2N5944 (SILICON)
2N5945
2N5946

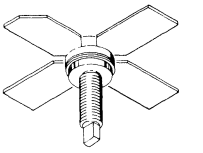
The RF Line

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
- RF ballasting provides protection against device damage due to load mismatch
- Characterized with series equivalent large-signal impedance parameters

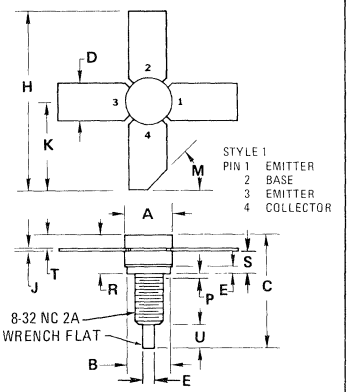
2.0, 4.0, 10 W – 470 MHz
RF POWER TRANSISTORS
NPN SILICON



MAXIMUM RATINGS

Rating	Symbol	2N5944	2N5945	2N5946	Unit
*Collector-Emitter Voltage	V_{CEO}	← 16 →			Vdc
*Collector-Base Voltage	V_{CBO}	← 36 →			Vdc
*Emitter-Base Voltage	V_{EBO}	← 4.0 →			Vdc
*Collector Current – Continuous	I_C	0.4	0.8	2.0	Adc
*Total Device Dissipation @ $T_C = 25^oC$[1]	P_D	5.0	15	37.5	Watts
Derate above 25^oC		28.5	85.5	214	mW/^oC
*Storage Temperature Range	T_{stg}	← −65 to +200 →			^oC
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 MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.06	7.26	0.278	0.286
B	6.25	6.45	0.246	0.254
C	15.49	16.51	0.610	0.650
D	5.59	5.84	0.220	0.230
E	1.52 NOM		0.060 NOM	
H	26.80	27.05	1.055	1.065
J	0.127 NOM		0.005 NOM	
K	13.41	13.51	0.528	0.532
M	45° NOM		45° NOM	
P	–	1.27	–	0.050
R	4.52	5.03	0.178	0.198
S	3.00	3.25	0.118	0.128
T	1.40	1.65	0.055	0.065
U	2.92	3.68	0.115	0.145

CASE 244

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector-Emitter Breakdown Voltage		BV_{CEO}				Vdc
(I_C = 50 mAdc, I_B = 0)	2N5944		16	–	–	
(I_C = 100 mAdc, I_B = 0)	2N5945		16	–	–	
(I_C = 200 mAdc, I_B = 0)	2N5946		16	–	–	
Collector-Emitter Breakdown Voltage		BV_{CES}				Vdc
