

# The RF Line

## NPN Silicon

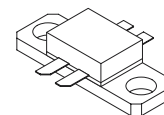
### RF Power Transistor

Designed for 24 Volt UHF large-signal, common emitter, class-AB linear amplifier applications in industrial and commercial FM/AM equipment operating in the range 800–970 MHz.

- Specified 24 Volt, 900 MHz Characteristics
  - Output Power = 30 Watts
  - Minimum Gain = 10.5 dB @ 900 MHz, class-AB
  - Minimum Efficiency = 30% @ 900 MHz, 30 Watts (PEP)
  - Maximum Intermodulation Distortion -30 dBc @ 30 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 Metalized, Emitter Ballasted for Long Life and Resistance to Metal-Migration

# MRF897R

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



CASE 395E-01, STYLE 1

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#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	30	Vdc
Collector-Emitter Voltage	$V_{CES}$	60	Vdc
Emitter-Base Voltage	$V_{EBO}$	4.0	Vdc
Collector-Current — Continuous	$I_C$	4.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	105 0.60	Watts W/ $^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.67	$^\circ\text{C/W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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#### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = 50 \text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	30	33	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 50 \text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	60	80	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 5 \text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	4.7	—	Vdc
Collector Cutoff Current ( $V_{CE} = 30 \text{ Vdc}$ , $V_{BE} = 0$ , $T_C = 25^\circ\text{C}$ )	$I_{CES}$	—	—	10.0	mAdc

#### ON CHARACTERISTICS

DC Current Gain ( $I_{CE} = 1.0 \text{ Adc}$ , $V_{CE} = 5 \text{ Vdc}$ )	$h_{FE}$	30	80	120	—
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#### DYNAMIC CHARACTERISTICS

Output Capacitance ( $V_{CB} = 24 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	14	21	28	pF
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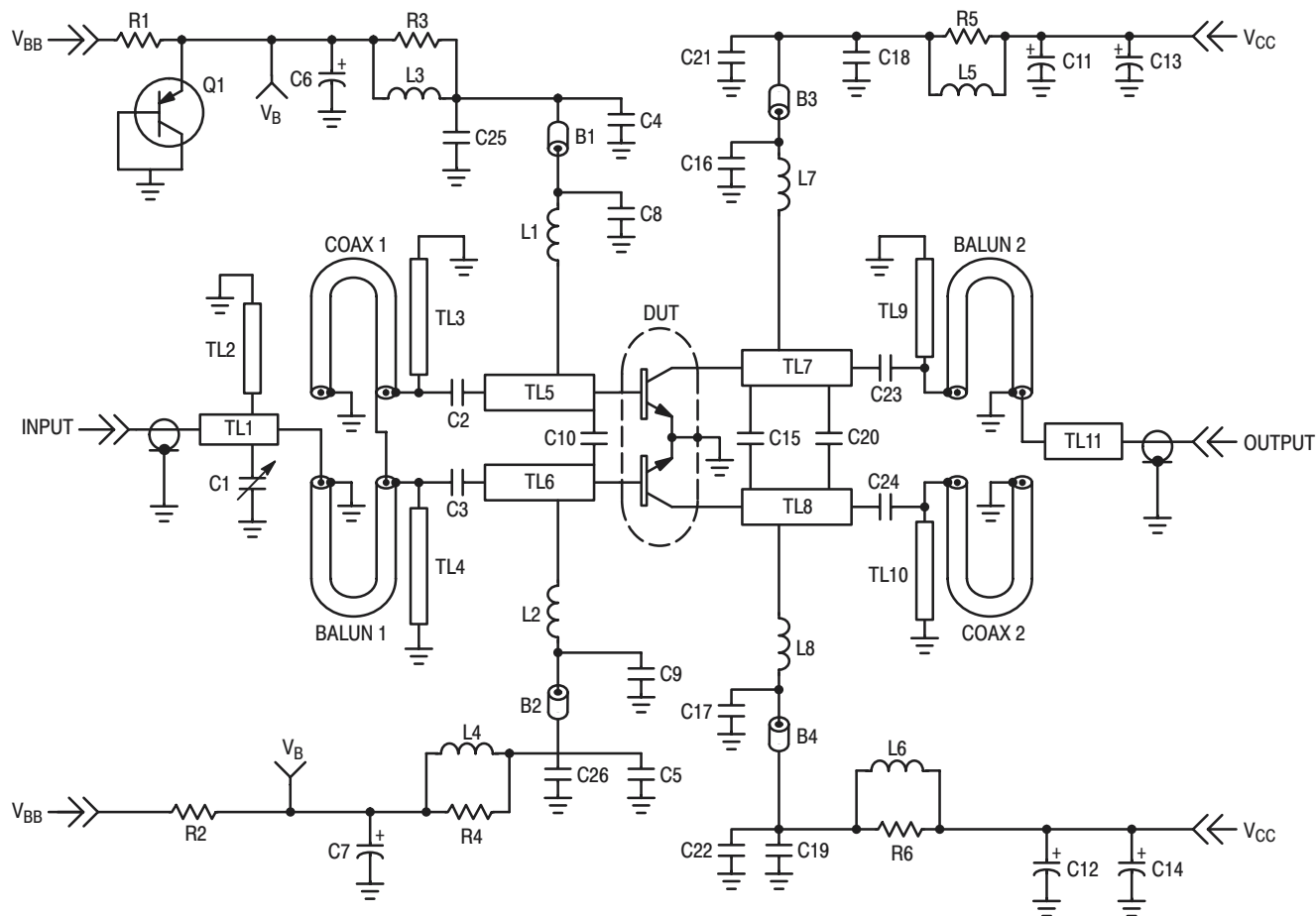
(continued)

