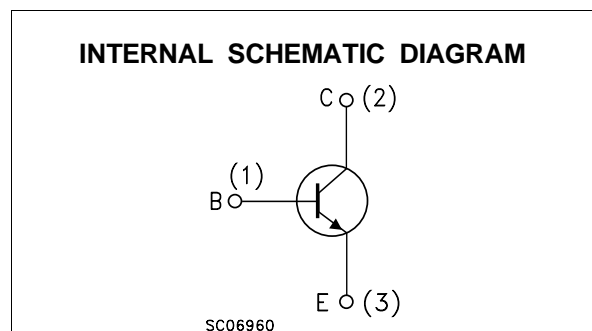
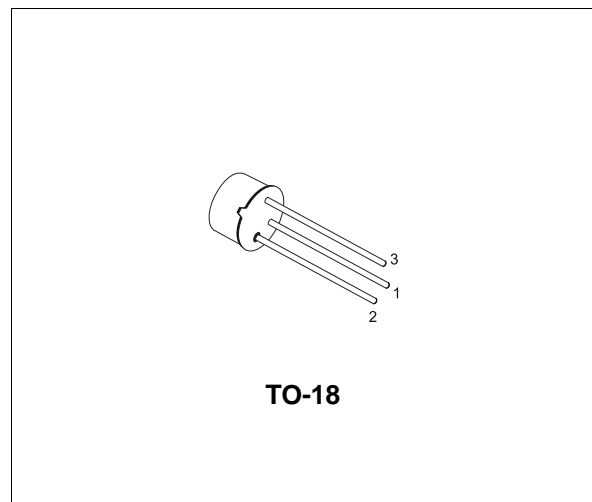


## SMALL SIGNAL NPN TRANSISTOR

### DESCRIPTION

The BCY59 is a silicon Planar Epitaxial NPN transistor in Jedec TO-18 metal case. It is intended for use in audio input stages, driver stages and low-noise input stages.

The PNP complementary type is BCY79.



### ABSOLUTE MAXIMUM RATINGS

| Symbol    | Parameter  | Value      | Unit             |
|-----------|--|------------|------------------|
| $V_{CES}$ | Collector-Emitter Voltage ( $V_{BE} = 0$ )   | 45         | V                |
| $V_{CEO}$ | Collector-Emitter Voltage ( $I_B = 0$ )  | 45         | V                |
| $V_{EBO}$ | Emitter-Base Voltage ( $I_C = 0$ )   | 7          | V                |
| $I_C$     | Collector Current  | 200        | mA               |
| $I_B$     | Base Current   | 50         | mA               |
| $P_{tot}$ | Total Dissipation at $T_{amb} \leq 25\text{ }^\circ\text{C}$<br>at $T_C \leq 25\text{ }^\circ\text{C}$ | 0.39<br>1  | W<br>W           |
| $T_{stg}$ | Storage Temperature  | -55 to 175 | $^\circ\text{C}$ |
| $T_j$     | Max. Operating Junction Temperature  | 175        | $^\circ\text{C}$ |

# BCY59

## THERMAL DATA

|                       |                                     |     |       |      |
|-----------------------|-------------------------------------|-----|-------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-Case    | Max | 150   | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-Ambient | Max | 384.6 | °C/W |

