

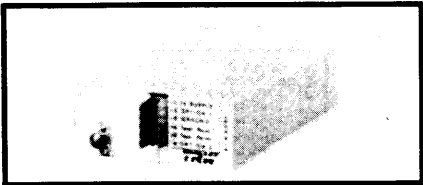
MOBILE VHF/UHF 900 MHz

PRODUCT SUMMARY

PART NUMBER	APPLICATION	FREQUENCY	POWER OR GAIN (dB)	SUPPLY VOLTAGE (V)	PACKAGE	PAGE
AMR 900-60	MOBILE	800-960 MHz	60 W	24	AMR	B 2
JO 3020	MOBILE	470 MHz	20 W	12.5	J-ZERO	B 6
JO 3037	MOBILE	470 MHz	37 W	12.5	J-ZERO	B 9
JO 4036	MOBILE	175 MHz	36 W	12.5	J-ZERO	B 10
JO 4045	MOBILE	175 MHz	45 W	12.5	J-ZERO	B 14
ML 20	MOBILE	66-88 MHz	20 W	12.5	MVM	B 18
MV 20	MOBILE	140-175 MHz	20 W	12.5	MVM	B 19
MV 30	MOBILE	150-160 MHz	30 W	12.5	MVM	B 19
MX 20	MOBILE	400-470 MHz	20 W	12.5	MVM	B 23
PT 8809	MOBILE	470 MHz	2 W	12.5	SOE 280	B 25
PT 8810	MOBILE	470 MHz	5 W	12.5	SOE 280	B 25
PT 8811	MOBILE	470 MHz	10 W	12.5	SOE 280	B 25
PT 8828/F	MOBILE	175 MHz	10 W	12.5	SOE 380/F	B 29
PT 9780/A	SSB	30 MHz	100 PEP	28	SOE 500/F	B 34
PT 9784/A	SSB	30 MHz	75 PEP	12.5	SOE 380/F	B 39
PT 9785	SSB	30 MHz	100 PEP	12.5	SOE 500	B 39
TP 212/S	MOBILE	88 MHz	1.5 W	7.5	SOE 280/SS	B 43
TP 251	MOBILE	470 MHz	0.2 W	7.5	SOE 200/SS	B 46
TP 252/S	MOBILE	470 MHz	1.5 W	7.5	SOE 280/SS	B 49
TP 1045	MOBILE	470 MHz	2 W	12.5	SOE 280/SS	B 52
TP 2180	MOBILE	88 MHz	80 W	12.5	J-ZERO	B 55
TP 2304	MOBILE	175 MHz	40 W	12.5	SOE 380	B 58
TP 2312	MOBILE	175 MHz	3 W	12.5	TO 39 GE	B 62
TP 2314	MOBILE	175 MHz	4 W	12.5	TO 39 GE	B 65
TP 2320	MOBILE	175 MHz	17 W	12.5	SOE 380	B 68
TP 2330/F	MOBILE	175 MHz	30 W	12.5	SOE 380/F	B 72
TP 2503	MOBILE	470 MHz	5 W	12.5	SOE 280/SS	B 75
TP 3020	MOBILE	960 MHz	2 W	24	SOE 280	B 78
TP 3022	MOBILE	960 MHz	15 W	24	230 F	B 82
TP 3024	MOBILE	960 MHz	30 W	24	BMA 2	B 86

Linear RF Power Amplifier

- 60 W
- 800-960 MHz
- Class "AB"



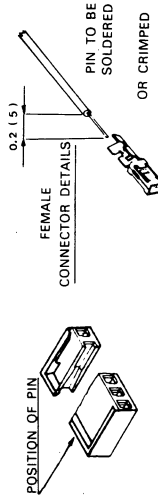
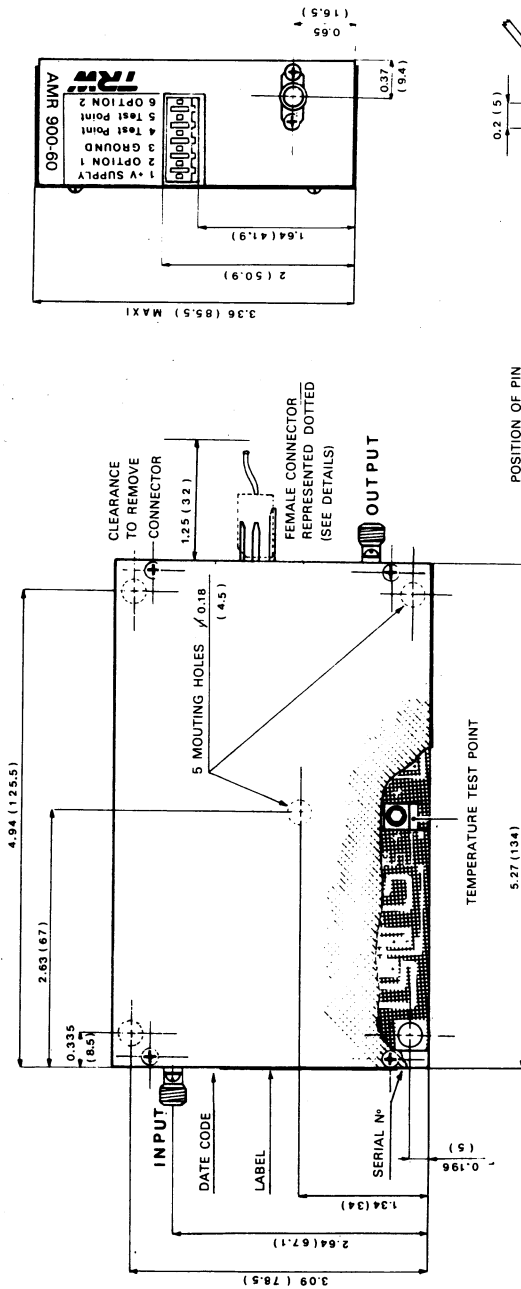
B

The AMR 900-60 solid state class B amplifier is specifically designed for cellular radio base stations.