**ELECTRICAL CHARACTERISTICS — continued** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>FUNCTIONAL CHARACTERISTICS</b>					
Common-Emitter Amplifier Power Gain ( $V_{CC} = 24\text{ Vdc}$ , $P_{out} = 30\text{ Watts (PEP)}$ , $I_{cq} = 125\text{ mA}$ , $f_1 = 900\text{ MHz}$ , $f_2 = 900.1\text{ MHz}$ )	$G_{pe}$	10.5	12.0	—	dB
Collector Efficiency ( $V_{CC} = 24\text{ Vdc}$ , $P_{out} = 30\text{ Watts (PEP)}$ , $I_{cq} = 125\text{ mA}$ , $f_1 = 900\text{ MHz}$ , $f_2 = 900.1\text{ MHz}$ )	$\eta$	30	38	—	%
Intermodulation Distortion ( $V_{CC} = 24\text{ Vdc}$ , $P_{out} = 30\text{ Watts (PEP)}$ , $I_{cq} = 125\text{ mA}$ , $f_1 = 900\text{ MHz}$ , $f_2 = 900.1\text{ MHz}$ )	IMD	—	-37	-30	dBc
Output Mismatch Stress ( $V_{CC} = 26\text{ Vdc}$ , $P_{out} = 30\text{ Watts (PEP)}$ , $I_{cq} = 125\text{ mA}$ , $f_1 = 900\text{ MHz}$ , $f_2 = 900.1\text{ MHz}$ , Load VSWR = 5:1 (all phase angles))	$\psi$	No Degradation in Output Power			