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

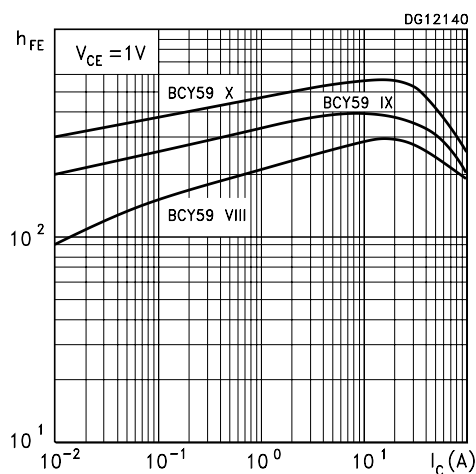
| Symbol                | Parameter  | Test Conditions  | Min.     | Typ. | Max. | Unit |
|-----------------------|--|--|----------|------|------|------|
| I <sub>CEs</sub>      | Collector Cut-off Current (V <sub>BE</sub> = 0)          | V <sub>CE</sub> = 45 V                                   |          | 0.1  | 10   | nA   |
|                       |  | V <sub>CE</sub> = 45 V T <sub>C</sub> = 150 °C           |          | 0.1  | 10   | μA   |
| I <sub>CEX</sub>      | Collector Cut-off Current (V <sub>BE</sub> = -0.2 V)     | V <sub>CE</sub> = 45 V T <sub>C</sub> = 100 °C           |          |      | 20   | μA   |
| I <sub>EBO</sub>      | Emitter Cut-off Current (I <sub>C</sub> = 0)             | V <sub>EB</sub> = 5 V                                    |          |      | 10   | nA   |
| V <sub>(BR)CEO*</sub> | Collector-Emitter Breakdown Voltage (I <sub>B</sub> = 0) | I <sub>C</sub> = 2 mA                                    | 45       |      |      | V    |
| V <sub>(BR)EBO</sub>  | Emitter-Base Breakdown Voltage (I <sub>C</sub> = 0)      | I <sub>E</sub> = 10 μA                                   | 7        |      |      | V    |
| V <sub>CE(sat)*</sub> | Collector-Emitter Saturation Voltage                     | I <sub>C</sub> = 10 mA I <sub>B</sub> = 0.25 mA          |          | 0.12 | 0.35 | V    |
|                       |  | I <sub>C</sub> = 100 mA I <sub>B</sub> = 2.5 mA          |          | 0.4  | 0.7  | V    |
| V <sub>BE(sat)*</sub> | Base-Emitter Saturation Voltage                          | I <sub>C</sub> = 10 mA I <sub>B</sub> = 0.25 mA          | 0.6      | 0.7  | 0.85 | V    |
|                       |  | I <sub>C</sub> = 100 mA I <sub>B</sub> = 2.5 mA          | 0.75     | 0.9  | 1.2  | V    |
| V <sub>BE(on)*</sub>  | Base-Emitter (on) Voltage                                | I <sub>C</sub> = 2 mA V <sub>CE</sub> = 5 V              | 0.55     | 0.65 | 0.7  | V    |
|                       |  | I <sub>C</sub> = 100 mA V <sub>CE</sub> = 1 V            |          | 0.75 |      | V    |
| h <sub>FE*</sub>      | DC Current Gain  | I <sub>C</sub> = 10 μA V <sub>CE</sub> = 5 V             | Gr. VIII | 20   | 140  |      |
|                       |  |  | Gr. IX   | 40   | 195  |      |
|                       |  |  | Gr. X    | 100  | 280  |      |
|                       |  | I <sub>C</sub> = 2 mA V <sub>CE</sub> = 5 V              | Gr. VIII | 180  | 250  | 310  |
|                       |  |  | Gr. IX   | 250  | 350  | 460  |
|                       |  |  | Gr. X    | 380  | 500  | 630  |
|                       |  | I <sub>C</sub> = 10 mA V <sub>CE</sub> = 1 V             | Gr. VIII | 120  | 260  |      |
|                       |  |  | Gr. IX   | 160  | 365  |      |
|                       |  |  | Gr. X    | 240  | 520  |      |
|                       |  | I <sub>C</sub> = 100 mA V <sub>CE</sub> = 1 V            | Gr. VIII | 45   |      |      |
|                       |  |  | Gr. IX   | 60   |      |      |
|                       |  |  | Gr. X    | 60   |      |      |
| h <sub>fe*</sub>      | Small Signal Current Gain                                | I <sub>C</sub> = 2 mA V <sub>CE</sub> = 5 V f = 1 KHz    | Gr. VIII | 175  | 350  |      |
|                       |  |  | Gr. IX   | 250  | 500  |      |
|                       |  |  | Gr. X    | 350  | 700  |      |
| f <sub>T</sub>        | Transition Frequency                                     | I <sub>C</sub> = 10 mA V <sub>CE</sub> = 5 V f = 100 MHz |          | 200  |      | MHz  |

