

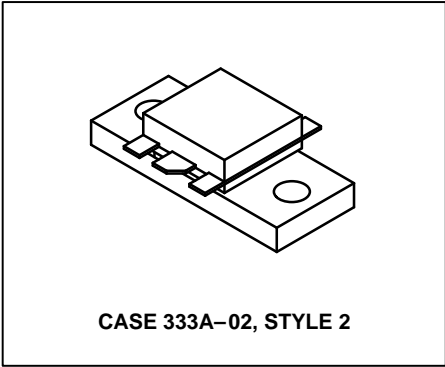
The RF Line  
**NPN Silicon**  
**RF Power Transistor**

**MRF6414**

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

The MRF6414 is designed for 26 volt UHF large signal, common emitter, class AB linear amplifier applications.

- Specified 26 Volt, 960 MHz Characteristics  
Output Power = 50 Watts  
Minimum Gain = 8.5 dB @ 960 MHz, Class AB  
Minimum Efficiency = 50% @ 960 MHz, 50 Watts
- Silicon Nitride Passivated
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Circuit Board Photomaster Available by Ordering Document MRF6414PHT/D from Motorola Literature Distribution.



**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	28	Vdc
Collector–Base Voltage	$V_{CBO}$	65	Vdc
Emitter–Base Voltage	$V_{EBO}$	4	Vdc
Collector–Current — Continuous	$I_C$	6	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	134 0.77	Watts W/ $^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.3	$^\circ\text{C}/\text{W}$

**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 ( $I_C = 20\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	28	—	—	Vdc
Collector–Base Breakdown Voltage ( $I_C = 20\text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	65	—	—	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 10\text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4	—	—	Vdc
Collector–Emitter Leakage Current ( $V_{CE} = 30\text{ Vdc}$ , $R_{BE} = 75\ \Omega$ )	$I_{CER}$	—	—	10	mAdc

