MRF240
MRF240A

The RF Line

NPN SILICON RF POWER TRANSISTOR

. . . designed for 13.6 volt VHF large-signal class C and class AB linear power amplifier applications in commercial and industrial equipment.

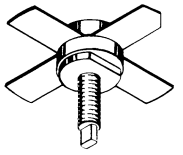
- High Common Emitter Power Gain
- Specified 13.6 V, 160 MHz Performance:
  Output Power = 40 Watts
  Power Gain = 9.0 dB Min
  Efficiency = 55% Min
- Load Mismatch Capability at Rated Voltage and RF Drive
- Silicon Nitride Passivated
- Low Intermodulation Distortion, d_3 = -30 dB Typ

See AN791 for description of a 35 W pep, 145 MHz linear amplifier.

40 W – 145–175 MHz

RF POWER TRANSISTOR

NPN SILICON



3

MAXIMUM RATINGS

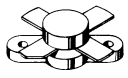
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	16	Vdc
Collector-Base Voltage	V_{CBO}	36	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	8.0	Adc
Total Device Dissipation @ T_C = 25°C (1)	P_D	100	Watts
Derate above 25°C		0.57	W/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	1.75	°C/W

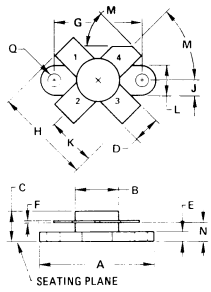
(1) This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

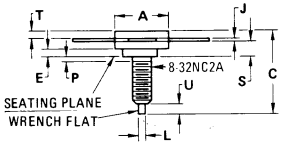


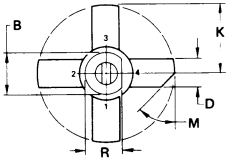
STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

MRF240A
CASE 211-07



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





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

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

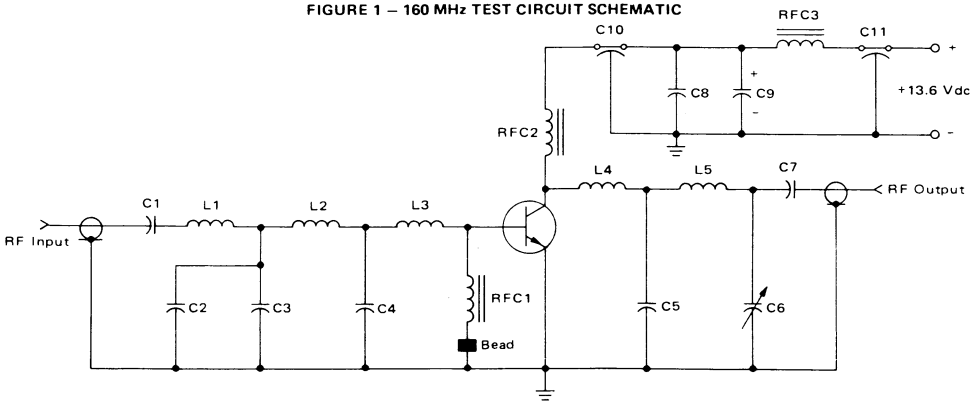
CASE 145A-09
MRF240

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)	$V_{(BR)CEO}$	16	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 20 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_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	10	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 4.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	10	70	150	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 12.5 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	90	125	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 13.6 Vdc, P_{out} = 40 W, f = 160 MHz)	G_{PE}	9.0	10	–	dB
Collector Efficiency (V_{CC} = 13.6 Vdc, P_{out} = 40 W, f = 160 MHz)	η	55	–	–	%
TYPICAL SSB PERFORMANCE					
Intermodulation Distortion (1) (V_{CC} = 13.6 Vdc, P_{out} = 35 W(PEP), f1 = 146 MHz, f2 = 146.002 MHz, I_{CQ} = 50 mAdc)	IMD(d_3)	–	-30	–	dB

(1) To MIL-STD-1311 Version A, Test Method 2204B, Two Tone, Reference Each Tone.

FIGURE 1 – 160 MHz TEST CIRCUIT SCHEMATIC



C1	200 pF, 350 Vdc, UNELCO	C10,C11	680 pF ALLEN BRADLEY Feedthru	L3	1.2 x 0.6 cm Brass Pad
C2	100 pF, 350 Vdc, UNELCO	RFC1	0.15 μH Molded Choke	L4	1.2 x 0.6 cm Brass Pad and 2.0 x 0.2 cm AIRLINE Inductor
C3	40 pF, 350 Vdc, UNELCO	RFC2	10 Turns, #18 AWG on 470 Ohm, 1 Watt Resistor	Board:	G10, ϵ_r = 5, t = 62 mils 2 sided, 2 oz. Clad
C4,C5	80 pF, 350 Vdc, UNELCO	Bead	FERROXCUBE Bead		
C6	1.0–20 pF, ARCO Trimmer	RFC3	FERROXCUBE Choke, VK200-4B	Connectors:	Type N
C7	100 pF 350 Vdc, UNELCO	L1	3.3 x 0.2 cm AIRLINE Inductor		
C8	0.1 μF ERIE Disc Ceramic	L2	1.0 x 0.2 cm AIRLINE Inductor		
C9	1.0 μF TANTALUM				

