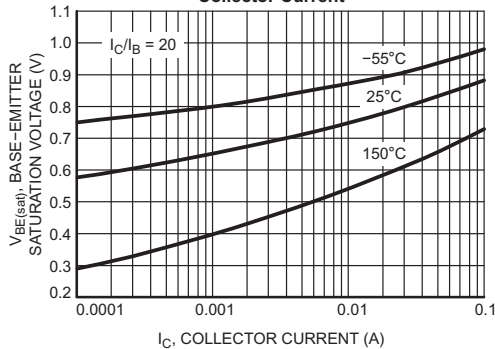
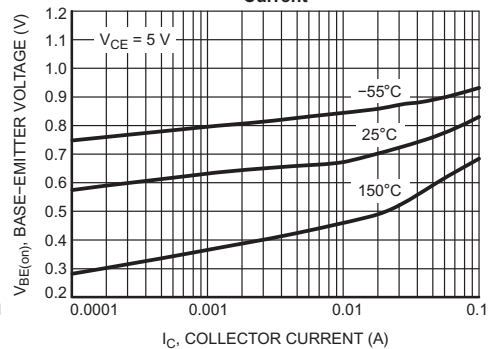


Figure 28. Base Emitter Voltage vs. Collector Current



Rating and characteristic curves (BC847C,BC848C)

Figure 29. Collector Saturation Region

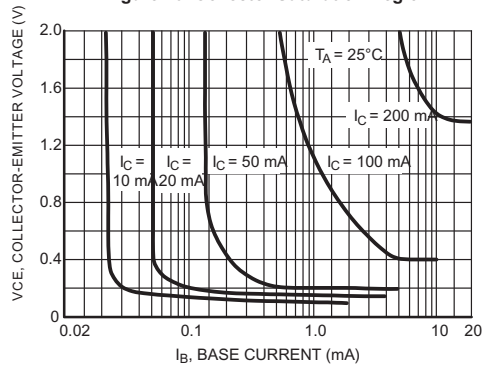


Figure 30. Base-Emitter Temperature Coefficient

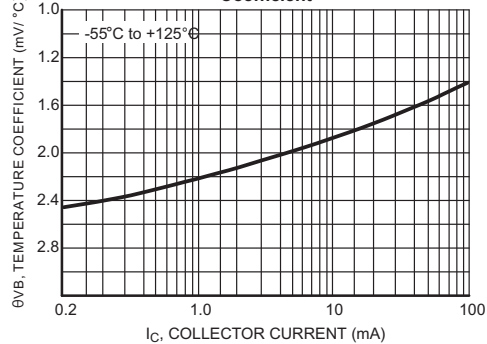


Figure 31. Capacitances

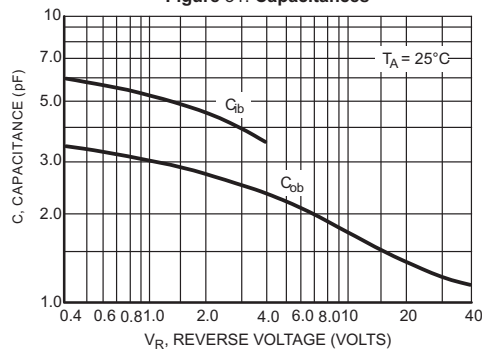
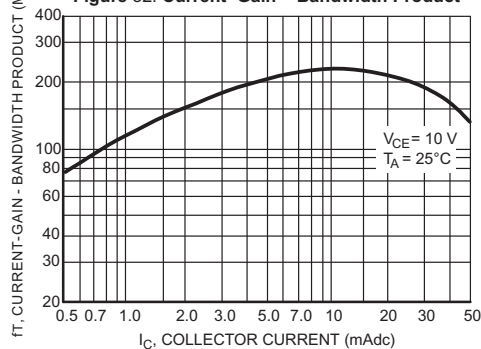


