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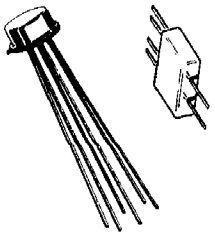
# MD3250, A, F, AF
# MD3251, A, F, AF

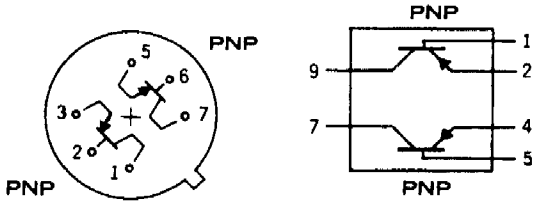
$V_{CEO} = 40V$
$I_C = 50$ mA



**CASE 33**
(TO-89)

**CASE 32**

Dual PNP silicon annular transistors, especially designed for low-level, differential amplifier applications.




PIN CONNECTIONS
(BOTTOM VIEW)

MD3250F, AF
MD3251F, AF

MAXIMUM RATINGS (each side) ($T_A = 25°C$ unless otherwise noted)

| Rating | Symbol | Value | | Unit |
|---|---|---|---|---|
| Collector-Base Voltage | $V_{CB}$ | 50 | | Vdc |
| Collector-Emitter Voltage | $V_{CEO}$ | 40 | | Vdc |
| Emitter-Base Voltage | $V_{EB}$ | 5 | | Vdc |
| DC Collector Current | $I_C$ | 50 | | mAdc |
| Junction Temperature | $T_J$ | +200 | | °C |
| Storage Temperature Range | $T_{stg}$ | -65 to +200 | | °C |
| | | One Side | Both Sides | |
| Total Device Dissipation @ $T_A = 25°C$<br>TO-5 Case<br>Derate above 25°C<br>Flat Pack<br>Derate above 25°C | $P_D$ | <br>500<br>2.9<br><br>250<br>1.5 | <br>600<br>3.4<br><br>350<br>2.0 | <br>mW<br>mW/°C<br>mW<br>mW/°C |
| Total Device Dissipation @ $T_C = 25°C$<br>TO-5 Case<br>Derate above 25°C | $P_D$ | <br>1.2<br>6.85 | <br>2.0<br>11.42 | <br>mW<br>mW/°C |

## MD3250, A, F, AF and MD3251, A, F, AF (continued)

ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C unless otherwise noted)

