

2N5944
2N5945
2N5946

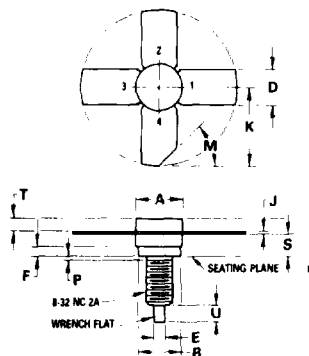
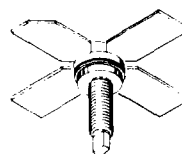
The RF Line

NPN SILICON RF POWER TRANSISTORS

... designed for 7.0 to 15 Volts, UHF large signal amplifier applications required in industrial and commercial FM equipment operating in the 400 to 960 MHz range.

- Specified 12.5 Volt, 470 MHz Characteristics -
 Power Output = 2.0 W 2N5944
 4.0 W 2N5945
 10 W 2N5946
 Minimum Gain = 9.0 dB - 2N5944
 8.0 dB 2N5945
 6.0 dB 2N5946
 Efficiency = 60% Minimum
- Characterized with series equivalent large signal impedance parameters

2.0, 4.0, 10 W - 470 MHz
 RF POWER
 TRANSISTORS
 NPN SILICON



MAXIMUM RATINGS

Rating	Symbol	2N5944	2N5945	2N5946	Unit
*Collector-Emitter Voltage	V_{CE0}	16			Vdc
*Collector-Base Voltage	V_{CB0}	36			Vdc
*Emitter-Base Voltage	V_{EB0}	4.0			Vdc
*Collector Current - Continuous	I_C	0.4	0.8	2.0	Adc
*Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above 25°C	P_D	5.0 28.5	15 85.5	37.5 214	Watts mW/ $^\circ\text{C}$
*Storage Temperature Range	T_{stg}	-65 to +200			$^\circ\text{C}$
Stud Torque(2)		6.5			in-lbs.

*Indicates JEDEC Registered Data

(1) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.

(2) For repeated assembly use 5 in lbs.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	7.06	7.26	0.278	0.286
B	6.20	6.50	0.244	0.256
C	14.99	16.51	0.590	0.650
D	5.46	5.96	0.215	0.235
E	1.40	1.65	0.055	0.065
F	1.52	—	0.060	—
J	0.08	0.17	0.003	0.007
K	11.05	—	0.435	—
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
S	3.00	3.25	0.118	0.128
T	1.40	1.77	0.055	0.070
U	2.92	3.68	0.115	0.145

STYLE 1

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

CASE 244-04

2N5944, 2N5945, 2N5946

*ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 50\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	16	—	—	Vdc
($I_C = 100\text{ mA}$, $I_B = 0$)		16	—	—	
($I_C = 200\text{ mA}$, $I_B = 0$)		16	—	—	
Collector-Emitter Breakdown Voltage ($I_C = 50\text{ mA}$, $V_{BE} = 0$)	$V_{(BR)CES}$	36	—	—	Vdc
($I_C = 100\text{ mA}$, $V_{BE} = 0$)		36	—	—	
($I_C = 200\text{ mA}$, $V_{BE} = 0$)		36	—	—	
Emitter-Base Breakdown Voltage ($I_E = 1.0\text{ mA}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	—	—	Vdc
($I_E = 2.0\text{ mA}$, $I_C = 0$)		4.0	—	—	
($I_E = 4.0\text{ mA}$, $I_C = 0$)		4.0	—	—	
Collector Cutoff Current ($V_{CE} = 15\text{ Vdc}$, $V_{BE} = 0$, $T_C = 55^\circ\text{C}$)	I_{CES}	—	0.2	10	mA
		—	0.5	20	
Collector Cutoff Current ($V_{CB} = 15\text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	1.0 2.0	mA

ON CHARACTERISTICS

DC Current Gain ($I_C = 100\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	20	80	—	
($I_C = 200\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$)		20	80	—	
($I_C = 500\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$)		20	80	—	

DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 12.5\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	11	15	pF
		18	25	
		38	45	

FUNCTIONAL TEST (Figures 20 and 21).