This amplifier incorporates microstrip technology and reliable TRW linear push-pull transistors.

Electrical Characteristics (T_{case} = 50 °C)

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
GENERAL OPERATING	R _L	Source and load Return loss	50 ohms reference			-20	dB
	BW	Bandwith	Continuous without Retuning	800		960	MHz
	V _{cc}	Supply voltage	Nominal		24		V
RF TEST	P _G	Power gain	P. ref. = 50 W		7		dB
	I _{typ}	Typical current consumption	P _{out} = 50 W V _{cc} = 24 V		4		A
	R _L	Input/output Return loss	50 ohms reference		-15	-10	dB
	VSWR	Output mismatch	P _{out} = 50 W V _{cc} = 24 V		5:1		
RATINGS	V _{cc}	Supply voltage		-	24	25	V
	I _{max}	Max DC current	V _{cc} = 24.0 V			6	A
	T _{op}	Operating temper.	Base plate (test point)	-20		+70	°C
	T _{STG}	Storage temperat.		-40		+100	°C



PLUS IN LAYOUT

- PIN 1 +V supply 28.5 volts
- PIN 2 Do not use
- PIN 3 Ground
- PIN 4-5 Collector current test point
- PIN 6 Optional

VOLTAGE MEASUREMENT

V supply (Between pin 1 and 3)

COLLECTOR CURRENT MEASUREMENT

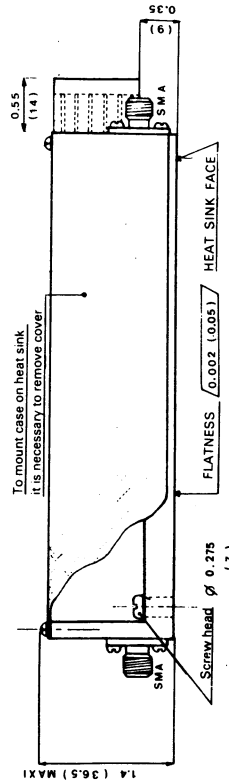
Voltmeter must have an input impedance greater than 10 K Ω .

TRANSISTOR N° 1

$$I_1 (A) = \frac{1}{0.47} \times V (V) \text{ Between Pin 1-5}$$

TRANSISTOR N° 1

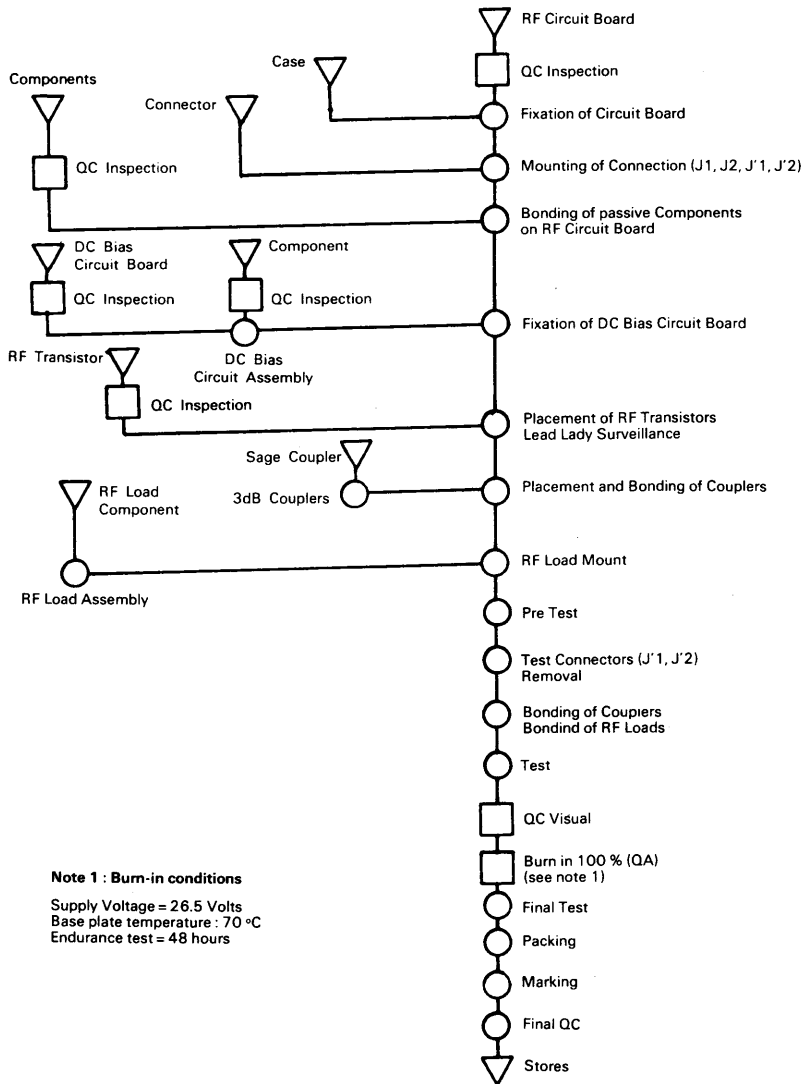
$$I_2 (A) = \frac{1}{0.47} \times V (V) \text{ Between Pin 1-4}$$