Figure 32. Current-Gain - Bandwidth Product



Rating and characteristic curves

Figure 33. Safe Operating Area for BC846A,BC846B

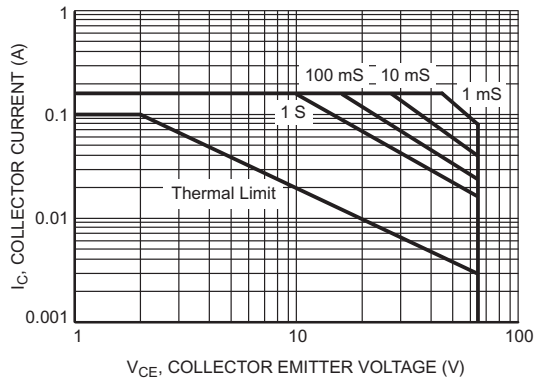


Figure 34. Safe Operating Area for BC847A,BC847B,BC847C

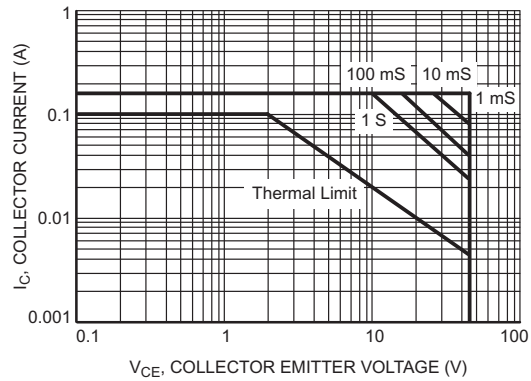
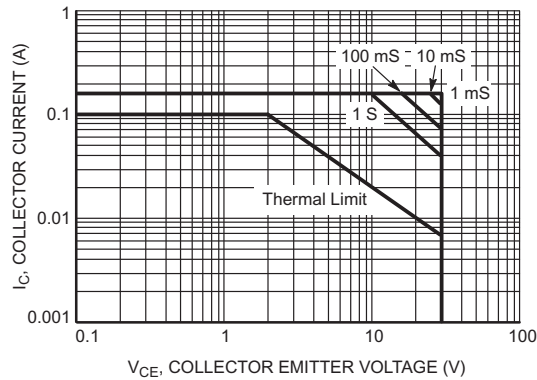
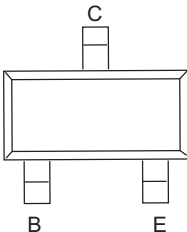
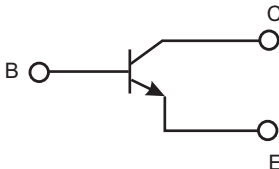


Figure 35. Safe Operating Area for BC848A,BC848B,BC848C

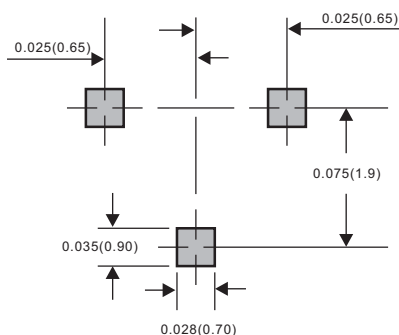


**BC846AW-Q1/BC846BW-Q1/BC847AW-Q1/BC847BW-Q1/BC847CW-Q1
BC848AW-Q1/BC848BW-Q1/BC848CW-Q1**
Pinning information

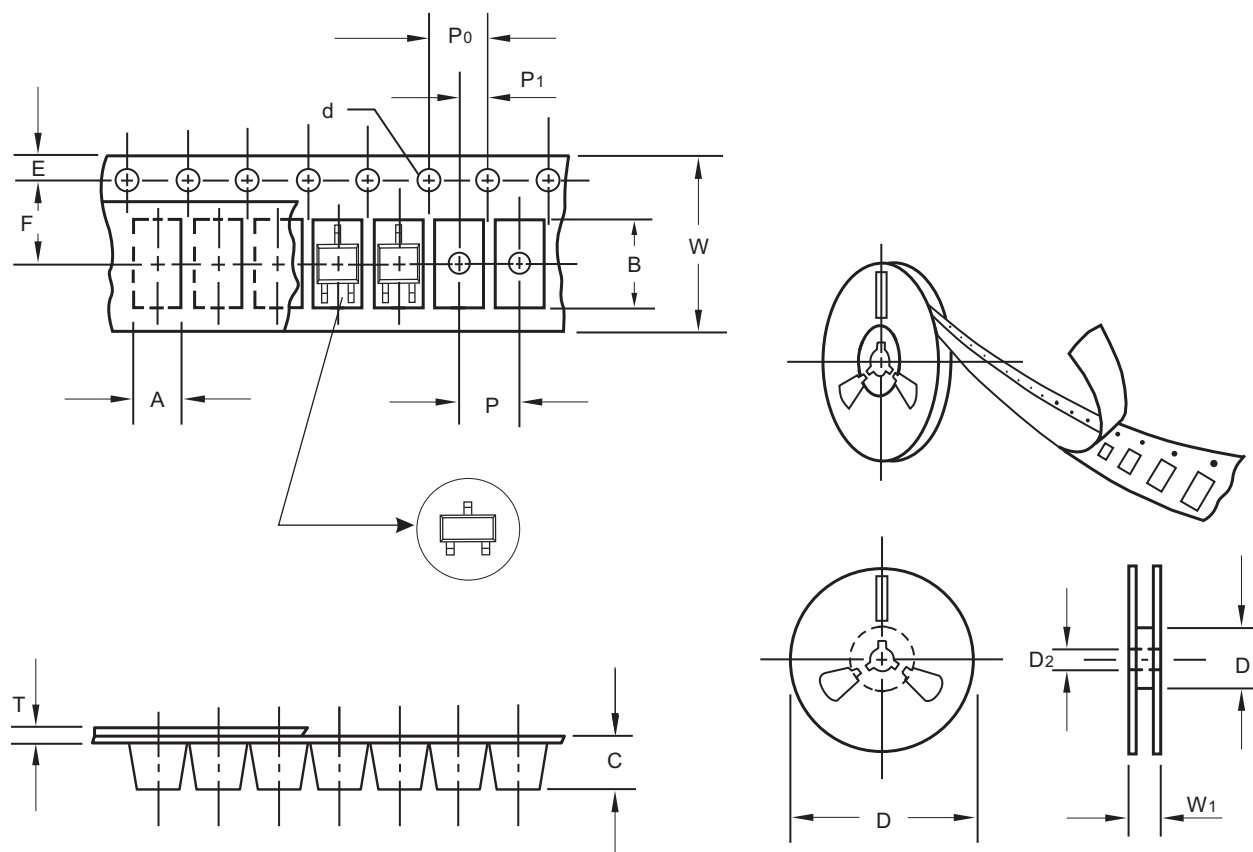
Pin	Simplified outline	Symbol
PinB Base PinC Collector PinE Emitter		