Common-Emitter Amplifier Power Gain ($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 2.0\text{ W}$, $I_C(\text{max}) = 267\text{ mA}$, $f = 470\text{ MHz}$)	G_{PE}	9.0	10	dB
($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 4.0\text{ W}$, $I_C(\text{max}) = 533\text{ mA}$, $f = 470\text{ MHz}$)		8.0	9.0	
($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 10\text{ W}$, $I_C(\text{max}) = 1.33\text{ A}$, $f = 470\text{ MHz}$)		6.0	7.0	
Collector Efficiency ($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 2.0\text{ W}$, $I_C(\text{max}) = 240\text{ mA}$, $f = 470\text{ MHz}$)	η	60	—	%
($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 4.0\text{ W}$, $I_C(\text{max}) = 500\text{ mA}$, $f = 470\text{ MHz}$)		60	—	
($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 10\text{ W}$, $I_C(\text{max}) = 1.3\text{ A}$, $f = 470\text{ MHz}$)		60	—	

* Indicates JEDEC Registered Data

These devices are available in various packages, such as a studless stripline package, TO-205AD (TO-39) and also in chip form on beryllium oxide carriers for hybrid assemblies.
For further information, contact your nearest Motorola representative or the factory representative.

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2N5944

TYPICAL PERFORMANCE DATA

FIGURE 1 – SERIES EQUIVALENT IMPEDANCE

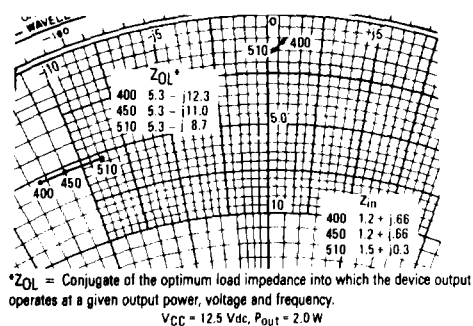


FIGURE 2 – OUTPUT POWER versus SUPPLY VOLTAGE

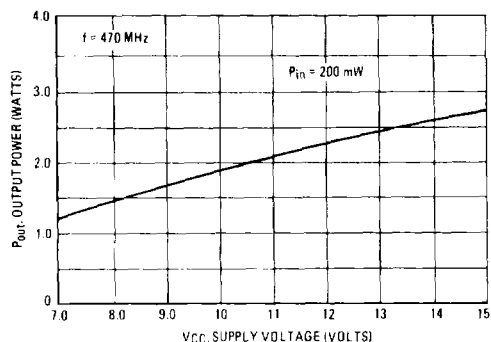


FIGURE 3 – OUTPUT POWER versus INPUT POWER

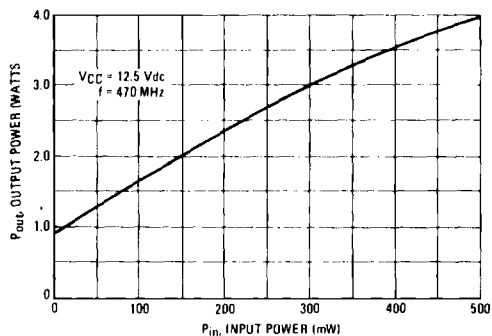


FIGURE 4 – OUTPUT POWER versus FREQUENCY

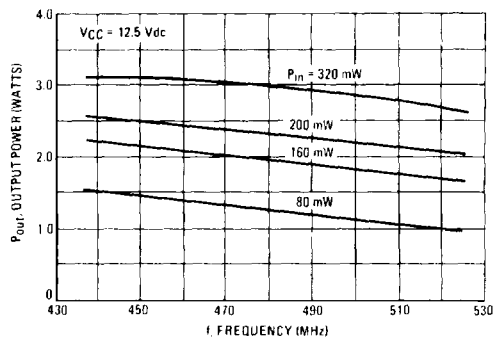


FIGURE 5 – OUTPUT POWER versus INPUT POWER

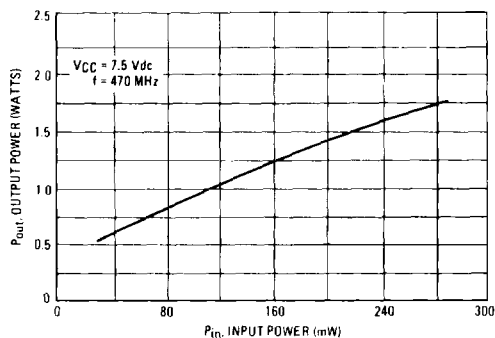
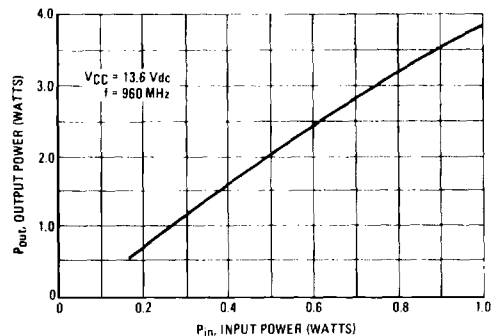


FIGURE 6 – OUTPUT POWER versus INPUT POWER



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2N5945 TYPICAL PERFORMANCE DATA

