MRF870
MRF870A

MOTOROLA

The RF Line

3.0 W—870 MHz

RF POWER TRANSISTOR

NPN SILICON

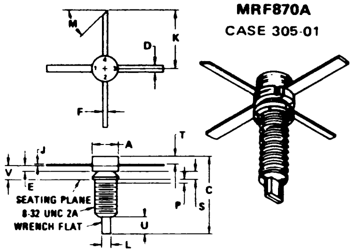
NPN SILICON RF POWER TRANSISTOR

. . . designed for 12.5-volt UHF large-signal, common-emitter amplifier applications in industrial and commercial FM equipment operating in the range of 806–947 MHz.

- Specified 12.5 Volt, 870 MHz Characteristics —
  - Output Power = 3.0 Watts
  - Minimum Gain = 5.0 dB
  - Efficiency = 60% Min
- Load Mismatch Capability at High Line and RF Overdrive
- Series Equivalent Large-Signal Characterization
- Silicon Nitride Passivation
- Gold Metal System

MRF870A

CASE 305-01

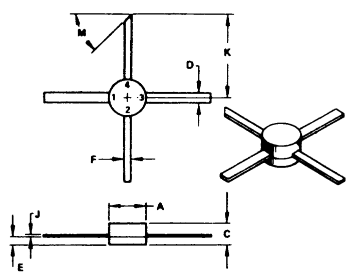


STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	5.08	5.59	0.200	0.220
C	13.97	16.26	0.550	0.640
D	1.40	1.65	0.055	0.065
E	1.02	1.27	0.040	0.050
F	0.64	0.89	0.025	0.035
J	0.08	0.18	0.003	0.007
K	11.05	–	0.435	–
L	1.40	1.65	0.055	0.065
M	45° NOM		45° NOM	
P	–	1.27	–	0.050
S	1.40	1.65	0.055	0.065
T	1.40	1.78	0.055	0.070
U	2.79	3.81	0.110	0.150
V	2.41	2.92	0.095	0.115

MRF870

CASE 305A-01



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

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	5.08	5.59	0.200	0.220
C	2.41	3.30	0.095	0.130
D	1.40	1.65	0.055	0.065
E	1.02	1.27	0.040	0.050
F	0.64	0.89	0.025	0.035
J	0.08	0.18	0.003	0.007
K	11.05	–	0.435	–
M	45° NOM		45° NOM	

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	16	Vdc
Collector-Base Voltage	V_{CBO}	36	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	0.75	Adc
Total Device Dissipation @ T_C = 25°C (1) Derate above 25°C	P_D	10 57	Watts mW/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	17.5	°C/W

(1) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0)	I_{CES}	—	—	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 100 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	10	30	150	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 12.5 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	—	8.0	10	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 3.0 W, f = 870 MHz)	G_{PE}	5.0	5.6	—	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 3.0 W, f = 870 MHz)	η	—	60	—	%
Load Mismatch (V_{CC} = 15.5 Vdc, P_{in} = 1.3 W, f = 870 MHz, VSWR = 20:1 All Phase Angles)	ψ	No Degradation in Output Power			

SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCE
(V_{CC} = 12.5 Vdc, P_{out} = 3.0 W)

f MHz	Z_{in} Ohms	Z_{OL}* Ohms
800	2.1 + j5.3	11.3 − j13.8
850	2.1 + j5.5	14.0 − j12.6
870	2.1 + j5.7	14.2 − j12.2
900	2.1 + j5.9	14.6 − j12.0
950	2.1 + j6.1	14.7 − j11.9

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

4.4

The RF Line
NPN Silicon RF Power Transistor

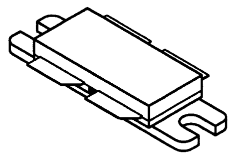
MRF880

Motorola Preferred Device

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

Designed for 26 V 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 V, 900 MHz Characteristics
  Output Power = 90 Watts
  Gain = 8.5 dB Min. @ 900 MHz, class AB
  Efficiency = 35% Min. @ 900 MHz, 90 Watts (PEP)
  Intermodulation Distortion –29 dBc Max. @ 90 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



CASE 375A, STYLE 1

2

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	15	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	140 0.80	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C
Operating Junction Temperature	T_J	200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.25	°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 = 50 mAdc, I_B = 0)	$V_{(BR)CEO}$	28	33	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	60	75	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	4.5	—	Vdc
Collector Cutoff Current (V_{CE} = 30 Vdc, V_{BE} = 0)	I_{CES}	—	—	10.0	mAdc

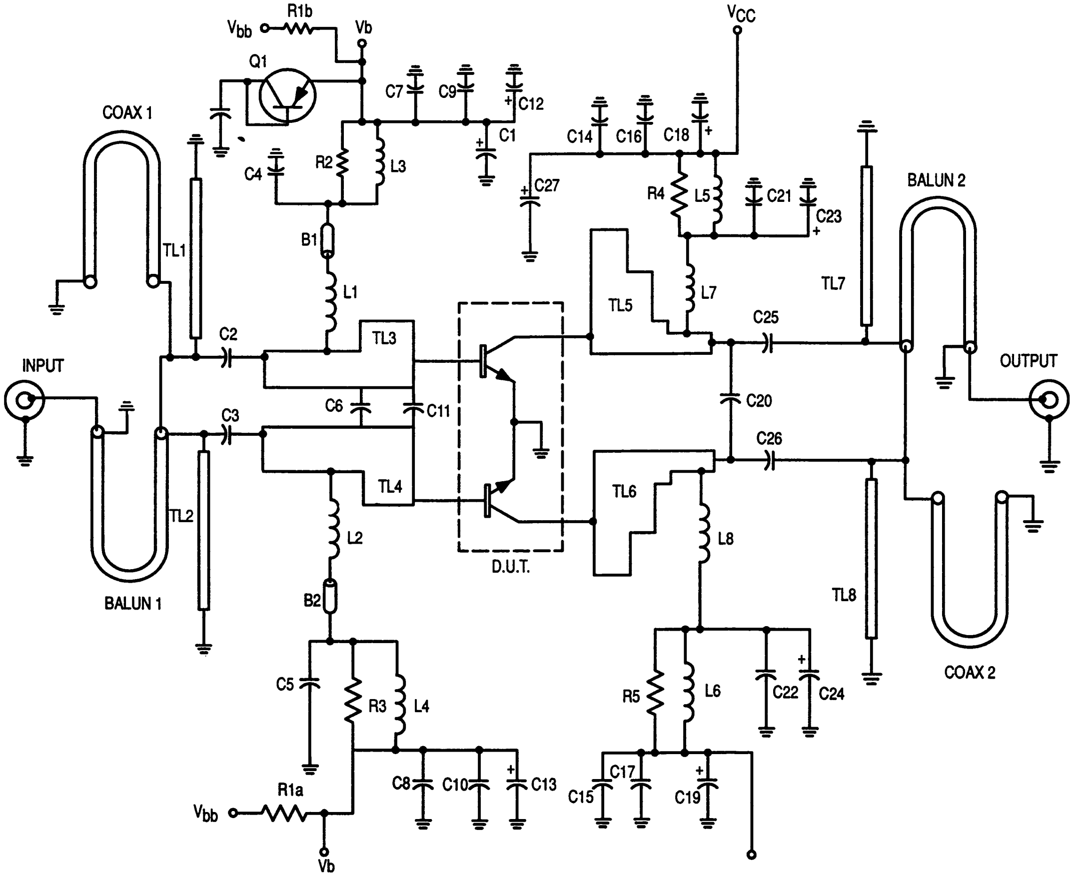
(continued)

Preferred devices are Motorola recommended choices for future use and best overall value.

