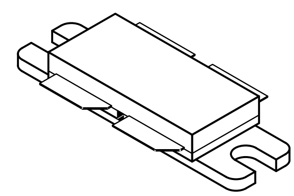
## The RF Line
# NPN Silicon RF Power Transistor

**MRF899**

**150 W, 900 MHz**
**RF POWER**
**TRANSISTOR**
**NPN SILICON**



CASE 375A–01, STYLE 1

Designed for 26 Volt UHF large–signal, common emitter, Class AB linear amplifier applications in industrial and commercial FM/AM equipment operating in the range 800–960 MHz.

- Specified 26 Volt, 900 MHz Characteristics
  Output Power = 150 Watts (PEP)
  Minimum Gain = 8.0 dB @ 900 MHz, Class AB
  Minimum Efficiency = 35% @ 900 MHz, 150 Watts (PEP)
  Maximum Intermodulation Distortion –28 dBc @ 150 Watts (PEP)
- Characterized with Series Equivalent Large–Signal Parameters from 800 to 960 MHz
- Silicon Nitride Passivated
- 100% Tested for Load Mismatch Stress at all Phase Angles with 5:1 VSWR @ 26 Vdc, and Rated Output Power
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

**MAXIMUM RATINGS**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector–Emitter Voltage | $V_{CEO}$ | 28 | Vdc |
| Collector–Emitter Voltage | $V_{CES}$ | 60 | Vdc |
| Emitter–Base Voltage | $V_{EBO}$ | 4.0 | Vdc |
| Collector–Current — Continuous | $I_C$ | 25 | Adc |
| Total Device Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 230<br>1.33 | Watts<br>W/°C |
| Storage Temperature Range | $T_{stg}$ | –65 to +150 | °C |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 0.75 | °C/W |

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted.)

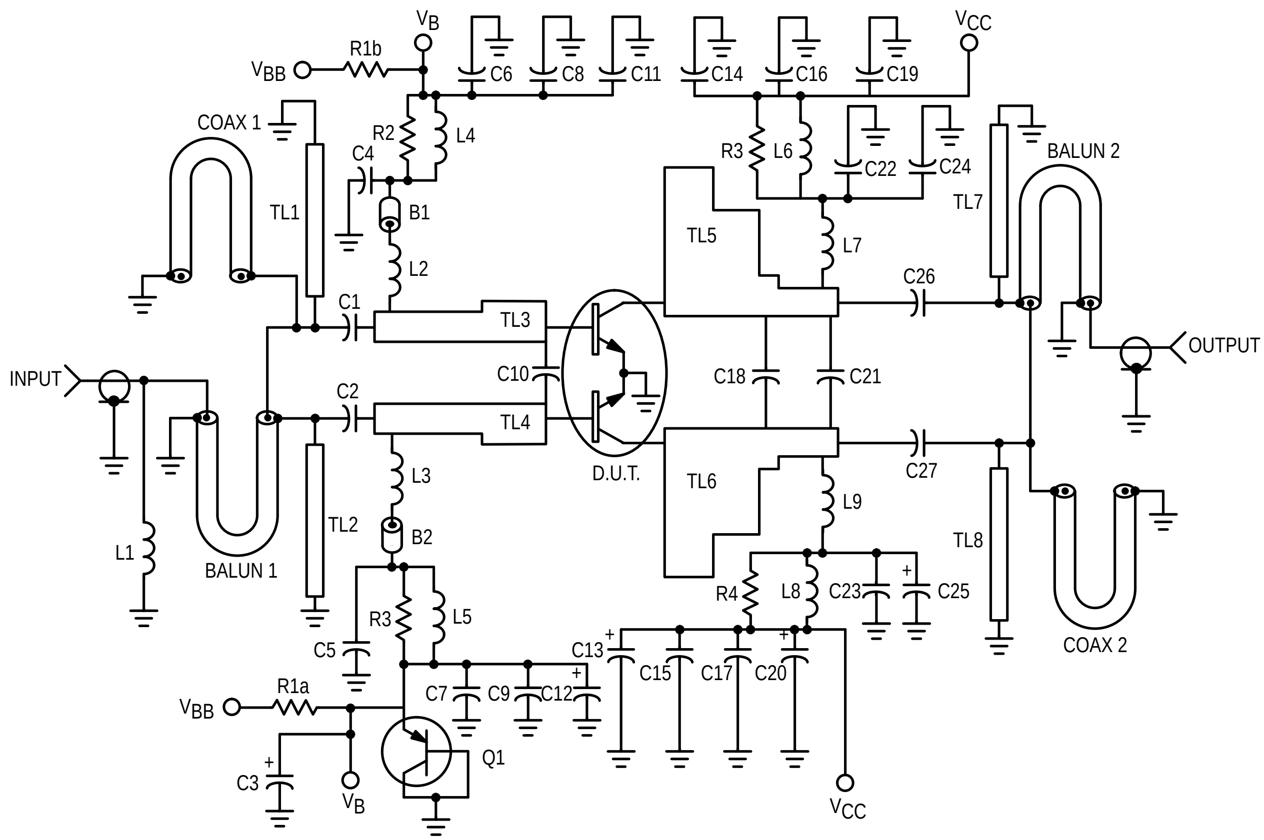
| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C$ = 100 mAdc, $I_B$ = 0) | $V_{(BR)CEO}$ | 28 | 37 | — | Vdc |
| Collector–Emitter Breakdown Voltage ($I_C$ = 50 mAdc, $V_{BE}$ = 0) | $V_{(BR)CES}$ | 60 | 85 | — | Vdc |
| Emitter–Base Breakdown Voltage ($I_E$ = 10 mAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | 4.0 | 4.9 | — | Vdc |
| Collector Cutoff Current ($V_{CE}$ = 30 Vdc, $V_{BE}$ = 0) | $I_{CES}$ | — | — | 10 | mAdc |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain ($I_{CE}$ = 1.0 Adc, $V_{CE}$ = 5.0 Vdc) | $h_{FE}$ | 30 | 75 | 120 | — |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Output Capacitance ($V_{CB}$ = 26 Vdc, $I_E$ = 0, f = 1.0 MHz) (1) | $C_{ob}$ | — | 75 | — | pF |