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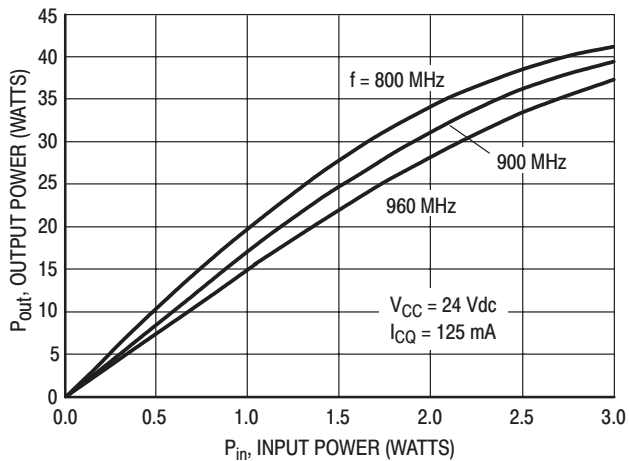
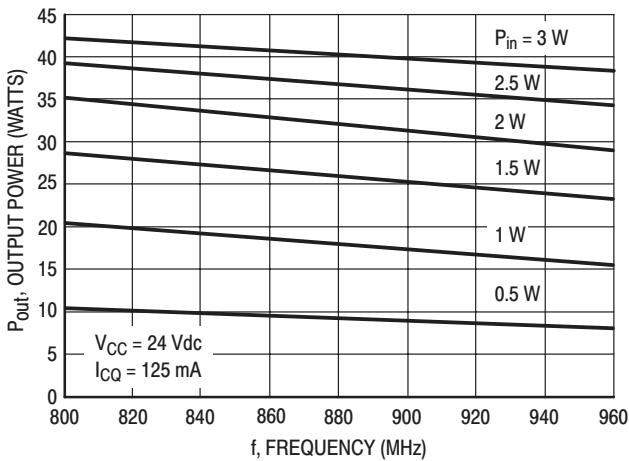
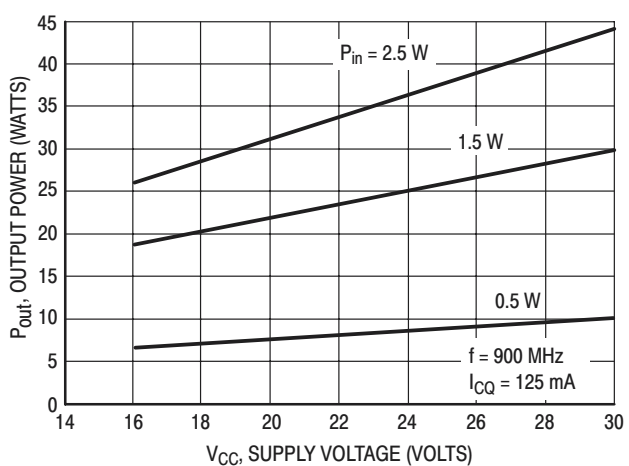
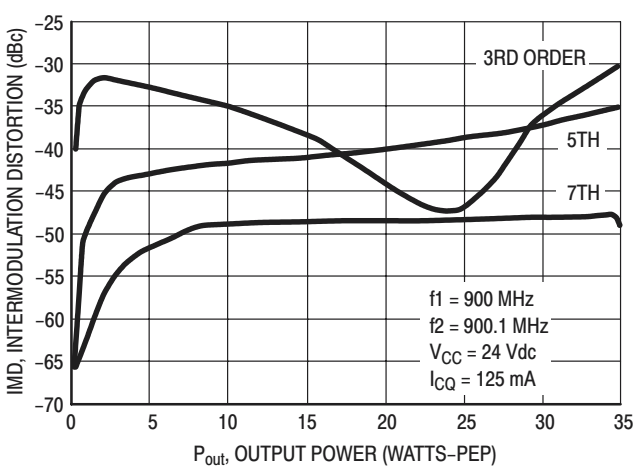
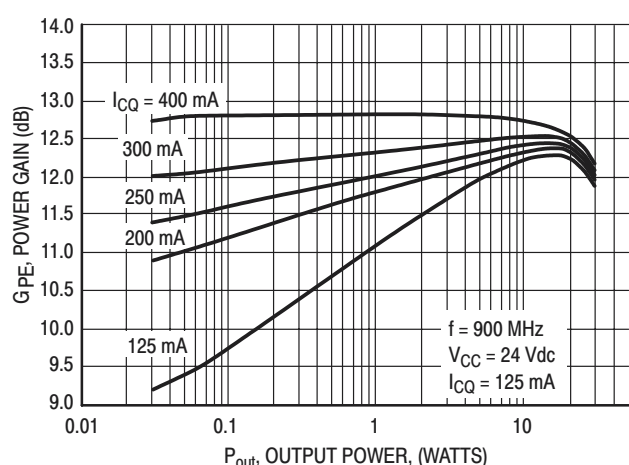
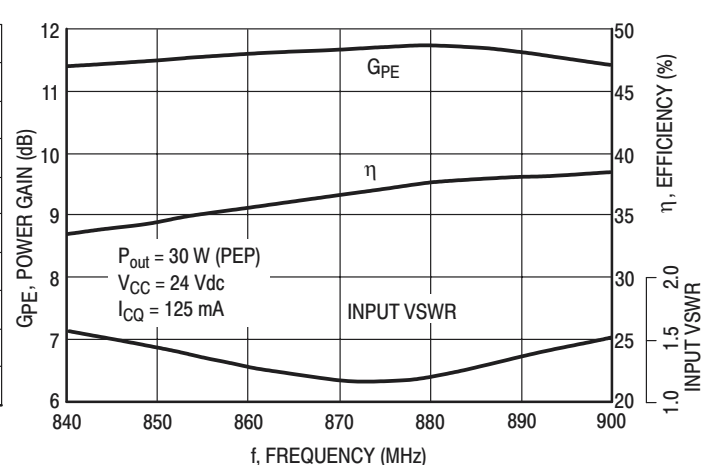
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- B1, B2, B3, B4 — Short Ferrite Bead, Fair Rite #2743019447
- C1 — 0.8–8.0 pF Var Capacitor, Johansen Gigatrim
- C2, C3, C23, C24 — 43 pF, 100 mil, ATC Chip Capacitor
- C4, C5, C21, C22 — 1000 pF, 100 mil, ATC Chip Capacitor
- C6, C7, C11, C12 — 10  $\mu\text{F}$ , Electrolytic Capacitor, Panasonic
- C8, C9, C16, C17 — 100 pF, 100 mil, ATC Chip Capacitor
- C10 — 9.1 pF, 50 mil, ATC Chip Capacitor
- C13 — 250  $\mu\text{F}$  Electrolytic Capacitor, Mallory
- C14, C18, C19, C25 — 0.1  $\mu\text{F}$ , Chip Capacitor, Kemet
- C15 — 1.1 pF, 50 mil, ATC Chip Capacitor
- C20 — 6.8 pF, 100 mil, ATC Chip Capacitor
- L1, L2, L3, L4, L5, L6, L7, L8 — 5 Turns 20 AWG, IDIA 0.126" Choke, Taylor Spring 46 nH