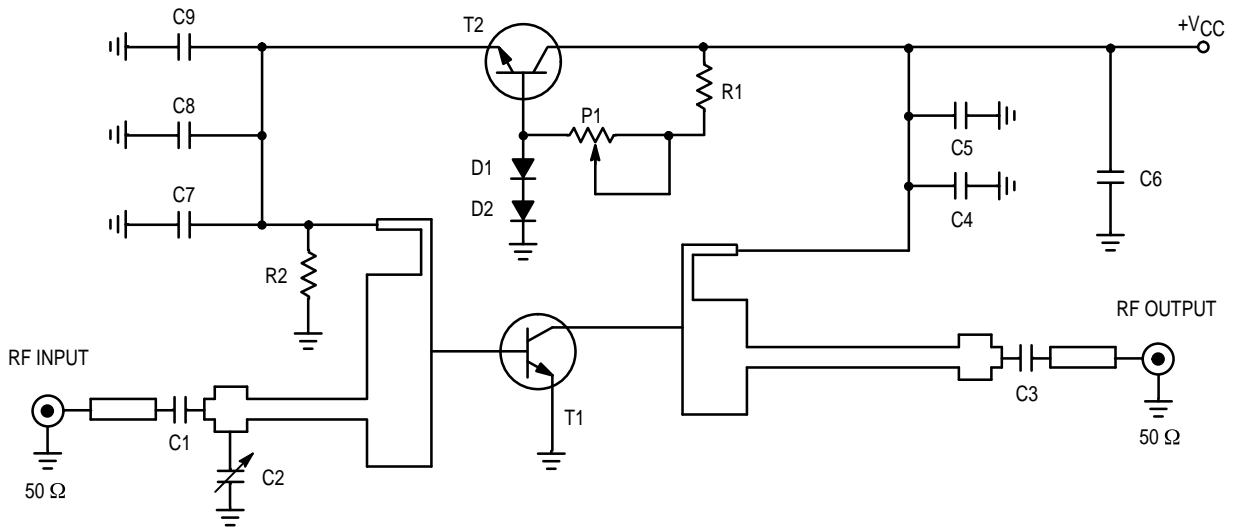
**ON CHARACTERISTICS**

DC Current Gain ( $I_{CE} = 1\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ )	$h_{FE}$	30	—	120	—
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**ELECTRICAL CHARACTERISTICS — continued** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance ( $V_{CB} = 26\text{ Vdc}$ , $I_E = 0$ , $f = 1\text{ MHz}$ ) (1)	$C_{ob}$	—	45	—	pF
<b>FUNCTIONAL TESTS</b>					
Common-Emitter Amplifier Power Gain ( $V_{CC} = 26\text{ Vdc}$ , $P_{out} = 50\text{ W}$ , $I_{CQ} = 200\text{ mA}$ , $f = 960\text{ MHz}$ )	$G_{pe}$	8.5	—	—	dB
Collector Efficiency ( $V_{CC} = 26\text{ Vdc}$ , $P_{out} = 50\text{ W}$ , $I_{CQ} = 200\text{ mA}$ , $f = 960\text{ MHz}$ )	$\eta$	50	55	—	%
Output Mismatch Stress ( $V_{CC} = 26\text{ Vdc}$ , $P_{out} = 50\text{ W}$ , $I_{CQ} = 200\text{ mA}$ , $f = 960\text{ MHz}$ ) VSWR = 3:1; all phase angles at frequency of test	$\Psi$	No Degradation in Output Power			

(1) For information only. It is not measurable in MRF6414 because of internal matching network.



C1, C3	100 pF, Chip Capacitor, Hight Q	P1	1 kΩ, Trimmer
C2, C7	330 pF, Chip Capacitor, 0805	R1	1 kΩ, Resistor
C5, C8	10 nF, Chip Capacitor, 0805	R2	58 Ω, Resistor, 0805
C6	15 μF, Capacitor, 63 V	T1	MRF6414
C9	100 μF, Capacitor, 16 V	T2	Transistor NPN Type BD135
D1, D2	Diode 1N4007		

**Figure 1. 960 MHz Test Circuit Schematic**

## TYPICAL CHARACTERISTICS

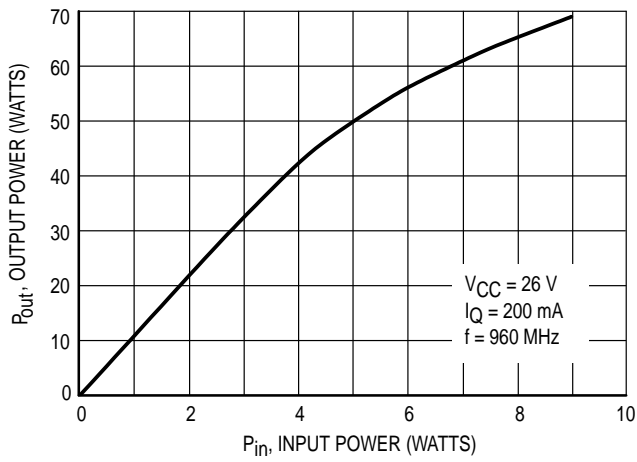


Figure 2. Output Power versus Input Power (Typical)

