MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

MRF1035MA
MRF1035MB
MRF1035MC

The RF Line

35 W PEAK — 960-1215 MHz

MICROWAVE POWER TRANSISTOR

NPN SILICON

MICROWAVE PULSE POWER TRANSISTOR

. . . designed for Class B and C *common-base* amplifier applications in short and long pulse TACAN, IFF, DME, and radar transmitters.

- Guaranteed Performance @ 1090 MHz, 50 Vdc
  Output Power = 35 Watts Peak
  Minimum Gain = 10 dB
- 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
- Industry Standard Package
- Nitride Passivated
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Compatible with Other 1035M Types
- Internal Input Matching for Broadband Operation

3

MAXIMUM RATINGS

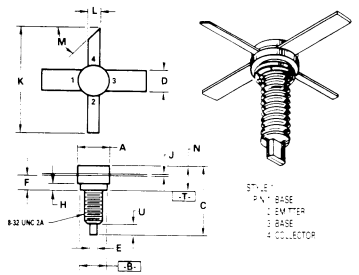
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	60	Vdc
Collector-Base Voltage	V_{CBO}	60	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	2.0	Adc
Total Device Dissipation @ T_C = 25°C(1) Derate above 25°C	P_D	35 200	Watts mW/°C
Storage Temperature Range	T_{stg}	−65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	5.0	°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.

MRF1035MA

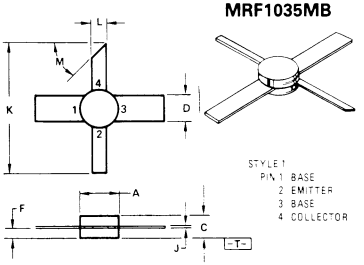


DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	5.86	7.62	0.270	0.300
B	6.10	6.60	0.240	0.260
C	16.26	16.76	0.640	0.660
D	4.95	5.21	0.195	0.205
E	1.40	1.65	0.055	0.065
F	2.67	4.32	0.105	0.170
H	1.40	1.65	0.055	0.065
J	0.08	0.18	0.003	0.007
K	15.24	—	0.600	—
L	2.41	2.67	0.095	0.105
M	45° Nom		45° Nom	
N	4.57	5.22	0.180	0.245
U	2.92	3.68	0.115	0.145

NOTES:
1. DIM B IS DATUM.
2. POSITIONAL TOLERANCE FOR LEADS:
   ⌖ ø 1.35 (0.053) M T B M
3. -T- IS SEATING PLANE.
4. DIMENSION K APPLIES TWO PLACES.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

CASE 332-04

MRF1035MB

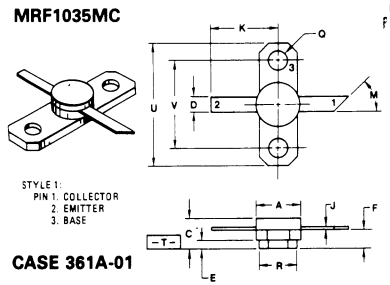


NOTES:
1. DIM A IS DATUM.
2. POSITIONAL TOLERANCE FOR LEADS:
   ⌖ 0.76 (0.030) M T A M
3. T IS SEATING PLANE.
4. DIM K APPLIES 2 PLACES.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.01	7.62	0.276	0.300
B	6.20	6.50	0.244	0.256
C	3.30	3.81	0.130	0.150
D	4.95	5.21	0.195	0.205
F	1.40	1.78	0.055	0.070
J	0.08	0.18	0.003	0.007
K	15.24	—	0.600	—
L	2.41	2.67	0.095	0.105
M	45° NOM		45° NOM	

CASE 332A-01

MRF1035MC



NOTES:
1. DIMENSIONS R AND U ARE DATUMS AND T IS A DATUM SURFACE AND SEATING PLANE.
2. POSITIONAL TOLERANCE FOR MOUNTING HOLES:
   ⌖ ø 0.38 (0.015) M T U M R M
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.06	7.26	0.278	0.286
C	4.44	5.20	0.175	0.205
D	2.36	2.71	0.093	0.107
E	1.39	1.77	0.055	0.070
F	2.66	3.42	0.105	0.135
J	0.10	0.15	0.004	0.006
K	11.04	—	0.435	—
M	45° NOM		45° NOM	
Q	3.04	34.2	0.120	0.135
R	6.09	6.68	0.240	0.260
U	20.06	20.57	0.790	0.810
V	14.27 BSC		0.562 BSC	

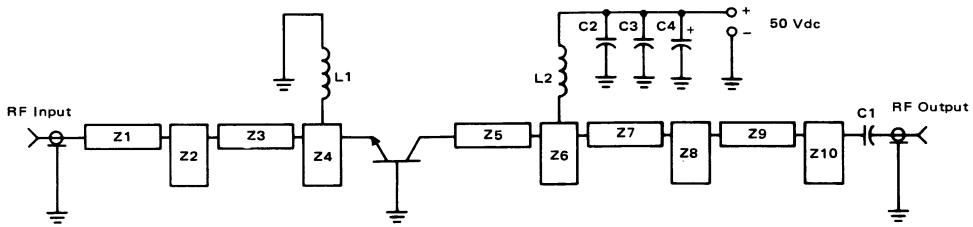
CASE 361A-01

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, V_{BE} = 0)	$V_{(BR)CES}$	60	–	–	Vdc
Collector-Base Breakdown Voltage (I_C = 20 mAdc, I_E = 0)	$V_{(BR)CBO}$	60	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 2.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CB} = 50 Vdc, I_E = 0)	I_{CBO}	–	–	2.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 500 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	10	40	100	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 50 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	10	15	pF
FUNCTIONAL TESTS (Pulse Width = 10 μs, Duty Cycle = 1%)					
Common-Base Amplifier Power Gain (V_{CC} = 50 Vdc, P_{out} = 35 W Peak, f = 1090 MHz)	G_{PB}	10	12.4	–	dB
Collector Efficiency (V_{CC} = 50 Vdc, P_{out} = 35 W Peak, f = 1090 MHz)	η	30	34	–	%
Load Mismatch (V_{CC} = 50 Vdc, P_{out} = 35 W Peak, f = 1090 MHz, VSWR = 10:1 All Phase Angles)	ψ	No Degradation in Output Power			

