Dual General Purpose Transistors
NPN Duals

BC846BDW1, BC847BDW1, BC848CDW1

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.

SOT−363/SC−88
CASE 419B
STYLE 1

Features

- S and NSV Prefixes 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*

MARKING DIAGRAM
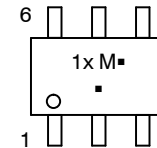
1x = Specific Device Code
x = B, F, G, L
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

MAXIMUM RATINGS

Rating	Symbol	BC846	BC847	BC848	Unit
Collector – Emitter Voltage	V_{CEO}	65	45	30	V
Collector – Base Voltage	V_{CBO}	80	50	30	V
Emitter – Base Voltage	V_{EBO}	6.0	6.0	5.0	V
Collector Current – Continuous	I_C	100	100	100	mAdc

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.
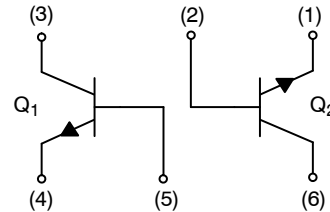
ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 10 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 10.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit

Total Device Dissipation
  Per Device
  FR−5 Board (Note 1)
  T_A = 25°C
  Derate Above 25°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

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 **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

June, 2024 – Rev. 14

Publication Order Number:
BC846BDW1T1/D

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector – Emitter Breakdown Voltage (I_C = 10 mA) BC846 BC847 BC848	$V_{(BR)CEO}$	 65 45 30	 – – –	 – – –	V
Collector – Emitter Breakdown Voltage (I_C = 10 µA, V_{EB} = 0) BC846 BC847 BC848	$V_{(BR)CES}$	 80 50 30	 – – –	 – – –	V
Collector – Base Breakdown Voltage (I_C = 10 µA) BC846 BC847 BC848	$V_{(BR)CBO}$	 80 50 30	 – – –	 – – –	V
Emitter – Base Breakdown Voltage (I_E = 1.0 µA) BC846 BC847 BC848	$V_{(BR)EBO}$	 6.0 6.0 5.0	 – – –	 – – –	V
Collector Cutoff Current (V_{CB} = 30 V) (V_{CB} = 30 V, T_A = 150°C)	I_{CBO}	– –	– –	15 5.0	nA µA
ON CHARACTERISTICS					
DC Current Gain (I_C = 10 µA, V_{CE} = 5.0 V) BC846B, BC847B BC847C, BC848C (I_C = 2.0 mA, V_{CE} = 5.0 V) BC846B, BC847B BC847C, BC848C	h_{FE}	 – – 200 420	 150 270 290 520	 – – 450 800	–
Collector – Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.5 mA) (I_C = 100 mA, I_B = 5.0 mA)	$V_{CE(sat)}$	– –	– –	0.25 0.6	V
Base – Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.5 mA) (I_C = 100 mA, I_B = 5.0 mA)	$V_{BE(sat)}$	– –	0.7 0.9	– –	V
Base – Emitter Voltage (I_C = 2.0 mA, V_{CE} = 5.0 V) (I_C = 10 mA, V_{CE} = 5.0 V)	$V_{BE(on)}$	580 –	660 –	700 770	mV
SMALL – SIGNAL CHARACTERISTICS					
Current – Gain – Bandwidth Product (I_C = 10 mA, V_{CE} = 5.0 Vdc, f = 100 MHz)	f_T	100	–	–	MHz
Output Capacitance (V_{CB} = 10 V, f = 1.0 MHz)	C_{obo}	–	–	4.5	pF
Noise Figure (I_C = 0.2 mA, V_{CE} = 5.0 Vdc, R_S = 2.0 kΩ, f = 1.0 kHz, BW = 200 Hz)	NF	–	–	10	dB

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.

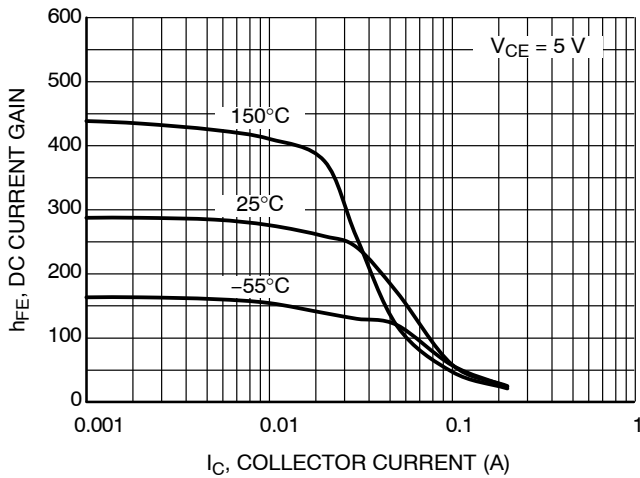## TYPICAL CHARACTERISTICS – BC846BDW1

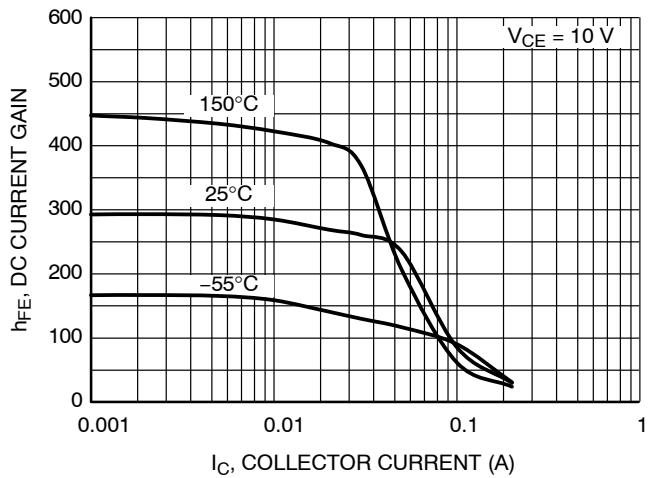**Figure 1. DC Current Gain at V_{CE} = 5 V**

