2N5947

The RF Line

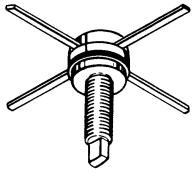
NPN SILICON HIGH FREQUENCY TRANSISTOR

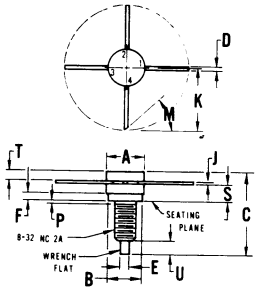
. . . designed specifically for broadband applications requiring low cross-modulation distortion and low noise figure. Characterized for use in CATV applications. The 2N5947 was formerly the MM8012.

- Low Cross Modulation Distortion –
  XM = -57 dB (Max) @ +50 dBmV Output
- Low Noise Figure – @ f = 200 MHz
  NF (Narrowband) = 3.8 dB (Typ)
  NF (Broadband) = 8.5 dB (Max)
- High Broadband Power Gain –
  G_{pe} = 10 dB (Min) @ f = 250 MHz

HIGH FREQUENCY TRANSISTOR

NPN SILICON





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

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.06	7.26	0.278	0.286
B	6.20	6.50	0.244	0.256
C	15.24	16.51	0.600	0.650
D	0.66	0.86	0.026	0.034
E	1.40	1.65	0.055	0.065
F	1.52	–	0.060	–
J	0.10	0.15	0.004	0.006
K	11.17	–	0.440	–
M	45° NOM		45° NOM	
P	–	1.27	–	0.050
S	2.74	3.35	0.108	0.132
T	1.40	1.78	0.055	0.070
U	2.92	3.68	0.115	0.145

CASE 244A-01

*MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	30	Vdc
Collector-Base Voltage	V_{CB}	40	Vdc
Emitter-Base Voltage	V_{EB}	3.5	Vdc
Collector Current – Continuous	I_C	400	mAdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	5.0 28.6	Watts mW/°C
Storage Temperature Range	T_{stg}	-65 to +200	°C

*Indicates JEDEC Registered Data.

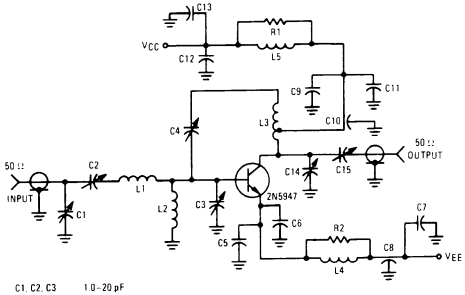
***ELECTRICAL CHARACTERISTICS** (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 20 mAdc, I_B = 0)	$V_{(BR)CEO}$	30	–	–	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	$V_{(BR)CBO}$	40	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	$V_{(BR)EBO}$	3.5	–	–	Vdc
Collector Cutoff Current (V_{CE} = 28 Vdc, I_B = 0)	I_{CEO}	–	–	100	μAdc
Collector Cutoff Current (V_{CB} = 20 Vdc, I_E = 0)	I_{CBO}	–	–	10	μAdc
Emitter Cutoff Current (V_{BE} = 3.5 Vdc, I_C = 0)	I_{EBO}	–	–	100	μAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 75 mAdc, V_{CE} = 20 Vdc)	h_{FE}	25	–	250	–
Collector-Emitter Saturation Voltage (I_C = 200 mAdc, I_B = 20 mAdc)	$V_{CE(sat)}$	–	0.2	0.35	Vdc
Base-Emitter Saturation Voltage (I_C = 200 mAdc, I_B = 20 mAdc)	$V_{BE(sat)}$	–	1.0	1.5	Vdc
DYNAMIC CHARACTERISTICS					
Current-Gain – Bandwidth Product (Figure 3) (I_C = 75 mAdc, V_{CE} = 20 Vdc, f = 200 MHz)	f_T	1100	1500	–	MHz
Collector-Base Capacitance (Figure 4) (V_{CB} = 30 Vdc, I_E = 0, f = 100 kHz)	C_{cb}	–	1.5	4.0	pF
Emitter-Base Capacitance (Figure 4) (V_{EB} = 0.5 Vdc, I_C = 0, f = 100 kHz)	C_{eb}	–	8.2	12	pF
Small-Signal Current Gain (I_C = 75 mAdc, V_{CE} = 20 Vdc, f = 1.0 kHz)	h_{fe}	25	–	300	–
Collector-Base Time Constant (I_E = 75 mAdc, V_{CB} = 20 Vdc, f = 31.8 MHz)	$r_b C_c$	2.0	–	20	ps
Noise Figure	NF				dB
(I_C = 50 mAdc, V_{CE} = 20 Vdc, f = 200 MHz) (Figure 1)		–	3.8	–	
(I_C = 50 mAdc, V_{CE} = 20 Vdc, f = 200 MHz) (1) (Figure 2, 9)		–	7.2	8.5	
(I_C = 75 mAdc, V_{CE} = 20 Vdc, f = 200 MHz) (1) (Figure 2, 9)		–	7.8	–	
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (Figure 2) (I_C = 75 mAdc, V_{CE} = 20 Vdc, f = 250 MHz)	G_{pe}	10	11	–	dB
Intermodulation Distortion (Figure 2, 10) (I_C = 75 mAdc, V_{CE} = 20 Vdc, V_{out} = +50 dBmv)	IM	–	-55	-50	dB
Cross Modulation Distortion (Figure 2, 11) (I_C = 75 mAdc, V_{CE} = 20 Vdc, V_{out} = +50 dBmV)	XM	–	-60	-57	dB

*Indicates JEDEC Registered Data.

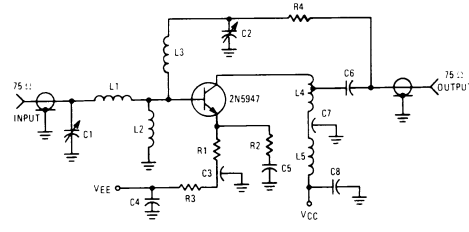
(1) Includes noise figure of post-amplifier and matching pad.