3

FIGURE 1 – 1090 MHz TEST CIRCUIT



C1, C2 – 220 pF 100 mil Chip Capacitor
C3 – 0.1 μF
C4 – 10 μF/75 V Electrolytic
L1, L2 – 3 Turns #18 AWG, 1/8" ID

Z1–Z10 – Microstrip, See Photomaster
Board Material – 0.031" Glass Teflon
ϵ_R = 2.5

FIGURE 2 – OUTPUT POWER versus INPUT POWER

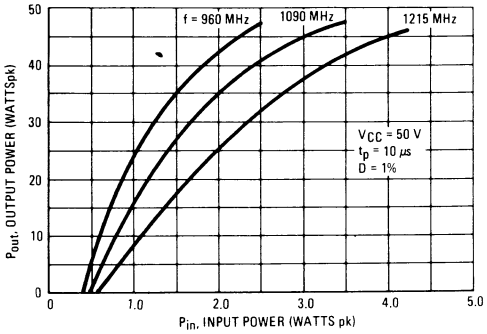


FIGURE 3 – OUTPUT POWER versus FREQUENCY

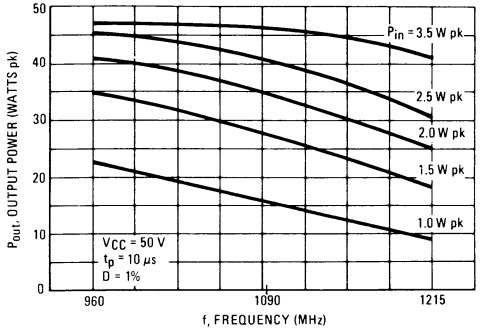


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE

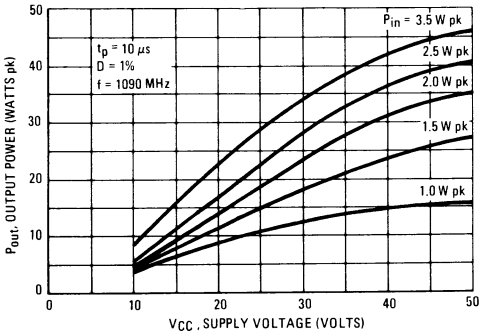


FIGURE 5 – POWER GAIN versus FREQUENCY

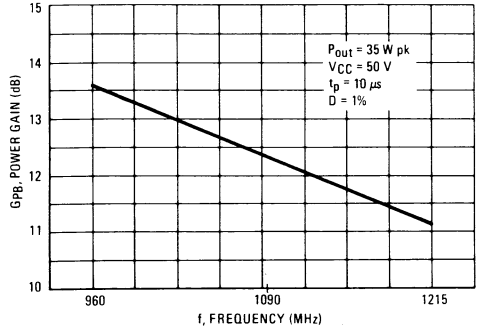
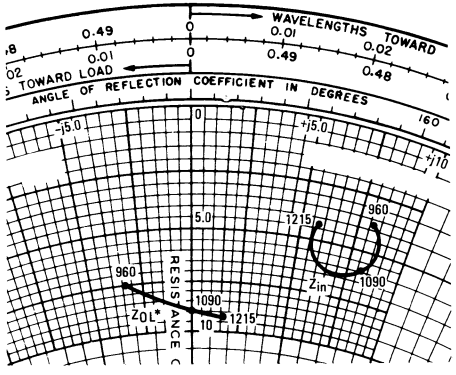


FIGURE 6 – SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCES



Pout = 35 W Pk VCC = 50 V
tp = 10 μs D = 1%

f MHz	Zin Ohms	ZOL* Ohms
960	3.8 + j 8.2	7.5 – j 3.3
1090	6.0 + j 8.2	9.0 + j 0
1215	4.2 + j 5.7	9.1 + j 1.7

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

FIGURE 7 – 1090 MHz TEST AMPLIFIER

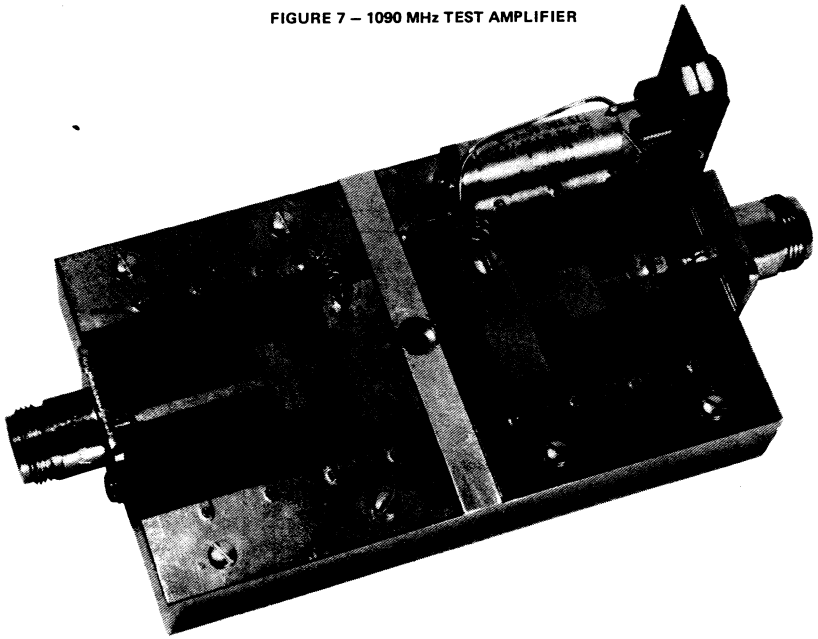
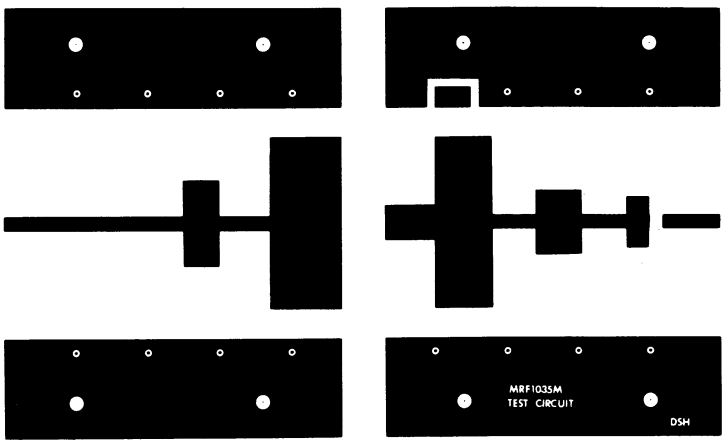


FIGURE 8 – PRINTED CIRCUIT BOARD LAYOUT – 1090 MHz TEST CIRCUIT



⊙ Soldered Eyelets

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

MRF1090MA
MRF1090MB
MRF1090MC

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90 W PEAK, 960-1215 MHz

MICROWAVE POWER TRANSISTOR

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MICROWAVE PULSE POWER TRANSISTOR

. . . designed for Class B and C *common base* amplifier applications in short pulse TACAN, IFF, and DME transmitters.