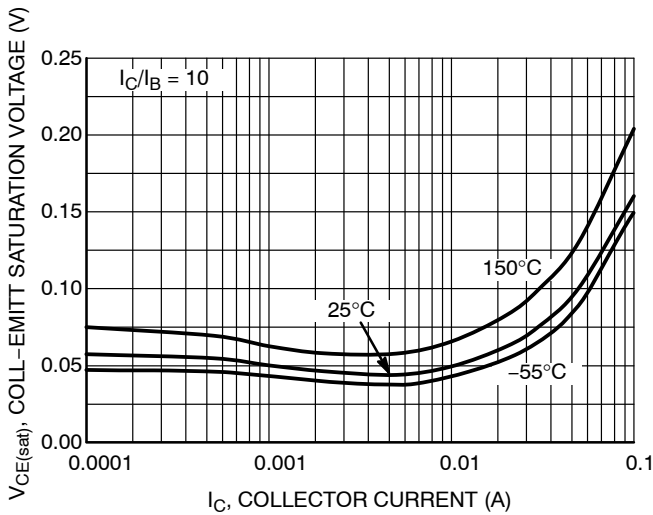**Figure 2. DC Current Gain at V_{CE} = 10 V**
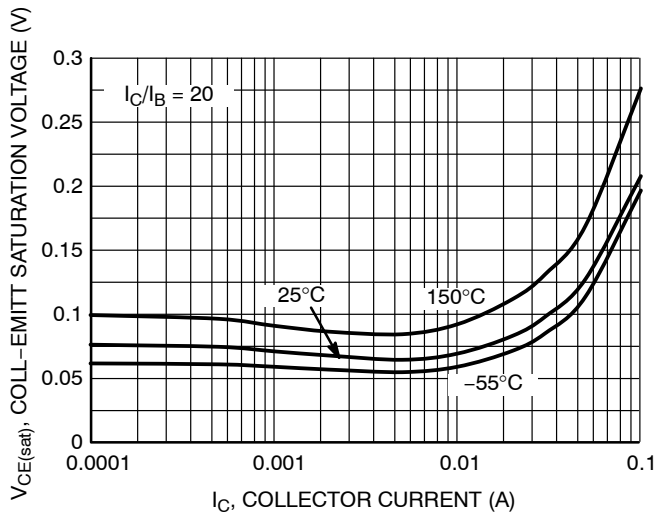
Figure 3. $V_{CE(sat)}$ at I_C/I_B = 10

Figure 4. $V_{CE(sat)}$ at I_C/I_B = 20

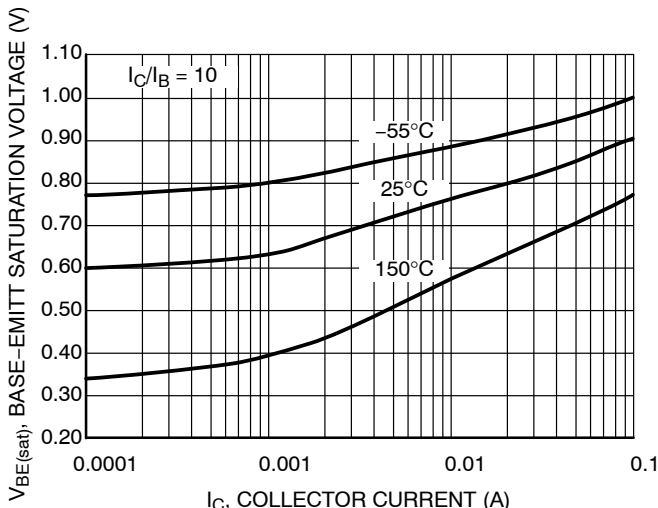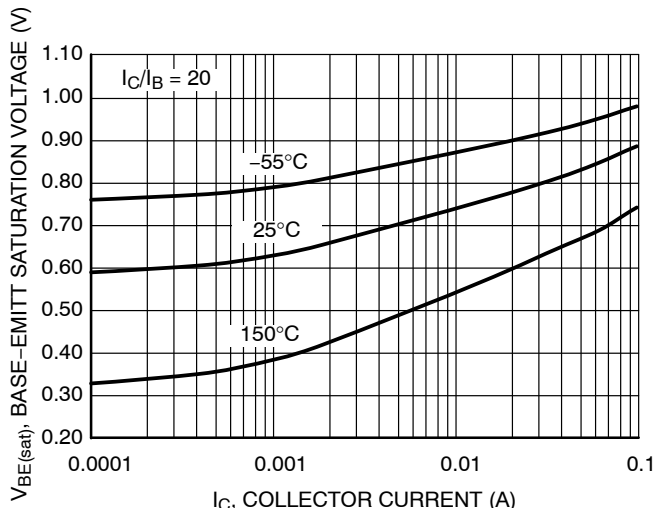**Figure 5. $V_{BE(sat)}$ at I_C/I_B = 10**

