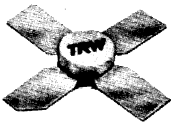
RF Power Transistor

- 5 W
- 12.5 V
- 470 MHz



280 SOE STUDLESS

The TP 2503 is designed for 12.5 V VHF and UHF amplifiers.

Its high gain at reduced voltage and stripline package make it suitable for use in pocketphone applications.

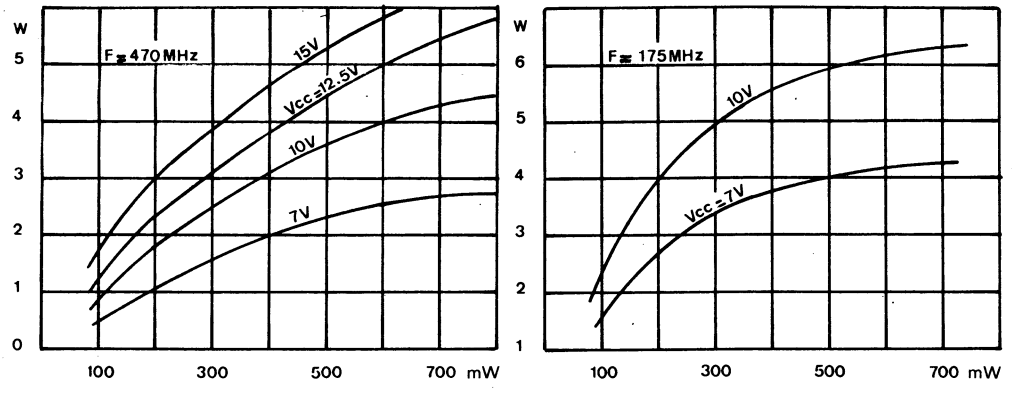
The power output is useable to the top of its ratings and it is able to withstand an infinite VSWR at all phase angles at rated output power.

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

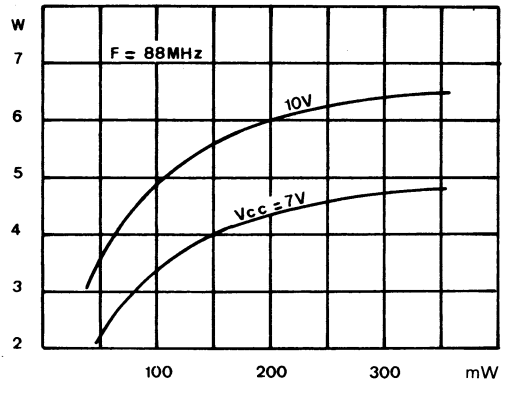
	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC Test	BV_{EBO}	Emitter - Base Breakdown Voltage	I_E = 2 mA I_C = 0	4			V
	BV_{CEO}	Collector - Emitter Breakdown Voltage	I_C = 50 mA I_B = 0	16			V
	BV_{CBO}	Collector - Base Breakdown Voltage	I_C = 10 mA I_E = 0	36			V
	I_{CBO}	Collector Cutoff Current	V_{CB} = 15 V I_E = 0			1	mA
	H_{FE}	D.C Current Gain	V_{CE} = 5 V I_C = 200 mA	20			—
RF Test	P_{GAIN}	Power Gain	V_{CE} = 12.5 V F = 470 MHz P_{in} = 0.7 W V_{CE} = 9.5 V F = 175 MHz P_{in} = 0.4 W V_{CE} = 9.5 V F = 88 MHz P_{in} = 0.2 W	5 5 5	5.5 5.5 6		W
	η	Efficiency	V_{CE} = 12.5 V F = 470 MHz P_{out} = 2 W	55			%
	Load VSWR	Mismatch Tolerance	All Phases Angles V_{CE} = 12.5 V F = 470 MHz P_{out} = 5 W		∞ : 1		
	Z_{in}	Common Emitter Amplifier Input Impedance	V_{CE} = 12.5 V F = 470 MHz P_{in} = 0.7 W		1.6 + j 3.5		Ω
	Z_{Load}	Common Emitter Amplifier Load Impedance	V_{CE} = 12.5 V F = 470 MHz P_{out} = 5 W		9.55 + j 5.75		Ω
	C_{OB}	Collector - Base Capacitance	V_{CB} = 15 V F = 1 MHz		13	17	pF
Operating	I_C	Continous Collector Current				1.7	A
	θ_{j-C}	Thermal Resistance	T_C = 25 °C			10	°C/W
	T_{STG}	Storage Temperature and Junction Temperature		— 65°		200°	°C
	P_D	Power Dissipation	T_C = 25 °C			17.5	W