- Guaranteed Performance @ 1090 MHz, 50 Vdc
  Output power = 90 Watts Peak
  Minimum Gain = 8.4 dB
- 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
- Industry Standard Package
- Nitride Passivated
- Gold Metallized for Long Life and Resistance to Metal Migration
- Compatible with Other 1090M and 1075M Types
- Internal Input Matching for Broadband Operation

3

MAXIMUM RATINGS

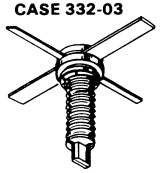
Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	70	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Peak (1)	I_C	6.0	Adc
Peak Device Dissipation @ T_C = 25°C (1) (2) Derate above 25°C	P_D	290 1.66	Watts W/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (3)	$R_{\theta JC}$	0.6	°C/W

(1) Pulse Width = 10 μs, Duty Cycle = 1%.
(2) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF short pulse amplifiers.
(3) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

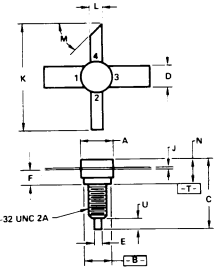
MRF1090MA
CASE 332-03



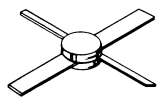
DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	7.01	7.62	0.276	0.300
B	6.20	6.50	0.244	0.256
C	16.26	16.76	0.640	0.660
D	4.95	5.21	0.195	0.205
E	1.40	1.65	0.055	0.065
F	2.92	4.32	0.115	0.170
J	0.08	0.18	0.003	0.007
K	15.24	–	0.600	–
L	2.41	2.67	0.095	0.105
M	45° Nom		45° Nom	
N	4.57	6.22	0.180	0.245
U	2.92	3.68	0.115	0.145

NOTES:
1. DIM [B] IS DATUM.
2. POSITIONAL TOLERANCE FOR LEADS: ⌖ 0.76(0.030)Ⓜ T BⓂ
3. [T] IS SEATING PLANE.
4. DIMENSION K APPLIES TWO PLACES.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

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



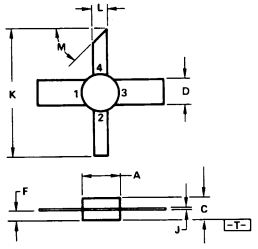
MRF1090MB
CASE 332A-01



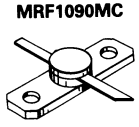
DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	7.01	7.62	0.276	0.300
C	3.30	3.81	0.130	0.150
D	4.95	5.21	0.195	0.205
F	1.40	1.78	0.055	0.070
J	0.08	0.18	0.003	0.007
K	15.24	–	0.600	–
L	2.41	2.67	0.095	0.105
M	45° NOM		45° NOM	

NOTES:
1. DIM [A] IS DATUM.
2. POSITIONAL TOLERANCE FOR LEADS: ⌖ 0.76 (0.030)Ⓜ T AⓂ
3. [T] IS SEATING PLANE.
4. DIM K APPLIES 2 PLACES.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

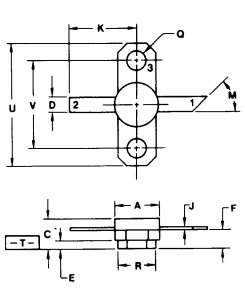
STYLE 1:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR



MRF1090MC



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



CASE 361A-01

NOTES:
1. DIMENSIONS R AND U ARE DATUMS AND T IS A DATUM SURFACE AND SEATING PLANE.
2. POSITIONAL TOLERANCE FOR MOUNTING HOLES: ⌖ ∮ 0.38 (0.015) Ⓜ T U Ⓜ R Ⓜ
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	7.06	7.26	0.278	0.286
C	4.44	5.20	0.175	0.205
D	2.36	2.71	0.093	0.107
E	1.39	1.77	0.055	0.070
F	2.66	3.42	0.105	0.135
J	0.10	0.15	0.004	0.006
K	11.04	–	0.435	–
M	45° NOM		45° NOM	
Q	3.04	3.4.2	0.120	0.135
R	6.09	6.86	0.240	0.260
U	20.06	20.57	0.790	0.810
V	14.27 BSC		0.562 BSC	

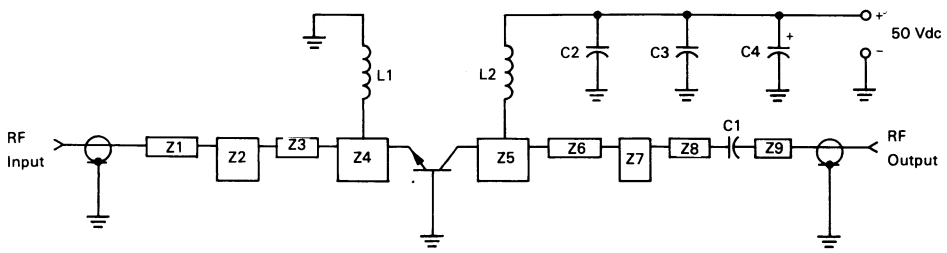
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 25 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	70	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 25 mAdc, I_E = 0)	$V_{(BR)CBO}$	70	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 50 Vdc, I_E = 0)	I_{CBO}	—	—	5.0	mAdc
ON CHARACTERISTICS					
DC Current Gain* (I_C = 2.5 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	10	30	—	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 50 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	—	12	16	pF
FUNCTIONAL TESTS (Pulse Width = 10 μs, Duty Cycle = 1.0%)					
Common-Base Amplifier Power Gain (V_{CC} = 50 Vdc, P_{out} = 90 W pk, f = 1090 MHz)	G_{PB}	8.4	10.8	—	dB
Collector Efficiency (V_{CC} = 50 Vdc, P_{out} = 90 W pk, f = 1090 MHz)	η	35	40	—	%
Load Mismatch (V_{CC} = 50 Vdc, P_{out} = 90 W pk, f = 1090 MHz) VSWR = 10:1 All Phase Angles)	ψ	No Degradation in Power Output			

* 80 μs Pulse on Tektronix 576 or equivalent.

