

## NPN SILICON PLANAR TRANSISTORS

**BC107/A/B/C**  
**BC108/A/B/C**  
**BC109/A/B/C**



TO-18

**TO-18**  
**Metal Can Package**  
**RoHS compliant**

### FEATURE:

1. This product is available in AEC-Q101 Compliant and PPAP Capable also.

**Note:** For AEC-Q101 compliant products, please use suffix -AQ in the part number while ordering.

**APPLICATION:** Low Noise General Purpose Audio Amplifiers

### ABSOLUTE MAXIMUM RATINGS (Ta = 25 °C Unless otherwise specified)

PARAMETER	SYMBOL	BC107	BC108	BC109	UNIT
Collector Emitter Voltage	$V_{CEO}$	45	25	25	V
Collector Base Voltage	$V_{CBO}$	50	30	30	V
Emitter Base Voltage	$V_{EBO}$	6.0	5.0	5.0	V
Collector Current Continuous	$I_C$	200			mA
Power Dissipation at Ta=25°C	$P_D$	300			mW
Derate above 25°C		1.72			mW/°C
Power Dissipation at Tc=25°C	$P_D$	750			mW
Derate above 25°C		4.29			mW/°C
Operating And Storage Junction Temperature Range	$T_j, T_{stg}$	-65 to +200			°C

### THERMAL RESISTANCE

PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient in free air	$R_{th(j-a)}$	583	°C/W
Junction to Case	$R_{th(j-c)}$	233	°C/W

**ELECTRICAL CHARACTERISTICS at** (Ta = 25 °C Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	VALUE			UNIT	
			BC 107	BC 108	BC 109		
Collector Emitter Voltage	$V_{CEO}$	$I_C=2mA, I_B=0$	MAX	45	25	25	V
Emitter Base Voltage	$V_{EBO}$	$I_E=10mA, I_C=0$	MAX	6	5	5	V
Collector Cut Off Current	$I_{CBO}$	$V_{CB}=45V, I_E=0$	MIN	15			nA
		$V_{CB}=25V, I_E=0$	MIN		15	15	nA
		$V_{CB}=45V, I_E=0, T_a=125^\circ C$	MIN	4			$\mu A$
		$V_{CB}=25V, I_E=0, T_a=125^\circ C$	MIN		4	4	$\mu A$
DC Current Gain	$h_{FE}$	$I_C=10mA, V_{CE}=5V$	B Group	MAX	40		
			C Group	MAX	100		
		$I_C = 2mA, V_{CE} = 5V$	BC107		110-450		
			BC108		110-800		
			BC109		200-800		
			A Group		110-220		
			B Group		200-450		
C Group		420-800					

**ELECTRICAL CHARACTERISTICS at** (Ta = 25 °C Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT	
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=10mA, I_B=0.5mA$	--	--	0.25	V	
		$I_C=100mA, I_B=5mA$	--	--	0.60	V	
Base Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C=10mA, I_B=0.5mA$	--	--	0.83	V	
		$I_C=100mA, I_B=5mA$	--	--	1.05	V	
Base Emitter On Voltage	$V_{BE(on)}$	$I_C=2mA, V_{CE}=5V$	0.55	--	0.70	V	
		$I_C=10mA, V_{CE}=5V$	--	--	0.77	V	
Collector Knee Voltage	$V_{CE(K)}$	$I_C=10mA, I_B=$ the value for which $I_C=11mA$ at $V_{CE}=1V$	--	--	0.60	V	
Transition frequency	$f_T$	$I_C=10mA, V_{CE}=5V, f=100MHz$	150	--		MHz	
Output Capacitance	$C_{obo}$	$V_{CB}=10V, I_E=0, f=1MHz$	--	--	4.5	pF	
Noise Figure	$N_F$	$I_C=0.2mA, V_{CE}=5V, R_g=2K\Omega$ $f=30Hz$ to $15KHz$ $f=1KHz,$ $\Delta F=200Hz$	BC109	--	--	4.0	dB
			BC109	--	--	4.0	dB
			BC107	--	--	10	dB
			/108	--	--		dB



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**ELECTRICAL CHARACTERISTICS at** (Ta = 25 °C Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT	
<b>SMALL SIGNAL CHARACTERISTICS</b>							
Small Signal Current Gain	h <sub>fe</sub>	I <sub>C</sub> =2mA, V <sub>CE</sub> =5V, f=1KHz	BC107	125	--	500	
			BC108	125	--	900	
			BC109	240	--	900	
			A Group	125	--	260	
			B Group	240	--	500	
			C Group	450	--	900	
Input Impedance	h <sub>ie</sub>	I <sub>C</sub> =2mA, V <sub>CE</sub> =5V, f=1KHz	A Group	1.6	--	4.5	KΩ
			B Group	3.2	--	8.5	KΩ
			C Group	6.0	--	15	KΩ
Output Admittance	h <sub>oe</sub>	I <sub>C</sub> =2mA, V <sub>CE</sub> =5V, f=1KHz	A Group	--	--	30	μmhos
			B Group	--	--	60	μmhos
			C Group	--	--	110	μmhos

### Recommended Reflow Solder Profiles

The recommended reflow solder profiles for Pb and Pb-free devices are shown below.