(I_C = 50 mAdc, V_{BE} = 0)	2N5944		36	–	–	
(I_C = 100 mAdc, V_{BE} = 0)	2N5945		36	–	–	
(I_C = 200 mAdc, V_{BE} = 0)	2N5946		36	–	–	
Emitter-Base Breakdown Voltage		BV_{EBO}				Vdc
(I_E = 1.0 mAdc, I_C = 0)	2N5944		4.0	–	–	
(I_E = 2.0 mAdc, I_C = 0)	2N5945		4.0	–	–	
(I_E = 4.0 mAdc, I_C = 0)	2N5946		4.0	–	–	
Collector Cutoff Current		I_{CES}				mAdc
(V_{CE} = 15 Vdc, V_{BE} = 0, T_C = 55°C)	2N5944		–	0.2	10	
	2N5945,2N5946		–	0.5	20	
Collector Cutoff Current		I_{CBO}				mAdc
(V_{CB} = 15 Vdc, I_E = 0)	2N5944,2N5945		–	–	1.0	
	2N5946		–	–	2.0	
ON CHARACTERISTICS						
DC Current Gain		h_{FE}				–
(I_C = 100 mAdc, V_{CE} = 5.0 Vdc)	2N5944		20	80	–	
(I_C = 200 mAdc, V_{CE} = 5.0 Vdc)	2N5945		20	80	–	
(I_C = 500 mAdc, V_{CE} = 5.0 Vdc)	2N5946		20	80	–	
DYNAMIC CHARACTERISTICS						
Output Capacitance		C_{ob}				pF
(V_{CB} = 12.5 Vdc, I_E = 0, f = 1.0 MHz)	2N5944		–	11	15	
	2N5945		–	18	25	
	2N5946		–	38	45	
FUNCTIONAL TEST (Figure 20)						
Common-Emitter Amplifier Power Gain		G_{PE}				dB
(V_{CC} = 12.5 Vdc, P_{out} = 2.0 W, I_C(max) = 267 mAdc, f = 470 MHz)	2N5944		9.0	10	–	
(V_{CC} = 12.5 Vdc, P_{out} = 4.0 W, I_C(max) = 533 mAdc, f = 470 MHz)	2N5945		8.0	9.0	–	
(V_{CC} = 12.5 Vdc, P_{out} = 10 W, I_C(max) = 1.33 Adc, f = 470 MHz)	2N5946		6.0	7.0	–	
Collector Efficiency		η				%
(V_{CC} = 12.5 Vdc, P_{out} = 2.0 W, I_C(max) = 240 mAdc, f = 470 MHz)	2N5944		60	–	–	
(V_{CC} = 12.5 Vdc, P_{out} = 4.0 W, I_C(max) = 500 mAdc, f = 470 MHz)	2N5945		60	–	–	
(V_{CC} = 12.5 Vdc, P_{out} = 10 W, I_C(max) = 1.3 Adc, f = 470 MHz)	2N5946		60	–	–	

