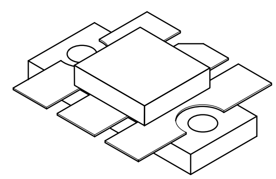
The RF Line
NPN Silicon RF Power Transistor

MRF338

Designed primarily for wideband large–signal output and driver amplifier stages in the 400 to 512 MHz frequency range.

- Specified 28 Volt, 470 MHz Characteristics
  Output Power = 80 Watts
  Minimum Gain = 7.3 dB
  Efficiency = 50% (Min)
- Built–In Matching Network for Broadband Operation
- 100% Tested for Load Mismatch at all Phase Angles with 30:1 VSWR
- Gold Metallization System for High Reliability Applications

**80 W, 400 to 512 MHz
CONTROLLED “Q”
BROADBAND RF POWER
TRANSISTOR
NPN SILICON**



CASE 333–04, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	30	Vdc
Collector–Base Voltage	V_{CBO}	60	Vdc
Emitter–Base Voltage	V_{EBO}	4	Vdc
Collector Current — Continuous — Peak	I_C	9 12	Adc
Total Device Dissipation @ T_C = 25°C (1) Derate above 25°C	P_D	250 1.43	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	0.7	°C/W

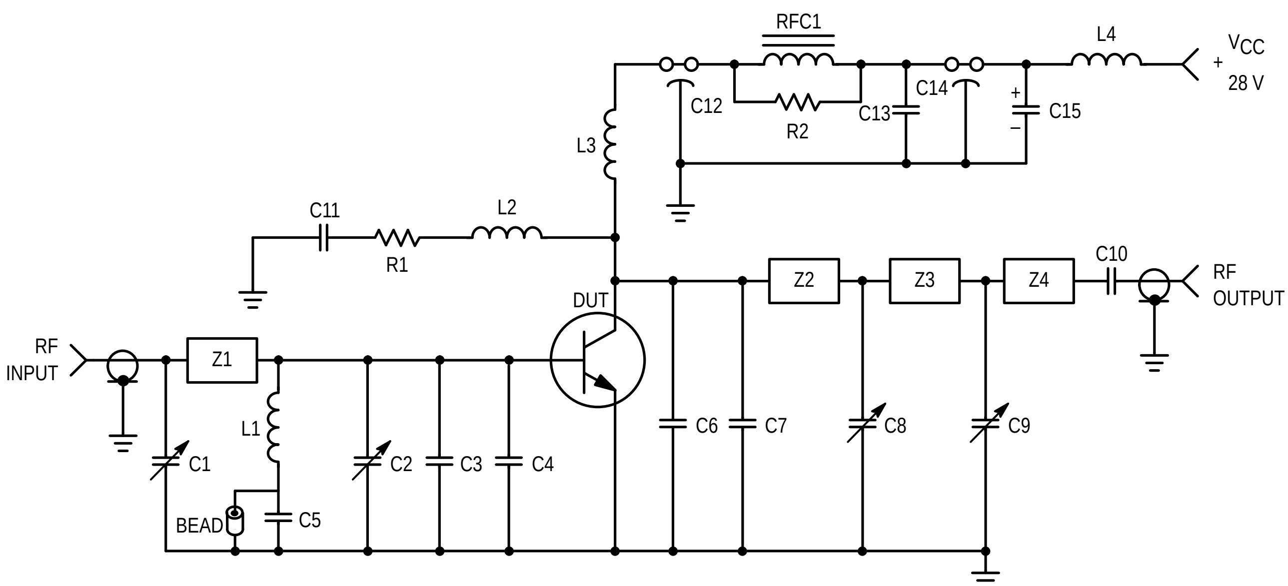
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = 80 mAdc, I_B = 0)	$V_{(BR)CEO}$	30	—	—	Vdc
Collector–Emitter Breakdown Voltage (I_C = 80 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	60	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 8 mAdc, I_C = 0)	$V_{(BR)EBO}$	4	—	—	Vdc

(1) This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.
(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Base Breakdown Voltage (I_C = 80 mAdc, I_E = 0)	$V_{(BR)CBO}$	60	—	—	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	—	—	5	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 4 Adc, V_{CE} = 5 Vdc)	h_{FE}	20	—	80	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 28 Vdc, I_E = 0, f = 1 MHz)	C_{ob}	—	95	125	pF
FUNCTIONAL TESTS (Figure 1)					
Common–Emitter Amplifier Power Gain (V_{CC} = 28 Vdc, P_{out} = 80 W, f = 470 MHz)	G_{PE}	7.3	8.8	—	dB
Collector Efficiency (V_{CC} = 28 Vdc, P_{out} = 80 W, f = 470 MHz)	η	50	60	—	%
Load Mismatch (V_{CC} = 28 Vdc, P_{out} = 80 W, f = 470 MHz, VSWR = 30:1, All Phase Angles at Frequency of Test)	ψ	No Degradation in Output Power			