Figure 1 shows the recommended solder profile for devices that have Pb-free terminal plating, and where a Pb-free solder is used.

Figure 2 shows the recommended solder profile for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 1

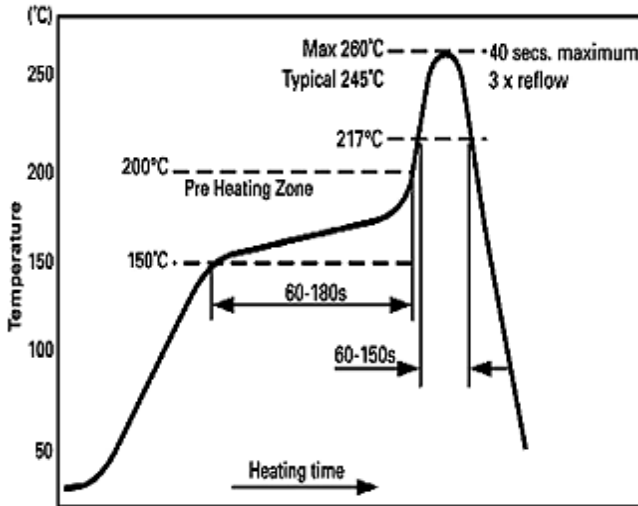
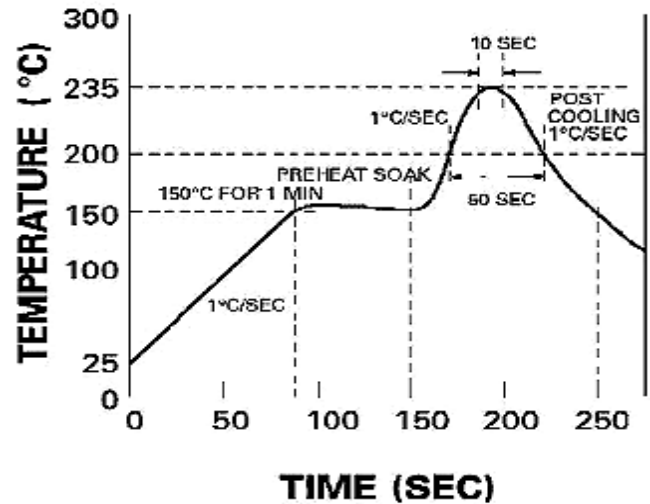


Figure 2



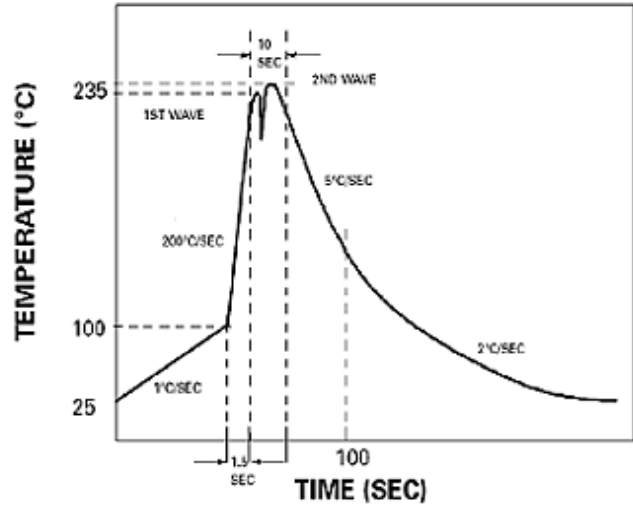
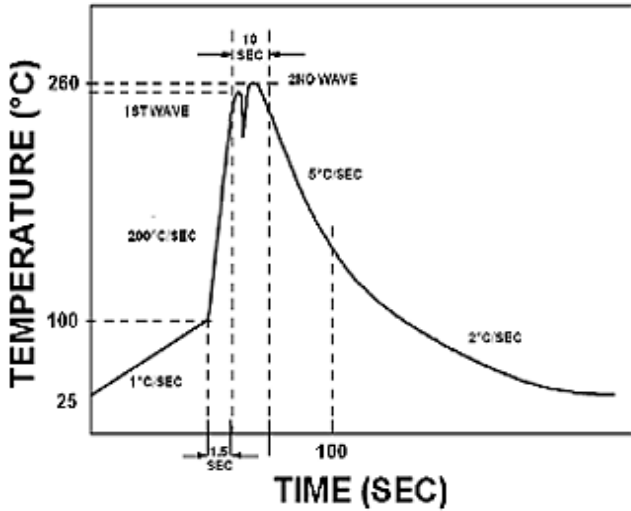
Reflow profiles in tabular form

Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~3°C/second	~3°C/second
<b>Preheat</b>		
– Temperature Range	150-170°C	150-200°C
– Time	60-180 seconds	60-180 seconds
Time maintained above:		
– Temperature	200°C	217°C
– Time	30-50 seconds	60-150 seconds
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	40 seconds
Ramp-Down Rate	3°C/second max.	6°C/second max.

### Recommended Wave Solder Profiles

The Recommended solder Profile For Devices with Pb-free terminal plating where a Pb-free solder is used

The Recommended solder Profile For Devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with leaded solder



### Wave Profiles in Tabular Form

Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~200°C/second	~200°C/second
Heating rate during preheat	Typical 1-2, Max 4°C/sec	Typical 1-2, Max 4°C/Sec
Final preheat Temperature	Within 125°C of Solder Temp	Within 125°C of Solder Temp
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	10 seconds
Ramp-Down Rate	5°C/second max.	5°C/second max

## TYPICAL CHARACTERISTICS CURVES

Figure 1 – DC Current Gain

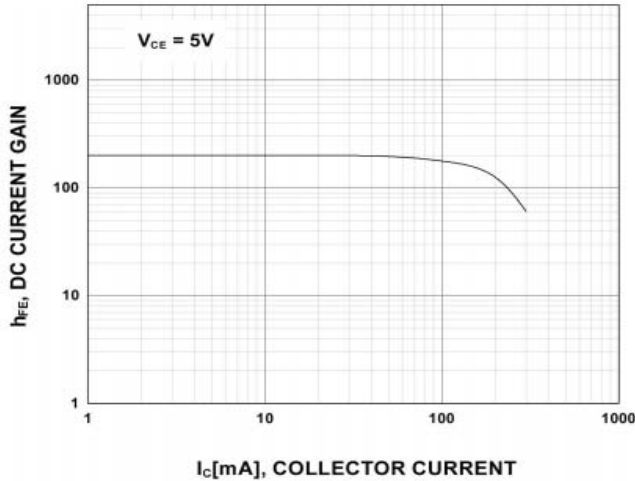


Figure 2 – Current Gain Bandwidth Product

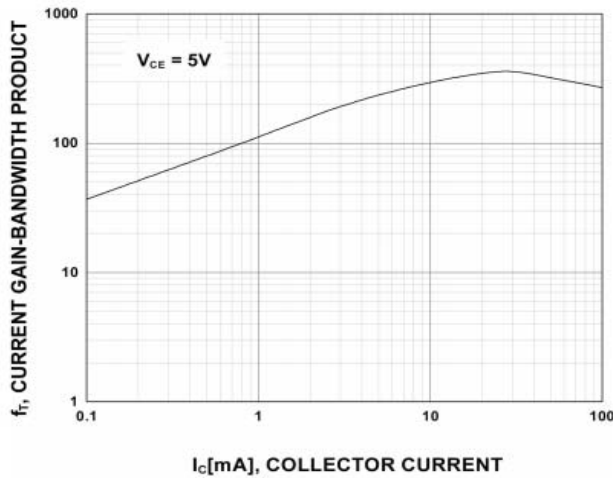


Figure 3 – Base-Emitter Saturation Voltage versus Collector-Emitter Saturation Voltage

