



MICROWAVE SEMICONDUCTOR CORP.

1020
80081

1010
80080

1005
80069

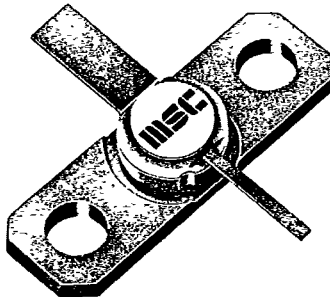
1002
80090

T-3309

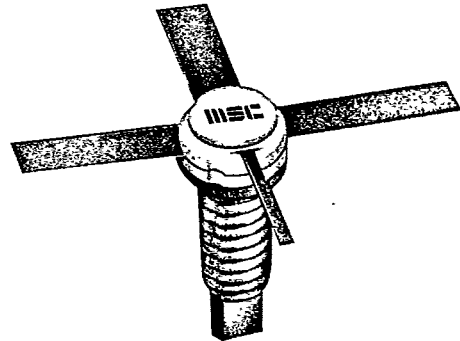
1GHZ POWER TRANSISTORS



GROUNDING STUD



STRIPAC®



ISOLATED STUD

The unique MSC 1GHz series of N-P-N epitaxial power transistors feature high performance along with optimized device reliability. The common base 1020, 1010, 1005 and 1002 give superior Class B and C amplifier performance; the common emitter (isolated stud 80081, 80080, 80069 and 80090 will retrofit existing designs and are ideally suited for all oscillator applications. All devices have been specifically designed to withstand the high VSWR's caused by mismatched outputs and feature the inherent reliability of the matrix pellet structure. They are

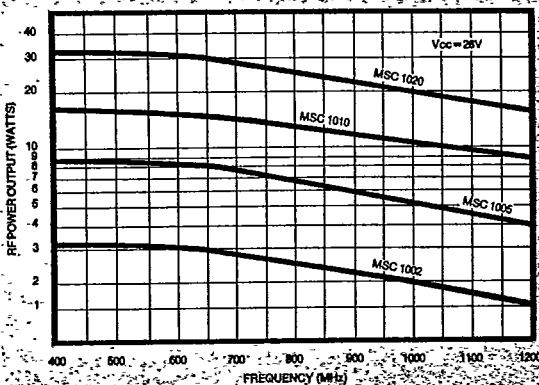
packaged in a hermetically sealed rugged stripline package designed for broadband capability.

These devices are recommended for usage in the 400 - 1200 MHz band for telemetry, communications, ECM, and both pulsed and CW avionics applications.

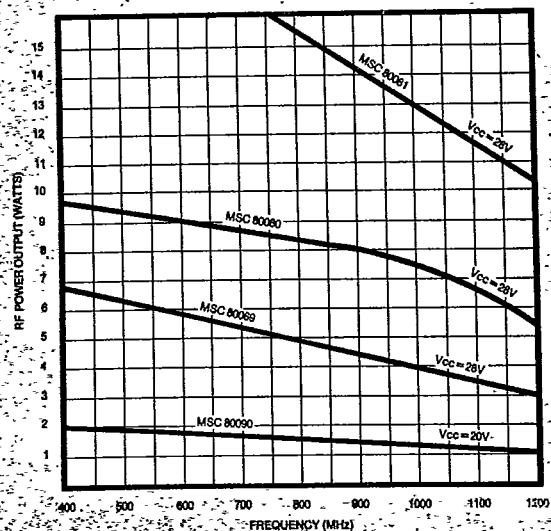
These MSC 1GHz transistors can be supplied to MIL-S-19500 and MIL-STD-750 on a custom basis. Reliability data on various MSC transistors is available on request.

*Patent Pending

TYPICAL AMPLIFIER POWER OUTPUT VS. FREQUENCY



TYPICAL OSCILLATOR POWER OUTPUT VS. FREQUENCY

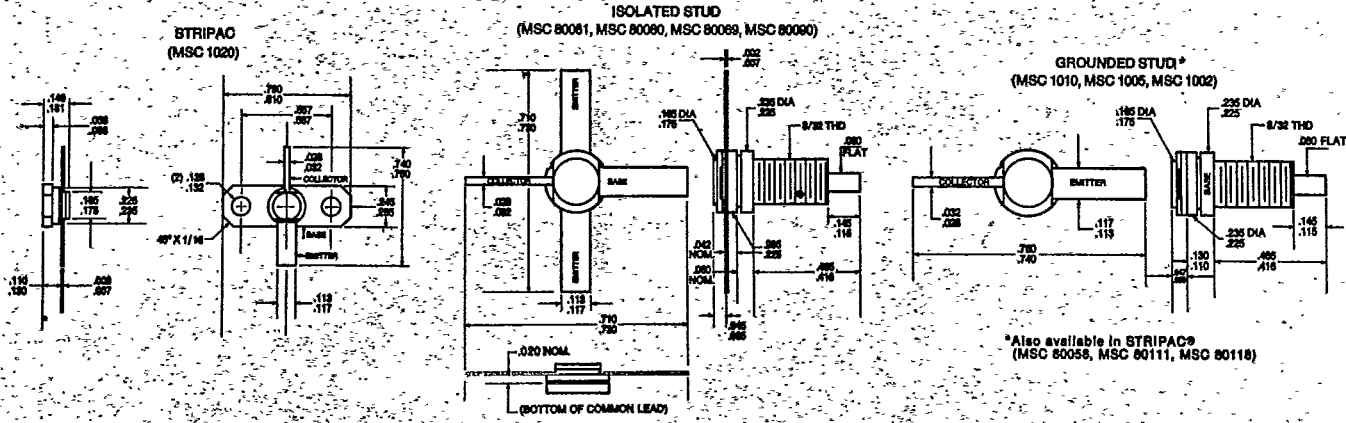




MICROWAVE SEMICONDUCTOR CORP.