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_{CE} = 1.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	30	60	120	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 24 Vdc, I_E = 0, f = 1.0 MHz) — for information only. This part is collector matched.	C_{ob}	—	45	—	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 26 Vdc, P_{out} = 90 Watts (PEP), I_{CQ} = 250 mA, f_1 = 900 MHz, f_2 = 900.1 MHz)	G_{pe}	8.5	9.5	—	dB
Collector Efficiency (V_{CC} = 26 Vdc, P_{out} = 90 Watts (PEP), I_{CQ} = 250 mA, f_1 = 900 MHz, f_2 = 900.1 MHz)	η_C	35	42	—	%
Intermodulation Distortion (V_{CC} = 26 Vdc, P_{out} = 90 Watts (PEP), I_{CQ} = 250 mA, f_1 = 900 MHz, f_2 = 900.1 MHz)	IMD	—	−32	−29	dBc
Output Mismatch Stress (V_{CC} = 26 Vdc, P_{out} = 90 Watts (PEP), I_{CQ} = 250 mA, f_1 = 900 MHz, f_2 = 900.1 MHz Load VSWR = 5:1, All phase angles at frequency of test)	ψ	No Degradation in Output Power Before and After Test			

2



B1, B2 — Ferrite Bead
C1 — 200 μF Cap, 50 Vdc Min
C2, C3, C25, C26 — 43 pF Chip Cap, 100 Mil
C4, C5, C21, C22 — 100 pF Chip Cap, 100 Mil
C6 — 3.3 pF Chip Cap, 100 Mil
C7, C8, C14, C15 — 1000 pF Chip Cap, 100 Mil
C9, C10, C16, C17 — 1800 pF Chip Cap, 100 Mil
C11 — 7.5 pF Chip Cap, 50 Mil
C12, C13, C18, C19, C23, C24 — 10 μF Cap, 50 Vdc
C20 — 1.8 pF Chip Cap
C27 — 500 μF Cap, 50 Vdc Min
L1, L2, L7, L8 — 4T No. 20 AWG, 0.163″ ID CW
L3, L4, L5, L6 — 12T No. 22 AWG, 0.140″ ID CW
Q1 — BD166
R1a, R1b — 56 Ohm, 1 W Resistor
R2, R3, R4, R5 — 4 x 39 Ohm, 1/8 W Chip Resistor
TL1-8 — On PCB Mask
Balun 1,2 Coax 1,2 — 2.20″ 50 Ohm Semi-Rigid Coax, 0.088″ OD
PCB — 0.030″, Teflon®-Fiberglass, $\epsilon_r = 2.55$
Wear Blocks — 0.330″ x 0.170″ x 0.50″ Beryllium Copper

Figure 1. Broadband Test Circuit

2

TYPICAL CHARACTERISTICS

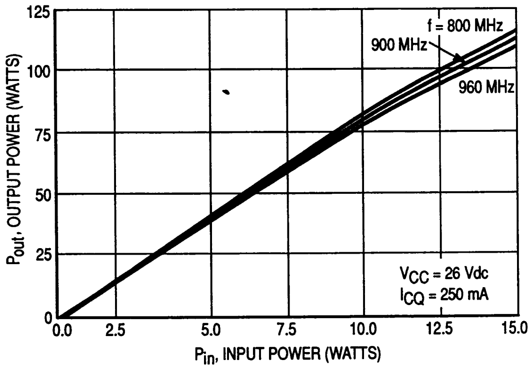


Figure 2. Output Power versus Input Power

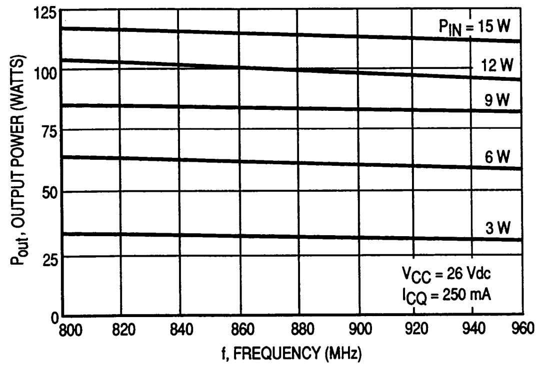


Figure 3. Output Power versus Frequency

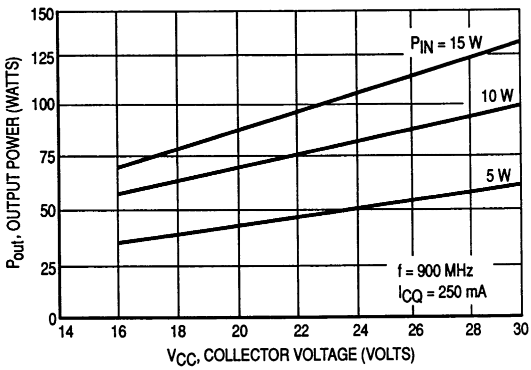


Figure 4. Output Power versus Supply Voltage

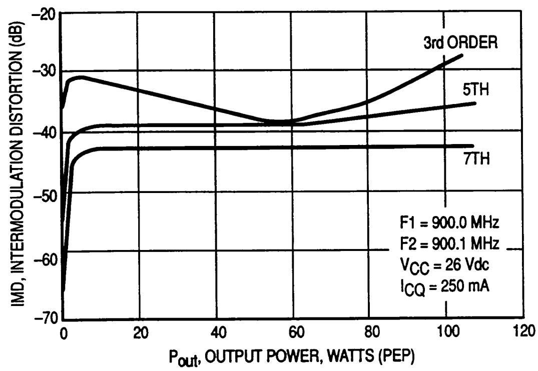
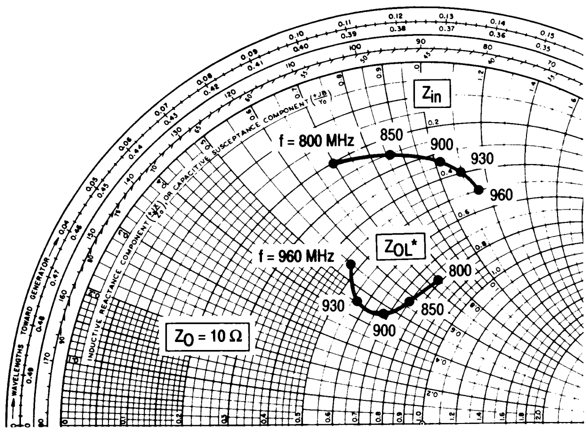


Figure 5. Intermodulation Distortion versus Output Power



P_o = 90 W, V_{CC} = 26 V

f (MHz)	Z_{in} ohms	Z_{OL}* ohms
800	2.00 + j6.90	7.68 + j7.33
850	2.45 + j8.60	7.38 + j5.86
900	3.30 + j10.1	6.93 + j4.53
930	3.90 + j10.9	5.89 + j4.42
960	5.00 + j11.5	4.58 + j5.57