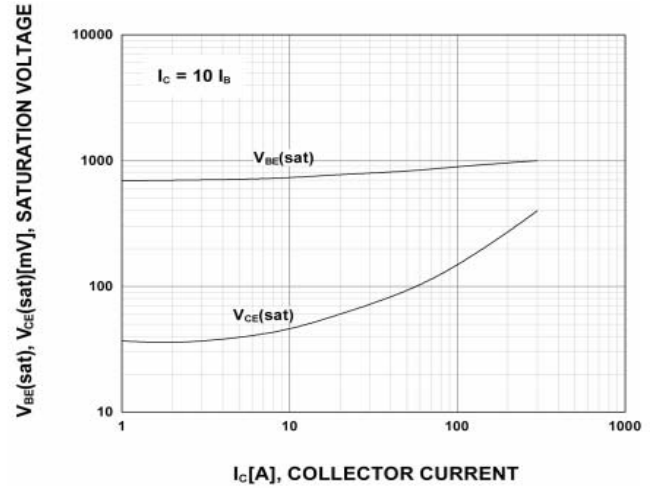
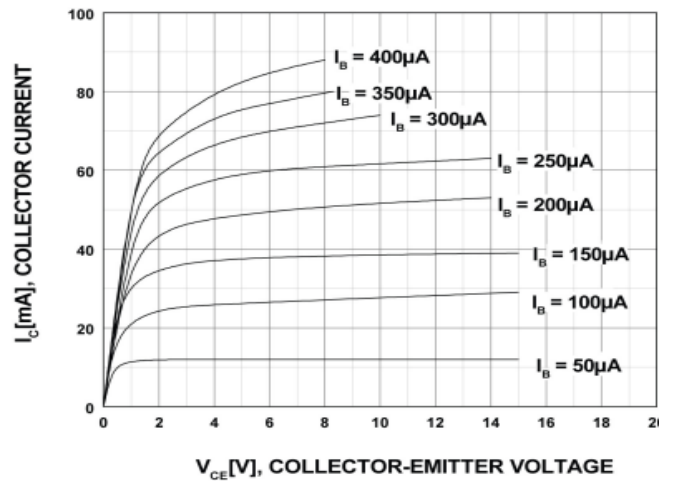


Figure 4 – Static Characteristics



## TYPICAL CHARACTERISTICS CURVES

Figure 5 – Base-Emitter Saturation Voltage versus Collector-  
 Emitter Saturation Voltage

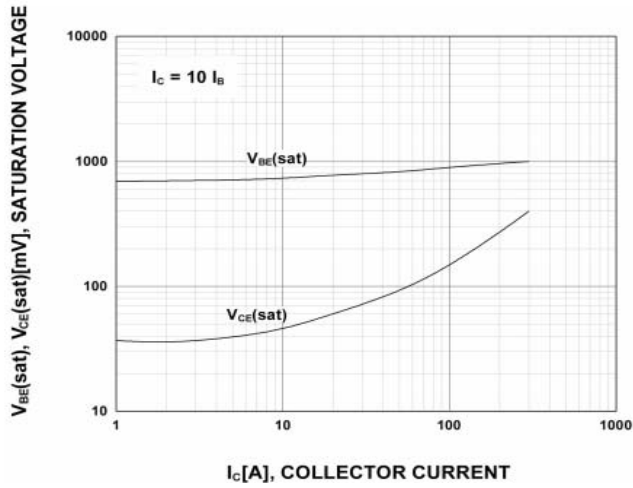


Figure 7 – Transfer Characteristic

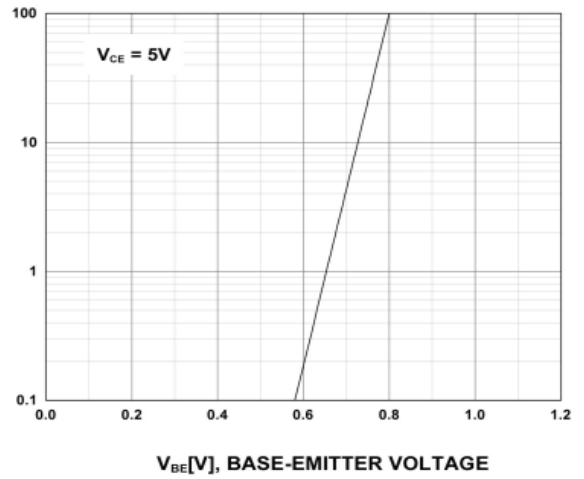
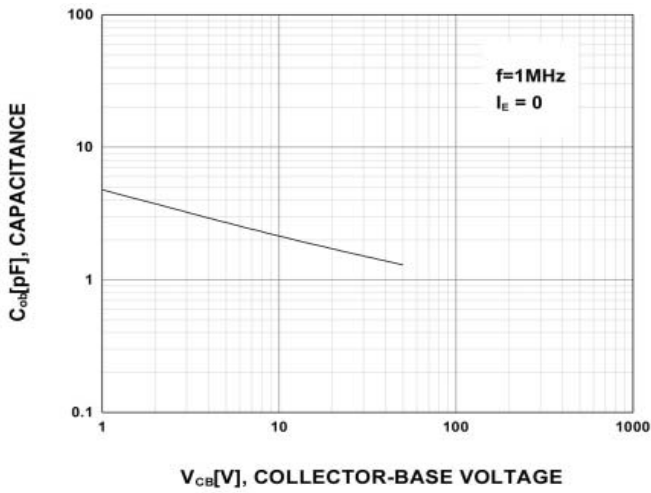
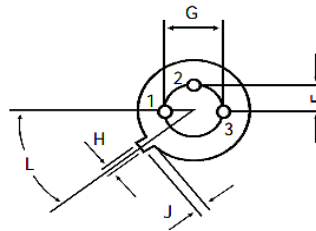
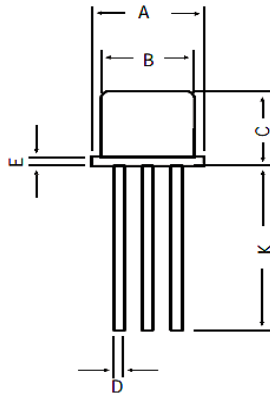