DC ELECTRICAL CHARACTERISTICS		CASE TEMPERATURE = 25°C														
SYMBOL	CHARACTERISTICS	TEST CONDITIONS					1020 80081		1010 80080		1005 80069		1002 80090		UNITS OF MEAS	
		VOLTAGE		CURRENT, mA		OHMS		MIN	MAX	MIN	MAX	MIN	MAX	MIN		MAX
		V _{CB}	V _{CE}	I _C	I _E	R _{BE}										
BV _{CBO}	Collector-to-Base Breakdown Voltage			10	0		55		55		55		50		Volts	
BV _{CER}	Collector-to-Emitter Breakdown Voltage			50 25 10		10 10 10	55		55		55		50		Volts Volts Volts	
BV _{EBO}	Emitter-to-Base Breakdown Voltage			0	1		3.5		3.5		3.5		3.5		Volts	
I _{CBO}	Collector Cutoff Current	28			0		5		2.5		1		.5		mA	
HFE	Forward-Current Transfer Ratio		15 15	500 50			15	120	15	120	15	120	15	120		
θ _{J-C}	Thermal Resistance (junction-to-case)						5		6		8.5		30		°C/Watt	
C _{OB}	Collector-to-Base Capacitance (1 MHz)	28					20		10		6		3		pF	

ABSOLUTE MAXIMUM RATINGS		CASE TEMPERATURE = 25°C					
SYMBOL	CHARACTERISTICS	1020 80081	1010 80080	1005 80069	1002 80090	UNITS OF MEAS	
V _{CBO}	COLLECTOR-TO-BASE VOLTAGE	55	55	55	50	VOLTS	
V _{CER}	COLLECTOR-TO-EMITTER VOLTAGE (WITH R _{BE} = 10 OHMS)	55	55	55	50	VOLTS	
V _{EBO}	EMITTER-TO-BASE VOLTAGE	3.5	3.5	3.5	3.5	VOLTS	
I _C	COLLECTOR CURRENT	6	4	2.5	0.25	AMPS	
P _T	TRANSISTOR DISSIPATION AT 25° C CASE	35	29	20.6	5.8	WATTS	
	TEMPERATURE RANGE STORAGE & OPERATING (JUNCTION)	-65 TO +200	-65 TO +200	-65 TO +200	-65 TO +200	°C	





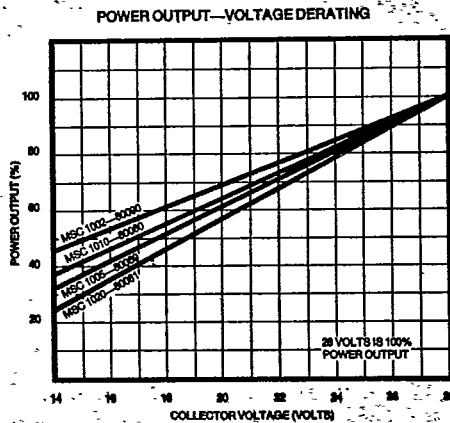
MICROWAVE SEMICONDUCTOR CORP.

RF ELECTRICAL CHARACTERISTICS		CASE TEMPERATURE = 25°C								
1 GHz COMMON BASE AMPLIFIER PERFORMANCE (V _{cc} = 28V)										
	SYMBOL	MSC 1020		MSC 1010		MSC 1005		MSC 1002		UNITS OF MEAS
		MIN	TYP	MIN	TYP	MIN	TYP	MIN	TYP	
Power Output	P _{0a}	18	20	10	11	5	5.5	2	2.2	Watts
Power Gain	G _{pa}	7.8	8.2	8.2	8.6	10	10.4	10	10.4	dB
Collector Efficiency	η _c	50	55	50	60	50	60	50	55	%
V.S.W.R. (At Rated P _{out})	VSWR		3:1		5:1		∞		∞	All Phases
Pulsed Power Output (1)	P _{out}		(2) 75		(3) 25		(3) 10			Watts
Pulsed Power Gain (1)	G _{pa}		(2) 8.8		(3) 9.2		(3) 10			dB

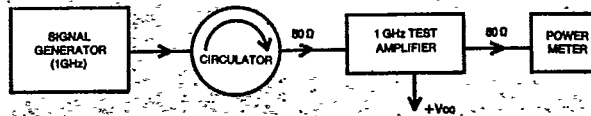
- (1) - PULSED PERFORMANCE AT 1090 MHz WITH 10μ SEC PULSE WIDTH @ 1% DUTY CYCLE
- (2) - V_{cc} = 50V
- (3) - V_{cc} = 40V

