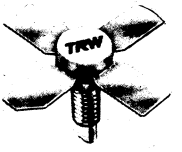
UHF Power Transistors

- 1.5 to 30 W
- 28 V
- 400 MHz
- Gold Metalized
- Diffused Ballast Resistors
- Class A, AB or C Operation
- Common Emitter
- Isolated Package
- ∞ VSWR



280 SOE

C

The PT 9700 UHF Series features both high gain and high power, providing the desired power output with fewer devices. Microwave cellular geometries processed for UHF application provide both high performance and ruggedness. Diffused ballast resistors in the higher power units enable these devices to withstand infinite VSWR at all phase angles. Ballast resistor design enables operation at Class A, AB and C. These rugged units are suitable for both narrow band and broad band UHF communications and instrumentation service. All are gold metalized for long life and incorporate ceramic stripline packages.

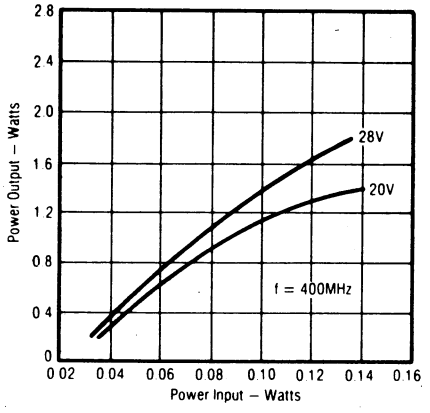
Electrical Characteristics (T_{FLANGE} = 25°C)

SYMBOL	CHARACTERISTICS	TEST CONDITIONS	PT 9700	PT 9701B	PT 9703B	PT 9702B	PT 9704A	UNIT
BV_{EBO}	Min. Emitter-Base Breakdown	I_E = 0.1mA, I_C = 0 I_E = 0.5mA, I_C = 0 I_E = 1mA, I_C = 0 I_E = 2mA, I_C = 0 I_E = 3mA, I_C = 0	3.5	4	4	4	4	V
BV_{CES}	Min. Collector-Emitter Breakdown	I_C = 1mA, V_{BE} = 0 I_C = 5mA, V_{BE} = 0 I_C = 10mA, V_{BE} = 0 I_C = 20mA, V_{BE} = 0 I_C = 30mA, V_{BE} = 0	55	60	60	60	55	V
BV_{CEO}	Min. Collector-Emitter Breakdown	I_C = 2.0mA, I_B = 0 I_C = 5mA, I_B = 0 I_C = 10mA, I_B = 0 I_C = 20mA, I_B = 0 I_C = 50mA, I_B = 0	35	30	30	30	30	V
I_{CBO}	Max. Collector-Base Leakage Current	V_{CB} = 30V	0.25	0.5	1.0	2.0	3.0	mA
H_{FE}	Min. D.C. Current Gain	I_C = 0.1A, V_{CE} = 5V	20-150	10-150	10-150	10-150	10-150	—
P_{GAIN}	Min. Power Gain	V_{CE} = 28V, P_{IN} = 0.12W P_{IN} = 0.62W P_{IN} = 1.5W f = 400 MHz, P_{IN} = 4W P_{IN} = 5W	1.5	5	10	20	30	W
η	Min. Collector Efficiency	V_{CE} = 28V, f = 400 MHz Rated Output Power	55	55	60	60	60	%
VSWR	Mismatch Tolerance	V_{CE} = 28V, f = 400 MHz 360° Rated Output Power	∞	∞	∞	∞	∞	
P_{SAT}	Min. Saturated Power Output	V_{CE} = 28V, f = 400 MHz	2	6	12	24	36	W
C_{OB}	Max. Collector-Base Capacitance	V_{CB} = 28V, f = 1 MHz I_E = 0	3.5	6	12	24	36	pF
I_C	Continuous Collector Current (Max. Rating)		0.5	0.75	1.25	2	5	A
Θ_{J-C}	Thermal Resistance	T_C = 25°C	35	17.5	8.8	4.4	2.5	°C/W
T_{STG}	Storage Temperature		−65 to +150					°C
T_J	Junction Temperature		+200° Maximum					
P_D	Power Dissipation	T_C = 25°C	5	10	20	40	70	W

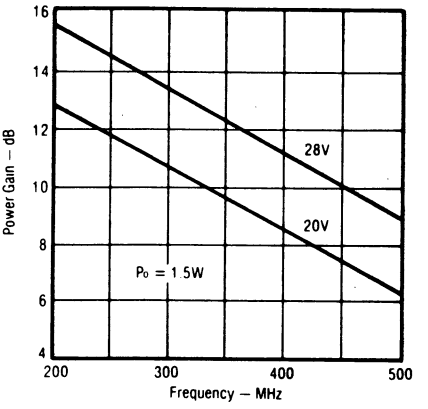
PT 9704 B Power Gain = 7 dB - Power Out/Power In = 30 W/6 W