NOTE:
1. For information only. This part is collector matched.

(continued)

**ELECTRICAL CHARACTERISTICS — continued** ($T_C$ = 25°C unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **FUNCTIONAL CHARACTERISTICS** | | | | | |
| Common–Emitter Amplifier Power Gain<br>$V_{CC}$ = 26 Vdc, $P_{out}$ = 150 Watts (PEP), $I_{cq}$ = 300 mA, $f_1$ = 900 MHz, $f_2$ = 900.1 MHz | $G_{pe}$ | 8.0 | 9.0 | — | dB |
| Collector Efficiency<br>$V_{CC}$ = 26 Vdc, $P_{out}$ = 150 Watts (PEP), $I_{cq}$ = 300 mA, $f_1$ = 900 MHz, $f_2$ = 900.1 MHz | η | 30 | 40 | — | % |
| 3rd Order Intermodulation Distortion<br>$V_{CC}$ = 26 Vdc, $P_{out}$ = 150 Watts (PEP), $I_{cq}$ = 300 mA, $f_1$ = 900 MHz, $f_2$ = 900.1 MHz | IMD | — | –32 | –28 | dBc |
| Output Mismatch Stress<br>$V_{CC}$ = 26 Vdc, $P_{out}$ = 150 Watts (PEP), $I_{cq}$ = 300 mA, $f_1$ = 900 MHz, $f_2$ = 900.1 MHz, VSWR = 5:1 (all phase angles) | ψ | No Degradation in Output Power Before and After Test | | | |