DIMENSIONS IN INCHES mm IN BRACKETS

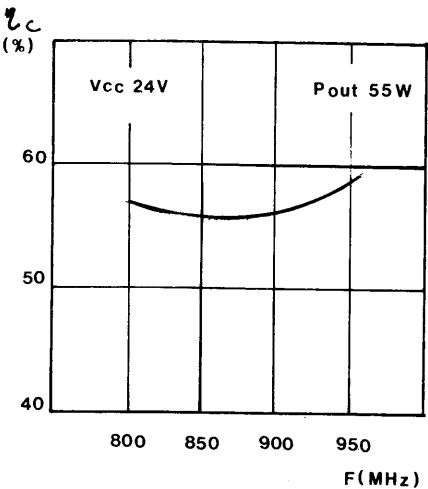
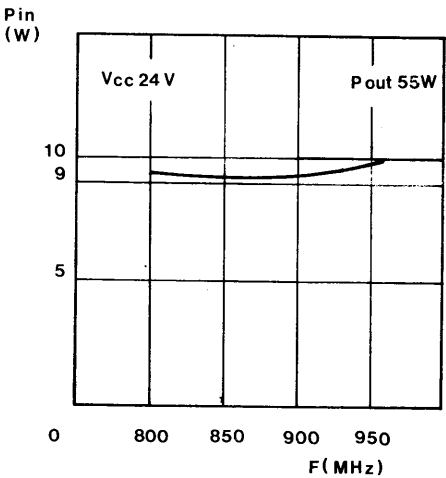
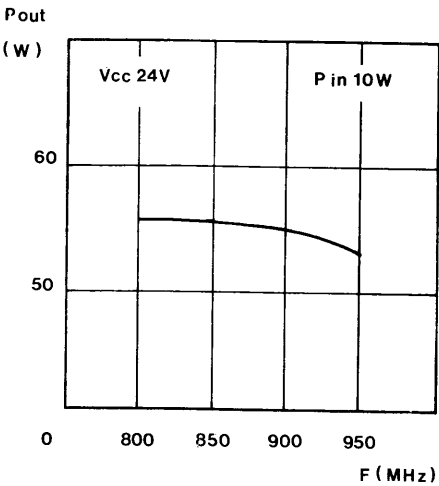
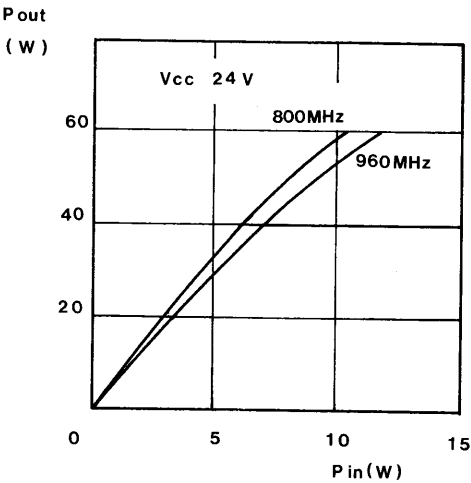
T.O.L. - GEN. : 0.008 (0.2)

MANUFACTURING FLOW CHART OPERATION



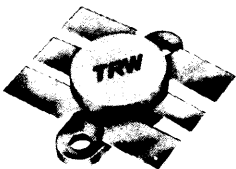
Note 1 : Burn-in conditions
Supply Voltage = 26.5 Volts
Base plate temperature : 70 °C
Endurance test = 48 hours

TYPICAL CHARACTERISTICS



UHF RF Power Transistor

- 20 W
- 12.5 V
- 450-512 MHz
- Diffused Ballast Resistors
- Internally Matched
- Common Emitter
- Isolated Package
- 20:1 VSWR



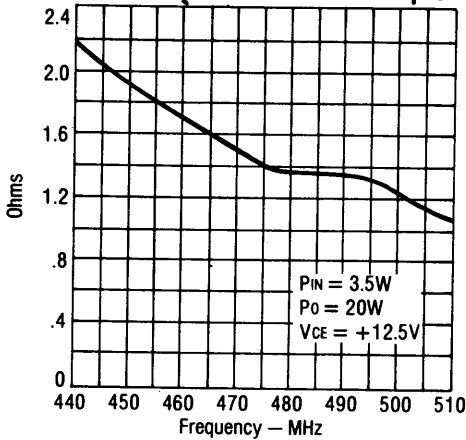
.500 J Zero

B

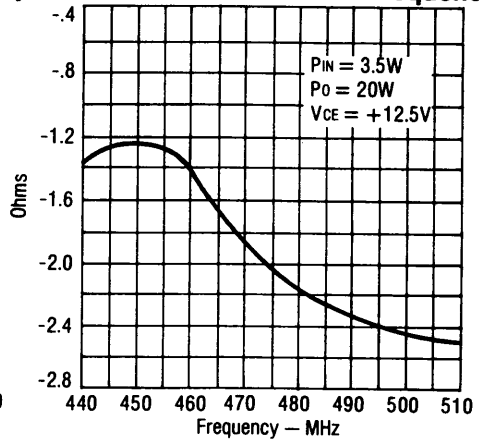
Electrical Characteristics (T_{case} = 25°C)

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC TEST	BVCBO	Collector Base Voltage	Ic = 50mA	36			V
	BVCEO	Collector Emitter Voltage	Ic = 50mA	16			V
	ICES	Collector Emitter Leakage	VCE = 15V			10	mA
	BVEBO	Emitter Base Voltage	Ie = 5mA, Ic = 0	4			V
	hFE	D.C. Current Gain	VCE = 5V, Ic = 1A	20		200	
RF TEST	P _{gain}	Power Gain	VCE = 12.5V, f = 470MHz P _{IN} = 3.5W	7.6			dB
	VSWR _L	Collector Load	VCE = 15.5V, f = 470MHz P _{IN} = 3.5W	20:1			VSWR
	η	Collector Efficiency	At P _D = 20W		60		%
THERMAL	θ _{JC}	Thermal Resistance	25°C Case		4.5		°C/W
	T _{STG}	Storage Temperature		-65		150	°C
	I _{C(MAX)}	Maximum Collector Current	Tc = 25°C			3	A
	P _{D(MAX)}	Total Dissipation	Tc = 25°C			39	W