PT9700 — 1.5 Watts

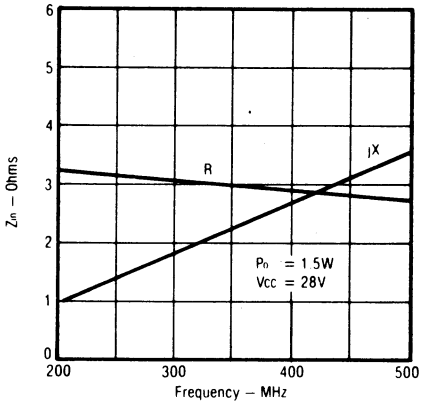
Power Output vs Power Input



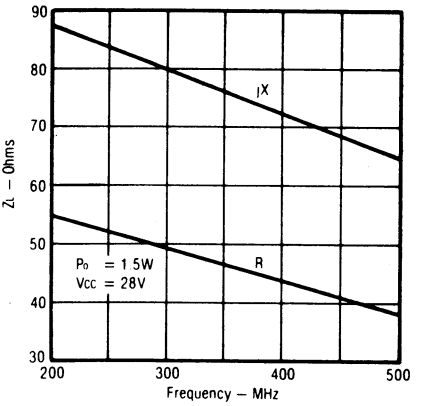
Power Gain vs Frequency



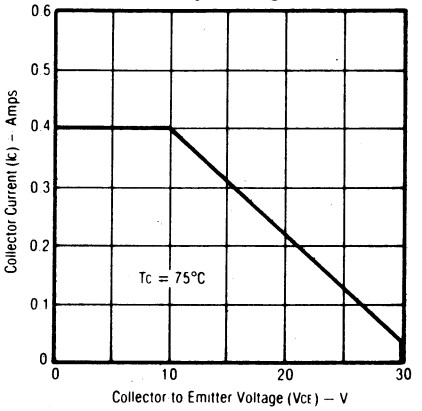
Series Input Impedance vs Frequency



Series Load Impedance vs Frequency

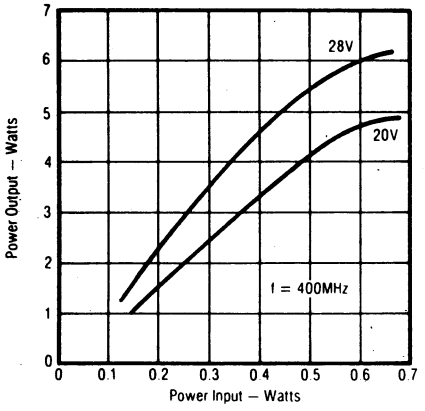


Safe Operating Area

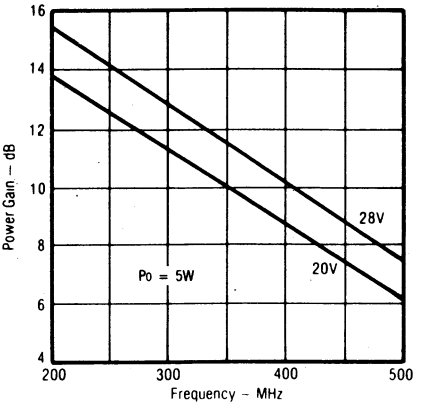


PT9701B — 5 Watts

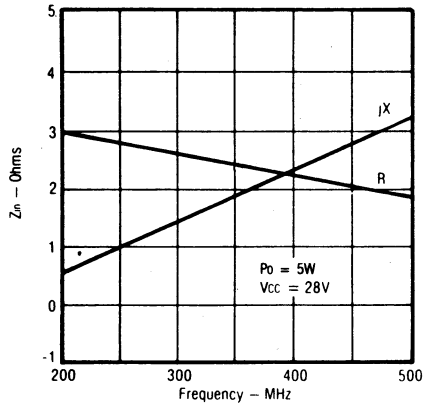
Power Output vs Power Input



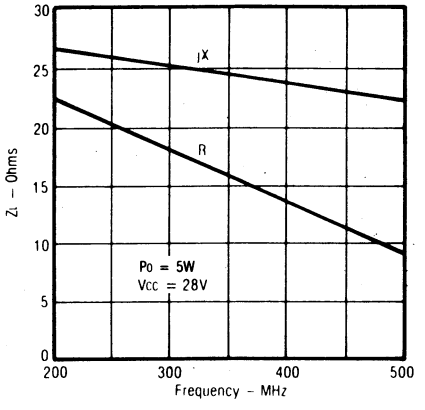
Power Gain vs Frequency



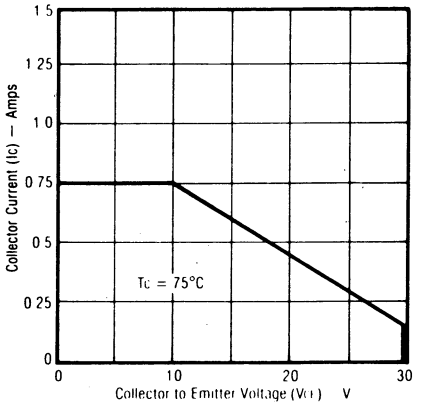
Series Input Impedance vs Frequency



Series Load Impedance vs Frequency



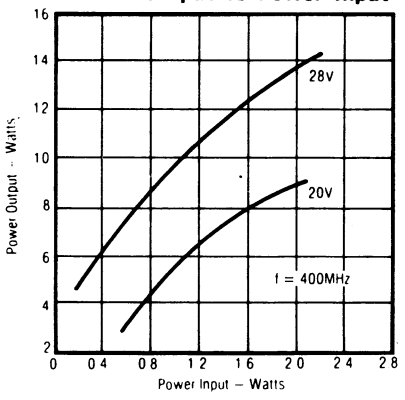
Safe Operating Area



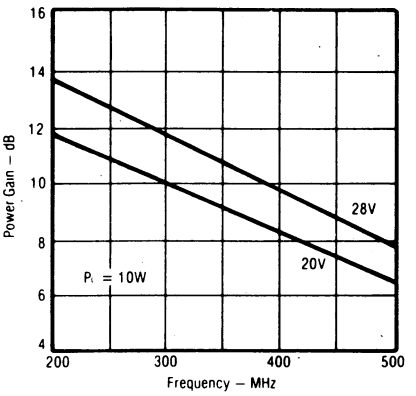
C

PT9703B — 10 Watts

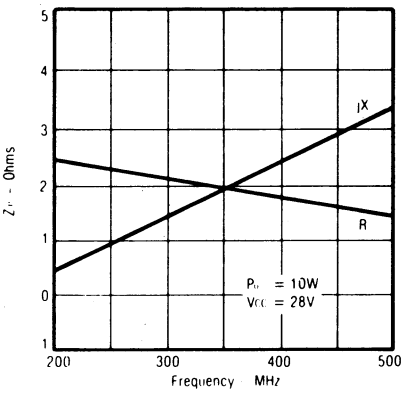
Power Output vs Power Input



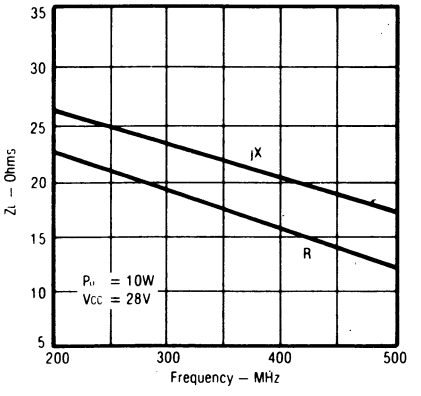
Power Gain vs Frequency



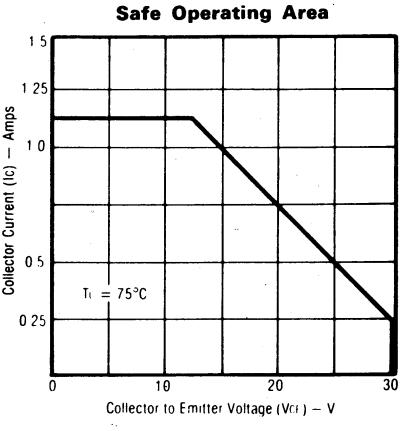
Series Input Impedance vs Frequency



Series Load Impedance vs Frequency