B

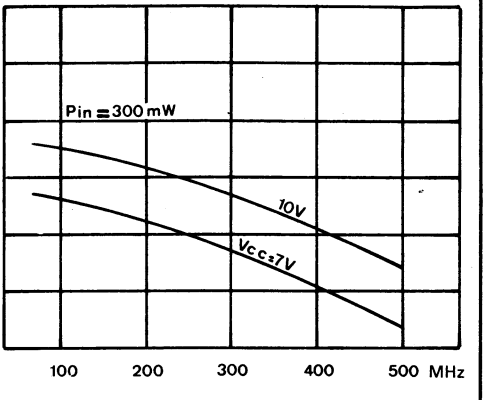
Output Power vs Input Power and Voltage Supply



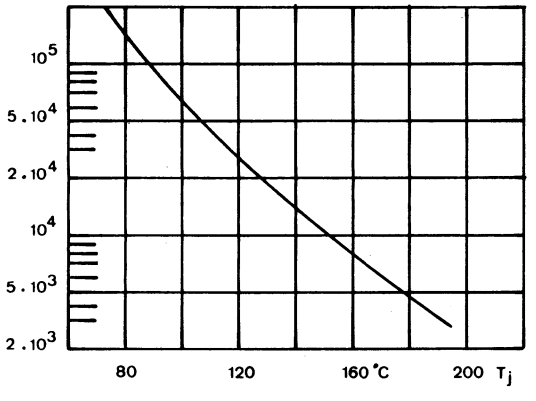
Output Power vs Input Power and Voltage Supply



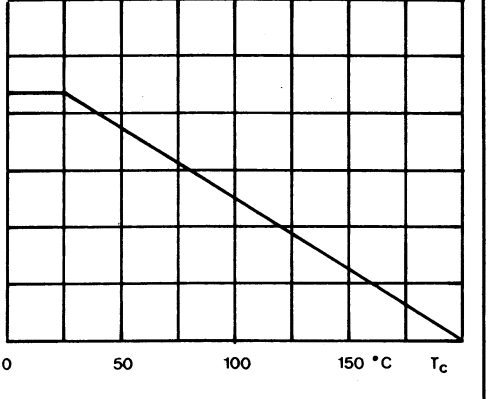
Power Gain vs Frequency and Voltage Supply



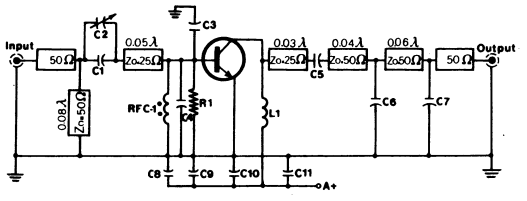
MTTF Factor vs Junction Temperature



Power - Temperature Operating Curve



TEST CIRCUIT BROADBAND (450-510 MHz)