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

Figure 6. Series Equivalent Input/Output Impedances

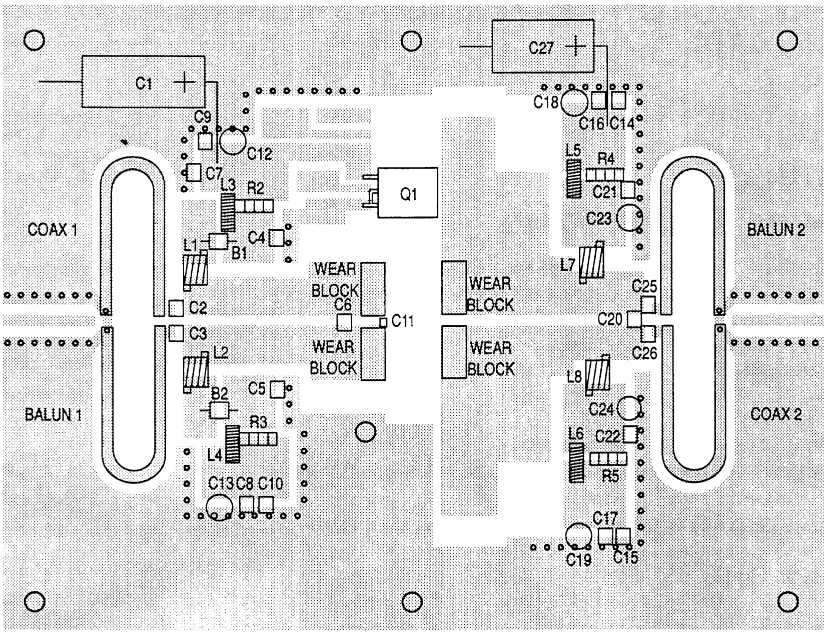
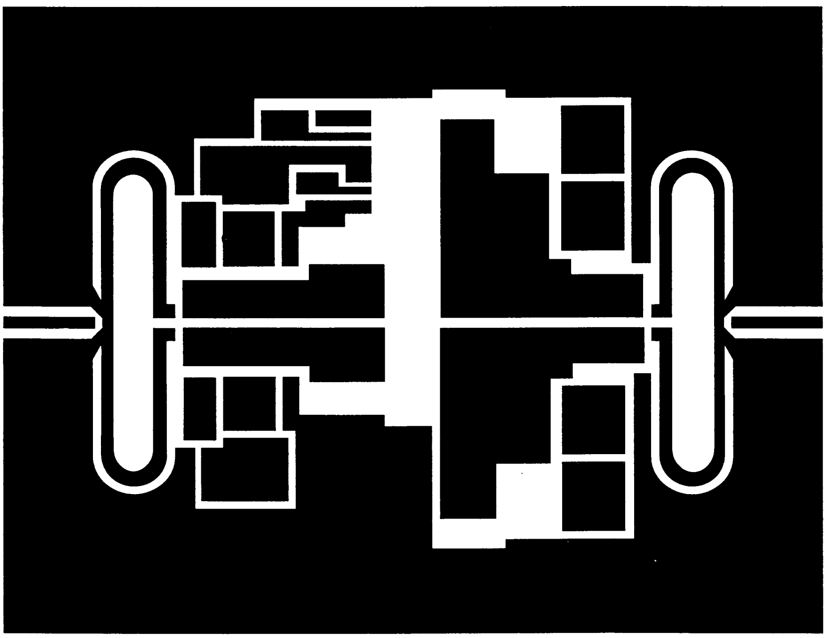


Figure 7. Fixture Component Layout



(Not to Scale)

Figure 8. Photomaster for Test Circuit

MRF896
MRF896S

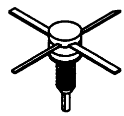
Motorola Preferred Devices

The RF Line
NPN Silicon
RF Power Transistors

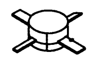
3.0 W, 900 MHz
RF POWER
TRANSISTORS
NPN SILICON

Designed for 24 Volt UHF large-signal, common emitter, Class AB and Class A linear amplifier applications in industrial and commercial FM/AM equipment operating in the range 800–960 MHz.

- Specified 24 Volt, I_{cq} = 8.0 mA (Class AB), 900 MHz Characteristics
  Output Power = 3.0 Watts
  Minimum Gain = 10 dB @ 900 MHz
  Minimum Efficiency = 30% @ 900 MHz, 3.0 Watts
  Maximum Intermodulation Distortion –30 dBc @ 3.0 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, at rated output power
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration



CASE 305, STYLE 1
MRF896



CASE 305D, STYLE 1
MRF896S

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	30	Vdc
Collector-Emitter Voltage	V_{CES}	55	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	0.45	Adc
Total Device Dissipation @ T_C = 50°C Derate Above 50°C	P_D	17 0.143	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	7.0	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise stated)

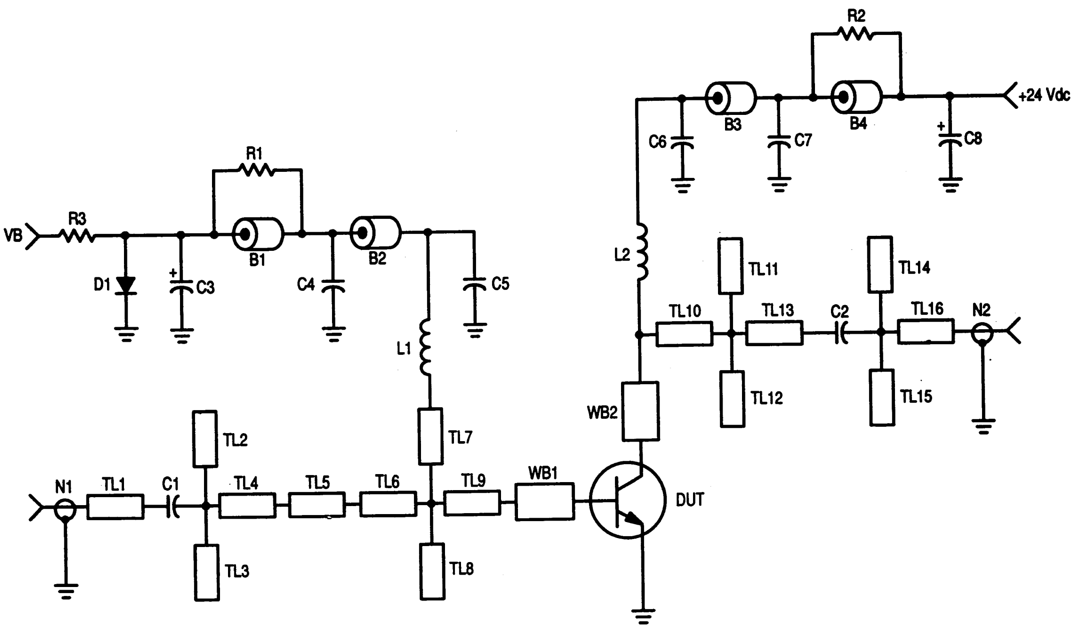
Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 20 mAdc, I_B = 0)	$V_{(BR)CEO}$	30	37	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 20 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	55	92	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 1.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	5.0	—	Vdc
Collector Cutoff Current (V_{CE} = 30 Vdc, V_{BE} = 0)	I_{CES}	—	1.0 nA	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_E = 100 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	30	60	120	—

(continued)

Preferred devices are Motorola recommended choices for future use and best overall value.

ELECTRICAL CHARACTERISTICS — continued (T_C = 25°C unless otherwise stated)

Characteristic	Symbol	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 24 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	2.4	3.3	4.4	pF
FUNCTIONAL TESTS (In Motorola Test Fixture. See Figure 1.)					
Common-Emitter Amplifier Power Gain (V_{CC} = 24 Vdc, P_{out} = 3.0 Watts, I_{cq} = 8.0 mA, f = 900 MHz)	G_{pe}	10	12	—	dB
Collector Efficiency (V_{CC} = 24 Vdc, P_{out} = 3.0 Watts, I_{cq} = 8.0 mA, f = 900 MHz)	η_c	30	45	—	%
3rd Order Intermodulation Distortion (V_{CC} = 24 Vdc, P_{out} = 3.0 Watts (PEP), I_{cq} = 8.0 mA, f_1 = 900 MHz, F_2 = 900.1 MHz)	IMD	—	−37	−30	dBc
Output Mismatch Stress (V_{CC} = 26 Vdc, P_{out} = 3.0 Watts, I_{cq} = 8.0 mA, f = 900 MHz, Load VSWR = 5:1, all phase angles)	ψ	No Degradation in Output Power Before and After Test			



B1, B4 — Long Bead, Fair Rite (2743019446)
B2, B3 — Short Bead, Fair Rite (2743021446)
C1, C2 — 43 pF, 100 Mil Chip Capacitor, ATC (100B430JCA500X)
C3, C8 — 10 µF, 50 V Electrolytic, Panasonic (ECEV1HV100R)
C4, C7 — 820 pF, Surface Mount, Kemit (C1206N821J1GSC)
C5, C6 — 100 pF Chip Cap, Murata Erie (GRH710COG101J100VBE)
D1 — Diode 1N4001, Motorola
L1, L2 — 7 Turns, 24 AWG, IDIA 0.116″