RF ELECTRICAL CHARACTERISTICS		CASE TEMPERATURE = 25°C								
1 GHz COMMON EMITTER OSCILLATOR/AMPLIFIER PERFORMANCE (V _{cc} = 28V)										
	SYMBOL	MSC 80081		MSC 80080		MSC 80089		MSC 80090		UNITS OF MEAS
		MIN	TYP	MIN	TYP	MIN	TYP	MIN	TYP	
Power Output (Osc)	P _{osc}	10	13	5	7.5	3	4	1 ⁽⁴⁾	1.3 ⁽⁴⁾	Watts
Oscillator Efficiency	η _{osc}		45		45		45		45 ⁽⁴⁾	%
Power Output (Amp)	P _{out}		20		10		5		2	Watts
Power Gain (Amp)	G _{pe}		5.2		6		6		8	dB
Collector Efficiency	η _c		55		60		60		55	%

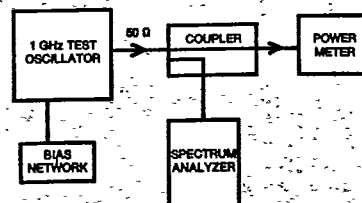
(4) - AT V_{cc} = 20V



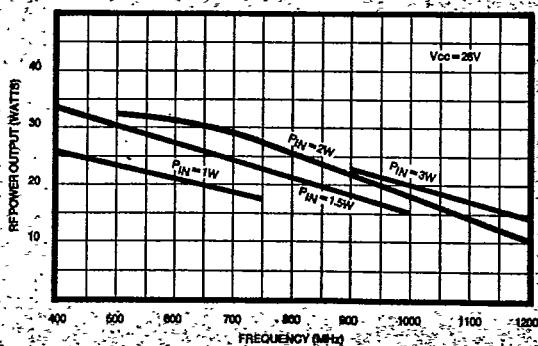
RF AMPLIFIER POWER OUTPUT TEST



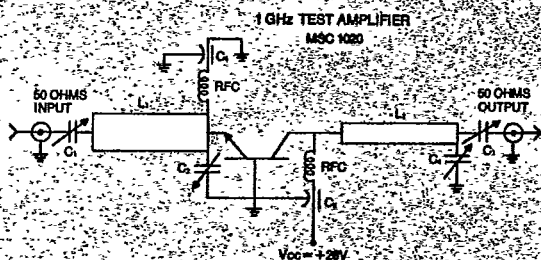
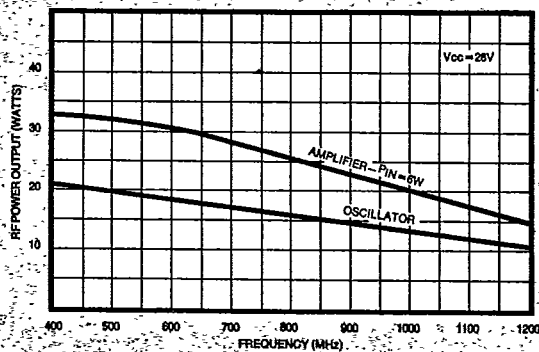
RF OSCILLATOR POWER OUTPUT TEST



TYPICAL POWER OUTPUT VS. FREQUENCY
MSC 1020

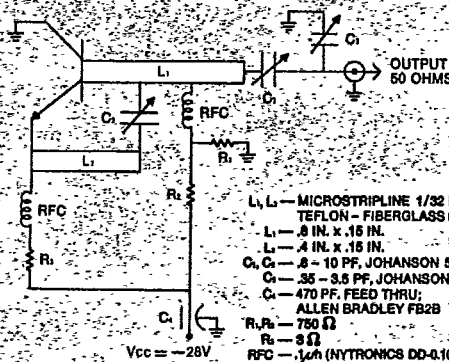


TYPICAL POWER OUTPUT VS. FREQUENCY
MSC 80081



- C₁, C₂, C₃, C₄ - 8 - 10 PF, JOHANSON 5202
- C₅, C₆ - 470 PF, FEED THRU; ALLEN BRADLEY FB2B
- L₁, L₂ - MICROSTRIPLINE, 1/32 IN. TEFLON-FIBERGLASS (ε_r = 2.6)
- L₃ - 4 IN. WIDE, 1.12 IN. LONG
- L₄ - 2 IN. WIDE, 1.08 IN. LONG
- RFC - 1/4" CHOKE; NYTRONICS DD-0.10