3

FIGURE 1 — 1090 MHz TEST CIRCUIT



C1, C2 — 220 pF Chip Capacitor, 100-mil ATC
C3 — 0.1 μF
C4 — 47 μF, 75 V
L1, L2 — 3 Turns, #18 AWG, 1/8" ID
Z1-Z9 — Distributed Microstrip Elements — See Figure 9
Board Material — 0.031" Thick Glass Teflon,
ϵ_r = 2.5

FIGURE 2 — OUTPUT POWER versus INPUT POWER

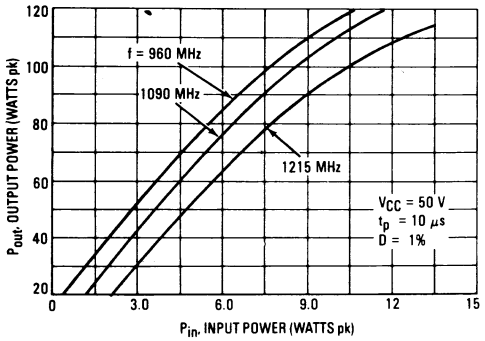


FIGURE 3 — OUTPUT POWER versus FREQUENCY

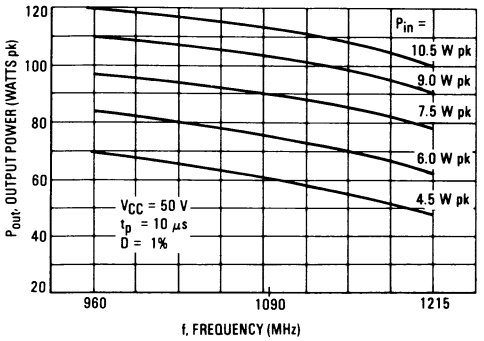


FIGURE 4 — OUTPUT POWER versus SUPPLY VOLTAGE

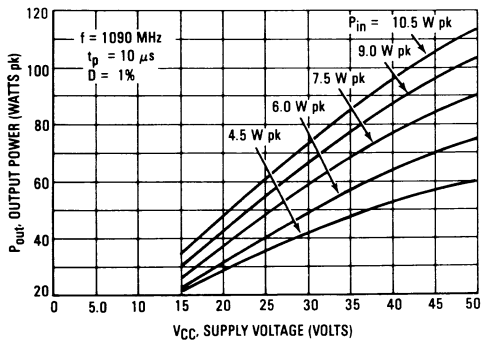


FIGURE 5 — POWER GAIN versus FREQUENCY

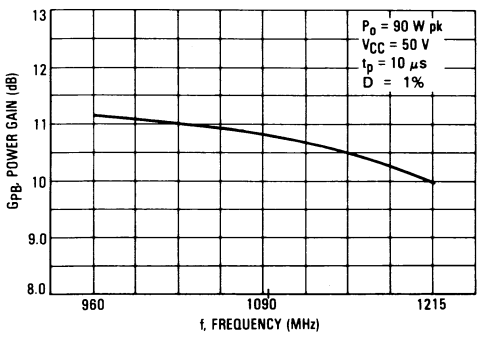
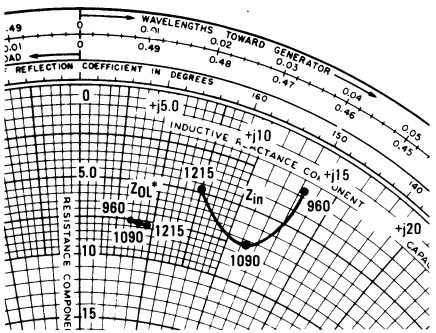


FIGURE 6 — SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCE



Coordinates in Ohms

P_{out} 90 W pk V_{CC} = 50 V
t_p = 10 μs D = 1%

f MHz	Z_{in} Ohms	Z_{OL}* Ohms
960	2.8 + j13.2	7.6 + j3.5
1090	7.4 + j11.4	7.6 + j4.0
1215	4.7 + j7.5	7.7 + j4.5

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

FIGURE 7 — 1090 MHz TEST AMPLIFIER

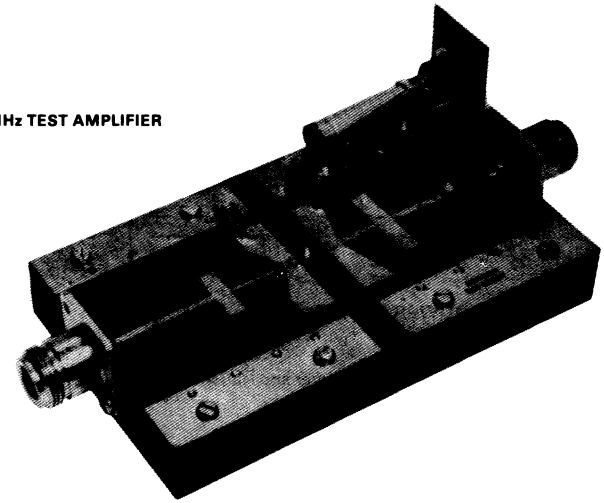


FIGURE 8 — TYPICAL PULSE PERFORMANCE

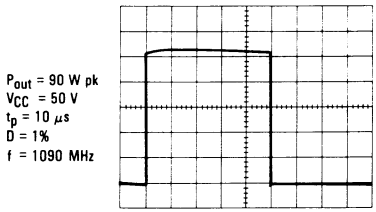
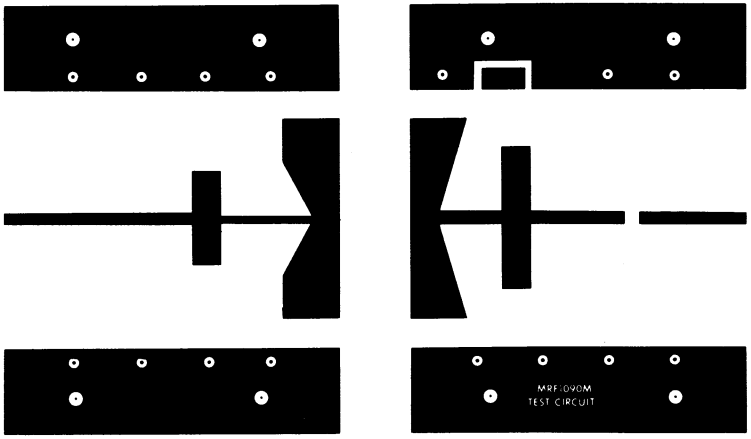