N1, N2 — Type N Flange, Omni Spectra (3052-1648-10)
R1, R2 — 4 x 39 Ohm, 1/8 W chips in parallel, Rohm (390-J)
R3 — 82 Ohm, 1.0 W
TL1 — Z_o = 50 Ohm
TL2–TL15 — See Photomaster
TL16 — Z_o = 50 Ohm
WB1 — Wear Block .200″ x .005″ BeCu
WB2 — Wear Block .200″ x .060″ x .005″ BeCu
Board — 30 mil Glass Teflon, ε_r = 2.55, Keene (GX-0300-55-22)

Figure 1. 840–960 MHz Broadband Test Circuit

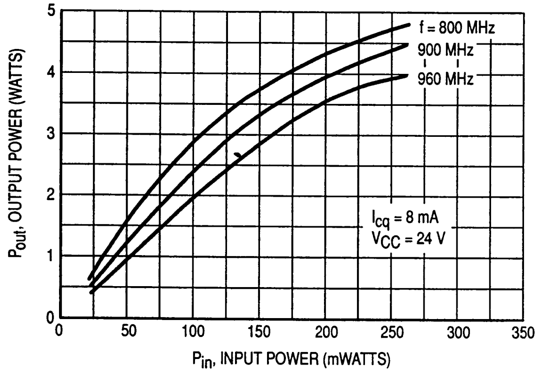


Figure 2. Output Power versus Input Power

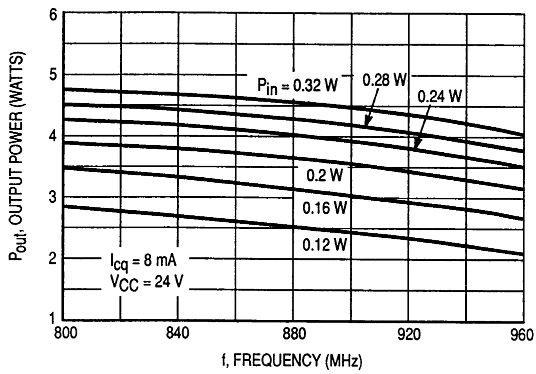


Figure 3. Output Power versus Frequency

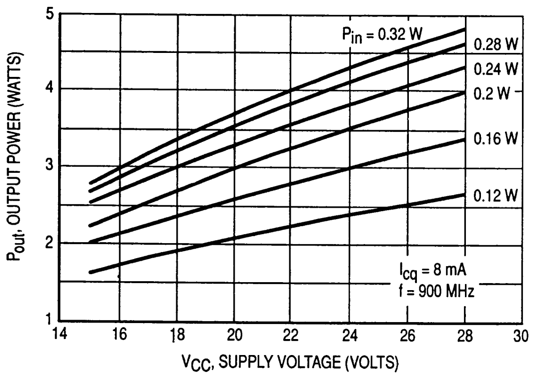


Figure 4. Output Power versus Supply Voltage

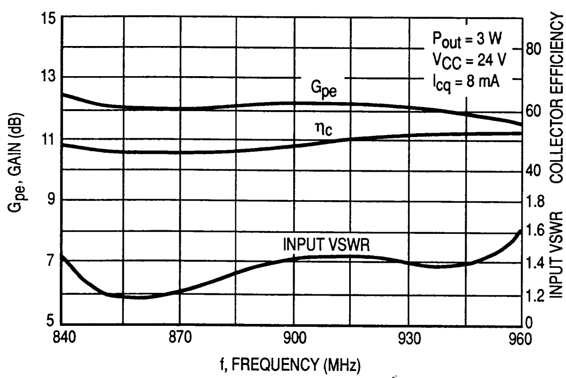


Figure 5. Performance in Broadband Test Fixture

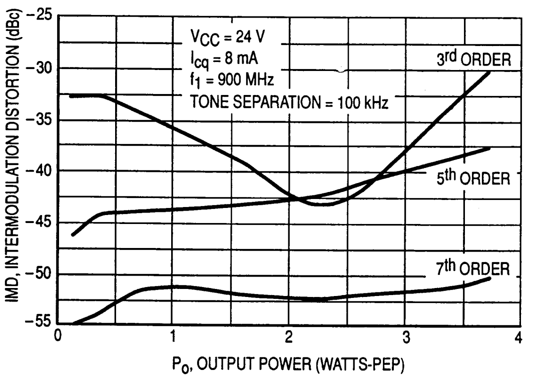


Figure 6. Intermodulation versus Output Power

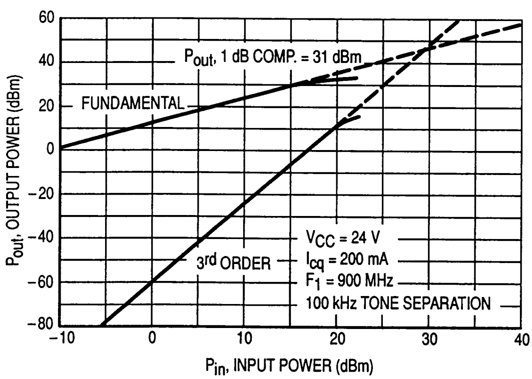
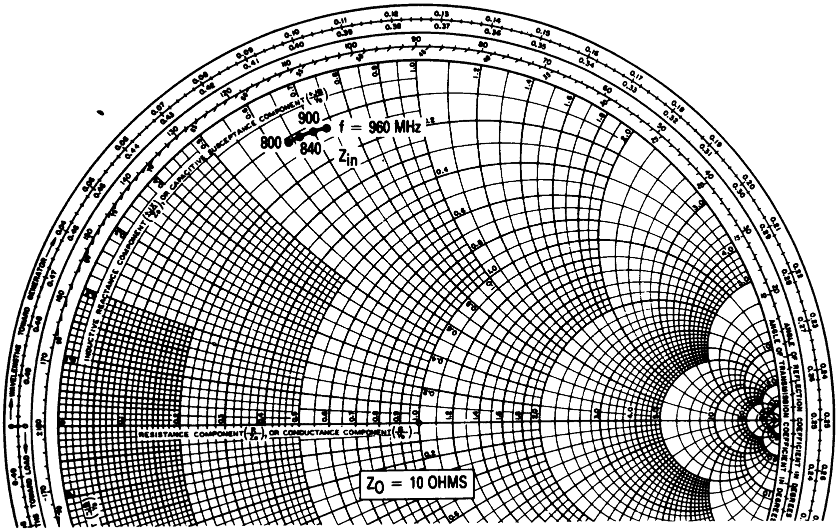
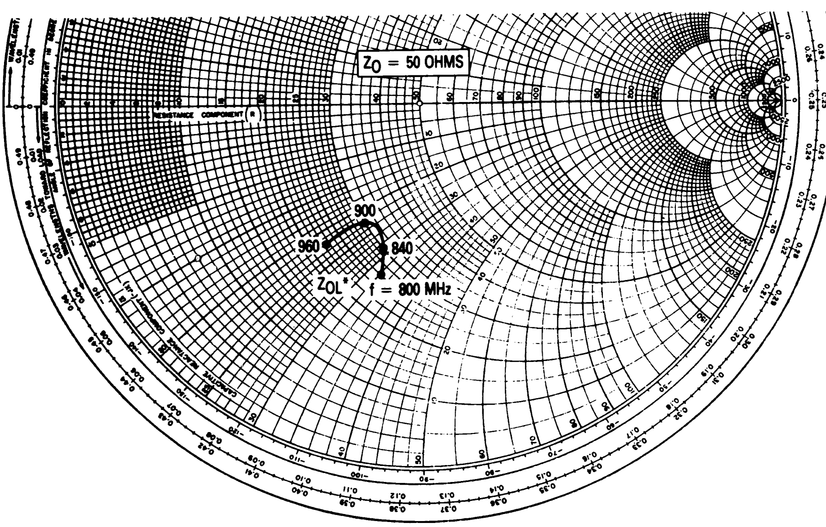


