## **Amplifier Transistors**

## **NPN Silicon**

#### **Features**

• Pb-Free Packages are Available\*

#### **MAXIMUM RATINGS**

Rating		Symbol	Value	Unit
Collector - Emitter Voltage	BC546 BC547 BC548	V <sub>CEO</sub>	65 45 30	Vdc
Collector - Base Voltage	BC546 BC547 BC548	V <sub>CBO</sub>	80 50 30	Vdc
Emitter - Base Voltage		V <sub>EBO</sub>	6.0	Vdc
Collector Current - Continuous		I <sub>C</sub>	100	mAdc
Total Device Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C		P <sub>D</sub>	625 5.0	mW mW/°C
Total Device Dissipation @ T <sub>C</sub> = Derate above 25°C	25°C	P <sub>D</sub>	1.5 12	W mW/°C
Operating and Storage Junction Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

#### THERMAL CHARACTERISTICS

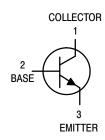
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	200	°C/W
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	83.3	°C/W

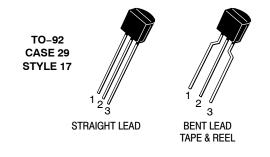
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



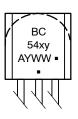
#### ON Semiconductor®

http://onsemi.com





#### **MARKING DIAGRAM**



x = 6, 7, or 8 y = A, B or C

A = Assembly Location

Y = Year WW = Work Week ■ = 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 5 of this data sheet.

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

## **ELECTRICAL CHARACTERISTICS** ( $T_A = 25^{\circ}C$ unless otherwise noted)

Characteristic		Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS						
Collector – Emitter Breakdown Voltage (I <sub>C</sub> = 1.0 mA, I <sub>B</sub> = 0)	BC546 BC547 BC548	V <sub>(BR)CEO</sub>	65 45 30	- - -	- - -	V
Collector - Base Breakdown Voltage (I <sub>C</sub> = 100 μAdc)	BC546 BC547 BC548	V <sub>(BR)CBO</sub>	80 50 30	- - -	- - -	V
Emitter – Base Breakdown Voltage ( $I_E$ = 10 $\mu$ A, $I_C$ = 0)	BC546 BC547 BC548	V <sub>(BR)EBO</sub>	6.0 6.0 6.0	- - -	- - -	V
Collector Cutoff Current $(V_{CE} = 70 \text{ V}, V_{BE} = 0)$ $(V_{CE} = 50 \text{ V}, V_{BE} = 0)$ $(V_{CE} = 35 \text{ V}, V_{BE} = 0)$ $(V_{CE} = 30 \text{ V}, T_{A} = 125^{\circ}\text{C})$	BC546 BC547 BC548 BC546/547/548	I <sub>CES</sub>	- - - -	0.2 0.2 0.2 -	15 15 15 4.0	nA μA
ON CHARACTERISTICS	Ţ			Т	1	
DC Current Gain ( $I_C = 10 \mu A$ , $V_{CE} = 5.0 V$ )	BC547A BC546B/547B/548B BC548C	h <sub>FE</sub>	- - -	90 150 270	- - -	_
$(I_C = 2.0 \text{ mA}, V_{CE} = 5.0 \text{ V})$	BC546 BC547 BC548 BC547A BC546B/547B/548B BC547C/BC548C		110 110 110 110 200 420	- - 180 290 520	450 800 800 220 450 800	
$(I_C = 100 \text{ mA}, V_{CE} = 5.0 \text{ V})$	BC547A/548A BC546B/547B/548B BC548C		- - -	120 180 300	- - -	
Collector – Emitter Saturation Voltage ( $I_C$ = 10 mA, $I_B$ = 0.5 mA) ( $I_C$ = 100 mA, $I_B$ = 5.0 mA) ( $I_C$ = 10 mA, $I_B$ = See Note 1)		V <sub>CE(sat)</sub>	- - -	0.09 0.2 0.3	0.25 0.6 0.6	V
Base – Emitter Saturation Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.5 mA)		V <sub>BE(sat)</sub>	-	0.7	-	V
Base – Emitter On Voltage ( $I_C$ = 2.0 mA, $V_{CE}$ = 5.0 V) ( $I_C$ = 10 mA, $V_{CE}$ = 5.0 V)		V <sub>BE(on)</sub>	0.55 -	- -	0.7 0.77	٧
SMALL-SIGNAL CHARACTERISTICS						
Current – Gain – Bandwidth Product ( $I_C$ = 10 mA, $V_{CE}$ = 5.0 V, f = 100 MHz)	BC546 BC547 BC548	f <sub>T</sub>	150 150 150	300 300 300	- - -	MHz
Output Capacitance $(V_{CB} = 10 \text{ V}, I_C = 0, f = 1.0 \text{ MHz})$		$C_{obo}$	_	1.7	4.5	pF
Input Capacitance (V <sub>EB</sub> = 0.5 V, I <sub>C</sub> = 0, f = 1.0 MHz)		C <sub>ibo</sub>	-	10	-	pF
Small – Signal Current Gain ( $I_C = 2.0$ mA, $V_{CE} = 5.0$ V, $f = 1.0$ kHz)	BC546 BC547/548 BC547A BC546B/547B/548B BC547C/548C	h <sub>fe</sub>	125 125 125 125 240 450	- 220 330 600	500 900 260 500 900	-
Noise Figure (I <sub>C</sub> = 0.2 mA, $V_{CE}$ = 5.0 V, $R_{S}$ = 2 k $\Omega$ , f =	1.0 kHz, Δf = 200 Hz) BC546 BC547 BC548	NF	- - -	2.0 2.0 2.0	10 10 10	dB