Figure 6. $V_{BE(sat)}$ at I_C/I_B = 20

TYPICAL CHARACTERISTICS – BC846BDW1
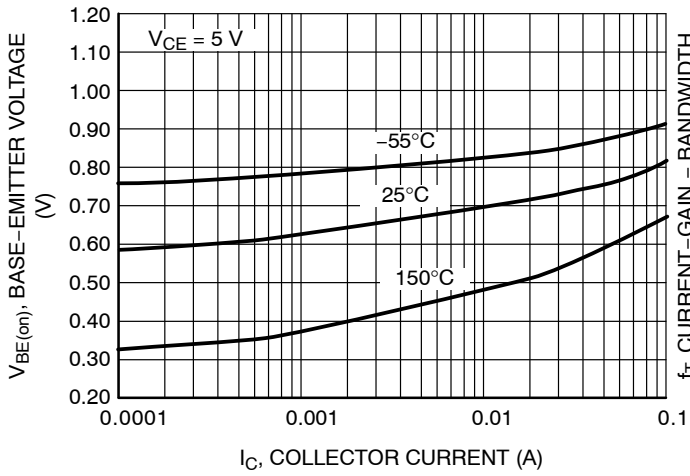
Figure 7. V_BE(on) at V_CE = 5 V
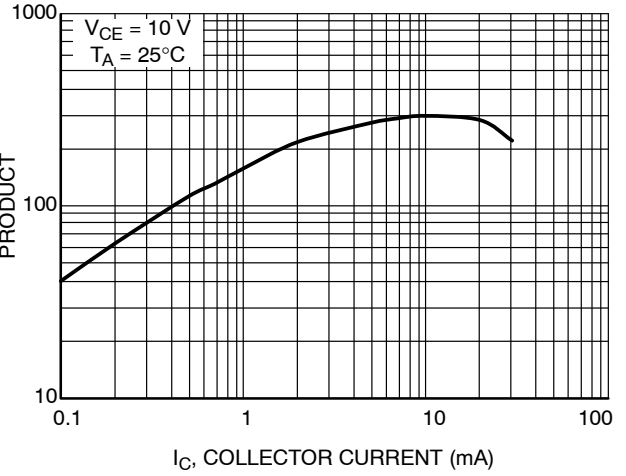
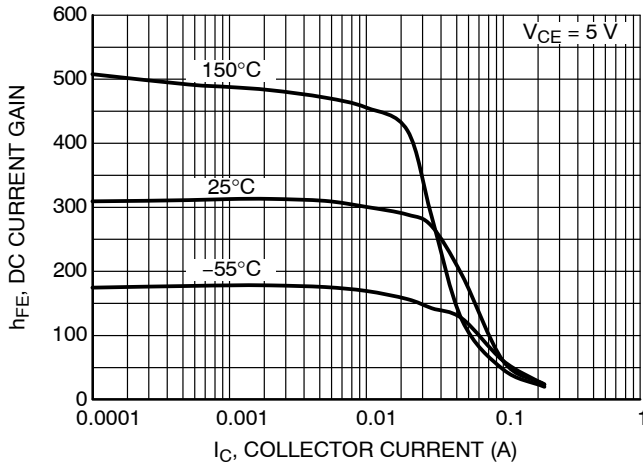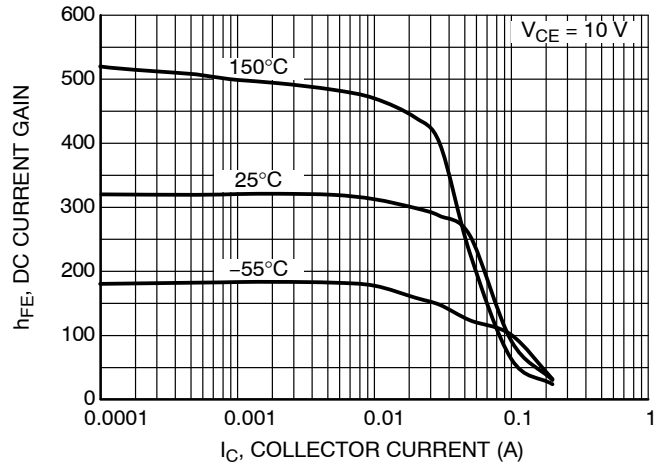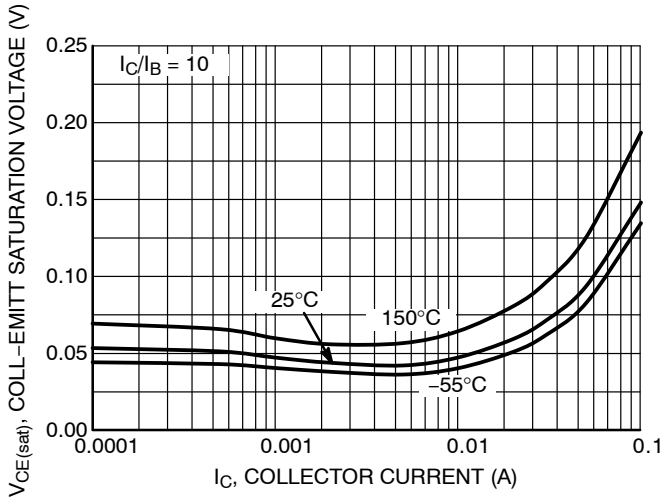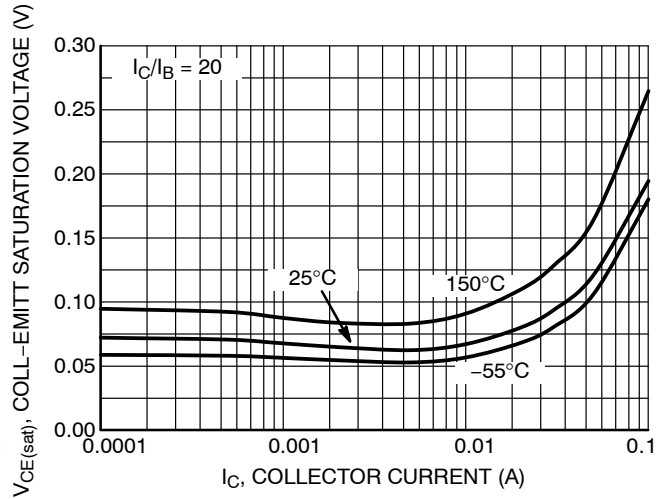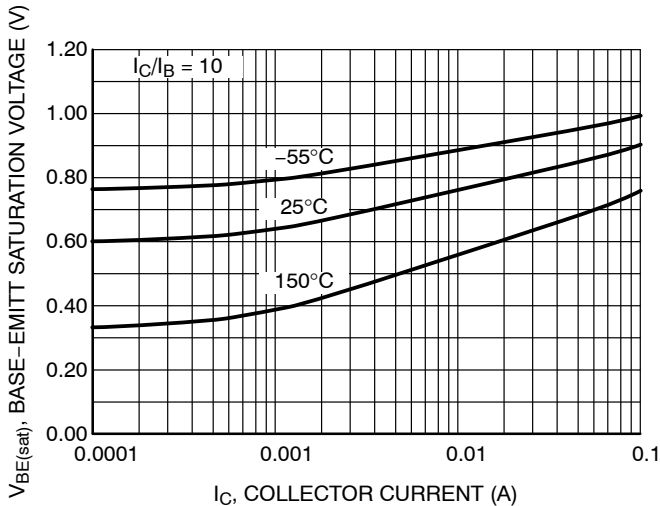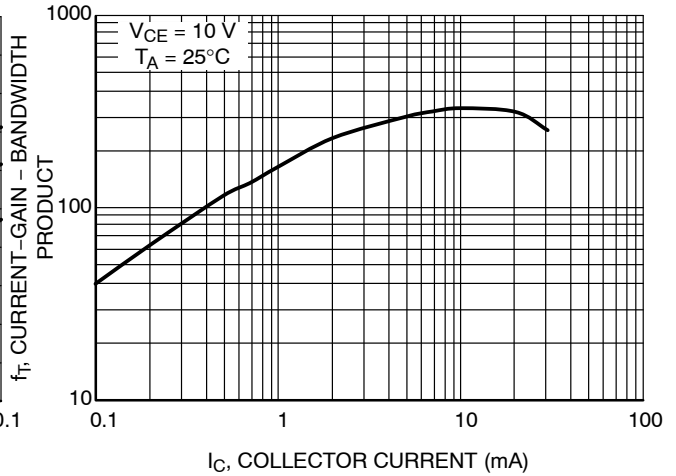**Figure 8. Current – Gain – Bandwidth Product**
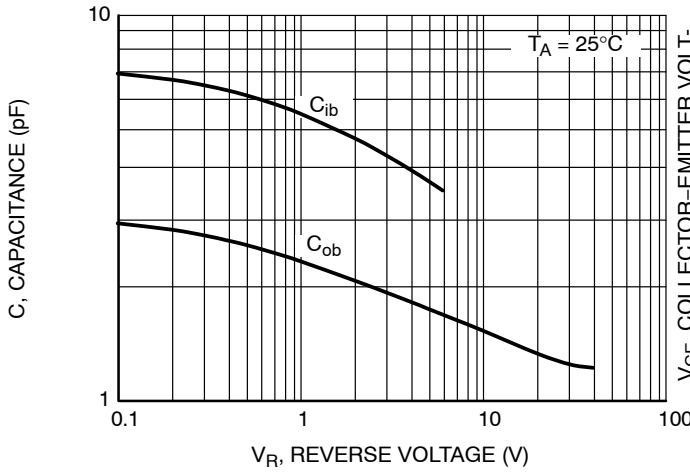
Figure 9. Capacitances
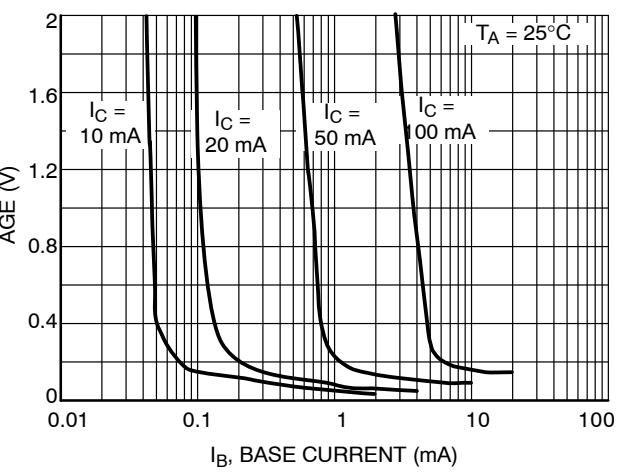
Figure 10. Collector Saturation Region
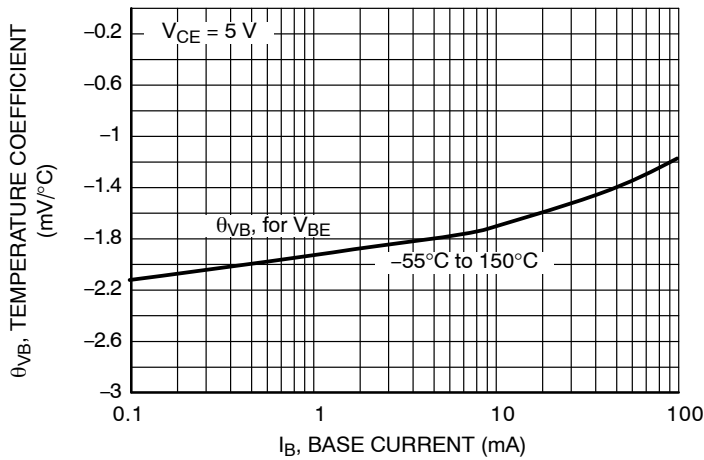
Figure 11. Base−Emitter Temperature Coefficient
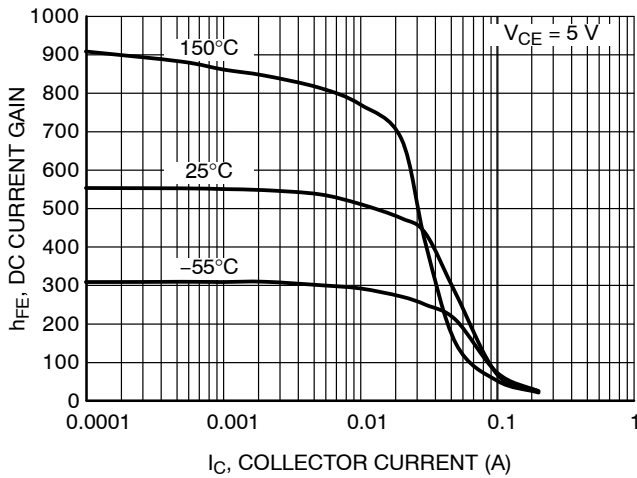
TYPICAL CHARACTERISTICS – BC847BDW1

