

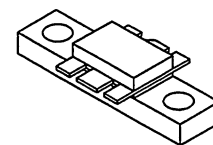
**The RF Line**  
**NPN Silicon**  
**RF Power Transistor**

**MRF6406**

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

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



**CASE 319**  
**STYLE 2**

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CER</sub>	40	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	50	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	3.5	Vdc
Collector-Current — Continuous	I <sub>C</sub>	2.5	Adc
Total Device Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	38 0.26	Watts W/°C
Quiescent Current (without RF drive)	I <sub>CQ</sub>	400	mAdc
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C
Operating Junction Temperature	T <sub>J</sub>	200	°C

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (1)	R <sub>θJC</sub>	4.5	°C/W

**ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)**

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

**OFF CHARACTERISTICS**

Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 10 mAdc, R <sub>BE</sub> = 75 Ω)	V <sub>(BR)CER</sub>	40	—	—	Vdc
Collector-Base Breakdown Voltage (I <sub>E</sub> = 10 mAdc, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	3.5	—	—	Vdc
Emitter-Base Breakdown Voltage (I <sub>C</sub> = 5 mAdc, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	50	—	—	Vdc
Collector-Emitter Leakage Current (V <sub>CE</sub> = 26 Vdc, R <sub>BE</sub> = 75 Ω)	I <sub>CER</sub>	—	—	5	mAdc

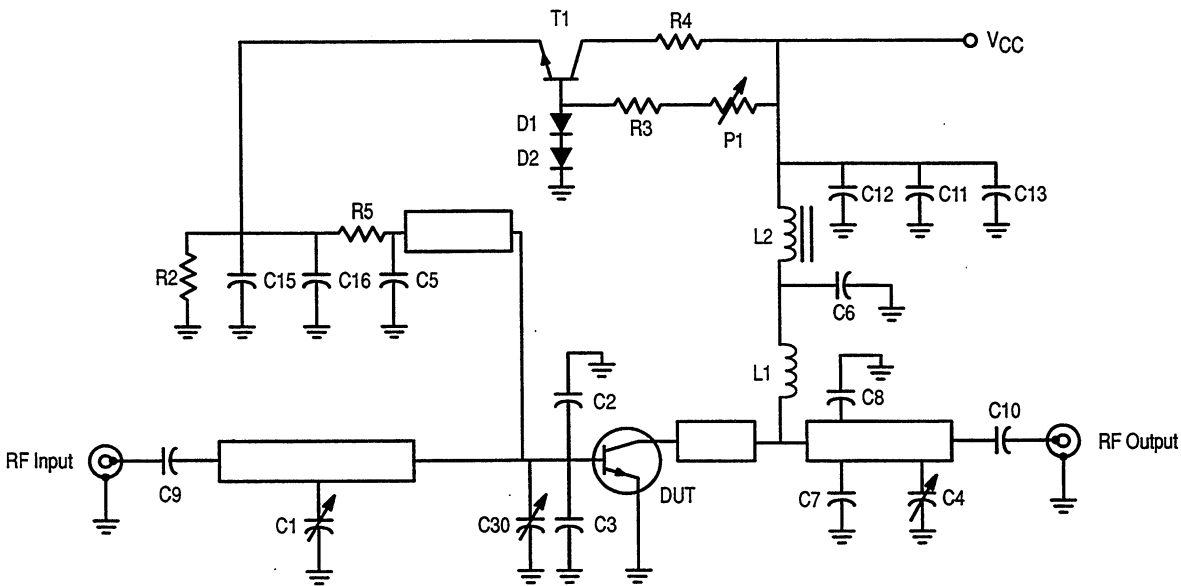
(1) Thermal resistance is determined under specified RF operating condition.

Teflon is a registered trademark of du Pont de Nemours & Co., Inc.



