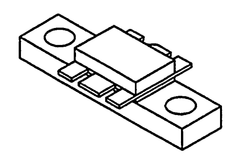
MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

Order this data sheet
by MRF6406/D

The RF Line
NPN Silicon
RF Power Transistor

MRF6406

12 W, 1.88 GHz
RF POWER TRANSISTOR
NPN SILICON



CASE 319
STYLE 2

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

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

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

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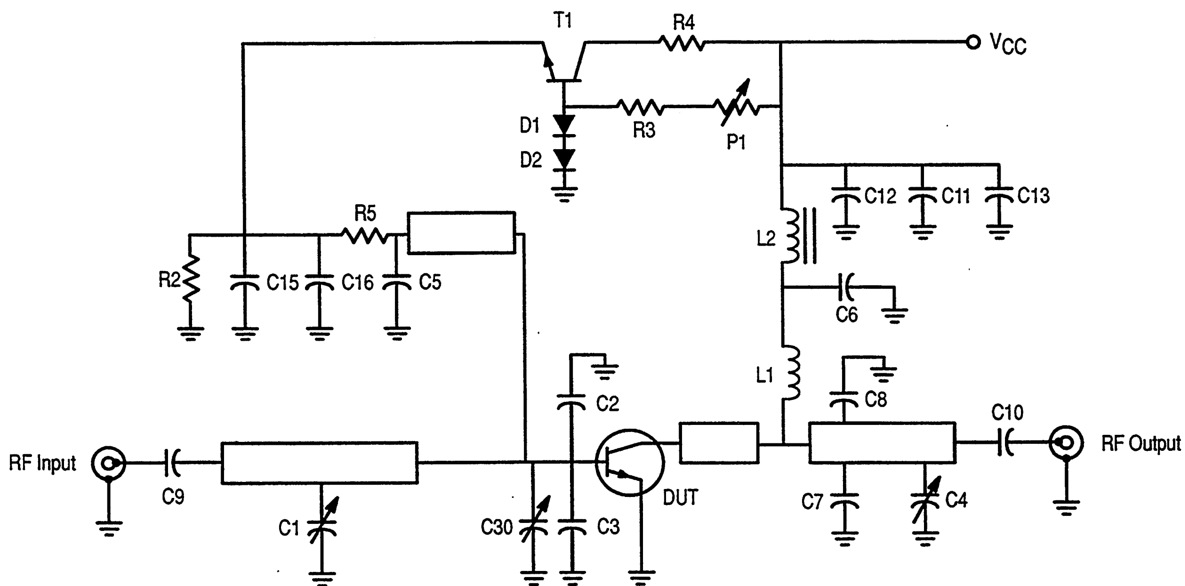
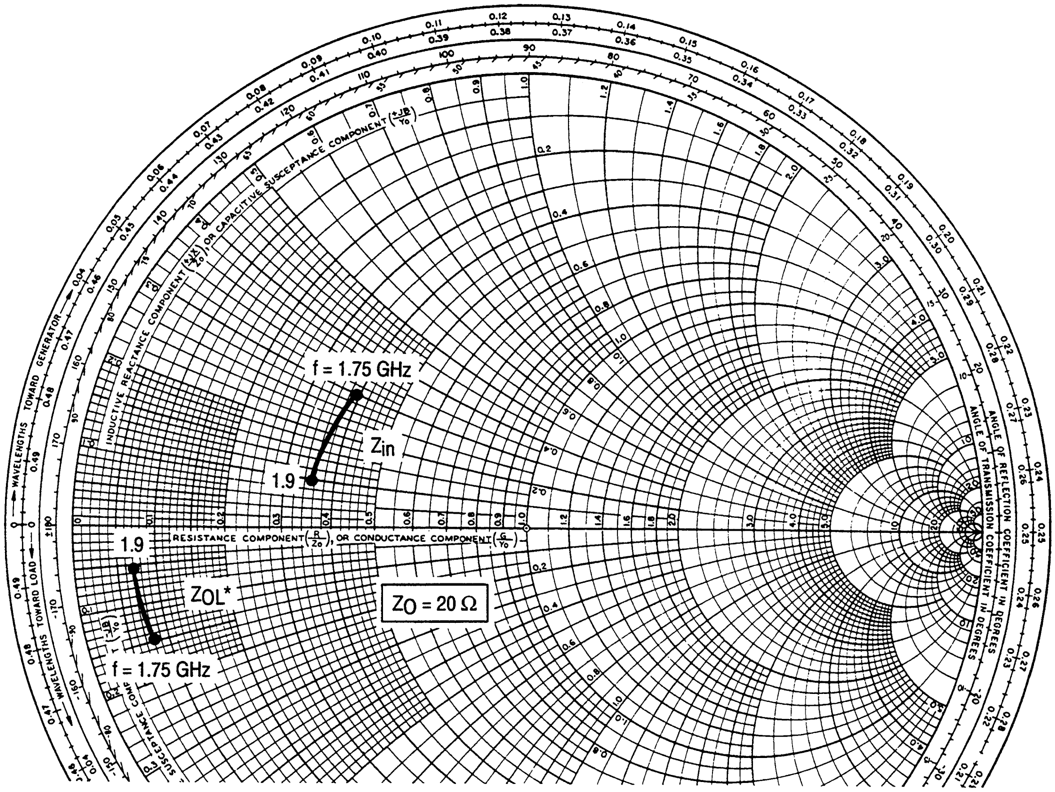
ELECTRICAL CHARACTERISTICS — continued (T_C = 25°C unless otherwise noted)