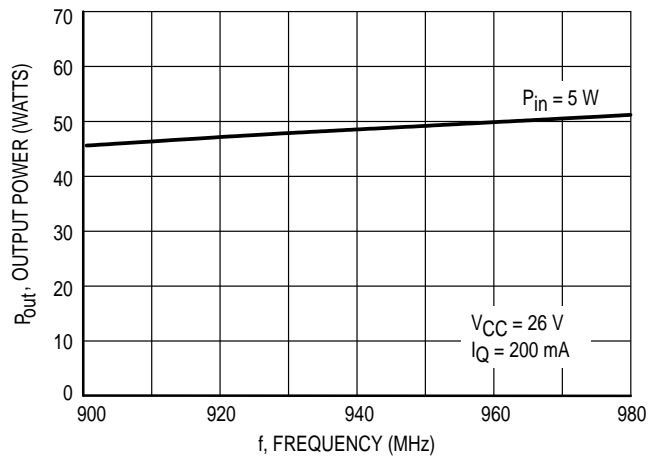


Figure 3. Output Power versus Frequency

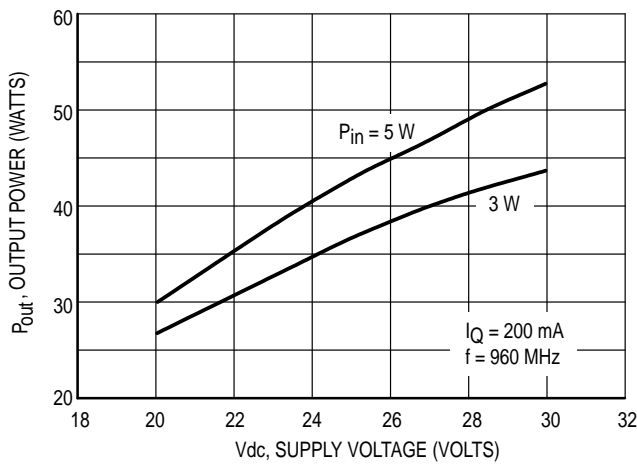


Figure 4. Output Power versus Supply Voltage

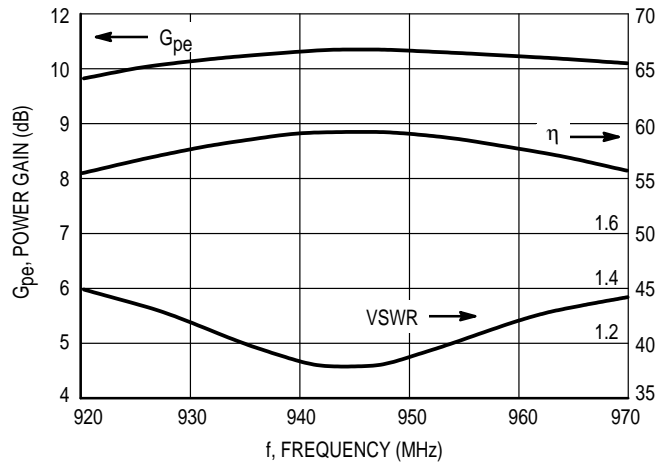


Figure 5. Typical Broadband Amplifier

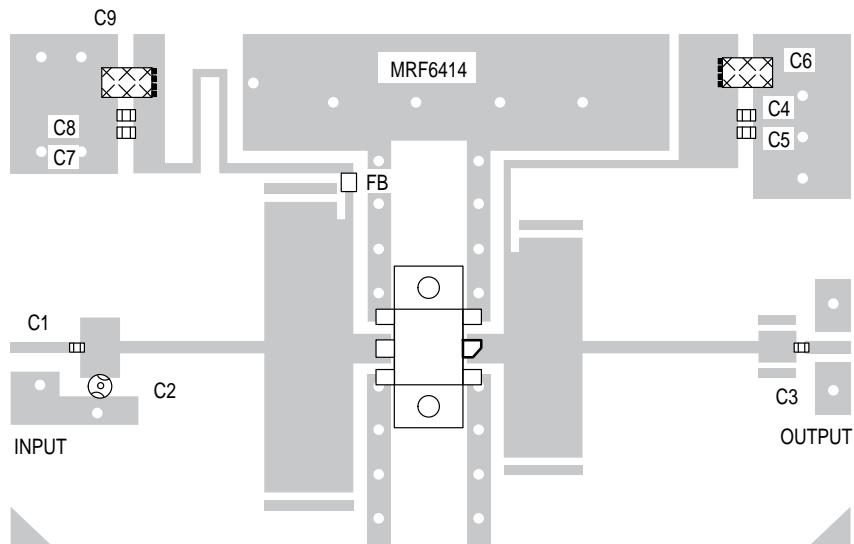
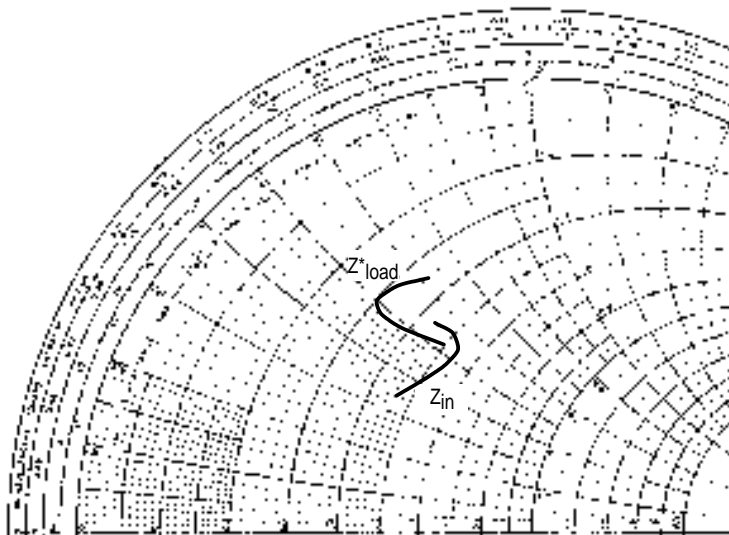


