2N6256 (SILICON)

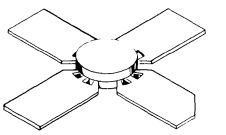
The RF Line

NPN SILICON RF POWER TRANSISTOR

. . . designed for 12.5 Volt, VHF/UHF large signal Amplifier/Multiplier applications required in industrial and commercial FM equipment operating to 520 MHz.

- Specified 12.5 Volt, 470 MHz Characteristics
  Power Output = 0.5 Watts
  Minimum Gain = 7.0 dB
  Efficiency = 60%
- Characterized with series equivalent large signal impedance parameters
- Driver for 2N5944 and 2N5945 UHF amplifiers
- Capable of withstanding severe load mismatch

0.5 WATT – 470 MHz RF POWER TRANSISTOR NPN SILICON



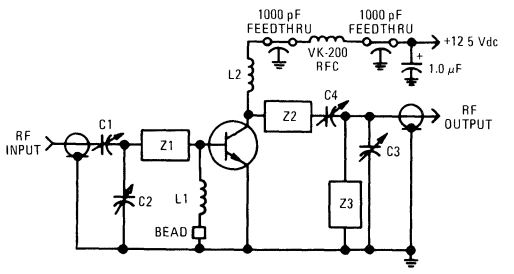
*MAXIMUM RATINGS

Rating	Symbol	Value	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	Adc
Total Continuous Device Dissipation @ $T_C = 25^oC$ – Derate above 25^oC	P_D	2.0 11.4	Watts mW/^oC
Storage Temperature Range	T_{stg}	-65 to +200	^oC

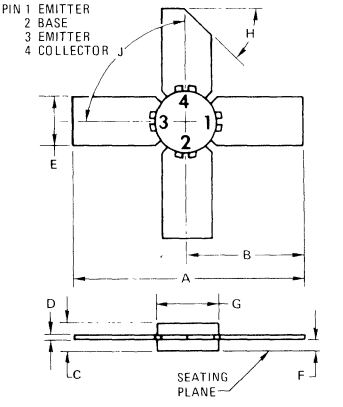
This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

* Indicates JEDEC Registered Data

FIGURE 1 – 470 MHz TEST CIRCUIT SCHEMATIC



NOTE: Test Circuit Layout and Component Descriptions Shown in Figure 6



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	26.800	27.050	1.055	1.065
B	13.340	13.600	0.525	0.535
C	2.920	3.350	0.115	0.132
D	0.102	0.152	0.004	0.006
E	5.590	5.840	0.220	0.230
F	1.400	1.650	0.055	0.065
G	7.060	7.260	0.278	0.286
H	40^0	50^0	40^0	50^0
J	90^0 TP		90^0 TP	

CASE 249-01

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 5.0 mAdc, I_B = 0)	BV_{CEO}	16	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 5.0 mAdc, V_{BE} = 0)	BV_{CES}	36	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 1.0 mAdc, I_C = 0)	BV_{EBO}	4.0	–	–	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0, T_A = 125°C)	I_{CES}	–	–	5.0	mAdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	0.5	mAdc
ON CHARACTERISTICS					
Dc Current Gain (I_C = 50 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	20	80	200	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 12.5 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	6.0	8.0	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (Figures 1, 6) (P_{out} = 0.5 W, V_{CC} = 12.5 Vdc, f = 470 MHz)	G_{PE}	7.0	9.0	–	dB
Collector Efficiency (Figures 1, 6) (P_{out} = 0.5 W, V_{CC} = 12.5 Vdc, f = 470 MHz)	η	60	70	–	%

*Indicates JEDEC Registered Data.

Typical Output Power curves were measured in circuit shown in Figure 6.

FIGURE 2 – OUTPUT POWER versus FREQUENCY

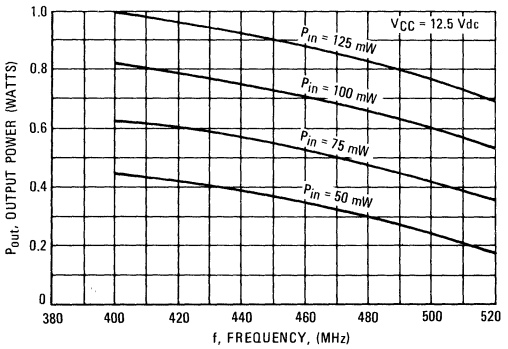


FIGURE 3 – OUTPUT POWER versus INPUT POWER

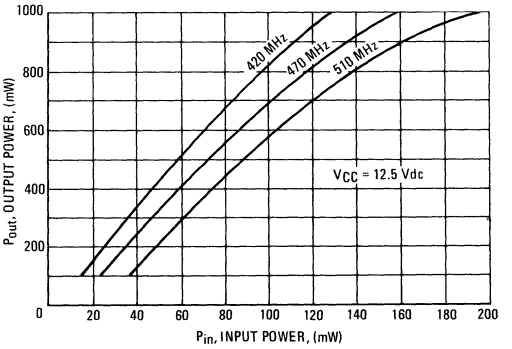


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE (f = 470 MHz)

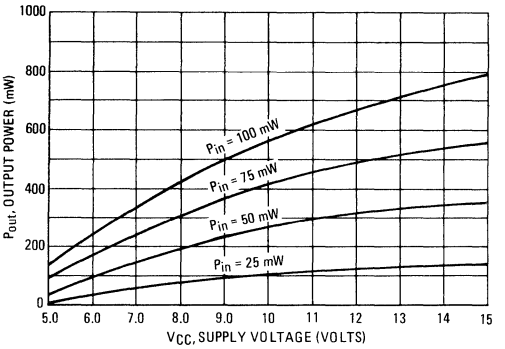


FIGURE 5 – SERIES EQUIVALENT INPUT and OUTPUT IMPEDANCE (V_{CC} = 12.5 Vdc, P_{out} = 0.5 Watts)