<sup>1.</sup>  $I_B$  is value for which  $I_C$  = 11 mA at  $V_{CE}$  = 1.0 V.

#### BC547/BC548

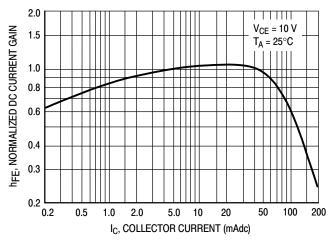


Figure 1. Normalized DC Current Gain

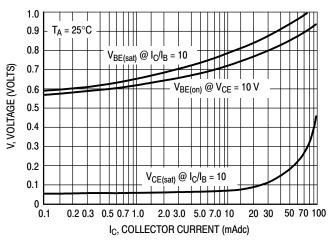


Figure 2. "Saturation" and "On" Voltages

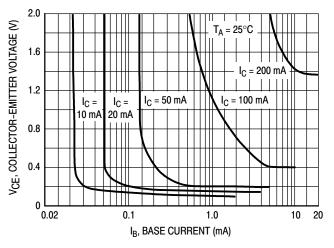


Figure 3. Collector Saturation Region

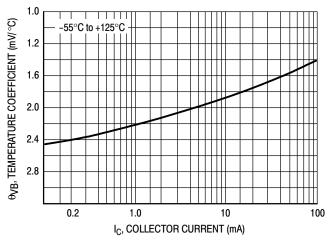


Figure 4. Base-Emitter Temperature Coefficient

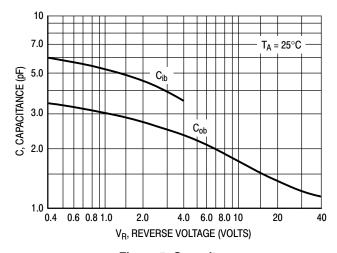


Figure 5. Capacitances

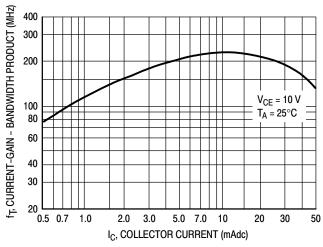


Figure 6. Current-Gain - Bandwidth Product

#### **BC546**

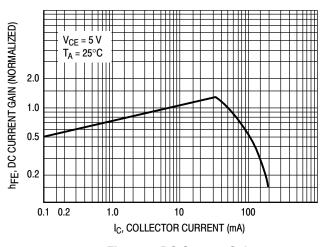


Figure 7. DC Current Gain

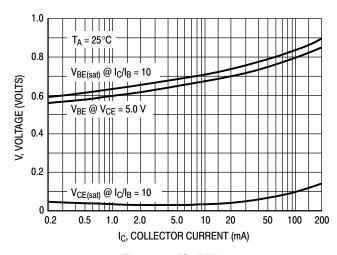


Figure 8. "On" Voltage

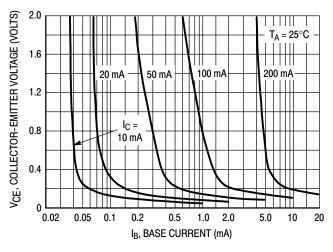


Figure 9. Collector Saturation Region

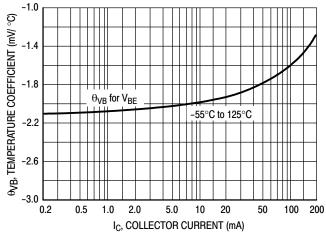


Figure 10. Base-Emitter Temperature Coefficient

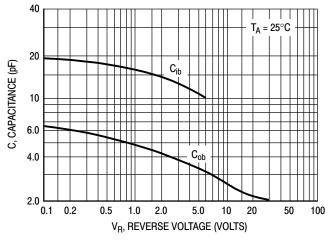


Figure 11. Capacitance

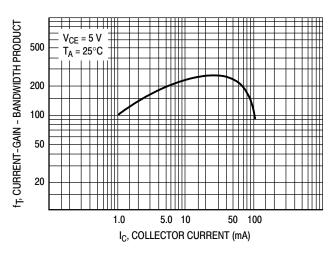


Figure 12. Current-Gain - Bandwidth Product

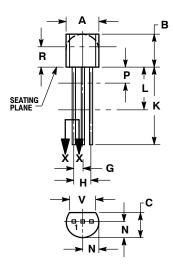
#### **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>	
BC546B	TO-92	5000 Units / Bulk	
BC546BG	TO-92 (Pb-Free)	5000 Units / Bulk	
BC546BRL1	TO-92	2000 / Tape & Reel	
BC546BRL1G	TO-92 (Pb-Free)	2000 / Tape & Reel	
BC546BZL1G	TO-92 (Pb-Free)	2000 / Ammo Box	
BC547ARL	TO-92	2000 / Tape & Reel	
BC547ARLG	TO-92 (Pb-Free)	2000 / Tape & Reel	
BC547AZL1G	TO-92 (Pb-Free)	2000 / Ammo Box	
BC547BG	TO-92 (Pb-Free)	5000 Units / Bulk	
BC547BRL1G	TO-92 (Pb-Free)	2000 / Tape & Reel	