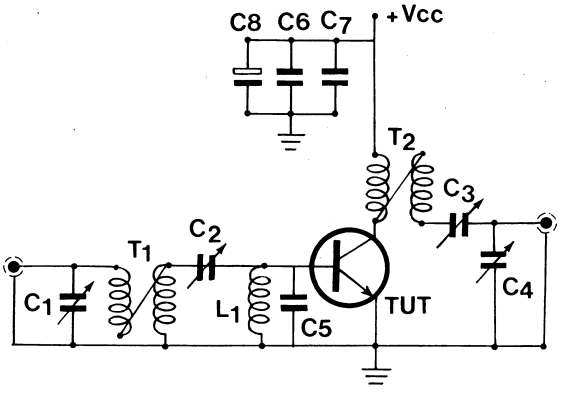


COMPONENT AND MATERIAL LIST

C_1 3,9 pF, ceramic chip
C_2 0.8-10 pF, Voltronics AP 10, variable
C_3, C_4 25 pF, ceramic chip
C_5 1500 pF, ceramic chip
C_6 10 pF, Underwood
C_7 5 pF, Underwood
C_8 0.01 µF, disc-ceramic
C_9 0.10 µF, disc-ceramic
C_{10} 1000 pF, Underwood
C_{11} 5 µF, electrolytic
L_1 4 turns, # 22 enameled, 0.1" I.D.
R_1 750 Ω, ½ watt, carbon
RFC-1 2½ turns # 22 AWG on Ferroxcube VK211/17-4B

All transmission lines reference at 480 MHz

175 MHz TEST CIRCUIT

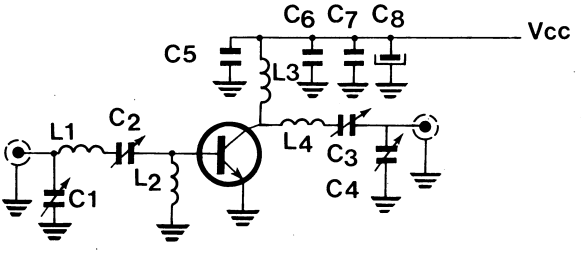


$C_1 = C_2 = C_4$ = 7-100 pF ARCO 423
C_3 = 24-200 pF ARCO 425
C_5 = 150 pF mica capacitor UNELCO
C_6 = 1000 pF mica capacitor UNELCO
C_7 = 10 nF ceramic disc
C_8 = 47 µF/63 V electrolytic

L_1 = 10 µH Molded Coil

$T_1 = T_2$ = Transmission Line Transformers 2 wires 8/10 mm twisted - 5 cm length

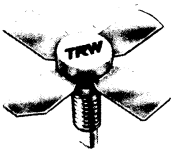
88 MHz TEST CIRCUIT



$C_1 = C_2 = C_3$ = 24-200 pF ARCO 425
C_4 = 7-100 pF ARCO 423
C_5 = 1000 pF mica capacitor UNELCO
C_6 = 10 nF ceramic disc
C_7 = 0.1 µF ceramic disc
C_8 = 100 µF/35 V electrolytic

$L_1 = L_4$ = 4 turns 14 AWG 1/2" I.D.
L_2 = 0.47 µH
L_3 = 6 turns 14 AWG 1/2" I.D. Close Wound

- 1.5 W
- 24 V
- 960 MHz
- 9 dB Gain
- Class "A"