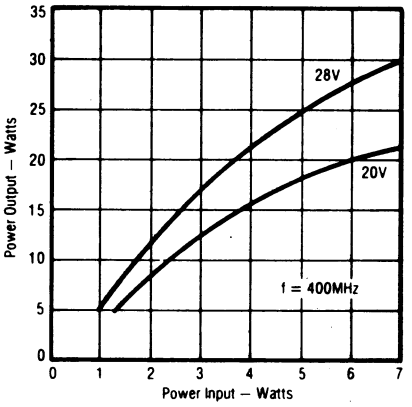
Safe Operating Area



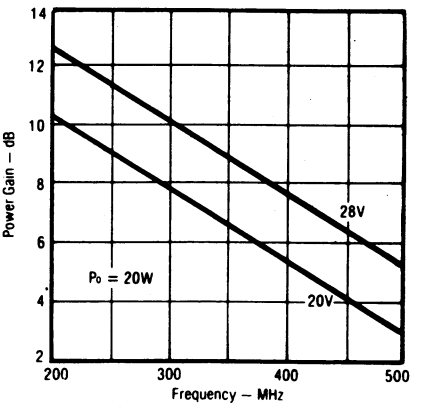
C

PT9702B — 20 Watts

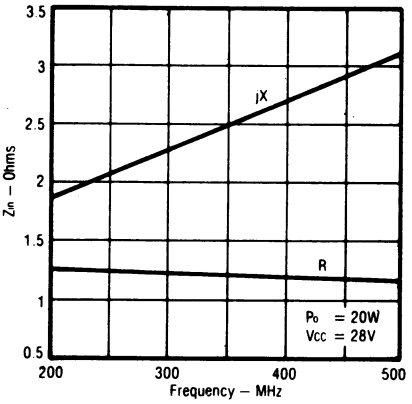
Power Output vs Power Input



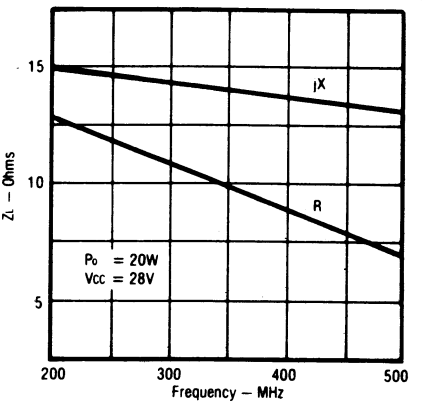
Power Gain vs Frequency



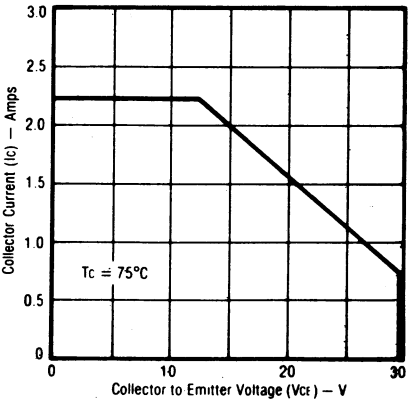
Series Input Impedance vs Frequency



Series Load Impedance vs Frequency

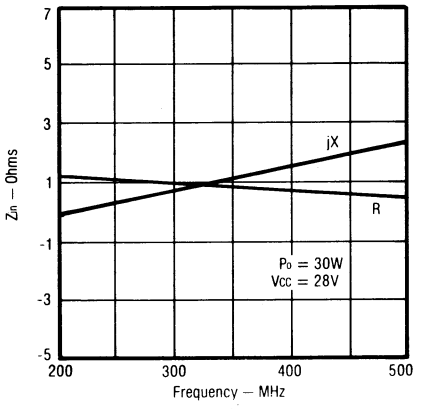


Safe Operating Area

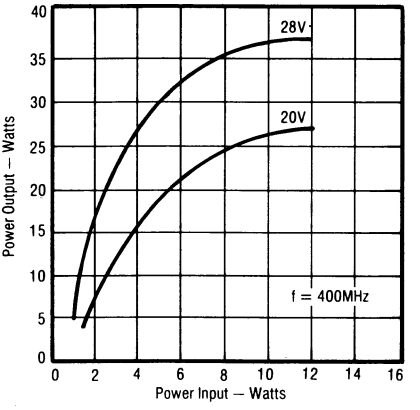


PT 9704 A — 30 Watts

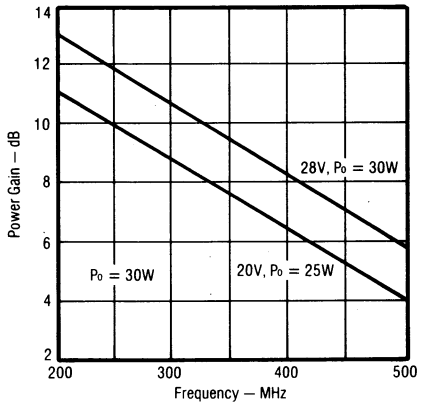
PT 9704 A
Series Input Impedance vs Frequency



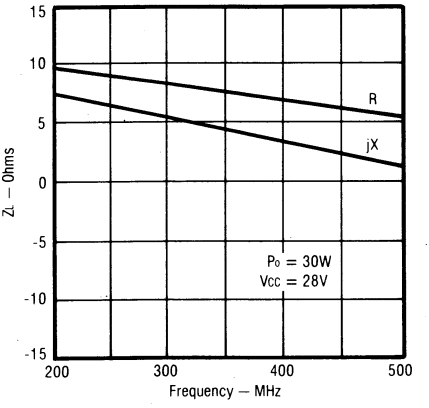
PT 9704 A Power Output vs Power Input



PT 9704 A Power Gain vs Frequency

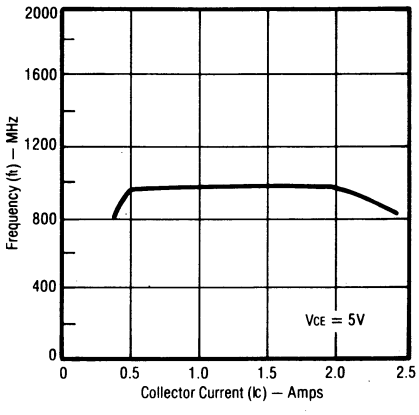


PT 9704 A
Series Load Impedance vs Frequency

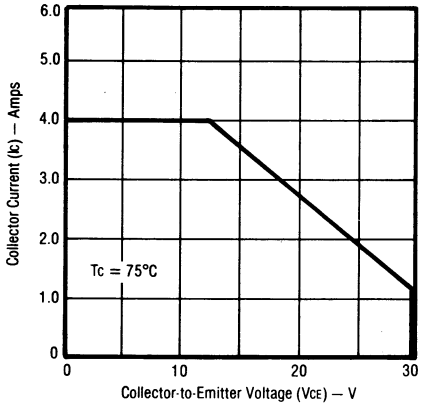


C

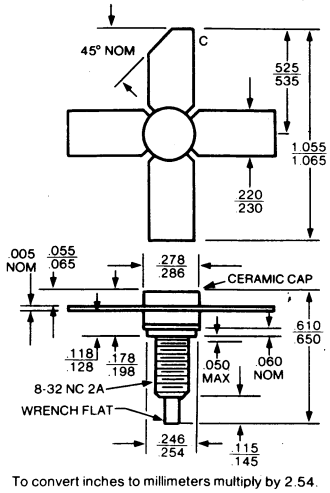
PT 9704 A f_t vs I_C



PT 9704 A Safe Operating Area

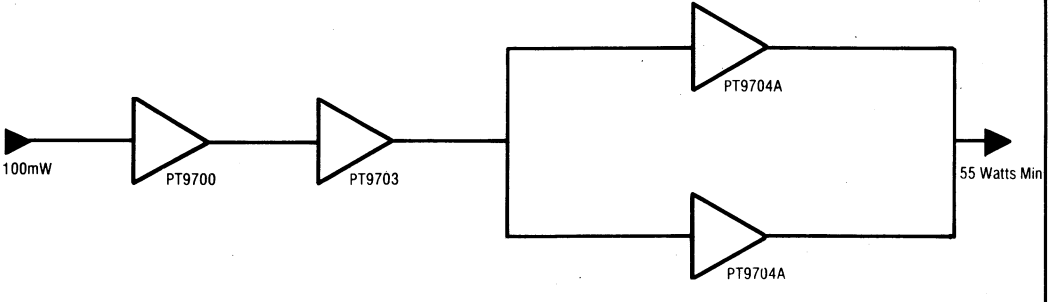


Package Outline



To convert inches to millimeters multiply by 2.54.