- N1, N2 — Type N Flange Mount, Omni Spectra 3052–1648–10
- Q1 — Bias Transistor BD136 PNP
- R1, R12 — 27 Ohm, 2.0 W
- R3, R4, R5, R6 — 4.0 x 39 Ohm, 1/8 W, Chips Resistors in Parallel, Rohm 390-J
- SB1 — 0.15" x 0.3" x 0.03" Cu
- TL1–TL11 — Microstrip Line, See Photomaster
- Balun1, Balun2, Coax 1, Coax 2 — 2.20" 50 Ohm, 0.086" o.d. semi-rigid coax, Micro Coax UT-85-M17
- Circuit Board — 1/32" Glass Teflon, Arlon GX-0300–55–22,  $\epsilon_r = 2.55$

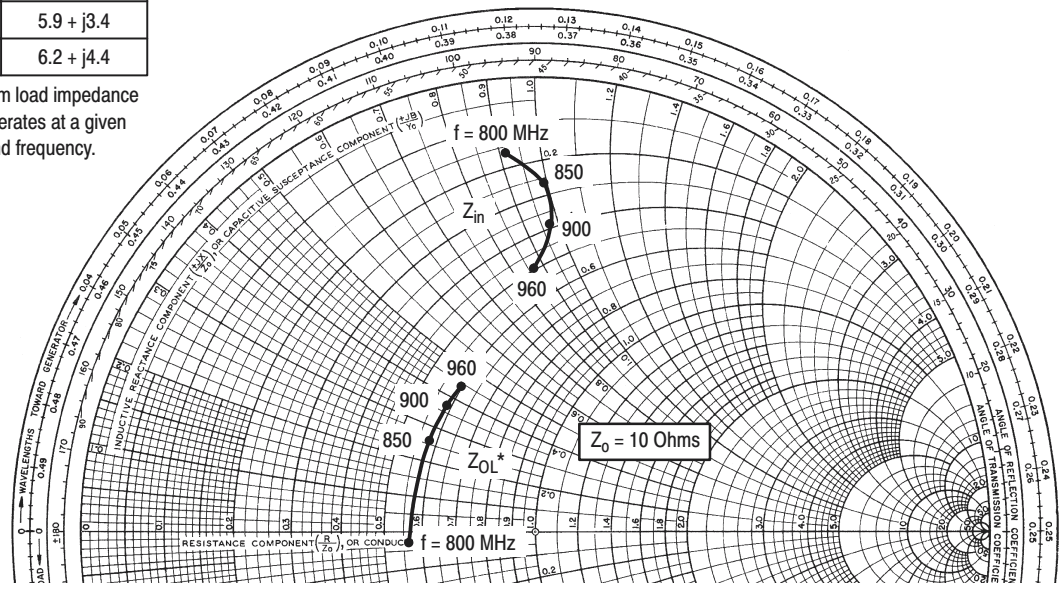
**Figure 1. 840–900 MHz Test Circuit Schematic**