280 SOE

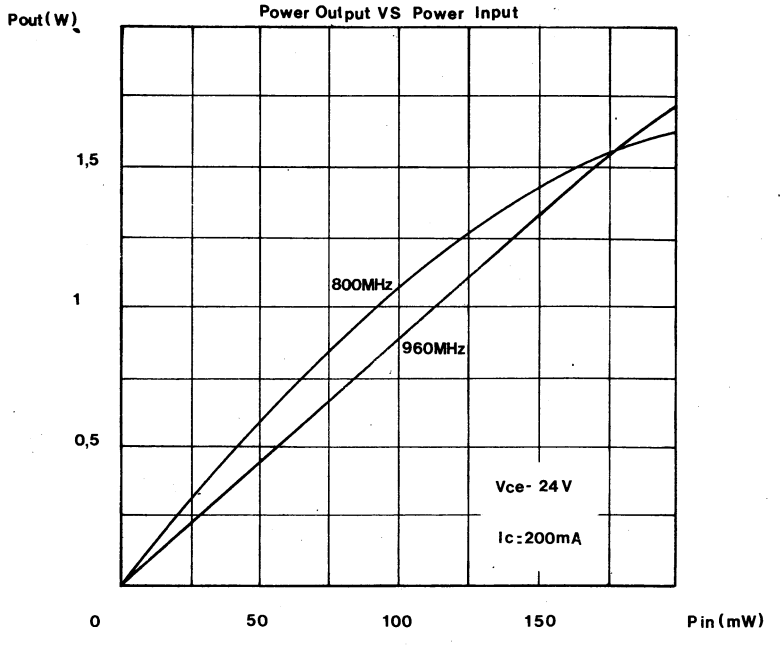
B

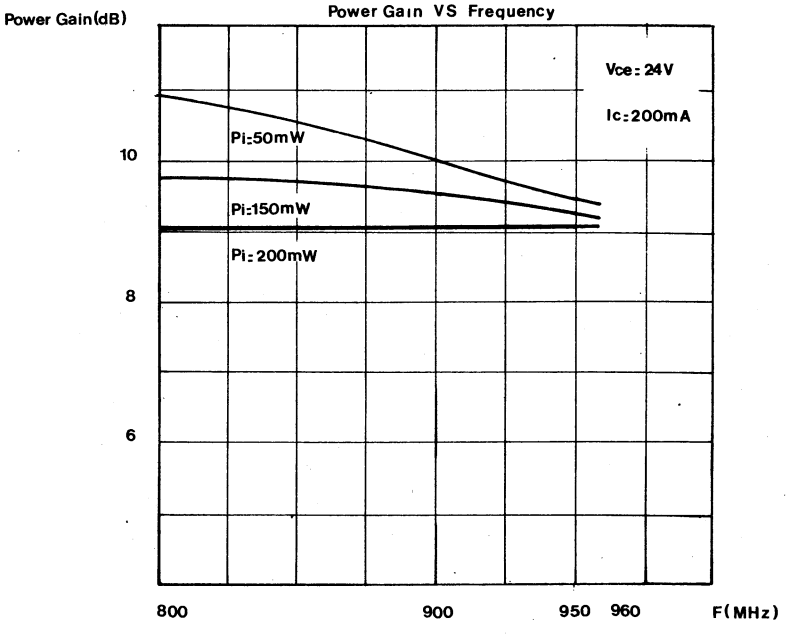
The TP 3020 is designed for use on the 900 MHz mobile band.

This device which is specified as a low power drive device, offering high gain, enables operation in class A, B or C circuits.

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

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC TEST	BV_{EBO}	Emitter - Base Breakdown Volt.	I_E = 0.25 mA	3.5			V
	BV_{CER}		I_C = 20 mA, R_{BE} = 10	50			V
	BV_{CBO}	Collector - Base Breakdown Volt.	I_C = 1 mA V_{CB} = 24 V	45		0.5	V mA
	I_{CBO} H_{FE}	Col. Base leakage DC fwd Cur. gain	V_{CE} = 5 V, I_C = 100 mA	20		120	–
RF TEST	P_{OUT}	Output Power	V_{CE} = 24 V, F = 960 MHz I_Q = 0.2 A, P_{IN} = 185 mW	1.5			W
	C_{OB}	Collector base capacitance (Each side)	V_{CB} = 28 V, F = 1 MHz			5	pF
THERMAL	I_C θ_{JC} P_T T_{STG}/T_J		T case = 70 °C T Heatsink = 25 °C	 –65		0.7 20 8.75 +200	A °C/W W °C

