MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

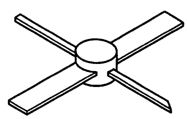
MRF6401

The RF Line
NPN Silicon RF Power Transistor

0.5 W, 1–2 GHz
RF LINEAR
POWER TRANSISTOR

The MRF6401 is designed for Class A common emitter, linear power amplifiers in the 1–2 GHz frequency range. It has been specifically designed for use in Personal Communications Network (PCN) base station and INMARSAT Standard M applications. The studless package version offers a good possibility for surface mounting.

- Specified 20 Volts, 1.66 GHz Characteristics:
  Output Power — 0.5 Watts
  Gain — 10 dB Min
  Class A Operation
- Specified 20 Volts, 1.88 GHz Characteristics:
  Output Power — 0.5 Watts
  Gain — 9 dB Min
  Class A Operation



CASE 305C, STYLE 1

2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	22	Vdc
Collector-Base Voltage	V_{CBO}	45	Vdc
Emitter-Base Voltage	V_{EBO}	3.5	Vdc
Operating Junction Temperature	T_J	200	°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	5.8 0.033	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (1)	$R_{\theta JC}$	30	°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 = 10 mAdc, R_B = 75 Ω)	$V_{(BR)CER}$	28	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 0.25 mAdc)	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 1 mAdc)	$V_{(BR)CBO}$	45	—	—	Vdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.1 Adc, V_{CE} = 5 Vdc)	h_{FE}	20	—	120	—

NOTE:
1. Thermal resistance is determined under specified RF operating condition.

(continued)

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

Characteristic	Symbol	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 26 V, I_E = 0, f = 1 MHz)	C_{ob}	—	1.4	—	pF
FUNCTIONAL TESTS (V_{CC} = 20 V, I_{CQ} = 80 mA)					
Common-Emitter Amplifier Power Gain	G_p				dB
(f = 1660 MHz, P_{out} = 0.5 W)		10	11	—	
(f = 1880 MHz, P_{out} = 0.5 W)		9	10	—	
Load Mismatch (f = 1660 MHz, f = 1880 MHz, P_{out} = 0.5 W, Load VSWR = 20:1, all phase angles at frequency of test)	ψ	No Degradiation in Output Power			
Intermodulation Distortion	IMD				dBc
(P_{out} = 0.5 W PEP, f1 = 1659.2 MHz, f2 = 1660 MHz)		−30	−35	—	
(P_{out} = 0.5 W PEP, f1 = 1879.2 MHz, f2 = 1880 MHz)		−30	−35	—	

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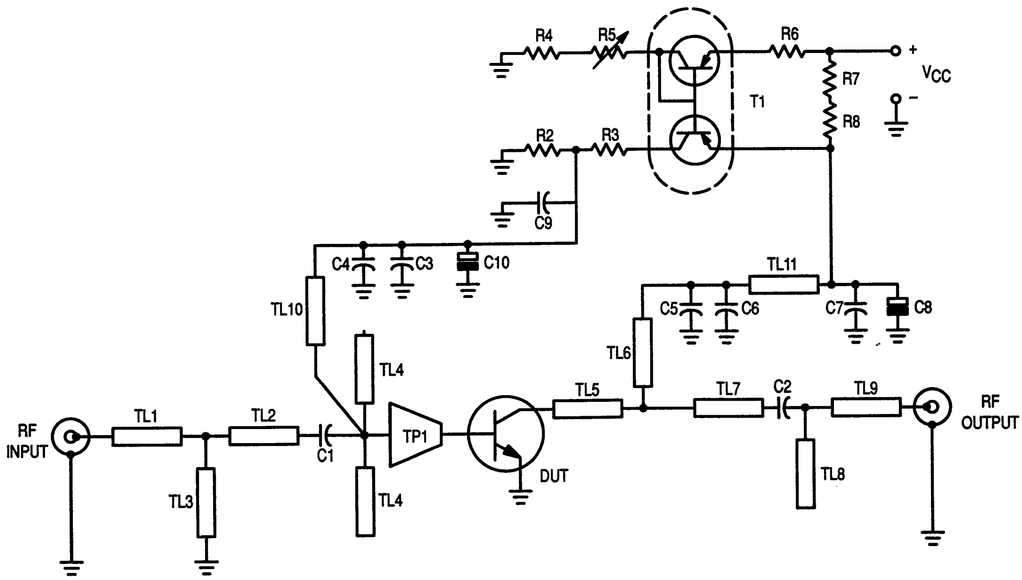


C1	1.5 pF, ATC Chip Capacitor 100A		R2	470 Ω, Chip Resistor 0805
C2	3.9 pF, ATC Chip Capacitor 100A		R3	4.7 kΩ, Chip Resistor 0805
C3	56 pF, ATC Chip Capacitor 100A		R4	8.2 kΩ, Chip Resistor 0805
C4, C6, C7, C9	15 nF, Chip Capacitor 0805		R5	5 kΩ, SMD Potentiometer
C5	47 pF, ATC Chip Capacitor 100A		R6	680 Ω, Chip Resistor 0805
C8	4.7 µF, 35 V, Capacitor		R7, R8	7.5 Ω, Chip Resistor 0805
C10	10 µF, 16 V, Capacitor		T1	Transistor, BCV62
C11	100 pF, ATC Chip Capacitor 100A			
TL1 to TL11	µStrip Lines; See Photomaster			
TP1	µStrip Taper; See Photomaster			