FIGURE 7 – SERIES EQUIVALENT IMPEDANCE

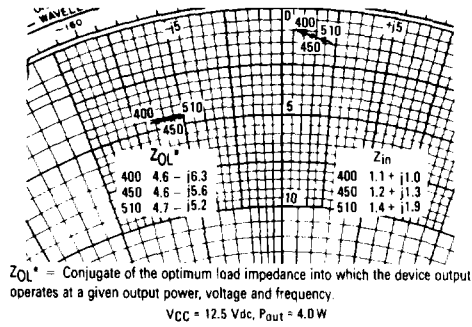


FIGURE 8 – OUTPUT POWER versus SUPPLY VOLTAGE

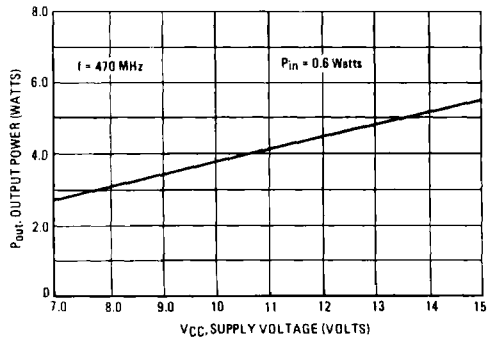


FIGURE 9 – OUTPUT POWER versus INPUT POWER

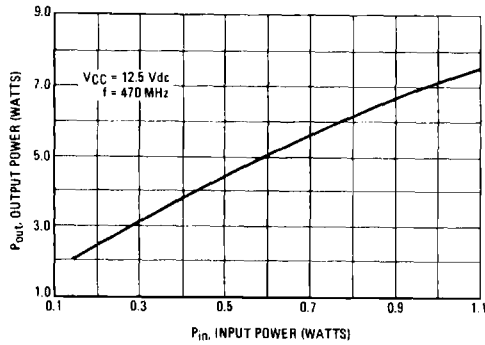


FIGURE 10 – OUTPUT POWER versus FREQUENCY

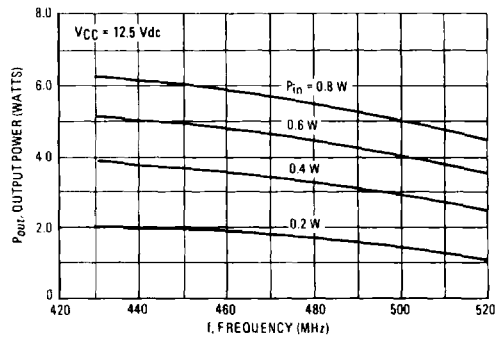


FIGURE 11 – OUTPUT POWER versus INPUT POWER

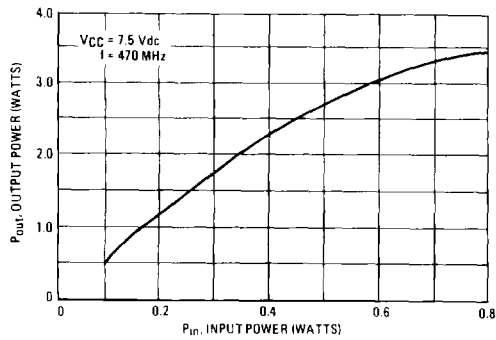
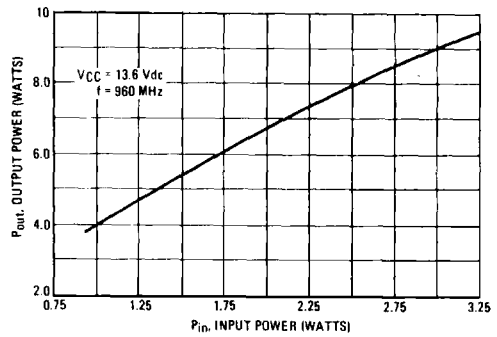


FIGURE 12 – OUTPUT POWER versus INPUT POWER



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2N5946 TYPICAL PERFORMANCE DATA

