MOTOROLA

MRF463

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The RF Line

80 W (PEP) – 30 MHz

RF POWER TRANSISTOR

NPN SILICON

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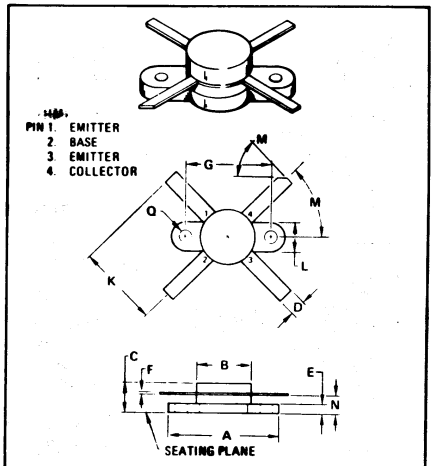
. . . designed primarily for applications as a high-power linear amplifier from 2.0 to 30 MHz, in single sideband mobile, marine and base station equipment.

- Specified 28 Volt, 30 MHz Characteristics –
  - Output Power = 80 W (PEP)
  - Minimum Gain = 15 dB
  - Efficiency = 40%
  - Intermodulation Distortion = -32 dB (Max)
- Motorola Improved Single Die Replacement for 2N5942



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	24.64	24.89	0.970	0.980
B	11.81	12.95	0.465	0.510
C	5.82	6.98	0.229	0.275
D	2.16	3.94	0.085	0.155
E	2.13	2.79	0.084	0.110
F	0.08	0.18	0.003	0.007
G	18.29	18.54	0.720	0.730
K	17.78	–	0.700	–
L	6.22	6.48	0.245	0.255
M	45° NOM		45° NOM	
N	3.66	4.52	0.144	0.178
Q	2.92	3.30	0.115	0.130

CASE 211-10

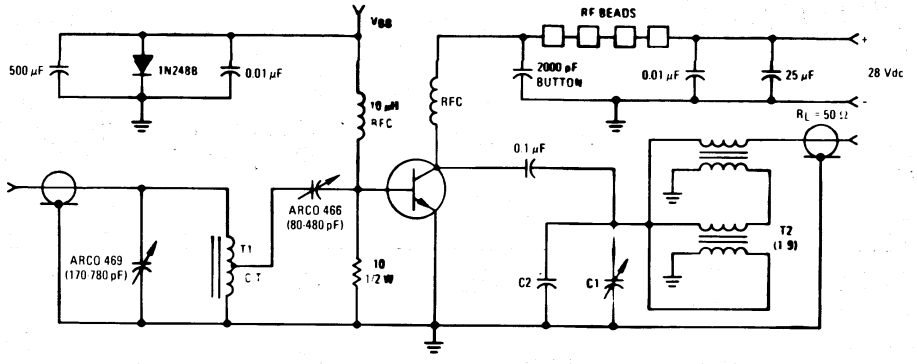
MAXIMUM RATINGS

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	10	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	250 1.4	Watts W/°C
Storage Temperature Range	T_{stg}	-65 to +200	°C

THERMAL CHARACTERISTICS

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

FIGURE 1–30 MHz TEST CIRCUIT



RFC: 20 TURNS #12 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 CREST 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} 40 mAdc (I_{CQ} = Quiescent Collector Current)

C1 – 170-780 pF ARCO 469 or Equiv.

C2 – 330 pF

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

Characteristic	Symbol	Min	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, T_C = +55°C)	I_{CES}	–	10	mAdc
ON CHARACTERISTICS				
DC Current Gain (I_C = 0.5 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	10	–	–
DYNAMIC CHARACTERISTICS				
Output Capacitance (V_{CB} = 28 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	200	pF
FUNCTIONAL TEST				
Common-Emitter Amplifier Power Gain (Figure 1) (P_{out} = 80 W (PEP), I_C = 3.6 Adc (Max), V_{CC} = 28 Vdc, f_1 = 30 MHz, f_2 = 30.001 MHz)	G_{PE}	15	–	dB
Intermodulation Distortion Ratio (Figure 1) (P_{out} = 80 W (PEP), I_C = 3.6 Adc (Max), V_{CC} = 28 Vdc, f_1 = 30 MHz, f_2 = 30.001 MHz)	IMD	–	-32	dB
Collector Efficiency (P_{out} = 80 W (PEP), I_C = 3.6 Adc (Max), V_{CC} = 28 Vdc, f_1 = 30 MHz, f_2 = 30.001 MHz)	η	40	–	%