Figure 1. 1600−2000 MHz Broadband Application Amplifier Schematic

TYPICAL CHARACTERISTICS

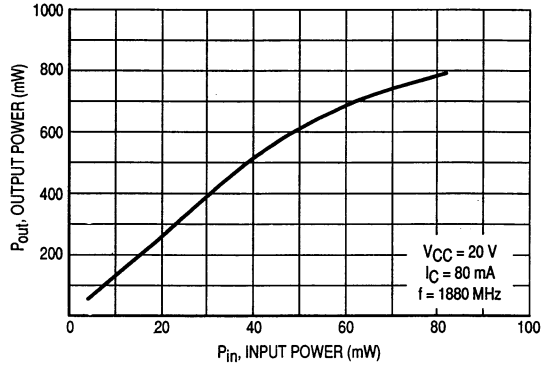


Figure 2. Output Power versus Input Power

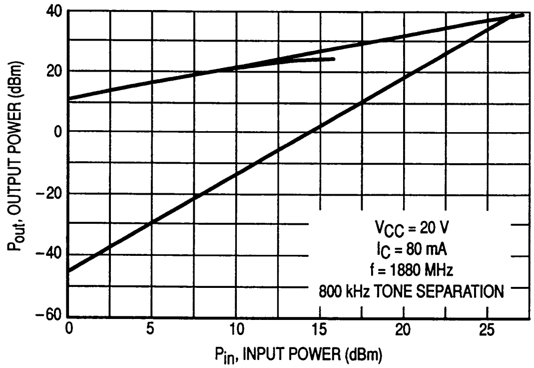


Figure 3. Third Order Intercept

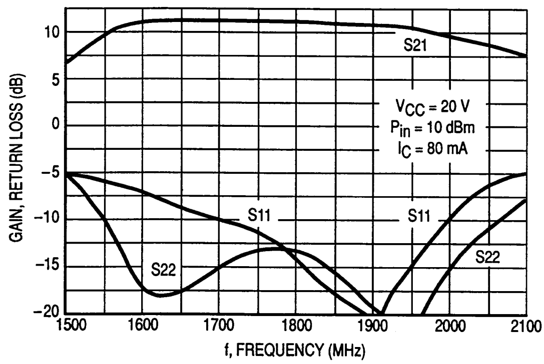


Figure 4. Performance in Broadband Test Fixture

Table 1. Common Emitter S-Parameters

V_{CC} = 20 V, I_C = 80 mA

POLAR S-PARAMETERS IN 50 Ω SYSTEM								
f	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	$\vert S_{11}\vert$	∠Ø	$\vert S_{21}\vert$	∠Ø	$\vert S_{12}\vert$	∠Ø	$\vert S_{22}\vert$	∠Ø
100	0.626	−118	28.4	127	0.0186	45	0.649	−40
200	0.718	−149	17.1	106	0.0230	35	0.434	−49
400	0.754	−171	9.10	88	0.0271	35	0.303	−53
600	0.761	179	6.15	77	0.0312	38	0.272	−56
800	0.762	171	4.65	68	0.0359	42	0.266	−62
1000	0.763	165	3.73	60	0.0409	44	0.271	−68
1200	0.758	159	3.13	52	0.0469	44	0.286	−75
1400	0.753	155	2.60	44	0.0490	46	0.291	−87
1600	0.765	150	2.30	39	0.0574	50	0.288	−93
1800	0.769	144	2.06	32	0.0665	49	0.303	−97
1900	0.768	142	1.98	29	0.0714	48	0.312	−100
2000	0.767	139	1.88	25	0.0756	48	0.322	−103

V_{CC} = 20 V, I_C = 50 mA

POLAR S-PARAMETERS IN 50 Ω SYSTEM								
f	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	$\vert S_{11}\vert$	∠Ø	$\vert S_{21}\vert$	∠Ø	$\vert S_{12}\vert$	∠Ø	$\vert S_{22}\vert$	∠Ø
100	0.618	−113	26.2	130	0.0195	45	0.678	−36
200	0.713	−145	16.2	108	0.0251	34	0.465	−47
400	0.758	−168	8.78	89.2	0.0288	32	0.331	−51
600	0.763	180	5.94	78	0.0323	35	0.297	−55
800	0.761	169	4.49	68	0.0363	39	0.290	−61
1000	0.764	166	3.61	60	0.0415	41	0.294	−68
1200	0.758	160	3.02	52	0.0467	42	0.310	−75
1400	0.757	155	2.52	44.5	0.0486	45	0.313	−87
1600	0.768	150	2.22	39	0.0566	48	0.311	−92
1800	0.772	145	2	32	0.0655	48	0.328	−97
1900	0.770	142	1.91	28	0.0705	47	0.335	−101
2000	0.772	140	1.81	25	0.0745	47	0.345	−104

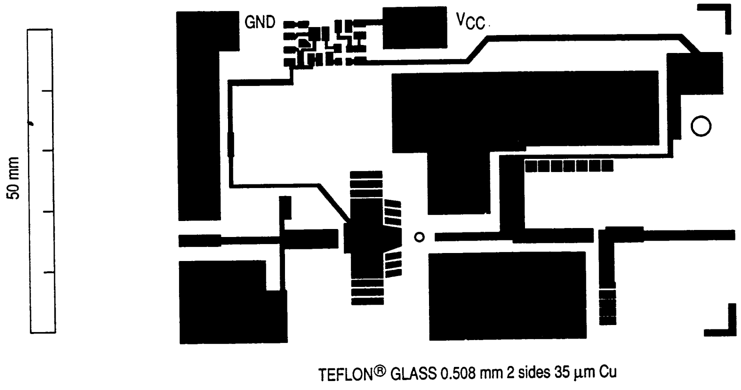


Figure 5. PC Board Photomaster

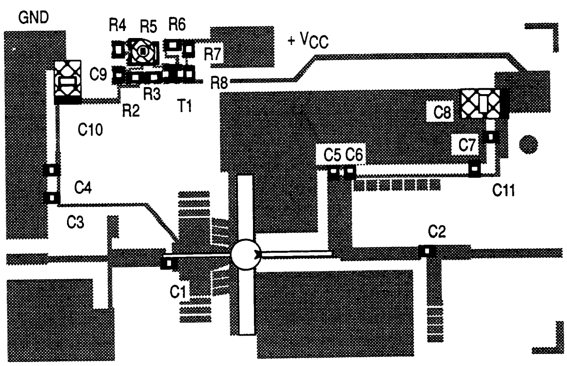


Figure 6. Test Circuit Components View

2

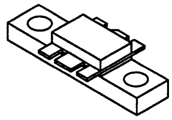
MRF6402

The RF Line
NPN Silicon
RF Power Transistor

The MRF6402 is designed for 1.8 GHz Personal Communications Network (PCN) base stations applications. It incorporates high value emitter ballast resistors, gold metallizations and offers a high degree of reliability and ruggedness. For ease of design, this transistor has an internally matched input.

- To be used in Class AB for PCN and Cellular Radio Applications
- Specified 26 V, 1.88 GHz Characteristics
  Output Power — 4.5 Watts
  Gain — 10 dB Typ
  Efficiency — 45% Typ

**4.5 W, 1.88 GHz
RF POWER TRANSISTOR
NPN SILICON**



CASE 319, STYLE 2

2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CER}	40	Vdc
Collector-Base Voltage	V_{CBO}	45	Vdc
Emitter-Base Voltage	V_{EBO}	3.5	Vdc
Collector-Current — Continuous	I_C	0.7	Adc
Total Device Dissipation @ $T_C = 25°C$ Derate above 25°C	P_D	15 0.2	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 (1)	$R_{\theta JC}$	5	°C/W