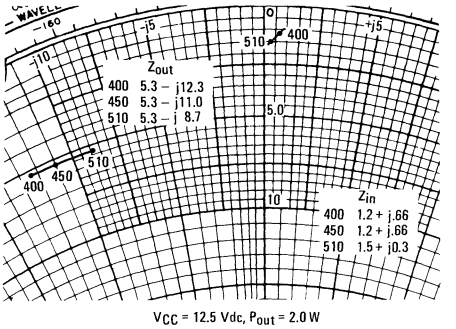
*Indicates JEDEC Registered Data

These devices are available in various packages, such as a studless stripline package, 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.

2N5944
TYPICAL PERFORMANCE DATA

FIGURE 1 – SERIES EQUIVALENT IMPEDANCE



V_{CC} = 12.5 Vdc, P_{out} = 2.0 W

FIGURE 2 – OUTPUT POWER versus SUPPLY VOLTAGE

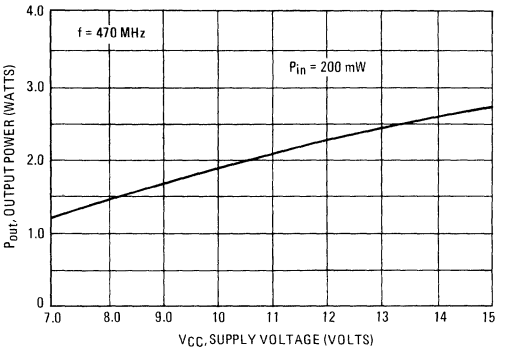


FIGURE 3 – OUTPUT POWER versus INPUT POWER

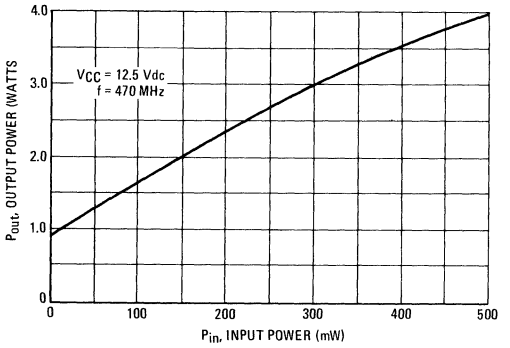


FIGURE 4 – OUTPUT POWER versus FREQUENCY

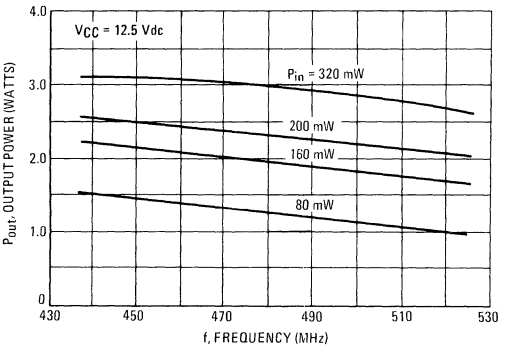


FIGURE 5 – OUTPUT POWER versus INPUT POWER

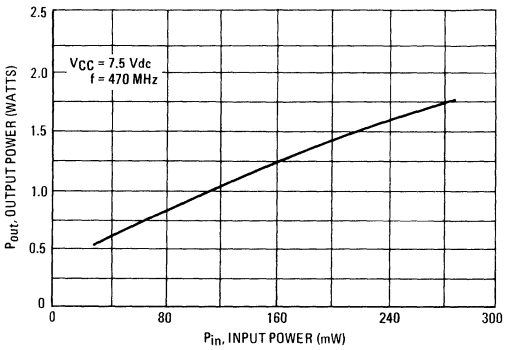
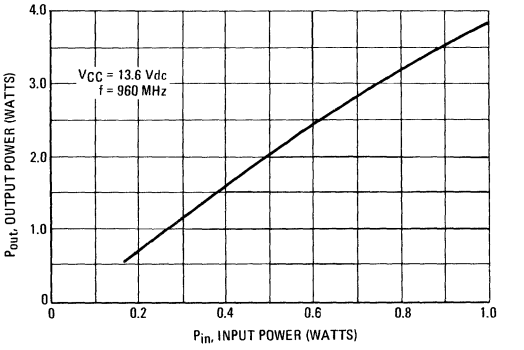
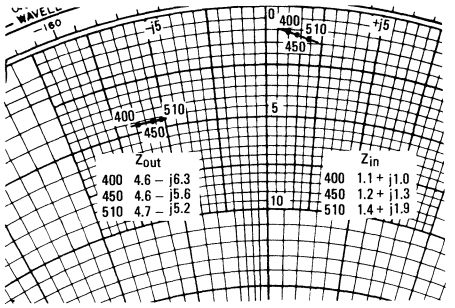


