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The RF Line

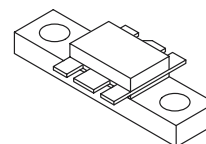
NPN Silicon RF Power Transistor

The MRF6409 is designed for GSM base stations 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
- Specified 26 Volts, 960 MHz Characteristics
Output Power — 20 Watts CW
Gain — 11 dB Typ
Efficiency — 60% Typ

MRF6409

**20 W, 960 MHz
RF POWER TRANSISTOR
NPN SILICON**



CASE 319-07, STYLE 2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	24	Vdc
Collector-Emitter Voltage	V_{CES}	55	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	5.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	45 0.26	Watts W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$
Operating Junction Temperature	T_J	200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (1)	$R_{\theta JC}$	3.8	$^\circ\text{C}/\text{W}$

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 ($I_C = 20\text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	24	30	—	Vdc
Emitter-Base Breakdown Voltage ($I_B = 5.0\text{ mAdc}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	5.0	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 20\text{ mAdc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	55	60	—	Vdc
Collector-Cutoff Current ($V_{CE} = 30\text{ Vdc}$, $V_{BE} = 0$)	I_{CES}	—	—	6.0	mA

(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 _{CE} = 1.0 Adc, V _{CE} = 5.0 Vdc)	h _{FE}	20	35	80	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V _{CB} = 26 Vdc, I _E = 0, f = 1.0 MHz)	C _{ob}	—	18	—	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V _{CC} = 26 Vdc, P _{out} = 20 W (CW), I _{CQ} = 50 mA, f = 960 MHz)	G _{pe}	10	11	—	dB
Collector Efficiency (V _{CC} = 26 Vdc, P _{out} = 20 W (CW), I _{CQ} = 50 mA, f = 960 MHz)	η	50	60	—	%
Load Mismatch (V _{CC} = 26 Vdc, P _{out} = 15 W (CW), I _{CQ} = 50 mA, f = 960 MHz, Load VSWR = 3:1, All Phase Angles at Frequency of Test)	Ψ	No Degradation in Output Power			