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

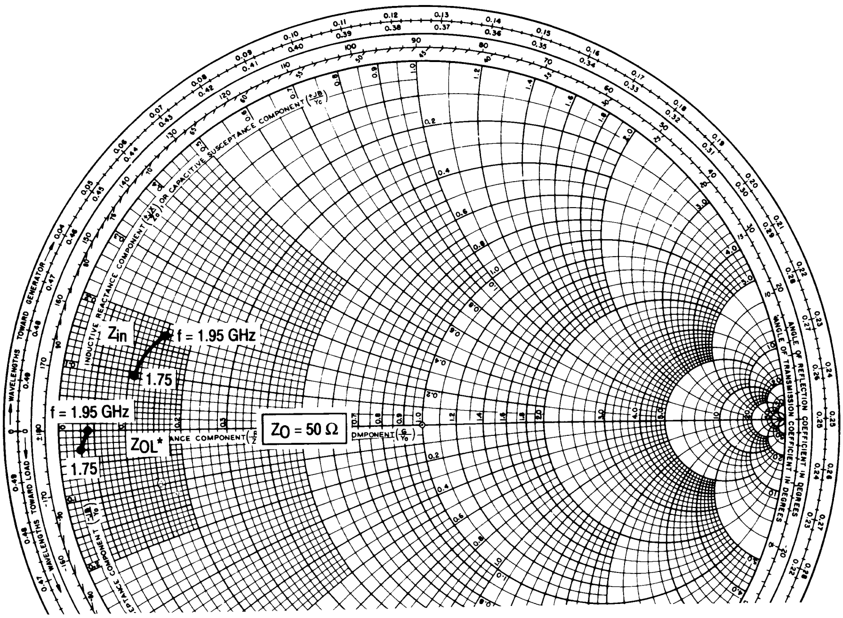
Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 10$ mA, $R_{BE} = 75\ \Omega$)	$V_{(BR)CER}$	40	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 5$ mAdc)	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10$ mAdc)	$V_{(BR)CBO}$	40	—	—	Vdc
Collector-Emitter Leakage ($V_{CE} = 26$ V, $R_{BE} = 75\ \Omega$)	I_{CER}	—	—	5	mA

NOTE:
1. Thermal resistance is determined under specified RF operating condition.

(continued)

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.1 Adc, V_{CE} ≈ 20 Vdc)	h_{FE}	50	—	200	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 26 V, I_E = 0, f = 1 MHz)	C_{ob}	—	6	—	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 26 V, P_{out} = 4 W, I_{CQ} = 40 mA, f = 1.88 GHz)	G_p	9	10	—	dB
Collector Efficiency (V_{CC} = 26 V, P_{out} = 4 W, f = 1.88 GHz)	η	40	43	—	%
Load Mismatch (V_{CC} = 26 V, P_{out} = 4.5 W, I_{CQ} = 40 mA, f = 1.88 GHz, Load VSWR = 3:1, All Phase Angles at Frequency of Test)	Ψ	No Degradation in Output Power			



f (GHz)	Z_{in} (Ω)	Z_{OL}* (Ω)
1.75	5.9 + j9.2	2.8 + j2.7
1.80	6.2 + j9.6	2.9 + j2.3
1.84	6.5 + j10	2.9 + j1.8
1.90	6.8 + j9.1	2.9 + j1.4
1.95	7.3 + j8.1	3.1 + j0.9

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

Figure 1. Input and Output Impedances with Circuit Tuned for Maximum Gain @ V_{CE} = 26 V, I_{CQ} = 40 mA, P_{out} = 4.5 W

TYPICAL CHARACTERISTICS

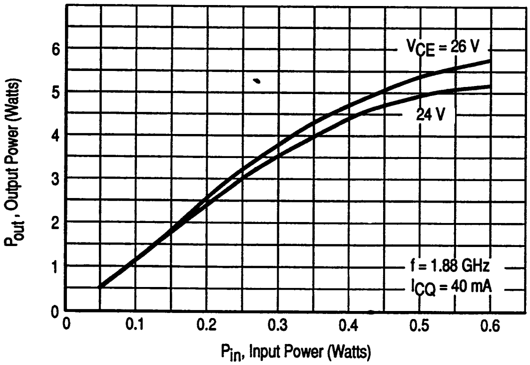


Figure 2. Typical Output Power versus Input Power

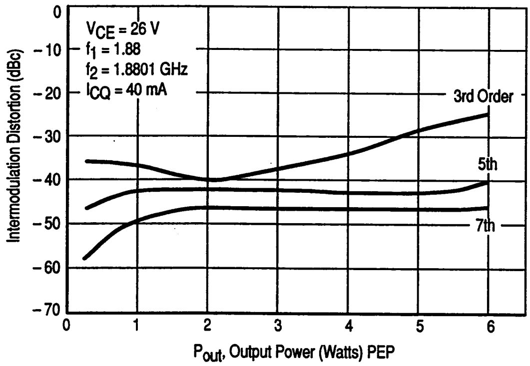


Figure 3. IMD versus Output Power

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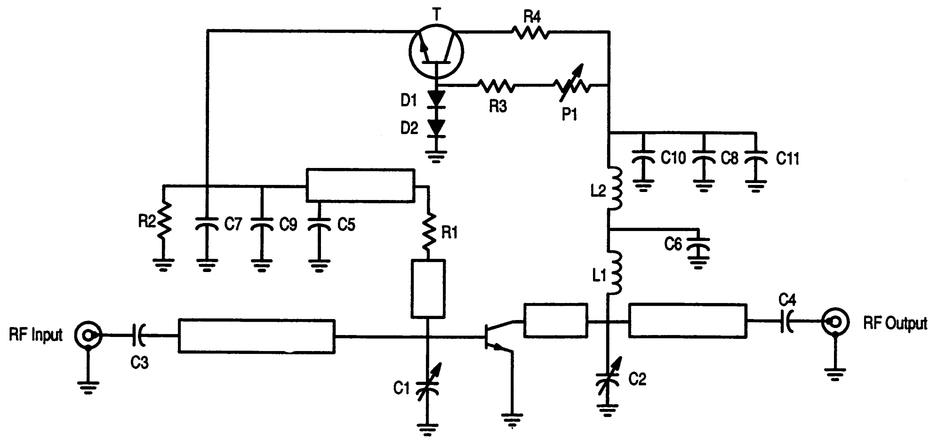
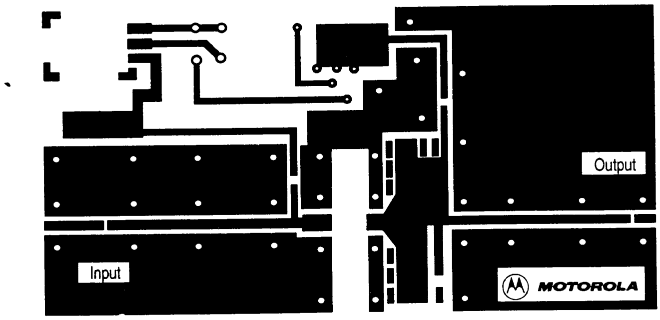