FIGURE 2 – POWER GAIN versus FREQUENCY

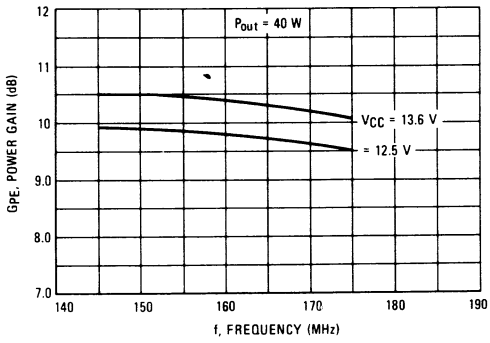


FIGURE 3 – OUTPUT POWER versus INPUT POWER

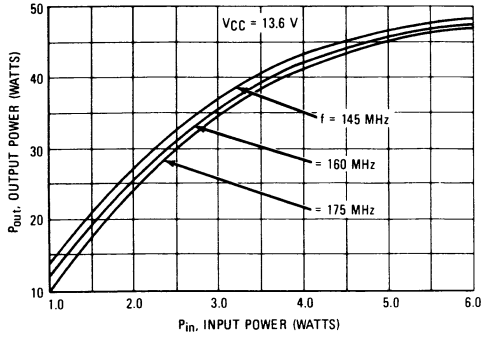


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE
145 MHz

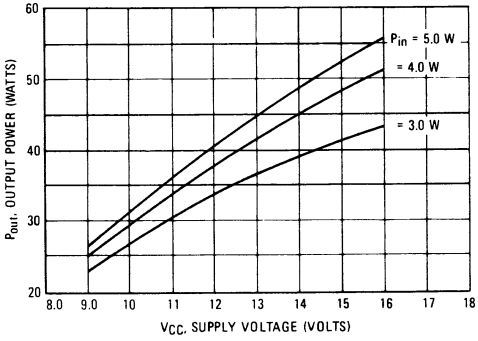


FIGURE 5 – OUTPUT POWER versus SUPPLY VOLTAGE
160 MHz

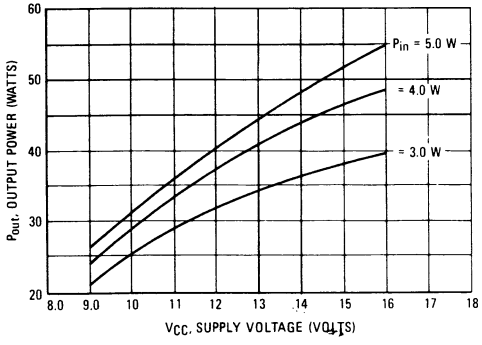


FIGURE 6 – OUTPUT POWER versus SUPPLY VOLTAGE
175 MHz

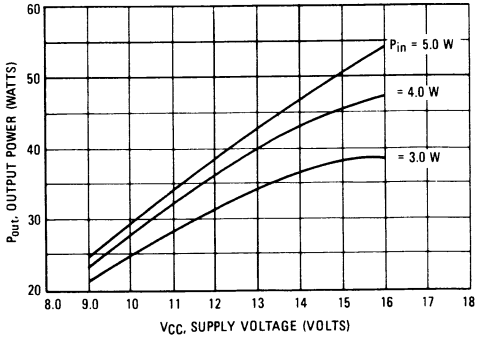
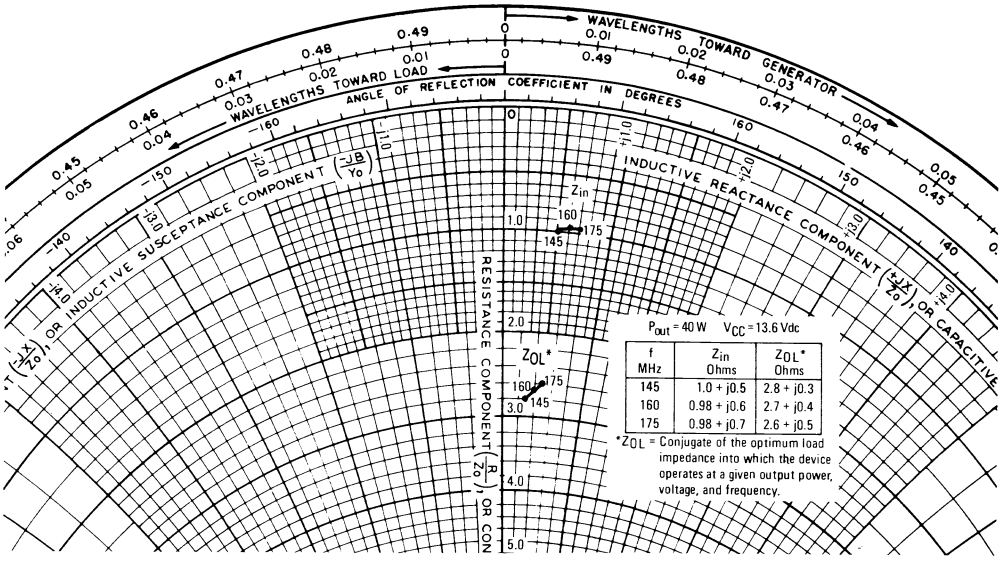


FIGURE 7 – SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCES



f MHz	Zin Ohms	ZOL* Ohms
145	1.0 + j0.5	2.8 + j0.3
160	0.98 + j0.6	2.7 + j0.4
175	0.98 + j0.7	2.6 + j0.5

3

MRF247

The RF Line

75 W – 175 MHz

CONTROLLED Q
RF POWER
TRANSISTOR

NPN SILICON

NPN SILICON RF POWER TRANSISTOR

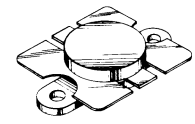
. . . designed for 12.5 Volt VHF large-signal amplifier applications in industrial and commercial FM equipment operating to 175 MHz.

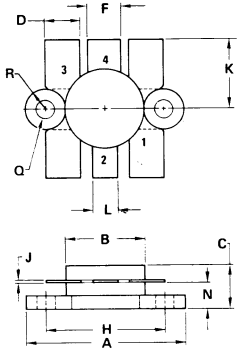
- Specified 12.5 Volt, 175 MHz Characteristics –

  Output Power = 75 Watts
  Minimum Gain = 7.0 dB
  Efficiency = 55%

- Characterized With Series Equivalent Large-Signal Impedance Parameters
- Internal Matching Network Optimized for Minimum Gain Frequency Slope Response Over the Range 136 to 175 MHz
- Load Mismatch Capability at Rated P_{out} and Supply Voltage

See AN-791 for Description of a 75 W PEP, 145 MHz Linear Amplifier.





STYLE 1:
PIN 1. EMITTER
2. COLLECTOR
3. EMITTER
4. BASE
FLANGE-ISOLATED

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	24.38	25.15	0.960	0.990
B	12.45	12.95	0.490	0.510
C	5.97	7.62	0.235	0.300
D	5.33	5.59	0.210	0.220
F	5.08	5.33	0.200	0.210
H	18.29	18.54	0.720	0.730
J	0.10	0.15	0.004	0.006
K	10.29	–	0.405	–
L	3.81	4.06	0.150	0.160
N	3.81	4.32	0.150	0.170
Q	2.92	3.30	0.115	0.130
R	3.05	3.30	0.120	0.130

CASE 316-01

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 – Peak	I_C	20	Adc
Total Device Dissipation @ $T_C = 25^oC$ (1) Derate Above 25^oC	P_D	250 1.43	Watts $W/^oC$
Storage Temperature Range	T_{stg}	-65 to +150	^oC

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R\theta_{JC}$	0.7	$^oC/W$

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

(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

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 = 50 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
ON CHARACTERISTICS					
DC Current Gain (I_C = 5.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	10	75	150	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	235	300	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 75 Watts, f = 175 MHz)	G_{PE}	7.0	8.5	–	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 75 Watts, f = 175 MHz)	η	55	60	–	%
Load Mismatch (V_{CC} = 12.5 Vdc, P_{out} = 75 Watts, f = 175 MHz, VSWR = 30:1 All Phase Angles)	ψ	No Degradation In Output Power			

3

FIGURE 1 – OUTPUT POWER versus INPUT POWER

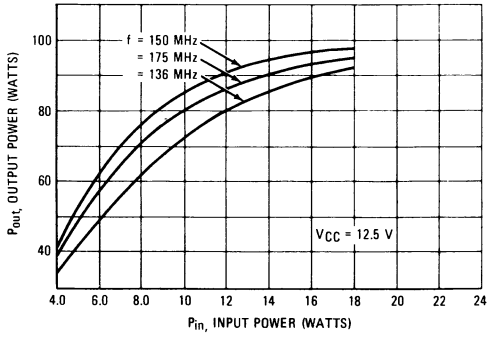


FIGURE 2 – POWER GAIN versus FREQUENCY

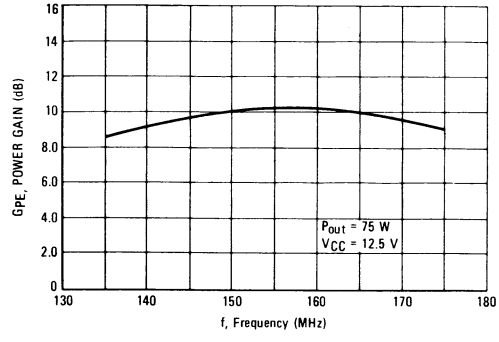


FIGURE 3 – OUTPUT POWER versus SUPPLY VOLTAGE
136 MHz

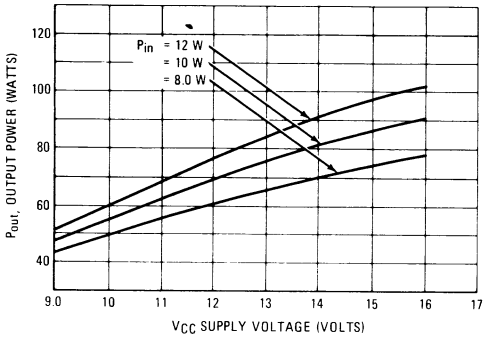


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE
150 MHz

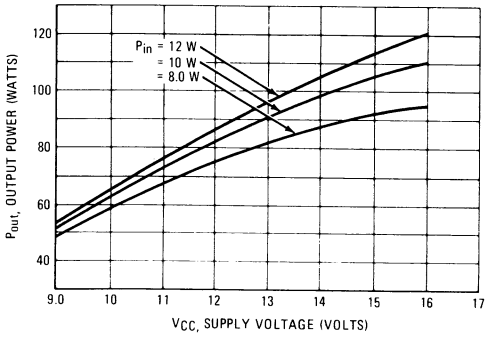


FIGURE 5 – OUTPUT POWER versus SUPPLY VOLTAGE
175 MHz

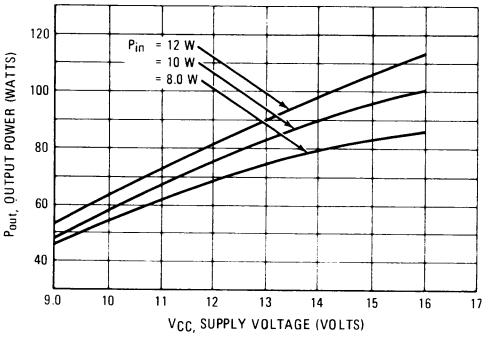
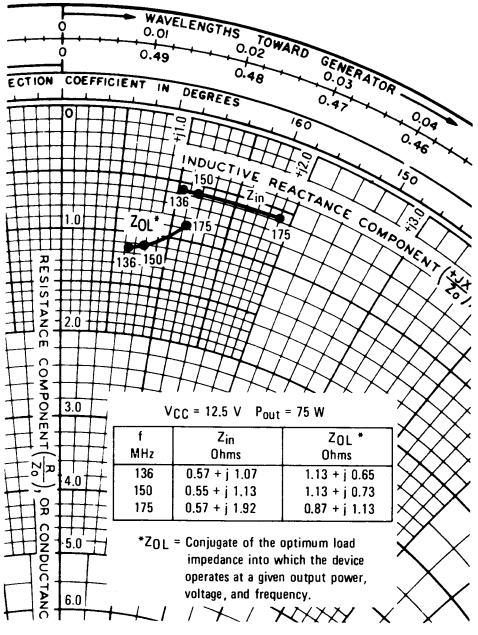


FIGURE 6 – SERIES EQUIVALENT IMPEDANCES



f MHz	Z_{in} Ohms	Z_{OL} * Ohms
136	0.57 + j 1.07	1.13 + j 0.65
150	0.55 + j 1.13	1.13 + j 0.73
175	0.57 + j 1.92	0.87 + j 1.13

3

MRF248

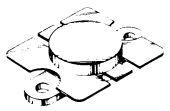
**80 WATTS, 175 MHz
CONTROLLED Q
RF POWER
TRANSISTOR
NPN SILICON**

The RF Line

NPN Silicon RF Power Transistor

. . . designed for 12.5 volt VHF large-signal amplifier applications in industrial and commercial FM equipment operating to 175 MHz.