**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**

$P_{out} = 30\text{ W (PEP)}, V_{CC} = 24\text{ V}$

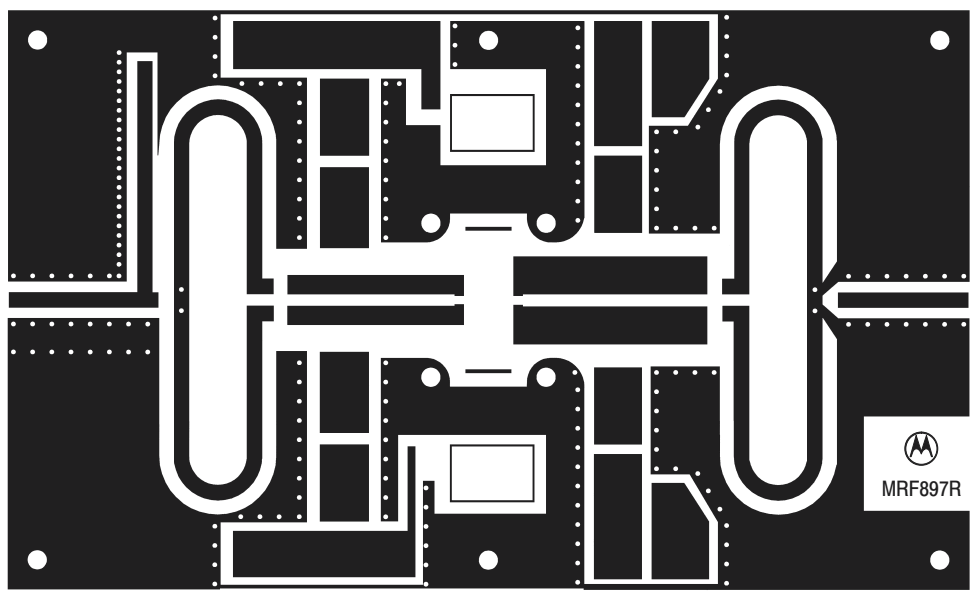
f MHz	$Z_{in}$ Ohms	$Z_{OL}^*$ Ohms
800	$1.7 + j9.2$	$5.9 - j0.4$
850	$2.6 + j10$	$5.7 + j2.6$
900	$4 + j9.9$	$5.9 + j3.4$
950	$5 + j8.8$	$6.2 + j4.4$

$Z_{OL}^*$  = Conjugate of the 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. Series Equivalent Input/Output Impedances



(SCALE: 1:1)

Figure 9. MRF897R Photomaster  
(Reduced 18% in printed data book, DL110/D)

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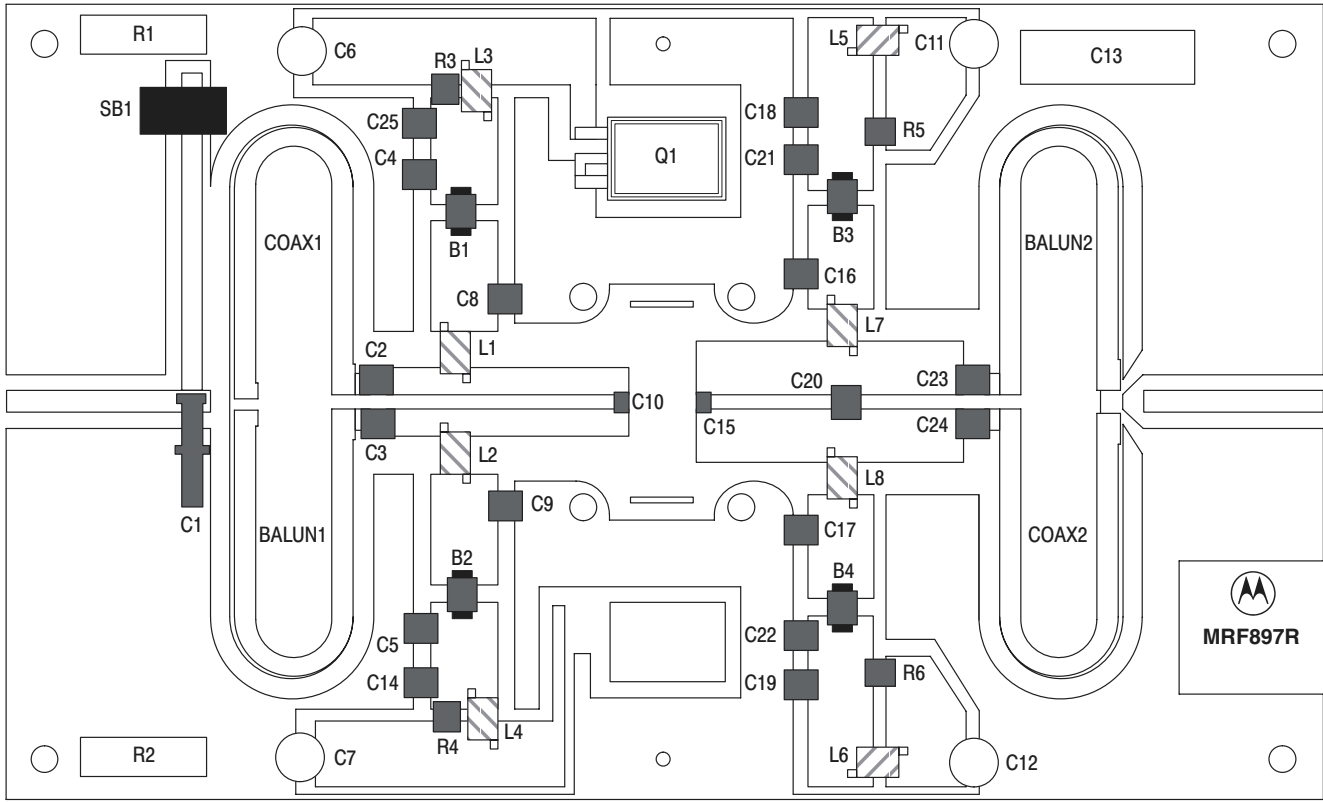