FIGURE 1 – NARROWBAND TEST CIRCUIT



C1, C2, C3	1.0–20 pF	L2	1 1/2 Turns AWG #18, 1/4" I.D., 3/16" Long
C4, C14, C15	1.0–10 pF	L3	9 3/4 Turns AWG #18, 3/16" I.D., 1" Long Tapped 1 3/4 Turns from Collector End
C5, C8, C9	470 pF		
C6, C10, C11	0.001 μF		
C7, C13	0.01 μF		
C12	0.1 μF	L4, L5	0.47 μH Molded Choke
L1	3 Turns AWG #18, 1/4" I.D., 5/16" Long	R1, R2	10 Ohms

FIGURE 2 – BROADBAND TEST CIRCUIT



C1, C2	0.5–6.0 pF	L4	#30 AWG Trifilar Wound 1.9 9 Stackpole 57-0985, #11 Toroid
C3, C7	1500 pF Underwood		
C4, C5, C8	0.01 μF		
C6	470 pF	L5	Ferrite Choke, 3 Turns #30 on Stackpole 57-0156 Bead
L1	3 Turns #20 AWG, 5/32" I.D.		
L2	0.84 μH, Ohmite Z235	R1	20 Ohms
L3	5 Turns #26 AWG, 5/32" I.D.	R2	68 Ohms
		R3	150 Ohms
		R4	360 Ohms

FIGURE 3 – CURRENT-GAIN–BANDWIDTH PRODUCT

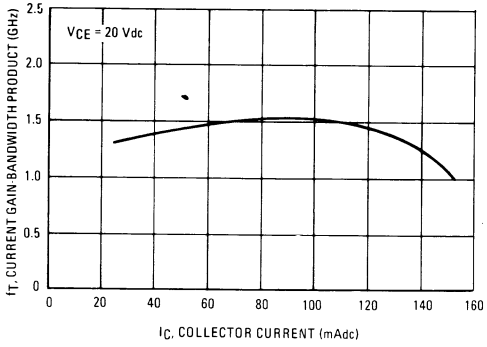


FIGURE 4 – CAPACITANCES

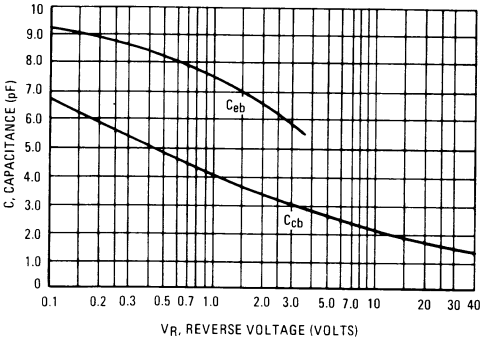


FIGURE 5 – COLLECTOR-EMITTER SATURATION VOLTAGE

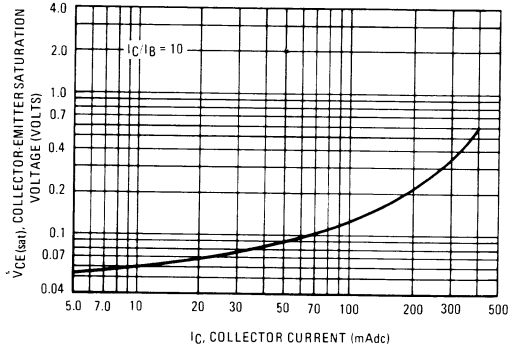


FIGURE 6 – BASE-EMITTER SATURATION VOLTAGE

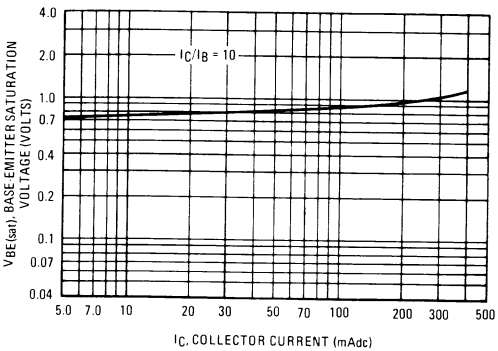


FIGURE 7 – NARROWBAND NOISE FIGURE versus CURRENT

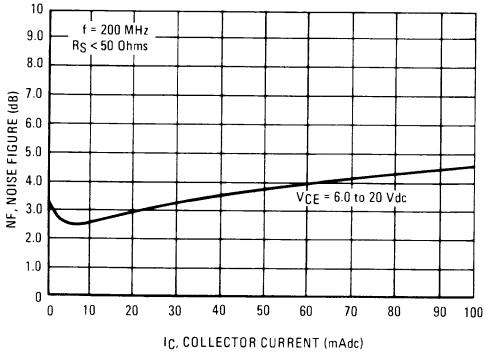


FIGURE 8 – BROADBAND NOISE FIGURE versus CURRENT

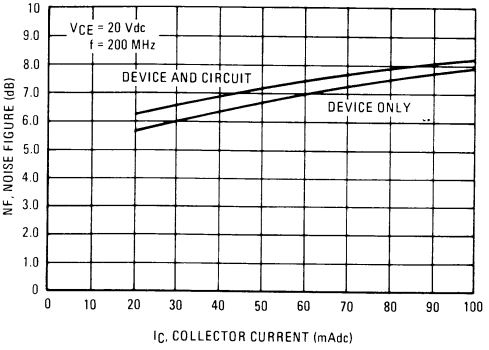
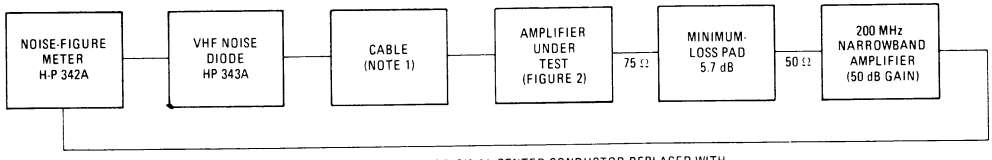


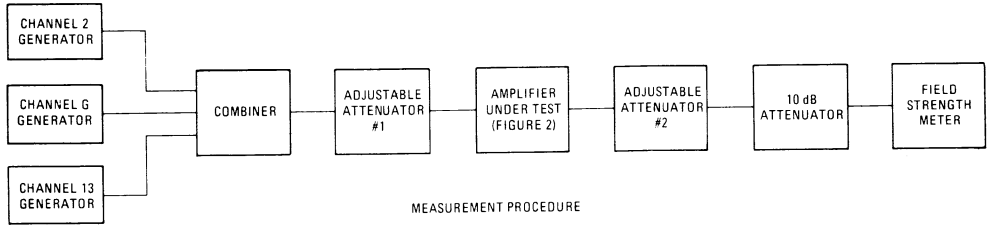
FIGURE 9 – NOISE FIGURE TEST SETUP



NOTE 1. RG-59 CABLE WITH ORIGINAL CENTER CONDUCTOR REPLACED WITH #30 WIRE. OVERALL LENGTH, INCLUDING BNC CONNECTORS, IS A QUARTER-WAVELENGTH AT 200 MHz (APPROX. 11 INCHES). USED TO MATCH IMPEDANCE OF NOISE DIODE TO AMPLIFIER UNDER TEST.