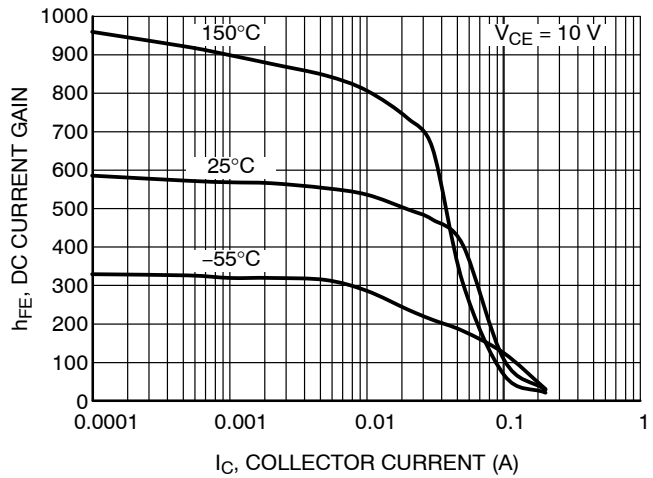**Figure 12. DC Current Gain at V_{CE} = 5 V**

**Figure 13. DC Current Gain at V_{CE} = 10 V**

Figure 14. V_{CE} at I_C/I_B = 10

Figure 15. V_{CE} at I_C/I_B = 20

Figure 16. $V_{BE(sat)}$ at I_C/I_B = 10
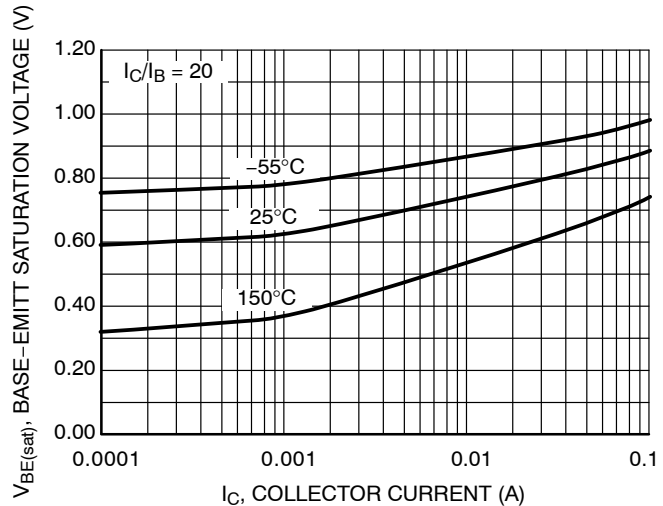
Figure 17. $V_{BE(sat)}$ at I_C/I_B = 20