Figure 10. 840–900 MHz Test Circuit Component Layout

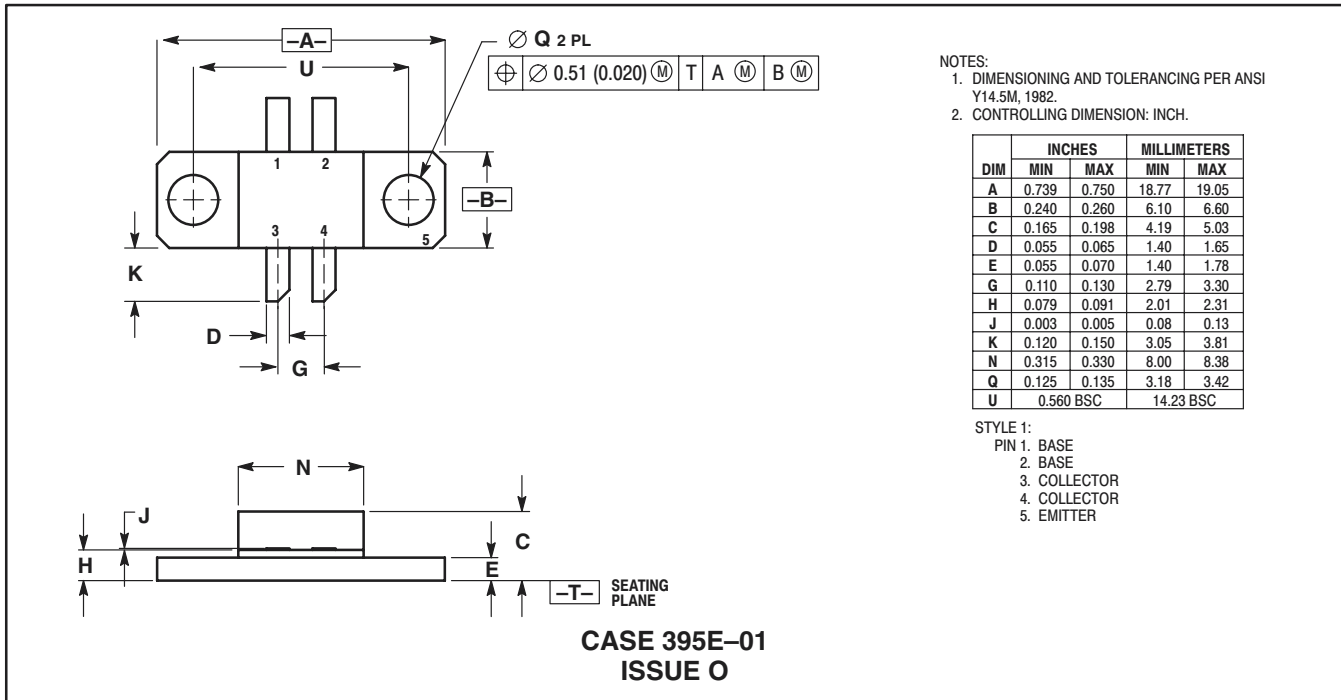


# NOTES



# NOTES

# PACKAGE DIMENSIONS



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