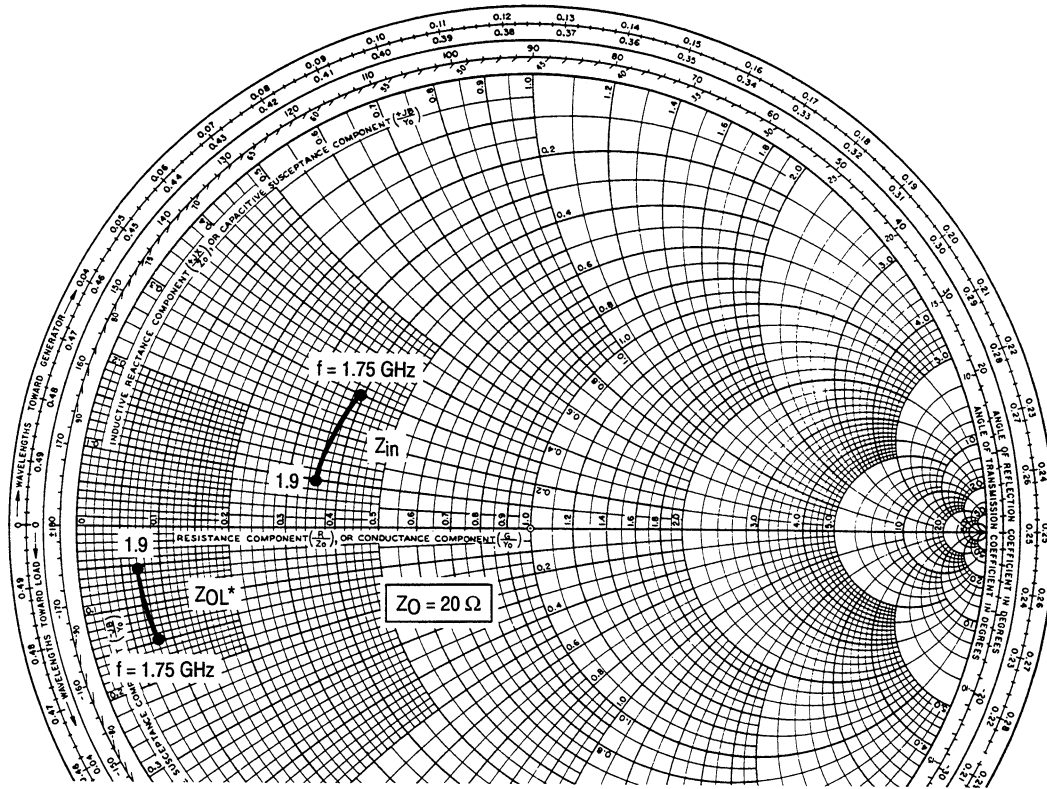
**ELECTRICAL CHARACTERISTICS — continued** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

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



- |          |                                       |        |                                      |
|----------|---------------------------------------|--------|--------------------------------------|
| 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 k $\Omega$ , Trimmer Resistor     |
| C7, C8   | 0.1 pF, Chip Capacitor, ATC 100A      | R2     | 56 $\Omega$ , Chip Resistor, 1206    |
| C9, C10  | 82 pF, Chip Capacitor, ATC 100A       | R3     | 1.2 k $\Omega$ , 1/4 W, 5%, Resistor |
| C11, C15 | 15 nF, Chip Capacitor, 0805           | R4     | 100 $\Omega$ , 3 W, Resistor         |
| C12, C16 | 330 pF, Chip Capacitor, 0805          | R5     | 2.2 $\Omega$ , Chip Resistor, 1206   |
| C13      | 4.7 $\mu\text{F}$ , 35 V, Capacitor   | T1     | Transistor, BD135                    |

**Figure 1. 1.80–1.88 GHz Test Circuit Electrical Schematic**



f (GHz)	Z <sub>in</sub> (Ω)	Z <sub>OL*</sub> (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<sub>OL\*</sub>: 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<sub>CC</sub> = 26 V, I<sub>CQ</sub> = 100 mA, P<sub>out</sub> = 12 W