THE NOISE FIGURE OF THE POST-AMPLIFIERS AND MINIMUM LOSS PAD IS 8.4 dB.

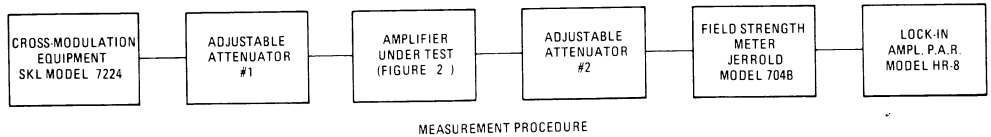
FIGURE 10 – INTERMODULATION DISTORTION TEST SETUP



MEASUREMENT PROCEDURE

1. ADJUST CHANNEL 2 GENERATOR FOR RATED OUTPUT FROM TEST AMPLIFIER (CHANNELS G & 13 OFF).
2. REPEAT FOR CHANNEL G (2 & 13 OFF) AND CHANNEL 13 (2 & G OFF). NOTE FOR REFERENCE THE FIELD STRENGTH METER READING FOR CHANNEL 13 (2 & G OFF).
3. TURN CHANNEL 13 OFF AND DRIVE THE TEST AMPLIFIER WITH CHANNELS 2 & G. MEASURE THE LEVEL OF INTERMODULATION DISTORTION AT CHANNEL 13 RELATIVE TO THE REFERENCE LEVEL IN STEP 2.

FIGURE 11 – CROSS MODULATION DISTORTION TEST SETUP



MEASUREMENT PROCEDURE

1. ADJUST THE CROSSMODULATION EQUIPMENT FOR +50 dBmV OUTPUT FROM EACH CHANNEL.
2. ADJUST ATTENUATOR #1 FOR THE DESIRED OUTPUT LEVEL FROM THE TEST AMPLIFIER. ADJUST ATTENUATOR #2 TO MAINTAIN THE FIELD STRENGTH METER INPUT AT +10 dBmV.
3. WITH THE FIELD STRENGTH METER SELECT CHANNEL 13. USING THE WAVE ANALYZER MEASURE THE LEVEL OF THE MODULATION ON CHANNEL 13 DUE TO CROSS-MODULATION OF CHANNELS 2-12.

FIGURE 12 – CROSS MODULATION DISTORTION versus OUTPUT LEVEL

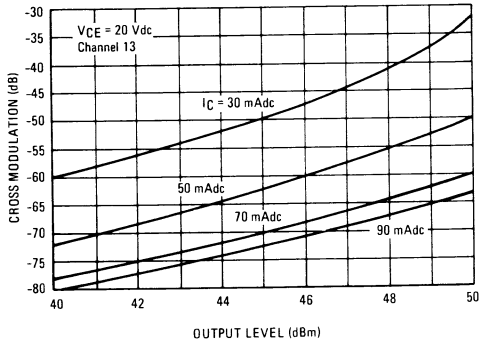
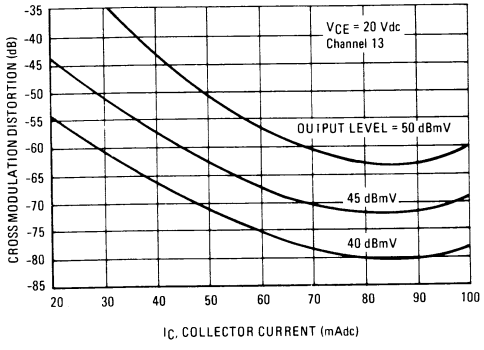


FIGURE 13 – CROSS MODULATION DISTORTION versus CURRENT



2N6080

The RF Line

4.0 W – 175 MHz

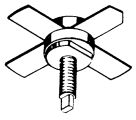
RF POWER
TRANSISTOR

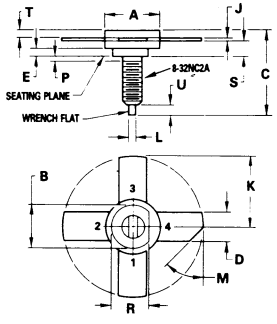
NPN SILICON

NPN SILICON RF POWER TRANSISTOR

. . . designed for 12.5 Volt VHF large-signal power amplifier applications required in military and industrial equipment operating to 300 MHz.

- Specified 12.5 Volt, 175 MHz Characteristics –
  Output Power = 4.0 W
  Minimum Gain = 12 dB
  Efficiency = 50%
- Characterized with Series Equivalent Large-Signal Impedance Parameters





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

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.40	9.78	0.370	0.385
B	8.13	8.38	0.320	0.330
C	17.02	20.07	0.670	0.790
D	5.46	5.97	0.215	0.235
E	1.78	—	0.070	—
J	0.08	0.18	0.003	0.007
K	12.45	—	0.490	—
L	1.40	1.78	0.055	0.070
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
R	7.59	7.80	0.299	0.307
S	4.01	4.52	0.158	0.178
T	2.11	2.54	0.083	0.100
U	2.49	3.35	0.098	0.132

CASE 145A-09

***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	1.0	Adc
Total Device Dissipation @ $T_C = 25^oC$ (2) Derate above 25^oC	P_D	12 68.5	Watts $mW/^oC$
Storage Temperature Range	T_{stg}	-65 to +200	^oC
Stud Torque (1)	—	6.5	in. lb.

*Indicates JEDEC Registered Data.
(1) For repeated assembly use 5 in lb.
(2) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	$V_{(BR)CEO}$	18	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 5.0 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 1.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0, T_C = +55°C)	I_{CES}	–	–	5.0	mAdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	0.25	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.25 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 0.1 MHz)	C_{ob}	–	15	20	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (P_{out} = 4.0 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	G_{PE}	12	–	–	dB
Collector Efficiency (P_{out} = 4.0 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	η	50	–	–	%

*Indicates JEDEC Registered Data.

