MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

T-33-11

MRF477

The RF Line

2

40 W (PEP) – 30 MHz

RF POWER TRANSISTOR

NPN SILICON

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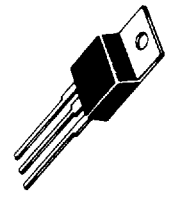
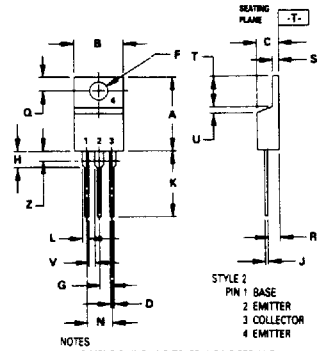
. . . designed primarily for application as a high-power linear amplifier from 1.5 to 30 MHz, in single sideband mobile, marine and base station equipment.

- Low-Cost, Common-Emitter TO-220AB Package
- Specified 12.5 Volt, 30 MHz Performance —
  Output Power = 40 W CW or PEP
  Power Gain = 15 dB Min
  Efficiency = 40% Min (PEP)
- Intermodulation Distortion @ 40 W (PEP) —
  IMD = −30 dB (Max)
- 30:1 VSWR Load Mismatch Capability at Rated Output Power and Supply Voltage





NOTES
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIM Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	14.48	15.75	0.570	0.620
B	9.66	10.28	0.380	0.405
C	4.07	4.82	0.160	0.190
D	0.64	0.88	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.42	2.66	0.095	0.105
H	2.80	3.93	0.110	0.155
J	0.36	0.55	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.15	1.39	0.045	0.055
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.15	1.39	0.045	0.055
T	5.97	6.47	0.235	0.255
U	0.00	1.27	0.000	0.050
V	1.15	—	0.045	—
Z	—	2.04	—	0.080

CASE 221A-04
TO-220AB

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	18	Vdc
Collector Base Voltage	V_{CBO}	36	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	5.0	Adc
Withstand Current (t = 5.0 s)	—	8.0	Adc
Total Device Dissipat on @ T_C = 25°C (1) Derate above 25°C	P_D	87.5 0.5	Watts W/°C
Storage Temperature Range	T_{stg}	−65 to +150	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.0	°C/W

(1) This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

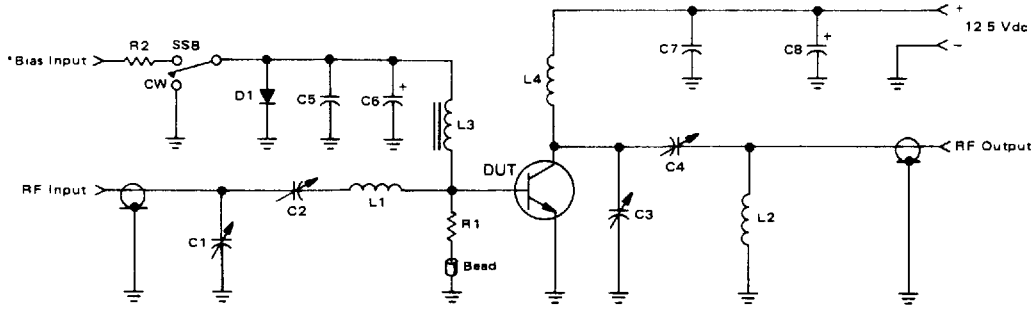
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 100 mAdc, I_B = 0)	$V_{(BR)CEO}$	18	–	–	Vdc
Collector Base Breakdown Voltage (I_C = 100 mAdc, I_E = 0)	$V_{(BR)CBO}$	36	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CE} = 12.5 Vdc, V_{BE} = 0, T_C = 25°C)	I_{CES}	–	–	10	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 2.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	20	70	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 12.5 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	175	250	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 40 W (PEP), f1 = 30 MHz, f2 = 30.001 MHz, I_{CQ} = 40 mAdc)	G_{PE}	15	17	–	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 40 W (PEP), f1 = 30 MHz, f2 = 30.001 MHz, I_{CQ} = 40 mAdc)	η	40	45	–	%
Intermodulation Distortion (1) (V_{CC} = 12.5 Vdc, P_{out} = 40 W (PEP), f1 = 30 MHz, f2 = 30.001 MHz, I_{CQ} = 40 mAdc)	IMD (d_3)	–	-35	-30	dB

(1) To Proposed EIA Method of Measurement Reference Peak Envelope Power

2

FIGURE 1 – 30 MHz TEST CIRCUIT



C1, C2, C4 – Arco 469, 190-780 pF
C3 – Arco 429, 90-400 pF
C5, C7 – 0.001 μF Disk Ceramics
C6 – 500 μF 3.0 Vdc Electrolytic
C8 – 100 μF 16 Vdc Electrolytic

R1 – 10 Ω 1.0 Watt Resistor
R2 – 5 Ω 5.0 Watt Resistor

L1 – 4 Turns #16 AWG 1/3" ID, 1/3" Long
L2 – 3 Turns #16 AWG 1/3" ID, 1/2" Long
L3 – 10 μH Molded Choke
L4 – 12 Turns #18 AWG 1/4" ID

Bead – Ferroxcube #56 590-65/38

D1 – 1N4719

*Adjust Bias (Base) Voltage for I_{CQ} = 40 mA with no RF applied.