B1, B2 — Ferrite Bead, Ferroxcube #56–590–65–3B
C1, C2, C26, C27 — 43 pF, B Case, ATC Chip Capacitor
C3 — 200 µF Lytic Capacitor
C4, C5, C22, C23 — 100 pF, B Case, ATC Chip Capacitor
C6, C7, C14, C15 — 1000 pF, B Case, ATC Chip Capacitor
C10 — 9.1 pF, A Case, ATC Chip Capacitor
C13 — 500 µF Electrolytic Capacitor
C18 — 3.9 pF, B Case, ATC Chip Capacitor
C21 — 0.8 pF, B Case, ATC Chip Capacitor
C8, C9, C16, C17 — CDR32BP182AJWS, 1800 pF, AVX Chip Capacitor
C11, C12, C19, C20, C24, C25 — 10 µF, Electrolytic Capacitor Panasonic
L1 — 5 Turns 24 AWG IDIA 0.059″ Choke, 19.8 nH
L2, L3, L7, L9 — 4 Turns 20 AWG IDIA 0.163″ Choke
L4, L5, L6, L8 — 12 Turns 22 AWG IDIA 0.140″ Choke, on 10–20 Ω Resistor
N1, N2 — Type N Flange Mount, Omni Spectra
Q1 — Bias Transistor BD136 PNP
R2, R3, R4, R5 — 4.0 x 39 Ohm 1/8 W Chips in Parallel
R1a, R1b — 56 Ohm 1.0 W
TL1–TL8 — See Photomaster
Balun1, Balun2, Coax 1, Coax 2 — 2.20″ 50 Ohm 0.088″ o.d. semi–rigid coax
Board — 1/32″ Glass Teflon, $\varepsilon_r$ = 2.55″ Arlon (GX–0300–55–22)

