

MOTOROLA
SEMICONDUCTOR
 TECHNICAL DATA

T-33-11
MRF477

The RF Line

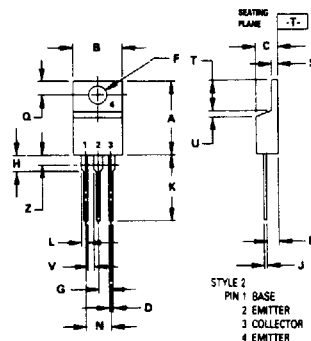
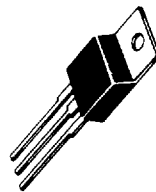
NPN SILICON RF POWER TRANSISTOR

... 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

40 W (PEP) — 30 MHz

RF POWER TRANSISTOR
 NPN SILICON



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		INCHES	
	MIN	MAX	MIN	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	3.81	3.75	0.142	0.147
G	2.42	2.66	0.095	0.105
H	2.80	3.83	0.110	0.150
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 Dissipation @ T _C = 25°C (1) Derate above 25°C	P _D	87.5	Watts W/°C
Storage Temperature Range	T _{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction to Case	R _{θJC}	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.

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MOTOROLA SC (XSTRS/R F)

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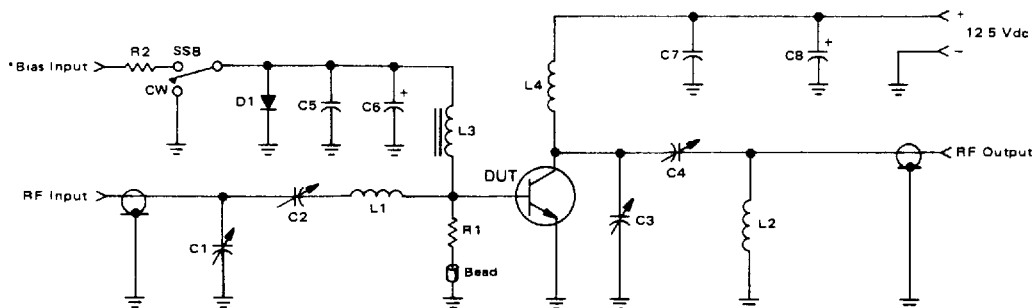
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ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I _C = 100 mA, I _B = 0)	V _{(BR)CEO}	18	—	—	Vdc
Collector Base Breakdown Voltage (I _C = 100 mA, I _E = 0)	V _{(BR)CBO}	36	—	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 5.0 mA, 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	mA
ON CHARACTERISTICS					
DC Current Gain (I _C = 2.0 A, 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), f ₁ = 30 MHz, f ₂ = 30.001 MHz, I _{CQ} = 40 mA)	G _{PE}	15	17	—	dB
Collector Efficiency (V _{CC} = 12.5 Vdc, P _{out} = 40 W (PEP), f ₁ = 30 MHz, f ₂ = 30.001 MHz, I _{CQ} = 40 mA)	η	40	45	—	%
Intermodulation Distortion (1) (V _{CC} = 12.5 Vdc, P _{out} = 40 W (PEP), f ₁ = 30 MHz, f ₂ = 30.001 MHz, I _{CQ} = 40 mA)	IMD (d ₃)	—	-35	-30	dB