\* Pulsed: Pulse duration = 300 μs, duty cycle ≤ 1 %

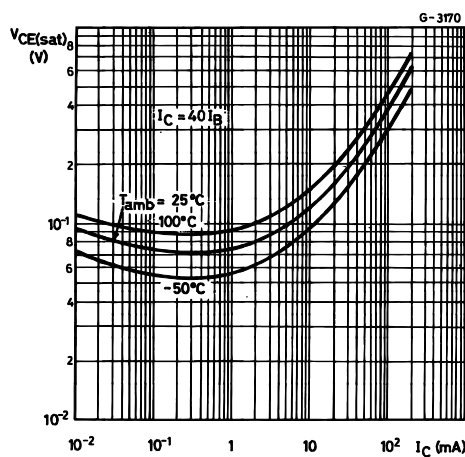
**ELECTRICAL CHARACTERISTICS** ( $T_{case} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| Symbol    | Parameter                  | Test Conditions  | Min. | Typ. | Max. | Unit |
|-----------|----------------------------|--|------|------|------|------|
| $C_{CBO}$ | Collector-Base Capacitance | $I_E = 0$ $V_{CB} = 10\text{ V}$ $f = 1\text{ MHz}$  |      | 3.5  | 6    | pF   |
| $C_{EBO}$ | Emitter-Base Capacitance   | $I_C = 0$ $V_{EB} = 0.5\text{ V}$ $f = 1\text{ MHz}$   |      | 11   | 15   | pF   |
| NF        | Noise Figure               | $I_C = 0.2\text{ mA}$ $V_{CE} = 5\text{ V}$<br>$f = 1\text{ KHz}$ $R_g = 2\text{ K}\Omega$ $\Delta f = 200\text{ Hz}$  |      | 2    | 6    | dB   |
| $t_{on}$  | Turn-on Time               | $I_C = 10\text{ mA}$ $V_{CC} = 10\text{ V}$<br>$I_{B1} = 1\text{ mA}$<br>$I_C = 100\text{ mA}$ $V_{CC} = 10\text{ V}$<br>$I_{B1} = 10\text{ mA}$                     |      | 85   | 150  | ns   |
| $t_{off}$ | Turn-off Time              | $I_C = 10\text{ mA}$ $V_{CC} = 10\text{ V}$<br>$I_{B1} = -I_{B2} = 1\text{ mA}$<br>$I_C = 100\text{ mA}$ $V_{CC} = 10\text{ V}$<br>$I_{B1} = -I_{B2} = 10\text{ mA}$ |      | 480  | 800  | ns   |