TYPICAL CHARACTERISTICS – BC847BDW1
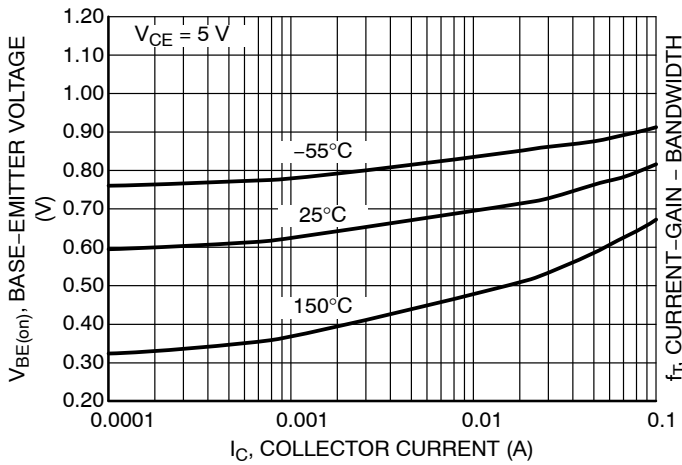
Figure 18. V_BE(on) at V_CE = 5 V

Figure 19. Current – Gain – Bandwidth Product
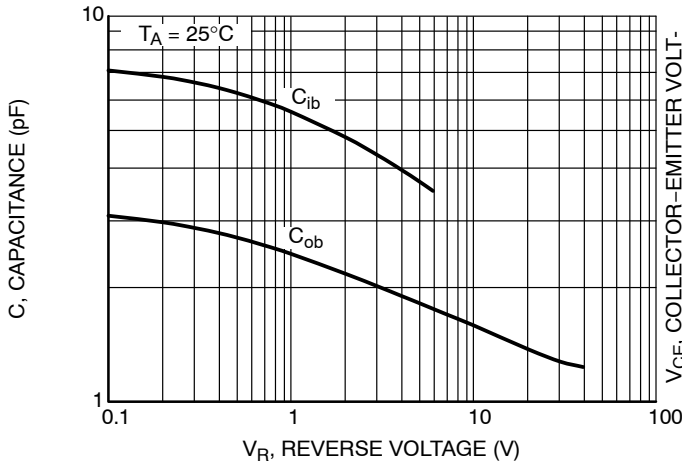
Figure 20. Capacitances
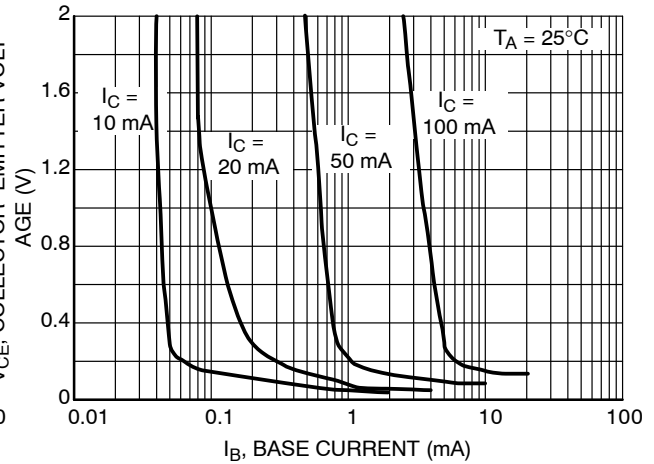
Figure 21. Collector Saturation Region
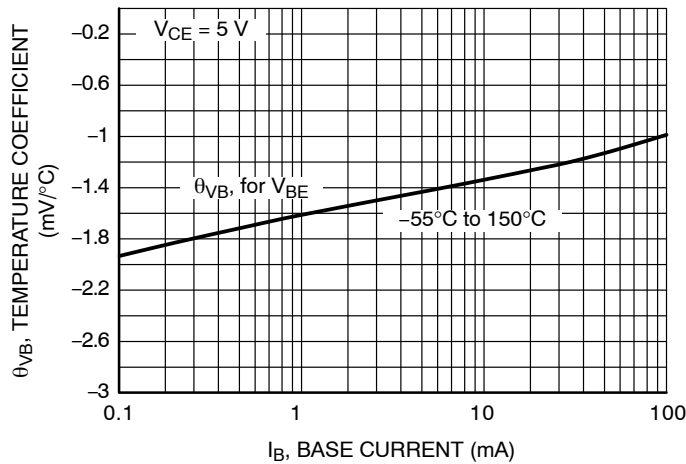
Figure 22. Base−Emitter Temperature Coefficient

TYPICAL CHARACTERISTICS – BC848CDW1

Figure 23. DC Current Gain at V_{CE} = 5 V

Figure 24. DC Current Gain at V_{CE} = 10 V
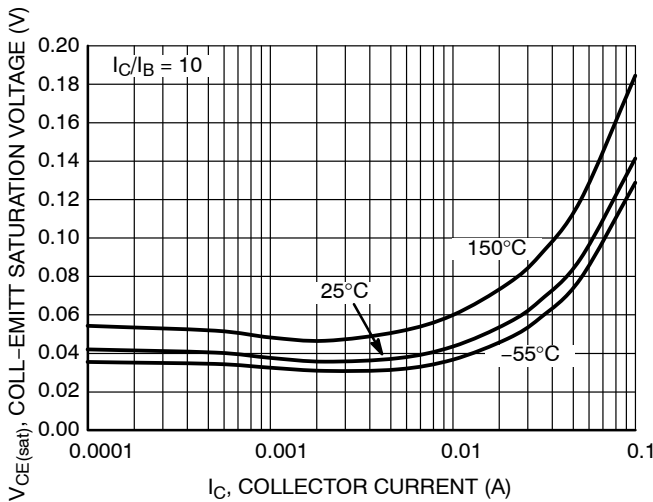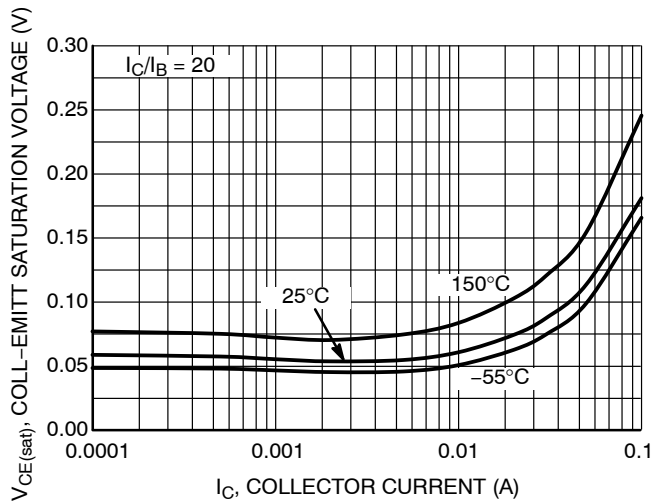