Figure 7. Class A — Third Order Intercept



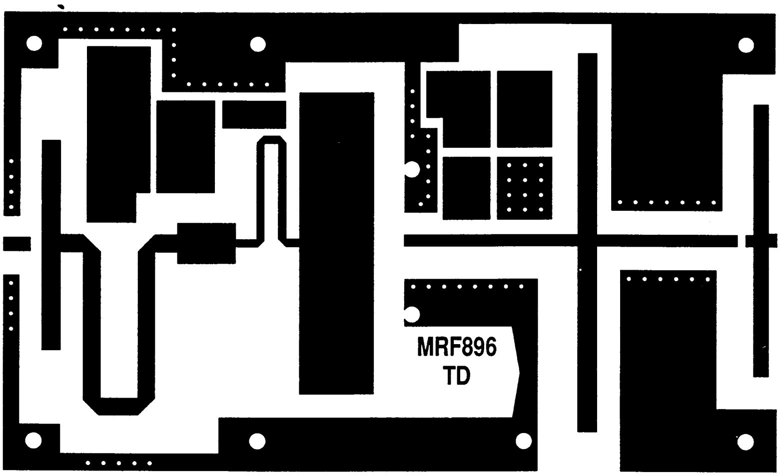
f (MHz)	Z_{in} ohms	Z_{OL} ohms
800	1.1 + j6.4	26.4 − j32.7
840	1.2 + j6.6	30.3 − j28.9
900	1.2 + j7.0	30.1 − j23.4
960	1.3 + j7.3	22.1 − j22.5



Z_{OL}* = CONJUGATE OF OPTIMUM LOAD IMPEDANCE INTO WHICH THE DEVICE OPERATES AT A GIVEN OUTPUT POWER, VOLTAGE AND FREQUENCY.

P_o = 3 W, V_{CC} = 24 V, I_{CQ} = 8 mA

Figure 8. Series Equivalent Input/Output Impedances



SCALE 0.75:1

Figure 9. Photomaster for Broadband Test Circuit

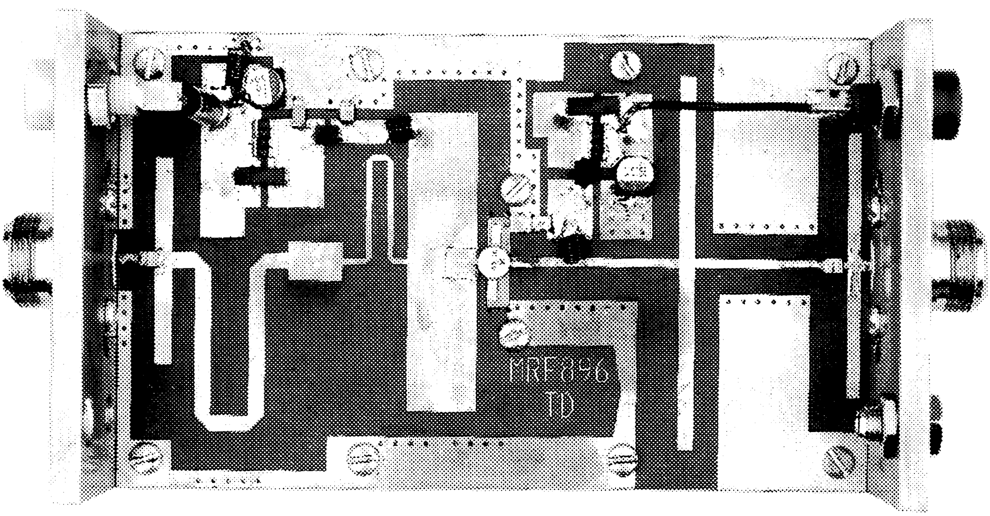


Figure 10. Broadband Test Circuit

2

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

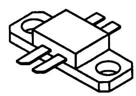
MRF897

The RF Line
NPN Silicon RF Power Transistor

30 W, 900 MHz
RF POWER
TRANSISTOR
NPN SILICON

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 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



CASE 395B-01, STYLE 1

2

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°C Derate above 25°C	P_D	105 0.60	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

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

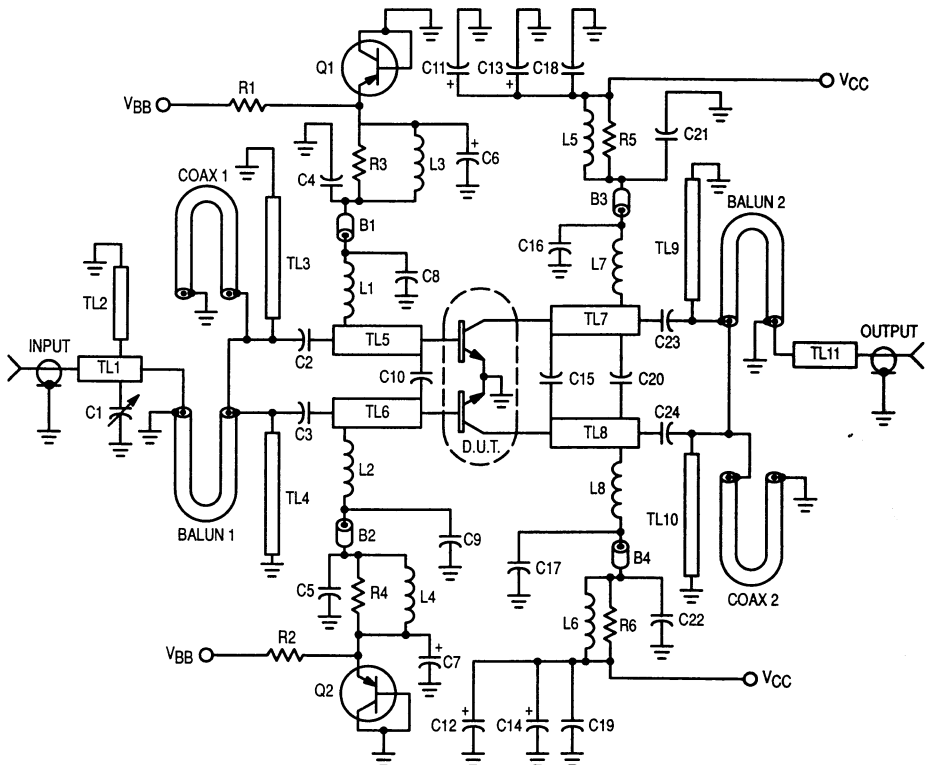
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, I_B = 0)	$V_{(BR)CEO}$	30	33	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	60	80	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 5 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	4.7	—	Vdc
Collector Cutoff Current (V_{CE} = 30 Vdc, V_{BE} = 0)	I_{CES}	—	—	10.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_{CE} = 1.0 Adc, V_{CE} = 5 Vdc)	h_{FE}	30	80	120	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 24 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	14	21	28	pF

(continued)

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

Characteristic	Symbol	Min	Typ	Max	Unit
FUNCTIONAL CHARACTERISTICS					
Common-Emitter Amplifier Power Gain (V_{CC} = 24 Vdc, P_{out} = 30 Watts (PEP), I_{cq} = 125 mA, f_1 = 900 MHz, f_2 = 900.1 MHz)	G_{pe}	10.0	12.0	—	dB
Collector Efficiency (V_{CC} = 24 Vdc, P_{out} = 30 Watts (PEP), I_{cq} = 125 mA, f_1 = 900 MHz, f_2 = 900.1 MHz)	η	35	38	—	%
Intermodulation Distortion (V_{CC} = 24 Vdc, P_{out} = 30 Watts (PEP), I_{cq} = 125 mA, f_1 = 900 MHz, f_2 = 900.1 MHz)	IMD	—	–37	–30	dBc
Output Mismatch Stress (V_{CC} = 26 Vdc, P_{out} = 30 Watts (PEP), I_{cq} = 125 mA, f_1 = 900 MHz, f_2 = 900.1 MHz, Load VSWR = 5:1 (all phase angles))	ψ	No Degradation in Output Power Before and After Test			



