MOTOROLA

MRF466

The RF Line

3

NPN SILICON RF POWER TRANSISTOR

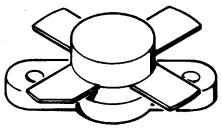
. . . designed primarily for applications as a high-power amplifier from 2.0 to 30 MHz, in single sideband mobile, marine and base station equipment.

- Specified 28 V, 30 MHz Characteristics —
  Output Power = 40 W PEP or CW
  Minimum Gain = 15 dB
  Efficiency = 40%
  Intermodulation Distortion d_3 = -30 dB Max
- Guaranteed Ruggedness
- 2N5941 Replacement

40 W (PEP) 30 MHz

RF POWER TRANSISTOR

NPN SILICON



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	35	Vdc
Collector-Base Voltage	V_{CBO}	65	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	6.0	Adc
Total Device Dissipation @ T_C = 25°C (1) Derate above 25°C	P_D	175 1.0	Watts W/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

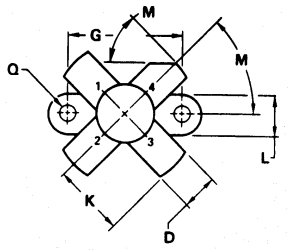
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	1.0	°C/W

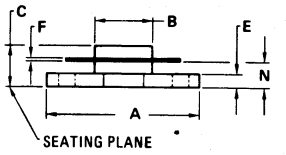
(1) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.
(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

MATCHING PROCEDURE

In the push-pull circuit configuration it is preferred that the transistors are used as matched pairs to obtain optimum performance.

The matching procedure used by Motorola consists of measuring h_{FE} at the data sheet conditions and color coding the device to predetermined h_{FE} ranges within the normal h_{FE} limits. A color dot is added to the marking on top of the cap. Any two devices with the same color dot can be paired together to form a matched set of units.





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

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	24.64	24.89	0.970	0.980
B	9.40	9.91	0.370	0.390
C	5.82	7.14	0.229	0.281
D	5.46	5.97	0.215	0.235
E	2.29	2.79	0.090	0.110
F	0.08	0.18	0.003	0.007
G	18.29	18.54	0.720	0.730
K	11.05	–	0.435	–
L	6.22	6.48	0.245	0.255
M	45° NOM		45° NOM	
N	3.81	4.57	0.150	0.180
Q	2.87	3.30	0.113	0.130