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Base Breakdown Voltage ($I_C$ = 10 μAdc, $I_E$ = 0) | | $BV_{CBO}$ | 50 | — | — | Vdc |
| Collector-Emitter Breakdown Voltage ($I_C$ = 10 mAdc, $I_B$ = 0) | | $BV_{CEO}$ | 40 | 70 | — | Vdc |
| Emitter-Base Breakdown Voltage ($I_E$ = 10 μAdc, $I_C$ = 0) | | $BV_{EBO}$ | 5 | — | — | Vdc |
| Collector Cutoff Current ($V_{CB}$ = 50 Vdc, $I_E$ = 0) | | $I_{CBO}$ | — | — | 0.01 | μAdc |
| ($V_{CB}$ = 50 Vdc, $I_E$ = 0, $T_A$ = 150°C) | | | — | — | 10 | |
| Emitter Cutoff Current ($V_{EB}$ = 3 Vdc, $I_C$ = 0) | | $I_{EBO}$ | — | — | 20 | nAdc |
| **ON CHARACTERISTICS** | | | | | | |
| DC Forward Current Transfer Ratio* ($I_C$ = 10 μAdc, $V_{CE}$ = 5 Vdc) | MD3250, MD3250A | $h_{FE}$* | 25 | — | — | — |
| | MD3251, MD3251A | | 50 | — | — | |
| ($I_C$ = 100 μAdc, $V_{CE}$ = 5 Vdc) | MD3250, MD3250A | | 50 | — | 150 | |
| | MD3251, MD3251A | | 100 | — | 300 | |
| ($I_C$ = 100 μAdc, $V_{CE}$ = 5 Vdc, $T_A$ = -55°C) | MD3250, MD3250A | | 25 | — | — | |
| | MD3251, MD3251A | | 50 | — | — | |
| ($I_C$ = 1 mAdc, $V_{CE}$ = 5 Vdc) | MD3250, MD3250A | | 50 | — | 150 | |
| | MD3251, MD3251A | | 100 | — | 300 | |
| ($I_C$ = 10 mAdc, $V_{CE}$ = 5 Vdc) | MD3250, MD3250A | | 50 | — | — | |
| | MD3251, MD3251A | | 100 | — | — | |
| ($I_C$ = 50 mAdc, $V_{CE}$ = 5 Vdc) | MD3250, MD3250A | | 15 | — | — | |
| | MD3251, MD3251A | | 30 | — | — | |
| Collector-Emitter Saturation Voltage* ($I_C$ = 10 mAdc, $I_B$ = 1.0 mAdc) | | $V_{CE(sat)}$* | — | — | 0.25 | Vdc |
| ($I_C$ = 50 mAdc, $I_B$ = 5 mAdc) | | | — | — | 0.50 | |
| Base-Emitter Saturation Voltage* ($I_C$ = 10 mAdc, $I_B$ = 1.0 mAdc) | | $V_{BE(sat)}$* | 0.6 | — | 0.9 | Vdc |
| ($I_C$ = 50 mAdc, $I_B$ = 5 mAdc) | | | — | — | 1.2 | |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| Current-Gain — Bandwidth Product ($I_C$ = 10 mAdc, $V_{CE}$ = 20 Vdc, f = 100 MHz) | MD3250, MD3250A | $f_T$ | 200 | — | — | MHz |
| | MD3251, MD3251A | | 250 | — | — | |
| Output Capacitance ($V_{CB}$ = 5 Vdc, $I_E$ = 0, f = 100 kHz) | | $C_{ob}$ | — | — | 6 | pF |
| Input Capacitance ($V_{BE}$ = 0.5 Vdc, $I_C$ = 0, f = 100 kHz) | | $C_{ib}$ | — | — | 8 | pF |
| Small Signal Current Gain ($I_C$ = 1.0 mA, $V_{CE}$ = 10 V, f = 1 kHz) | MD3250, MD3250A | $h_{fe}$ | 50 | — | 200 | — |
| | MD3251, MD3251A | | 100 | — | 400 | |
| Voltage Feedback Ratio ($I_C$ = 1.0 mA, $V_{CE}$ = 10 V, f = 1 kHz) | MD3250, MD3250A | $h_{re}$ | — | — | 10 | X10-4 |
| | MD3251, MD3251A | | — | — | 20 | |
| Input Impedance ($I_C$ = 1.0 mA, $V_{CE}$ = 10 V, f = 1 kHz) | MD3250, MD3250A | $h_{ie}$ | 1 | — | 6 | kohms |
| | MD3251, MD3251A | | 2 | — | 12 | |
| Output Admittance ($I_C$ = 1.0 mA, $V_{CE}$ = 10 V, f = 1 kHz) | MD3250, MD3250A | $h_{oe}$ | 4 | — | 40 | μmhos |
| | MD3251, MD3251A | | 10 | — | 60 | |
| Wide Band Noise Figure ($I_C$ = 100 μA, $V_{CE}$ = 10 V, $R_g$ = 3 kohm, Noise Bandwidth 10 cps to 15.7 kHz) | MD3250, MD3250A | NF | — | — | 4 | dB |
| | MD3251, MD3251A | | — | — | 3 | |
| **MATCHING CHARACTERISTICS** (Types MD3250A and MD3251A only) | | | | | | |
| DC Current Gain Ratio** ($I_C$ = 100 μAdc and 1 mAdc, $V_{CE}$ = 5 Vdc) | MD3250A, MD3251A | $h_{FE1}/h_{FE2}$** | 0.9 | — | 1.0 | — |
| Base Voltage Differential ($I_C$ = 10 μA, to 10 mA, $V_{CE}$ = 5 Vdc) | MD3250A, MD3251A | $\lvert V_{BE1}-V_{BE2}\rvert$ | — | — | 5 | mVdc |
| ($I_C$ = 100 μAdc, $V_{CE}$ = 5 Vdc) | MD3250A, MD3251A | | — | — | 3 | |
| Base Voltage Differential Change ($I_C$ = 100 μAdc, $V_{CE}$ = 5 Vdc, $T_A$ = -55 to +25°C) | MD3250A, MD3251A | $\Delta(V_{BE1}-V_{BE2})$ | — | — | 0.8 | mVdc |
| ($I_C$ = 100 μAdc, $V_{CE}$ = 5 Vdc, $T_A$ = 25 to 125°C) | MD3250A, MD3251A | | — | — | 1.0 | |

*Pulse Test ≤ 300 μs, duty cycle ≤ 2%

** The lowest $h_{FE}$ reading is taken as $h_{FE1}$ for this ratio