FIGURE 9 — PRINTED CIRCUIT BOARD LAYOUT — 1090 MHz TEST CIRCUIT



⊙ Soldered Eyelet
⊙ 4–40 Screw Placement
NOTE: The Printed Circuit Board shown is 75% of the original.

MRF1150M

The RF Line

150 W PEAK, 1020-1150 MHz

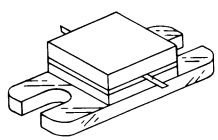
MICROWAVE POWER TRANSISTOR

NPN SILICON

MICROWAVE PULSE POWER TRANSISTOR

. . . designed for Class B and C *common base* amplifier applications in short pulse TACAN, IFF, and DME transmitters.

- Guaranteed Performance @ 1090 MHz, 50 Vdc
  Output Power = 150 Watts Peak
  Minimum Gain = 7.8 dB
- 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
- Industry Standard Package
- Nitride Passivated
- Gold Metallized for Long Life and Resistance to Metal Migration
- Compatible with Other 1150M Types
- Internal Input and Output Matching for Broadband Operation



3

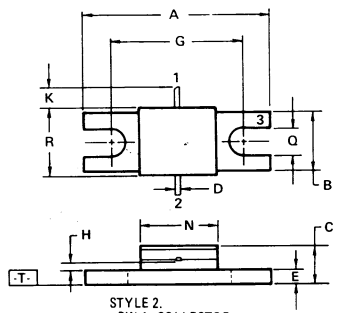
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	70	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Peak (1, 2)	I_C	12	Adc
Peak Device Dissipation @ T_C = 25°C (1, 2) Derate above 25°C	P_D	583 3.33	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (1,2,3)	$R_{\theta JC}$	0.3	°C/W

(1) Pulse Width = 10 μs, Duty Cycle = 1%.
(2) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF short pulse amplifiers.
(3) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.



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

NOTES:
1. DIMENSIONS -A- AND -B- ARE DATUMS.
2. POSITIONAL TOLERANCE FOR MOUNTING HOLES:
   ⌖ .76(0.030) Ⓜ T A Ⓜ B Ⓜ
3. -T- IS SEATING PLANE.
4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	22.61	23.11	0.890	0.910
B	9.65	9.91	0.380	0.390
C	4.06	5.84	0.160	0.230
D	0.51	0.76	0.020	0.030
E	1.40	1.65	0.055	0.065
G	16.51 BSC		0.650 BSC	
H	1.14	1.77	0.045	0.070
K	2.54	–	0.100	–
N	9.91	10.41	0.390	0.410
Q	3.00	3.61	0.118	0.142
R	9.91	10.41	0.390	0.410

CASE 336-03

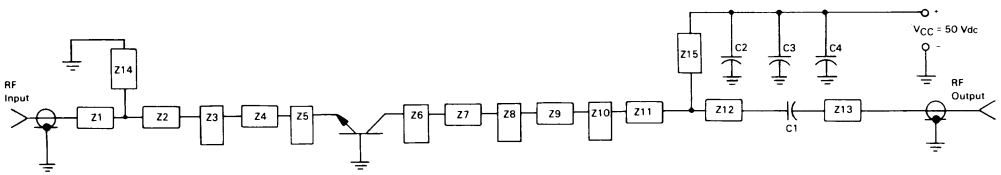
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	70	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 50 mAdc, I_E = 0)	$V_{(BR)CBO}$	70	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 50 Vdc, I_E = 0)	I_{CBO}	—	—	10	mAdc
ON CHARACTERISTICS					
DC Current Gain* (I_C = 5.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	10	30	—	—
FUNCTIONAL TESTS (Pulse Width = 10 μs, Duty Cycle = 1.0%)					
Common-Base Amplifier Power Gain (V_{CC} = 50 Vdc, P_{out} = 150 W pk, f = 1090 MHz)	G_{PB}	7.8	8.7	—	dB
Collector Efficiency (V_{CC} = 50 Vdc, P_{out} = 150 W pk, f = 1090 MHz)	η	33	—	—	%
Load Mismatch (V_{CC} = 50 Vdc, P_{out} = 150 W pk, f = 1090 MHz, VSWR = 10:1 All Phase Angles)	ψ	No Degradation in Power Output			

*80 μs Pulse on Tektronix 576 or equivalent.

3

FIGURE 1 — 1090 MHz TEST CIRCUIT



C1, C2 — 150 pF
C3 — 0.1 μF/100 V
C4 — 47 μF/75 V, Electrolytic
Z1–Z15 — Distributed Microstrip Elements
Board Material — 0.0031" Thick Teflon-Fiberglass
ϵ_r = 2.55