FIGURE 6 – OUTPUT POWER versus INPUT POWER



2N5945
TYPICAL PERFORMANCE DATA

FIGURE 7 – SERIES EQUIVALENT IMPEDANCE



V_{CC} = 12.5 Vdc, P_{out} = 4.0 W

FIGURE 8 – OUTPUT POWER versus SUPPLY VOLTAGE

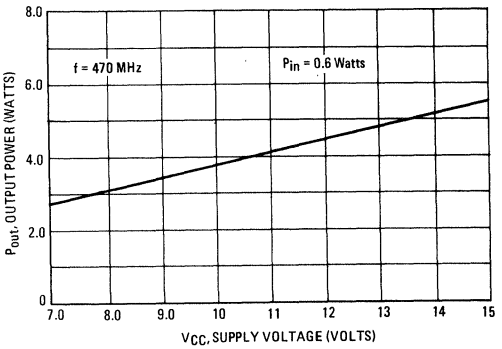


FIGURE 9 – OUTPUT POWER versus INPUT POWER

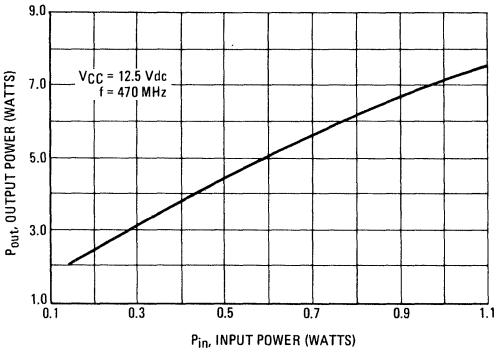


FIGURE 10 – OUTPUT POWER versus FREQUENCY

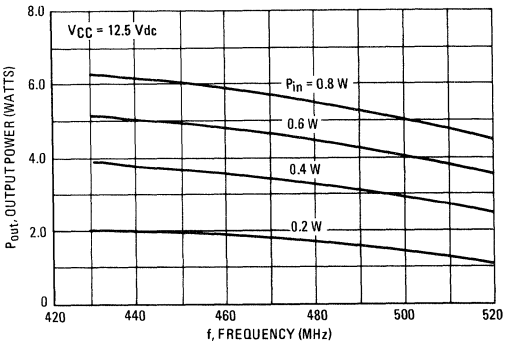


FIGURE 11 – OUTPUT POWER versus INPUT POWER

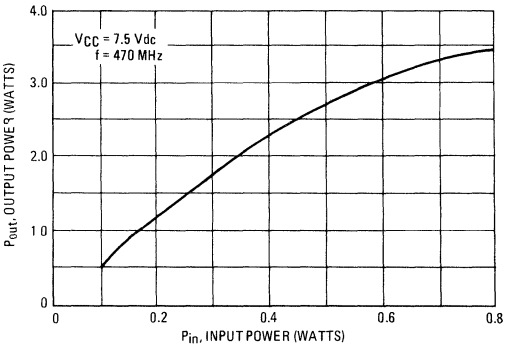
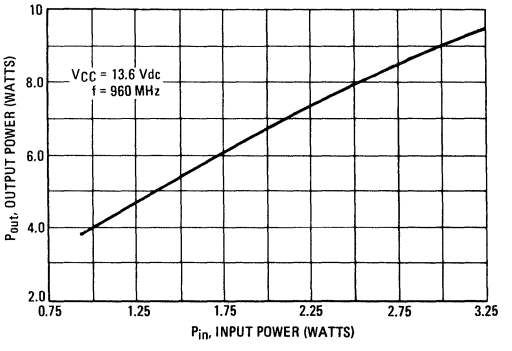
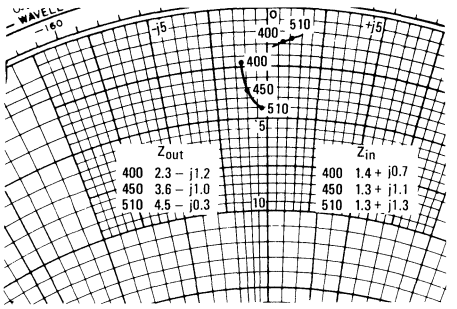