- Typical 12.5 Volt, 175 MHz Characteristics in Broadband Circuit:
  Output Power = 80 Watts
  Gain = 11.3 dB
  Efficiency = 59%
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Internal Matching Network Optimized for Broadband Operation
- Ion Implanted Emitter Ballast Resistors for Improved Load Mismatch Capability at Elevated Drive and Voltage



CASE 316-01

3

MAXIMUM RATINGS

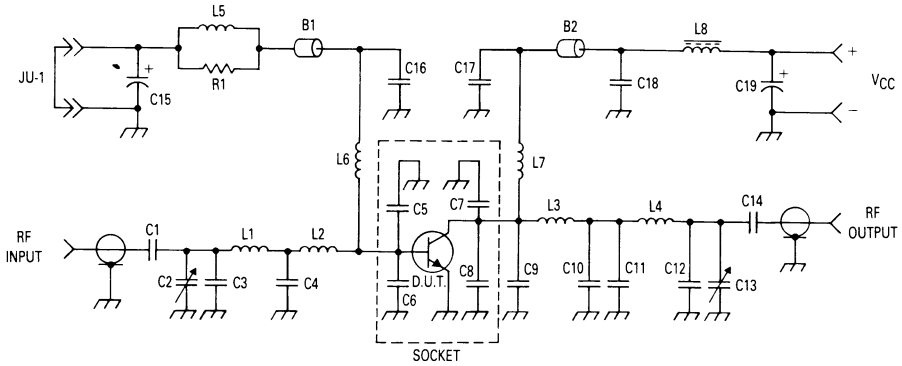
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	16.5	Vdc
Collector-Base Voltage	V_{CBO}	38	Vdc
Emitter-Base Voltage	V_{EBO}	4	Vdc
Collector-Current — Continuous	I_C	15	Adc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	250 1.43	Watts W/°C
Storage Temperature Range	T_{stg}	−65 to +150	°C
Junction Temperature	T_J	200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.7	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Emitter-Base Breakdown Voltage (I_E = 5 mAdc, I_C = 0)	$V_{(BR)EBO}$	4	—	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, I_B = 0)	$V_{(BR)CEO}$	16.5	—	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	38	—	—	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0)	I_{CES}	—	—	10	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 2 Adc, V_{CE} = 5 Vdc)	h_{FE}	20	—	120	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 12.5 Vdc, I_E = 0, f = 1 MHz)	C_{ob}	—	270	350	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 80 W, f = 175 MHz)	G_{pe}	10	11.3	—	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 80 W, f = 175 MHz)	η_c	50	59	—	%
Load Mismatch (V_{CC} = 15.5 Vdc, P_{in} = 2 dB Overdrive, f = 175 MHz, VSWR = 30:1 All Phase Angles)	ψ	No Degradation In Output Power			



C1, C14 — 1000 pF Chip Cap, ATC100B102JC50
C3 — 15 pF Unelco, Standex J-101-15
C2, C13 — 1–20 pF Johanson
C4 — 150 pF Unelco, Standex J-101-150
C5 — 300 pF Chip Cap, ATC100B301JC200
C6, C8 — 270 pF Chip Cap, ATC100B271JC200
C7 — 240 pF Chip Cap, ATC100B241JC200
C9, C11 — 80 pF Unelco, Standex J-101-80
C10 — 100 pF Unelco, Standex J-101-100
C12 — 30 pF Unelco, Standex J-101-30
C15, C19 — 10 μF/35 V
C16, C17 — 91 pF Mini-Unelco, Standex 3HS0006-91
C18 — 0.001 μF

L1 — 3 Turns #18 AWG, 0.165″ ID
L2, L3 — 0.2″W x 0.3″L, 5 mil Cu Sheet
L4 — 2 Turns #18 AWG, 0.165″ ID
L5 — 5.6 μH Choke, Cambion
L6, L7 — 3 Turns #18 AWG, 0.13″ ID
L8 — Ferrite Choke, Ferroxcube VK200-20-4B
B1, B2 — Ferrite Bead, Ferroxcube 56-590-65-3B
R1 — 10 Ω, 1/2 Watt
Board Material — 0.062″ G-10, 2 oz. Cu, ϵ_r = 4.5
JU-1 — Jumper for V_{re} Test Port

Figure 1. 135–175 MHz Broadband Test Circuit

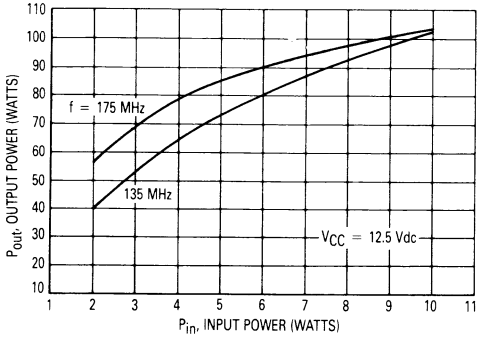


Figure 2. Output Power versus Input Power

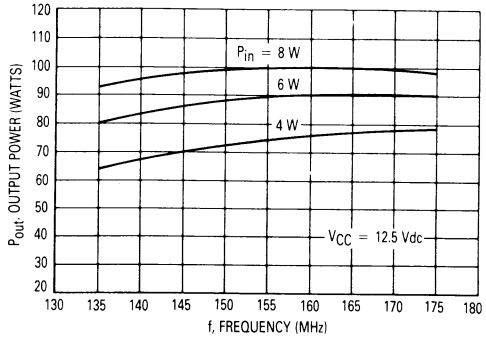


Figure 3. Output Power versus Frequency

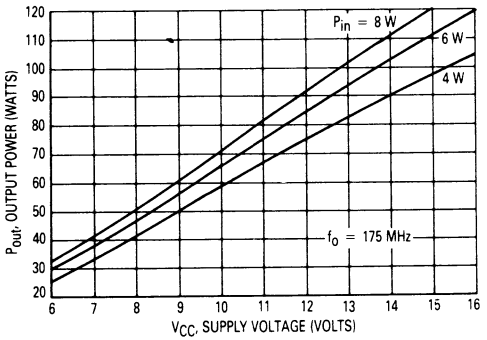


Figure 4. Output Power versus Voltage

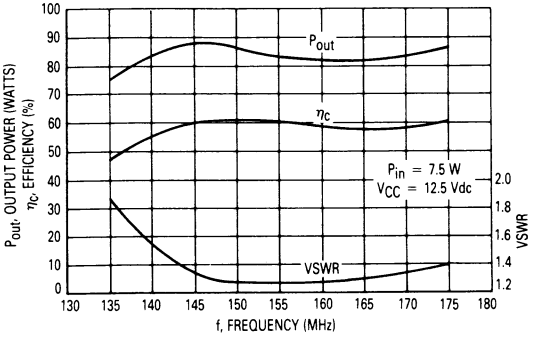
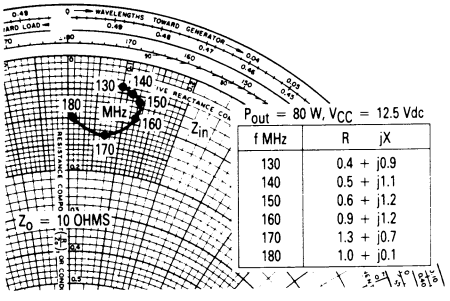


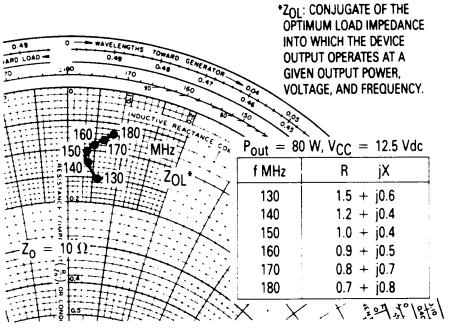
Figure 5. Typical Broadband Performance



f MHz	R	jX
130	0.4	+ j0.9
140	0.5	+ j1.1
150	0.6	+ j1.2
160	0.9	+ j1.2
170	1.3	+ j0.7
180	1.0	+ j0.1