Typical Application
55 Watt UHF 28 V Power Amplifier
225-400 MHz

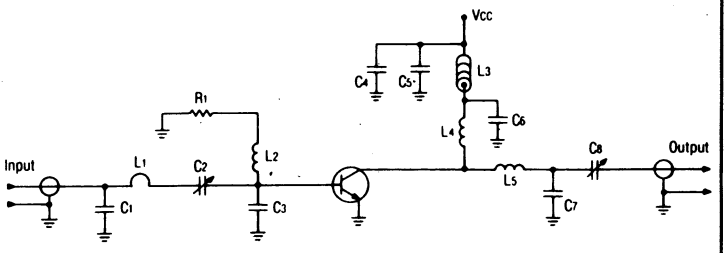


PT9700, 400 MHz TEST CIRCUIT

$C_{1,7,8}$ 0.9-7pF ARCO #400
C_2 3-35pF ARCO #403
C_3 30pF UNELCO
$C_{4,6}$ 1000pF UNELCO
C_5 1000µF electrolytic

L_1 1 loop #22AWG, 3/4"
$L_{2,5}$ 4 turns #22AWG, 0.1" I.D.
L_3 3 Ferrite beads
L_4 6 turns #22AWG, 0.1" I.D.

R_1 1 ohm, 1/4 watt carbon resistor

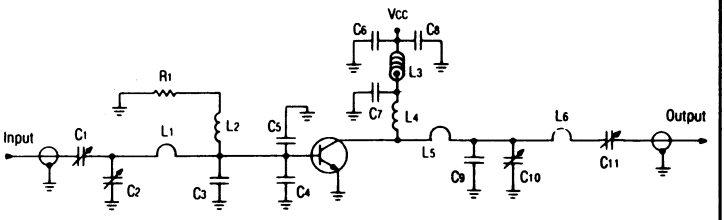


PT9701B and PT9703B, 400 MHz TEST CIRCUIT

C_1 3-35pF ARCO #403
$C_{2,10}$ 0.9-7pF ARCO #400
$C_{3,9}$ 10pF UNELCO
$C_{4,5}$ 30pF UNELCO
$C_{6,7}$ 1000pF UNELCO
C_8 100µF electrolytic
C_{11} 0-18pF ARCO #402

L_1 #22AWG, 1/2"
L_2 4 turns #22AWG, 0.1" I.D.
L_3 3 Ferrite beads
L_4 2 turns #22AWG, 0.1" I.D.
L_5 #22AWG, 0.5" hairpin
L_6 3 turns #22AWG, 0.1" I.D.

R_1 1 ohm, 1/4 watt carbon resistor

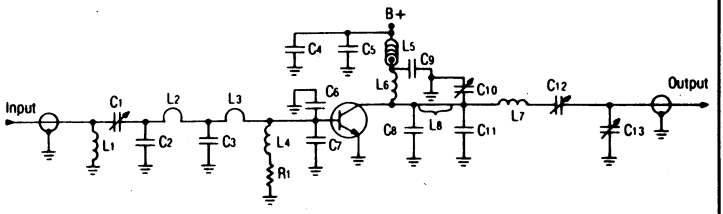


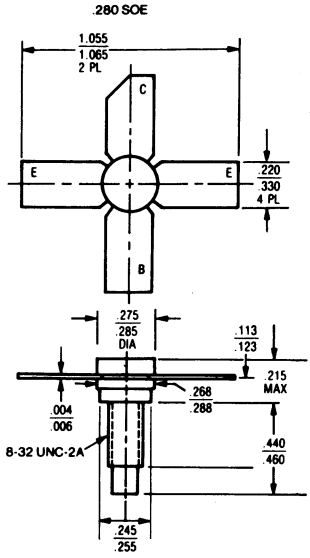
PT9702B and PT9704A, 400 MHz TEST CIRCUIT

$C_{1,12}$ 1.5-20pF ARCO #402
C_2 15pF UNELCO
$C_{3,6,7}$ 30pF UNELCO
$C_{4,9}$ 1000pF UNELCO
C_5 100µF electrolytic
C_8 35pF UNELCO
$C_{10,13}$ 0.9-7pF ARCO #400
C_{11} 10pF UNELCO

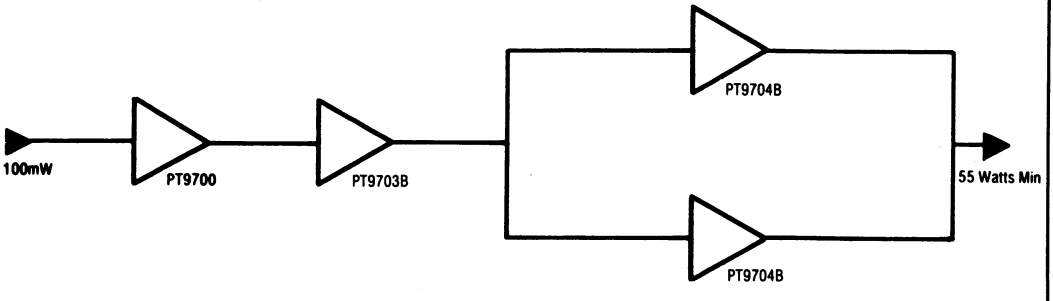
L_1 6 turns #22AWG, 1/8" I.D.
L_2 #22AWG, 3/8" hairpin
L_3 1/8" by 1/4" strap
L_4 2 turns on resistor lead
L_5 3 Ferrite beads
$L_{6,7}$ 2 turns #22AWG, 1/8" I.D.
L_8 #22AWG, 0.3"

R_1 1 ohm, 1/2 watt carbon resistor





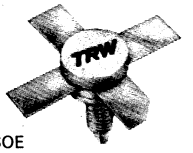
Typical Application
55 Watt UHF 28 V Power Amplifier
225-400 MHz



VHF Power Transistors

- PT 9730 4 W
- PT 9732 8 W
- PT 9734 15 W
- PT 9731 25 W
- PT 9733 50 W

- 28 V
- 175 MHz



380 SOE

The PT9730 VHF Series feature both high gain and high power, providing the desired power output with fewer devices. These power transistors are ballasted for ruggedness and will withstand infinite VSWR at all phase angles. A unique emitter structure provides high gain with wider emitter and base fingers resulting in high reliability. Ballast resistor design enables operation at Class A, AB, and C. These rugged units are suitable for both narrow band and broadband VHF communications and instrumentation service.