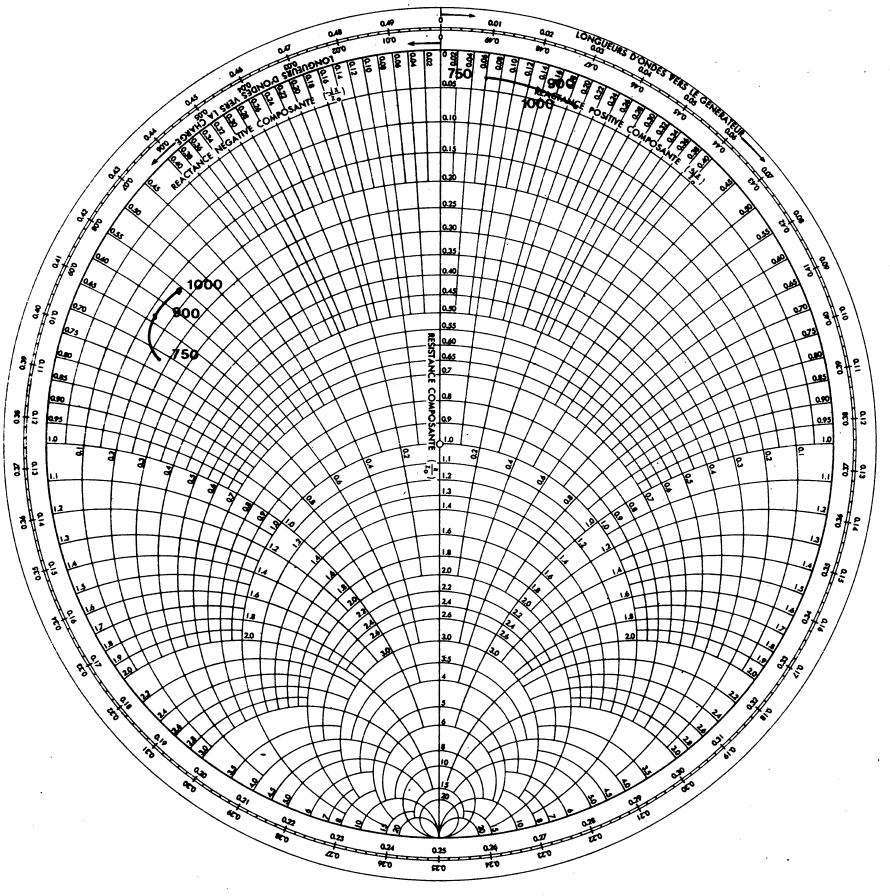

Power Output VS Power Input
Pout(W)
1,5
1
0,5
800MHz
960MHz
Vce- 24V
Ic:200mA
0
50
100
150
Pin(mW)


Power Gain VS Frequency
Power Gain(dB)
Vce: 24V
Ic:200mA
Pi:50mW
Pi:150mW
Pi:200mW
10
8
6
800
900
950
960
F(MHz)