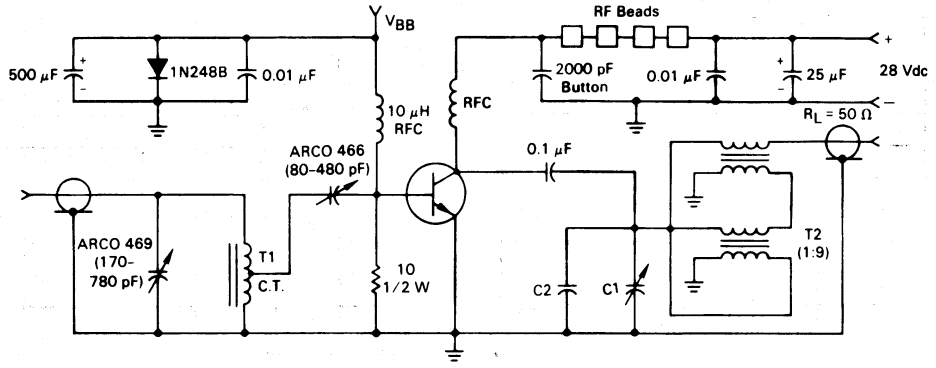
CASE 211-09

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 100 mAdc, I_B = 0)	BV_{CEO}	35	—	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 100 mAdc, V_{BE} = 0)	BV_{CES}	65	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 1.0 mADC, I_C = 0)	BV_{EBO}	4.0	—	—	Vdc
Collector Cutoff Current (V_{CE} = 28 Vdc, V_{BE} = 0)	I_{CES}	—	—	5.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.5 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	10	40	80	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 28 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	—	125	200	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 28 Vdc, P_{out} = 40 W (PEP), f1 = 30 MHz, f2 = 30.001 MHz, I_{CQ} = 20 mA)	G_{PE}	15	19	—	dB
Collector Efficiency (V_{CC} = 28 Vdc, P_{out} = 40 W (PEP), f1 = 30 MHz f2 = 30.001 MHz, I_{CQ} = 20 mA)	η	40	—	—	%
Intermodulation Distortion (1) (V_{CC} = 28 Vdc, P_{out} = 40 W (PEP), f1 = 30 MHz, f2 = 30.001 MHz, I_{CQ} = 20 mA)	$IMD_{(d_3)}$	—	-40	-30	dB
Load Mismatch (V_{CC} = 28 Vdc, P_{out} = 40 W (PEP), f = 30 MHz, VSWR = 30:1 All Angles)	—	No Degradation in Poutput Power			

(1) To MIL-STD-1311 Version A, Test Method 2204B, Two Tone, Reference Each Tone.

FIGURE 1 – 30 MHz TEST CIRCUIT



RFC: 20 Turns #18 AWG Enameled Wire Close Wound in 2 Layers, 1/4" I.D.

T1: 20 Turns #24 AWG Wire Wound on Micro Metals T37-7 Toroid Core Center Tapped.

T2: 1:9 XFMR; 6 Turns of 2 Twisted Pairs of #28 AWG Enameled Wire (8 Crests per Inch) Bifilar Wound on each of 2 Separate Balun Cores.
(Stackpole #57-1503 No. 14 Material) Interconnected as shown.

RF BEADS: Ferroxcube #56-590-65/3B

V_{BB} adjusted for I_{CQ}: 20 mAdc (I_{CQ} = Quiescent Collector Current)

