

# New Jersey Semi-Conductor Products, Inc.

20 STERN AVE.  
SPRINGFIELD, NEW JERSEY 07081  
U.S.A.

**BC177,8,9**

**BC257,8,9**

**BC307,8,9**

**BC320,1,2**

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THE ABOVE TYPES ARE PNP SILICON PLANAR EPITAXIAL TRANSISTORS FOR USE IN AF SMALL SIGNAL AMPLIFIER STAGES AND DIRECT COUPLED CIRCUITS.

BC177, 8, 9 are complementary to BC107, 8, 9.

BC257, 8, 9 are complementary to BC167, 8, 9.

BC307, 8, 9 are complementary to BC237, 8, 9.

BC320, 1, 2 are complementary to BC317, 8, 9.

## CASE

TO-18



CBE

BC177,8,9

TO-92B



ECB

BC257,8,9

TO-92F



CEB

BC307,8,9

TO-92A



ECB

BC320,1,2

## ABSOLUTE MAXIMUM RATINGS

| TYPE  | -V <sub>CB0</sub><br>(V) | -V <sub>CES</sub><br>(V) | -V <sub>CE0</sub><br>(V) | -V <sub>EB0</sub><br>(V) | -I <sub>C</sub> (DC)<br>(mA) | P <sub>tot</sub> *<br>(mW) | T <sub>j</sub> , T <sub>stg</sub> |
|-------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------------|----------------------------|-----------------------------------|
| BC177 | 50                       | 50                       | 45                       | 5                        | 100                          | 300                        | -55 to 175°C                      |
| BC178 | 30                       | 30                       | 25                       | 5                        | 100                          | 300                        |                                   |
| BC179 | 25                       | 25                       | 20                       | 5                        | 100                          | 300                        |                                   |
| BC257 | 50                       | 50                       | 45                       | 5                        | 100                          | 300                        | -55 to 150°C                      |
| BC258 | 30                       | 30                       | 25                       | 5                        | 100                          | 300                        |                                   |
| BC259 | 25                       | 25                       | 20                       | 5                        | 100                          | 300                        |                                   |
| BC307 | 50                       | 50                       | 45                       | 5                        | 100                          | 300                        | -55 to 150°C                      |
| BC308 | 30                       | 30                       | 25                       | 5                        | 100                          | 300                        |                                   |
| BC309 | 25                       | 25                       | 20                       | 5                        | 100                          | 300                        |                                   |
| BC320 | 50                       |                          | 45                       | 6                        | 150                          | 310                        | -55 to 150°C                      |
| BC321 | 45                       |                          | 30                       | 5                        | 150                          | 310                        |                                   |
| BC322 | 30                       |                          | 20                       | 5                        | 150                          | 310                        |                                   |

\* Total Power Dissipation @ T<sub>A</sub> ≤ 25°C

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**Quality Semi-Conductors**

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

| PARAMETER                                                                                              | SYMBOL                  | MIN    | TYP  | MAX  | UNIT      | TEST CONDITIONS                                                                                  |
|--------------------------------------------------------------------------------------------------------|-------------------------|--------|------|------|-----------|--------------------------------------------------------------------------------------------------|
| Collector-Base Breakdown Voltage                                                                       | -BV <sub>CB0</sub>      | Note 1 |      |      | V         | -I <sub>C</sub> =10μA I <sub>E</sub> =0                                                          |
| Collector-Emitter Breakdown Voltage                                                                    | -LV <sub>CEO</sub> *    |        |      |      | V         | -I <sub>C</sub> =2mA I <sub>B</sub> =0                                                           |
| Emitter-Base Breakdown Voltage                                                                         | -BV <sub>EB0</sub>      |        |      |      | V         | -I <sub>E</sub> =1μA I <sub>C</sub> =0                                                           |
| Collector Cutoff Current<br>BC177, 178, 179 }<br>BC257, 258, 259 } only<br>BC307, 308, 309 }           | -I <sub>CES</sub>       |        |      |      | 15 nA     | V <sub>CE</sub> =V <sub>CES</sub> V <sub>BE</sub> =0                                             |
|                                                                                                        |                         |        |      |      | 4 μA      | V <sub>CE</sub> =V <sub>CES</sub> V <sub>BE</sub> =0                                             |
|                                                                                                        |                         |        |      |      |           | T <sub>A</sub> =125°C                                                                            |
| Collector Cutoff Current<br>BC320, 321, 322 only                                                       | -I <sub>CBO</sub>       |        |      |      | 30 nA     | -V <sub>CB</sub> =20V I <sub>E</sub> =0                                                          |
|                                                                                                        |                         |        |      |      | 15 μA     | -V <sub>CB</sub> =20V I <sub>E</sub> =0                                                          |
| Collector-Emitter Saturation Voltage<br><br>All types                                                  | -V <sub>CE(sat)</sub> * |        |      |      | 0.1 0.3 V | -I <sub>C</sub> =10mA -I <sub>B</sub> =0.5mA                                                     |
|                                                                                                        |                         |        |      |      | 0.25 V    | -I <sub>C</sub> =100mA -I <sub>B</sub> =5mA                                                      |
| Collector-Emitter Knee Voltage<br>BC177, 178, 179 } only<br>BC307, 308, 309 }                          | -V <sub>CEK</sub>       |        | 0.3  | 0.6  | V         | -I <sub>C</sub> =10mA, I <sub>B</sub> =value at which -I <sub>C</sub> =11mA -V <sub>CE</sub> =1V |
| Base-Emitter Saturation Voltage<br><br>All types                                                       | -V <sub>BE(sat)</sub> * |        |      |      | 0.72 V    | -I <sub>C</sub> =10mA -I <sub>B</sub> =0.5mA                                                     |
|                                                                                                        |                         |        |      |      | 0.92 V    | -I <sub>C</sub> =100mA -I <sub>B</sub> =5mA                                                      |
| Base-Emitter Voltage All types<br><br>BC320, 321, 322 only                                             | -V <sub>BE</sub> *      | 0.6    | 0.65 | 0.75 | V         | -I <sub>C</sub> =2mA -V <sub>CE</sub> =5V                                                        |
|                                                                                                        | -V <sub>BE</sub> *      |        | 0.7  | 0.77 | V         | -I <sub>C</sub> =10mA -V <sub>CE</sub> =5V                                                       |
| Current Gain-Bandwidth Product                                                                         | f <sub>T</sub>          |        | 180  |      | MHz       | -I <sub>C</sub> =10mA -V <sub>CE</sub> =5V                                                       |
| Collector-Base Capacitance<br>BC177, 178, 179<br>BC257, 258, 259<br>BC307, 308, 309<br>BC320, 321, 322 | C <sub>ob</sub>         |        |      |      | 3.6 pF    | -V <sub>CB</sub> =10V I <sub>E</sub> =0<br>f=1MHz                                                |
|                                                                                                        |                         |        |      |      | 7 pF      |                                                                                                  |
|                                                                                                        |                         |        |      |      | 3.2 pF    |                                                                                                  |
|                                                                                                        |                         |        |      |      | 6 pF      |                                                                                                  |
|                                                                                                        |                         |        |      |      | 3.2 pF    |                                                                                                  |
| Noise Figure<br>BC177, 178<br><br>BC257, 258<br>BC307, 308<br>BC320, 321                               | NF                      |        |      |      | 2 dB      | -I <sub>C</sub> =0.2mA -V <sub>CE</sub> =5V<br>R <sub>G</sub> =2KΩ f=1kHz<br>Δf=200Hz            |
|                                                                                                        |                         |        |      |      | 10 dB     |                                                                                                  |
|                                                                                                        |                         |        |      |      | 2 dB      |                                                                                                  |
|                                                                                                        |                         |        |      |      | 10 dB     |                                                                                                  |
|                                                                                                        |                         |        |      |      | 2 dB      |                                                                                                  |