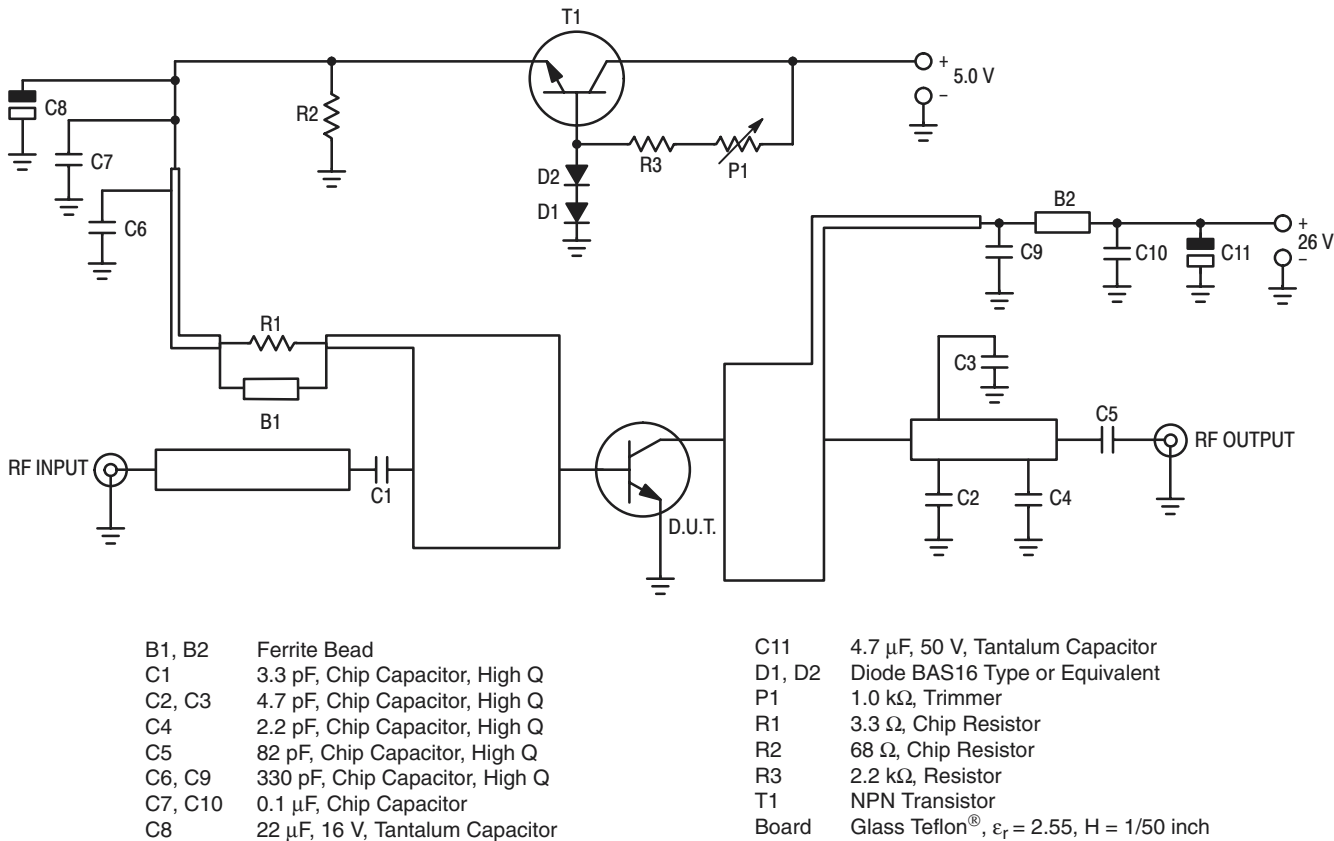


Figure 1. Test Circuit Electrical Schematic

TYPICAL CHARACTERISTICS

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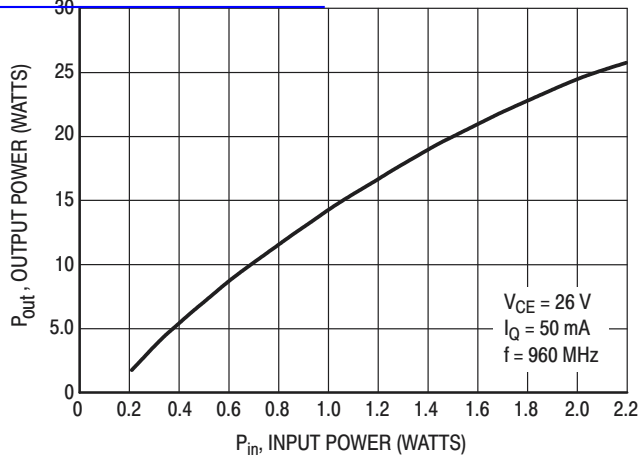


Figure 2. Output Power versus Input Power (CW)

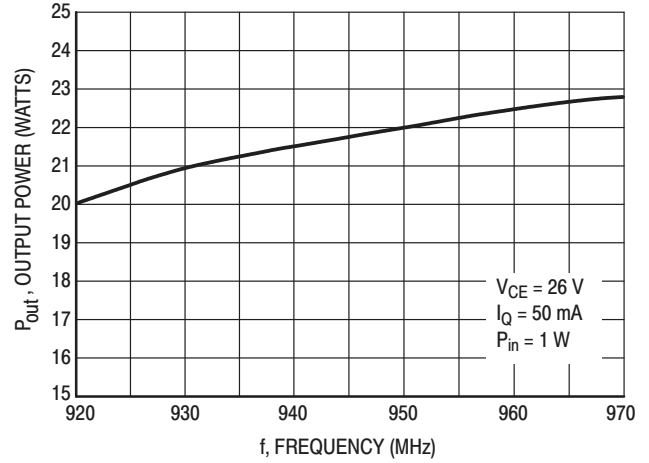


Figure 3. Output Power versus Frequency (CW)

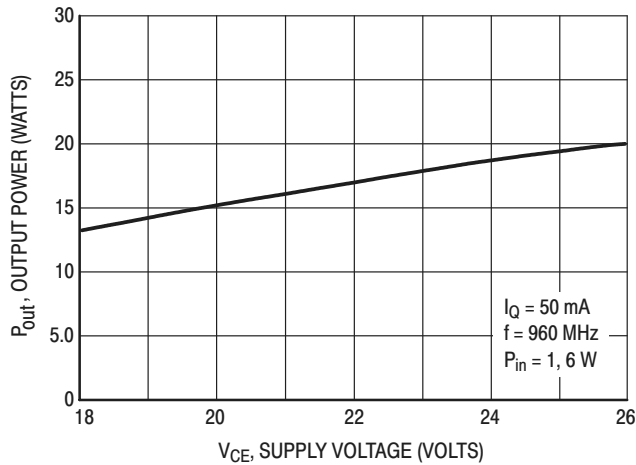


Figure 4. Output Power versus Supply Voltage (CW)