**Figure 1. 900 MHz Power Gain Test Circuit**

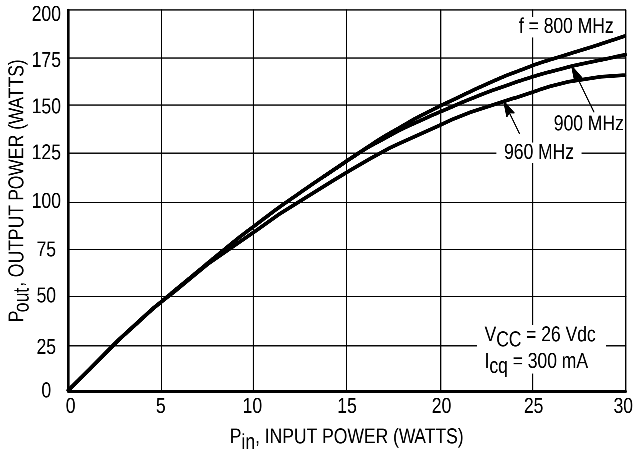



**Figure 2. Output Power versus Input Power**

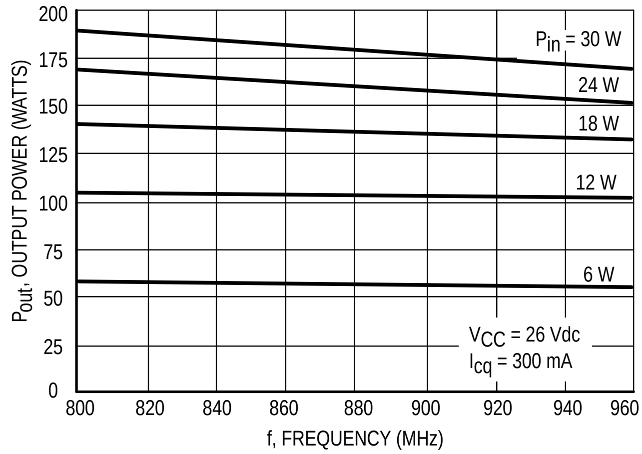



**Figure 3. Output Power versus Frequency**

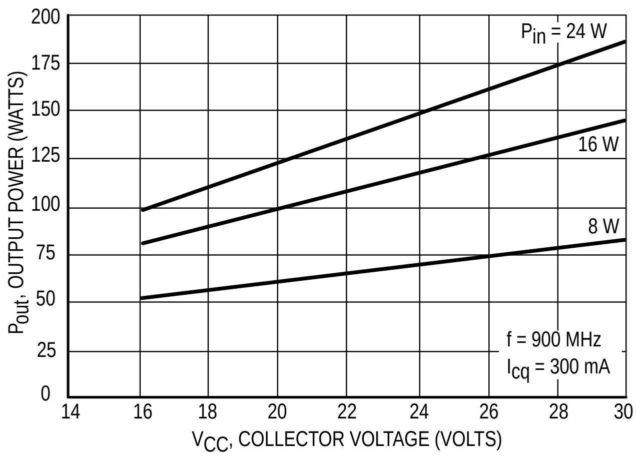