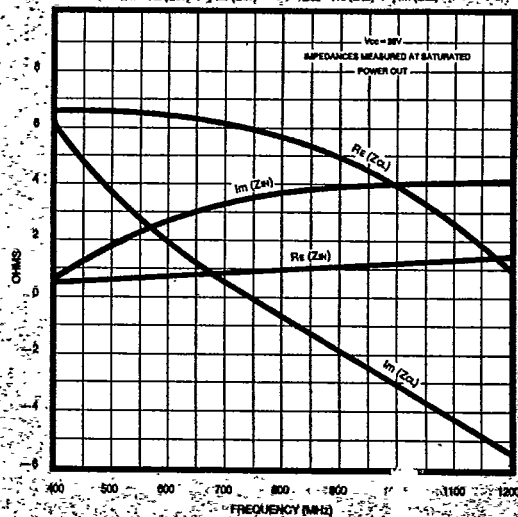
1 GHz MICROSTRIPLINE TEST OSCILLATOR
MSC 80081



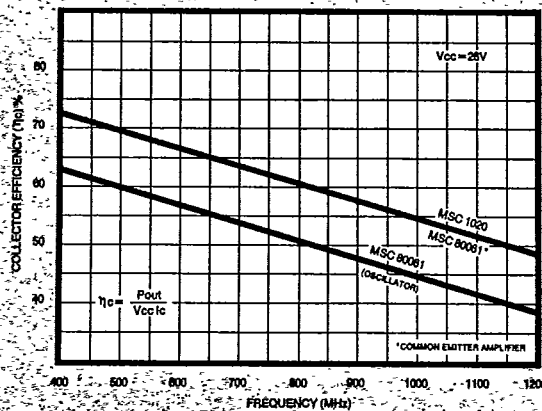
- L₁, L₂ - MICROSTRIPLINE 1/32 IN. TEFLON - FIBERGLASS (ε_r = 2.6)
- L₃ - 8 IN. x .15 IN.
- L₄ - 4 IN. x .15 IN.
- C₁, C₂ - 8 - 10 PF, JOHANSON 5202
- C₃ - 35 - 3.5 PF, JOHANSON 5802
- C₄ - 470 PF, FEED THRU; ALLEN BRADLEY FB2B
- R₁, R₂ - 750 Ω
- R₃ - 3 Ω
- RFC - 1/4" (NYTRONICS DD-0.10)

TYPICAL IMPEDANCES
MSC 1020

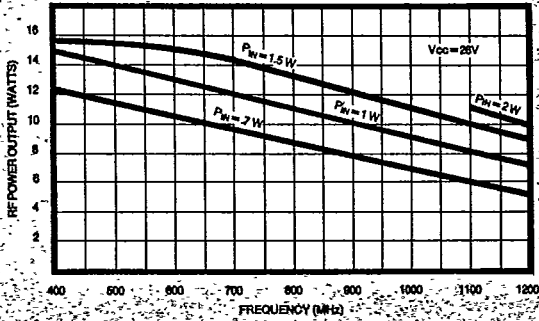
$Z_{in} = R_e(Z_{in}) + j \text{Im}(Z_{in})$; $Z_{o} = R_e(Z_o) + j \text{Im}(Z_o)$



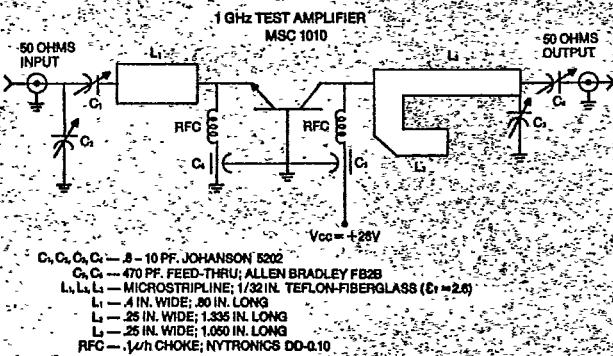
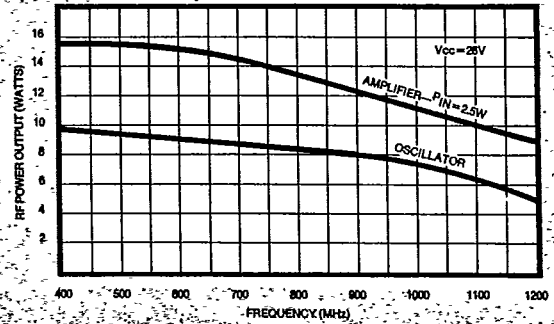
TYPICAL EFFICIENCY VS. FREQUENCY



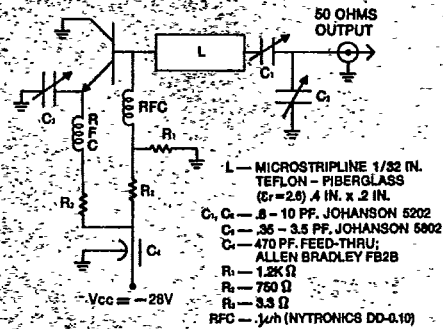
TYPICAL POWER OUTPUT VS. FREQUENCY
MSC 1010