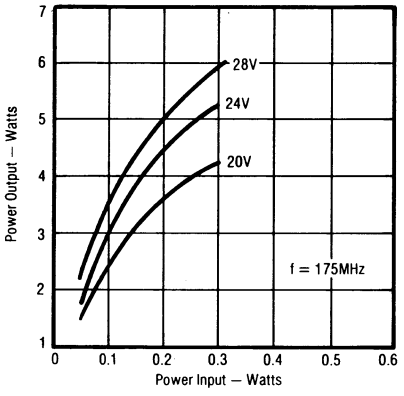
Electrical Characteristics (T_{flange} = 25 °C)

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	PT 9730	PT 9732	PT 9734	PT 9731	PT 9733	UNIT
DC Test	BV_{EBO}	Min. Emitter - Base Breakdown	I_E = 1 mA = 2 mA = 3 mA = 4 mA = 8 mA, I_C = 0	4	4	4	4	4	V
	BV_{CES}	Min. Collector - Emitter Breakdown	I_C = 50 mA, V_{BE} = 0	60	60	60	60	60	V
	BV_{CEO}	Min. Collector - Emitter Breakdown	I_C = 25 mA, I_B = 0	35	35	35	35	35	V
	I_{CES}	Max. Collector - Emitter Cutoff Current	V_{CE} = 25 V	0.5	0.5	0.75	1	2	mA
	H_{FE}	Min. D.C Current Gain	I_C = 500 mA, V_{CE} = 10 V	20 to 150	20 to 150	20 to 150	20 to 150	20 to 150	—
RF Test	P_{GAIN}	Min. Power Gain	V_{CE} = 28 V, F = 175 MHz, P_{in} = 0.2 W / 0.5 W / 1 W / 2.5 W / 10 W	4	8	15	25	50	W
	η	Min. Collector Efficiency	V_{CE} = 28 V, F = 175 MHz, Rated Output Power	60	60	60	60	60	%
	VSWR	Mismatch Tolerance	V_{CE} = 28 V, F = 175 MHz, Rated Output Power	∞	∞	∞	∞	∞	
	P_{SAT}	Min. Saturated Power Output	V_{CE} = 28 V, F = 175 MHz	6	10	18	30	60	W
	C_{OB}	Max. Collector - Base Capacitance	V_{CB} = 28 V, F = 1 MHz, I_E = 0	12	18	24	40	90	pF
Operating	I_C	Continous Collector Current		1	1.25	2.5	4	8	A
	θ_{j-C}	Thermal Resistance	T_C = 25 °C	17.5	8.8	5.8	3.9	2.1	°C/W
	T_{STG}	Storage Temperature and Junction Temperature		— 65 to + 200					°C
	P_D	Power Dissipation	T_C = 25 °C	10	20	30	45	85	W