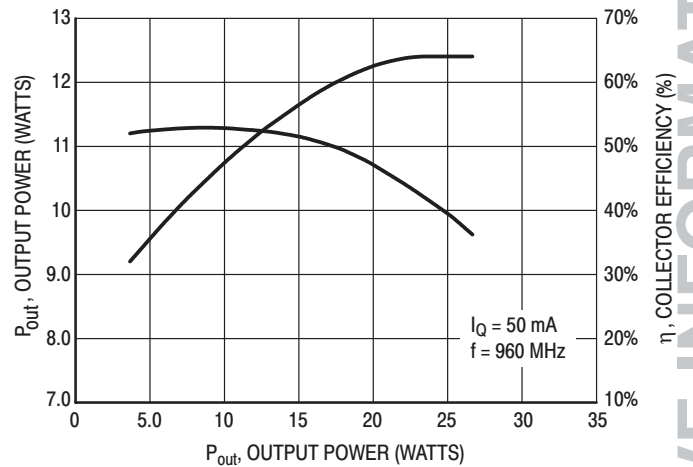


Figure 5. Power Gain and Efficiency versus Output Power

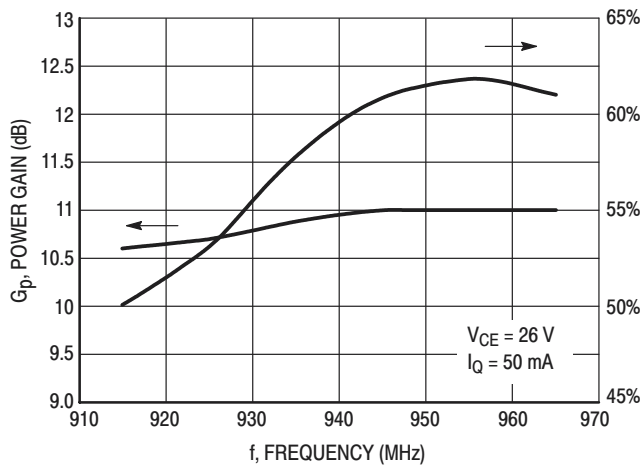


Figure 6. Typical Broadband Performances

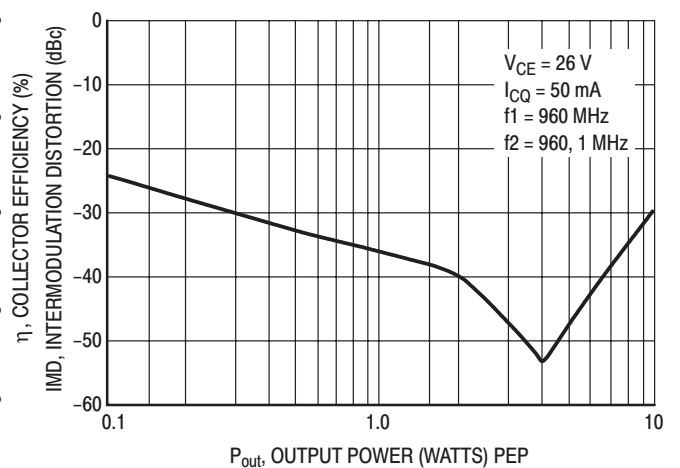
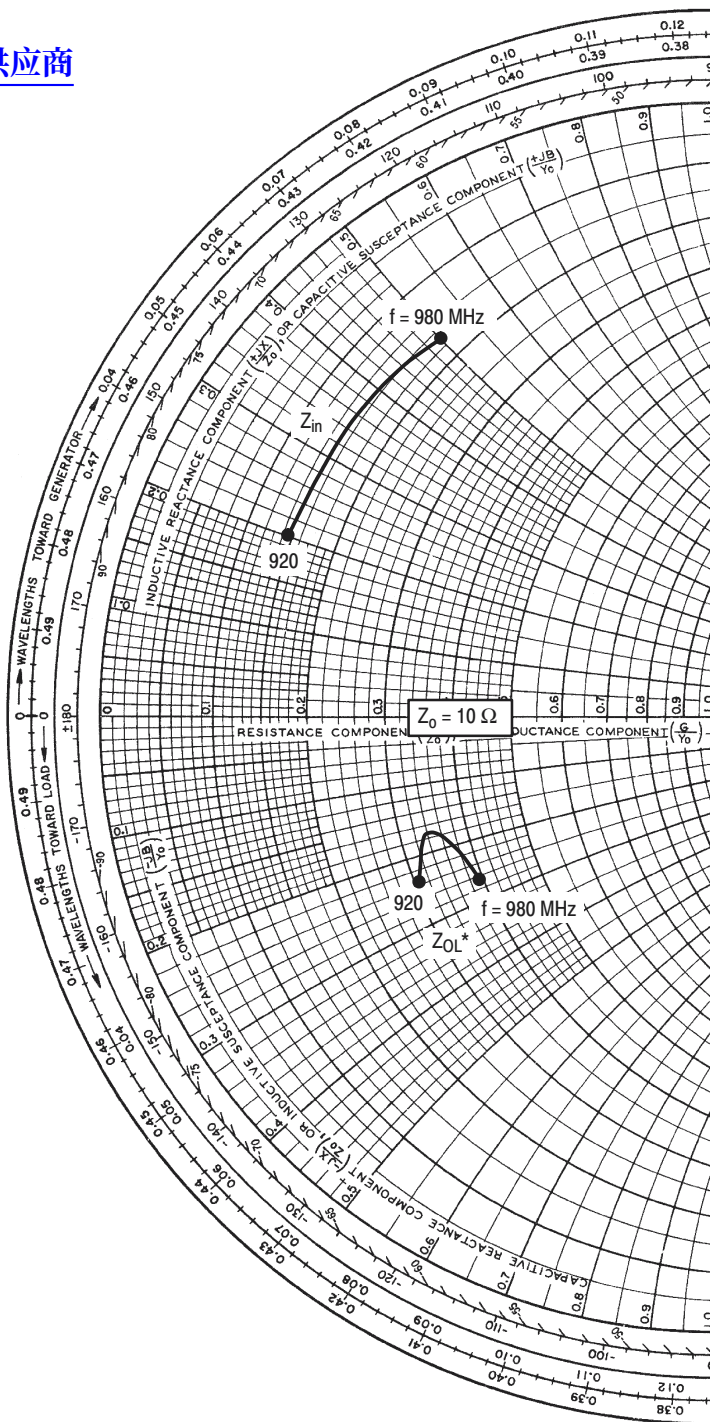


Figure 7. Intermodulation Distortion versus Output Power



f (MHz)	Z_{in} (Ω)	Z_{OL}^* (Ω)
920	$1.4 + j3.0$	$3.2 - j2.5$
940	$1.5 + j3.9$	$3.5 - j1.88$