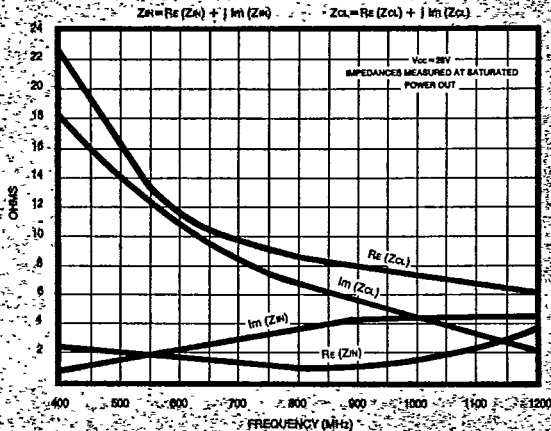
TYPICAL POWER OUTPUT VS. FREQUENCY
MSC 80080



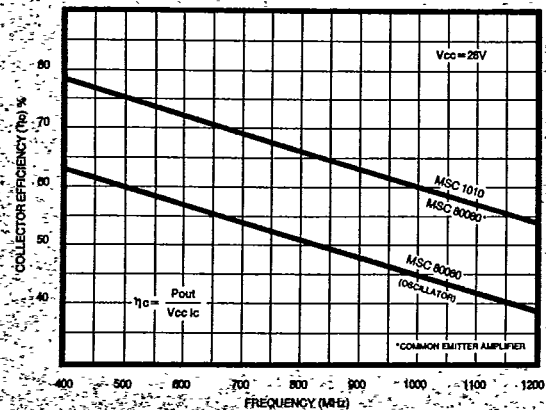
1GHz MICROSTRIPLINE TEST OSCILLATOR
MSC 80080



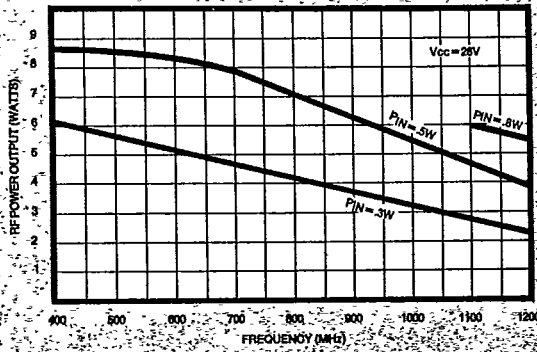
TYPICAL IMPEDANCES
MSC 1010



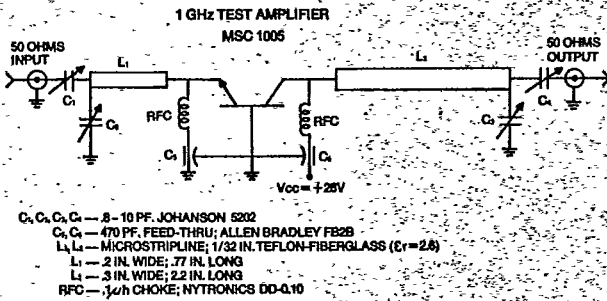
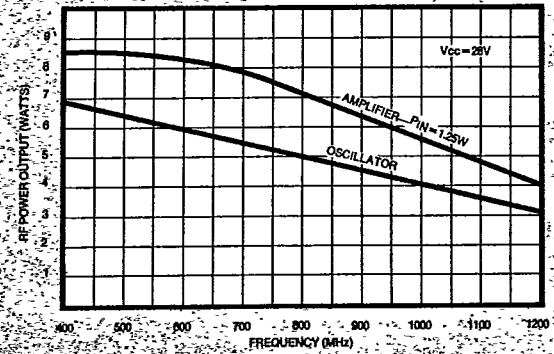
TYPICAL EFFICIENCY VS. FREQUENCY



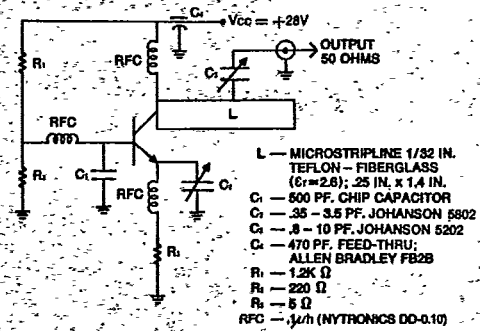
TYPICAL POWER OUTPUT VS. FREQUENCY
MSC 1005



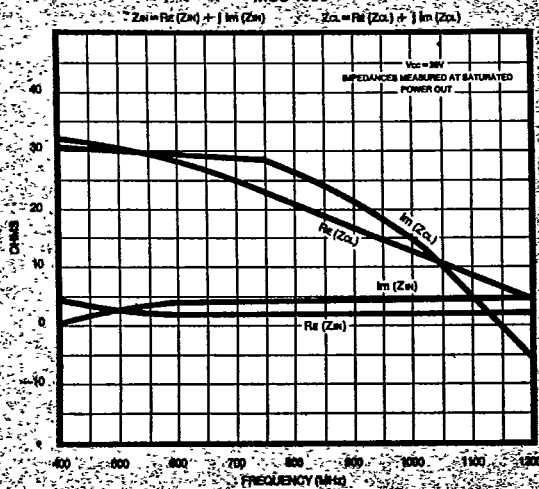
TYPICAL POWER OUTPUT VS. FREQUENCY
MSC 80069