Figure 6. 960 MHz Test Circuit Components Layout



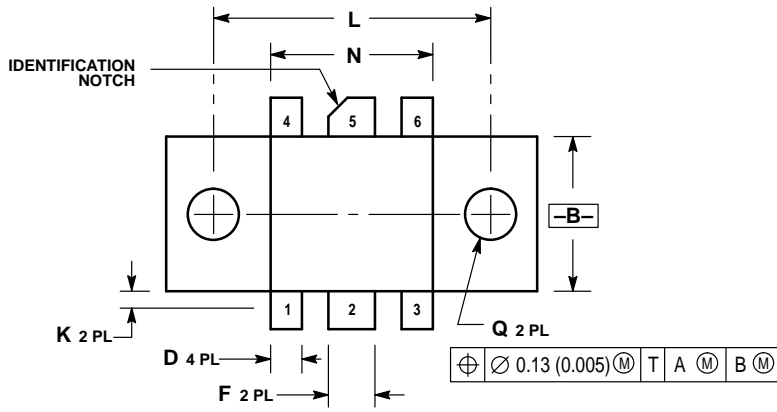
Normalized to 10  $\Omega$

f MHz	$Z_{in}$ Ohms	$Z_{OL}^*$ Ohms
900	4.4 + j4.6	4.7 + j4.7
935	5.1 + j4.8	4.0 + j3.9
960	5.4 + j3.6	3.7 + j4.5
980	4.7 + j2.5	3.4 + j4.7

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

Figure 7. Input and Output Impedances with Circuit Tuned for Maximum Gain  
@  $V_{CC} = 26$  V,  $I_Q = 200$  mA,  $P_{out} = 50$  W

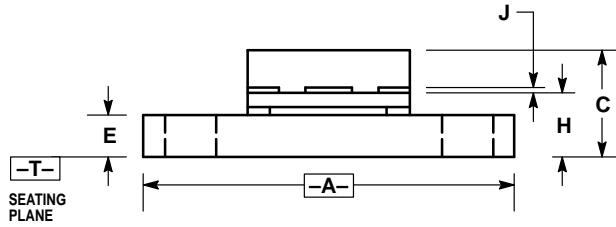
# PACKAGE DIMENSIONS




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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.965	0.985	24.52	25.01
B	0.390	0.410	9.91	10.41
C	0.250	0.290	6.35	7.36
D	0.075	0.090	1.91	2.28
E	0.095	0.115	2.42	2.92
F	0.110	0.130	2.80	3.30
H	0.155	0.175	3.94	4.44
J	0.004	0.006	0.11	0.15
K	0.090	0.116	2.29	2.94
L	0.725 BSC		18.41 BSC	
N	0.415	0.435	10.55	11.04
Q	0.120	0.135	3.05	3.42

- STYLE 2:  
 PIN 1. EMITTER  
 2. BASE  
 3. EMITTER  
 4. EMITTER  
 5. COLLECTOR  
 6. EMITTER



**CASE 333A-02  
 ISSUE C**

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MRF6414/D