C1, C2	1 to 5 pF, Trimmer Capacitor, Johanson	L1	2 Turns, Wire 0.5 mm, ID 2 mm
C3, C4	100A, 68 pF, Chip Capacitor, ATC	L2	Ferrite Bead, SMD Fair-Rite
C5, C6	100A, 82 pF, Chip Capacitor, ATC	P1	10 kΩ, Trimmer
C7, C8	15 nF, Chip Capacitor, 0805	R1	2.2 Ω, Chip Resistor, 0805
C9, C10	330 pF, Chip Capacitor, 0805	R2	56 Ω, Chip Resistor, 1206
C11	4.7 μF, 35 V, Capacitor	R3	1.2 kΩ, 1/4 W, 5%, Resistor
D1, D2	Diode, 1N4148	R4	100 Ω, 3 W, Power Resistor
		T	Transistor, BD135

Figure 4. 1.80−1.88 GHz Test Circuit Electrical Schematic



Teflon Glass® 0.5 mm — Double Side 35 μm Cu.

Figure 5. Photomaster

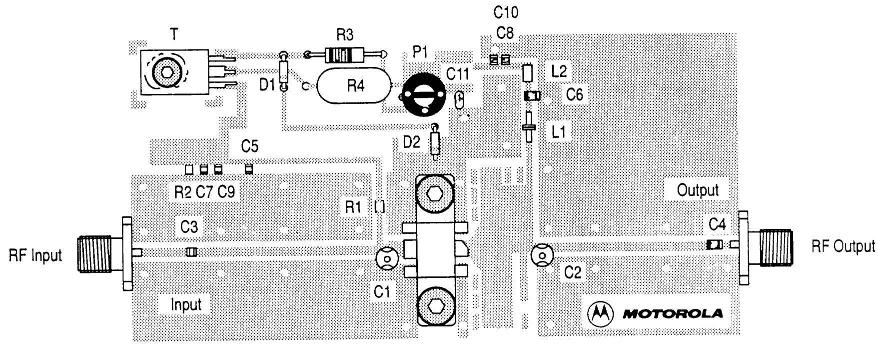


Figure 6. Test Circuit Components View and Parts List

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

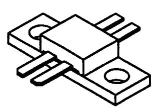
MRF6403

The RF Line
NPN Silicon
RF Power Transistor

The MRF6403 is designed for 1.8 GHz Personal Communications Network (PCN) base station applications. It incorporates high value emitter ballast resistors, gold metallizations and offers a high degree of reliability and ruggedness.

- To be used in Class AB for PCN and Cellular Radio
- Specified 26 Volts, 1.88 GHz Characteristics
  Output Power — 25 Watts
  Gain — 6.5 dB Typ
  Efficiency — 43% Typ

25 W, 1.88 GHz
RF POWER TRANSISTOR
NPN SILICON



CASE 395, STYLE 1

2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CER}	40	Vdc
Collector-Base Voltage	V_{CBO}	45	Vdc
Emitter-Base Voltage	V_{EBO}	3.5	Vdc
Collector-Current — Continuous	I_C	2.5	Adc
Total Device Dissipation @ $T_C = 25°C$ Derate above 25°C	P_D	70 0.4	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 (1)	$R_{\theta JC}$	2.5	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 10$ mA, $R_{BE} = 75\ \Omega$)	$V_{(BR)CER}$	40	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 5$ mAdc)	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10$ mAdc)	$V_{(BR)CBO}$	45	—	—	Vdc
Collector-Emitter Leakage ($V_{CE} = 26$ V, $R_{BE} = 75\ \Omega$)	I_{CER}	—	—	5	mA

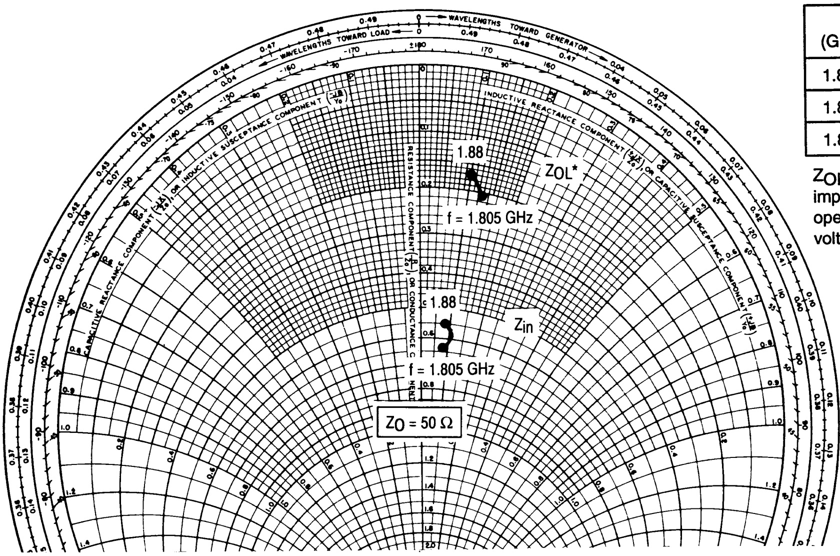
(continued)

NOTE:
1. Thermal resistance is determined under specified RF operating condition.

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.2 Adc, V_{CE} = 20 Vdc)	h_{FE}	30	—	120	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (each side) (V_{CB} = 26 V, I_E = 0, f = 1 MHz)	C_{ob}	—	15	—	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 26 V, P_{out} = 25 W, I_{CQ} = 200 mA, f = 1.88 GHz)	G_p	—	6.5	—	dB
Collector Efficiency (V_{CC} = 26 V, P_{out} = 25 W, f = 1.88 GHz)	η	38	43	—	%

2



f (GHz)	Z_{in} (Ω)	Z_{OL}* (Ω)
1.805	33.7 + j5.6	9.8 + j7.7
1.845	31.5 + j5.4	9.3 + j7
1.880	29.5 + j5.1	8.9 + j6.4

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

Figure 1. Series Equivalent Input and Output Impedances

TYPICAL CHARACTERISTICS

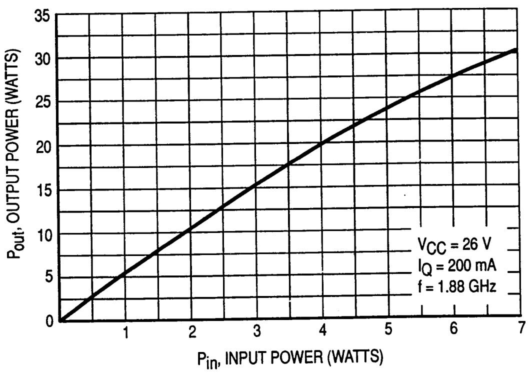
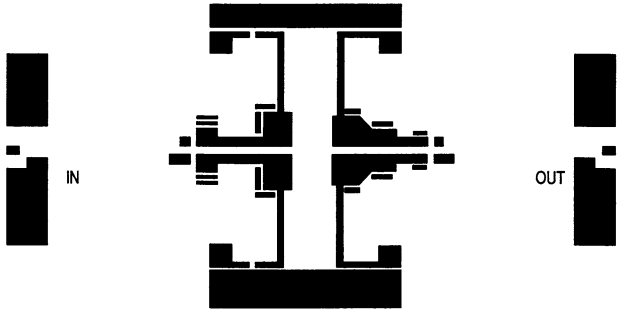