FIGURE 13 - SERIES EQUIVALENT IMPEDANCE

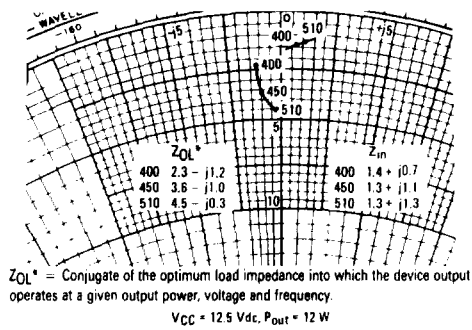


FIGURE 14 - OUTPUT POWER versus SUPPLY VOLTAGE

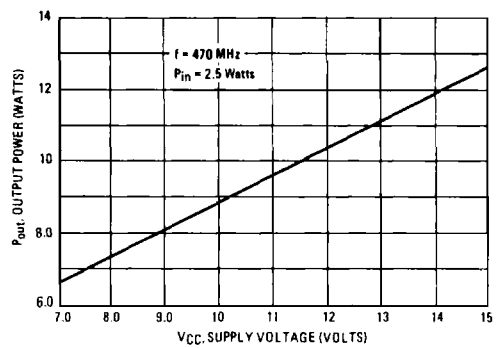


FIGURE 15 - OUTPUT POWER versus INPUT POWER

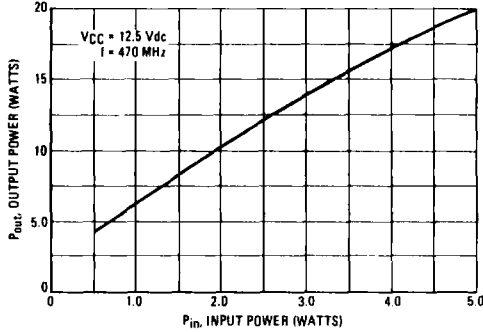


FIGURE 16 - OUTPUT POWER versus FREQUENCY

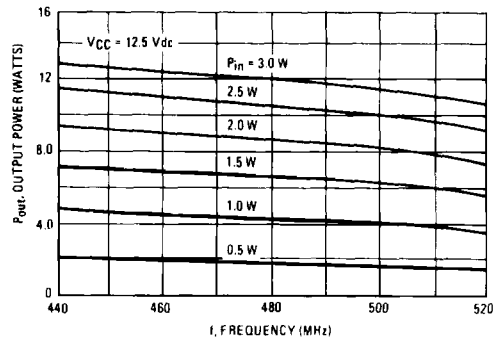
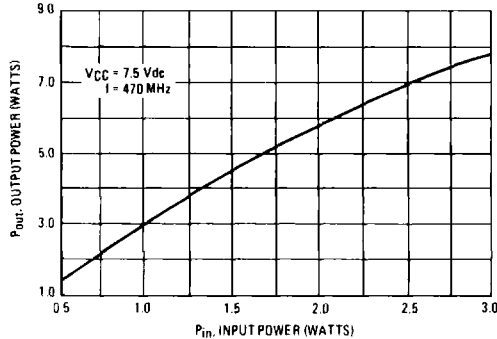
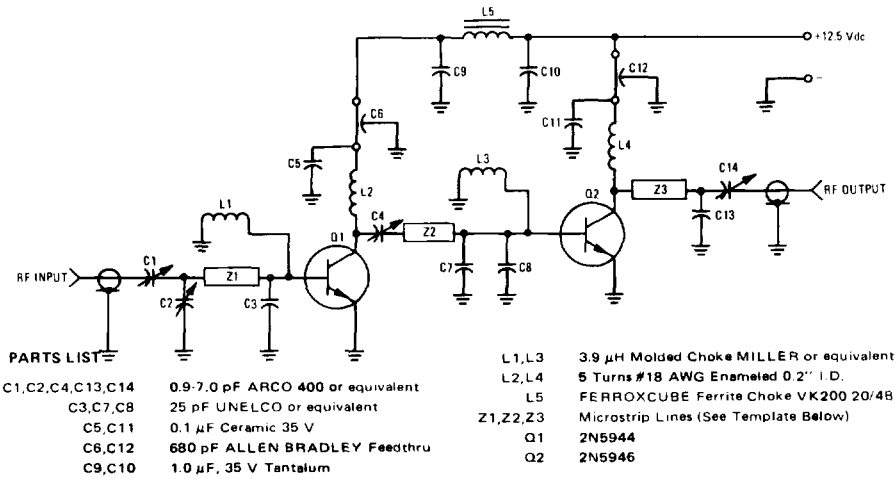