FIGURE 12 – OUTPUT POWER versus INPUT POWER



2N5946
TYPICAL PERFORMANCE DATA

FIGURE 13 – SERIES EQUIVALENT IMPEDANCE



V_{CC} = 12.5 Vdc, P_{out} = 12 W

FIGURE 14 – OUTPUT POWER versus SUPPLY VOLTAGE

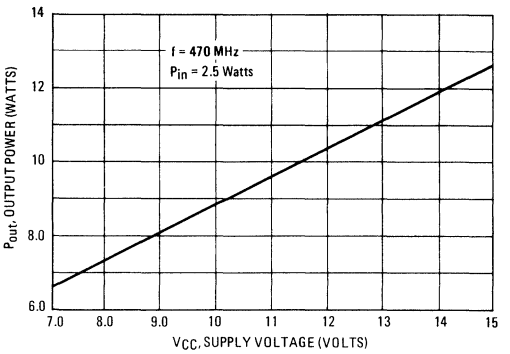


FIGURE 15 – OUTPUT POWER versus INPUT POWER

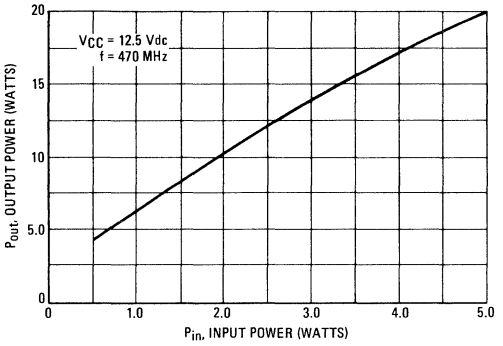


FIGURE 16 – OUTPUT POWER versus FREQUENCY

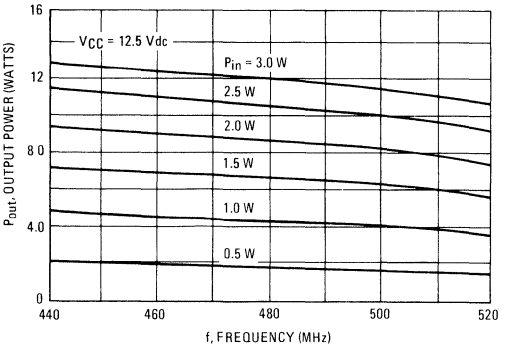


FIGURE 17 – OUTPUT POWER versus INPUT POWER

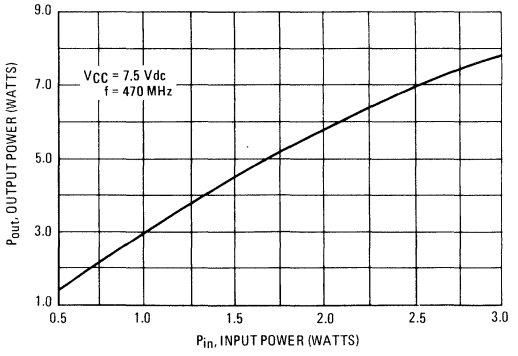
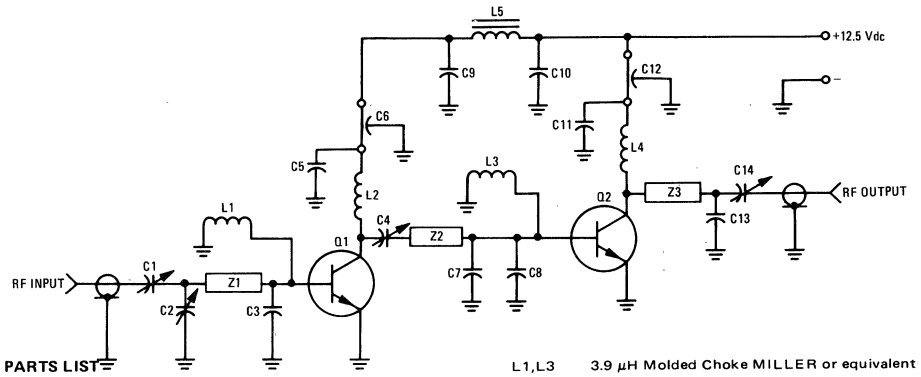


FIGURE 18



PARTS LIST

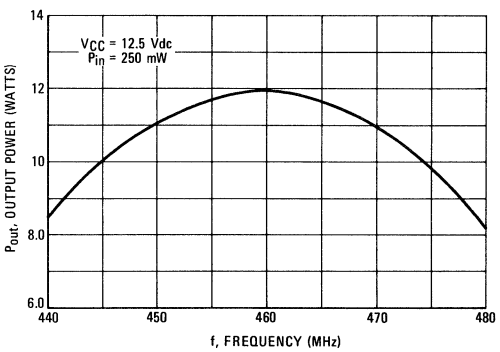
C1,C2,C4,C13,C14	0.9-7.0 pF ARCO 400 or equivalent
C3,C7,C8	25 pF UNELCO or equivalent
C5,C11	0.1 μF Ceramic 35 V
C6,C12	680 pF ALLEN BRADLEY Feedthru
C9,C10	1.0 μF, 35 V Tantalum
L1,L3	3.9 μH Molded Choke MILLER or equivalent
L2,L4	5 Turns #18 AWG Enameled 0.2" I.D.
L5	FERROXCUBE Ferrite Choke VK200 20/4B
Z1,Z2,Z3	Microstrip Lines (See Template Below)
Q1	2N5944
Q2	2N5946