MATCHING PROCEDURE

In the push-pull circuit configuration two device parameters are critical for optimum circuit performance. These parameters are $V_{BE(on)}$ and h_{FE}. Both parameters can be guaranteed by measuring I_{CQ} of the devices and selecting pairs with a $\triangle I_{CQ} \leq$ 10 mAdc.

Actual I_{CQ} matching is performed in the MRF463 test circuit with a V_{CE} equal to 28 Volts. The base bias supply is adjusted to set I_{CQ} equal to 40 mAdc using a reference standard MRF463. The I_{CQ} of all production MRF463 transistors is measured using this base bias supply setting. The production MRF463's are tested and categorized in ranges of 10 mAdc. Finally, the devices are stocked as pairs with a guaranteed $\triangle I_{CQ} \leq$ 10 mAdc.

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FIGURE 2 – OUTPUT POWER versus INPUT POWER

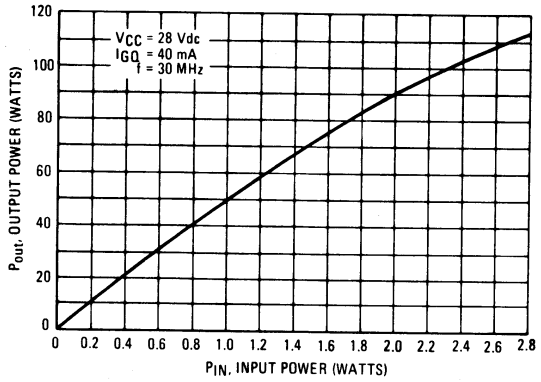


FIGURE 3 – POWER GAIN versus FREQUENCY

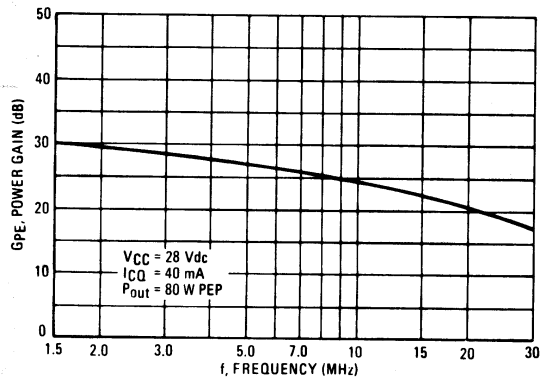


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE

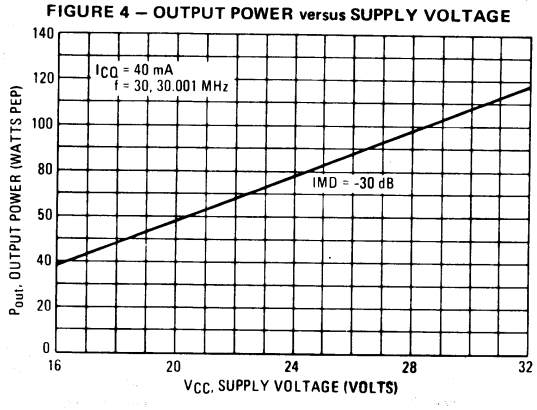


FIGURE 5 – INTERMODULATION DISTORTION versus OUTPUT POWER

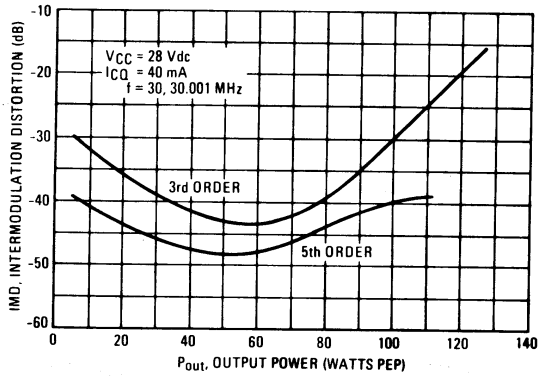


FIGURE 6 – OUTPUT CAPACITANCE versus FREQUENCY

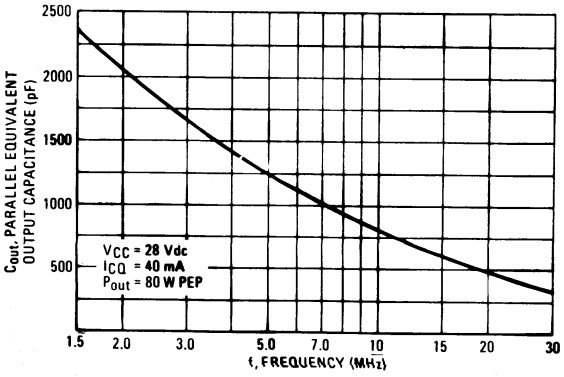


FIGURE 7 – OUTPUT RESISTANCE versus FREQUENCY

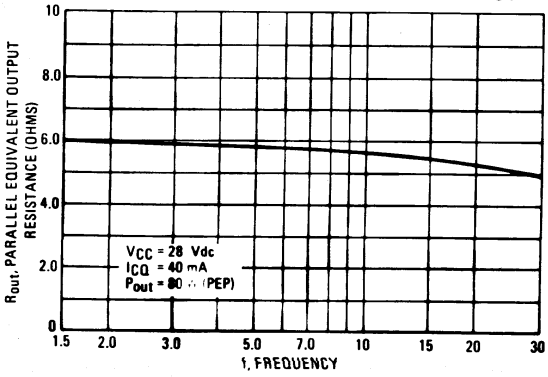


FIGURE 8 – DC SAFE OPERATING AREA

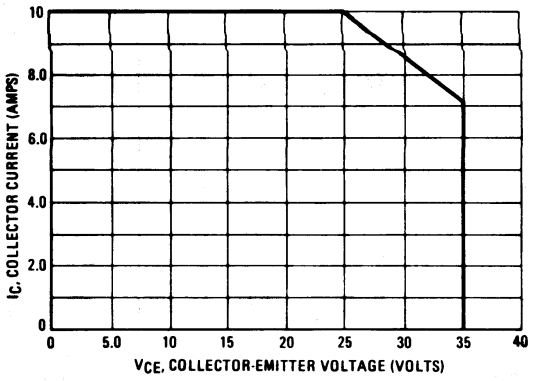
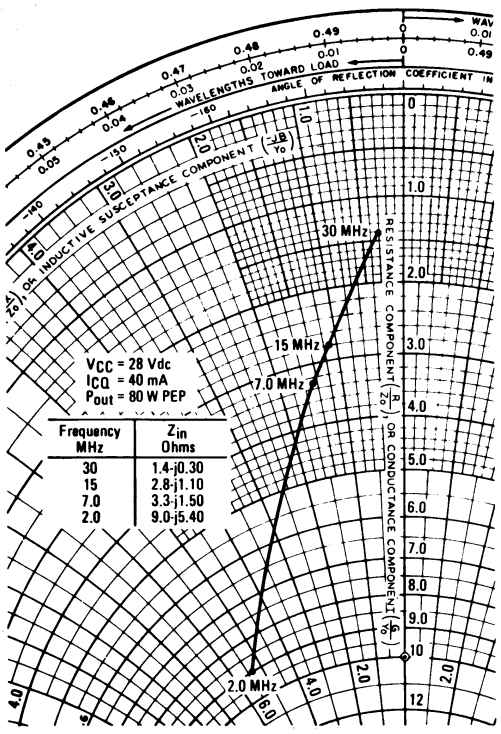


FIGURE 9 – SERIES INPUT IMPEDANCE



Frequency MHz	Z_{in} Ohms
30	1.4-j0.30
15	2.8-j1.10
7.0	3.3-j1.50
2.0	9.0-j5.40