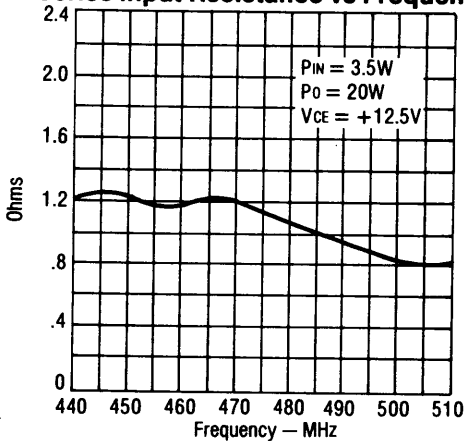
Series Load Resistance vs Frequency



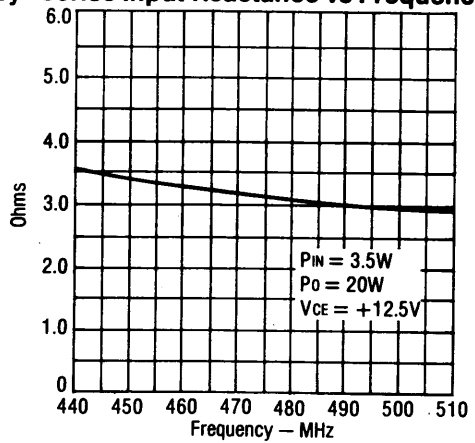
Series Load Reactance vs Frequency



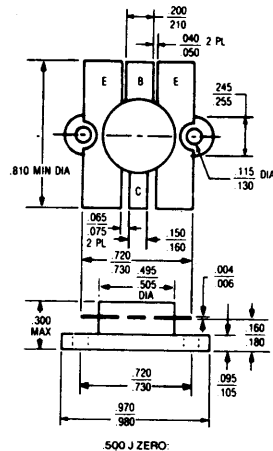
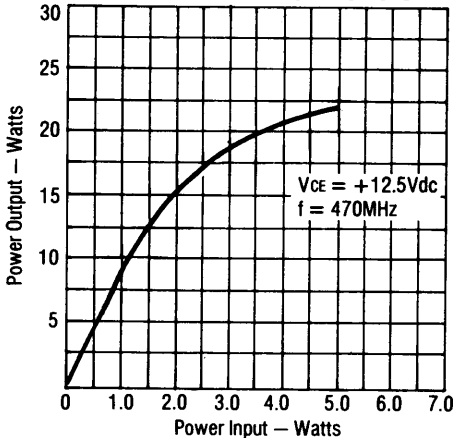
Series Input Resistance vs Frequency



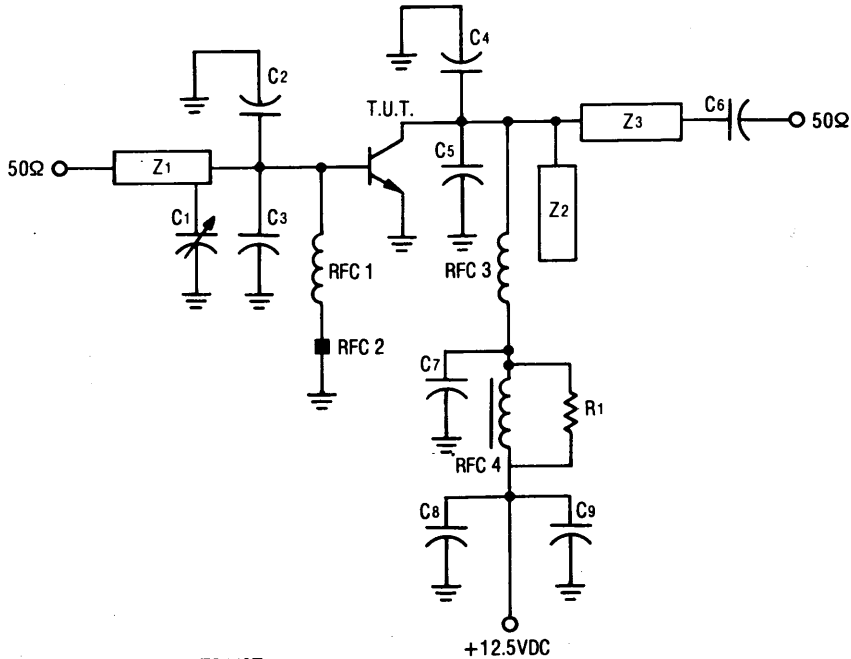
Series Input Reactance vs Frequency



J-Zero 3020 Power Transfer



TEST CIRCUIT

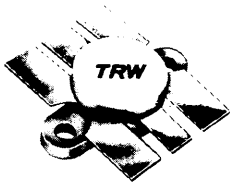


PARTS LIST:

- C1 1-10pf piston trimmer, located 0.4" from device end on Z1.
- C2,4 30pf uncased mica capacitor.
- C3 20pf uncased mica capacitor.
- C5 40pf uncased mica capacitor.
- C6 30pf miniature uncased mica capacitor.
- C7 220pf uncased mica capacitor.
- C8 5μf @ 25 volts.
- C9 0.1μf @ 50 volts disc ceramic.
- RFC 1 6 T. #18 AWG., 1/4" dia., 1/2" long.
- RFC 2 Ferrite bead.
- RFC 3 4 T. #18 AWG., 3/8" dia., 1/2" long.
- RFC 4 3 T. #18 AWG. on 1/2" "H" toroid
- R1 10 ohms @ 1/2 watt.
- Z1 Microstripline, $Z_0 = 30$ ohms, $W = 0.37"$, $L = 3.02"$
- Z2 Microstripline capacitor, $Z_0 = 24$ ohms, $W = 0.46"$, $L = 1.62$
- Z3 Microstripline, $Z_0 = 20$ ohms, $W = 0.56"$, $L = 2.34"$
- Board material — 1/16" Teflon-glass

UHF RF Power Transistor

- 37 W
- 12.5 V
- 450-512 MHz
- High Gain
- 20:1 VSWR
- Common Emitter
- Isolated Package
- Internally Matched



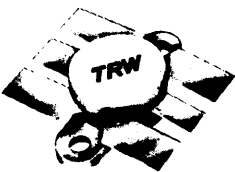
.500 J Zero

Electrical Characteristics (T_{CASE} = 25°C)

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC TEST	BVCBO	Collector-Base Voltage	IC = 50mA	36			V
	BVCEO	Collector-Emitter Voltage	IC = 50mA	16			V
	BVEBO	Emitter-Base Voltage	IE = 5mA, IC = 0	4			V
	ICES	Collector Emitter Leakage	VCE = 15V		10		mA
	hFE	D.C. Current Gain	VCE = 5V, IC = 1A	10		200	
RF TEST	Pg	Power Gain	VCE = +12.5V, f = 470MHz PIN = 12W	4.9			dB
	VSWRL	Collector Load	VCE = +15.5V, f = 470MHz PIN = 12W	20:1			VSWR
	η	Collector Efficiency	PO = 37W, f = 470MHz		60		%
THERMAL	θjc	Thermal Resistance	25 deg C case		2.1		°C/W
	Tstg	Storage Temperature		- 65		+150	°C
	IC(MAX)	Maximum Collector Current	Tc = 25°C			5	A
	PD(MAX)	Total Dissipation	Tc = 25°C			83	W

RF Power Transistors

- 36 W
- 12.5 V
- 175 MHz
- Gold Metalization
- Diffused Ballast Resistors
- Low Thermal Resistance
- Common Emitter
- Isolated Package
- Internally Matched
- 20:1 VSWR
- Class C

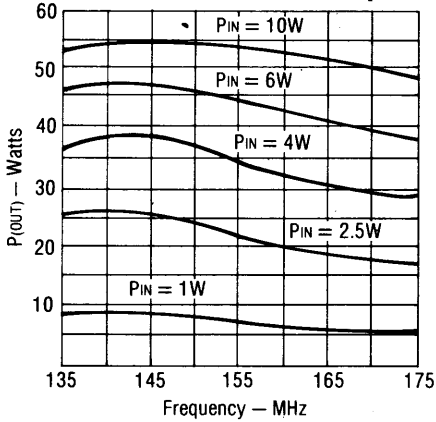


.500 Jo

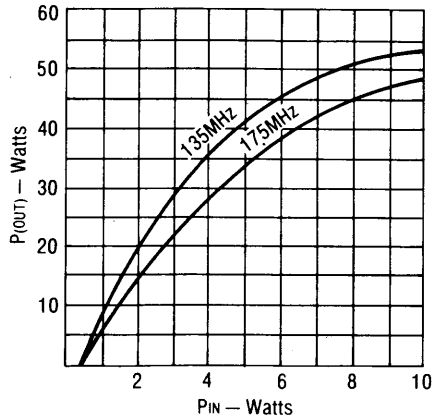
B

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC TEST	BVEBO	Emitter-Base Breakdown Voltage	I _E = 5mA	4			V
	BVCEO	Collector-Emitter Breakdown Voltage	I _C = 50mA	16			V
	BVCBO	Collector-Base Breakdown Voltage	I _C = 50mA	36			V
	ICES	Collector Cutoff Current	V _{CE} = 15V			10	mA
RF TEST	PGAIN	Power Gain	V _{CE} = 12.5V, f = 175MHz P _{IN} = 6W	7.8			dB
	PREF	Power Reflected	V _{CE} = 12.5V, f = 175MHz P _{IN} = 6W			0.60	W
	Load VSWR	Mismatch Tolerance	V _{CE} = 15.5V, f = 175MHz P _{IN} = 6W	20:1			VSWR
THERMAL	I _C	Continuous Collector Current	T _c = 25°C			6.5	A
	P _T	Total Dissipation	T _c = 25°C			100	W
	θ _{Jc}	Thermal Resistance Junction to Flange			1.75		°C/W
	T _{STG}	Storage Temperature		-65		150	°C