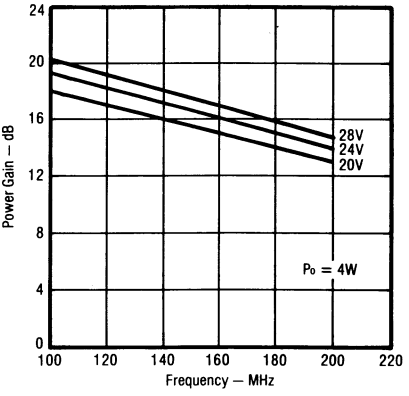
C

PT 9730 — 4 Watts

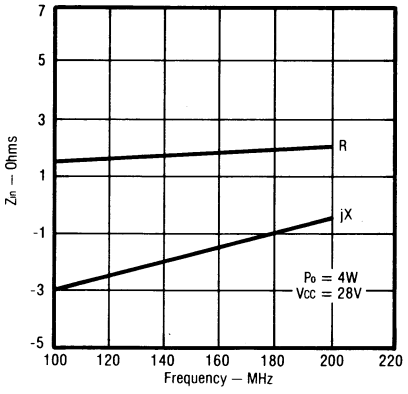
Power Output vs Power Input



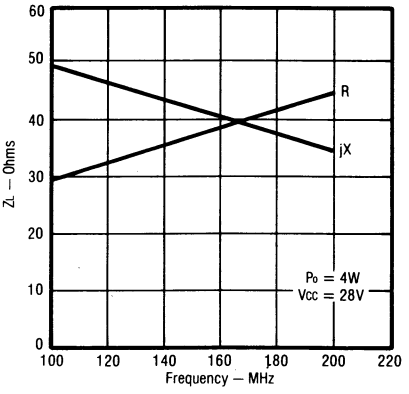
Power Gain vs Frequency



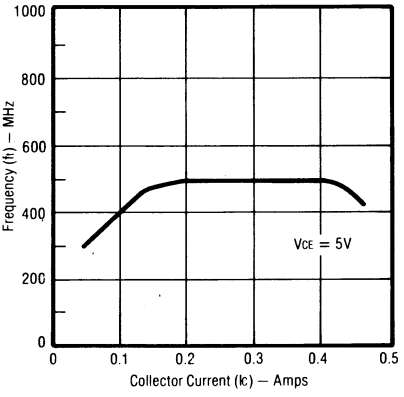
Series Input Impedance vs Frequency



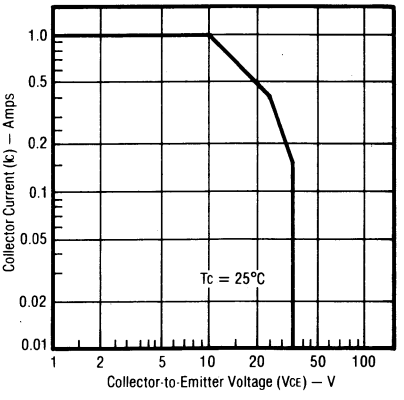
Series Load Impedance vs Frequency



f_t vs I_C

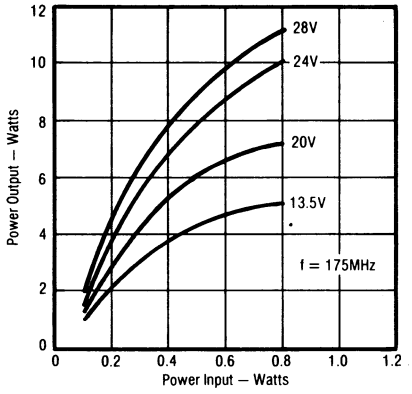


Safe Operating Area

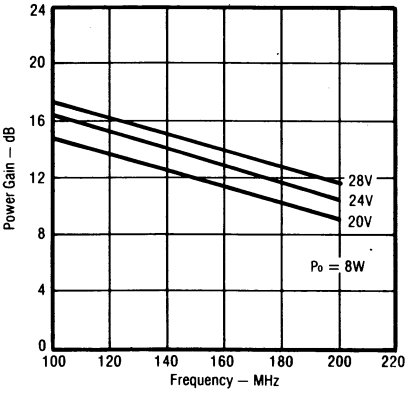


PT 9732 — 8 Watts

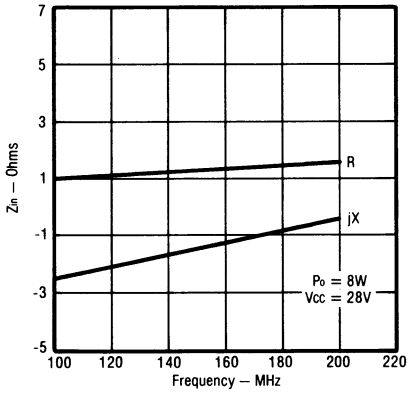
Power Output vs Power Input



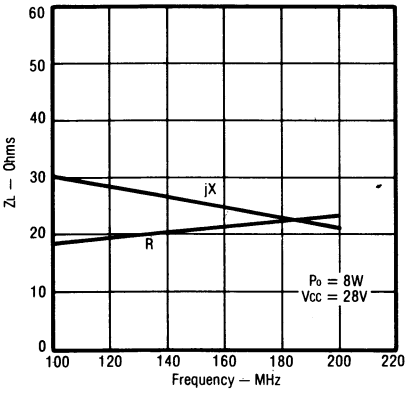
Power Gain vs Frequency



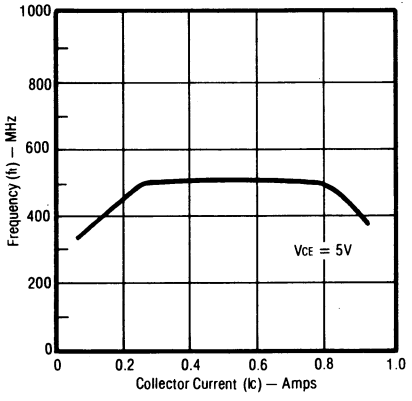
Series Input Impedance vs Frequency



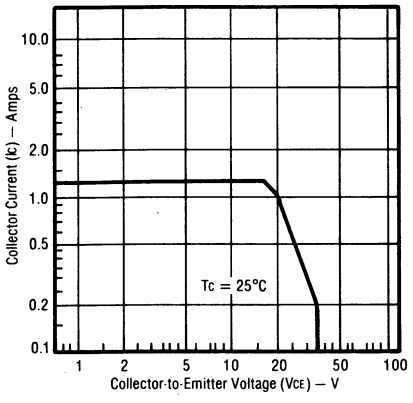
Series Load Impedance vs Frequency



f_t vs I_C

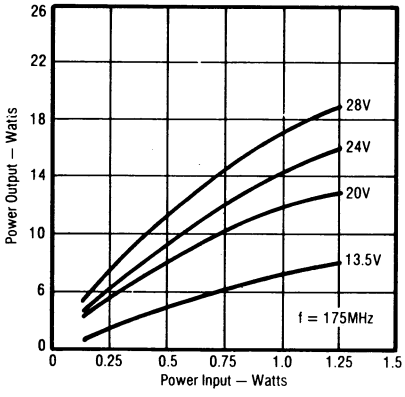


Safe Operating Area

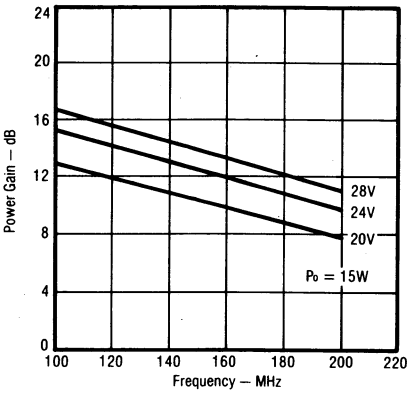


PT 9734 — 15 Watts

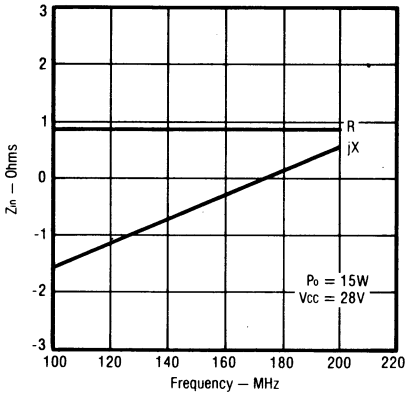
Power Output vs Power Input



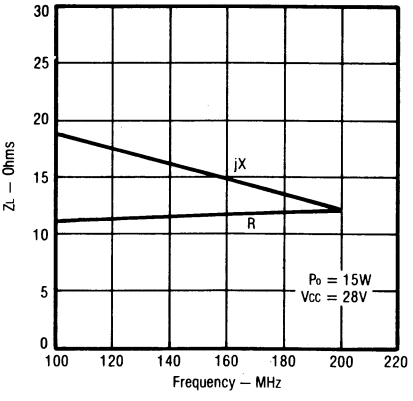
Power Gain vs Frequency



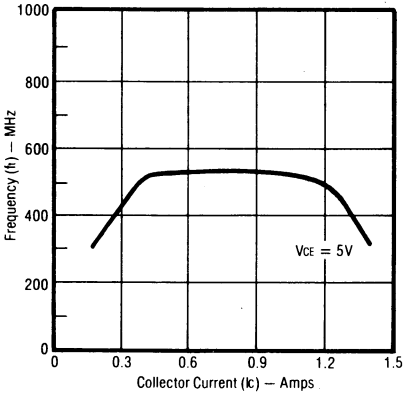
Series Input Impedance vs Frequency



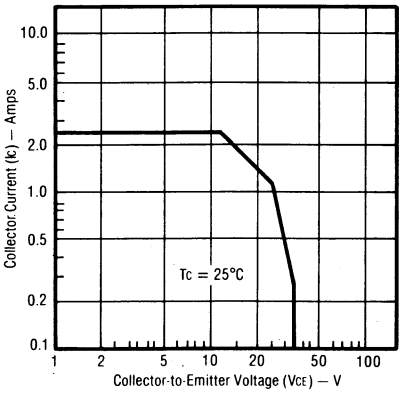
Series Load Impedance vs Frequency



f_t vs I_C



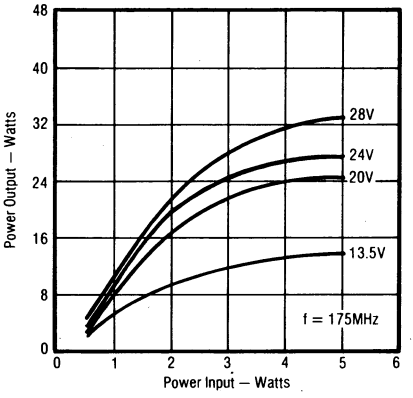
Safe Operating Area



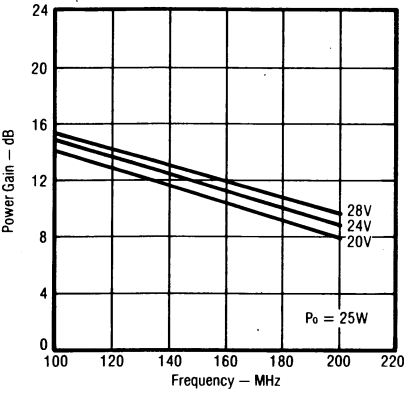
C

PT 9731 — 25 Watts