C1 — 80-480 pF, ARCO 466 or Equiv

C2 — 220 pF

FIGURE 2 — OUTPUT POWER versus INPUT POWER

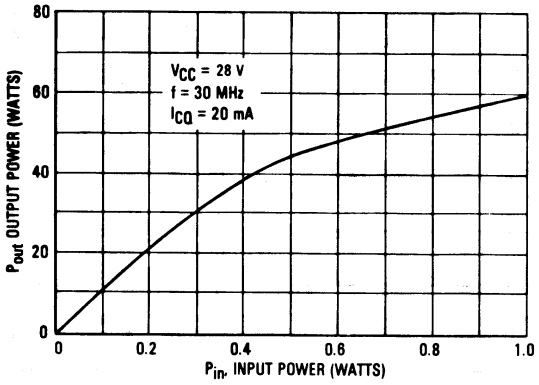


FIGURE 3 — POWER GAIN versus FREQUENCY

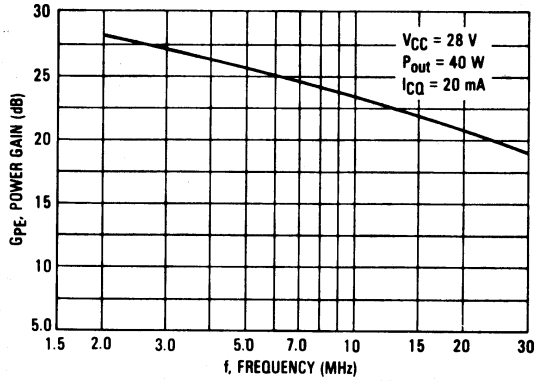


FIGURE 4 — OUTPUT POWER versus SUPPLY VOLTAGE

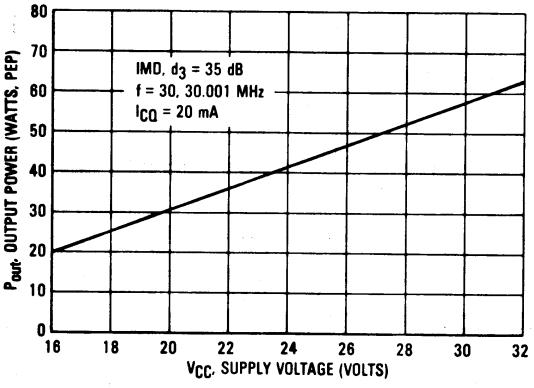


FIGURE 5 — INTERMODULATION DISTORTION versus OUTPUT POWER

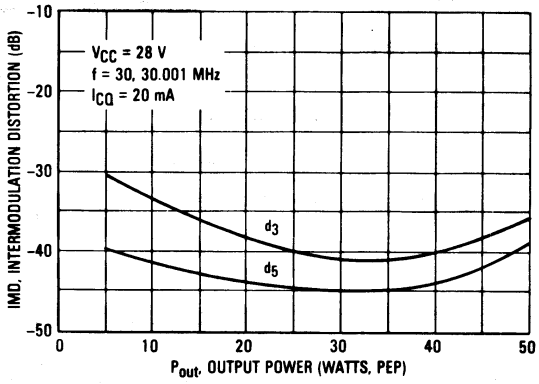


FIGURE 6 — OUTPUT CAPACITANCE versus FREQUENCY

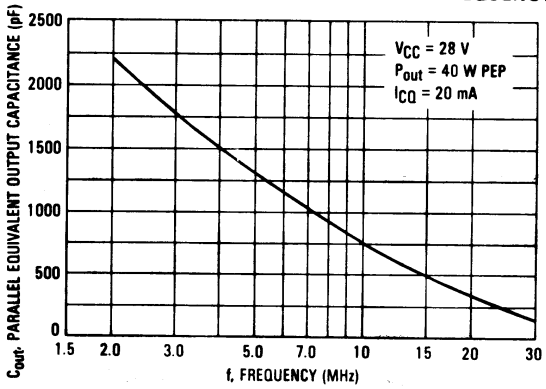


FIGURE 7 — OUTPUT RESISTANCE versus FREQUENCY

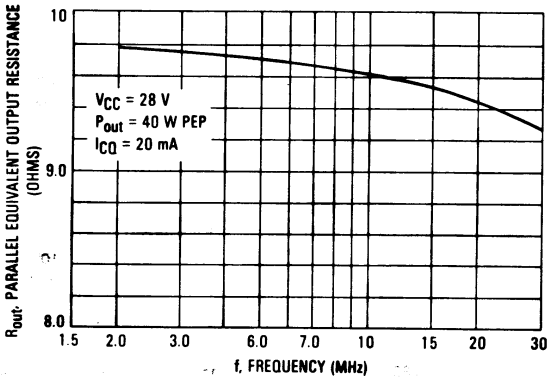


FIGURE 8 — SAFE OPERATING AREA

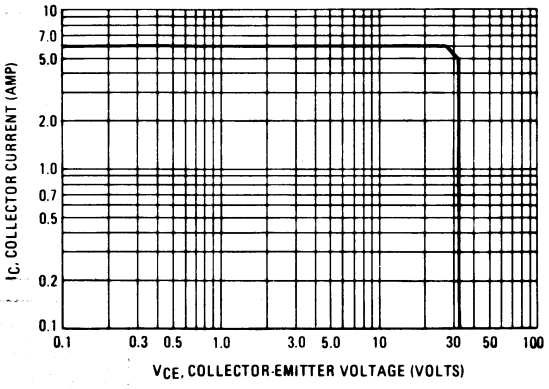
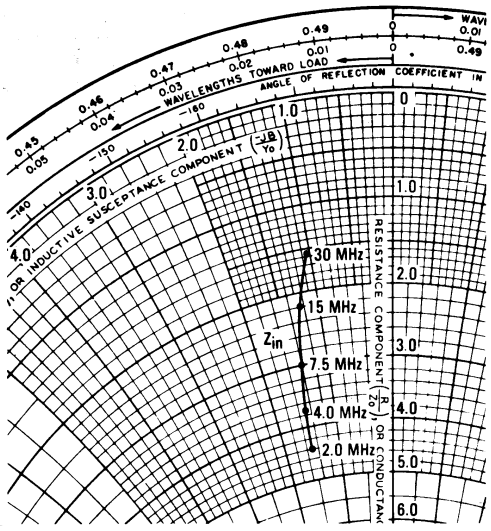


FIGURE 9 — SERIES INPUT IMPEDANCE



V_{CC} = 28 V
I_{CQ} = 20 mA
P_{out} = 40 W (PEP)

f MHz	Z_{in} Ohms
30	1.58 – j1.04
15	2.20 – j1.24
7.5	3.00 – j1.38
4.0	3.70 – j1.45
2.0	4.40 – j1.51