Figure 25. V_{CE} at I_C/I_B = 10
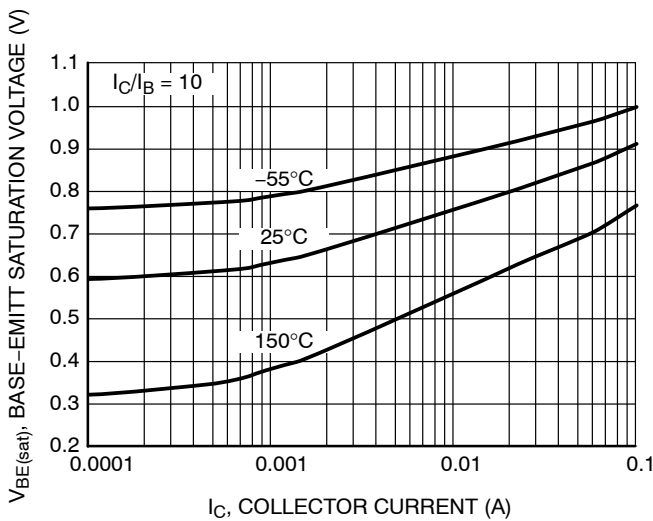

Figure 26. V_{CE} at I_C/I_B = 20

Figure 27. $V_{BE(sat)}$ at I_C/I_B = 10

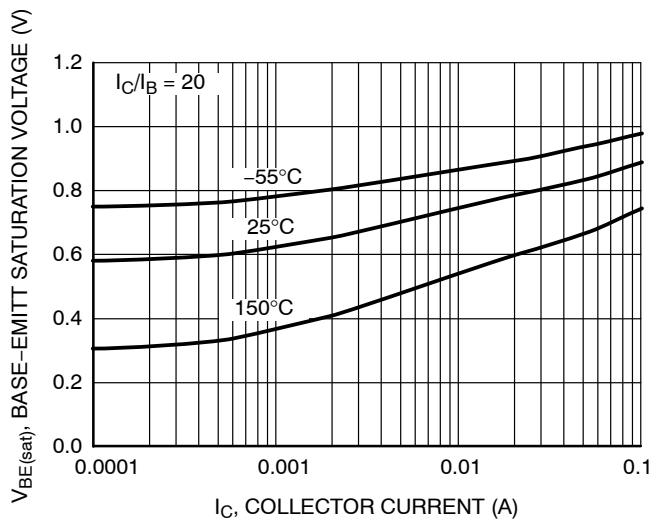Figure 28. $V_{BE(sat)}$ at I_C/I_B = 20

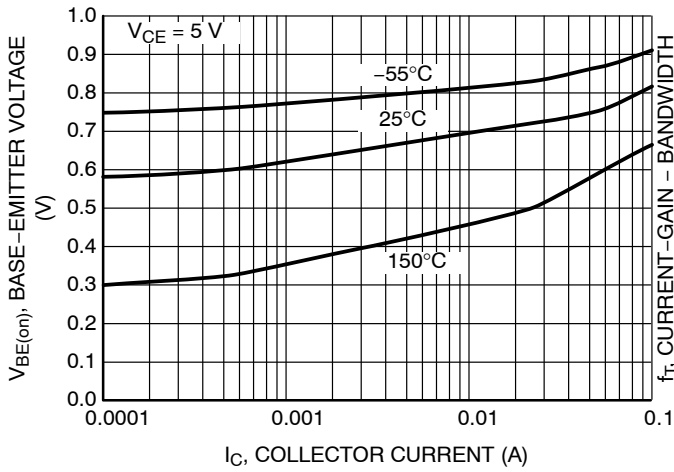## TYPICAL CHARACTERISTICS – BC848CDW1

Figure 29. V$_{BE(on)}$ at V$_{CE}$ = 5 V
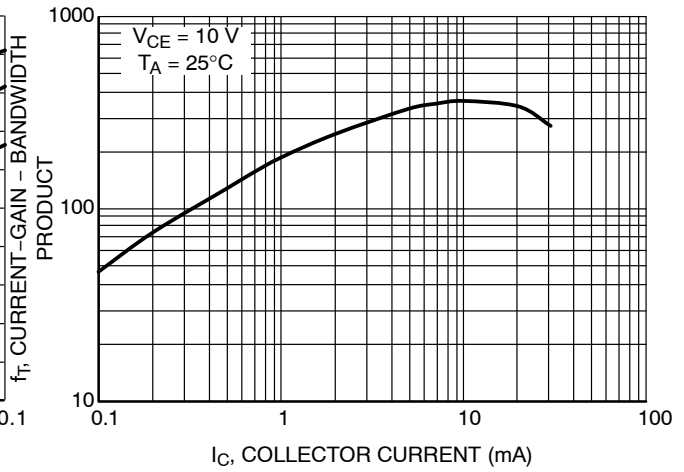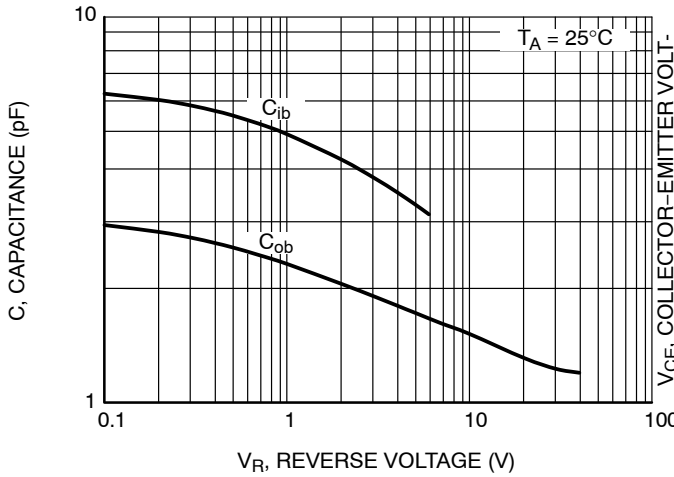