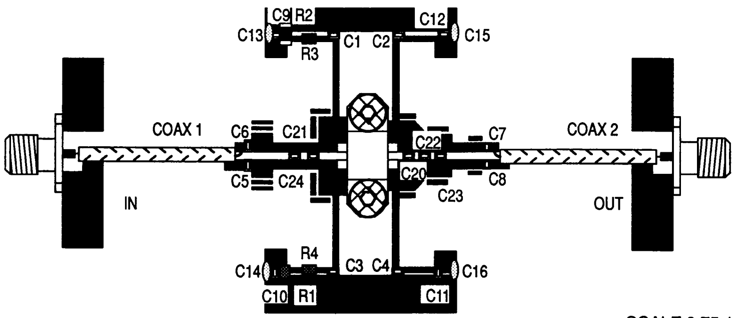
Figure 2. Output Power versus Input Power



TEFLON® GLASS 0.5 mm — DOUBLE SIDE 35 μm Cu.

SCALE 0.75:1

Figure 3. Photomaster



SCALE 0.75:1

Figure 4. Components View

C1 to C8	68 pF, ATC Chip Capacitor 100A
C9 to C12	330 pF, Chip Capacitor 0805
C13 to C16	4.7 μF, 35 V, Capacitor
C20	1.3 pF, ATC Chip Capacitor 100A
C21 to C23	1 pF, ATC Chip Capacitor 100A
C24	0.5 pF, ATC Chip Capacitor 100A
R1, R2	56 Ω, Chip Resistor 1206
R3, R4	2.2 Ω, Chip Resistor 0805
Coax 1, Coax 2	50 Ω Coaxial, l = 27 mm

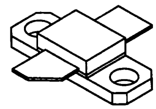
MRF6404

The RF Line
NPN Silicon RF Power Transistor

The MRF6404 is designed for 1.8 GHz Personal Communications Network (PCN) base station applications. It incorporates high value emitter ballast resistors, gold metallizations and offers a high degree of reliability and ruggedness.

- To be used in Class AB for PCN and Cellular Radio
- Specified 26 V, 1.88 GHz Characteristics
  Output Power — 30 Watts
  Gain — 9 dB Typ
  Efficiency — 43% Typ

**30 W, 1.88 GHz
RF POWER TRANSISTOR
NPN SILICON**



CASE 395C, STYLE 1

2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	25	Vdc
Collector-Base Voltage	V_{CES}	60	Vdc
Emitter-Base Voltage	V_{EBO}	4	Vdc
Collector-Current — Continuous	I_C	10	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	125 0.71	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 (1)	$R_{\theta JC}$	1.4	°C/W

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

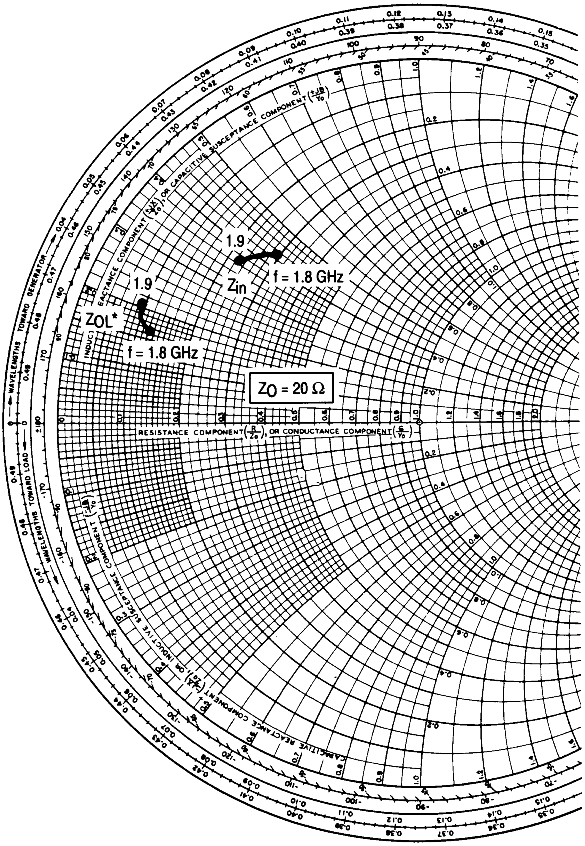
Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 50 mA, I_B = 0)	$V_{(BR)CEO}$	25	28	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 mAdc)	$V_{(BR)EBO}$	4	5	—	Vdc
Collector-Base Breakdown Voltage (I_C = 50 mAdc)	$V_{(BR)CES}$	60	68	—	Vdc
Collector Cutoff Current (V_{CE} = 30 V, V_{BE} = 0)	I_{CES}	—	—	10	mA

(continued)

NOTE:
1. Thermal resistance is determined under specified RF operating condition.

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = 1 Adc, V_{CE} = 5 Vdc)	h_{FE}	30	50	120	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 26 V, I_E = 0, f = 1 MHz)	C_{ob}	—	38	—	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 26 V, P_{out} = 30 W, I_{CQ} = 150 mA, f = 1.88 GHz)	G_p	—	9	—	dB
Collector Efficiency (V_{CC} = 26 V, P_{out} = 30 W, f = 1.88 GHz)	η	—	43	—	%
Load Mismatch (V_{CC} = 26 V, P_{out} = 30 W, I_{CQ} = 150 mA, f = 1.88 GHz, Load VSWR = 3:1, All Phase Angles at Frequency of Test)	Ψ	No Degradation in Output Power			



f (GHz)	Z_{in} (Ω)	Z_{OL}* (Ω)
1.8	6.5 + j8.5	3 + j3
1.85	5.6 + j8	2.6 + j3.3
1.9	5.2 + j7.3	2.3 + j3.7

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

Figure 1. Input and Output Impedances with Circuit Tuned for Maximum Gain @ V_{CC} = 26 V, I_{CQ} = 0.15 A, P_{out} = 30 W