FIGURE 1 – 175 MHz TEST CIRCUIT

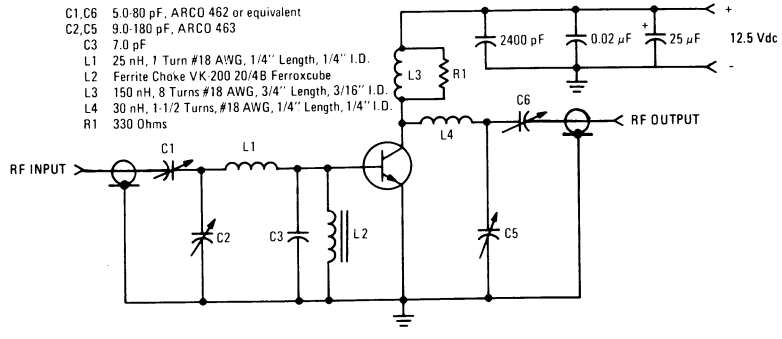


FIGURE 2 – OUTPUT POWER versus INPUT POWER

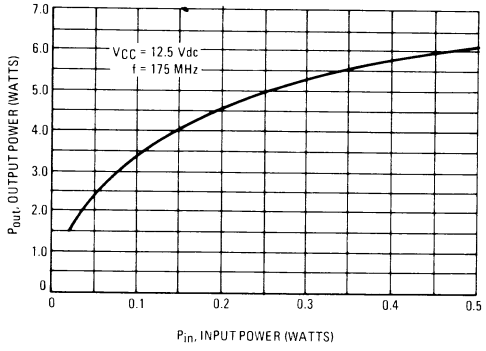


FIGURE 3 – OUTPUT POWER versus FREQUENCY

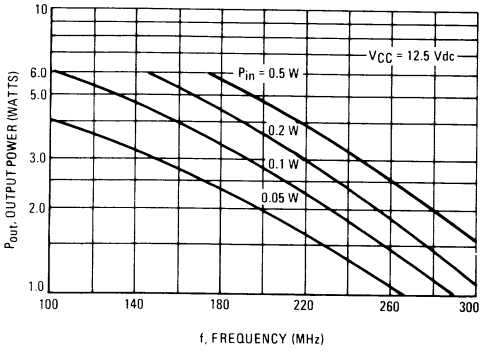


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE

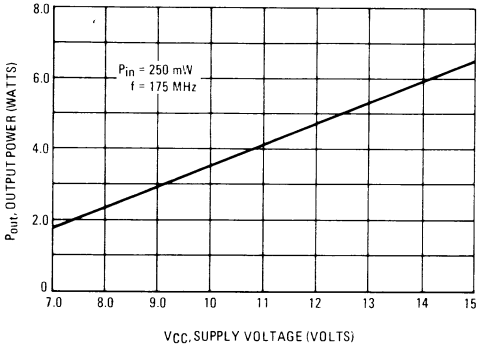
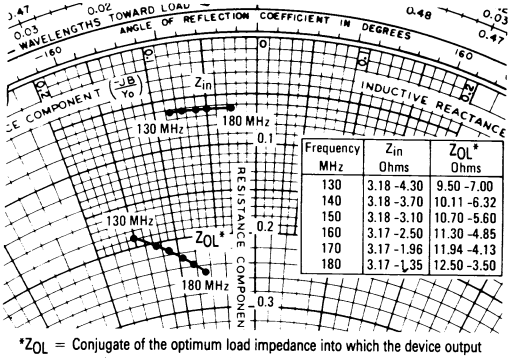


FIGURE 5 – SERIES EQUIVALENT IMPEDANCE



*Z_{OL} = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

3

2N6081
MRF221

The RF Line

15 W – 175 MHz

RF POWER TRANSISTORS

NPN SILICON

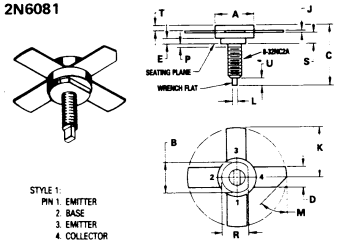
NPN SILICON RF POWER TRANSISTORS

. . . designed for 12.5 Volt VHF large-signal power amplifier applications required in commercial and industrial equipment operating to 300 MHz.

- Specified 12.5 Volt, 175 MHz Characteristics –
  Output Power = 15 W
  Minimum Gain = 6.3 dB
  Efficiency = 60%
- Characterized with Series Equivalent Large-Signal Impedance Parameters

3

2N6081



DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	9.40	9.78	0.370	0.385
B	8.13	8.38	0.320	0.330
C	17.02	20.07	0.670	0.790
D	5.46	5.97	0.215	0.235
E	1.78	—	0.070	—
J	0.08	0.18	0.003	0.007
K	12.45	—	0.490	—
L	1.40	1.78	0.055	0.070
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
R	7.59	7.80	0.299	0.307
S	4.01	4.52	0.158	0.178
T	2.11	2.54	0.083	0.100
U	2.49	3.35	0.098	0.132

CASE 145A-09

***MAXIMUM RATINGS**

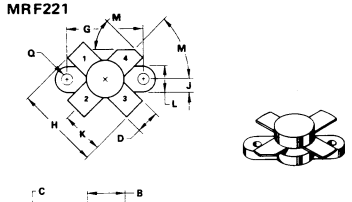
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	18	Vdc
Collector-Base Voltage	V_{CBO}	36	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector Current – Continuous	I_C	2.5	Adc
Total Device Dissipation @ $T_C = 25^oC$ (1) Derate above 25^oC	P_D	31 177	Watts $mW/^oC$
Storage Temperature Range	T_{stg}	-65 to +200	^oC
Stud Torque (2)	–	6.5	in. lb.

*Indicates JEDEC Registered Data for 2N6081.

(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. lb.