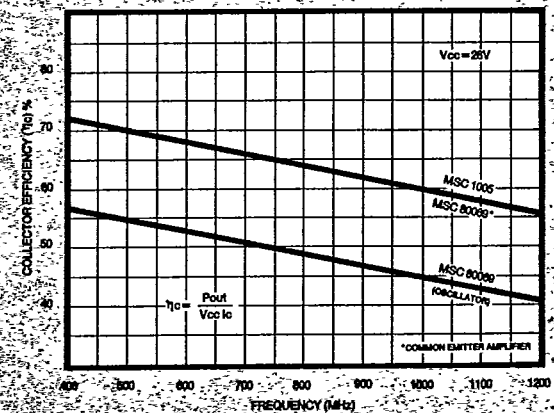
1GHz MICROSTRIPLINE TEST OSCILLATOR
MSC 80069



TYPICAL IMPEDANCES
MSC 1005

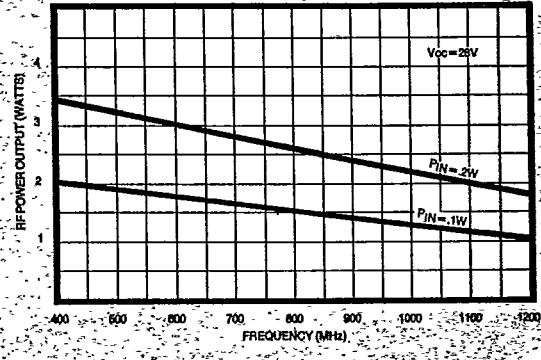


TYPICAL EFFICIENCY VS. FREQUENCY

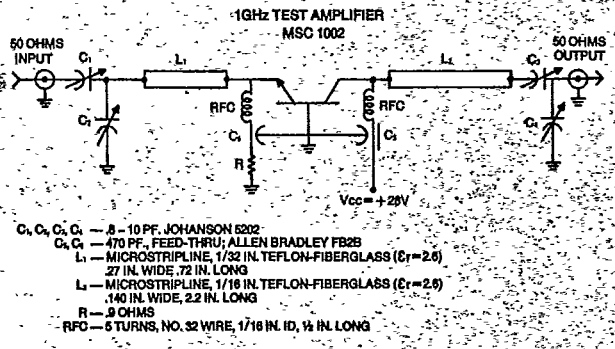
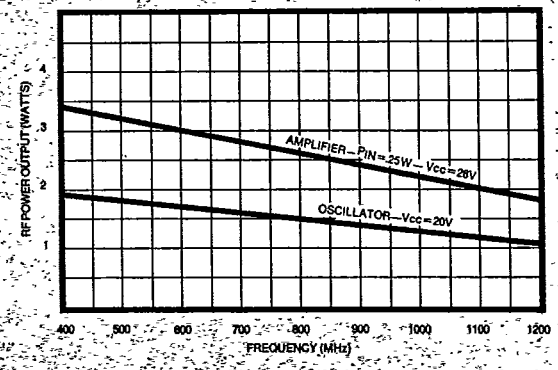


6

TYPICAL POWER OUTPUT VS. FREQUENCY
MSC 1002

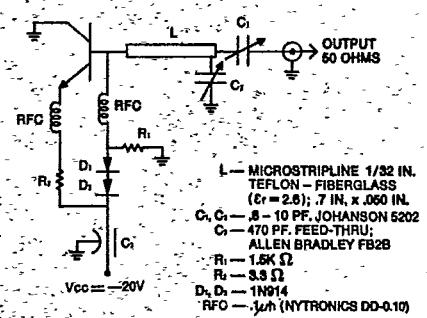


TYPICAL POWER OUTPUT VS. FREQUENCY
MSC 80090



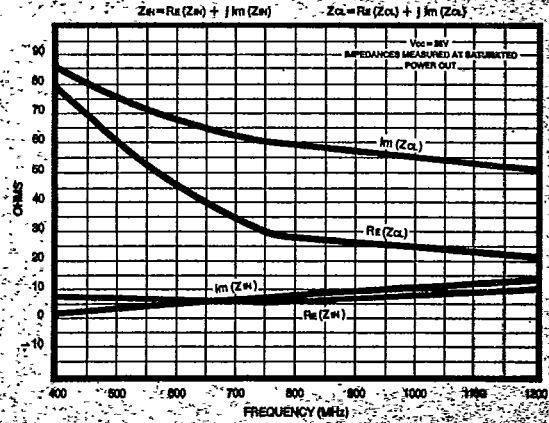
- C₁, C₂, C₃, C₄ — 5-10 PF. JOHANSON 5202
- C₅, C₆ — 470 PF. FEED-THRU; ALLEN BRADLEY FB28
- L₁ — MICROSTRIPLINE, 1/32 IN. TEFLON-FIBERGLASS ($\epsilon_r = 2.6$), 27 IN. WIDE, 72 IN. LONG
- L₂ — MICROSTRIPLINE, 1/16 IN. TEFLON-FIBERGLASS ($\epsilon_r = 2.6$), 140 IN. WIDE, 2.2 IN. LONG
- R — 9 OHMS
- RFC — 5 TURNS, NO. 32 WIRE, 1/16 IN. ID, 1/4 IN. LONG