\* Pulse Test : Pulse Width=0.3mS, Duty Cycle=1%

Note 1 : equal to the value of absolute maximum ratings.

| PARAMETER                                | SYMBOL | MIN | TYP | MAX | UNIT | TEST CONDITIONS                                                                                             |
|------------------------------------------|--------|-----|-----|-----|------|-------------------------------------------------------------------------------------------------------------|
| Noise Figure                             | NF     |     |     |     |      | $-I_C=0.2\text{mA}$ $-V_{CE}=5\text{V}$<br>$R_G=2\text{K}\Omega$ $f=1\text{KHz}$<br>$\Delta f=200\text{Hz}$ |
| BC179 }<br>BC259 }<br>BC309 }<br>BC322 } |        | 1.2 |     | 4   | dB   |                                                                                                             |
| only                                     |        | 1.2 |     | 4   | dB   | $-I_C=0.2\text{mA}$ $-V_{CE}=5\text{V}$<br>$R_G=2\text{K}\Omega$ $f=30\text{Hz}-15\text{KHz}$               |

D.C. CURRENT GAIN ( $H_{FE}$ ) @  $-V_{CE}=5\text{V}$   $T_A=25^\circ\text{C}$

| at $-I_C$ | HFE GROUP VI |     |     | HFE GROUP A |     |     | HFE GROUP B |     |     | HFE GROUP C |     |     |
|-----------|--------------|-----|-----|-------------|-----|-----|-------------|-----|-----|-------------|-----|-----|
| (Pulsed)  | MIN          | TYP | MAX | MIN         | TYP | MAX | MIN         | TYP | MAX | MIN         | TYP | MAX |
| 0.01mA    |              | 70  |     |             | 110 |     |             | 200 |     |             | 330 |     |
| 2mA       | 70           | 110 | 140 | 110         | 170 | 220 | 200         | 300 | 450 | 420         | 520 | 800 |
| 100mA     |              | 60  |     |             | 80  |     |             | 140 |     |             | 240 |     |

h - PARAMETERS @  $-I_C=2\text{mA}$   $-V_{CE}=5\text{V}$   $f=1\text{kHz}$   $T_A=25^\circ\text{C}$

| h - PARAMETER             | SYMBOL   | HFE GROUP VI |     |     | HFE GROUP A |     |     | HFE GROUP B |     |     | HFE GROUP C |     |     | UNIT             |     |
|---------------------------|----------|--------------|-----|-----|-------------|-----|-----|-------------|-----|-----|-------------|-----|-----|------------------|-----|
|                           |          | MIN          | TYP | MAX | MIN         | TYP | MAX | MIN         | TYP | MAX | MIN         | TYP | MAX |                  |     |
| Input Impedance           | $h_{ie}$ |              |     | 1.4 |             |     | 2.7 |             |     | 4.5 |             |     | 8.7 | $k\Omega$        |     |
| Voltage Feedback Ratio    | $h_{re}$ |              |     | 2.5 |             |     | 3   |             |     | 3.5 |             |     | 4   | $\times 10^{-4}$ |     |
| Small Signal Current Gain | $h_{fe}$ |              |     | 75  | 110         | 150 | 125 | 190         | 260 | 240 | 330         | 500 | 450 | 580              | 900 |
| Output Admittance         | $h_{oe}$ |              |     | 20  |             |     | 25  |             |     | 35  |             |     | 60  | $\mu S$          |     |

# TYPICAL CHARACTERISTICS AT $T_A=25^\circ\text{C}$ (Pulse Test)