B1, B2, B3, B4 — Ferrite Bead, Fair Rite #2743019447
C1 — 0.8–8.0 pF Trimmer Capacitor, Johanson
C2, C3, C23, C24 — 43 pF, 100 mil, ATC Chip Capacitor
C4, C5, C18, C19, C21, C22 — 820 pF, 100 mil, Chip Capacitor, Kemet
C6, C7, C11, C12 — 10 µF, Lytic Capacitor, Panasonic
C8, C9, C16, C17 — 100 pF, 100 mil, Chip Capacitor, Murata Erie
C10 — 13 pF, 50 mil, ATC Chip Capacitor
C13, C14 — 250 µF Lytic Capacitor, Mallory
C15 — 1.1 pF, 50 mil, ATC Chip Capacitor
C20 — 6.8 pF, 100 mil, ATC Chip Capacitor
L1, L2, L3, L4, L5, L6 — 5 Turns 20 AWG, IDIA 0.126″ choke
N1, N2 — Type N Flange Mount, Omni Spectra 3052-1648-10
Q1 — Bias Transistor BD136 PNP
R1, R12 — 39 Ohm, 2.0 W
R3, R4, R5, R6 — 4.0 x 39 Ohm, 1/8 W, Chips in Parallel, Rohm 390-J
TL1–TL11 — See Photomaster
Balun1, Balun2, Coax 1, Coax 2 — 2.20″ 50 Ohm, 0.088″ o.d. semi-rigid coax, Micro Coax UT-85-M17
Board — 1/32″ Glass Teflon, Arlon GX-0300-55-22, ε_r = 2.55

Figure 1. MRF897 Broadband Test Circuit

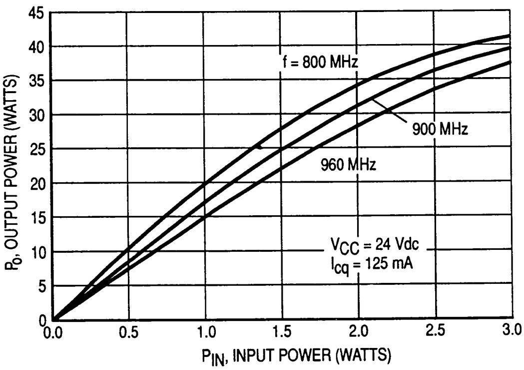


Figure 2. Output Power versus Input Power

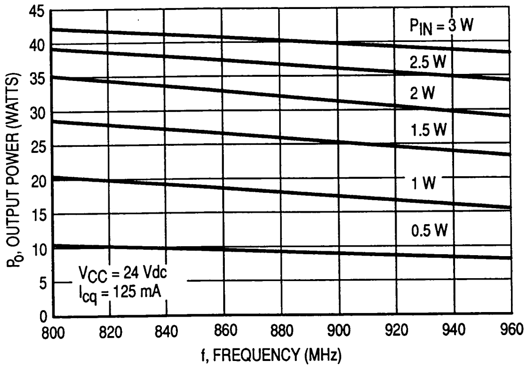


Figure 3. Output Power versus Frequency

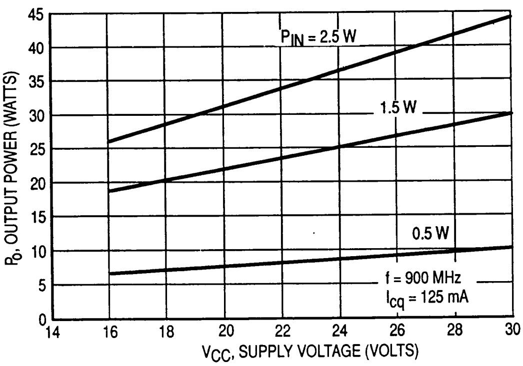


Figure 4. Output Power versus Supply Voltage

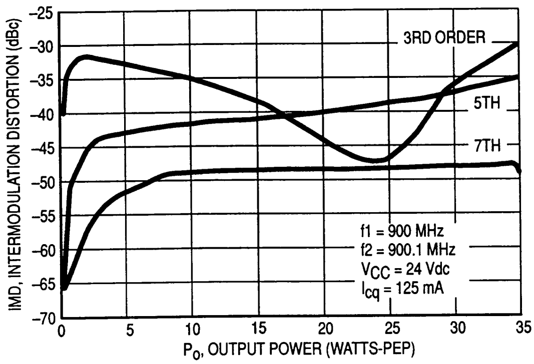


Figure 5. Intermodulation versus Output Power

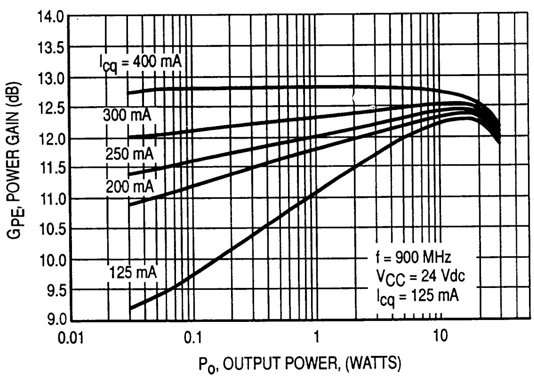


Figure 6. Power Gain versus Output Power

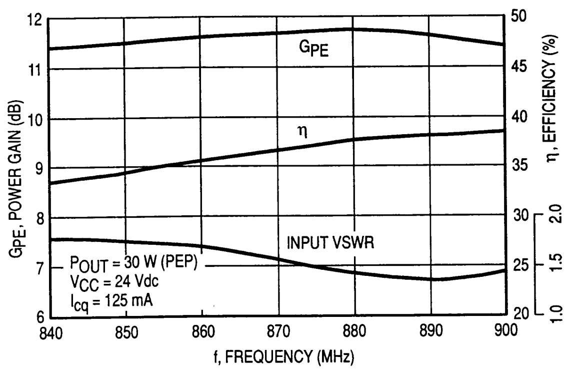


Figure 7. Broadband Test Fixture Performance

f (MHz)	Z_{in} ohms	Z^*_{OL} ohms
800	1.0 + j10.3	5.9 – j0.4
850	1.5 + j10.5	5.7 + j2.6
900	1.8 + j11.0	5.9 + j3.4
960	2.2 + j11.4	6.2 + j4.4

