

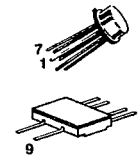
# 2N4937 thru 2N4939

CASE 654-07  
STYLE 1

## 2N4941

CASE 610A-04  
STYLE 1

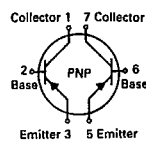
DUAL  
AMPLIFIER TRANSISTORS  
PNP SILICON



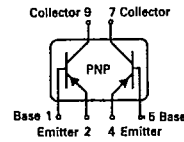
Refer to MD3250.A for graphs.

### PIN CONNECTION DIAGRAMS

CASE 654-07  
STYLE 1



CASE 610A-04  
STYLE 1



### MAXIMUM RATINGS

| Rating                                                                                                                                      | Symbol         | Value                  |          | Unit           |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------|----------|----------------|
| Collector-Emitter Voltage                                                                                                                   | $V_{CE0}$      | 40                     |          | Vdc            |
| Collector 1 to Collector 2 Voltage<br>Voltage Rating and Lead to Case                                                                       | $V_{C1C2}$     | $\pm 200$<br>$\pm 200$ |          | Vdc            |
| Collector-Base Voltage                                                                                                                      | $V_{CBO}$      | 50                     |          | Vdc            |
| Emitter-Base Voltage                                                                                                                        | $V_{EBO}$      | 5.0                    |          | Vdc            |
| Base Current                                                                                                                                | $I_B$          | 10                     |          | mAdc           |
| Collector Current — Continuous                                                                                                              | $I_C$          | 50                     |          | mAdc           |
|                                                                                                                                             |                | One Die                | Both Die |                |
| Total Device Dissipation<br>@ $T_A = 25^{\circ}\text{C}$ — Ceramic<br>Metal Can<br>Derate above $25^{\circ}\text{C}$ — Ceramic<br>Metal Can | $P_D$          | 250                    | 350      | mW<br>mW/°C    |
|                                                                                                                                             |                | 500                    | 600      |                |
|                                                                                                                                             |                | 1.5                    | 2.0      |                |
|                                                                                                                                             |                | 2.9                    | 3.4      |                |
| Total Device Dissipation @ $T_C = 25^{\circ}\text{C}$<br>Derate above $25^{\circ}\text{C}$<br>Metal Can                                     | $P_D$          | 1.2                    | 2.0      | Watts<br>mW/°C |
|                                                                                                                                             |                | 6.85                   | 11.42    |                |
| Operating and Storage Junction<br>Temperature Range                                                                                         | $T_J, T_{stg}$ | -65 to +200            |          | °C             |

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

| Characteristic                                                                    | Symbol        | Min | Max | Unit |
|-----------------------------------------------------------------------------------|---------------|-----|-----|------|
| <b>OFF CHARACTERISTICS</b>                                                        |               |     |     |      |
| Collector-Emitter Breakdown Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 0$ )       | $V_{(BR)CEO}$ | 40  | —   | Vdc  |
| Collector-Base Breakdown Voltage<br>( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ ) | $V_{(BR)CBO}$ | 50  | —   | Vdc  |
| Emitter-Base Breakdown Voltage<br>( $I_E = 10\text{ }\mu\text{A}$ , $I_C = 0$ )   | $V_{(BR)EBO}$ | 5.0 | —   | Vdc  |
| Collector Cutoff Current<br>( $V_{CB} = 40\text{ Vdc}$ , $I_E = 0$ )              | $I_{CBO}$     | —   | 20  | nA   |
| Emitter Cutoff Current<br>( $V_{BE} = 3.0\text{ Vdc}$ , $I_C = 0$ )               | $I_{EBO}$     | —   | 20  | nA   |

### ON CHARACTERISTICS

|                                                                                                                                                                                                 |          |                |                   |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------|-------------------|---|
| DC Current Gain<br>( $I_C = 100\text{ }\mu\text{A}$ , $V_{CE} = 10\text{ Vdc}$ )<br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ )<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ ) | $h_{FE}$ | 40<br>50<br>50 | 200<br>250<br>250 | — |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------|-------------------|---|

### SMALL-SIGNAL CHARACTERISTICS

|                                                                                                                                                    |          |     |     |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|-----|------------------|
| Current-Gain — Bandwidth Product<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 100\text{ MHz}$ )                                     | $f_T$    | 300 | 900 | MHz              |
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 140\text{ kHz}$ ) Emitter Guarded                                              | $C_{cb}$ | —   | 5.0 | pF               |
| Input Impedance<br>( $I_{BE} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 140\text{ kHz}$ ) Collector Guarded                                              | $C_{eb}$ | —   | 10  | pF               |
| Input Impedance<br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                                                     | $h_{ie}$ | 1.0 | 10  | k $\Omega$       |
| Voltage Feedback Ratio<br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                                              | $h_{re}$ | —   | 10  | $\times 10^{-4}$ |
| Small-Signal Current Gain<br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                                           | $h_{fe}$ | 50  | —   | —                |
| Output Admittance<br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                                                   | $h_{oe}$ | 5.0 | 50  | $\mu\text{mhos}$ |
| Noise Figure<br>( $I_C = 100\text{ }\mu\text{A}$ , $V_{CE} = 10\text{ Vdc}$ , $R_S = 3.0\text{ k}\Omega$ , $f = 10\text{ Hz to }15.7\text{ kHz}$ ) | NF       | —   | 4.0 | dB               |

MOTOROLA SMALL-SIGNAL TRANSISTORS, FETs AND DIODES

T-29-27

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

| Characteristic                                                                                                                                      | Symbol                                       | Min         | Max        | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------|------------|------|
| MATCHING CHARACTERISTICS                                                                                                                            |                                              |             |            |      |
| DC Current Gain Ratio(1)<br>(I <sub>C</sub> = 100 μAdc to 1.0 mAdc, V <sub>CE</sub> = 10 Vdc)                                                       | h <sub>FE1</sub> /h <sub>FE2</sub>           | 0.9<br>0.8  | 1.0<br>1.0 | —    |
| (I <sub>C</sub> = 100 μAdc to 1.0 mAdc, V <sub>CE</sub> = 10 Vdc,<br>T <sub>A</sub> = -55°C to 125°C)                                               |                                              | 0.85<br>0.7 | 1.0<br>1.0 |      |
| Base-Emitter Voltage Differential<br>(I <sub>C</sub> = 100 μAdc to 1.0 mAdc, V <sub>CE</sub> = 10 Vdc)                                              | V <sub>BE1</sub> -V <sub>BE2</sub>           | —<br>—      | 3.0<br>5.0 | mVdc |
| Base-Emitter Voltage Differential Gradient<br>(I <sub>C</sub> = 100 μAdc to 1.0 mAdc, V <sub>CE</sub> = 10 Vdc,<br>T <sub>A</sub> = 25°C to +125°C) | $\frac{\Delta(V_{BE1}-V_{BE2})}{\Delta T_A}$ | —<br>—      | 1.0<br>2.0 | mVdc |
| (I <sub>C</sub> = 100 μAdc to 1.0 mAdc, V <sub>CE</sub> = 10 Vdc,<br>T <sub>A</sub> = -55°C to 25°C)                                                |                                              | —<br>—      | 0.8<br>1.6 |      |

(1) The lowest h<sub>FE</sub> reading is taken as h<sub>FE1</sub> for this ratio.