FIGURE 2 — OUTPUT POWER versus INPUT POWER

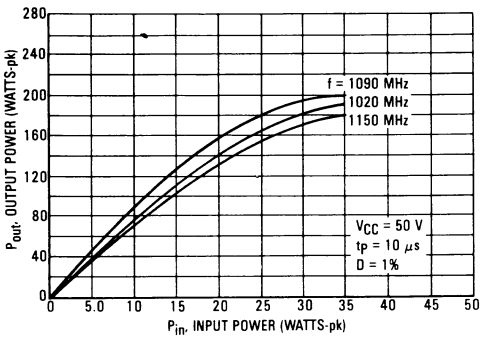


FIGURE 3 — OUTPUT POWER versus FREQUENCY

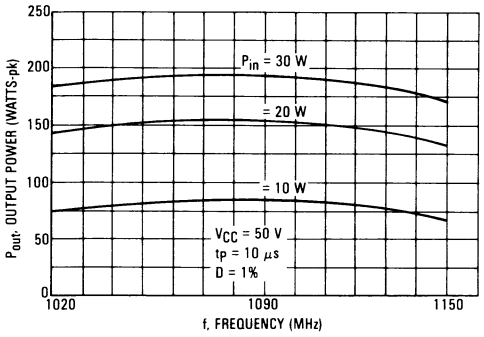


FIGURE 4 — OUTPUT POWER versus SUPPLY VOLTAGE

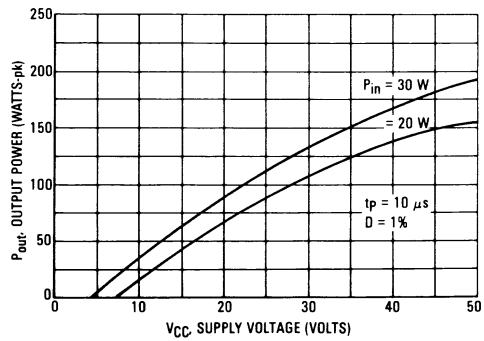
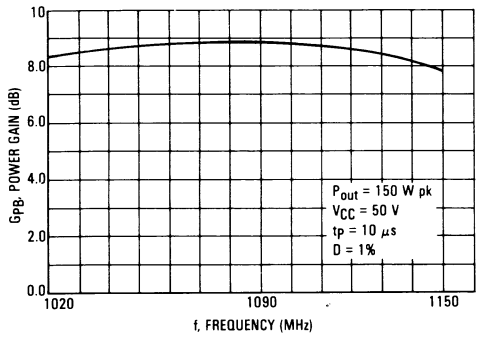


FIGURE 5 — POWER GAIN versus FREQUENCY



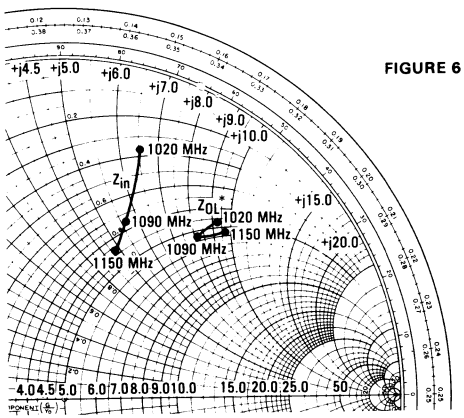


FIGURE 6 — SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCE

P_{out} = 150 W-pk V_{CC} = 50 V
t_p = 10 μs D = 1%

f MHz	Z_{in} Ohms	Z_{OL}^* Ohms
1020	1.85 + j6.6	4.6 + j9.4
1090	3.5 + j5.7	5.3 + j8.1
1150	4.4 + j4.8	5.2 + j9.7

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

FIGURE 7 — OUTPUT POWER, INPUT VSWR, POWER GAIN versus FREQUENCY

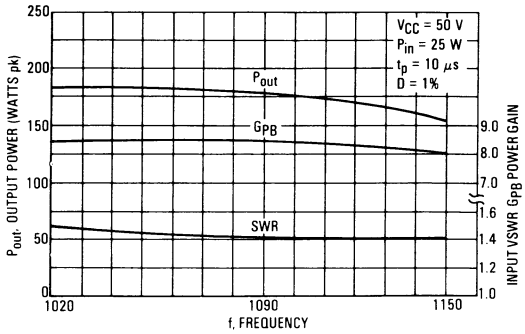


FIGURE 8 — 1090 MHz TEST CIRCUIT

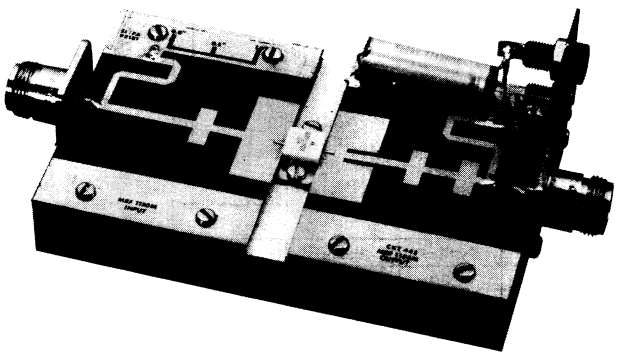
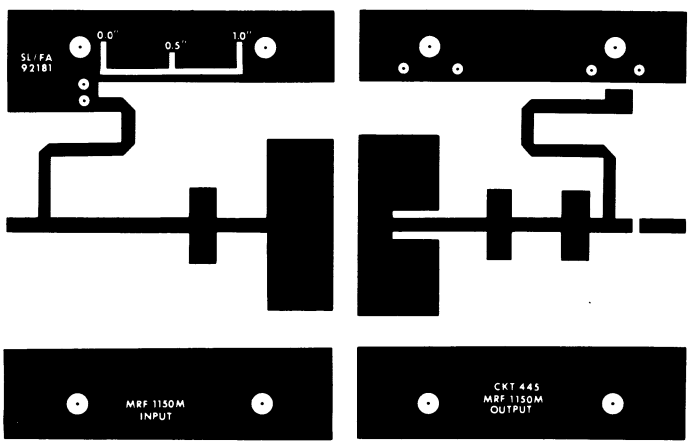


FIGURE 9 — 1090 MHz PHOTOMASTER



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

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

MRF1150MA
MRF1150MB
MRF1150MC

The RF Line

150 W PEAK, 960-1215 MHz

MICROWAVE POWER TRANSISTOR

NPN SILICON

MICROWAVE PULSE POWER TRANSISTOR

. . . designed for Class B and C *common base* amplifier applications in short pulse TACAN, IFF, and DME transmitters.