Figure 6. Z_{in}, Input Impedance

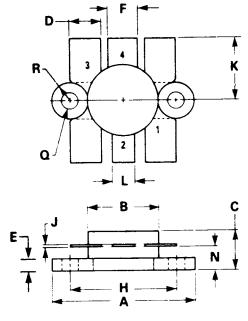
*Z_{OL}: CONJUGATE OF THE OPTIMUM LOAD IMPEDANCE INTO WHICH THE DEVICE OUTPUT OPERATES AT A GIVEN OUTPUT POWER, VOLTAGE, AND FREQUENCY.



f MHz	R	jX
130	1.5	+ j0.6
140	1.2	+ j0.4
150	1.0	+ j0.4
160	0.9	+ j0.5
170	0.8	+ j0.7
180	0.7	+ j0.8

Figure 7. Z_{OL}*, Output Impedance

OUTLINE DIMENSIONS

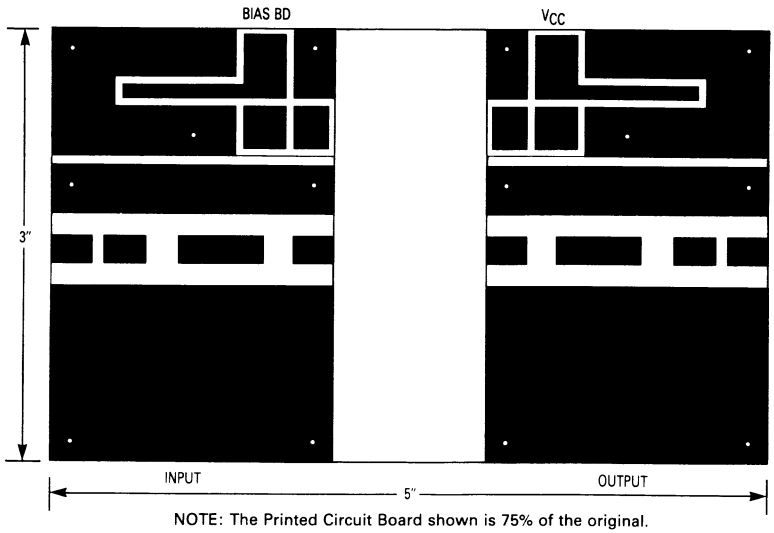


NOTE:
FLANGE IS ISOLATED IN ALL STYLES.

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

CASE 316-01

DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	24.38	25.14	0.960	0.990
B	12.45	12.95	0.490	0.510
C	5.97	7.62	0.235	0.300
D	5.33	5.58	0.210	0.220
E	2.16	3.04	0.085	0.120
F	5.08	5.33	0.200	0.210
H	18.29	18.54	0.720	0.730
J	0.10	0.15	0.004	0.006
K	10.29	11.17	0.405	0.440
L	3.81	4.06	0.150	0.160
N	3.81	4.31	0.150	0.170
Q	2.92	3.30	0.115	0.130
R	3.05	3.30	0.120	0.130
U	11.94	12.57	0.470	0.495



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

Figure 8. MRF248 Photomaster

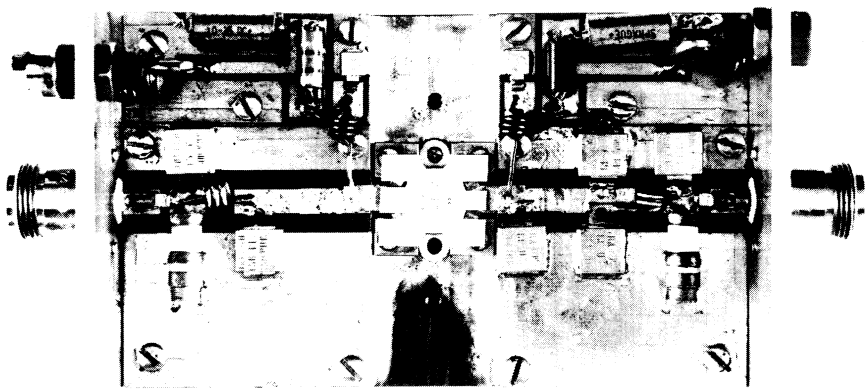


Figure 9. 136–175 MHz Test Circuit

MRF260

The RF Line

5 W 136– 175 MHz

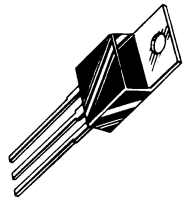
RF POWER TRANSISTOR

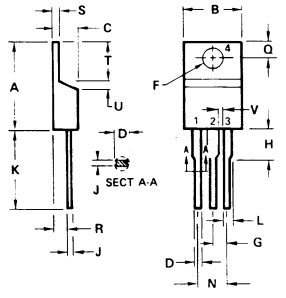
NPN SILICON

NPN SILICON RF POWER TRANSISTOR

. . . designed for 12.5-volt VHF large-signal power amplifier applications in commercial and industrial equipment.

- Low-Cost Common-Emitter TO-220 Package
- Specified 12.5 V, 175 MHz Performance:
  - Output Power 5.0 Watts
  - Power Gain 10 dB Min
  - Efficiency 55% Min
- Load Mismatch Capability at High Line and rated RF Input
- Other Devices in the Series:
  - MRF262 15 Watts
  - MRF264 30 Watts





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

NOTE
1. DIM. L & H APPLIES TO ALL LEADS.

DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	15.11	15.75	0.595	0.620
B	9.65	10.29	0.380	0.405
C	4.06	4.82	0.160	0.190
D	0.64	0.89	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.41	2.67	0.095	0.105
H	2.79	3.30	0.110	0.130
J	0.36	0.56	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.14	1.27	0.045	0.050
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.14	1.39	0.045	0.055
T	5.97	6.48	0.235	0.255
U	0.76	1.27	0.030	0.050
V	1.14	-	0.045	-

CASE 221A-02

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 @ $T_C = 25^oC$ (1) Derate above 25^oC	P_D	12 68.5	Watts mW/^oC
Storage Temperature Range	T_{stg}	−65 to +150	^oC

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	14.6	$^oC/W$

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

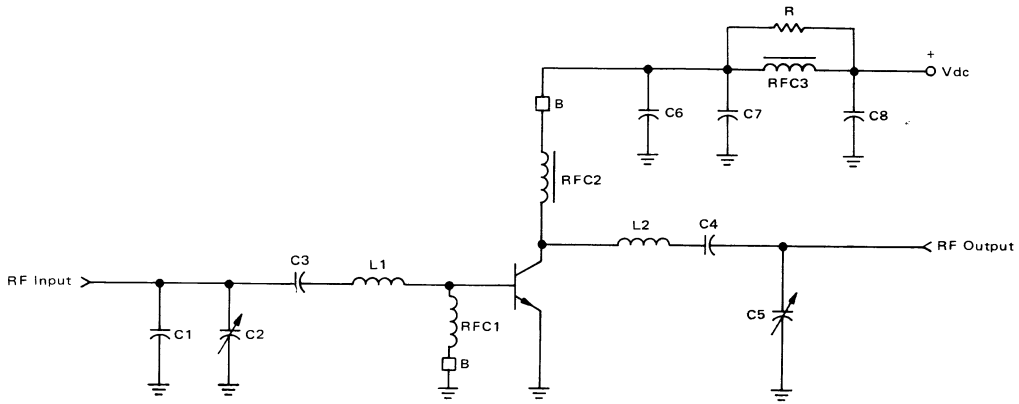
(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

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_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	0.25	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 250 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	15	20	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 5.0 W, f = 175 MHz)	G_{PE}	10	11	–	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 5.0 W, f = 175 MHz)	η	55	–	–	%

3

FIGURE 1 – 175 MHz TEST CIRCUIT



C1 – 40 pF Underwood
C2, C5 – Johanson Trimmer #JMC-5501
C3 – 60 pF Underwood
C4 – 25 pF Underwood
C6 – 1000 pF Underwood
C7 – 0.1 μF Erie Red Cap
C8 – 100 μF Electrolytic, 15 V

L1 – 1-1/2 Turns, #18 AWG, 3/16" ID, l = 1/8"
L2 – 3 Turns, #18 AWG, 5/16" ID, l = 1/4"
R – 10 Ω, 1.0 W
B – Ferroxcube Bead 56-590-65-3B
RFC1 – 0.15 μH Molded Coil
RFC2 – 0.15 μH Molded Coil
RFC3 – Ferroxcube VK200-20-4B
Board Material:
Teflon Fiberglass – G10, thickness = 0.062 inches.

