

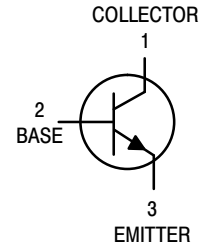
# Amplifier Transistors

## NPN Silicon

### BC546B, BC547A, B, C, BC548B, C

#### Features

- Pb-Free Packages are Available\*



#### MAXIMUM RATINGS

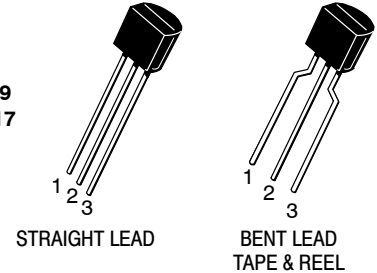
Rating	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CEO}$		Vdc
	BC546	65	
	BC547	45	
	BC548	30	
Collector - Base Voltage	$V_{CBO}$		Vdc
	BC546	80	
	BC547	50	
	BC548	30	
Emitter - Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current - Continuous	$I_C$	100	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.5 12	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

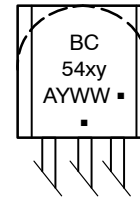
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{W}$

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.

TO-92  
CASE 29  
STYLE 17



#### 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.

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

# BC546B, BC547A, B, C, BC548B, C

## 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 ( $I_C = 1.0\text{ mA}$ , $I_B = 0$ )	BC546 BC547 BC548	$V_{(BR)CEO}$	65 45 30	– – –	– – –	V
Collector – Base Breakdown Voltage ( $I_C = 100\ \mu\text{A}$ )	BC546 BC547 BC548	$V_{(BR)CBO}$	80 50 30	– – –	– – –	V
Emitter – Base Breakdown Voltage ( $I_E = 10\ \mu\text{A}$ , $I_C = 0$ )	BC546 BC547 BC548	$V_{(BR)EBO}$	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	$I_{CES}$	– – – –	0.2 0.2 0.2 –	15 15 15 4.0	nA   $\mu\text{A}$
<b>ON CHARACTERISTICS</b>						
DC Current Gain ( $I_C = 10\ \mu\text{A}$ , $V_{CE} = 5.0\text{ V}$ )	BC547A BC546B/547B/548B BC548C	$h_{FE}$	– – –	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 ( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ ) ( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ ) ( $I_C = 10\text{ mA}$ , $I_B = \text{See Note 1}$ )		$V_{CE(sat)}$	– – –	0.09 0.2 0.3	0.25 0.6 0.6	V
Base – Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ )		$V_{BE(sat)}$	–	0.7	–	V
Base – Emitter On Voltage ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ ) ( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )		$V_{BE(on)}$	0.55 –	– –	0.7 0.77	V
<b>SMALL-SIGNAL CHARACTERISTICS</b>						
Current – Gain – Bandwidth Product ( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ , $f = 100\text{ MHz}$ )	BC546 BC547 BC548	$f_T$	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 ( $V_{EB} = 0.5\text{ V}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )		$C_{ibo}$	–	10	–	pF
Small – Signal Current Gain ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ , $f = 1.0\text{ kHz}$ )	BC546 BC547/548 BC547A BC546B/547B/548B BC547C/548C	$h_{fe}$	125 125 125 240 450	– – 220 330 600	500 900 260 500 900	–
Noise Figure ( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ , $R_S = 2\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $\Delta f = 200\text{ Hz}$ )	BC546 BC547 BC548	NF	– – –	2.0 2.0 2.0	10 10 10	dB

1.  $I_B$  is value for which  $I_C = 11\text{ mA}$  at  $V_{CE} = 1.0\text{ V}$ .

