

# SEMELAB LIMITED

\* ORIG \*

**BC237  
BC238  
BC239**

**CASE 29-02, STYLE 17  
TO-92 (TO-226AA)**

**AMPLIFIER TRANSISTORS**

**NPN SILICON**

## MAXIMUM RATINGS

| Rating                                                                | Symbol                            | BC<br>237   | BC<br>238 | BC<br>239 | Unit             |
|-----------------------------------------------------------------------|-----------------------------------|-------------|-----------|-----------|------------------|
| Collector-Emitter Voltage                                             | V <sub>CEO</sub>                  | 45          | 25        | 25        | V <sub>dc</sub>  |
| Collector-Emitter Voltage                                             | V <sub>CES</sub>                  | 50          | 30        | 30        | V <sub>dc</sub>  |
| Emitter-Base Voltage                                                  | V <sub>EB0</sub>                  | 6.0         | 5.0       | 5.0       | V <sub>dc</sub>  |
| Collector Current - Continuous                                        | I <sub>C</sub>                    | 100         |           |           | mA <sub>dc</sub> |
| Total Device Dissipation @ T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 350<br>2.8  |           |           | mW<br>mW/°C      |
| Total Device Dissipation @ T <sub>C</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 1.0<br>8.0  |           |           | Watt<br>mW/°C    |
| Operating and Storage Junction<br>Temperature Range                   | T <sub>J</sub> , T <sub>stg</sub> | -55 to +150 |           |           | °C               |

## THERMAL CHARACTERISTICS

| Characteristic                          | Symbol           | Max | Unit |
|-----------------------------------------|------------------|-----|------|
| Thermal Resistance, Junction to Case    | R <sub>nJC</sub> | 125 | °C/W |
| Thermal Resistance, Junction to Ambient | R <sub>nJA</sub> | 357 | °C/W |

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

| Characteristic                                                                                                                                                                                                                                                             | Type                                               | Symbol               | Min.           | Typ.                                         | Max.                          | Unit     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------|----------------|----------------------------------------------|-------------------------------|----------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                                                                                                 |                                                    |                      |                |                                              |                               |          |
| Collector-Emitter Breakdown Voltage<br>(I <sub>C</sub> = 2.0 mA, I <sub>B</sub> = 0)                                                                                                                                                                                       | BC237<br>BC238<br>BC239                            | V <sub>(BR)CEO</sub> | 45<br>25<br>25 |                                              |                               | V        |
| Emitter-Base Breakdown Voltage<br>(I <sub>E</sub> = 100 µA, I <sub>C</sub> = 0)                                                                                                                                                                                            | BC237<br>BC238<br>BC239                            | V <sub>(BR)EBO</sub> | 6<br>5<br>5    |                                              |                               | V        |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 30 V, V <sub>BE</sub> = 0)<br>(V <sub>CE</sub> = 50 V, V <sub>BE</sub> = 0)<br>(V <sub>CE</sub> = 30 V, V <sub>BE</sub> = 0) T <sub>A</sub> = 125°C<br>(V <sub>CE</sub> = 50 V, V <sub>BE</sub> = 0) T <sub>A</sub> = 125°C | BC238<br>BC239<br>BC237<br>BC238<br>BC239<br>BC237 | I <sub>CES</sub>     |                | 0.20<br>0.20<br>0.20<br>0.20<br>0.20<br>0.20 | 15<br>15<br>15<br>4<br>4<br>4 | nA<br>µA |