### TYPICAL CHARACTERISTICS

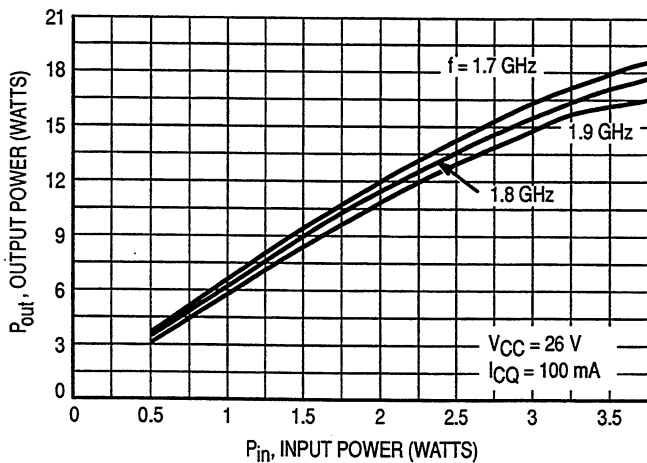


Figure 3. Output Power versus Input Power

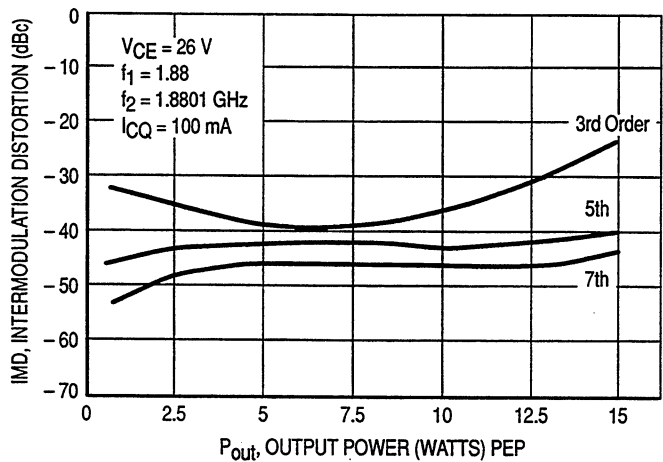


Figure 4. IMD versus Output Power

### TYPICAL CHARACTERISTICS

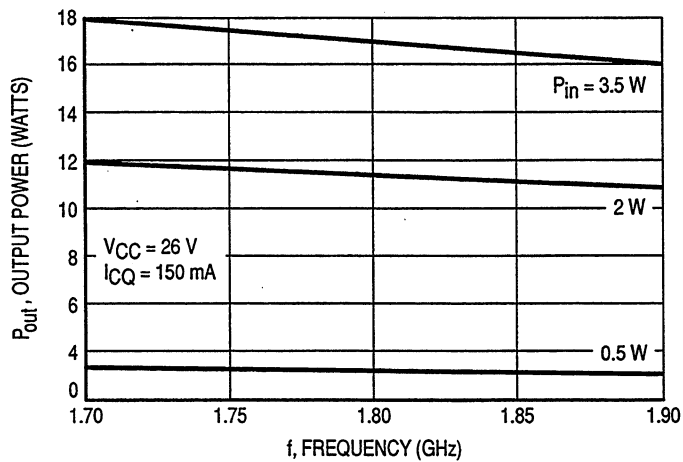
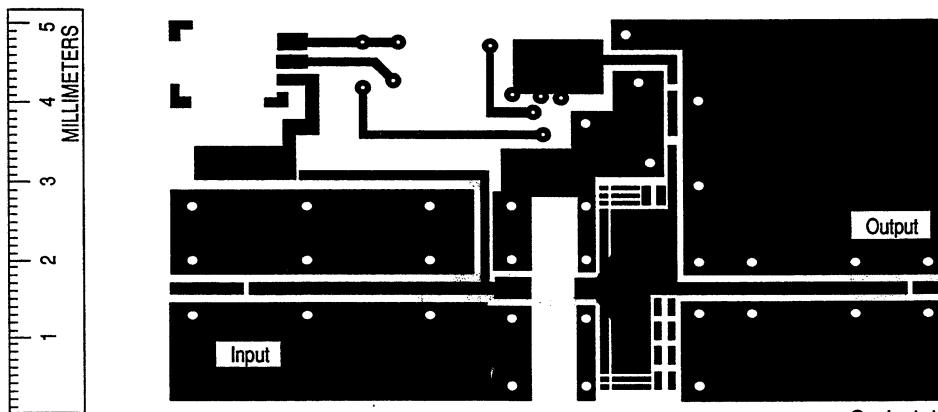