Marking

Type number	Marking code
BC846AW-Q1	1A
BC846BW-Q1	1B
BC847AW-Q1	1E
BC847BW-Q1	1F
BC847CW-Q1	1G
BC848AW-Q1	1J
BC848BW-Q1	1K
BC848CW-Q1	1L

Suggested solder pad layout
SOT-323


Dimensions in inches and (millimeters)

BC846AW-Q1/BC846BW-Q1/BC847AW-Q1/BC847BW-Q1/BC847CW-Q1
BC848AW-Q1/BC848BW-Q1/BC848CW-Q1
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

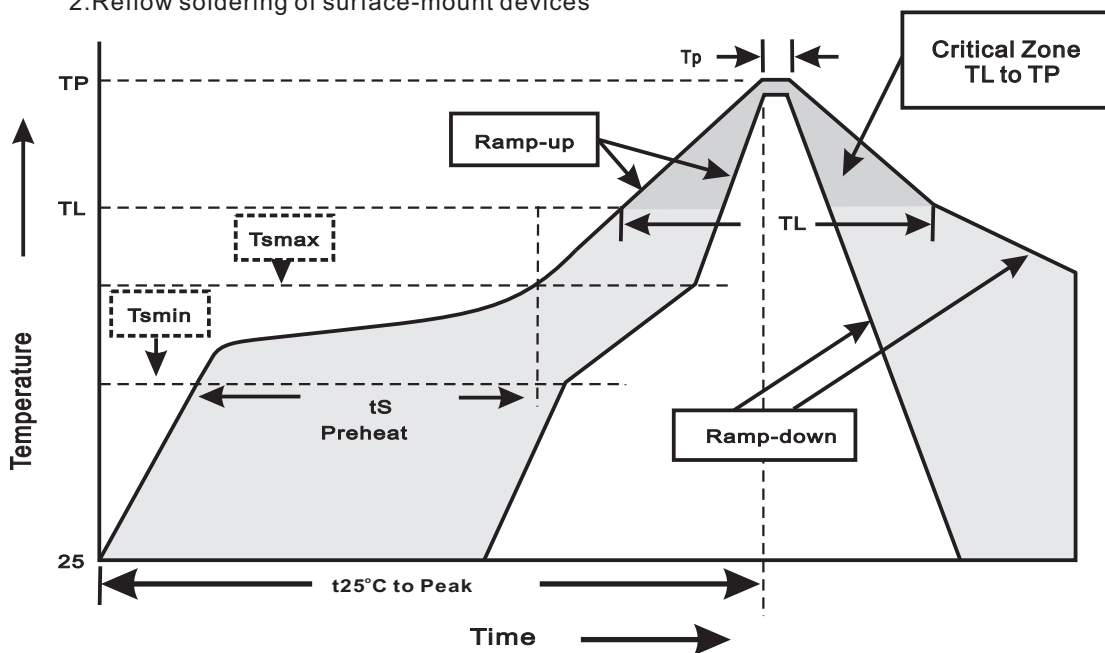
Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

**BC846AW-Q1/BC846BW-Q1/BC847AW-Q1/BC847BW-Q1/BC847CW-Q1
BC848AW-Q1/BC848BW-Q1/BC848CW-Q1**
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

BC846AW-Q1/BC846BW-Q1/BC847AW-Q1/BC847BW-Q1/BC847CW-Q1 BC848AW-Q1/BC848BW-Q1/BC848CW-Q1

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, $\Delta T_j \geq 100^\circ\text{C}$ On/Off=2min Test Duration:1000hrs	MIL-STD-750E METHOD 1037
3. High Temperature Reverse Bias	VCE=80%BVC _{EO} (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%BVC _{EO} Test Duration:1000hrs	JESD22-A101