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FIGURE 2 – OUTPUT POWER versus INPUT POWER

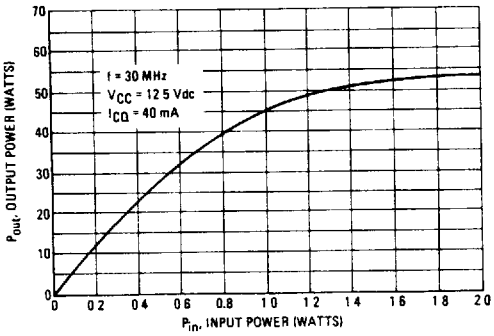


FIGURE 3 – OUTPUT POWER versus SUPPLY VOLTAGE

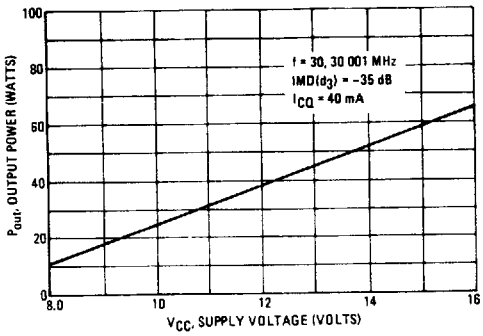


FIGURE 4 – POWER GAIN versus FREQUENCY

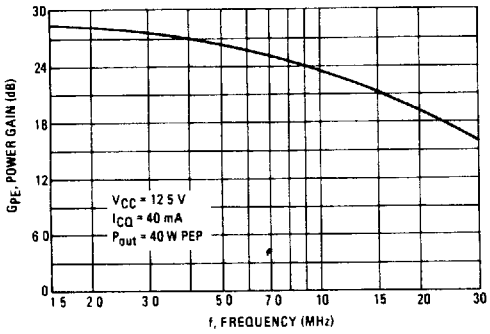


FIGURE 5 – INTERMODULATION DISTORTION versus OUTPUT POWER

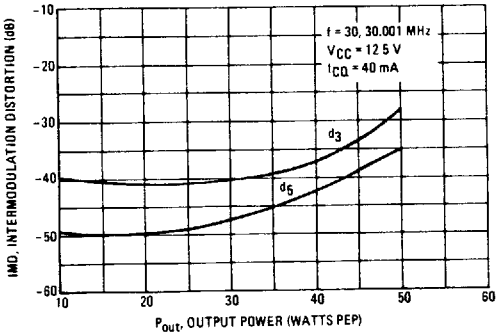


FIGURE 6 – SAFE OPERATING AREA

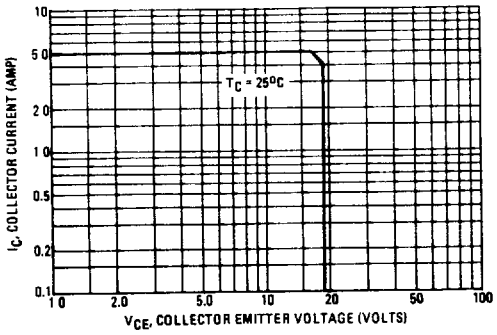
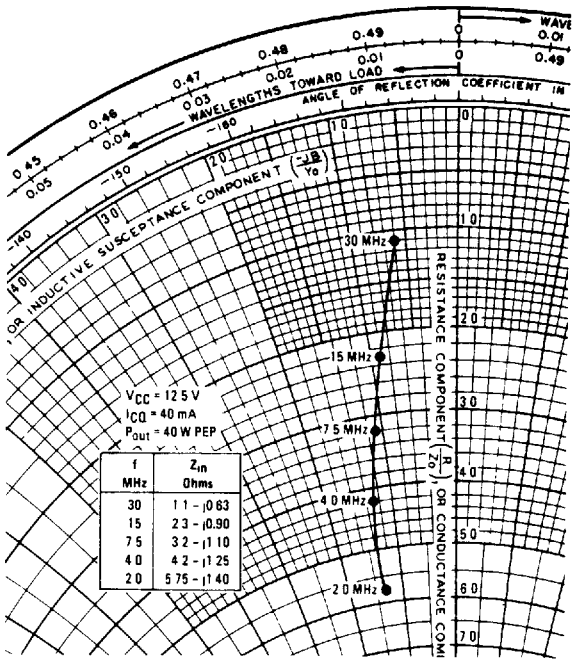


FIGURE 7 – SERIES EQUIVALENT INPUT IMPEDANCE



f MHz	Zin Ohms
30	1.1 - j0.63
15	2.3 - j0.90
7.5	3.2 - j1.10
4.0	4.2 - j1.25
2.0	5.75 - j1.40

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FIGURE 8 – OUTPUT CAPACITANCE versus FREQUENCY

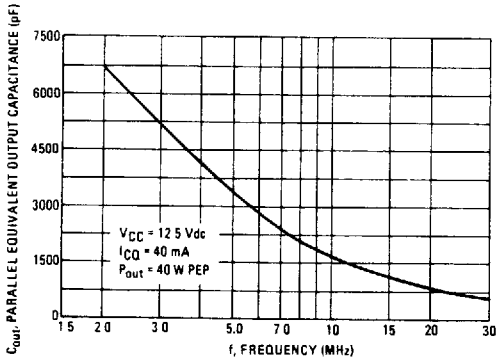

FIGURE 9 – OUTPUT RESISTANCE versus FREQUENCY