2

TYPICAL CHARACTERISTICS

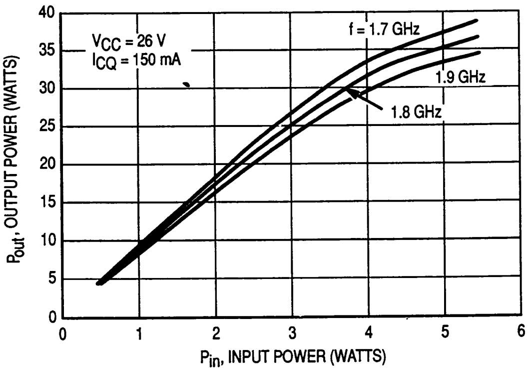


Figure 2. Output Power versus Input Power

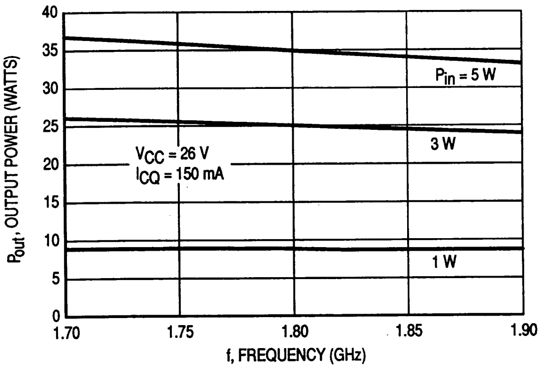


Figure 3. Output Power versus Frequency

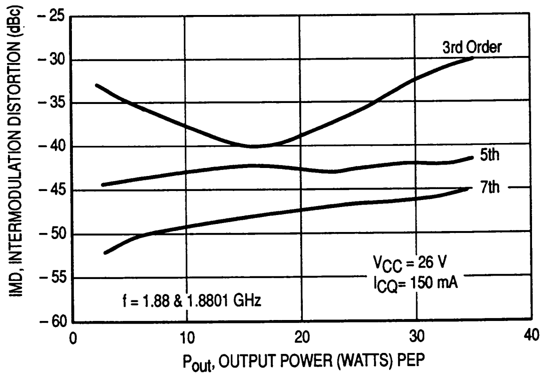


Figure 4. Intermodulation versus Output Power

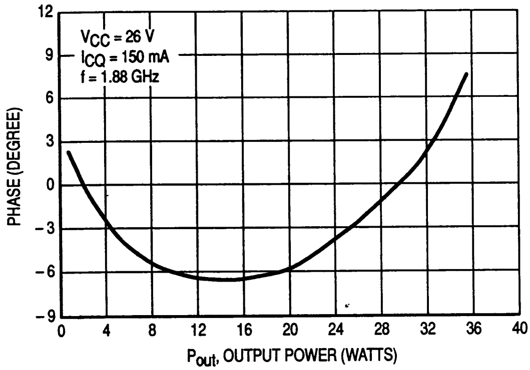
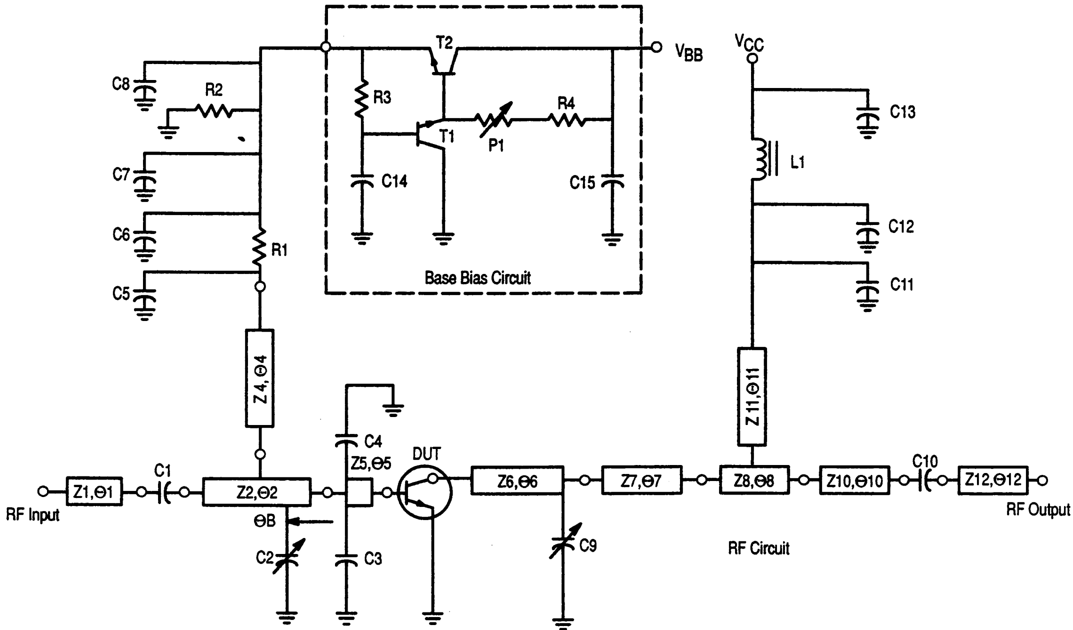


Figure 5. AM/PM Conversion

2



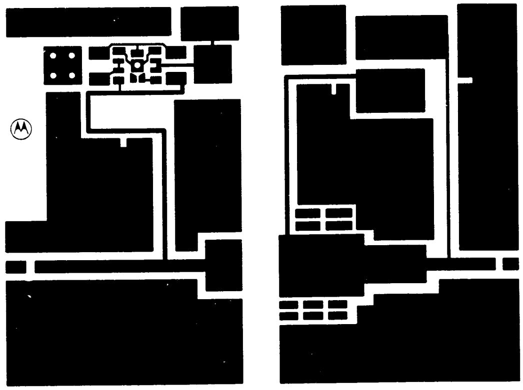
C1, C5, C10, C11	68 pF, Chip Capacitor, ATC 100A
C2, C9	Trimmer Capacitor, Gigatrim
C3, C4	1.3 pF, Chip Capacitor, ATC 100A
C6, C12	330 pF, Chip Capacitor, Vitramon
C7, C14, C15	15 nF, Chip Capacitor, Vitramon
C8	10 μF, 63 V, Electrolytic Capacitor
C13	4.7 μF, 63 V, Electrolytic Capacitor
L1	Ferrite Bead SMD Fair-Rite
P1	1 KΩ, Trimmer
R1	2.2 Ω, Chip Resistor, 0805
R2	56 Ω, Chip Resistor, 1206
R3	47 Ω, Chip Resistor, 0805
R4	330 Ω, Chip Resistor, 0805
T1,T2	Motorola MJD 31C
Board	ε_r = 2.55, H = 0.508 mm, T = 0.035 mm

All Electrical Lengths Are Referenced from λg @ F = 1.9 GHz

Z1 : 50 Ω	Θ1 : 10°	
Z2 : 50 Ω	Θ2 : 74.5°	ΘB : 16.5°
Z4 : 74 Ω	Θ4 : 68°	
Z5 : 12.8 Ω	Θ5 : 21°	
Z6 : 10.4 Ω	Θ6 : 49.5°	
Z7 : 18 Ω	Θ7 : 36.5°	
Z8 : 45 Ω	Θ8 : 20°	
Z10 : 50 Ω	Θ10 : 10°	
Z11 : 74 Ω	Θ11 : 74.5°	
Z12 : 50 Ω	Θ12 : 10°	

Figure 6. 1.8–1.88 GHz Test Circuit Electrical Schematic

2



(Not to Scale)

Teflon® Glass 0.5 mm – Double Side 35 µm Cu.