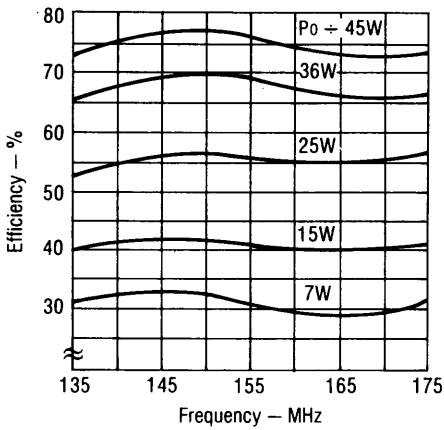
Broadband $P_{(OUT)}$ vs. Frequency



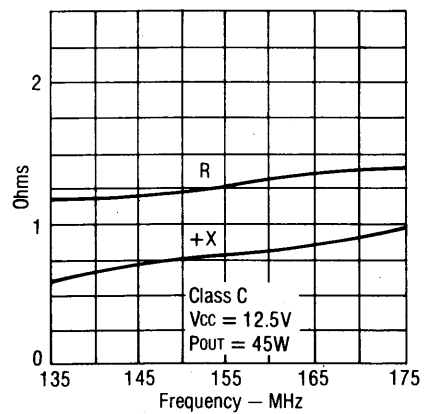
Broadband Power Transfer



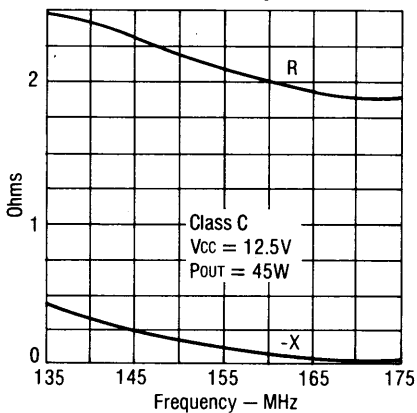
Broadband Collector Efficiency



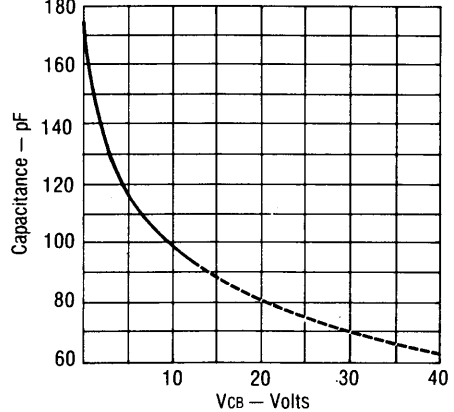
Series Input Impedance



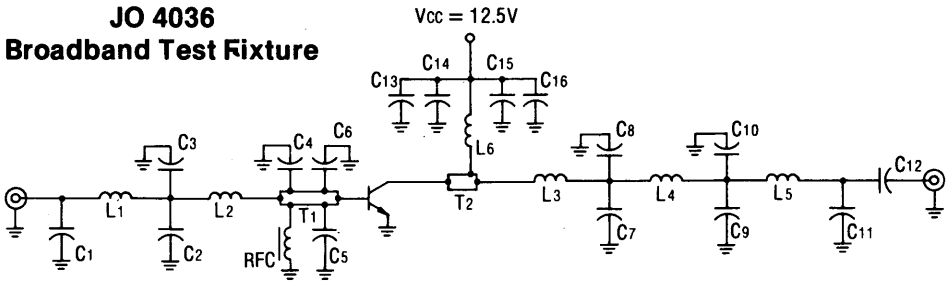
Series Load Impedance



Output Capacitance



JO 4036
Broadband Test Fixture

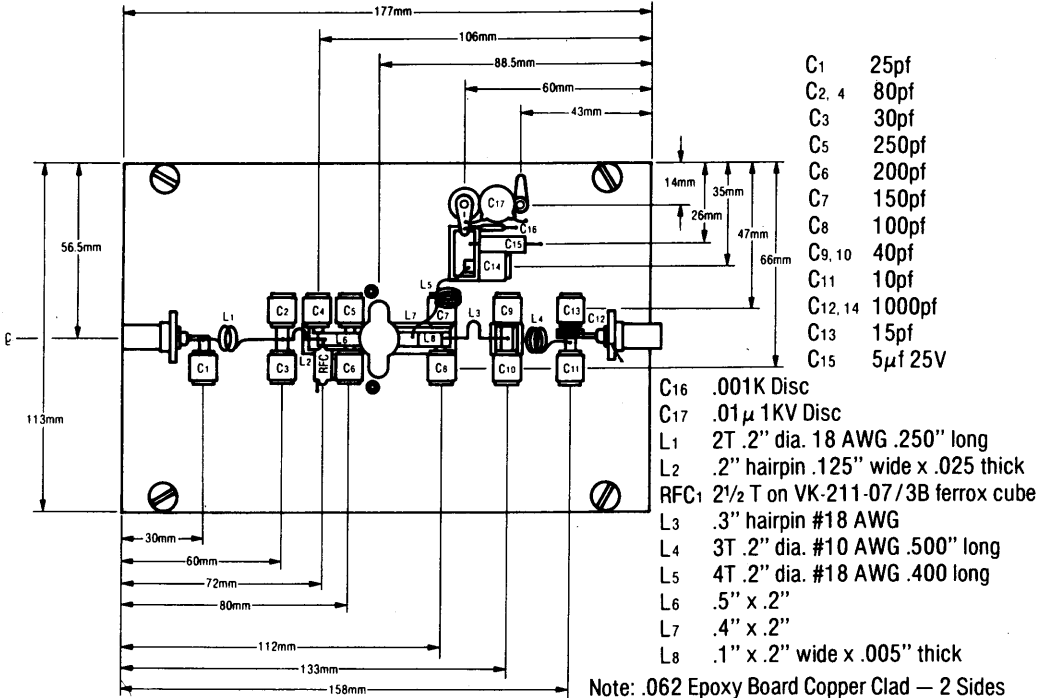


COMPONENTS LIST:

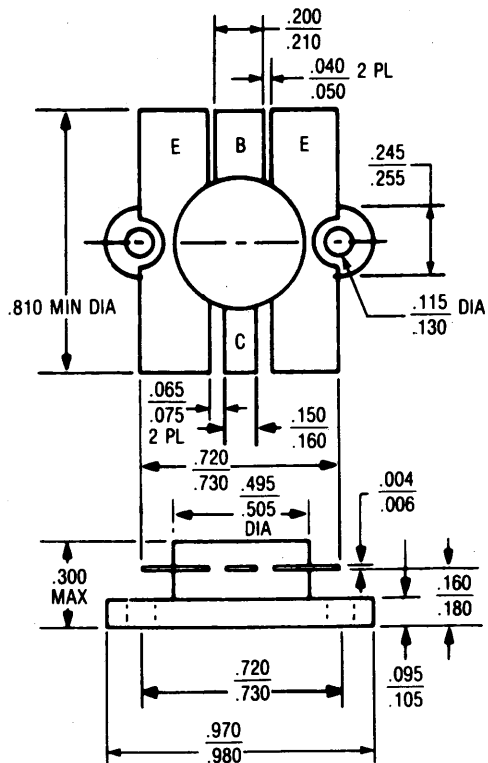
C _{1,2}	25pf	L ₂	.2" hairpin .125" wide x .025 thick copper strip
C _{3,4}	80pf	L ₃	.1" x .2" wide x .005" thick copper loop
C ₅	250pf	L ₄	.3" hairpin 18 AWG.
C ₆	200pf	L ₅	3 T. 18 AWG. .2" dia.
C ₇	150pf	L ₆	4 T. 18 AWG. .2" dia.
C ₈	100pf	RFC	2 1/2 T. on VK-211-07/38 ferrox cube
C _{9,10}	40pf	T ₁	.2" width .5" length from package as ref.
C ₁₁	25pf	T ₂	.2" width .4" length from package as ref.
C _{12,13}	1000pf		
C ₁₄	.001μf		
C ₁₅	.01μf		
C ₁₆	25μf		
L ₁	2T 18 AWG .2" dia.		

NOTES:

1. All capacitors in signal path are Underwood Electric Corp. Case Type J101.
2. Position C₅ and C₆ as close to pkg. as possible.



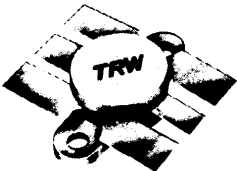
Note: .062 Epoxy Board Copper Clad — 2 Sides



.500 J ZERO:

RF Power Transistors

- 45 W
- 12.5 V
- 175 MHz
- Gold Metalization
- Diffused Ballast Resistors
- Low Thermal Resistance
- Common Emitter
- Isolated Packages
- Class C Operation
- 20:1 VSWR
- Internally Matched

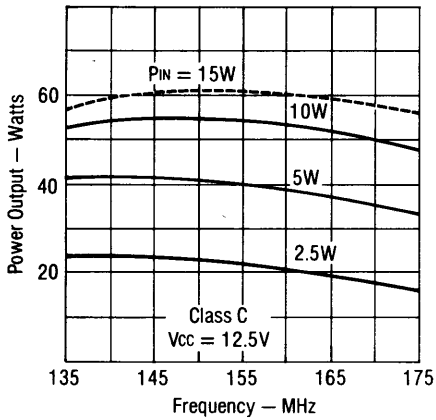


.500 J Zero

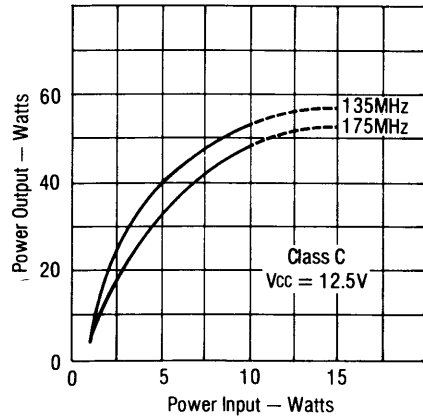
B

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC TEST	BVCES	Collector-Emitter Breakdown Voltage	IC = 50mA	36			Vdc
	BVCEO	Collector-Emitter Breakdown Voltage	IC = 50mA	16			Vdc
	ICES	Collector Cutoff Current	VCE = 15V			10	mA dc
	hFE	DC Current Gain	VCE = 5V, IC = 1A	10		200	—
RF TEST	Pg	Power Gain	VCE = 12.5V, f = 175MHz PIN = 10W	6.5			dB
	PREF	Power Reflected	VCE = 12.5V, f = 175MHz PIN = 10W			1.0	W
	Load VSWR	Load Mismatch Tolerance	VCE = 15.5V, f = 175MHz PIN = 10W	20:1			VSWR
THERMAL	IC(MAX)	Collector Current	Tc = 25°C			6.5	A
	PD(MAX)	Total Dissipation	Tc = 25°C			100	W
	TSTG	Operating and Storage Temperature		-65		150	°C
	θJA	Thermal Resistance			1.75		°C/W