1GHz MICROSTRIPLINE TEST OSCILLATOR
MSC 80090

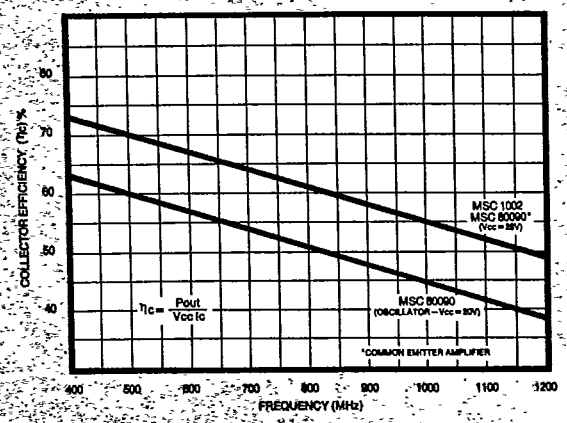


- L — MICROSTRIPLINE 1/32 IN. TEFLON-FIBERGLASS ($\epsilon_r = 2.6$); 7 IN. x .050 IN.
- C₁, C₂ — 5-10 PF. JOHANSON 5202
- C₃ — 470 PF. FEED-THRU; ALLEN BRADLEY FB28
- R₁ — 1.5K Ω
- R₂ — 3.3 Ω
- D₁, D₂ — 1N914
- RFC — 3/4" (NYTRONICS DD-010)

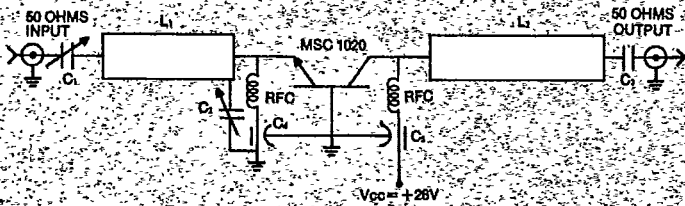
TYPICAL IMPEDANCES
MSC 1002



TYPICAL EFFICIENCY VS. FREQUENCY

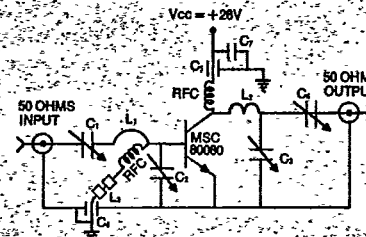


20 WATTS, 8.2 dB GAIN, 900 TO 950 MHz



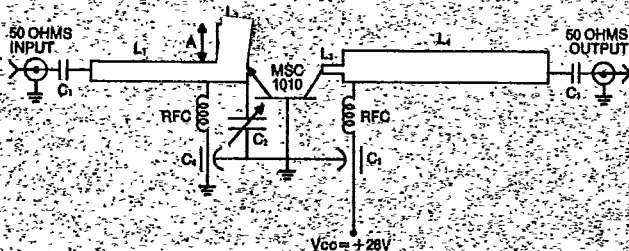
- C₁ - .8 - 10 PF. JOHANSON 5202
- C₂ - .35 - 3.5 PF. JOHANSON 5802
- C₃ - 200 PF. CHIP CAPACITOR
- C₄, C₅ - 470 PF. FEED-THRU; ALLEN BRADLEY FB2B
- L₁, L₂ - MICROSTRIPLINE, 1/32 IN. TEFLON-FIBERGLASS (ε_r = 2.6)
- L₃ - 4 IN. WIDE, 1.33 IN. LONG
- L₄ - 4 IN. WIDE, 1.82 IN. LONG
- RFC - 1/2h CHOKE; NYTRONICS DD-0.10

14W; 750MHz LUMPED CONSTANT COMMON EMITTER AMPLIFIER - 7.5dB GAIN



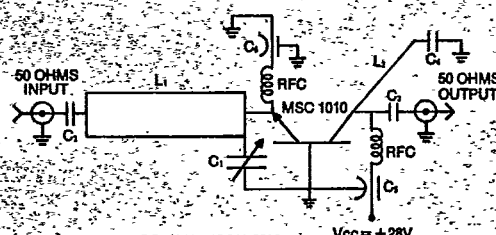
- C₁, C₂, C₃, C₄ - .8 - 10 PF. JOHANSON 5202
- L₁ - #18 WIRE; 2 IN. HIGH, .65 IN. WIDE (AS SHOWN)
- L₂ - #18 WIRE, 2 1/2 TURNS, .180 IN. DIAMETER
- L₃ - RFC FERRITE BEADS
- C₅, C₆ - 470 PF. FEED-THRU; ALLEN BRADLEY FB2B
- C₇ - .01 μF DISC CERAMIC
- RFC - 1/2h CHOKE; NYTRONICS DD-0.10