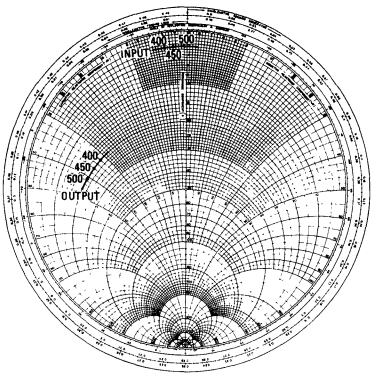
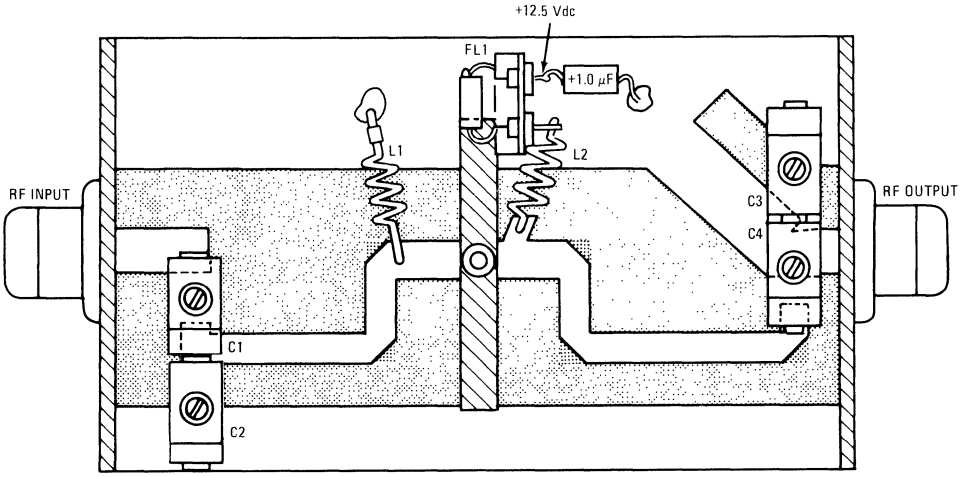


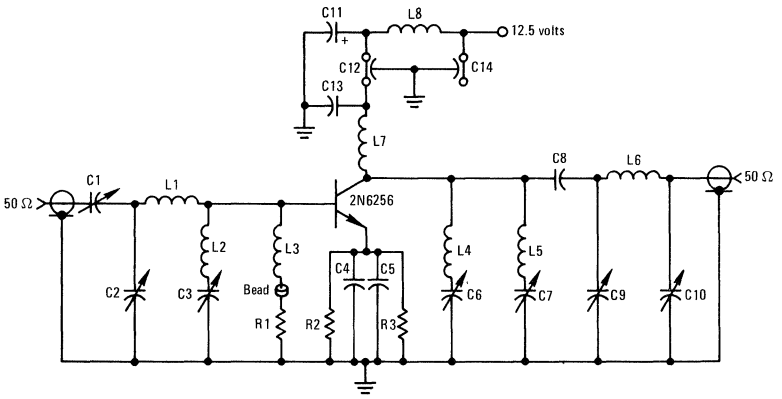
FIGURE 6 – 470 MHz TEST CIRCUIT LAYOUT (See Figure 1 for Schematic Diagram)



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 BEAD 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 7 – 150 MHz to 450 MHz TRIPLER USING 2N6256



C1, 2, 3, 9, 10 1-7 pF ARCO 400 OR EQUIVALENT
C6, 7 1.5-20 pF ARCO 402 OR EQUIVALENT
C4, 5 470 pF ATC TYPE 100-B-420-m-ms
C8 1000 pF UNDERWOOD TYPE J-101
C11 0.47 μF TANTALUM
C12, 14 470 pF FEED THRU
C13 0.1 μF CERAMIC
R1-20 OHM
R2,3-160 OHM

L1 7 TURNS 1/4" I.D.
L2,6-4 TURNS 1/8" I.D.
L3 0.68 μH MOLDED CHOKE
L4 5 TURNS 1/4" I.D.
L5 6 TURNS 1/8" I.D.
L7 1 μH MOLDED CHOKE
L8 FERROXCUBE VK200-20/4B
FERRITE BEAD IS FERROXCUBE 56-590-65/3B

NOTE: ALL COILS AIR CORE SPACE WOUND WITH #20 AWG WIRE UNLESS OTHERWISE SPECIFIED

Figure 7 shows the 2N6256 in a 150 MHz to 450 MHz tripler circuit. This circuit will typically produce 85 mW at 450 MHz with 30 mW at 150 MHz input (4.5 db gain). Collector efficiency is 25% and all unwanted harmonics are at least 30 db down from the 450 MHz output level.

It is important that each emitter lead be bypassed separately with a good hi-quality capacitor. The emitter resistor is likewise split in two with one-half on each emitter lead.

The input network is a modified "TEE" consisting of C1, C2, and L1, which matches the 50 Ohm input to the transistor impedance at 150 MHz; this is roughly 18-j20 Ohms. The combination of L2 and C3 form a 450 MHz idler to provide a base return for third harmonic current. L4, C6 and L5, C7 are 150 MHz and 300 MHz output idlers respectively. The output matching section is a pi network made up of L6, C9 and C10. All coils are air core space-wound (turns one wire diameter apart) with #20 AWG wire.