FIGURE 2 – POWER GAIN versus FREQUENCY

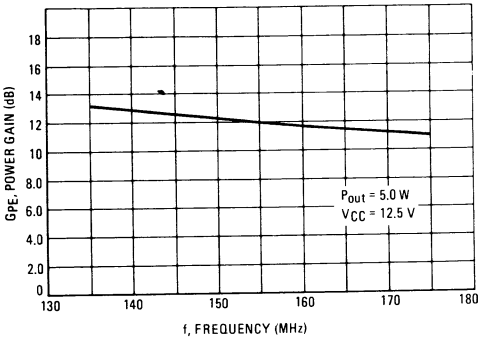


FIGURE 3 – OUTPUT POWER versus INPUT POWER

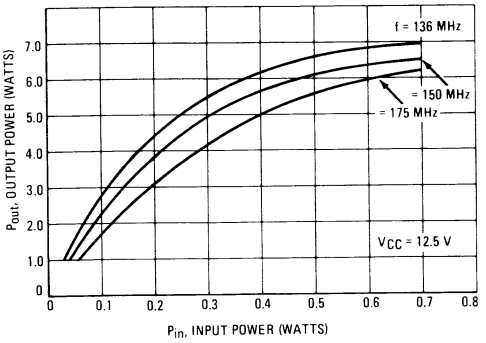


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE
136 MHz

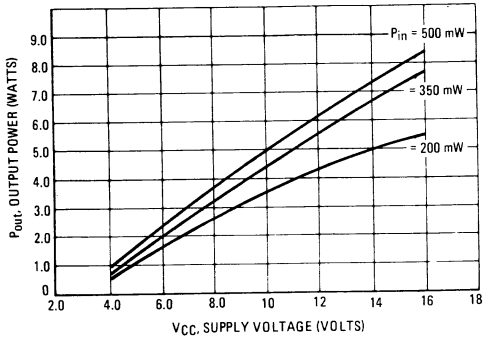


FIGURE 5 – OUTPUT POWER versus SUPPLY VOLTAGE
150 MHz

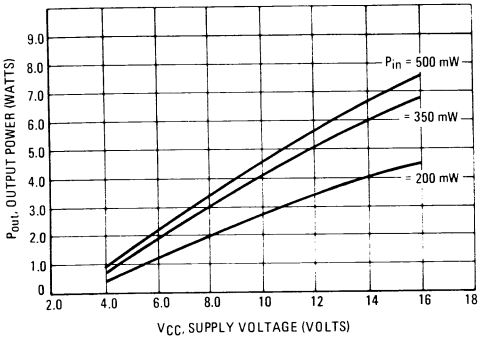


FIGURE 6 – OUTPUT POWER versus SUPPLY VOLTAGE
175 MHz

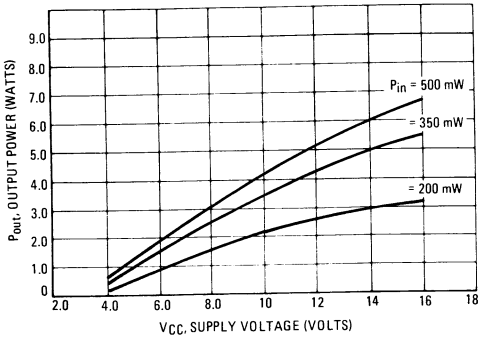


FIGURE 7 – SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCES

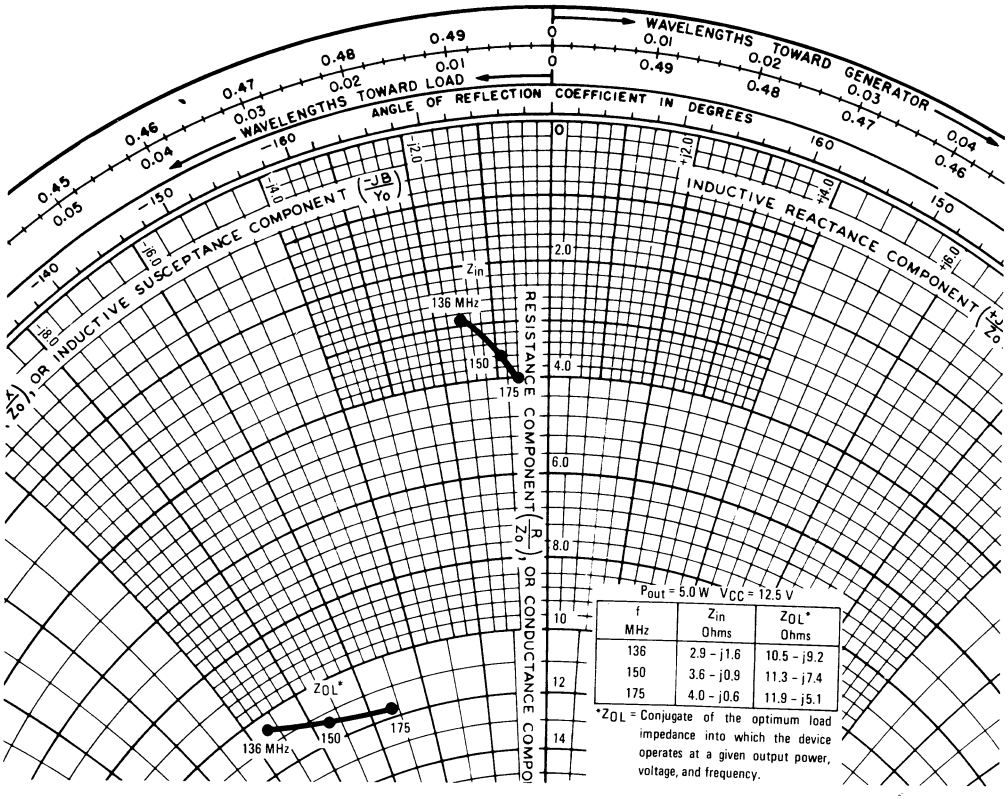
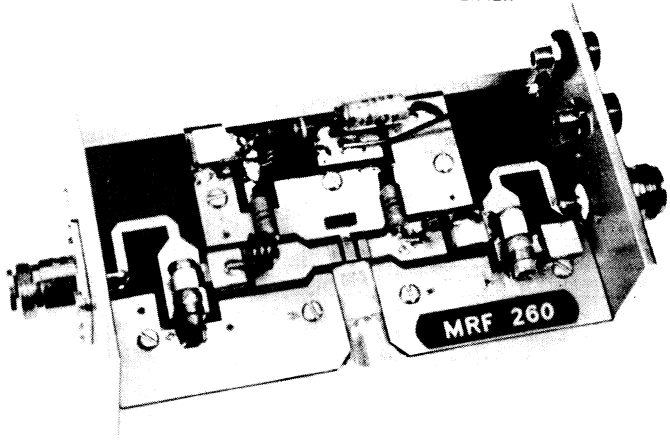


FIGURE 8 – 175 MHz TEST AMPLIFIER



MRF261

The RF Line

10 W 136-175 MHz

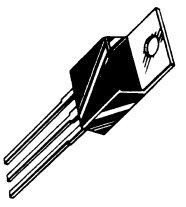
RF POWER TRANSISTOR

NPN SILICON

NPN SILICON RF POWER TRANSISTOR

. . . designed for 12.5-volt VHF large-signal power amplifier applications in commercial and industrial equipment.

- Low-Cost, Common-Emitter TO-220 Package
- Specified 12.5 V, 175 MHz Performance —
  Output Power = 10 Watts
  Power Gain = 5.2 dB Min
  Efficiency = 50% Min
- Load Mismatch Capability at High Line and RF Overdrive
- Other Devices in the Series —
  MRF260 5.0 Watts
  MRF262 15 Watts
  MRF264 30 Watts



MAXIMUM RATINGS

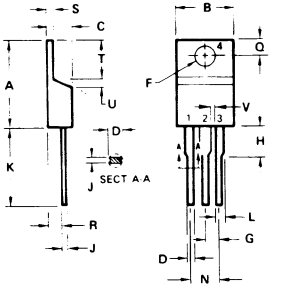
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	18	Vdc
Collector-Base Voltage	V_{CBO}	36	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	2.0	Adc
Total Device Dissipation @ T_C = 25°C (1) Derate above 25°C	P_D	30 171	Watts mW/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	5.85	°C/W

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

(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.