**Figure 4. Output Power versus Supply Voltage**

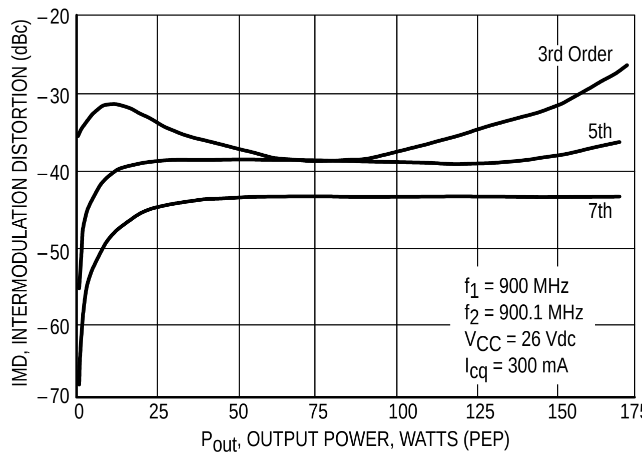



**Figure 5. Intermodulation versus Output Power**

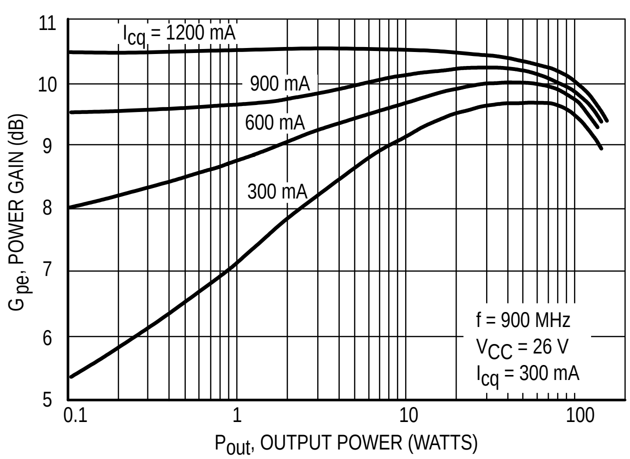



**Figure 6. Power Gain versus Output Power**

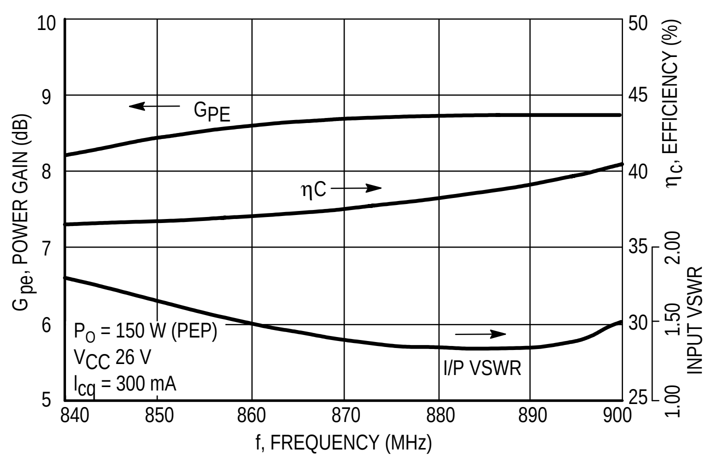
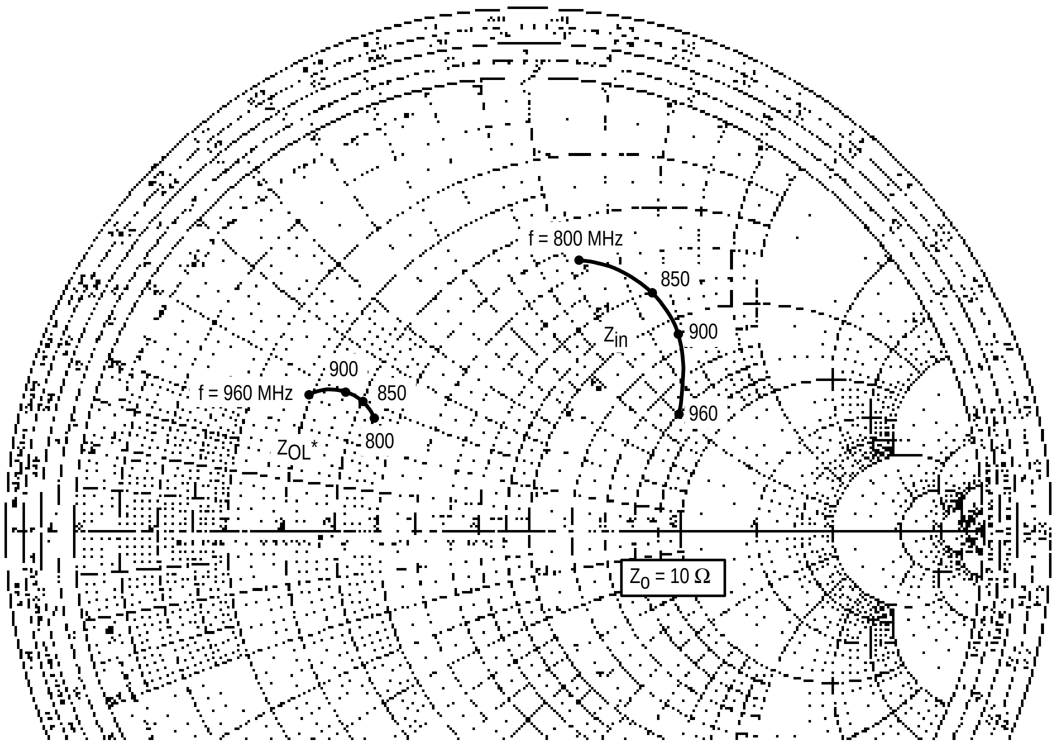