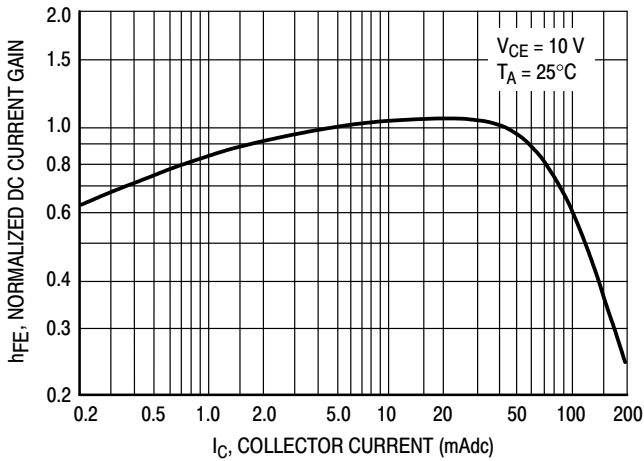


Figure 1. Normalized DC Current Gain

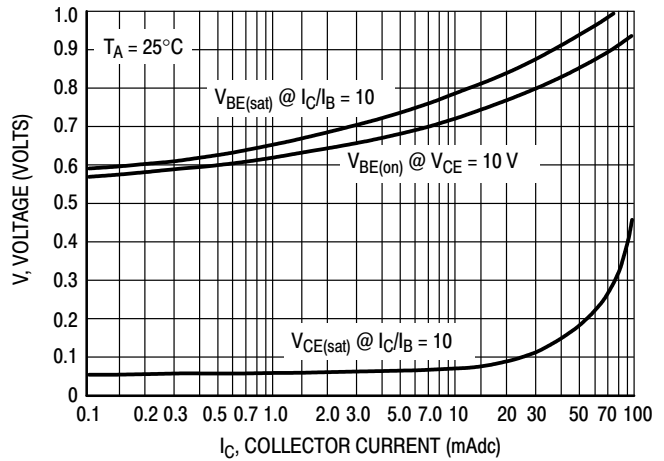


Figure 2. "Saturation" and "On" Voltages

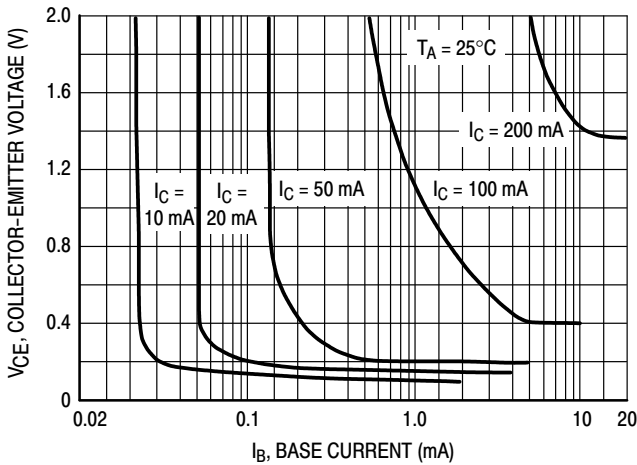


Figure 3. Collector Saturation Region

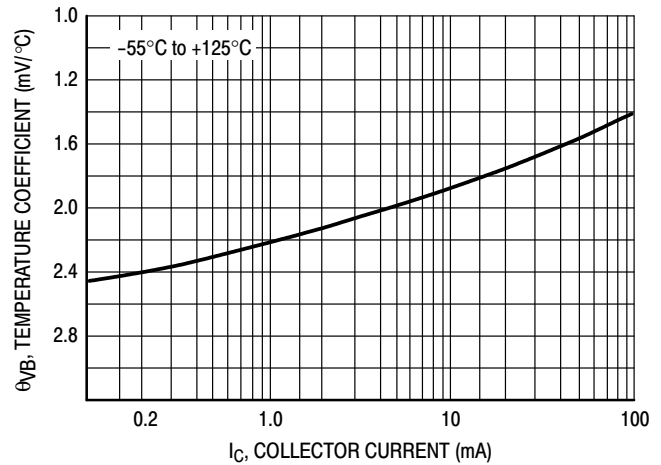


Figure 4. Base-Emitter Temperature Coefficient

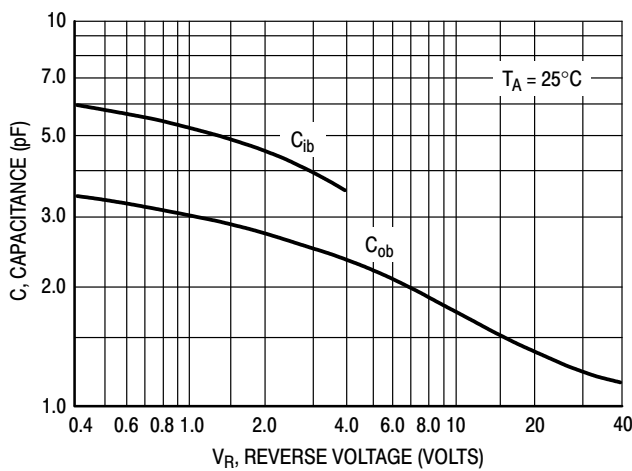


Figure 5. Capacitances

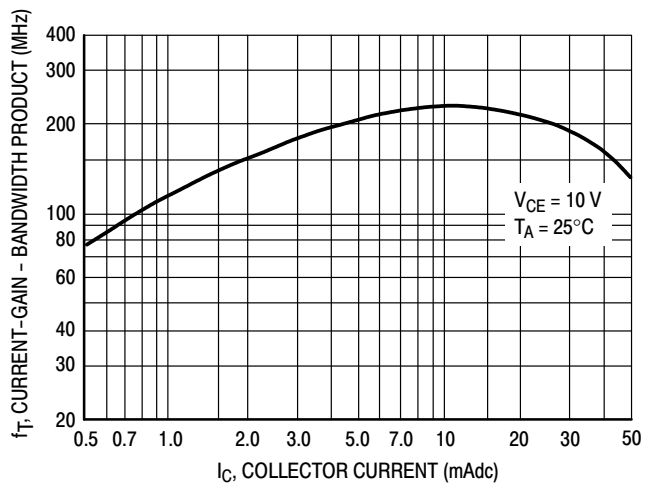


Figure 6. Current-Gain - Bandwidth Product

BC546