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

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

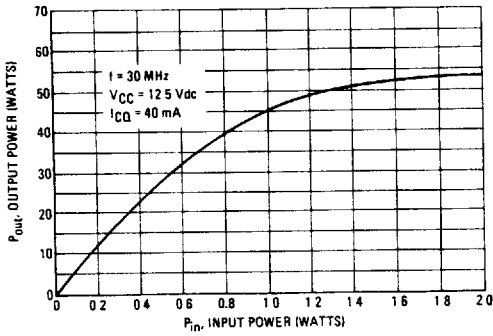


FIGURE 3 - OUTPUT POWER versus SUPPLY VOLTAGE

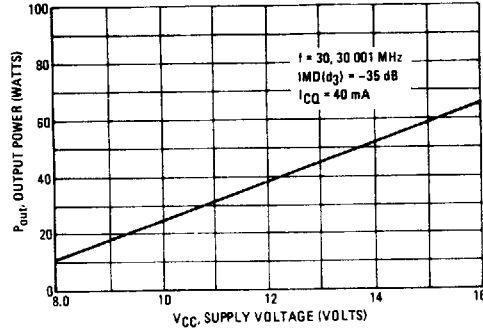


FIGURE 4 - POWER GAIN versus FREQUENCY

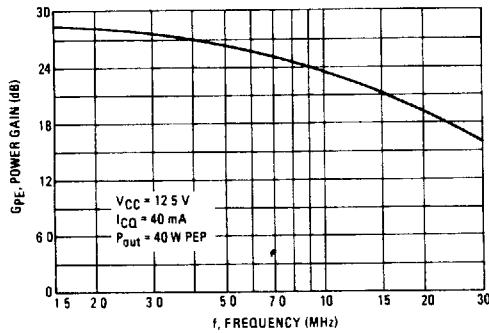


FIGURE 5 - INTERMODULATION DISTORTION versus OUTPUT POWER

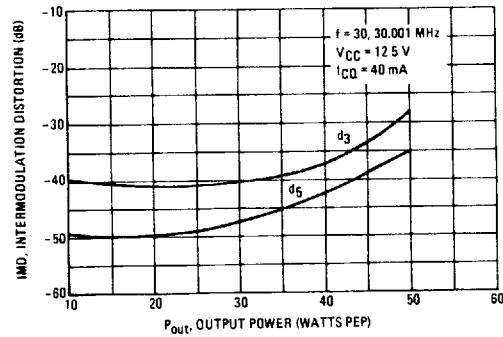
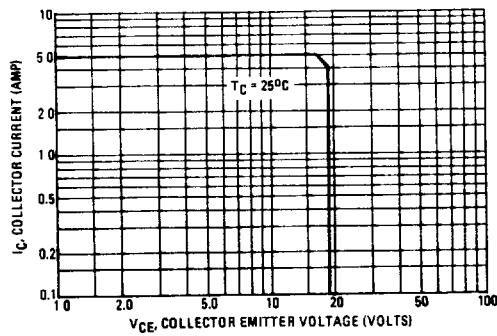


FIGURE 6 - SAFE OPERATING AREA



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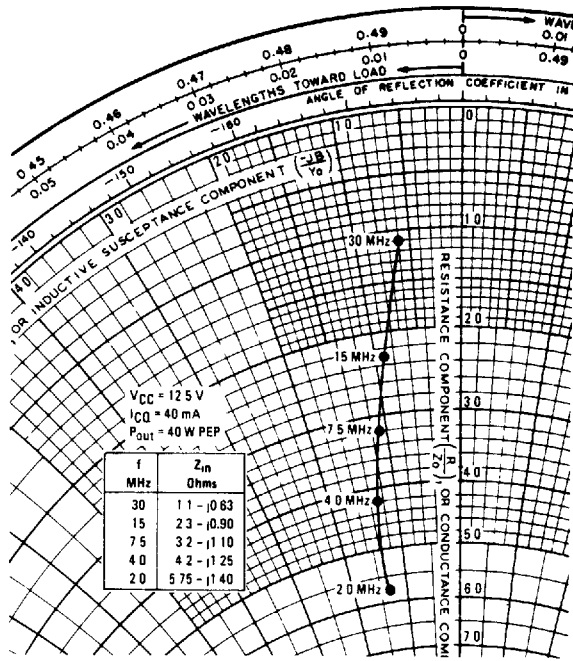
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FIGURE 7 - SERIES EQUIVALENT INPUT IMPEDANCE



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FIGURE 8 - OUTPUT CAPACITANCE versus FREQUENCY

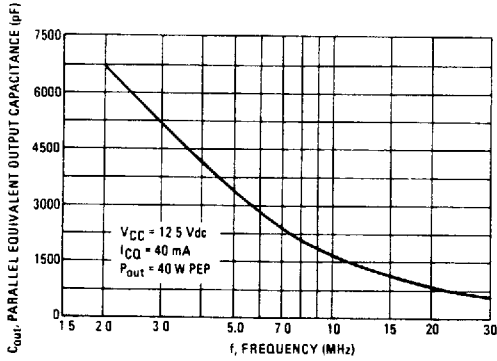


FIGURE 9 - OUTPUT RESISTANCE versus FREQUENCY