Figure 30. Current – Gain – Bandwidth Product

Figure 31. Capacitances
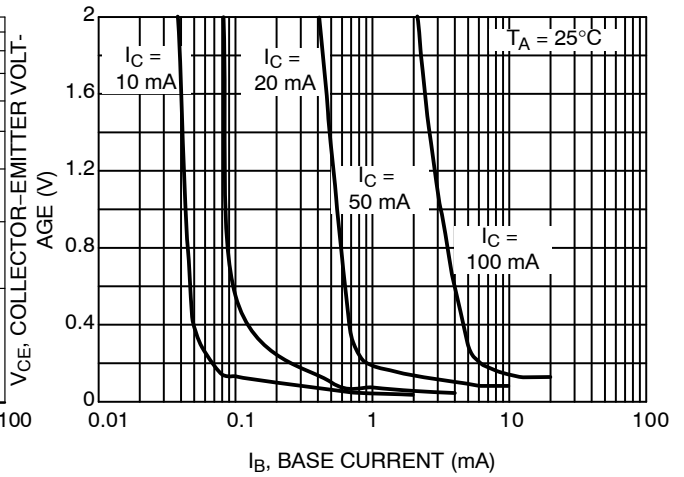
Figure 32. Collector Saturation Region
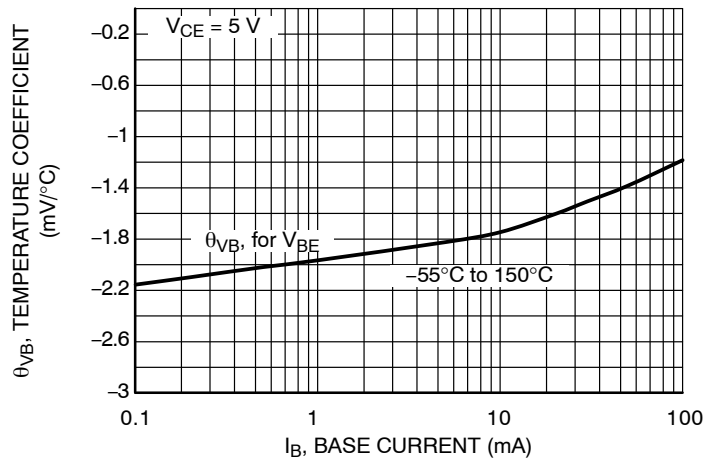
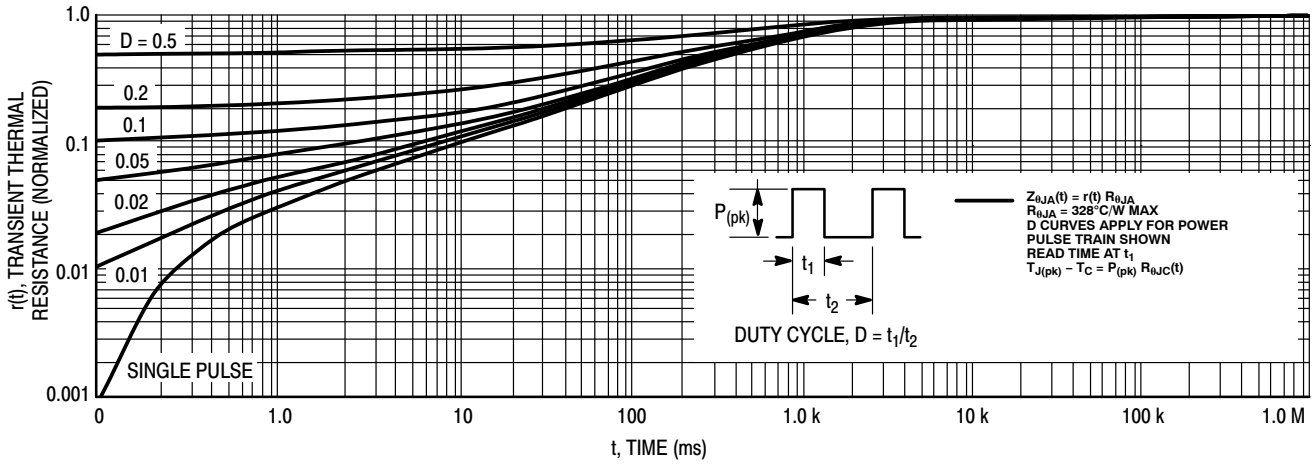**Figure 33. Base−Emitter Temperature Coefficient**
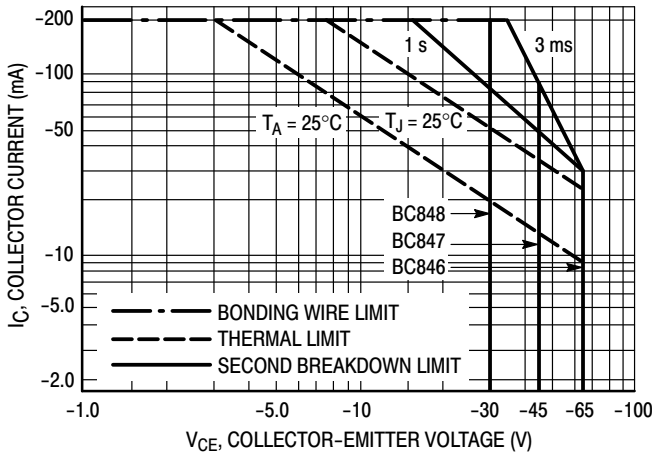
Figure 34. Thermal Response

Figure 35. 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 35 is based upon $T_{J(pk)} = 150°C$; T_C or T_A is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150°C$. $T_{J(pk)}$ may be calculated from the data in Figure 34. 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	Markings	Package	Shipping†
BC846BDW1T1G	1B	SOT−363 (Pb−Free)	3,000 / Tape & Reel
SBC846BDW1T1G*	1B	SOT−363 (Pb−Free)	3,000 / Tape & Reel
BC847BDW1T1G	1F	SOT−363 (Pb−Free)	3,000 / Tape & Reel
SBC847BDW1T1G*	1F	SOT−363 (Pb−Free)	3,000 / Tape & Reel
BC847BDW1T3G	1F	SOT−363 (Pb−Free)	10,000 / Tape & Reel
SBC847BDW1T3G*	1F	SOT−363 (Pb−Free)	10,000 / Tape & Reel
NSVBC847BDW1T2G*	1F	SOT−363 (Pb−Free)	3,000 / Tape & Reel
BC847CDW1T1G	1G	SOT−363 (Pb−Free)	3,000 / Tape & Reel
SBC847CDW1T1G*	1G	SOT−363 (Pb−Free)	3,000 / Tape & Reel
BC848CDW1T1G	1L	SOT−363 (Pb−Free)	3,000 / Tape & Reel

DISCONTINUED (Note 2)

Device	Markings	Package	Shipping†
NSVBC848CDW1T1G*	1L	SOT−363 (Pb−Free)	3,000 / 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 Prefixes for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable.

2. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.
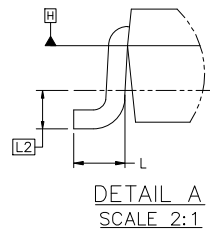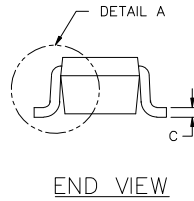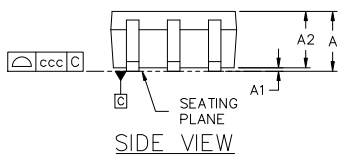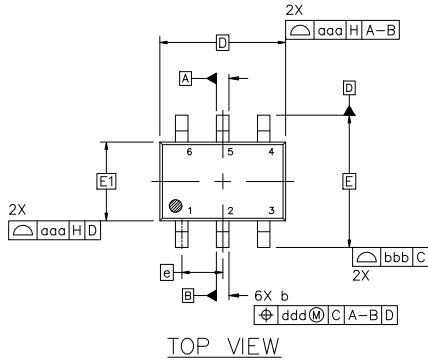
SC−88 2.00x1.25x0.90, 0.65P
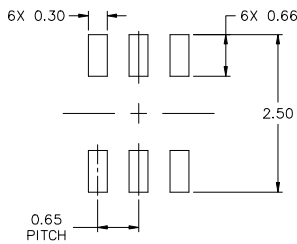CASE 419B−02
ISSUE Z
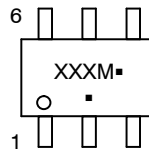
DATE 18 APR 2024

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5−2018.
2. ALL DIMENSION ARE IN 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.

TOP VIEW

SIDE VIEW

DETAIL A

END VIEW

DETAIL A
SCALE 2:1

RECOMMENDED MOUNTING FOOTPRINT*

6X 0.30
6X 0.66
2.50
0.65 PITCH

* FOR ADDITIONAL INFORMATION ON OUR Pb−FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*

XXXM▪

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.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	−−−	−−−	1.10
A1	0.00	−−−	0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
c	0.08	0.15	0.22
D	2.00 BSC		
E	2.10 BSC		
E1	1.25 BSC		
e	0.65 BSC		
L	0.26	0.36	0.46
L2	0.15 BSC		
aaa	0.15		
bbb	0.30		
ccc	0.10		
ddd	0.10		

STYLES ON PAGE 2

DOCUMENT NUMBER:	98ASB42985B		
DESCRIPTION:	SC−88 2.00x1.25x0.90, 0.65P		PAGE 1 OF 2

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

STYLE 2:
CANCELLED

STYLE 3:
CANCELLED

STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. COLLECTOR
4. EMITTER
5. BASE
6. ANODE

STYLE 5:
PIN 1. ANODE
2. ANODE
3. COLLECTOR
4. EMITTER
5. BASE
6. CATHODE

STYLE 6:
PIN 1. ANODE 2
2. N/C
3. CATHODE 1
4. ANODE 1
5. N/C
6. CATHODE 2

STYLE 7:
PIN 1. SOURCE 2
2. DRAIN 2
3. GATE 1
4. SOURCE 1
5. DRAIN 1
6. GATE 2

STYLE 8:
CANCELLED

STYLE 9:
PIN 1. EMITTER 2
2. EMITTER 1
3. COLLECTOR 1
4. BASE 1
5. BASE 2
6. COLLECTOR 2

STYLE 10:
PIN 1. SOURCE 2
2. SOURCE 1
3. GATE 1
4. DRAIN 1
5. DRAIN 2
6. GATE 2

STYLE 11:
PIN 1. CATHODE 2
2. CATHODE 2
3. ANODE 1
4. CATHODE 1
5. CATHODE 1
6. ANODE 2

STYLE 12:
PIN 1. ANODE 2
2. ANODE 2
3. CATHODE 1
4. ANODE 1
5. ANODE 1
6. CATHODE 2

STYLE 13:
PIN 1. ANODE
2. N/C
3. COLLECTOR
4. EMITTER
5. BASE
6. CATHODE

STYLE 14:
PIN 1. VREF
2. GND
3. GND
4. IOUT
5. VEN
6. VCC

STYLE 15:
PIN 1. ANODE 1
2. ANODE 2
3. ANODE 3
4. CATHODE 3
5. CATHODE 2
6. CATHODE 1

STYLE 16:
PIN 1. BASE 1
2. EMITTER 2
3. COLLECTOR 2
4. BASE 2
5. EMITTER 1
6. COLLECTOR 1

STYLE 17:
PIN 1. BASE 1
2. EMITTER 1
3. COLLECTOR 2
4. BASE 2
5. EMITTER 2
6. COLLECTOR 1

STYLE 18:
PIN 1. VIN1
2. VCC
3. VOUT2
4. VIN2
5. GND
6. VOUT1

STYLE 19:
PIN 1. I OUT
2. GND
3. GND
4. V CC
5. V EN
6. V REF

STYLE 20:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

STYLE 21:
PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. N/C
6. CATHODE 1

STYLE 22:
PIN 1. D1 (i)
2. GND
3. D2 (i)
4. D2 (c)
5. VBUS
6. D1 (c)

STYLE 23:
PIN 1. Vn
2. CH1
3. Vp
4. N/C
5. CH2
6. N/C

STYLE 24:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 25:
PIN 1. BASE 1
2. CATHODE
3. COLLECTOR 2
4. BASE 2
5. EMITTER
6. COLLECTOR 1

STYLE 26:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 27:
PIN 1. BASE 2
2. BASE 1
3. COLLECTOR 1
4. EMITTER 1
5. EMITTER 2
6. COLLECTOR 2

STYLE 28:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 29:
PIN 1. ANODE
2. ANODE
3. COLLECTOR
4. EMITTER
5. BASE/ANODE
6. CATHODE

STYLE 30:
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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DESCRIPTION:	**SC−88 2.00x1.25x0.90, 0.65P**		**PAGE 2 OF 2**

ADDITIONAL INFORMATION

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