960	$1.5 + j4.2$	$3.9 - j2.5$
980	$1.6 + j4.4$	$4.0 - j2.8$

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

Figure 8. Input and Output Impedances with Circuit Tuned for Maximum Gain
@ $V_{CC} = 26$ V, $I_{CQ} = 50$ mA, $P_{out} = 20$ W (CW)

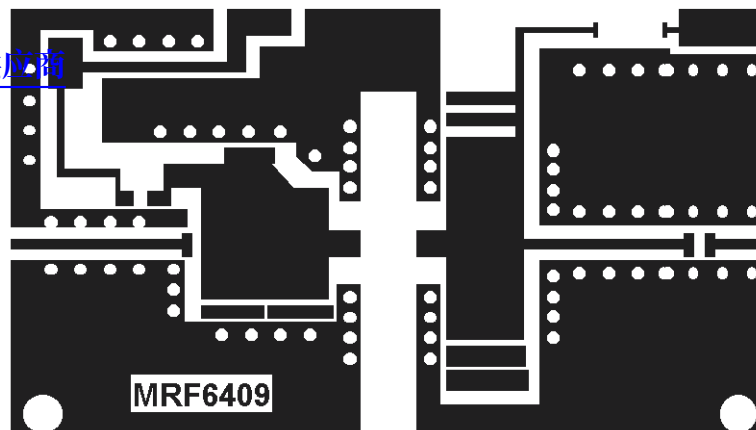


Figure 9. 960 MHz Test Circuit RF, Photomaster Scale 1:1
(Reduced 18% in printed data book, DL110/D)