Bead	Ferroxcube #56–590–65/3B	L3	3 Turns #18 AWG, 0.185″ ID, Close Wound
C1, C2, C8, C9	0.8 – 20 pF, Johanson (JMC 5501)	L4	4 Turns #18 AWG, 0.185″ ID, Close Wound
C3, C4, C6, C7	25 pF, 100 V, Underwood	RFC1	Ferroxcube VK200 19/4B
C5, C10	100 pF, 100 V, Underwood	R1, R2	10 Ω, 2.0 Watt Carbon
C11, C13	0.1 µF, Erie Redcap	Z1	0.190″ W x 2.5″ L, Microstrip Lin
C12, C14	680 pF, Feedthru	Z2	0.190″ W x 0.289″ L, Microstrip Line
C15	1.0 µF, Tantalum	Z3	0.190″ W x 0.55″ L, Microstrip Line
L1	0.15 µH, Molded Choke	Z4	0.190″ W x 0.325″ L, Microstrip Line
L2	5 Turns #20 AWG, 0.185″ ID, Close Wound	Board	Glass Teflon, t = 0.062″, ε_r = 2.56

Figure 1. 470 MHz Test Circuit

TYPICAL CHARACTERISTICS

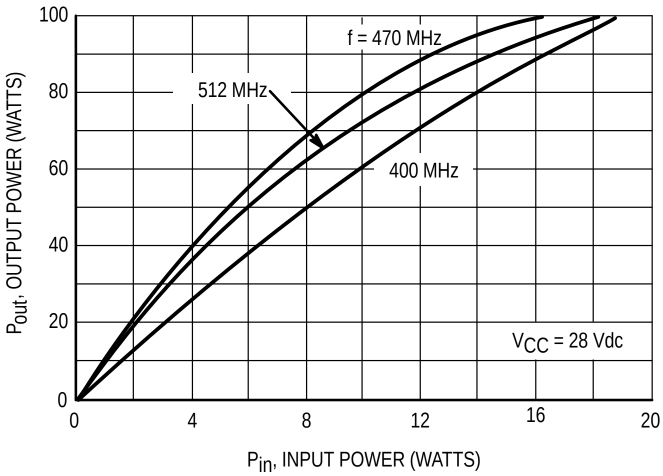


Figure 2. Output Power versus Input Power

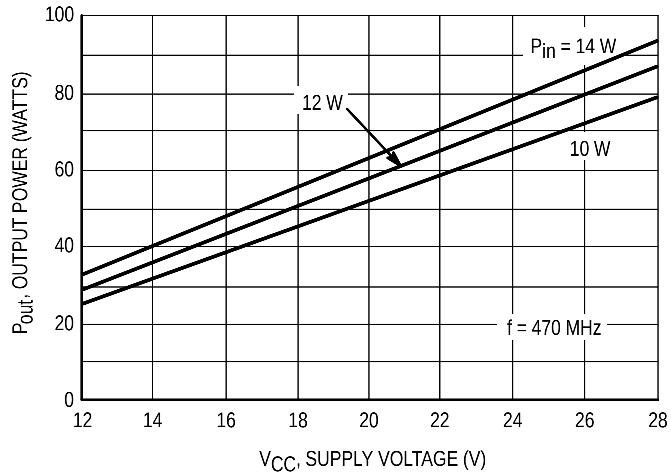


Figure 3. Output Power versus Supply Voltage

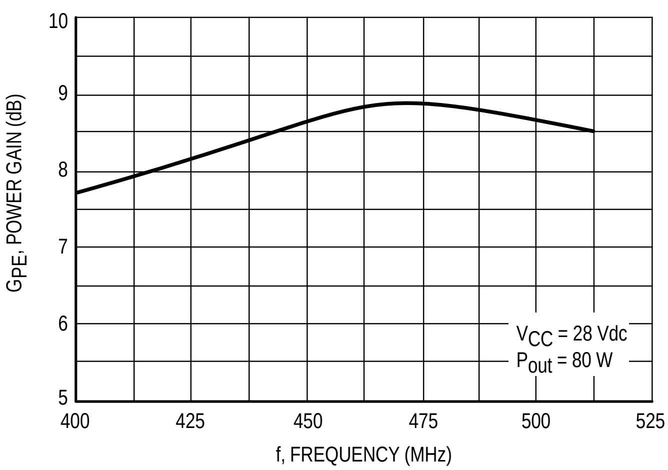


Figure 4. Power Gain versus Frequency

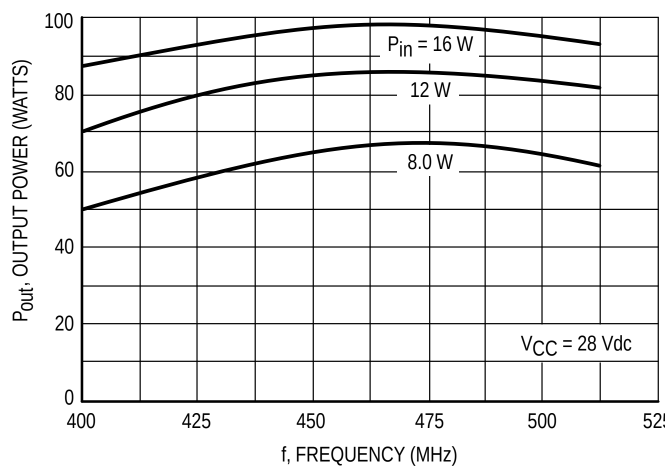