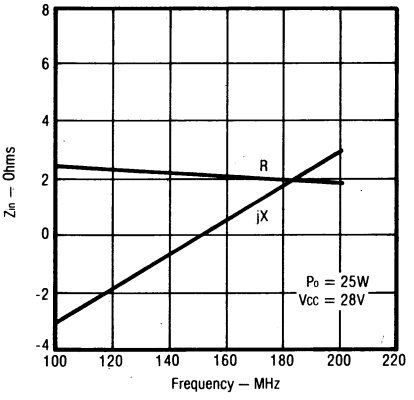
Power Output vs Power Input



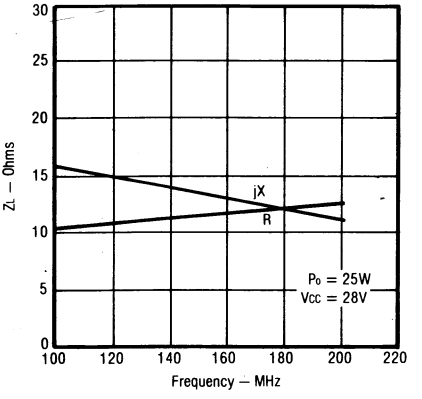
Power Gain vs Frequency



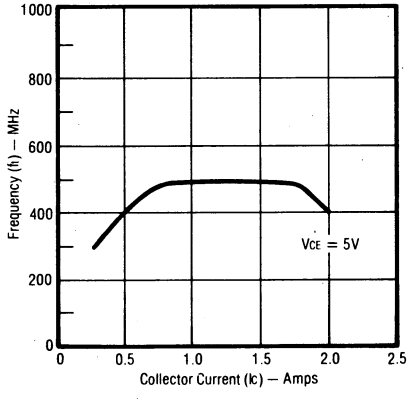
Series Input Impedance vs Frequency



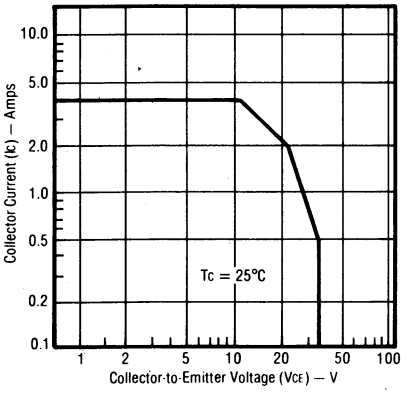
Series Load Impedance vs Frequency



f_t vs I_C

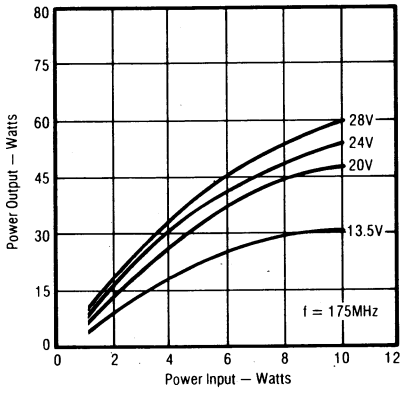


Safe Operating Area

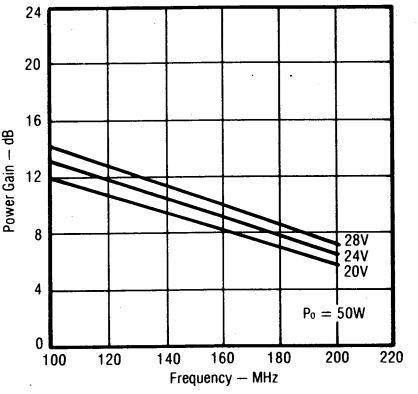


PT 9733 — 50 Watts

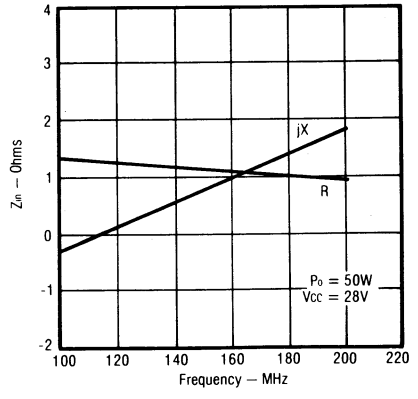
Power Output vs Power Input



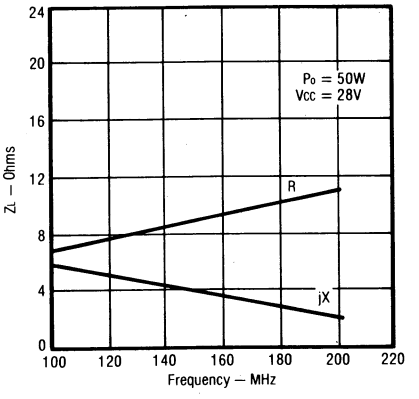
Power Gain vs Frequency



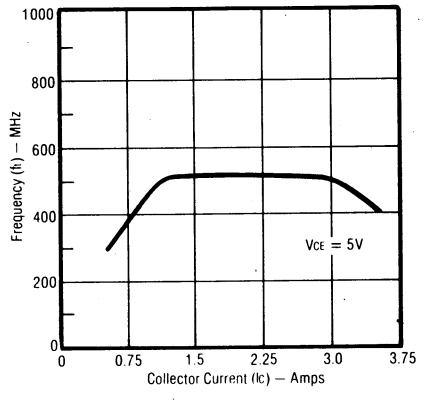
Series Input Impedance vs Frequency



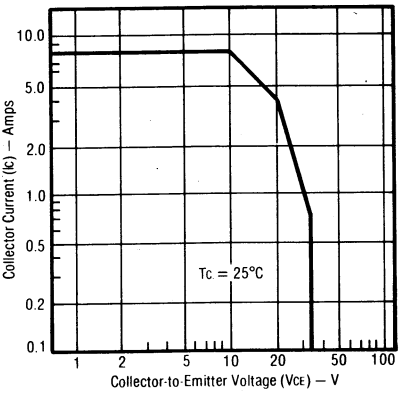
Series Load Impedance vs Frequency



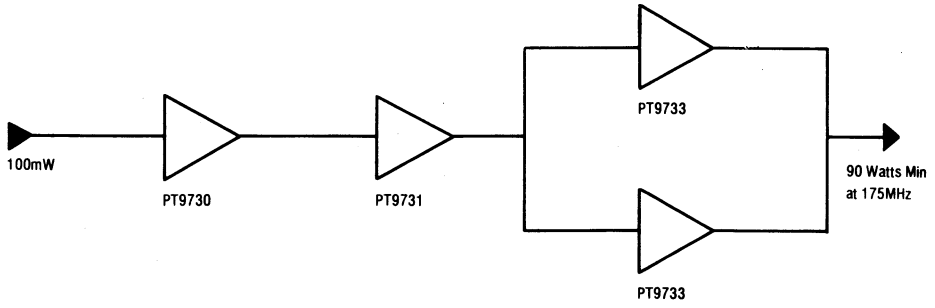
f_t vs t_C



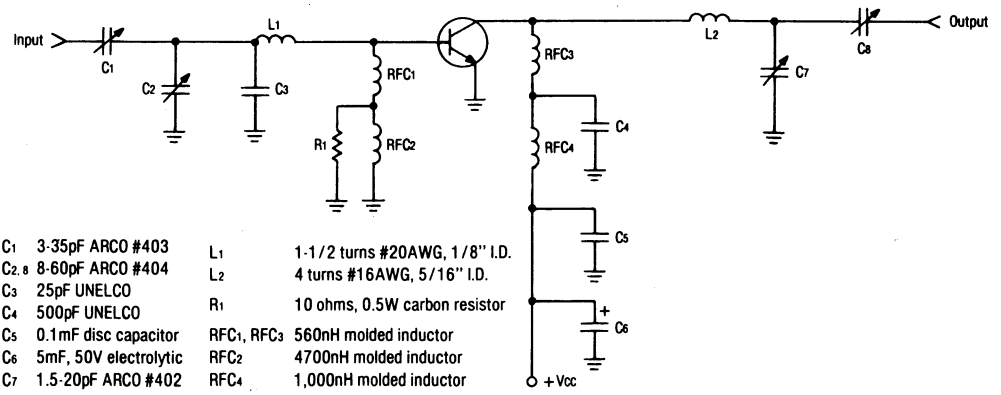
Safe Operating Area



TYPICAL APPLICATION
90 Watt VHF 28 V Power Amplifier

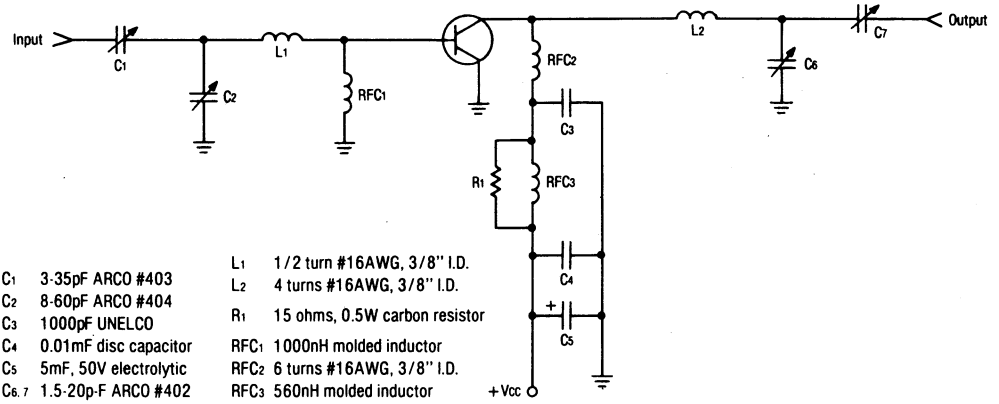


PT 9730 and PT 9732 175 MHz TEST CIRCUIT



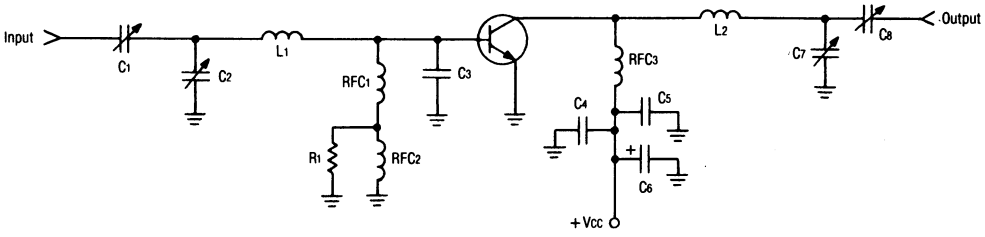
C_1	3-35pF ARCO #403	L_1	1-1/2 turns #20AWG, 1/8" I.D.
$C_{2,8}$	8-60pF ARCO #404	L_2	4 turns #16AWG, 5/16" I.D.
C_3	25pF UNELCO	R_1	10 ohms, 0.5W carbon resistor
C_4	500pF UNELCO	RFC_1, RFC_3	560nH molded inductor
C_5	0.1mF disc capacitor	RFC_2	4700nH molded inductor
C_6	5mF, 50V electrolytic	RFC_4	1,000nH molded inductor