FIGURE 17 - OUTPUT POWER versus INPUT POWER



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FIGURE 18 — 10-WATT BROADBAND UHF AMPLIFIER



10 W AMPLIFIER PERFORMANCE

$V_{CC} = 12.5 \text{ Vdc}$

Frequency MHz	P_{in} mW	P_{out} W	I_C Amp
440	250	8.5	1.5
450	250	11	1.6
460	250	12	1.6
470	250	10.9	1.5
480	250	8.2	1.2

FIGURE 19 — OUTPUT POWER versus FREQUENCY

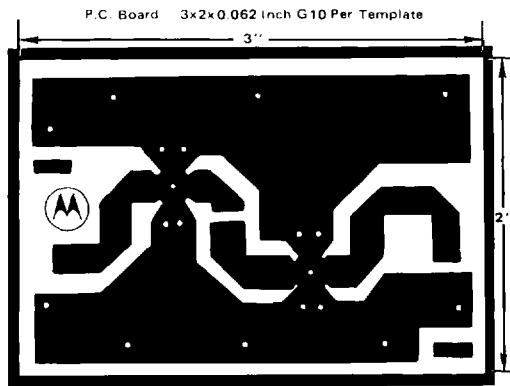
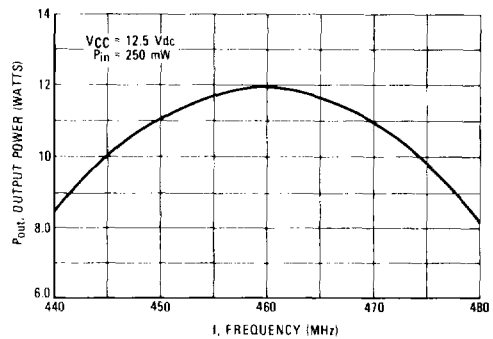