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			



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)	Zin (Ω)	ZOL* (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

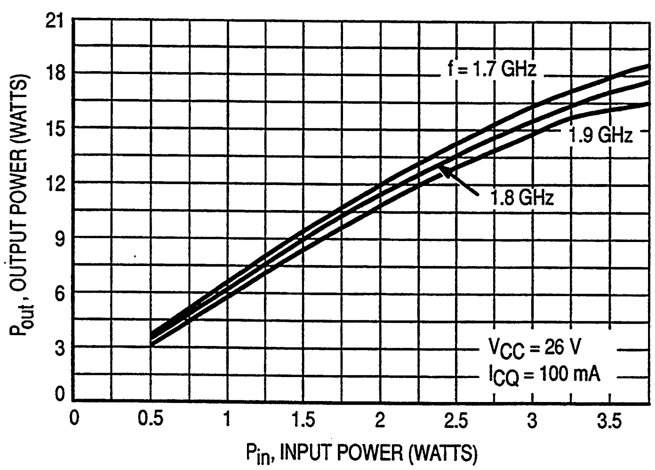


Figure 3. Output Power versus Input Power

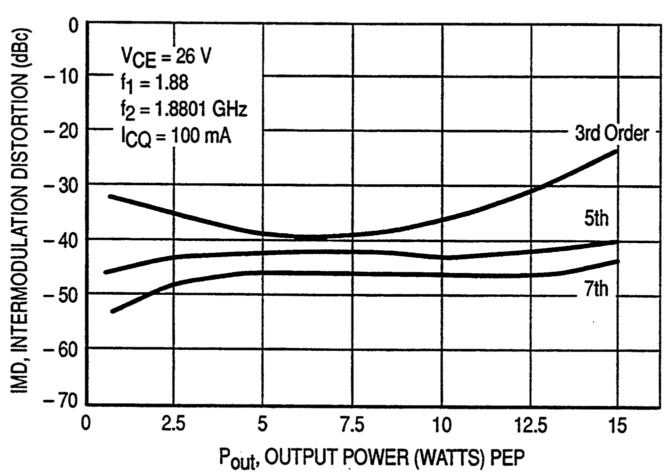


Figure 4. IMD versus Output Power

TYPICAL CHARACTERISTICS

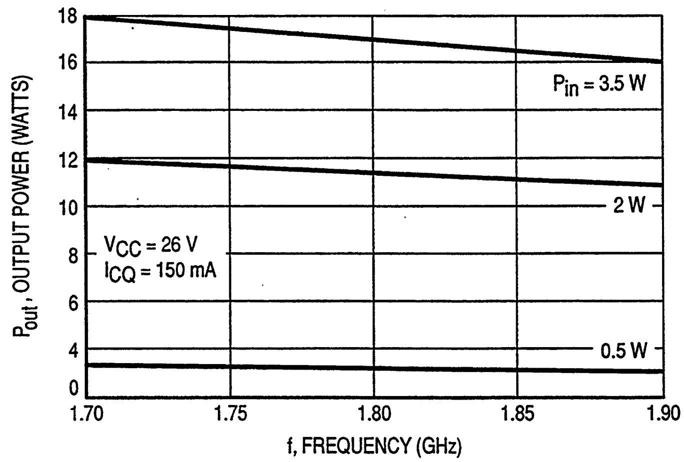
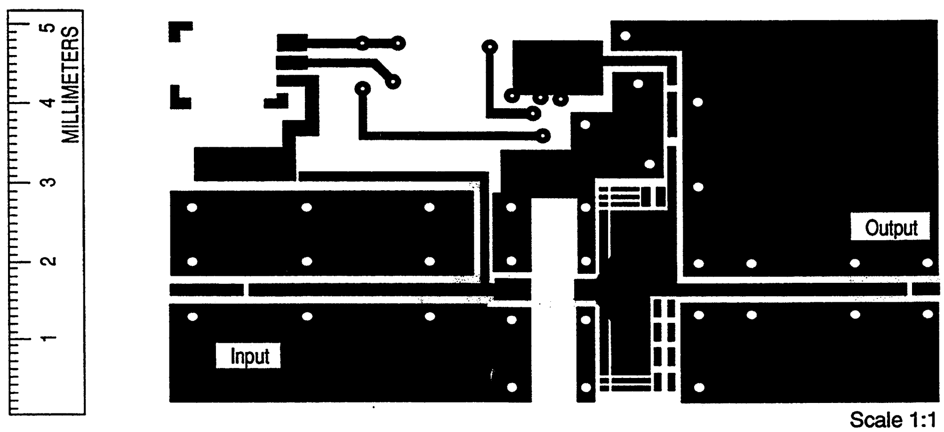