MRF221



DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	24.38	25.15	0.960	0.990
B	9.40	9.91	0.370	0.390
C	5.82	7.14	0.229	0.281
D	5.46	5.97	0.215	0.235
E	2.16	2.67	0.085	0.105
F	0.10	0.15	0.004	0.006
G	18.29	18.54	0.720	0.730
H	20.07	20.57	0.790	0.810
K	10.03	10.29	0.395	0.405
L	6.22	6.48	0.245	0.255
M	40°	50°	40°	50°
N	3.81	4.57	0.150	0.180
Q	2.87	3.30	0.113	0.130

CASE 211-07

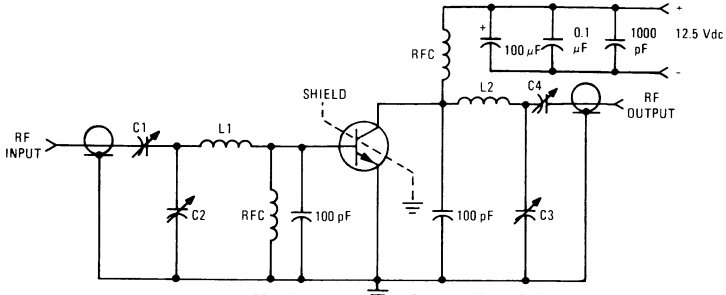
***ELECTRICAL CHARACTERISTICS** (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 20 mAdc, I_B = 0)	$V_{(BR)CEO}$	18	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 2.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0, T_C = +55°C)	I_{CES}	–	–	8.0	mAdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	0.5	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.5 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 0.1 MHz)	C_{ob}	–	70	85	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (P_{out} = 15 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	G_{PE}	6.3	–	–	dB
Collector Efficiency (P_{out} = 15 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	η	60	–	–	%

*Indicates JEDEC Registered Data for 2N6081.

3

FIGURE 1 – 175 MHz TEST CIRCUIT



C1,2,3,4 5.0-80 pF ARCO 462
L1 Straight Wire, #14 AWG, 1-3/8" Long
L2 1 Turn, #14 AWG, 3/8" ID, Length Plus Leads = 1"
RFC VK200-20/4B, FERROXCUBE.

FIGURE 2 – OUTPUT POWER versus INPUT POWER

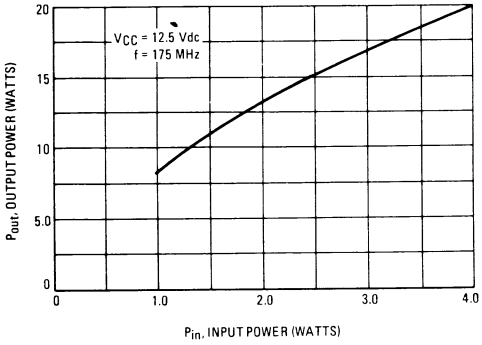


FIGURE 3 – OUTPUT POWER versus FREQUENCY

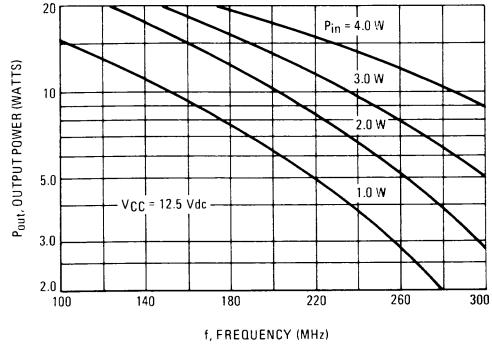


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE

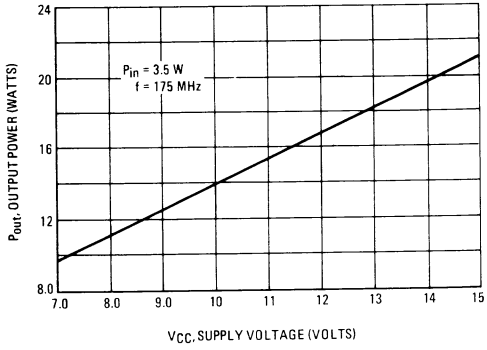
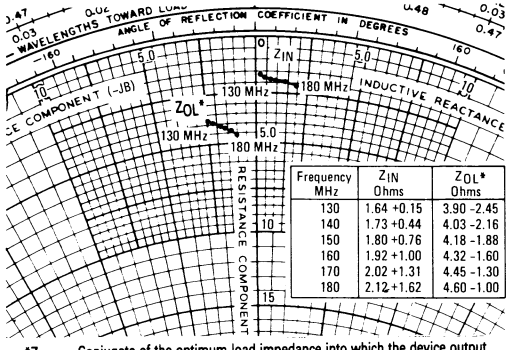


FIGURE 5 – SERIES EQUIVALENT IMPEDANCE



Frequency MHz	Z_{IN} Ohms	Z_{OL}* Ohms
130	1.64 +0.15	3.90 -2.45
140	1.73 +0.44	4.03 -2.16
150	1.80 +0.76	4.18 -1.88
160	1.92 +1.00	4.32 -1.60
170	2.02 +1.31	4.45 -1.30
180	2.12 +1.62	4.60 -1.00

*Z_{OL} = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

2N6082

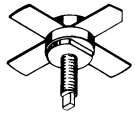
The RF Line

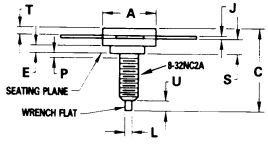
25 W – 175 MHz
RF POWER TRANSISTOR
NPN SILICON

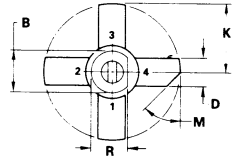
NPN SILICON RF POWER TRANSISTORS

. . . designed for 12.5 Volt VHF large-signal amplifier applications required in commercial and industrial equipment operating to 300 MHz.

- Specified 12.5 Volt, 175 MHz Characteristics –
  Output Power = 25 W
  Minimum Gain = 6.2 dB
  Efficiency = 65%







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

***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
Total Device Dissipation @ T_C = 25°C(2) Derate above 25°C	P_D	65 .37	Watts W/°C
Storage Temperature Range	T_{stg}	−65 to +200	°C
Stud Torque(1)	—	6.5	in.lb.