10 WATTS, 8.2dB GAIN, 850-960 MHz



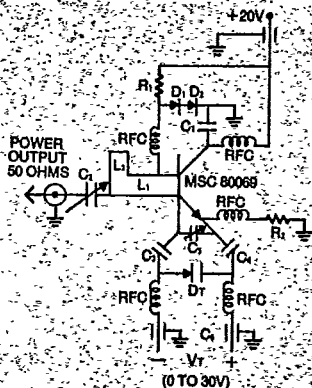
- C₁ - .8 - 10 PF. JOHANSON 5202
- C₂, C₃ - 200 PF. CHIP CAPACITOR
- C₄, C₅ - 470 PF. FEED-THRU; ALLEN BRADLEY FB2B
- L₁, L₂ - MICROSTRIPLINE, 1/32 IN. TEFLON - FIBERGLASS (ε_r = 2.6)
- L₃ - 2 IN. WIDE; 1.65 IN. LONG
- L₄ - A = .36 IN.; B = .28 IN.
- L₅ - .030 IN. WIDE; 25 IN. LONG
- L₆ - 2 IN. WIDE; 1.95 IN. LONG
- RFC - 1/2h CHOKE; NYTRONICS DD-0.10

10 WATTS, 10dB GAIN, 535 to 645 MHz



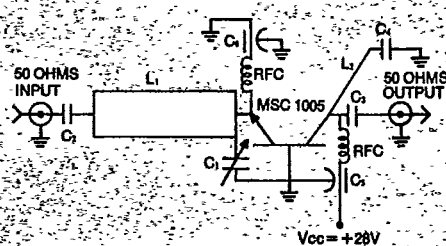
- C₁ - 1 - 20 PF. JOHANSON 5502
- C₂, C₃ - 200 PF. CHIP CAPACITOR
- C₄, C₅ - 3300 PF. CHIP CAPACITOR
- C₆, C₇ - 470 PF. FEED-THRU; ALLEN BRADLEY FB2B
- L₁ - 4 IN. WIDE; 2.6 IN. LONG MICROSTRIPLINE, 1/32 IN. TEFLON-FIBERGLASS (ε_r = 2.6)
- L₂ - 30 MIL DIAMETER WIRE; 5 IN. LONG
- RFC - 1/2h CHOKE; NYTRONICS DD-0.10

VOLTAGE TUNED OSCILLATOR 1.0 TO 1.2 GHz,
1 WATT MIN ACROSS BAND



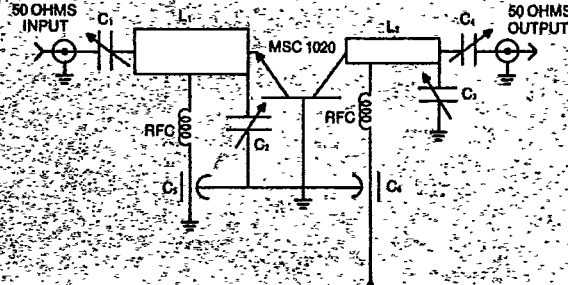
- L₁, L₂ - MICROSTRIPLINE (ε_r = 2.6) 1/32 IN. TEFLON-FIBERGLASS
- L₃ - 5 IN. X .25 IN.
- L₄ - 275 IN. X .2 IN.
- C₁ - 330 PF. CHIP CAPACITOR (ATC 100 B OR EQUIVALENT)
- C₂ - 4.3 PF. CHIP CAPACITOR (ATC 100 B OR EQUIVALENT)
- C₃ - 5.8 PF. CHIP CAPACITOR (ATC 100 B OR EQUIVALENT)
- C₄, C₅ - .8 - 10 PF. JOHANSON 5202
- C₆ - 470 PF. FEED-THRU; ALLEN BRADLEY FB2B
- RFC - 1/2h NYTRONICS DD-0.10
- R₁ - 500 OHMS
- R₂ - 5 OHMS
- D₁, D₂ - 1N914
- D₃ - TUNING VARACTOR C_T = 4 PF. @ -4V (0 TO 30V)

5 WATTS, 10dB GAIN, 675 TO 825 MHz



- C₁ - .8 - 10 PF. JOHANSON 5202
- C₂, C₃ - 200 CHIP CAPACITOR
- C₄ - 3300 PF. CHIP CAPACITOR
- L₁ - 4 IN. WIDE; 1.88 IN. LONG MICROSTRIPLINE, 1/32 IN. TEFLON-FIBERGLASS, (ε_r = 2.6)
- L₂ - 20 MIL DIAMETER WIRE; 53 IN. LONG
- C₅, C₆ - 470 PF. FEED-THRU; ALLEN BRADLEY FB2B
- RFC - 1/2h CHOKE; NYTRONICS DD-0.10

75 WATTS PULSED POWER*, 8.8 dB GAIN, AT 1090 MHz



- *10 μSEC PULSE WIDTH @ 1% DUTY CYCLE
- C₁, C₂, C₃, C₄ - .8 - 10 PF. JOHANSON 5202
- C₅, C₆ - 470 PF. FEED-THRU; ALLEN BRADLEY FB2B
- L₁, L₂ - MICROSTRIP LINE, 1/32 IN. TEFLON-FIBERGLASS (ε_r = 2.6)
- L₃ - 4 IN. WIDE, .885 IN. LONG
- L₄ - 2 IN. WIDE, .88 IN. LONG
- RFC - 5 TURNS #32 WIRE