FIGURE 20 — PC BOARD PHOTOMASTER —
10 WATT BROADBAND AMPLIFIER

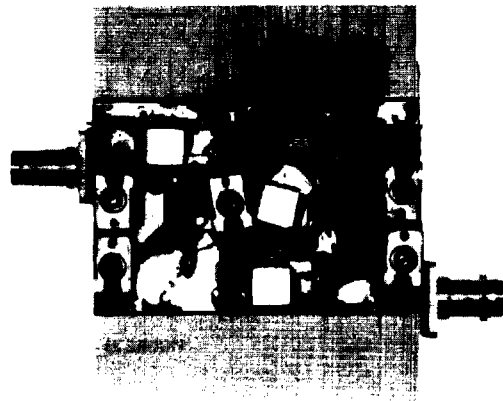
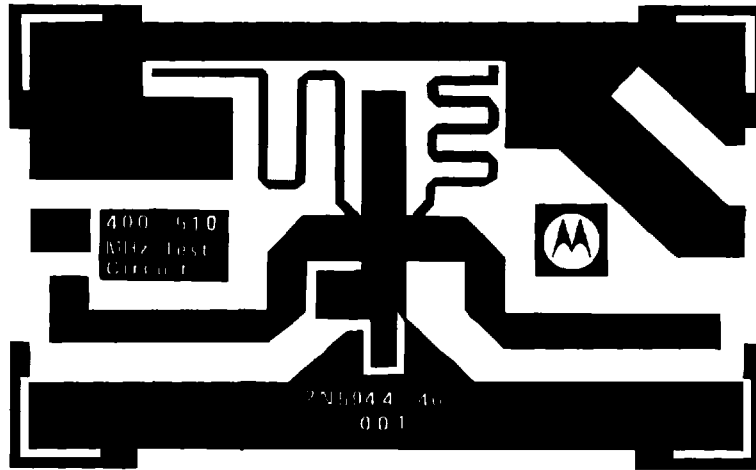
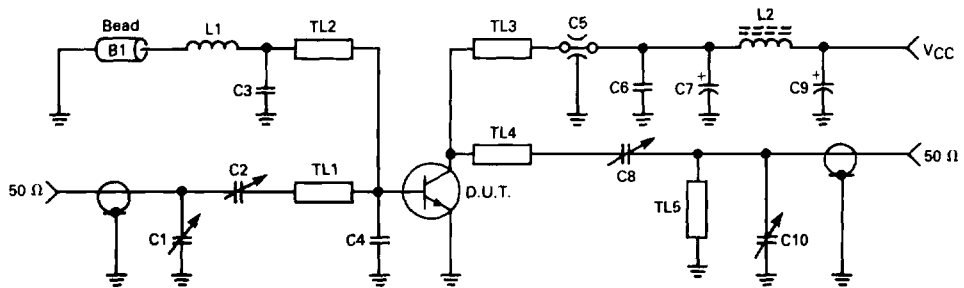


FIGURE 21 — PHOTO OF 10 WATT BROADBAND AMPLIFIER



NOTE: The Printed Circuit Board shown is 75% of the original.

FIGURE 22 — 470 MHz TEST CIRCUIT



C1, C2, C8, C10 — Johanson Trimmer, JMC #5501
 C3 — 100 pF Unelco 350 Vdc J101
 C4 — 15 pF Unelco
 C5 — 680 pF Allen Bradley Feed-Thru
 C6 — 0.1 μ F Monolithic
 C7 — 1 μ F Tantalum Sprague $\pm 10\%$ 35 Vdc
 C9 — 5 μ F Electrolytic 5–25 Vdc

TL1 — Micro Strip 0.26" x 2.9"
 TL2 — Micro Strip 0.055" x 3.9"
 TL3 — Micro Strip 0.055" x 2.9"
 TL4 — Micro Strip 0.26" x 2.9"
 TL5 — Micro Strip 0.50" x 1.2"
 L1 — #18 AWG Wire 0.750" Long
 L2 — VK200 20/4B
 B1 — Ferroxcube Bead, 56-590-65-3B

Board — 0.062" Glass Teflon
 2 oz. Cu CLAD
 $\epsilon_r = 2.55$

FIGURE 23 — 470 MHz TEST CIRCUIT SCHEMATIC