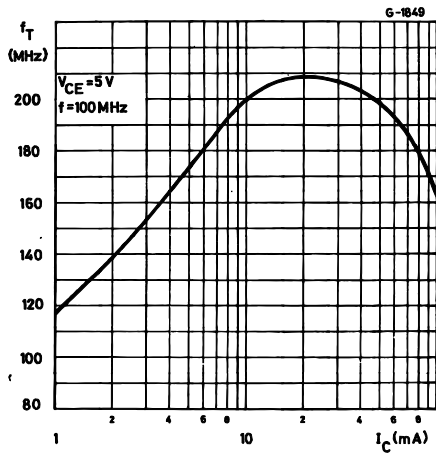
DC Current Gain



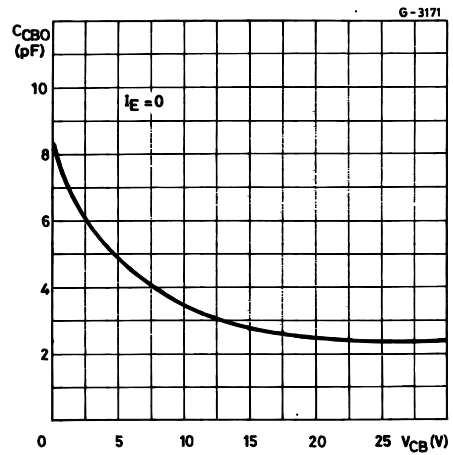
Collector-Emitter Saturation Voltage



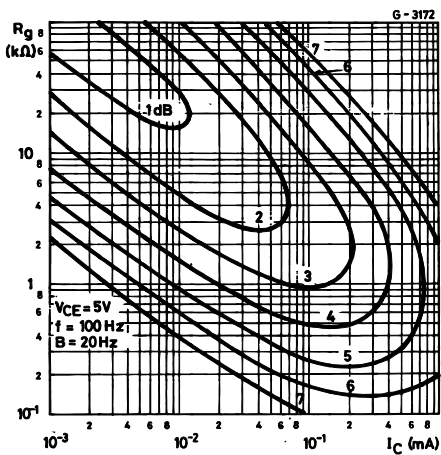
Transition Frequency



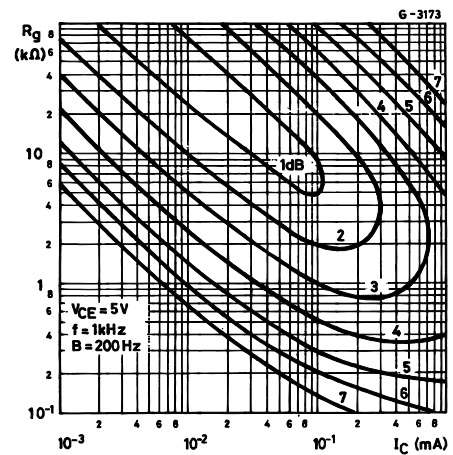
Collector-Base Capacitance



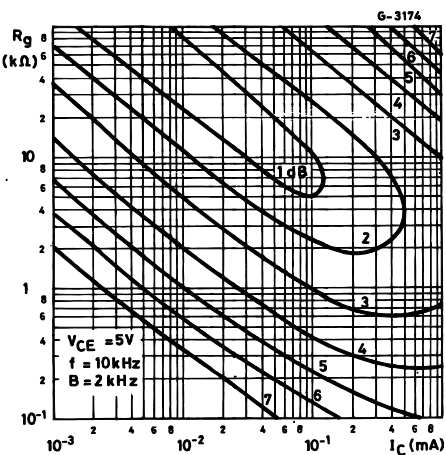
Noise Figure (f = 100 Hz)



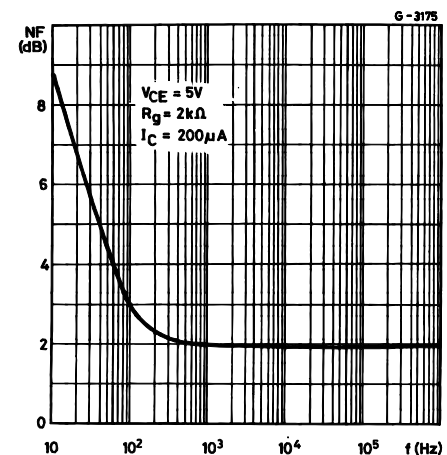
Noise Figure (f = 1 KHz)



Noise Figure (f = 10 KHz)

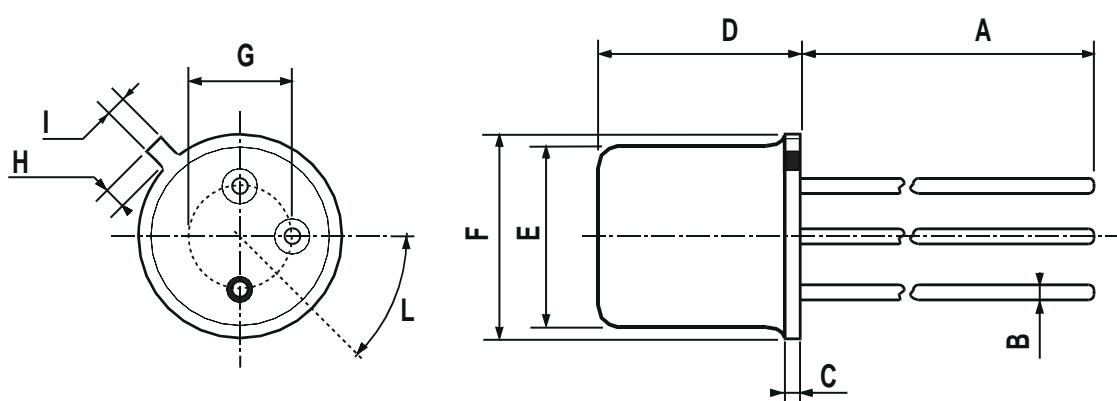


Noise Figure vs. Frequency



## TO-18 MECHANICAL DATA

| DIM. | mm   |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    |      | 12.7 |      |       | 0.500 |       |
| B    |      |      | 0.49 |       |       | 0.019 |
| D    |      |      | 5.3  |       |       | 0.208 |
| E    |      |      | 4.9  |       |       | 0.193 |
| F    |      |      | 5.8  |       |       | 0.228 |
| G    | 2.54 |      |      | 0.100 |       |       |
| H    |      |      | 1.2  |       |       | 0.047 |
| I    |      |      | 1.16 |       |       | 0.045 |
| L    | 45°  |      |      | 45°   |       |       |



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