*Indicates JEDEC Registered Data for 2N6082.
(1)For Repeated Assembly Use 5 in. lb.
(2)These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.40	9.78	0.370	0.385
B	8.13	8.38	0.320	0.330
C	17.02	20.07	0.670	0.790
D	5.46	5.97	0.215	0.235
E	1.78	—	0.070	—
J	0.08	0.18	0.003	0.007
K	12.45	—	0.490	—
L	1.40	1.78	0.055	0.070
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
R	7.59	7.80	0.299	0.307
S	4.01	4.52	0.158	0.178
T	2.11	2.54	0.083	0.100
U	2.49	3.35	0.098	0.132

CASE 145A-09

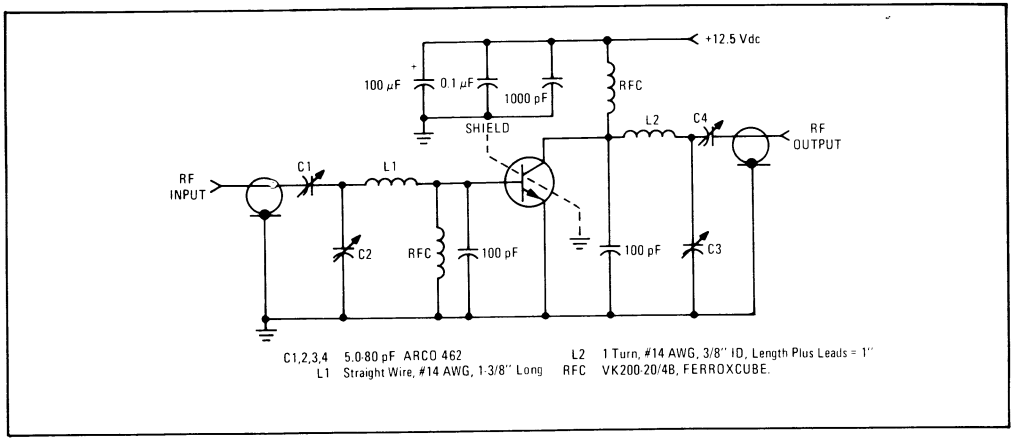
***ELECTRICAL CHARACTERISTICS** (T_C = 25°C unless otherwise noted).

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 100 mAdc, I_B = 0)	$V_{(BR)CEO}$	18	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 15 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0, T_C = +55°C	I_{CES}	–	–	10	mAdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 0.1 MHz)	C_{ob}	–	110	130	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (P_{out} = 25 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	G_{PE}	6.2	–	–	dB
Collector Efficiency (P_{out} = 25 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	η	65	–	–	%

*Indicates JEDEC Registered Data for 2N6082.

3

FIGURE 1 – 175 MHz TEST CIRCUIT



C1,2,3,4 5.0-80 pF ARCO 462
L1 Straight Wire, #14 AWG, 1-3/8" Long
L2 1 Turn, #14 AWG, 3/8" ID, Length Plus Leads = 1"
RFC VK200-20/4B, FERROXCUBE.

FIGURE 2 – OUTPUT POWER versus INPUT POWER

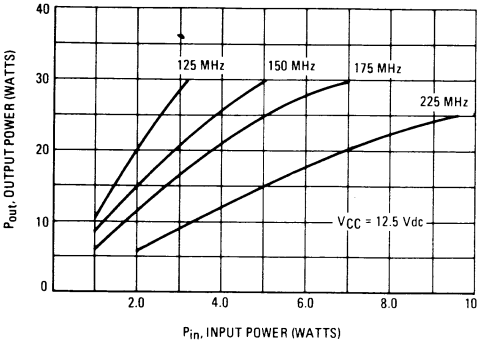


FIGURE 3 – OUTPUT POWER versus SUPPLY VOLTAGE

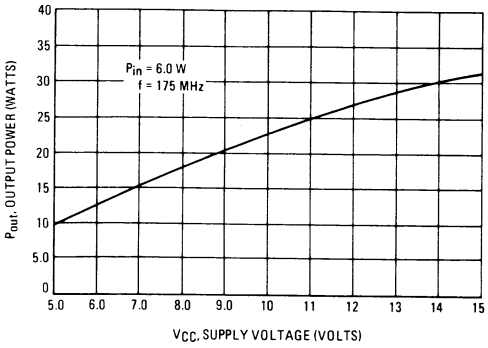
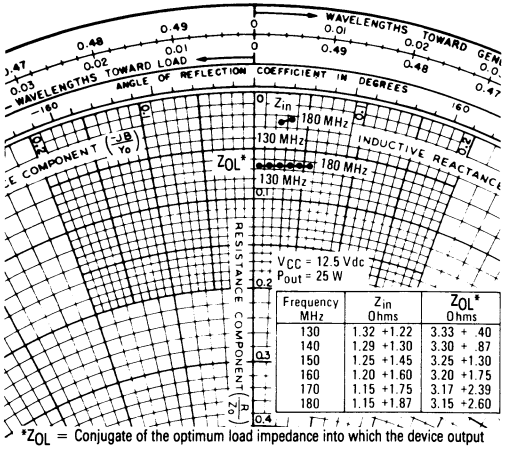


FIGURE 4 – SERIES EQUIVALENT IMPEDANCE



Frequency MHz	Z_{in} Ohms	Z_{OL}^* Ohms
130	1.32 +1.22	3.33 + .40
140	1.29 +1.30	3.30 + .87
150	1.25 +1.45	3.25 +1.30
160	1.20 +1.60	3.20 +1.75
170	1.15 +1.75	3.17 +2.39
180	1.15 +1.87	3.15 +2.60

*Z_{OL} = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

2N6083

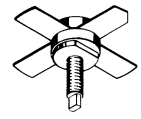
The RF Line

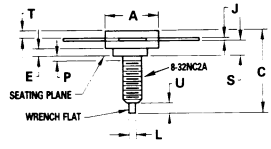
30 W – 175 MHz
RF POWER TRANSISTOR
NPN SILICON

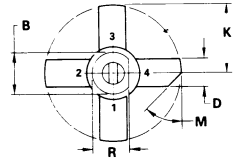
NPN SILICON RF POWER TRANSISTORS

. . . designed for 12.5 Volt VHF large-signal amplifier applications required in commercial and industrial equipment operating to 300 MHz.

- Specified 12.5 Volt, 175 MHz Characteristics –
  Output Power = 30 W
  Minimum Gain = 5.7 dB
  Efficiency = 65%







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

***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
Total Device Dissipation @ T_C = 25°C(2) Derate above 25°C	P_D	65 .37	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +200	°C
Stud Torque(1)	—	6.5	in.lb.