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

NOTE:
1. DIM. L & H APPLIES TO ALL LEADS.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	15.11	15.75	0.595	0.620
B	9.65	10.29	0.380	0.405
C	4.06	4.82	0.160	0.190
D	0.64	0.89	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.41	2.67	0.095	0.105
H	2.79	3.30	0.110	0.130
J	0.36	0.56	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.14	1.27	0.045	0.050
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.14	1.39	0.045	0.055
T	5.97	6.48	0.235	0.255
U	0.76	1.27	0.030	0.050
V	1.14	-	0.045	-

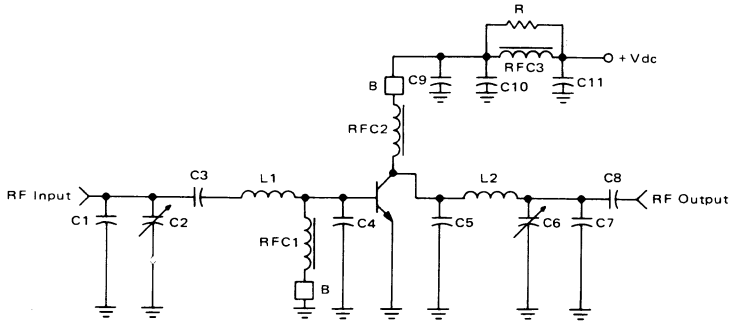
CASE 221A-02

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, I_B = 0)	$V_{(BR)CEO}$	18	—	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 2.5 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	—	—	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 250 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	10	65	—	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	—	35	50	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 10 W, f = 175 MHz)	G_{PE}	5.2	7.0	—	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 10 W, f = 175 MHz)	η	50	—	—	%

3

FIGURE 1 — 175-MHz TEST CIRCUIT



C1 — 10 pF Underwood
C2, C6 — Johanson Trimmer #5501
C3 — 60 pF Underwood
C4 — 150 pF Underwood
C5 — 100 pF Underwood
C7, C8 — 15 pF Underwood
C9 — 1000 pF Underwood
C10 — 0.1 μF Erie Red Cap
C11 — 100 μF Electrolytic, 15 Vdc

L1 — 2 Turns, #18 AWG, 5/16" ID
L2 — 1-1/2 Turns, #18 AWG, 5/16" ID
R — 10 Ω, 1.0 W
B — Ferroxcube Bead 56-590-65-3B
RFC1 — 0.15 μH Molded Coil
RFC2 — 6 Turns #18 Wire, 5/16" ID
RFC3 — VK200-20/4B
Board Material — Teflon Fiberglass
t = 0.062"

FIGURE 2 – POWER GAIN versus FREQUENCY

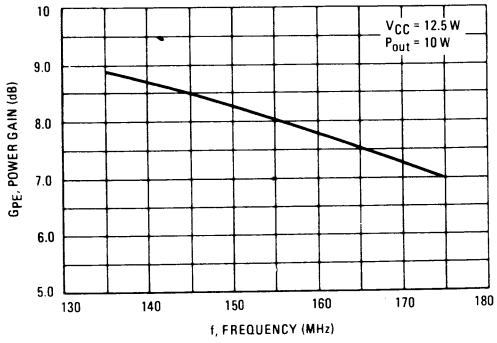


FIGURE 3 – OUTPUT POWER versus INPUT POWER

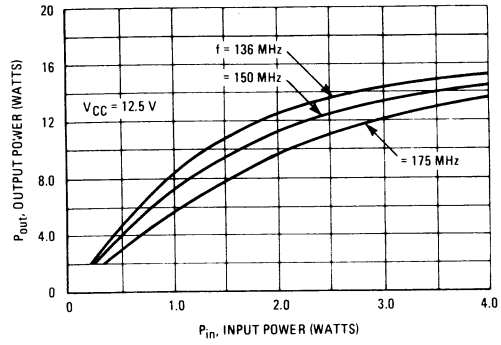


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE
136 MHz

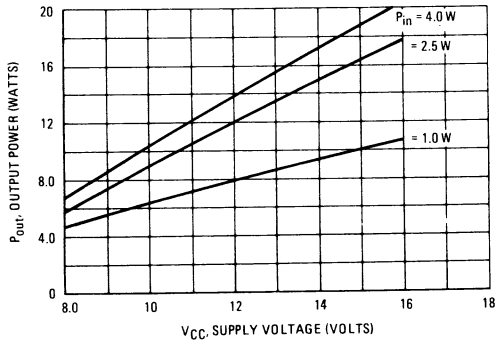


FIGURE 5 – OUTPUT POWER versus SUPPLY VOLTAGE
150 MHz

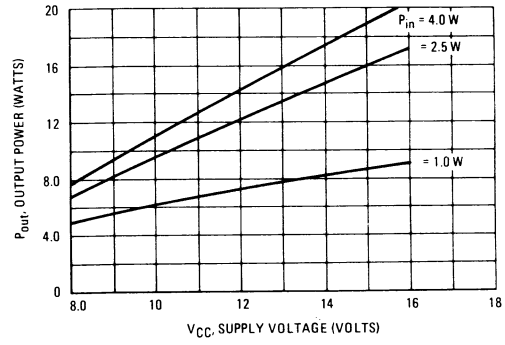


FIGURE 6 – OUTPUT POWER versus SUPPLY VOLTAGE
175 MHz

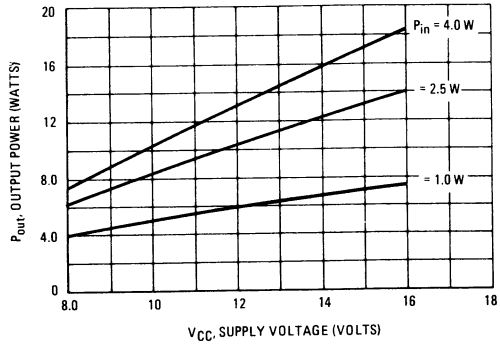
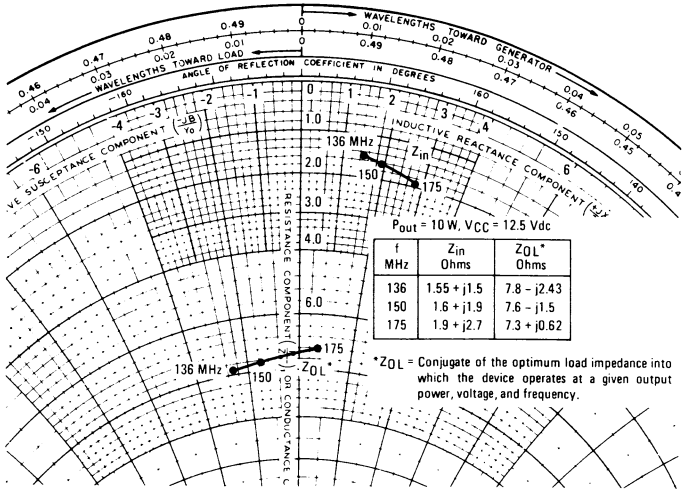


FIGURE 7 – SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCES



f MHz	Z_{in} Ohms	Z_{OL}^* Ohms
136	1.55 + j1.5	7.8 – j2.43
150	1.6 + j1.9	7.6 – j1.5
175	1.9 + j2.7	7.3 + j0.62

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

3

MRF262

The RF Line

15 W 136-175 MHz

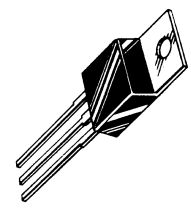
RF POWER TRANSISTOR

NPN SILICON

NPN SILICON RF POWER TRANSISTOR

. . . designed for 12.5-volt VHF large-signal power amplifier applications in commercial and industrial equipment.

- Low-Cost Common-Emitter TO-220 Package
- Specified 12.5 V, 175 MHz Performance:
  - Output Power 15 Watts
  - Power Gain 6.3 dB Min
  - Efficiency 55% Min
- Load Mismatch Capability at Rated Voltage and RF Drive
- Other Devices in the Series:
  - MRF260 5.0 Watts
  - MRF264 30 Watts



3

MAXIMUM RATINGS

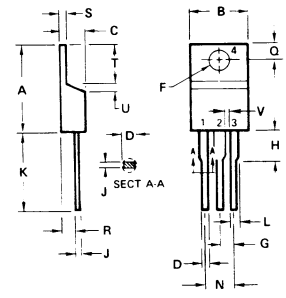
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	18	Vdc
Collector-Base Voltage	V_{CBO}	36	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	2.5	Adc
Total Device Dissipation @ $T_C = 25^oC$ (1) Derate above 25^oC	P_D	40 225	Watts $mW/^oC$
Storage Temperature Range	T_{stg}	−65 to +150	^oC

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	4.38	$^oC/W$

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

(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.



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

NOTE:
1. DIM. L & H APPLIES TO ALL LEADS.