**Figure 7. Broadband Test Fixture Performance**




| f MHz | $Z_{in}$ Ohms | $Z_{OL}$* Ohms |
|---|---|---|
| 800 | 5.51 + j10.6 | 4.52 + j2.64 |
| 850 | 8.17 + j13.2 | 4.21 + j2.98 |
| 900 | 11.2 + j13.8 | 3.68 + j2.97 |
| 960 | 16.8 + j10.1 | 2.98 + j2.71 |

$Z_{OL}$* = Conjugate of optimum load impedance into which the device operates at a given output power, voltage and frequency.

NOTE: $Z_{in}$ & $Z_{OL}$* are given from base–to–base and collector–to–collector respectively

**Figure 8. Input and Output Impedances with Circuit Tuned for Maximum Gain @ $P_O$ = 150 W (PEP), $V_{CC}$ = 26 V**

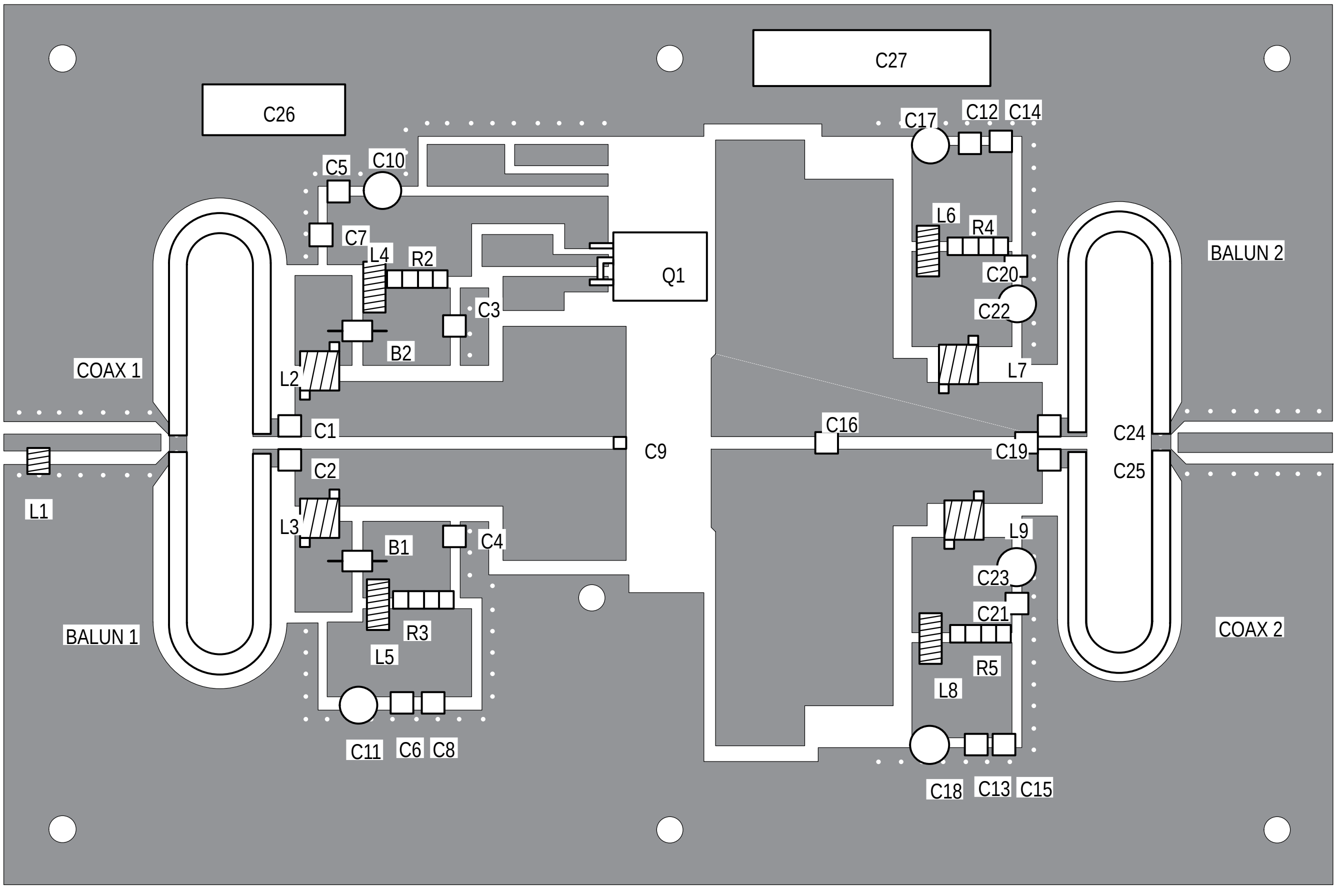
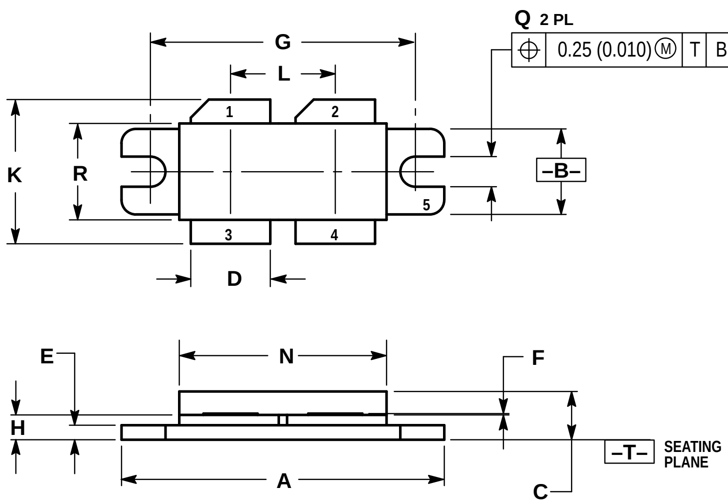



Figure 9. MRF899 Test Fixture Component Layout

## PACKAGE DIMENSIONS




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | 1.330 | 1.350 | 33.79 | 34.29 |
| B | 0.375 | 0.395 | 9.52 | 10.03 |
| C | 0.180 | 0.205 | 4.57 | 5.21 |
| D | 0.320 | 0.340 | 8.13 | 8.64 |
| E | 0.060 | 0.070 | 1.52 | 1.77 |
| F | 0.004 | 0.006 | 0.11 | 0.15 |
| G | 1.100 BSC | | 27.94 BSC | |
| H | 0.082 | 0.097 | 2.08 | 2.46 |
| K | 0.580 | 0.620 | 14.73 | 15.75 |
| L | 0.435 BSC | | 11.05 BSC | |
| N | 0.845 | 0.875 | 21.46 | 22.23 |
| Q | 0.118 | 0.130 | 3.00 | 3.30 |
| R | 0.390 | 0.410 | 9.91 | 10.41 |

STYLE 1:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. BASE
5. EMITTER

**CASE 375A–01**
**ISSUE O**

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