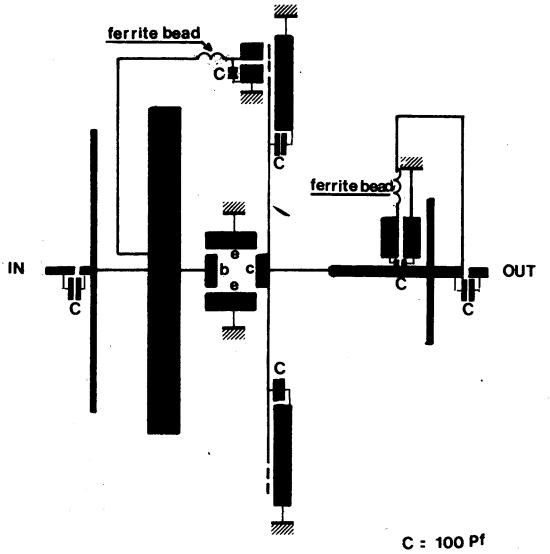
B

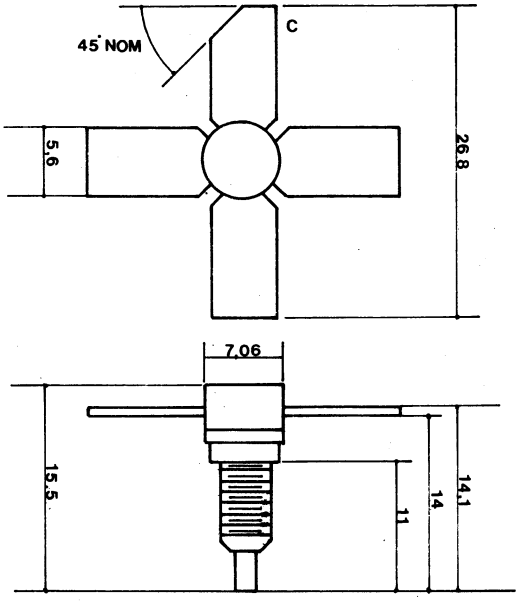
IMPEDANCE DATA NORMALIZED TO 50 OHMS

V_{CE} = 24 V, I_C = 200 mA

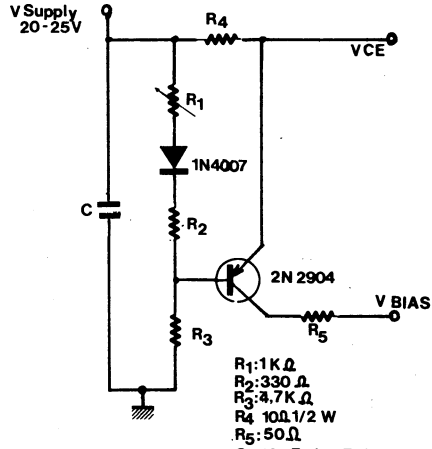


N° 361





CLASS A BIAS CIRCUIT



R_1: 1 KΩ
R_2: 330 Ω
R_3: 4,7 K Ω
R_4 10Ω 1/2 W
R_5: 50 Ω
C : 100 F + 10 r F + 1nF

- 15 W
- 24 V
- 960 MHz
- 8 dB Gain
- Class "AB"

230 F

B

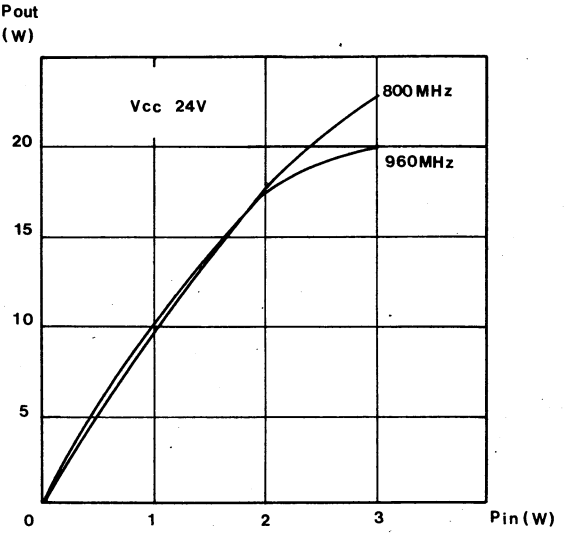
The TP 3022 is designed for operation in the 900 MHz mobile band and has been specifically conceived for use either as a medium power output device or driver for the TP 3024.

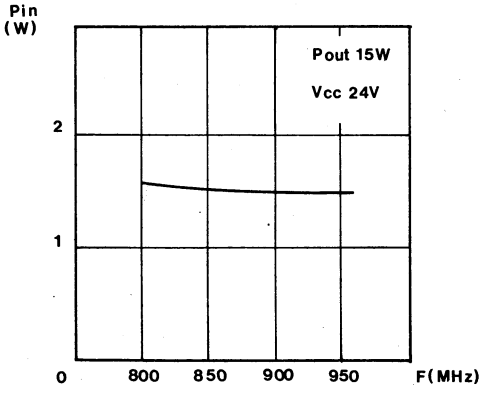
Using the latest in technology from TRW, this device offers a high degree of reliability and ruggedability.

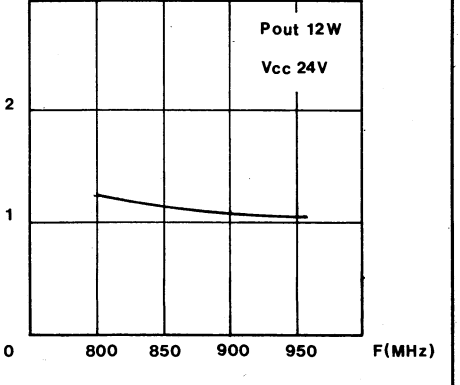
Electrical Characteristics (T_{case} = 25 °C)

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC TEST	BV_{EBO}	Emitter - Base Breakdown Volt.	I_B = 5 mA	4			V
	BV_{CEO}	Collector - Emit. Beakdown Volt.	I_E = 20 mA	25	28		V
	BV_{CBO}	Collector - Base Breakdown Volt.	I_{CB} = 50 mA	48	50		V
	I_{CBO}	Col. Base leakage	V_{CB} = 24 V			10	mA
	H_{FE}	DC fwd Cur. gain	V_{CE} = 10 V, I_E = 100 mA	20		100	
RF TEST	P_{OUT}	Output power	V_{CE} = 24 V, F = 960 MHz P_{IN} = 2.38 W	15			W
	η_C	Collector efficiency	V_{CE} = 24 V, F = 960 MHz P_{OUT} = 15 W		50 %		
	C_{OB}	Collector - Base capacitance	V_{CB} = 24 V, F = 1 MHz		17	25	pF
THERMAL	R_{TH} J_C T_{STG}	Thermal resist. Junction-case Storage	T case = 70 °C measured under DC conditions hottest point.	 −65	6	 +200	°C/W