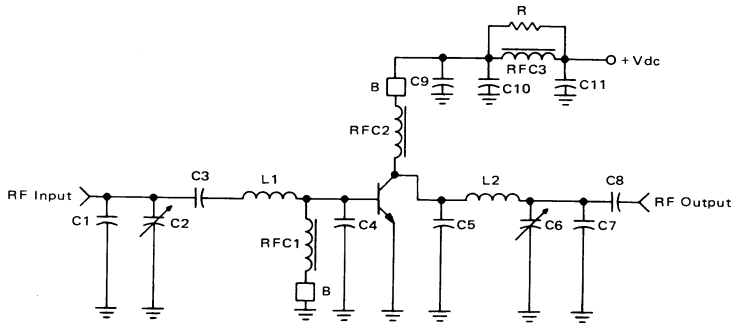
DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	15.11	15.75	0.595	0.620
B	9.65	10.29	0.380	0.405
C	4.06	4.82	0.160	0.190
D	0.64	0.89	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.41	2.67	0.095	0.105
H	2.79	3.30	0.110	0.130
J	0.36	0.56	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.14	1.27	0.045	0.050
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.14	1.39	0.045	0.055
T	5.97	6.48	0.235	0.255
U	0.76	1.27	0.030	0.050
V	1.14	-	0.045	-

CASE 221A-02

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, $I_B \geq 0$)	$V_{(BR)CEO}$	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_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	0.5	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 500 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 1.0 MHz	C_{ob}	–	40	60	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 15 W, f = 175 MHz)	G_{PE}	6.3	8.2	–	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 15 W, f = 175 MHz)	η	55	–	–	%

FIGURE 1 – 175 MHz TEST CIRCUIT



C1 – 10 pF Underwood
C2, C6 – Johanson Trimmer #5501
C3 – 60 pF Underwood
C4 – 150 pF Underwood
C5 – 100 pF Underwood
C7, C8 – 15 pF Underwood
C9 – 1000 pF Underwood
C10 – 0.1 μF Erie Red Cap
C11 – 100 μF Electrolytic, 15 Vdc

L1 – 2 Turns, #18 AWG, 5/16" ID
L2 – 1-1/2 Turns, #18 AWG, 5/16" ID
R – 10 Ω, 1.0 W
B – Ferroxcube Bead 56-590-65-3B
RFC1 – 0.15 μH Molded Coil
RFC2 – 6 Turns #18 Wire, 5/16" ID
RFC3 – VK200-20/4B
Board Material – Teflon Fiberglass
t = 0.062"

FIGURE 2 – POWER GAIN versus FREQUENCY

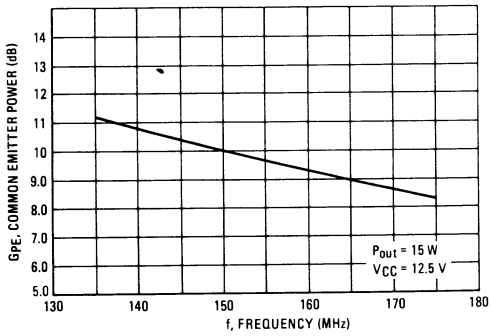


FIGURE 3 – OUTPUT POWER versus INPUT POWER

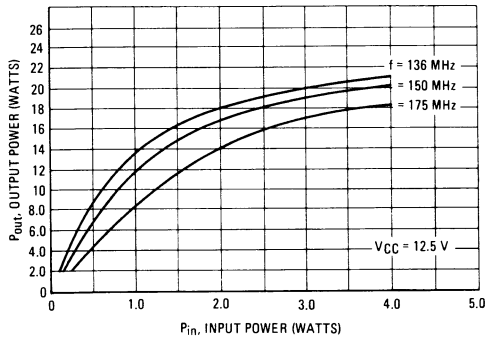


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE
136 MHz

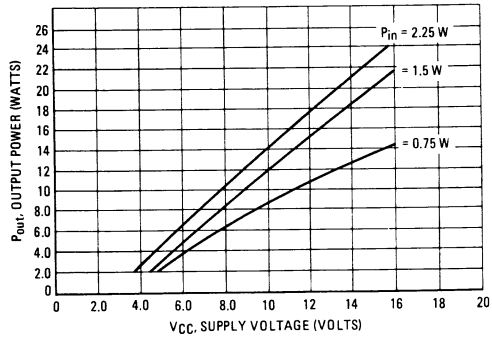


FIGURE 5 – OUTPUT POWER versus SUPPLY VOLTAGE
150 MHz

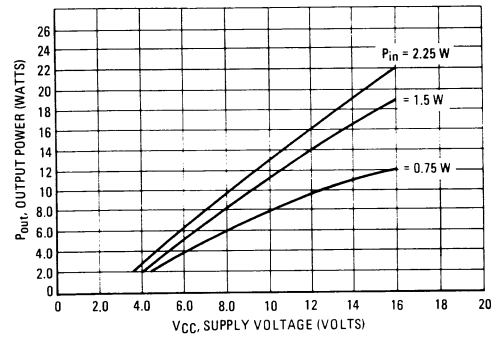


FIGURE 6 – OUTPUT POWER versus SUPPLY VOLTAGE
175 MHz

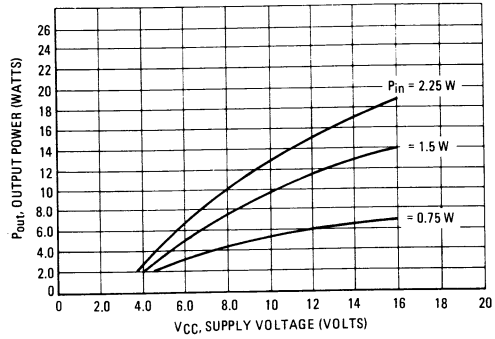


FIGURE 7 – SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCES

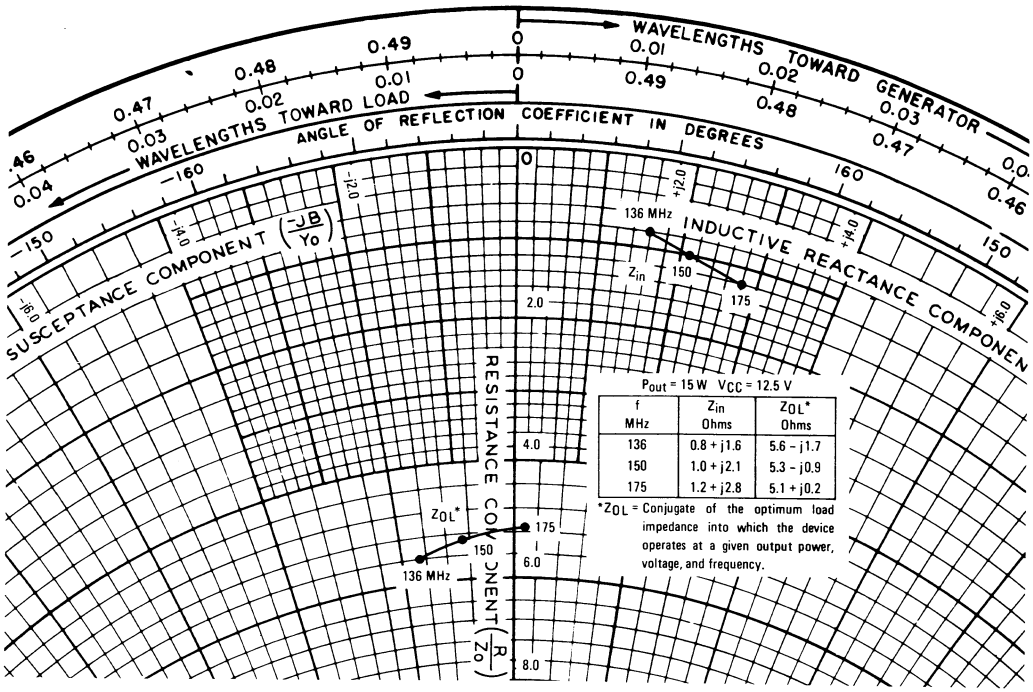
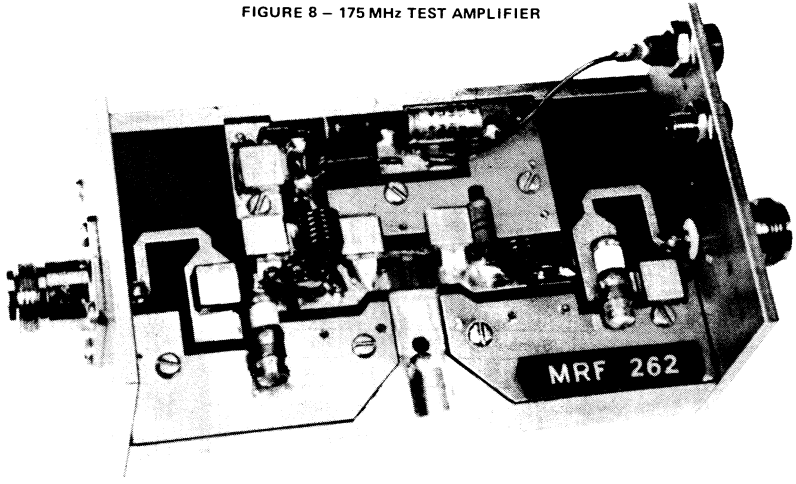


FIGURE 8 – 175 MHz TEST AMPLIFIER



MRF264

The RF Line

30 W 136–175 MHz

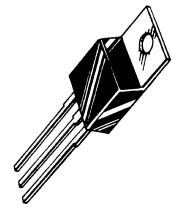
RF POWER TRANSISTOR

NPN SILICON

NPN SILICON RF POWER TRANSISTOR

. . . designed for 12.5-volt VHF large-signal power amplifier applications in commercial and industrial FM equipment.