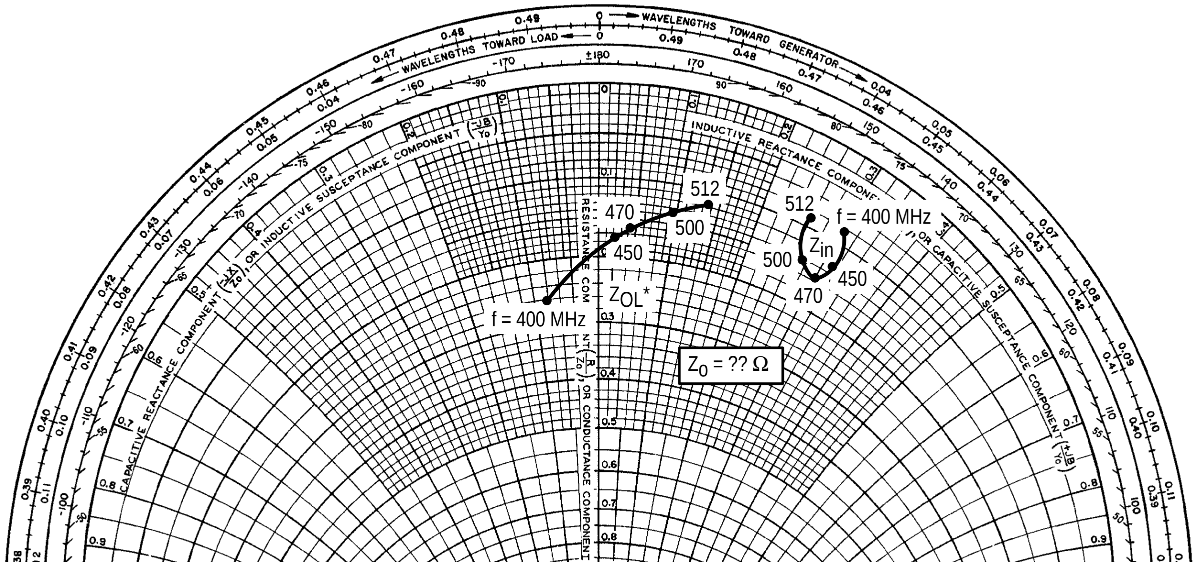


Figure 5. Output Power versus Frequency

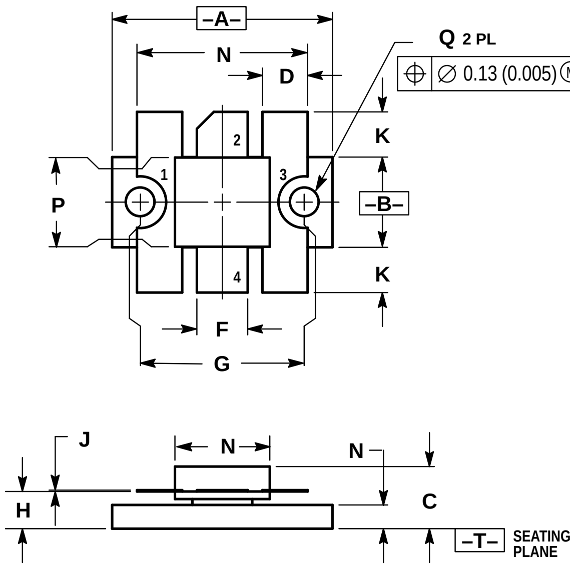


V_{CC} = 28 V, P_{out} = 80 W		
f MHz	Z_{in} Ohms	Z_{OL}* Ohms
512	0.91 + j2.61	1.19 + j1.34
500	1.47 + j2.71	1.33 + j0.96
470	1.53 + j2.98	1.60 + j0.45
450	1.27 + j3.09	1.70 + j0.25
400	0.86 + j3.01	2.58 – j0.79

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

Figure 6. Series Equivalent Input/Output Impedance

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	24.51	25.02
B	0.390	0.410	9.91	10.41
C	0.250	0.290	6.73	7.36
D	0.190	0.210	4.83	5.33
E	0.095	0.115	2.42	2.92
F	0.215	0.235	5.47	5.96
G	0.725 BSC		18.42 BSC	
H	0.155	0.175	3.94	4.44
J	0.004	0.006	0.10	0.15
K	0.195	0.205	4.95	5.21
L	0.740	0.770	18.80	19.55
N	0.415	0.425	10.54	10.80
P	0.390	0.400	9.91	10.16
Q	0.120	0.135	3.05	3.42

STYLE 1:
PIN 1. EMITTER
2. COLLECTOR
3. EMITTER
4. BASE

CASE 333–04
ISSUE E

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