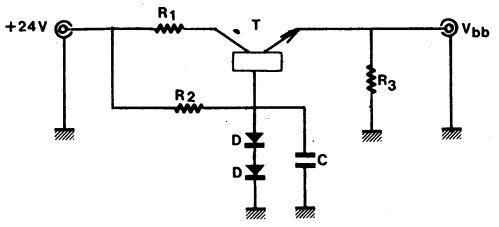
TYPICAL CHARACTERISTICS







CLASS AB BIAS CIRCUIT



COMPONENTS LIST

R_1 = 82 Ω (1 W)
R_2 = 5.6 K Ω (1/4 W)
R_3 = 150 Ω (1/4 W)

C = 1 nF

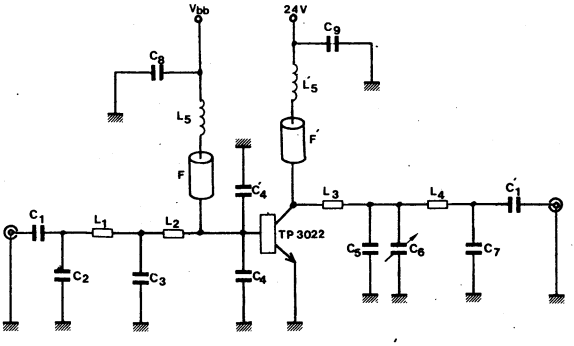
D = 1 N 4148 (or equivalent)

T = B D 135 (or equivalent)