- Guaranteed Performance @ 1090 MHz, 50 Vdc
  Output power = 150 Watts Peak
  Minimum Gain = 7.8 dB
- 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
- Industry Standard Package
- Nitride Passivated
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Compatible with Other 1150M Types
- Internal Input Matching for Broadband Operation

3

MAXIMUM RATINGS

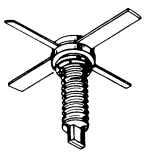
Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	70	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Peak (1)	I_C	12	Adc
Peak Device Dissipation @ T_C = 25°C (1) (2) Derate above 25°C	P_D	583 3.33	Watts W/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (3)	$R_{\theta JC}$	0.3	°C/W

(1) Pulse Width = 10 μs, Duty Cycle = 1%.
(2) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF short pulse amplifiers.
(3) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

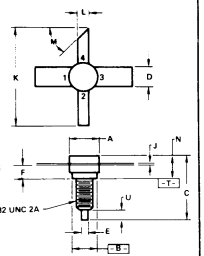
MRF1150MA
CASE 332-01



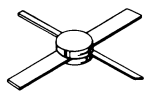
DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.01	7.62	0.276	0.300
B	6.20	6.50	0.244	0.256
C	16.26	16.76	0.640	0.660
D	4.95	5.21	0.195	0.205
E	1.40	1.65	0.055	0.065
F	2.92	3.43	0.115	0.135
J	0.08	0.18	0.003	0.007
K	15.24	–	0.600	–
L	2.41	2.67	0.095	0.105
M	45° Nom		45° Nom	
N	5.08	5.46	0.200	0.215
U	2.92	3.68	0.115	0.145

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

NOTES:
1. DIM B IS DATUM.
2. POSITIONAL TOLERANCE FOR LEADS: ⌖ 0.76(0.030) M T B M
3. T IS SEATING PLANE.
4. DIMENSION K APPLIES TWO PLACES.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.



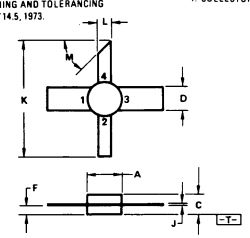
MRF1150MB
CASE 332A-01



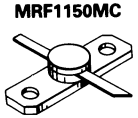
DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.01	7.62	0.276	0.300
B	6.20	6.50	0.244	0.256
C	3.30	3.81	0.130	0.150
D	4.95	5.21	0.195	0.205
F	1.40	1.78	0.055	0.070
J	0.08	0.18	0.003	0.007
K	15.24	–	0.600	–
L	2.41	2.67	0.095	0.105
M	45° NOM		45° NOM	

NOTES:
1. DIM A IS DATUM.
2. POSITIONAL TOLERANCE FOR LEADS: ⌖ 0.76 (0.030) M T A M
3. T IS SEATING PLANE.
4. DIM K APPLIES 2 PLACES.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

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

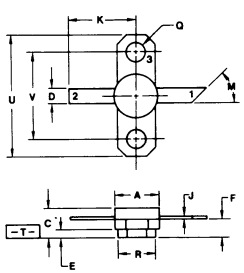


MRF1150MC



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

CASE 361A-01



NOTES:
1. DIMENSIONS R AND U ARE DATUMS AND T IS A DATUM SURFACE AND SEATING PLANE.
2. POSITIONAL TOLERANCE FOR MOUNTING HOLES: ⌖ ∅ 0.38 (0.015) M T U M R M
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

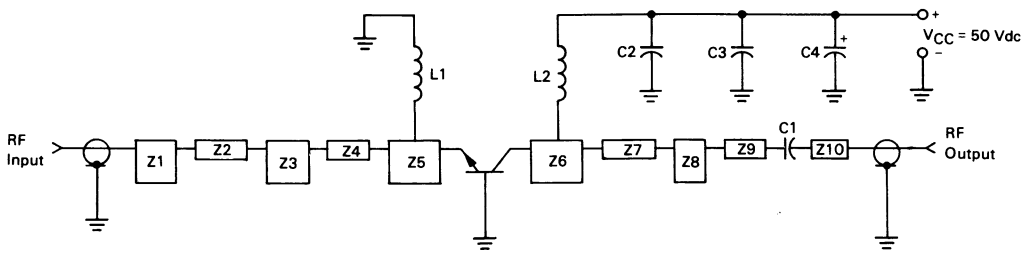
DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.06	7.26	0.278	0.286
C	4.44	5.20	0.175	0.205
D	2.36	2.71	0.093	0.107
E	1.39	1.77	0.055	0.070
F	2.66	3.42	0.105	0.135
J	0.10	0.15	0.004	0.006
K	11.04	–	0.435	–
M	45° NOM		45° NOM	
Q	3.04	3.42	0.120	0.135
R	6.09	6.86	0.240	0.260
U	20.06	20.57	0.790	0.810
V	14.27 BSC		0.562 BSC	

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, V_{BE} = 0)	$V_{(BR)CES}$	70	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 50 mAdc, I_E = 0)	$V_{(BR)CBO}$	70	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 50 Vdc, I_E = 0)	I_{CBO}	—	—	10	mAdc
ON CHARACTERISTICS					
DC Current Gain* (I_C = 5.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	10	30	—	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 50 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	—	25	32	pF
FUNCTIONAL TESTS (Pulse Width = 10 μs, Duty Cycle = 1.0%)					
Common-Base Amplifier Power Gain (V_{CC} = 50 Vdc, P_{out} = 150 W pk, f = 1090 MHz)	G_{PB}	7.8	9.8	—	dB
Collector Efficiency (V_{CC} = 50 Vdc, P_{out} = 150 W pk, f = 1090 MHz)	η	35	40	—	%
Load Mismatch (V_{CC} = 50 Vdc, P_{out} = 150 W pk, f = 1090 MHz) VSWR = 10:1 All Phase Angles)	ψ	No Degradation in Power Output			

*80 μs Pulse on Tektronix 576 or equivalent.