*Indicates JEDEC Registered Data for 2N6083.
(1)For Repeated Assembly Use 5 in. lb.
(2)These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.40	9.78	0.370	0.385
B	8.13	8.38	0.320	0.330
C	17.02	20.07	0.670	0.790
D	5.46	5.97	0.215	0.235
E	1.78	—	0.070	—
J	0.08	0.18	0.003	0.007
K	12.45	—	0.490	—
L	1.40	1.78	0.055	0.070
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
R	7.59	7.80	0.299	0.307
S	4.01	4.52	0.158	0.178
T	2.11	2.54	0.083	0.100
U	2.49	3.35	0.098	0.132

CASE 145A-09

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 100 mAdc, I_B = 0)	$V_{(BR)CEO}$	18	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 15 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0, T_C = +55°C)	I_{CES}	–	–	10	mAdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 0.1 MHz)	C_{ob}	–	110	130	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (P_{out} = 30 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	G_{PE}	5.7	–	–	dB
Collector Efficiency (P_{out} = 30 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	η	65	–	–	%

*Indicates JEDEC Registered Data for 2N6083.

3

FIGURE 1 – 175 MHz TEST CIRCUIT

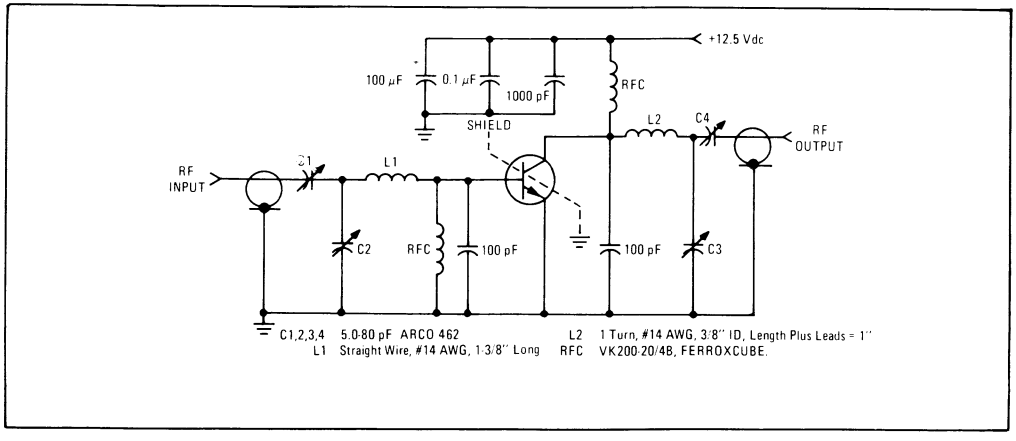


FIGURE 2 – OUTPUT POWER versus INPUT POWER

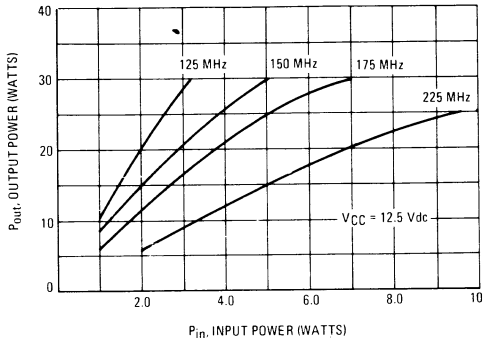


FIGURE 3 – OUTPUT POWER versus SUPPLY VOLTAGE

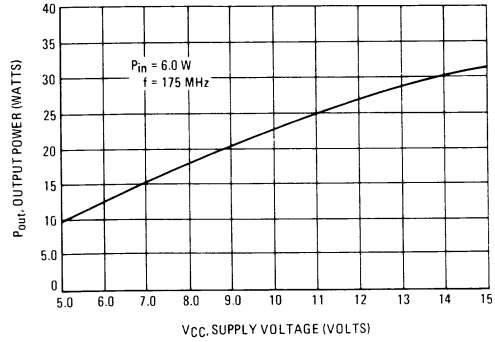
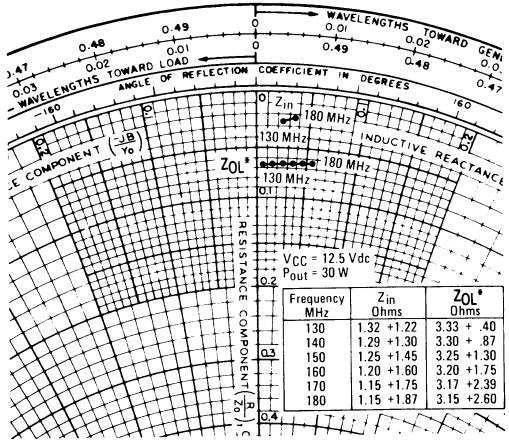


FIGURE 4 – SERIES EQUIVALENT IMPEDANCE



Frequency MHz	Z_{in} Ohms	Z_{OL}^* Ohms
130	1.32 +1.22	3.33 + .40
140	1.29 +1.30	3.30 + .87
150	1.25 +1.45	3.25 +1.30
160	1.20 +1.60	3.20 +1.75
170	1.15 +1.75	3.17 +2.39
180	1.15 +1.87	3.15 +2.60

*Z_{OL} = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

2N6084
MRF224

The RF Line

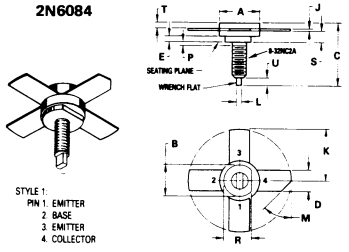
40 W – 175 MHz
RF POWER
TRANSISTORS
NPN SILICON

NPN SILICON RF POWER TRANSISTORS

. . . designed for 12.5 Volt VHF large-signal amplifier applications required in commercial and industrial equipment operating to 300 MHz.

- Specified 12.5 Volt, 175 MHz Characteristics –
  Output Power = 40 W
  Minimum Gain = 4.5 dB
  Efficiency = 70%

2N6084



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.40	9.78	0.370	0.385
B	8.13	8.38	0.320	0.330
C	17.02	20.07	0.670	0.790
D	5.46	5.97	0.215	0.235
E	1.78	—	0.070	—
J	0.08	0.18	0.003	0.007
K	12.45	—	0.490	—
L	1.40	1.78	0.055	0.070
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
R	7.59	7.80	0.299	0.307
S	4.01	4.52	0.158	0.178
T	2.11	2.54	0.083	0.100
U	2.49	3.35	0.098	0.132

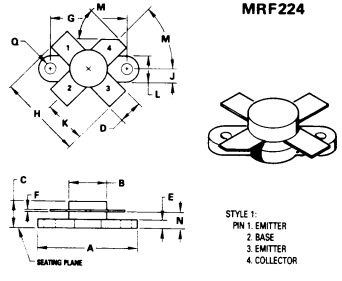
CASE 145A-09

***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	7.0	Adc
Total Device Dissipation @ T_C = 25°C(2) Derate above 25°C	P_D	80 .46	Watts W/°C
Storage Temperature Range	T_{stg}	−65 to +200	°C
Stud Torque(1)	—	6.5	in.lb.