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

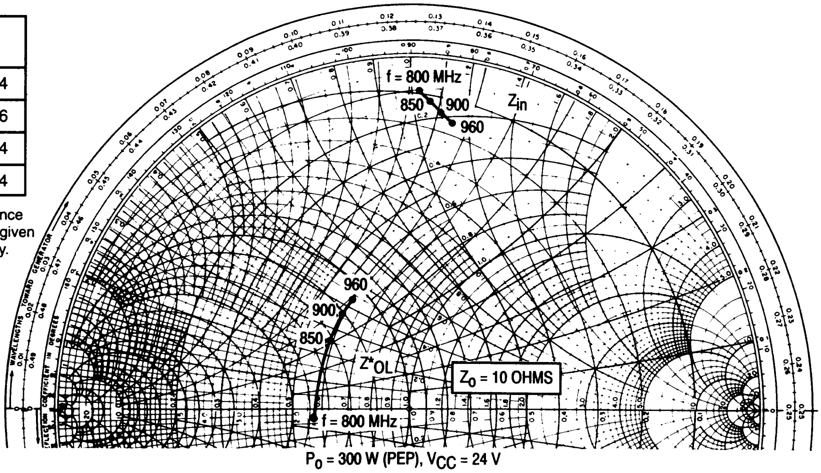


Figure 8. Series Equivalent Input/Output Impedances

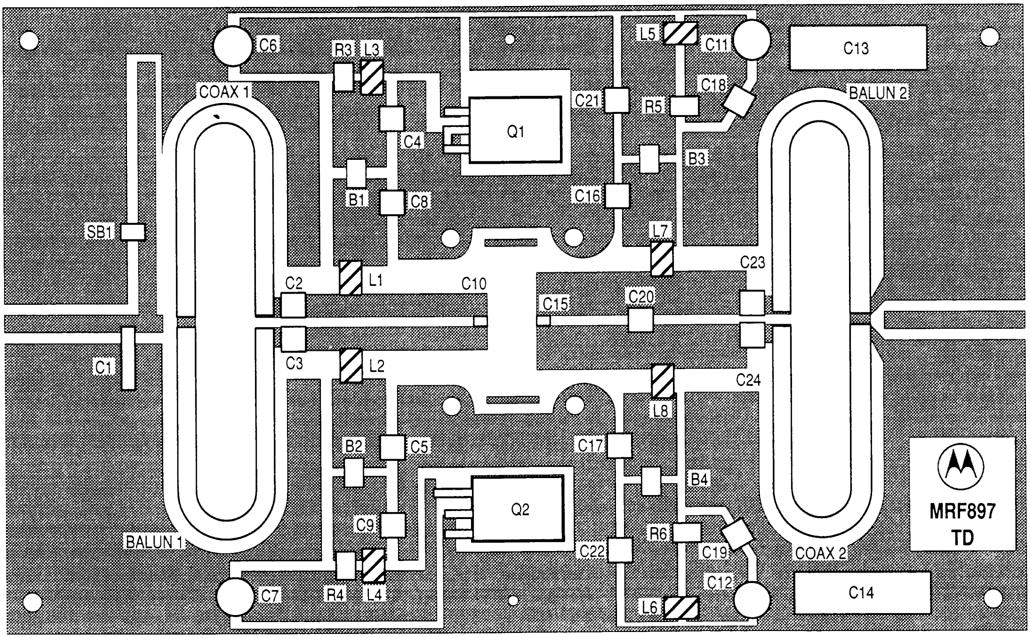
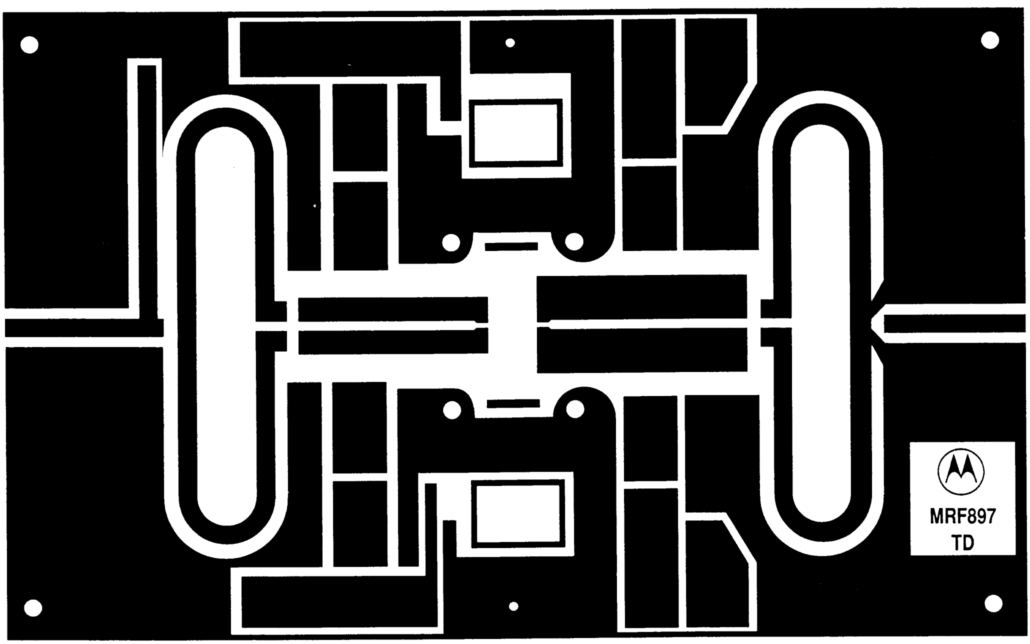


Figure 9. MRF897 Broadband Test Fixture

2



(Not to Scale)

Figure 10. Photomaster for MRF897 Test Fixture

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

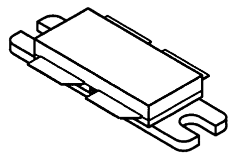
MRF899

The RF Line
NPN Silicon RF Power Transistor

150 W, 900 MHz
RF POWER
TRANSISTOR
NPN SILICON

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



CASE 375A, STYLE 1

2

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 Derate above 25°C	P_D	230 1.33	Watts 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.)

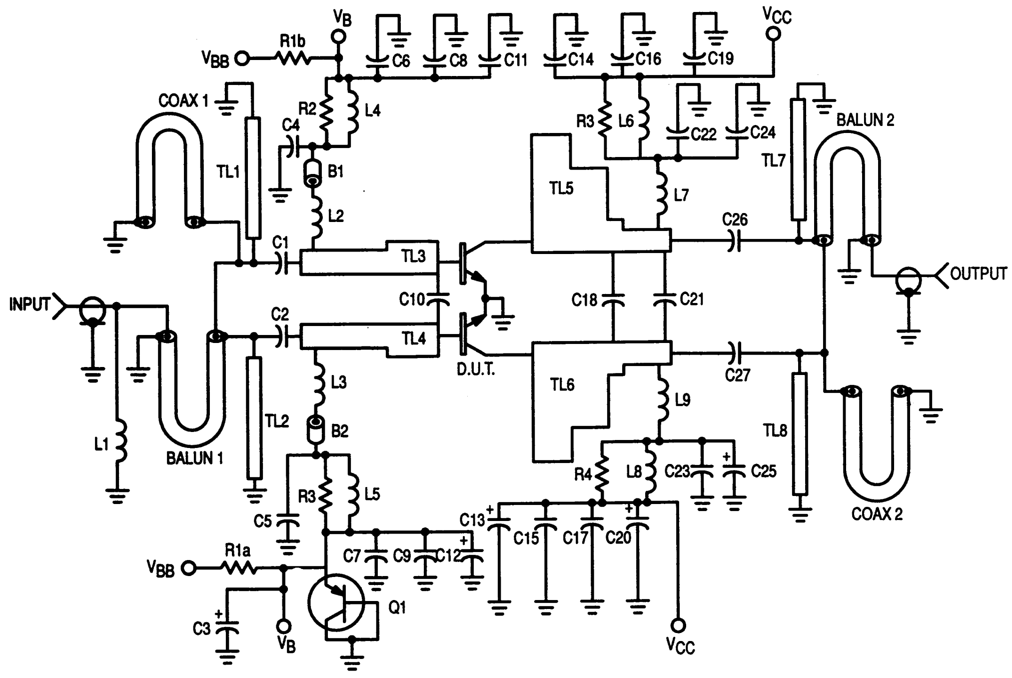
Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 100 mAdc, I_B = 0)	$V_{(BR)CEO}$	28	37	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	60	85	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 mAdc, I_C = 0)	$V_{(BR)EBO}$	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 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 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 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 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, ε_r = 2.55″ Arlon (GX-0300-55-22)

