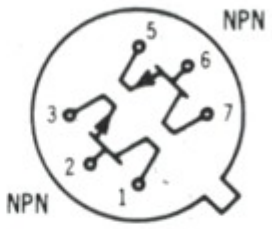
# MD708, F (SILICON)
# MD708A, F
# MD708B, F

Dual NPN silicon annular transistors designed for high-speed, logic switching and space saving considerations. Matched pairs are available for differential amplifier applications.

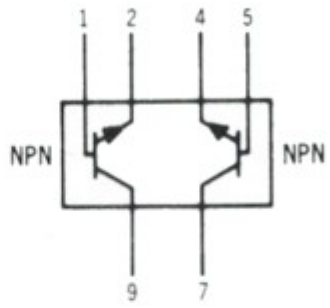
CASE
654-01

MD708
MD708A
MD708B




PINS 4 AND 8 OMITTED

Case 610-02




MD708F
MD708AF
MD708BF

Pin Connections, Bottom View
All Leads Electrically Isolated from Case

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

| Rating | Symbol | Value | | Unit |
|---|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEO}$ | 15 | | Vdc |
| Collector-Base Voltage | $V_{CB}$ | 40 | | Vdc |
| Emitter-Base Voltage | $V_{EB}$ | 5.0 | | Vdc |
| Collector Current | $I_C$ | 200 | | mAdc |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | -65 to +200 | | °C |
| | | One Side | Both Sides | |
| Total Device Dissipation @ $T_A$ = 25°C | $P_D$ | | | |
| Metal Can | | 300 | 400 | mW |
| Derate above 25°C | | 1.7 | 2.3 | mW/°C |
| Flat Package | | 250 | 350 | mW |
| Derate above 25°C | | 1.5 | 2.0 | mW/°C |

FIGURE 1 — TURN-ON AND TURN-OFF TIME TEST CIRCUIT

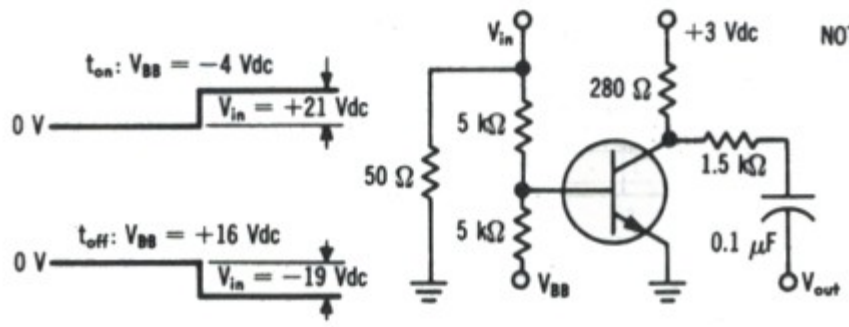
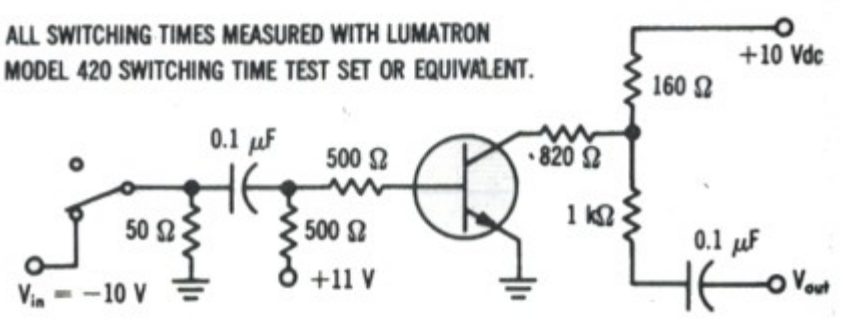



FIGURE 2 — CHARGE-STORAGE TIME CONSTANT TEST CIRCUIT

NOTE: ALL SWITCHING TIMES MEASURED WITH LUMATRON MODEL 420 SWITCHING TIME TEST SET OR EQUIVALENT.