FIGURE 1 — 1090 MHz TEST CIRCUIT



C1, C2 — 220 pF Chip Capacitor, 100-mil ATC
C3 — 0.1 μF/100 V
C4 — 47 μF/75 V Electrolytic
L1, L2 — 3 Turns, #18 AWG, 1/8" ID
Z1–Z10 — Distributed Microstrip Elements — See Figure 9
Board Material — 0.031" Thick Teflon-Fiberglass,
ϵ_r = 2.5

FIGURE 2 — OUTPUT POWER versus INPUT POWER

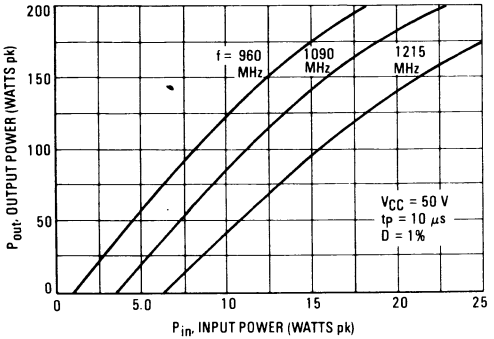


FIGURE 3 — OUTPUT POWER versus FREQUENCY

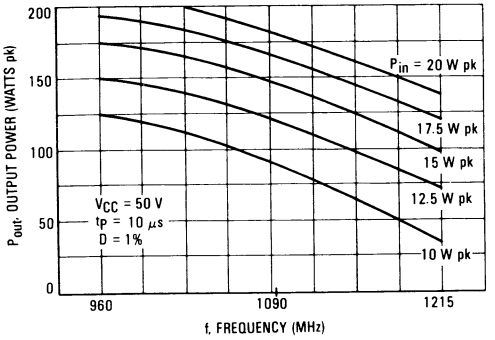


FIGURE 4 — OUTPUT POWER versus SUPPLY VOLTAGE

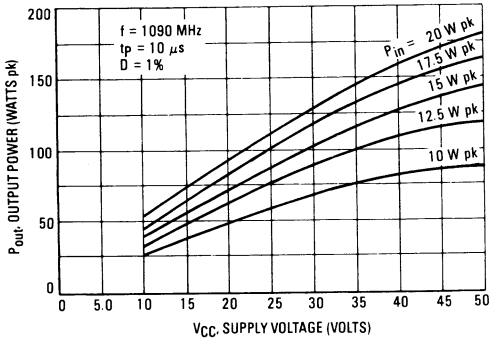


FIGURE 5 — POWER GAIN versus FREQUENCY

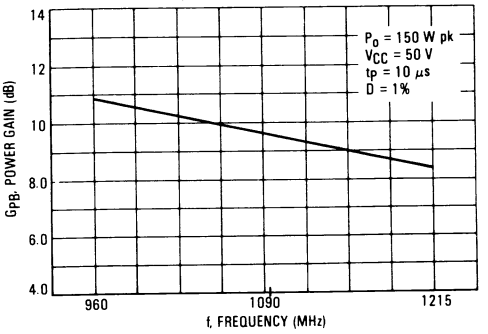
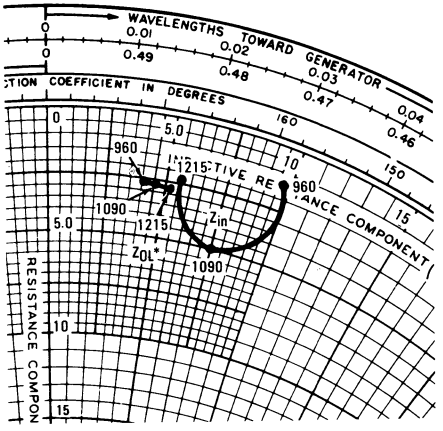


FIGURE 6 — SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCE



P_{out} = 150 W pk V_{CC} = 50 V
t_p = 10 μs D = 1%

f MHz	Z_{in} Ohms	Z_{OL}* Ohms
960	1.5 + j9.6	2.6 + j4.1
1090	5.0 + j7.5	2.7 + j4.6
1215	2.4 + j5.6	2.8 + j5.3

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

FIGURE 7 — 1090 MHz TEST AMPLIFIER

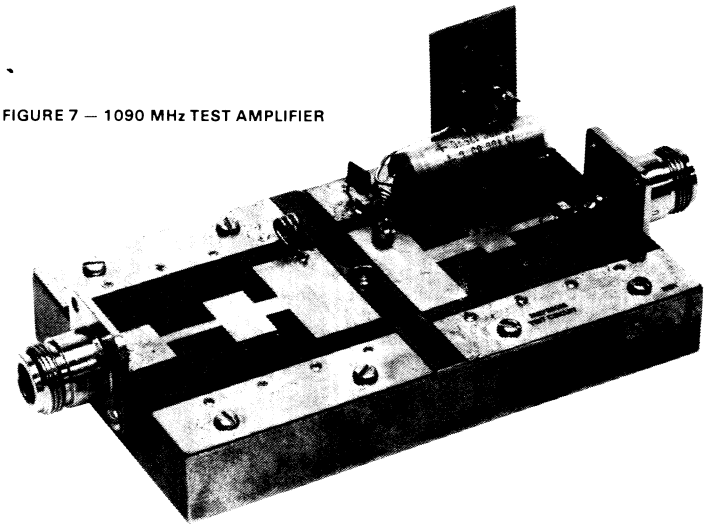


FIGURE 8 — TYPICAL PULSE PERFORMANCE

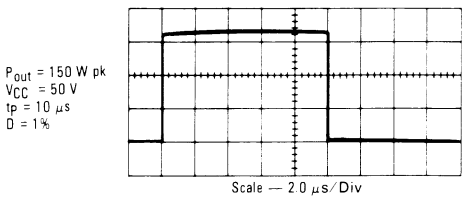
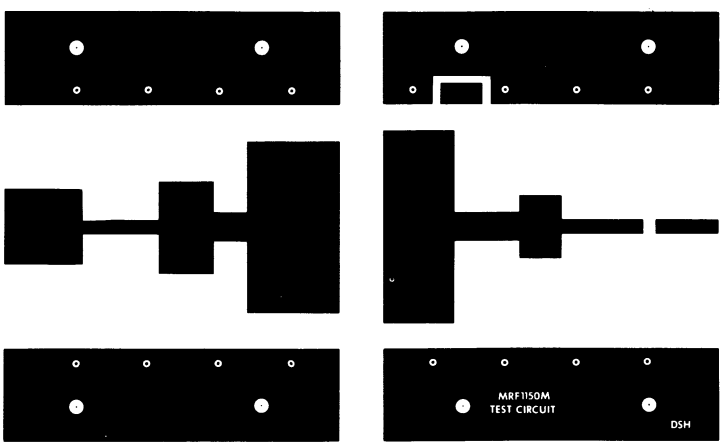


FIGURE 9 — PRINTED CIRCUIT BOARD LAYOUT — 1090 MHz TEST CIRCUIT



⊙ Soldered Eyelet

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