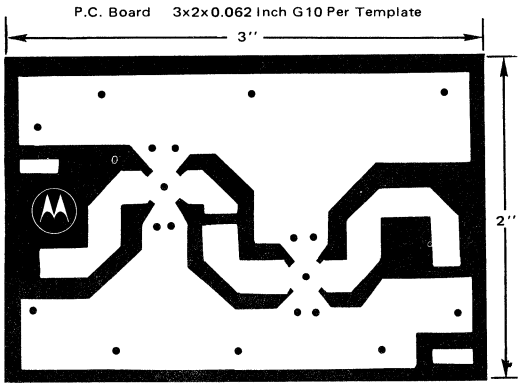
10 W AMPLIFIER PERFORMANCE

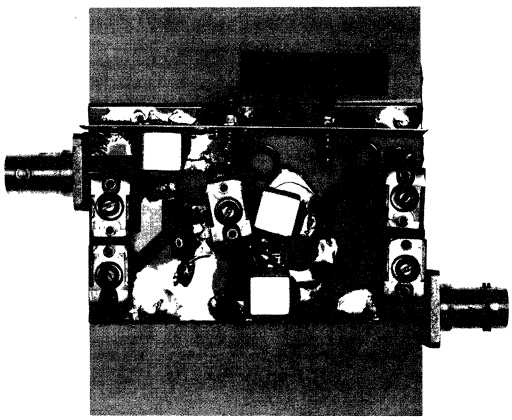
V_{CC} = 12.5 Vdc

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

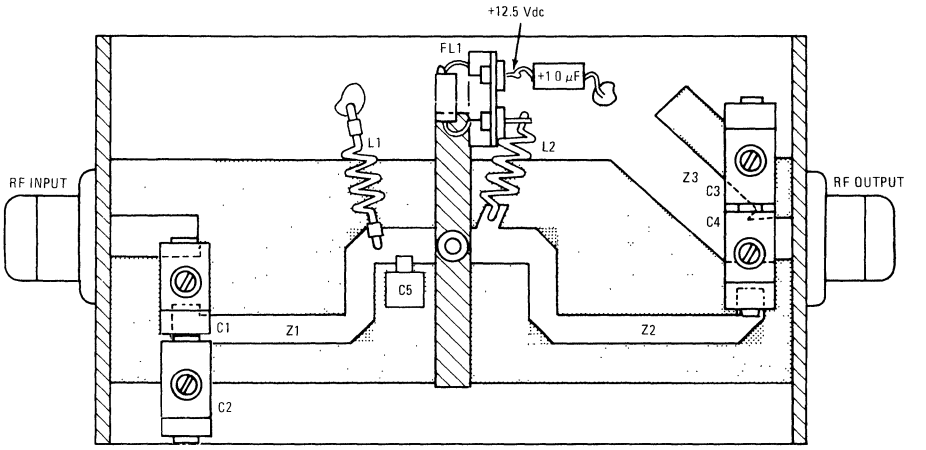






470 MHz TEST CIRCUIT

FIGURE 20



C1,2 1.0-25 pF ARCO 421 OR EQUIVALENT
C3,4 1.0-25 pF ARCO 421 OR EQUIVALENT
L1,2 7 TURNS #22 AWG, 0.2" I.D.
FERRITE BEADS FERROXCUBE 56-590-65-3B
AS SHOWN ON L1
FL1 DC SUPPLY FILTER
2-1000 pF FT CAPACITOR
1-1.0 μF, 35 V CAPACITOR
1-CHOKE FERROXCUBE VK 200-20-4B

CONNECTORS ARE TYPE "N"
BOARD IS GLASS TEFLON
3" x 5" x 0.060"
MOUNTING PLATE IS 3" x 5" x 0.75"

FIGURE 21