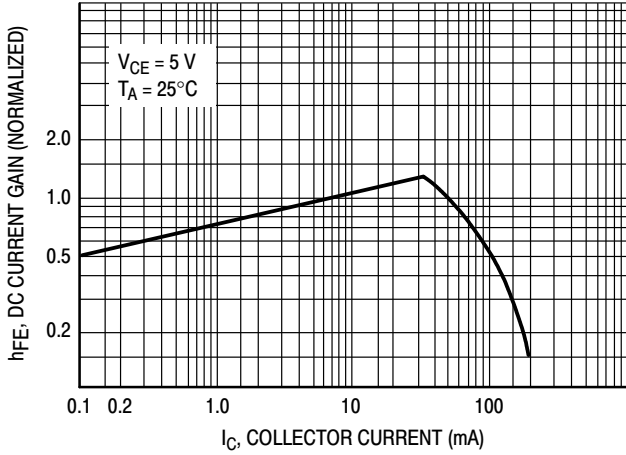


Figure 7. DC Current Gain

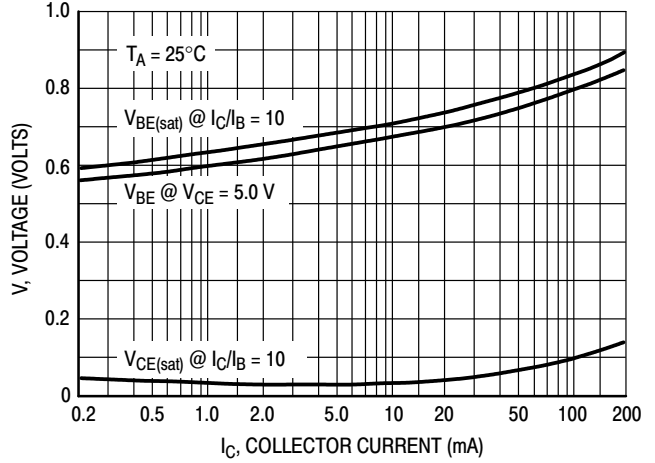


Figure 8. "On" Voltage

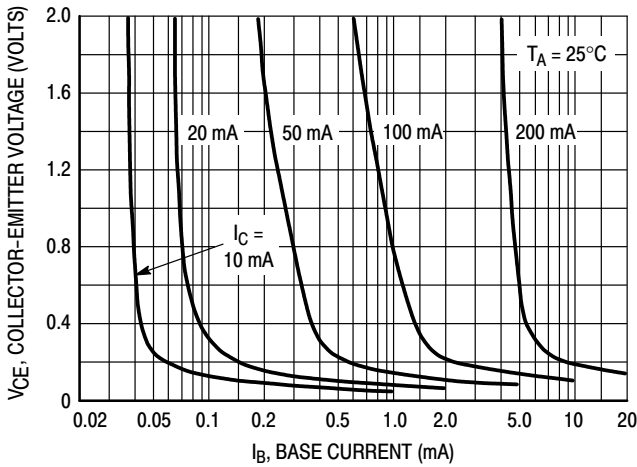


Figure 9. Collector Saturation Region

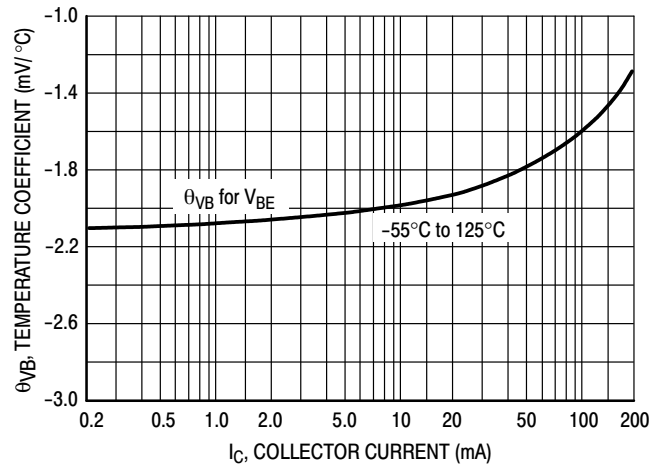


Figure 10. Base-Emitter Temperature Coefficient

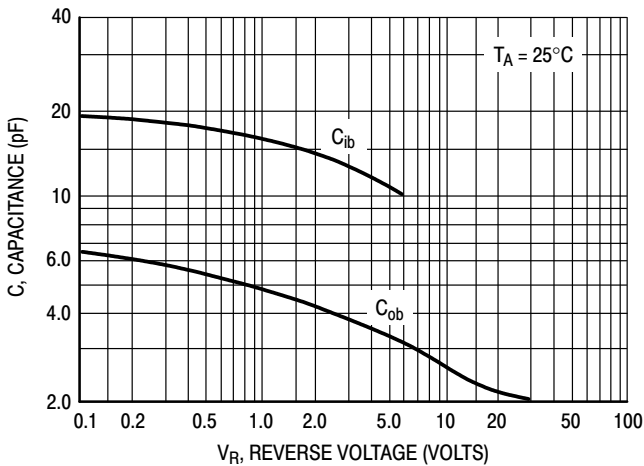


Figure 11. Capacitance

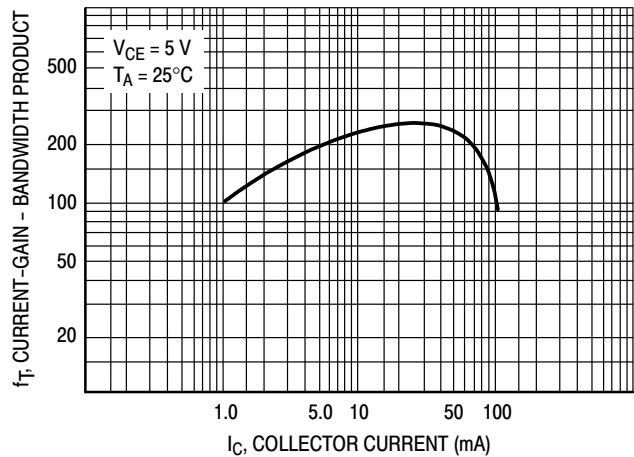


Figure 12. Current-Gain - Bandwidth Product

## BC546B, BC547A, B, C, BC548B, C

### ORDERING INFORMATION

Device	Package	Shipping†
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

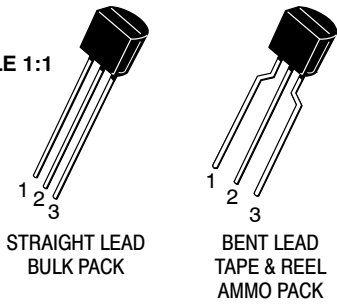
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 1:1



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

DATE 09 MAR 2007



STRAIGHT LEAD  
BULK PACK



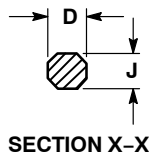
NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	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
H	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  
AMMO PACK