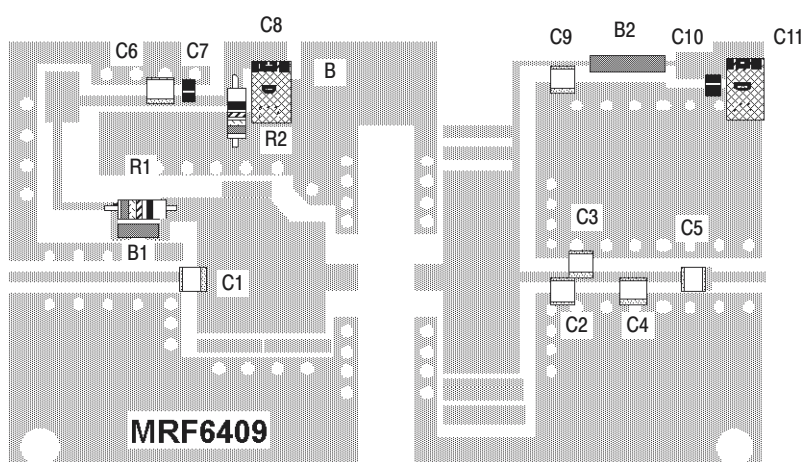
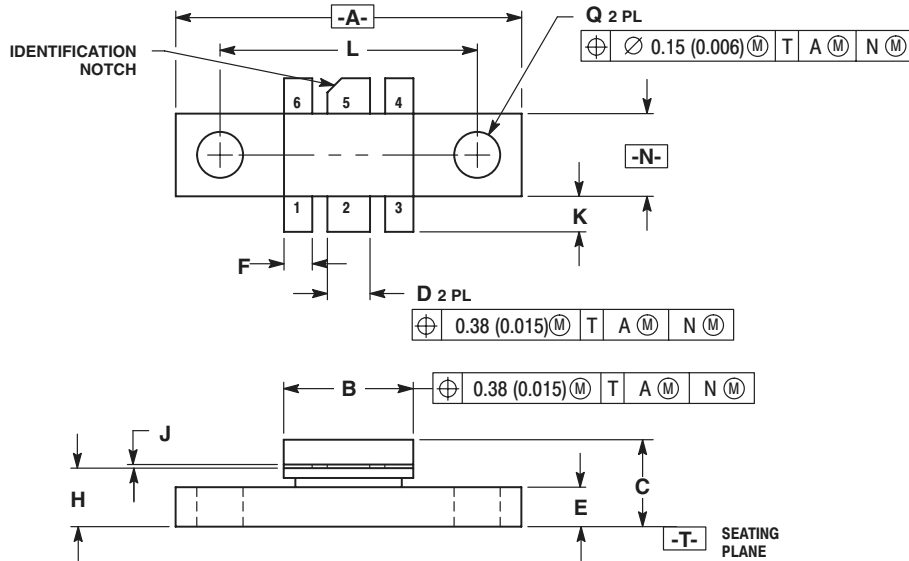


Figure 10. 960 MHz Test Circuit RF, Photomaster Scale 1:1
and Components Location
(Reduced 18% in printed data book, DL110/D)

PACKAGE DIMENSIONS

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NOTES:

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

DIM	INCHES		MILLIMETER	
	MIN	MAX	MIN	MAX
A	0.965	0.985	24.52	25.01
B	0.355	0.375	9.02	9.52
C	0.230	0.260	5.85	6.60
D	0.115	0.125	2.93	3.17
E	0.102	0.114	2.59	2.90
F	0.075	0.085	1.91	2.15
H	0.160	0.170	4.07	4.31
J	0.004	0.006	0.11	0.15
K	0.090	0.110	2.29	2.79
L	0.725 BSC		18.42 BSC	
N	0.225	0.241	5.72	6.12
Q	0.125	0.135	3.18	3.42

STYLE 2:

- PIN 1. EMITTER (COMMON)
- BASE (INPUT)
- EMITTER (COMMON)
- EMITTER (COMMON)
- COLLECTOR (OUTPUT)
- EMITTER (COMMON)

CASE 319-07
ISSUE M

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How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 303-675-2140 or 1-800-441-2447

Mfax™: RMFA00@email.sps.mot.com – TOUCHTONE 602-244-6609
INTERNET: <http://sps.motorola.com>

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, 6F Seibu-Butsuryu-Center,
3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 81-3-3521-8315

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298



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