Figure 5. Output Power versus Frequency



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

Figure 6. Photomaster

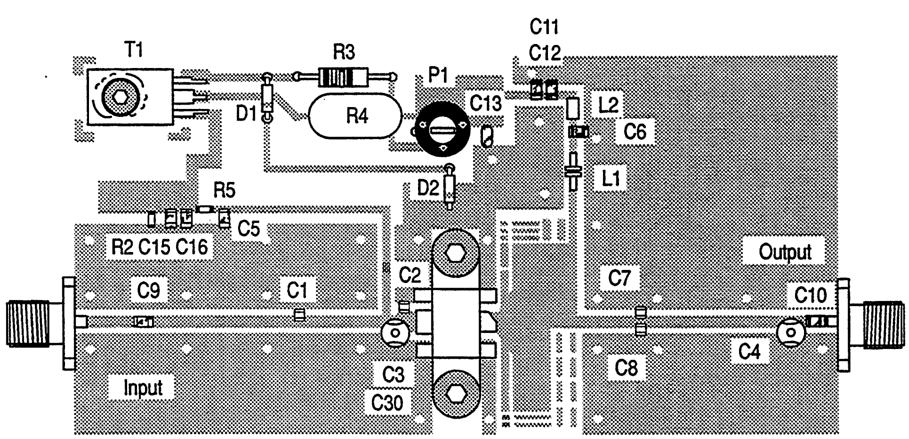
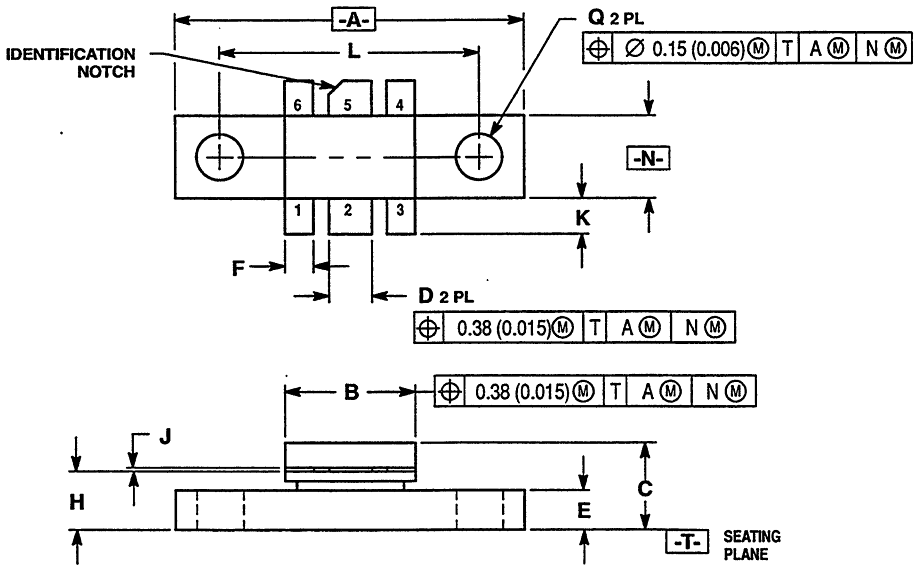


Figure 7. Components Layout

OUTLINE DIMENSIONS



CASE 319-07
(CS-12)

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

DIM	INCHES MIN	INCHES MAX	MILLIMETER MIN	MILLIMETER 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)

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