BC547BZL1G	TO-92 (Pb-Free)	2000 / Ammo Box	
BC547CG	TO-92 (Pb-Free)	5000 Units / Bulk	
BC547CZL1G	TO-92 (Pb-Free)	2000 / Ammo Box	
BC548BG	TO-92 (Pb-Free)	5000 Units / Bulk	
BC548BRL1G	TO-92 (Pb-Free)	2000 / Tape & Reel	
BC548BZL1G	TO-92 (Pb-Free)	2000 / Ammo Box	
BC548CG	TO-92 (Pb-Free)	5000 Units / Bulk	
BC548CZL1G	TO-92 (Pb-Free)	2000 / Ammo Box	

<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.

#### PACKAGE DIMENSIONS

TO-92 (TO-226) CASE 29-11 **ISSUE AM** 

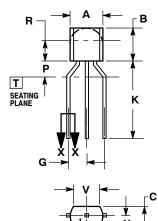


STRAIGHT LEAD



- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982. CONTROLLING DIMENSION: INCH.
- CONTOUR OF PACKAGE BEYOND DIMENSION R
- IS UNCONTROLLED.
  LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	INCHES		MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.175	0.205	4.45	5.20
В	0.170	0.210	4.32	5.33
С	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
Н	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500		12.70	
L	0.250		6.35	
N	0.080	0.105	2.04	2.66
P	-	0.100		2.54
R	0.115		2.93	
V	0.135		3.43	



**BENT LEAD TAPE & REEL** 



#### NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
- CONTROLLING DIMENSION: MILLIMETERS.
  CONTOUR OF PACKAGE BEYOND
  DIMENSION R IS UNCONTROLLED.
- LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	MILLIMETERS		
DIM	MIN	MAX	
Α	4.45	5.20	
В	4.32	5.33	
С	3.18	4.19	
D	0.40	0.54	
G	2.40	2.80	
J	0.39	0.50	
K	12.70		
N	2.04	2.66	
P	1.50	4.00	
R	2.93		
V	3.43		

STYLE 17:

PIN 1. COLLECTOR

BASE

**EMITTER** 

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