*Indicates JEDEC Registered Data for 2N6084.
(1)For Repeated Assembly Use 5 in. lb.
(2)These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.

MRF224



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	24.38	25.15	0.960	0.990
B	9.40	9.91	0.370	0.390
C	5.82	7.14	0.229	0.281
D	5.46	5.97	0.215	0.235
E	2.16	2.67	0.085	0.105
F	0.10	0.15	0.004	0.006
G	18.29	18.54	0.720	0.730
H	20.07	20.57	0.790	0.810
K	10.03	10.29	0.395	0.405
L	6.22	6.48	0.245	0.255
M	40°	50°	40°	50°
N	3.81	4.57	0.150	0.180
Q	2.87	3.30	0.113	0.130

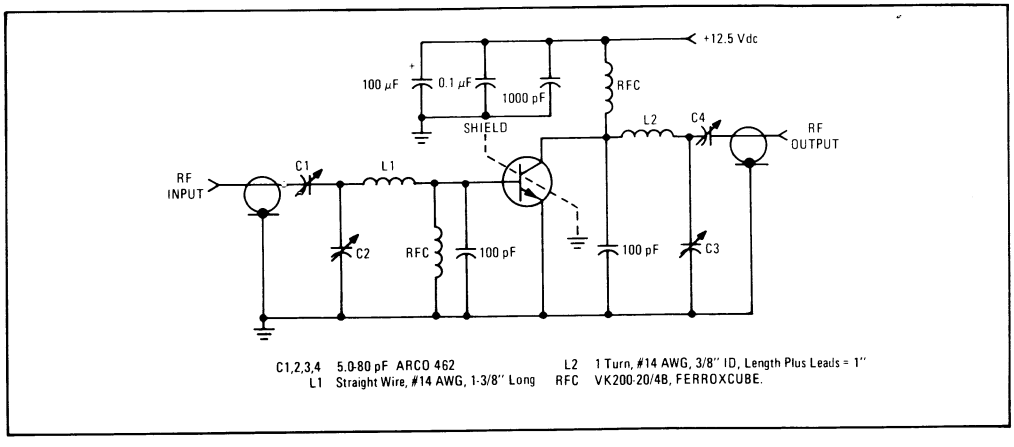
CASE 211-07

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 100 mAdc, I_B = 0)	$V_{(BR)CEO}$	18	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 20 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0, T_C = +55°C)	I_{CES}	–	–	10	mAdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	2.5	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 0.1 MHz)	C_{ob}	–	170	200	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (P_{out} = 40 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	G_{PE}	4.5	–	–	dB
Collector Efficiency (P_{out} = 40 W, V_{CC} = 12.5 Vdc, f = 175 MHz)	η	70	–	–	%

*Indicates JEDEC Registered Data for 2N6084.

FIGURE 1 – 175 MHz TEST CIRCUIT



C1,2,3,4 5.0-80 pF ARCO 462
L1 Straight Wire, #14 AWG, 1-3/8" Long
L2 1 Turn, #14 AWG, 3/8" ID, Length Plus Leads = 1"
RFC VK200-20/4B, FERROXCUBE.

FIGURE 2 – OUTPUT POWER versus INPUT POWER

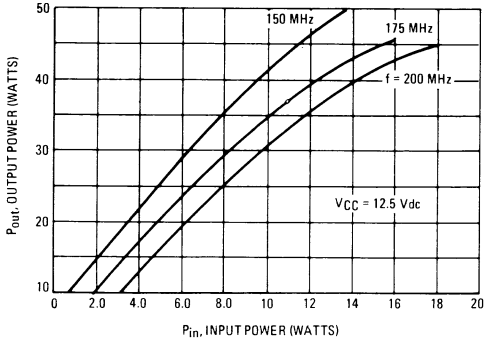


FIGURE 3 – OUTPUT POWER versus SUPPLY VOLTAGE

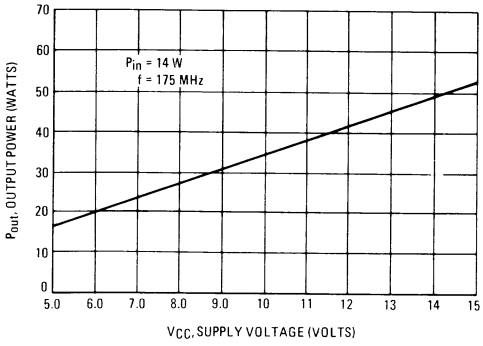
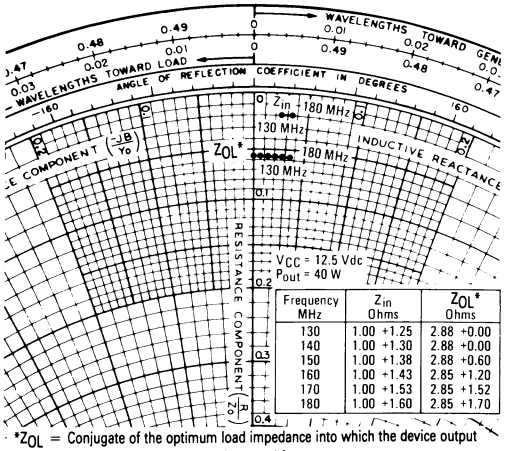


FIGURE 4 – SERIES EQUIVALENT IMPEDANCE



Frequency MHz	Z_{in} Ohms	Z_{OL}^* Ohms
130	1.00 +1.25	2.88 +0.00
140	1.00 +1.30	2.88 +0.00
150	1.00 +1.38	2.88 +0.60
160	1.00 +1.43	2.85 +1.20
170	1.00 +1.53	2.85 +1.52
180	1.00 +1.60	2.85 +1.70

*Z_{OL} = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.