C_7	1.5-20pF ARCO #402		

PT 9734 175 MHz TEST CIRCUIT



C_1	3-35pF ARCO #403	L_1	1/2 turn #16AWG, 3/8" I.D.
C_2	8-60pF ARCO #404	L_2	4 turns #16AWG, 3/8" I.D.
C_3	1000pF UNELCO	R_1	15 ohms, 0.5W carbon resistor
C_4	0.01mF disc capacitor	RFC_1	1000nH molded inductor
C_5	5mF, 50V electrolytic	RFC_2	6 turns #16AWG, 3/8" I.D.
$C_{6,7}$	1.5-20p-F ARCO #402	RFC_3	560nH molded inductor

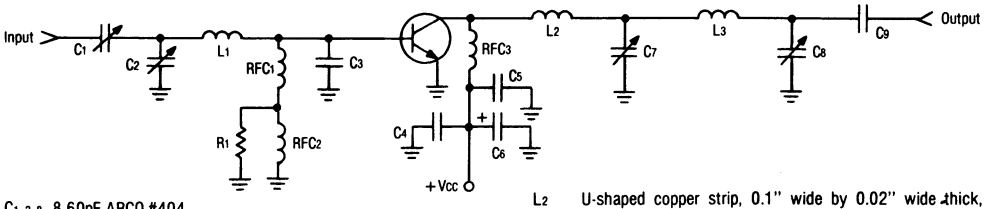
PT 9731 175 MHz TEST CIRCUIT



C1, 8 7-100pF ARCO #423
C2 8-60pF ARCO #404
C3 90pF UNELCO
C4 1000pF UNELCO
C5 0.1mF disc capacitor
C6 5mF, 50V electrolytic
C7 5-80pF ARCO #462

L1 2 turns, 0.1" wide by 0.02" thick copper strip, 1/4" I.D.
L2 4 turns, 0.1" wide by 0.02" thick copper strip, 1/4" I.D.
R1 10 ohms, 0.5W carbon resistor
RFC1 150nH molded inductor
RFC2 10,000nH molded inductor
RFC3 4 turns #16AWG, 5/16" I.D.

PT 9733 175 MHz TEST CIRCUIT



C1, 2, 8 8-60pF ARCO #404
C3 150pF UNELCO
C4 500pF UNELCO
C5 0.1mF disc capacitor
C6 5mF, 50V electrolytic
C7 5-80pF ARCO #462
C9 0.001mF disc capacitor
L1 1 turn, 0.1" wide by 0.02" thick copper strip, 5/16" I.D.

L2 U-shaped copper strip, 0.1" wide by 0.02" wide thick, 0.25" high by 0.675" long
L3 1-1/2 turns, 0.1" wide by 0.02" thick copper strip, 5/16" I.D.
R1 10 ohms, 0.5W carbon resistor
RFC1 150nH molded inductor
RFC2 10,000nH molded inductor
RFC3 4 turns #16AWG, 5/16" I.D.

PACKAGE OUTLINE