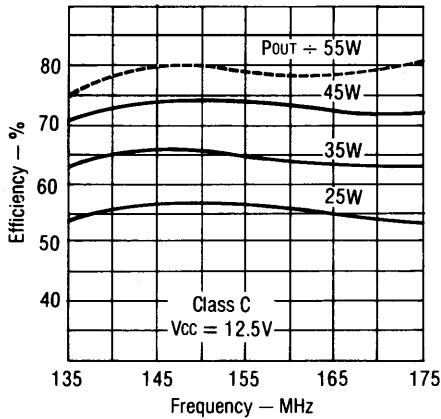
Broadband $P_{(OUT)}$ vs. Frequency



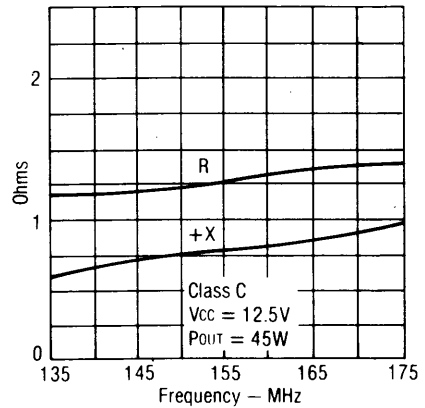
Broadband Power Transfer



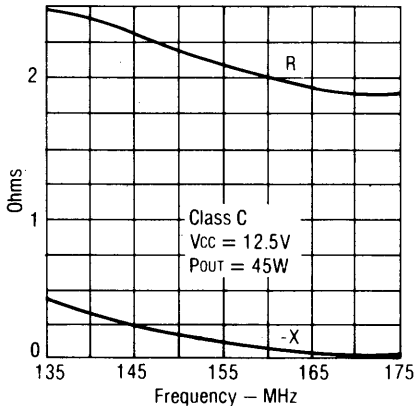
Broadband Collector Efficiency



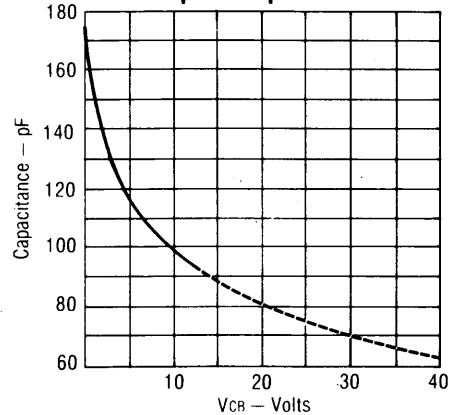
Series Input Impedance



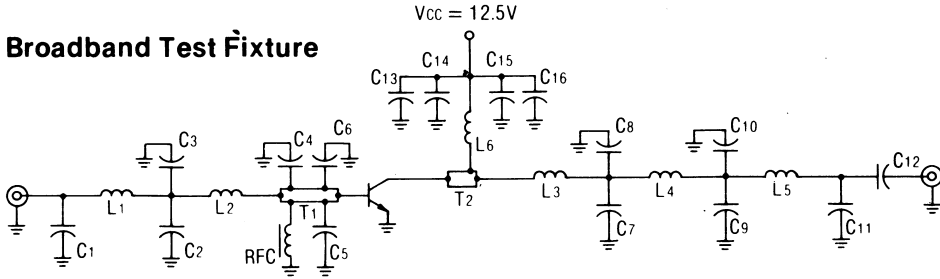
Series Load Impedance



Output Capacitance



Broadband Test Fixture

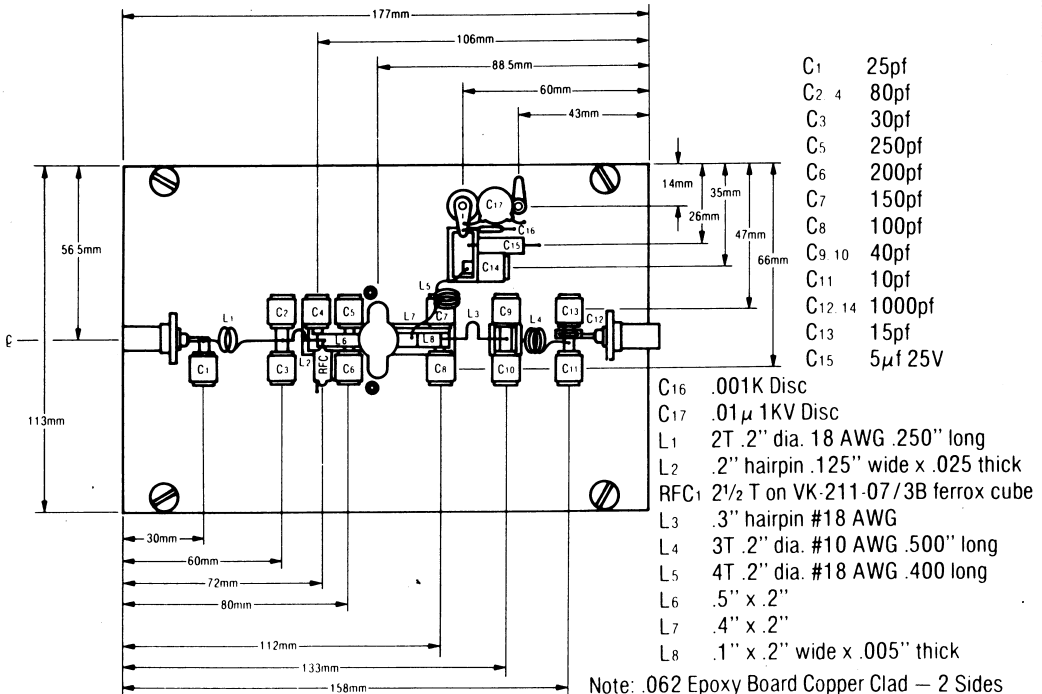


COMPONENTS LIST:

C1, 2	25pf	L2	.2" hairpin .125" wide x .025 thick copper strip
C3, 4	80pf	L3	.1" x .2" wide x .005" thick copper loop
C5	250pf	L4	.3" hairpin 18 AWG.
C6	200pf	L5	3 T. 18 AWG. .2" dia.
C7	150pf	L6	4 T. 18 AWG. .2" dia.
C8	100pf	RFC	2 1/2 T. on VK-211-07/38 ferrox cube
C9, 10	40pf	T1	.2" width .5" length from package as ref.
C11	25pf	T2	.2" width .4" length from package as ref.
C12, 13	1000pf		
C14	.001μf		
C15	.01μf		
C16	25μf		
L1	2T 18 AWG .2" dia.		

NOTES:

1. All capacitors in signal path are Underwood Electric Corp. Case Type J101.
2. Position C5 and C6 as close to pkg. as possible.



Note: .062 Epoxy Board Copper Clad — 2 Sides