- Low-Cost, Common-Emitter TO-220 Package
- Specified 12.5 V, 175 MHz Performance —
  Output Power = 30 Watts
  Power Gain = 5.2 dB Min
  Efficiency = 60% Min
- Load Mismatch Capability at High Line and RF Overdrive
- Other Devices in the Series —
  MRF260 5.0 Watts
  MRF261 10 Watts
  MRF262 15 Watts



3

MAXIMUM RATINGS

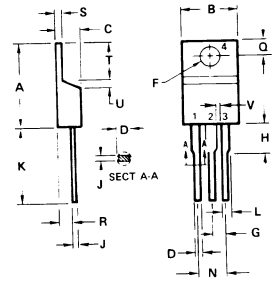
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	16	Vdc
Collector-Base Voltage	V_{CBO}	36	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	6.0	Adc
Total Device Dissipation @ T_A = 25°C (1) Derate above 25°C	P_D	80 0.64	Watts mW/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	1.56	°C/W

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

(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.



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

NOTE:
1. DIM. L & H APPLIES TO ALL LEADS.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	15.11	15.75	0.595	0.620
B	9.65	10.29	0.380	0.405
C	4.06	4.82	0.160	0.190
D	0.64	0.89	0.025	0.035
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R	2.04	2.79	0.080	0.110
S	1.14	1.39	0.045	0.055
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U	0.76	1.27	0.030	0.050
V	1.14	-	0.045	-

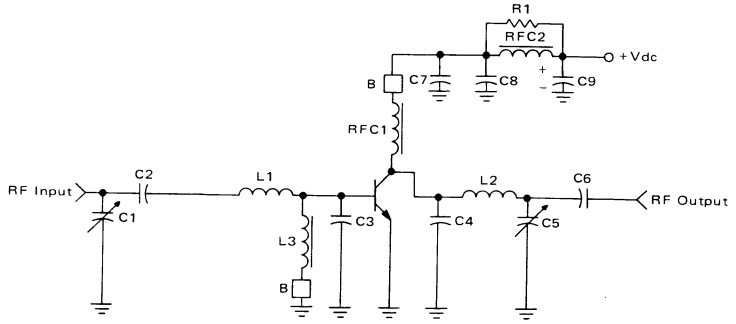
CASE 221A-02

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)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 20 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_{CB} = 15 Vdc, I_E = 0)	I_{CES}	—	—	5.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 500 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	20	50	—	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc; I_E = 0, f = 1.0 MHz)	C_{ob}	—	70	85	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 30 W, f = 175 MHz)	G_{PE}	5.2	6.0	—	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 30 W, f = 175 MHz)	η	60	—	—	%

3

FIGURE 1 – 175 MHz TEST CIRCUIT



C1, C5 – 1.0-20 pF Johanson
C2 – 25 pF Unelco
C3 – 120 pF Unelco
C4 – 100 pF Unelco
C6 – 15 pF Unelco
C7 – 1000 pF Unelco
C8 – 0.1 pF Erie Redcap
C9 – 100 µF, Electrolytic, 15 Vdc

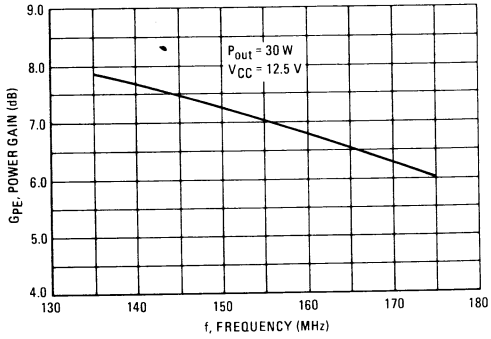
L1 – 2-1/2 Turns, #16 AWG 0.35" ID
L2 – 2 Turns, #16 AWG 0.25" ID
L3 – 0.15 µH Molded Choke

RFC1 – 5 Turns, #18 AWG 0.25" ID
RFC2 – Ferroxcube VK200 21/4B

R1 – 10 Ω, 2.0 W

B – Ferroxcube Bead 56-590-65-3B

FIGURE 2 – POWER GAIN versus FREQUENCY



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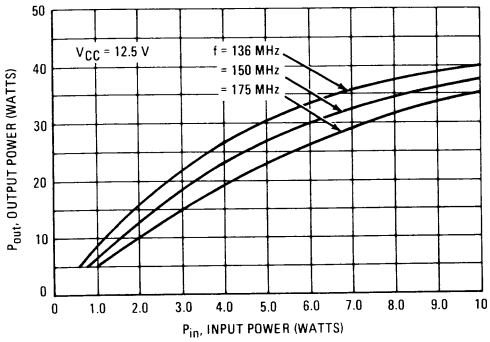


FIGURE 4 – OUTPUT POWER SUPPLY VOLTAGE
136 MHz

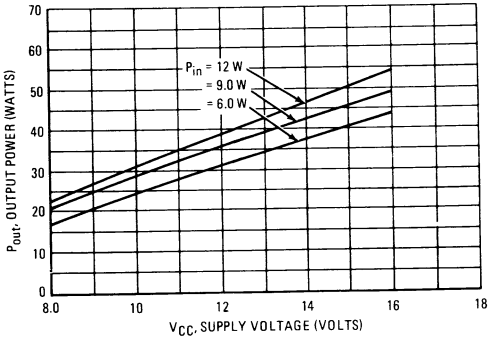
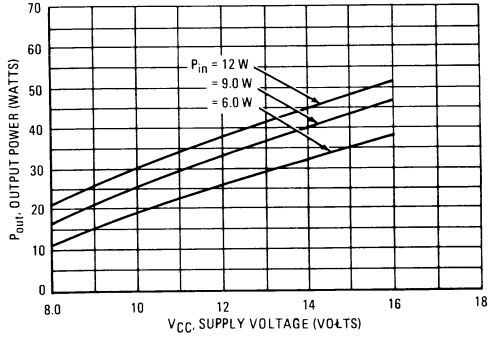


FIGURE 5 – OUTPUT POWER versus SUPPLY VOLTAGE
150 MHz



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175 MHz

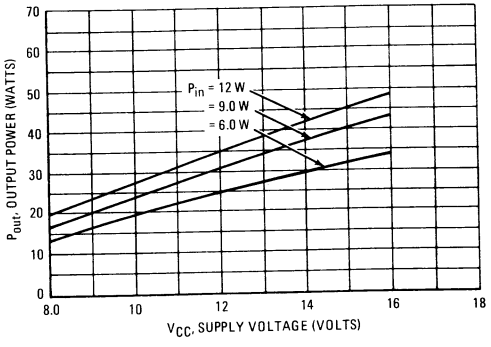
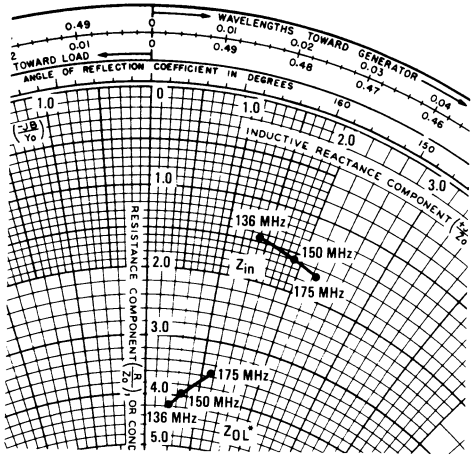


FIGURE 7 – SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCES



P_{out} = 30 W, V_{CC} = 12.5 V

f MHz	Z_{in} Ohms	Z_{OL}^* Ohms
136	1.44 + j1.4	4.16 + j0.48
150	1.55 + j1.92	3.96 + j0.65
175	1.67 + j2.22	3.59 + j1.17

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

3