Figure 8. Photomaster

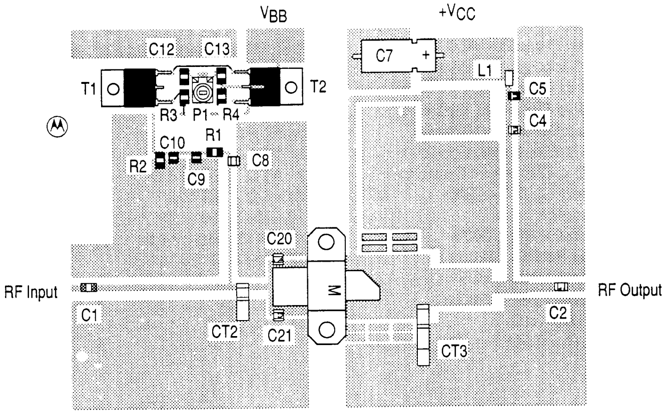


Figure 9. Components Layout

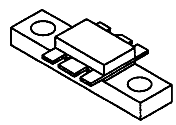
MRF6406

The RF Line
NPN Silicon RF Power Transistor

The MRF6406 is designed for 1.88 GHz Personal Communications Network (PCN) base station applications. For ease of design, this transistor has an internally matched input.

- Specified 26 V, 1.88 GHz Characteristics
  Output Power — 12 Watts
  Gain — 7.5 dB Typ @ 1.88 GHz, Class AB
  Efficiency — 43% Typ @ 1.88 GHz, 12 Watts
- Characterized with Series Equivalent Large-Signal Parameters from 1.75–1.9 GHz
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Silicon Nitride Passivated

**12 W, 1.88 GHz
RF POWER TRANSISTOR
NPN SILICON**



CASE 319, STYLE 2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CER}	40	Vdc
Collector-Base Voltage	V_{CBO}	50	Vdc
Emitter-Base Voltage	V_{EBO}	3.5	Vdc
Collector-Current — Continuous	I_C	2.5	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	38 0.26	Watts W/°C
Quiescent Current (without RF drive)	I_{CQ}	400	mAdc
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 (1)	$R_{\theta JC}$	4.5	°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 = 10 mAdc, R_{BE} = 75 Ω)	$V_{(BR)CER}$	40	—	—	Vdc
Collector-Base Breakdown Voltage (I_E = 10 mAdc, I_C = 0)	$V_{(BR)EBO}$	3.5	—	—	Vdc
Emitter-Base Breakdown Voltage (I_C = 5 mAdc, I_E = 0)	$V_{(BR)CBO}$	50	—	—	Vdc
Collector-Emitter Leakage Current (V_{CE} = 26 Vdc, R_{BE} = 75 Ω)	I_{CER}	—	—	5	mAdc

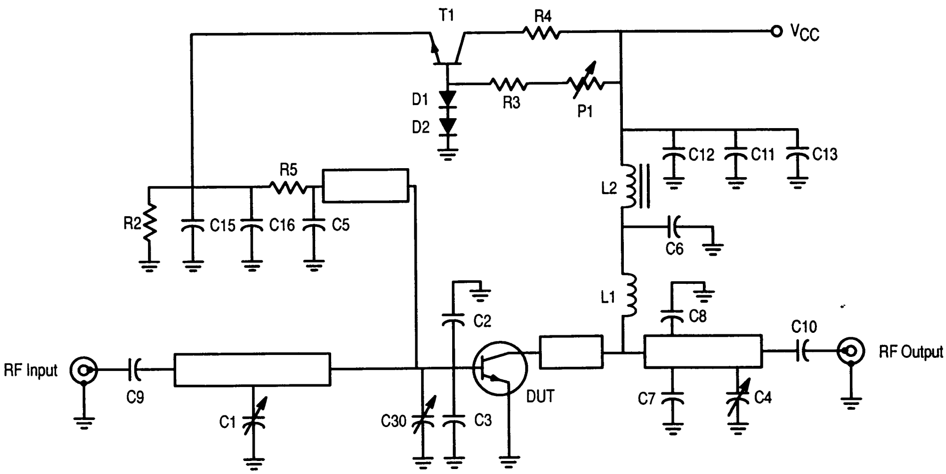
NOTE:
1. Thermal resistance is determined under specified RF operating condition.

(continued)

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

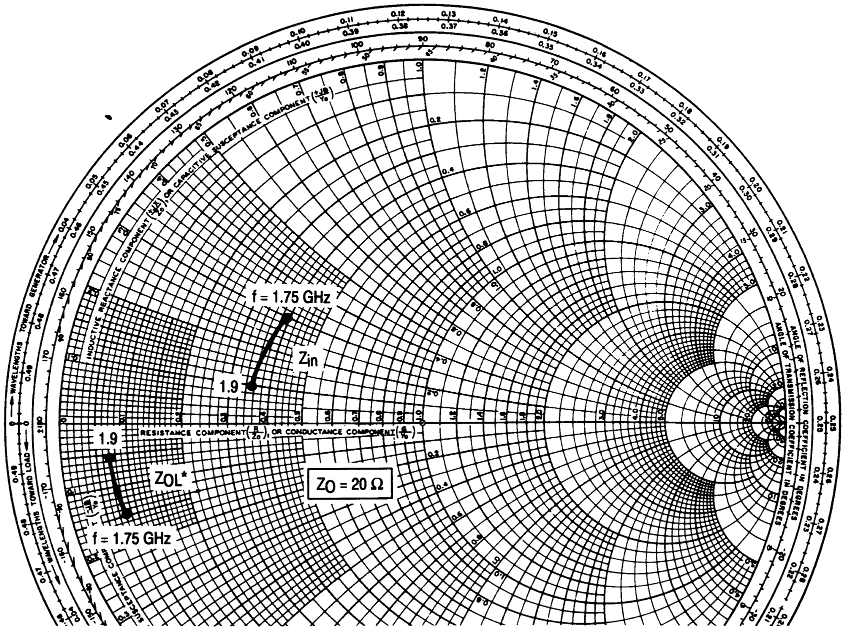
Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_{CE} = 200 mAdc, V_{CE} = 10 Vdc)	h_{FE}	30	—	100	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 26 Vdc, I_E = 0, f = 1 MHz)	C_{ob}	—	17	—	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CE} = 26 Vdc, P_{out} = 12 W, I_{CQ} = 100 mA, f = 1.88 GHz)	G_{pe}	—	7.5	—	dB
Collector Efficiency (V_{CE} = 26 Vdc, P_{out} = 12 W, I_{CQ} = 100 mA, f = 1.88 GHz)	η	38	43	—	%
Load Mismatch (V_{CE} = 26 Vdc, P_{out} = 12 W, I_{CQ} = 100 mA, f = 1.88 GHz, Load VSWR = 3:1, All Phase Angles at Frequency of Test)	Ψ	No Degradation in Output Power			