Figure 5. Output Power versus Frequency



Scale 1:1

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

Figure 6. Photomaster

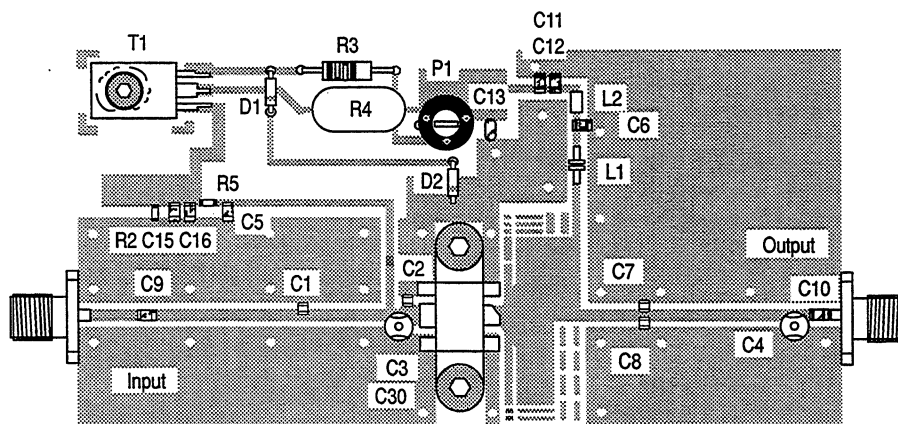
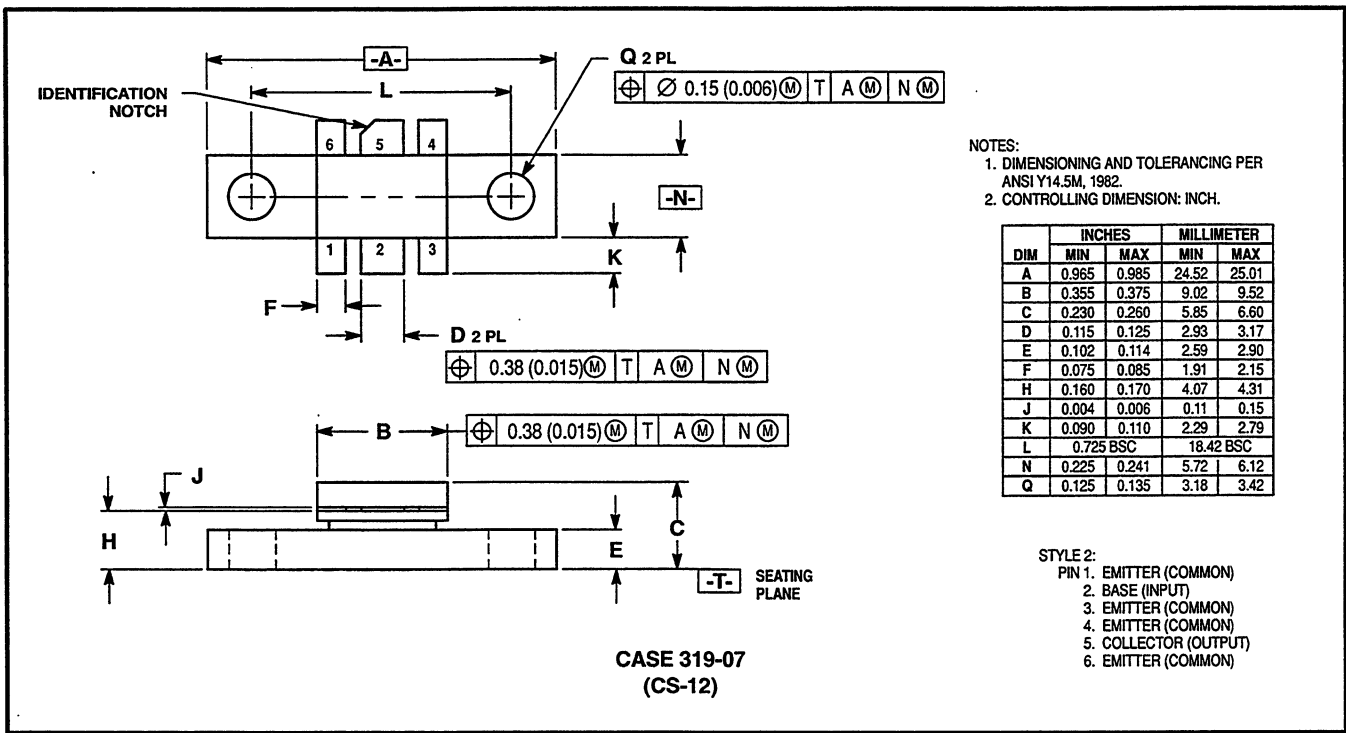


Figure 7. Components Layout

# OUTLINE DIMENSIONS




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)  
 2. BASE (INPUT)  
 3. EMITTER (COMMON)  
 4. EMITTER (COMMON)  
 5. COLLECTOR (OUTPUT)  
 6. EMITTER (COMMON)





Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

**Literature Distribution Centers:**

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141 Japan.

ASIA-PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.



**MOTOROLA**

2PHX33607Q-0 PRINTED IN USA (1994) MPS/POD RF YBACAA

MRF6406/D