Figure 1. 900 MHz Power Gain Test Circuit

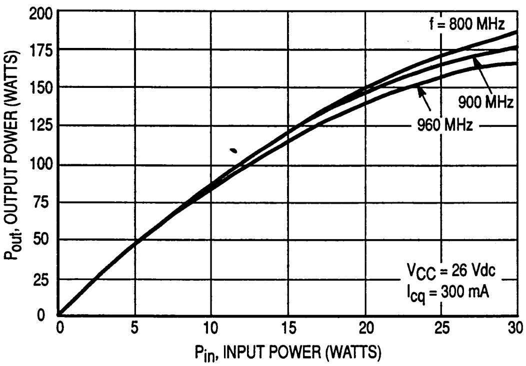


Figure 2. Output Power versus Input Power

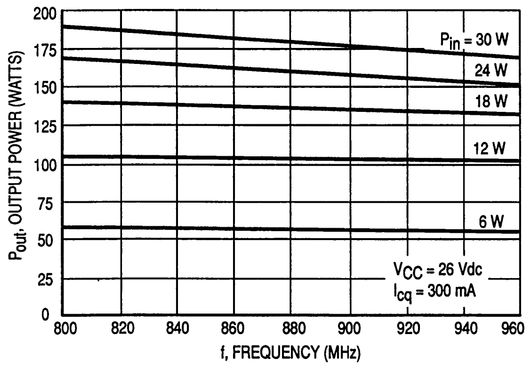


Figure 3. Output Power versus Frequency

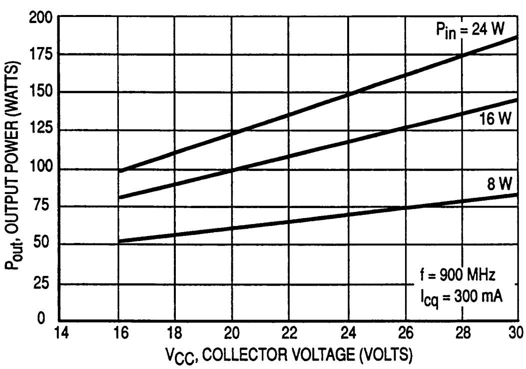


Figure 4. Output Power versus Supply Voltage

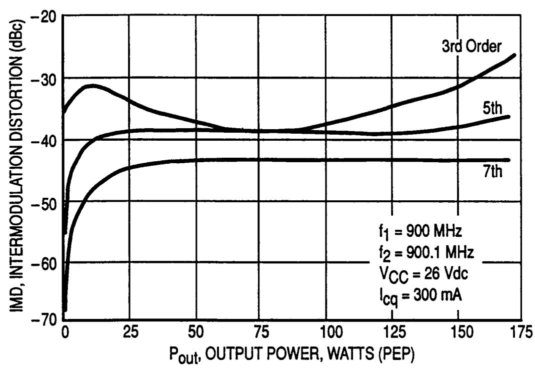


Figure 5. Intermodulation versus Output Power

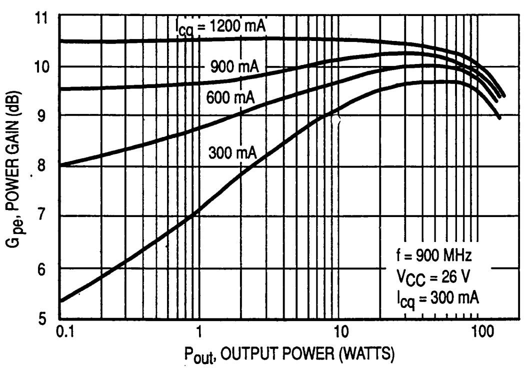


Figure 6. Power Gain versus Output Power

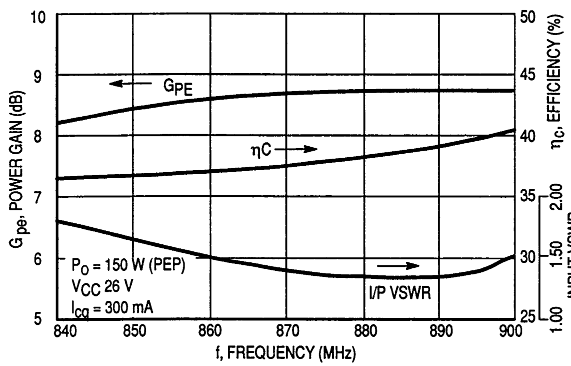
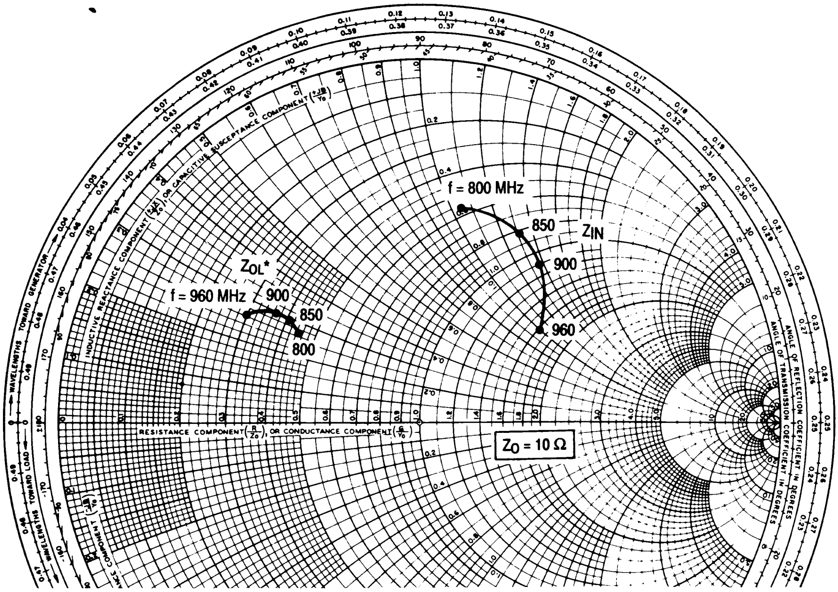


Figure 7. Broadband Test Fixture Performance



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.

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

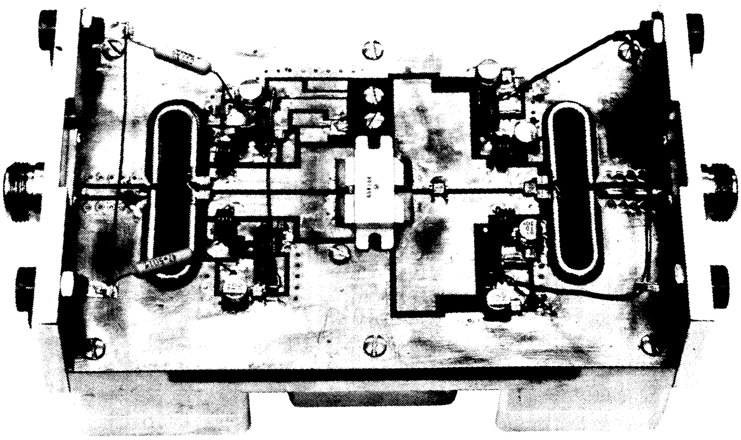
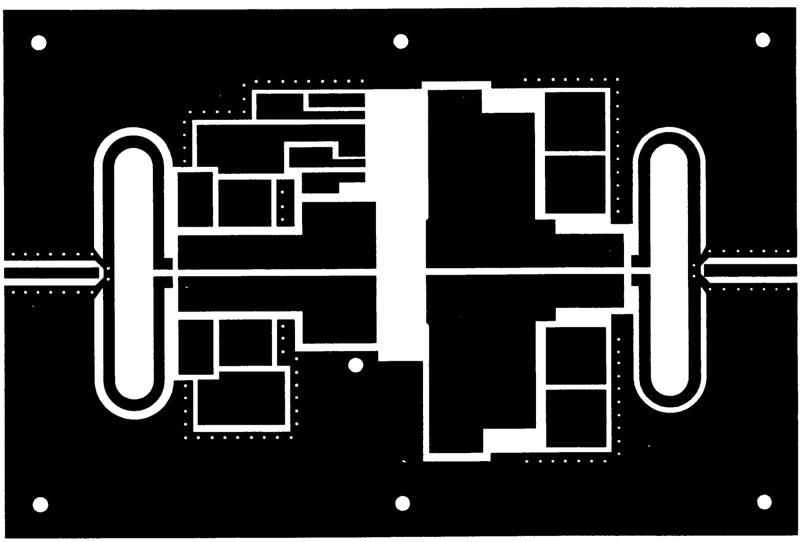


Figure 9. Photo of 900 MHz Test Circuit



(Not to Scale)

Figure 10. MRF899 Test Circuit Photomaster