2



C1	0.5 pF, Chip Capacitor, ATC 100A	D1, D2	Diode, 1N4148
C2, C3	1.2 pF, Chip Capacitor, ATC 100A	L1	2 Turns, Wire Dia. 0.5 mm, ID 2 mm
C4, C30	1.5/5 pF, Trimmer Capacitor, Johanson	L2	Ferrite Bead, SMD Fair Rite
C5, C6	68 pF, Chip Capacitor, ATC 100A	P1	10 kΩ, Trimmer Resistor
C7, C8	0.1 pF, Chip Capacitor, ATC 100A	R2	56 Ω, Chip Resistor, 1206
C9, C10	82 pF, Chip Capacitor, ATC 100A	R3	1.2 kΩ, 1/4 W, 5%, Resistor
C11, C15	15 nF, Chip Capacitor, 0805	R4	100 Ω, 3 W, Resistor
C12, C16	330 pF, Chip Capacitor, 0805	R5	2.2 Ω, Chip Resistor, 1206
C13	4.7 μF, 35 V, Capacitor	T1	Transistor, BD135

Figure 1. 1.80–1.88 GHz Test Circuit Electrical Schematic



f (GHz)	Z_{in} (Ω)	Z_{OL}* (Ω)
1.75	8.3 + j6.8	1.9 – j2.8
1.80	7.7 + j3.4	1.75 – j2
1.90	7.5 + j2.1	1.7 – j1.3

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

Figure 2. Input and Output Impedances with Circuit Tuned for Maximum Gain @ V_{CC} = 26 V, I_{CQ} = 100 mA, P_{out} = 12 W

TYPICAL CHARACTERISTICS

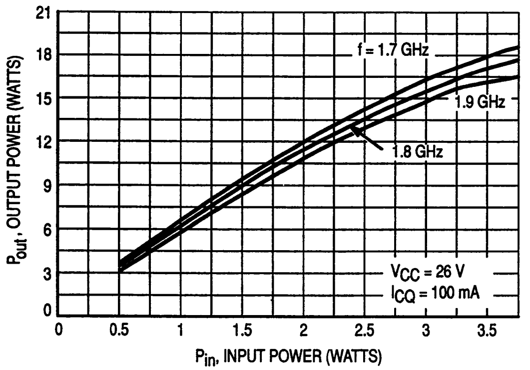


Figure 3. Output Power versus Input Power

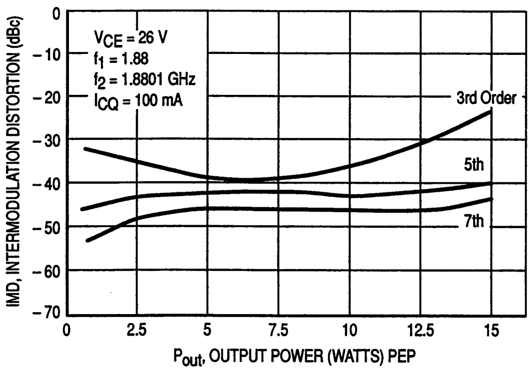


Figure 4. IMD versus Output Power

2

TYPICAL CHARACTERISTICS

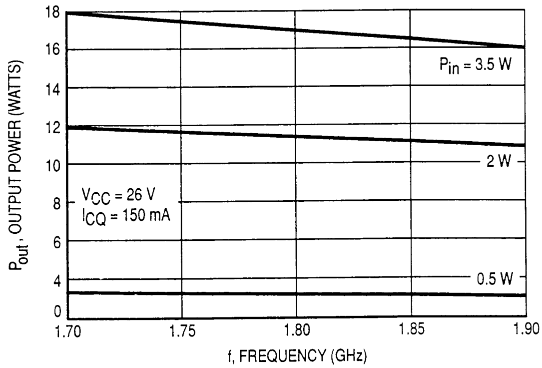
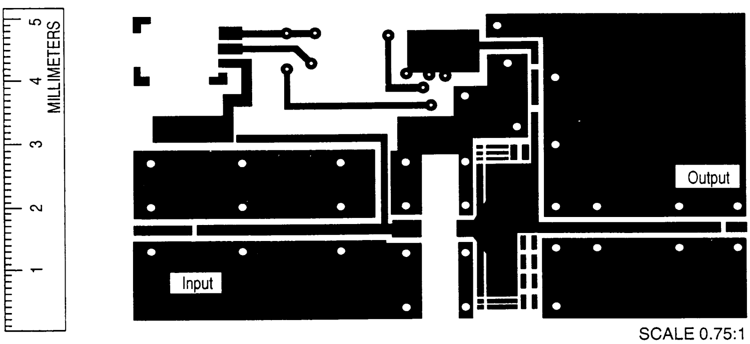


Figure 5. Output Power versus Frequency



Teflon® Glass 0.5 mm — Double Side 35 μm Cu.

Figure 6. Photomaster

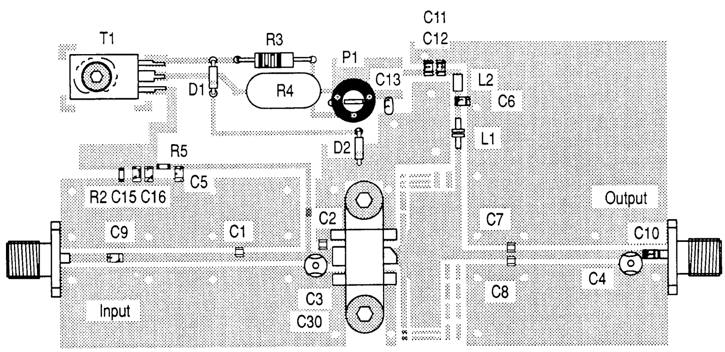


Figure 7. Components Layout