## MD708,F/MD708A,F/MD708B,F (continued)

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector-Emitter Sustaining Voltage (1) ($I_C$ = 30 mAdc, $I_B$ = 0) | $BV_{CEO(sus)}$ | 15 | — | Vdc |
| Collector-Base Breakdown Voltage ($I_C$ = 10 μAdc, $I_E$ = 0) | $BV_{CBO}$ | 40 | — | Vdc |
| Emitter-Base Breakdown Voltage ($I_E$ = 10 μAdc, $I_C$ = 0) | $BV_{EBO}$ | 5.0 | — | Vdc |
| Collector Cutoff Current ($V_{CB}$ = 20 Vdc, $I_E$ = 0) | $I_{CBO}$ | — | 0.015 | μAdc |
| ($V_{CB}$ = 20 Vdc, $I_E$ = 0, $T_A$ = +150°C) | | — | 50 | |
| **ON CHARACTERISTICS** | | | | |
| DC Current Gain (1) ($I_C$ = 0.5 mAdc, $V_{CE}$ = 1.0 Vdc) | $h_{FE}$ | 40 | — | — |
| ($I_C$ = 10 mAdc, $V_{CE}$ = 1.0 Vdc) | | 40 | 200 | |
| ($I_C$ = 100 mAdc, $V_{CE}$ = 5.0 Vdc) | | 35 | — | |
| ($I_C$ = 150 mAdc, $V_{CE}$ = 5.0 Vdc) | | 30 | — | |
| Collector-Emitter Saturation Voltage ($I_C$ = 10 mAdc, $I_B$ = 1 mAdc) | $V_{CE(sat)}$ | — | 0.2 | Vdc |
| ($I_C$ = 50 mAdc, $I_B$ = 5 mAdc) | | — | 0.35 | |
| ($I_C$ = 100 mAdc, $I_B$ = 10 mAdc) | | — | 0.5 | |
| Base-Emitter Saturation Voltage ($I_C$ = 10 mAdc, $I_B$ = 1 mAdc) | $V_{BE(sat)}$ | 0.65 | 0.85 | Vdc |
| ($I_C$ = 50 mAdc, $I_B$ = 5 mAdc) | | — | 0.95 | |
| ($I_C$ = 100 mAdc, $I_B$ = 10 mAdc) | | — | 1.1 | |
| **DYNAMIC CHARACTERISTICS** | | | | |
| Current-Gain—Bandwidth Product ($I_C$ = 20 mAdc, $V_{CE}$ = 10 Vdc, f = 100 MHz) | $f_T$ | 300 | — | MHz |
| Output Capacitance ($V_{CB}$ = 10 Vdc, $I_E$ = 0, f = 100 kHz) | $C_{ob}$ | — | 5.0 | pF |
| Input Capacitance ($V_{BE}$ = 0.5 Vdc, $I_C$ = 0, f = 100 kHz) | $C_{ib}$ | — | 7.0 | pF |
| Charge-Storage Time Constant (Figure 2) ($I_C$ = 10 mAdc, $I_{B1}$ = $I_{B2}$ = 10 mAdc) | $t_s$ | — | 25 | ns |
| Turn-On Time (Figure 1) ($I_C$ = 10 mAdc, $I_{B1}$ = 3 mAdc, $I_{B2}$ = 1 mAdc) | $t_{on}$ | — | 35 | ns |
| Turn-Off Time (Figure 1) ($I_C$ = 10 mAdc, $I_{B1}$ = 3 mAdc, $I_{B2}$ = 1 mAdc) | $t_{off}$ | — | 75 | ns |
| **MATCHING CHARACTERISTICS** | | | | |
| DC Current Gain Ratio** ($I_C$ = 10 mAdc, $V_{CE}$ = 1 Vdc) MD708A, MD708AF | $h_{FE1}/h_{FE2}$** | 0.9 | 1.0 | — |
| MD708B, MD708BF | | 0.8 | 1.0 | |
| Base Voltage Differential ($I_C$ = 10 mAdc, $V_{CE}$ = 1 Vdc) MD708A, MD708AF | $\lvert V_{BE1} - V_{BE2} \rvert$ | — | 5.0 | mVdc |
| MD708B, MD708BF | | — | 10 | |
| Base Voltage Differential Gradient ($I_C$ = 10 mAdc, $V_{CE}$ = 1 Vdc, $T_A$ = -55 to +125°C) MD708A, MD708AF | $\frac{\Delta(V_{BE1} - V_{BE2})}{\Delta T_A}$ | — | 10 | μV/°C |
| MD708B, MD708BF | | — | 20 | |

(1) Pulse Test: Pulse Width = 300 μs; Duty Cycle = 2%

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