Figure 6 – Output Capacitance



## PACKAGE DETAILS

### TO-18 Metal Can Package

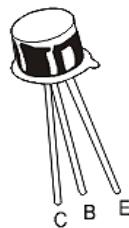


DIM	MIN	MAX
A	5.24	5.84
B	4.52	4.97
C	4.31	5.33
D	0.40	0.53
E		0.76
F		1.27
G		2.97
H	0.91	1.17
J	0.71	1.21
K	12.70	--
L	45°	

All Dimensions are in mm

### Pin Configuration

1. Emitter
2. Base
3. Collector



### Packing Detail

PACKAGE	STANDARD PACK		INNER CARTON BOX		OUTER CARTON BOX		
	Details	Net Weight/Qty	Size	Qty	Size	Qty	Gr Wt
TO-18	1K/polybag	350 gm/1K pcs	3" x 7.5" x 7.5"	5K	17" x 15" x 13.5"	80K	34 kgs





## Recommended Product Storage Environment for Discrete Semiconductor Devices

This storage environment assumes that the Diodes and transistors are packed properly inside the original packing supplied by CDIL.

- Temperature 5 °C to 30 °C
- Humidity between 40 to 70 %RH
- Air should be clean.
- Avoid harmful gas or dust.
- Avoid outdoor exposure or storage in areas subject to rain or water spraying .
- Avoid storage in areas subject to corrosive gas or dust. Product shall not be stored in areas exposed to direct sunlight.
- Avoid rapid change of temperature.
- Avoid condensation.
- Mechanical stress such as vibration and impact shall be avoided.
- The product shall not be placed directly on the floor.
- The product shall be stored on a plane area. They should not be turned upside down. They should not be placed against the wall.

### **Shelf Life of CDIL Products**

The shelf life of products is the period from product manufacture to shipment to customers. The product can be unconditionally shipped within this period. The period is defined as 2 years.

If products are stored longer than the shelf life of 2 years the products shall be subjected to quality check as per CDIL quality procedure.

The products are further warranted for another one year after the date of shipment subject to the above conditions in CDIL original packing.

### **Floor Life of CDIL Products and MSL Level**

When the products are opened from the original packing, the floor life will start.

For this, the following JEDEC table may be referred:

JEDEC MSL Level		
Level	Time	Condition
1	Unlimited	≤30 °C / 85% RH
2	1 Year	≤30 °C / 60% RH
2a	4 Weeks	≤30 °C / 60% RH
3	168 Hours	≤30 °C / 60% RH
4	72 Hours	≤30 °C / 60% RH
5	48 Hours	≤30 °C / 60% RH
5a	24 Hours	≤30 °C / 60% RH
6	Time on Label(TOL)	≤30 °C / 60% RH



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## Customer Notes

### Component Disposal Instructions

1. CDIL Semiconductor Devices are RoHS compliant, customers are requested to please dispose as per prevailing Environmental Legislation of their Country.
2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

### Disclaimer

The product information and the selection guides facilitate selection of the CDIL's Semiconductor Device(s) best suited for application in your product(s) as per your requirement. It is recommended that you completely review our Data Sheet(s) so as to confirm that the Device(s) meet functionality parameters for your application. The information furnished in the Data Sheet and on the CDIL Web Site/CD are believed to be accurate and reliable. CDIL however, does not assume responsibility for inaccuracies or incomplete information. Furthermore, CDIL does not assume liability whatsoever, arising out of the application or use of any CDIL product; neither does it convey any license under its patent rights nor rights of others. These products are not designed for use in life saving/support appliances or systems. CDIL customers selling these products (either as individual Semiconductor Devices or incorporated in their end products), in any life saving/support appliances or systems or applications do so at their own risk and CDIL will not be responsible for any damages resulting from such sale(s).

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