NOTES:

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

DIM	MILLIMETERS	
	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	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	---

STYLES ON PAGE 2

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DESCRIPTION:	TO-92 (TO-226)	PAGE 1 OF 3

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

DATE 09 MAR 2007

STYLE 1:  
 PIN 1. EMITTER  
 2. BASE  
 3. COLLECTOR

STYLE 2:  
 PIN 1. BASE  
 2. EMITTER  
 3. COLLECTOR

STYLE 3:  
 PIN 1. ANODE  
 2. ANODE  
 3. CATHODE

STYLE 4:  
 PIN 1. CATHODE  
 2. CATHODE  
 3. ANODE

STYLE 5:  
 PIN 1. DRAIN  
 2. SOURCE  
 3. GATE

STYLE 6:  
 PIN 1. GATE  
 2. SOURCE & SUBSTRATE  
 3. DRAIN

STYLE 7:  
 PIN 1. SOURCE  
 2. DRAIN  
 3. GATE

STYLE 8:  
 PIN 1. DRAIN  
 2. GATE  
 3. SOURCE & SUBSTRATE

STYLE 9:  
 PIN 1. BASE 1  
 2. EMITTER  
 3. BASE 2

STYLE 10:  
 PIN 1. CATHODE  
 2. GATE  
 3. ANODE

STYLE 11:  
 PIN 1. ANODE  
 2. CATHODE & ANODE  
 3. CATHODE

STYLE 12:  
 PIN 1. MAIN TERMINAL 1  
 2. GATE  
 3. MAIN TERMINAL 2

STYLE 13:  
 PIN 1. ANODE 1  
 2. GATE  
 3. CATHODE 2

STYLE 14:  
 PIN 1. EMITTER  
 2. COLLECTOR  
 3. BASE

STYLE 15:  
 PIN 1. ANODE 1  
 2. CATHODE  
 3. ANODE 2

STYLE 16:  
 PIN 1. ANODE  
 2. GATE  
 3. CATHODE

STYLE 17:  
 PIN 1. COLLECTOR  
 2. BASE  
 3. EMITTER

STYLE 18:  
 PIN 1. ANODE  
 2. CATHODE  
 3. NOT CONNECTED

STYLE 19:  
 PIN 1. GATE  
 2. ANODE  
 3. CATHODE

STYLE 20:  
 PIN 1. NOT CONNECTED  
 2. CATHODE  
 3. ANODE

STYLE 21:  
 PIN 1. COLLECTOR  
 2. EMITTER  
 3. BASE

STYLE 22:  
 PIN 1. SOURCE  
 2. GATE  
 3. DRAIN

STYLE 23:  
 PIN 1. GATE  
 2. SOURCE  
 3. DRAIN

STYLE 24:  
 PIN 1. EMITTER  
 2. COLLECTOR/ANODE  
 3. CATHODE

STYLE 25:  
 PIN 1. MT 1  
 2. GATE  
 3. MT 2

STYLE 26:  
 PIN 1. V<sub>CC</sub>  
 2. GROUND 2  
 3. OUTPUT

STYLE 27:  
 PIN 1. MT  
 2. SUBSTRATE  
 3. MT

STYLE 28:  
 PIN 1. CATHODE  
 2. ANODE  
 3. GATE

STYLE 29:  
 PIN 1. NOT CONNECTED  
 2. ANODE  
 3. CATHODE

STYLE 30:  
 PIN 1. DRAIN  
 2. GATE  
 3. SOURCE

STYLE 31:  
 PIN 1. GATE  
 2. DRAIN  
 3. SOURCE

STYLE 32:  
 PIN 1. BASE  
 2. COLLECTOR  
 3. EMITTER

STYLE 33:  
 PIN 1. RETURN  
 2. INPUT  
 3. OUTPUT

STYLE 34:  
 PIN 1. INPUT  
 2. GROUND  
 3. LOGIC

STYLE 35:  
 PIN 1. GATE  
 2. COLLECTOR  
 3. EMITTER

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<b>NEW STANDARD:</b>		
<b>DESCRIPTION:</b>	<b>TO-92 (TO-226)</b>	<b>PAGE 2 OF 3</b>





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