## ON CHARACTERISTICS

|                                                                                                                                                                                   |                                                                                                                                                                                                      |                      |      |                                                                                         |                     |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------|-----------------------------------------------------------------------------------------|---------------------|---|
| DC Current Gain<br>(I <sub>C</sub> = 10 µA, V <sub>CE</sub> = 5 V)<br><br>(I <sub>C</sub> = 2 mA, V <sub>CE</sub> = 5 V)<br><br>(I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 5 V)  | BC237A/238A<br>BC237B/238B/239B<br>BC237C/238C/239C<br><br>BC237<br>BC238<br>BC239<br>BC237A/238A<br>BC237B/238B/239B<br>BC237C/238C/239C<br><br>BC237A/238A<br>BC237B/238B/239B<br>BC237C/238C/239C | h <sub>FE</sub>      |      | 90<br>150<br>270<br><br>120<br>120<br>120<br>120<br>180<br>380<br><br>120<br>180<br>300 |                     |   |
| Collector-Emitter On Voltage<br>(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.5 mA)<br>(I <sub>C</sub> = 100 mA, I <sub>B</sub> = 5 mA)                                             | BC237/BC238/BC239<br>BC237/BC239<br>BC238                                                                                                                                                            | V <sub>CE(sat)</sub> |      | 0.07<br>0.20                                                                            | 0.20<br>0.60<br>0.8 | V |
| Base-Emitter Saturation Voltage<br>(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.5 mA)<br>(I <sub>C</sub> = 100 mA, I <sub>B</sub> = 5 mA)                                          |                                                                                                                                                                                                      | V <sub>BE(sat)</sub> |      | 0.60                                                                                    | 0.83<br>1.05        | V |
| Base-Emitter On Voltage<br>(I <sub>C</sub> = 100 µA, V <sub>CE</sub> = 5 V)<br>(I <sub>C</sub> = 2 mA, V <sub>CE</sub> = 5 V)<br>(I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 5 V) |                                                                                                                                                                                                      | V <sub>BE(on)</sub>  | 0.55 | 0.50<br>0.62<br>0.83                                                                    | 0.70                | V |

# SEMELAB LIMITED

BC237, BC238, BC239

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

| Characteristic                                                                                                                                                                                                                                                         | Type                                                | Symbol   | Min               | Typ               | Max                | Unit             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------|-------------------|-------------------|--------------------|------------------|
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                                                                                                                                                         |                                                     |          |                   |                   |                    |                  |
| Current Gain Bandwidth Product<br>( $I_C = 0.5\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $f = 100\text{ MHz}$ )                                                                                                                                                             | BC237<br>BC238<br>BC239                             | $f_T$    |                   | 100<br>120<br>140 |                    | MHz              |
| ( $I_C = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 100\text{ MHz}$ )                                                                                                                                                                                                | BC237<br>BC238<br>BC239                             |          | 150<br>150<br>150 | 200<br>240<br>280 |                    |                  |
| Collector-Base Capacitance<br>( $V_{CB} = 10\text{ V}$ , $I_C = 0$ , $f = 1\text{ MHz}$ )                                                                                                                                                                              |                                                     | $C_{cb}$ |                   |                   | 4.50               | pf               |
| Emitter-Base Capacitance<br>( $V_{BE} = 0.5\text{ V}$ , $I_C = 0$ , $f = 1\text{ MHz}$ )                                                                                                                                                                               |                                                     | $C_{be}$ |                   | 8.0               |                    | pf               |
| Input Impedance<br>( $I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ )                                                                                                                                                                                | BC237A/238A<br>BC237B/238B/239B<br>BC237C/238C/239C | $h_{ie}$ | 1.6<br>3.2<br>6.0 | 2.2<br>6.0<br>8.7 | 4.5<br>8.5<br>15.0 | kohm             |
| Voltage Feedback Ratio<br>( $I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ )                                                                                                                                                                         | BC237A/238A<br>BC237B/238B/239B<br>BC237C/238C/239C | $h_{re}$ |                   | 1.5<br>2.0<br>3.0 |                    | $\times 10^{-4}$ |
| Small-Signal Current Gain<br>( $I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ )                                                                                                                                                                      | BC237A/238A<br>BC237B/238B/239B<br>BC237C/238C/239C | $h_{fe}$ | 125<br>240<br>450 | 220<br>330<br>600 | 260<br>500<br>900  |                  |
| Output Admittance<br>( $I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ )                                                                                                                                                                              | BC237A/238A<br>BC237B/238B/239B<br>BC237C/238C/239C | $h_{oc}$ |                   | 8<br>10<br>12     | 30<br>60<br>110    | $\mu\text{mhos}$ |
| Noise Figure<br>( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $R_S = 2\text{ Kohms}$ ,<br>$f = 30\text{ Hz to }15\text{ kHz}$ )<br>( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $R_S = 2\text{ Kohms}$ ,<br>$f = 1\text{ kHz}$ , $\Delta f = 200\text{ Hz}$ ) | BC239<br><br>BC237<br>BC238<br>BC239                | Nf       |                   | 2<br>2<br>2<br>2  | 4<br>10<br>10<br>4 | dB               |