B

CIRCUIT DIAGRAM

BROADBAND AMPLIFIER



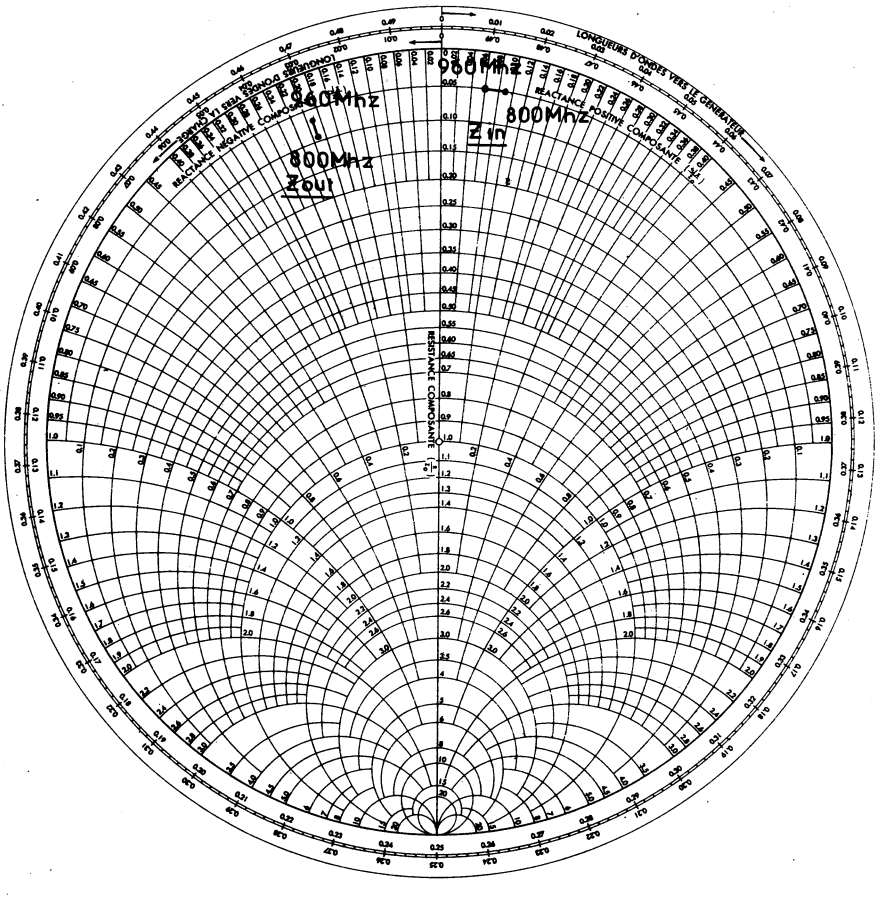
COMPONENTS LIST

$L_1 = L_2$ = 50 Ω line (1.45 mm wide), 13 mm long
L_3 = 50 Ω line (1.45 mm wide), 9 mm long
L_4 = 50 Ω line (1.45 mm wide), 17 mm long
$L_5 = L'_5$ = 2 turns - 10/10 mm enameled wire, 5 mm I.D.
F = F' = Ferrite bead
$C_1 = C'_1$ = 330 pF chip capacitor
C_2 = 3.3 pF chip capacitor
C_3 = 3.9 pF chip capacitor
$C_4 = C'_4$ = 15 pF chip capacitor
C_5 = 15 pF ATC chip capacitor
C_6 = 0 – 4 pF Johanson variable capacitor
C_7 = 6.8 pF ATC chip capacitor
C_8 = 330 pF + 1000 pF + 15nF
C_9 = 330 pF + 1000 pF + 15 nF + 10μF

Substrate material:

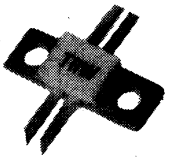
Teflon glass 1/50 inch. ϵ_r = 2.43

IMPEDANCES



N° 361

- 30 W
- 24 V
- 960 MHz
- 7.5 dB Gain
- Push Pull



BMA-2

B

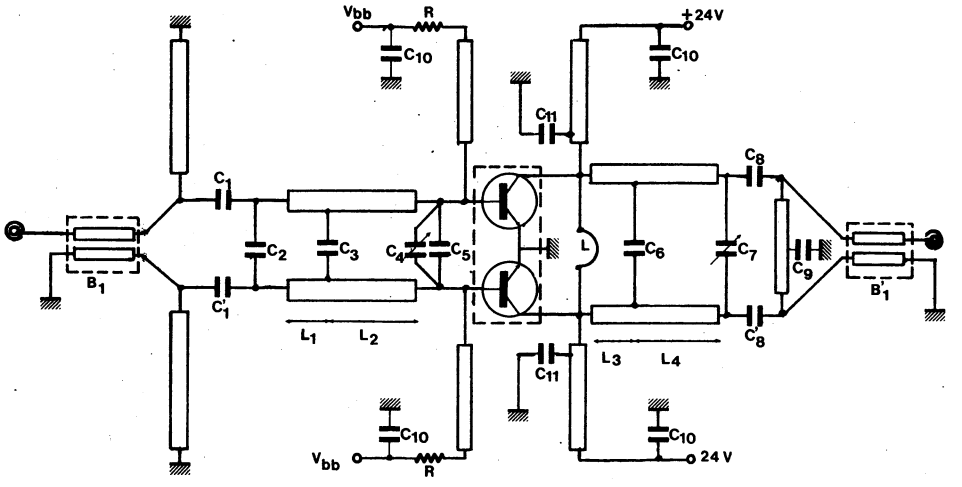
The TP 3024 is a balanced transistor designed specifically for used in cellular radio systems.

This device permits the design of a class AB push-pull, high gain, broadband amplifier having the high degree of linearity necessary in the latest systems, without the need for very complicated biasing circuitry.

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

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Each side. DC TEST	BV_{EBO}	Emitter - Base Breakdown Volt.	I_B = 5 mA	4			V
	BV_{CEO}	Collector - Emitter Breakdown Volt.	I_E = 20 mA	25	28		V
	BV_{CBO}	Collector - Base Breakdown Volt.	I_{CB} = 50 mA	48	50		V
	I_{CBO}	Col. Base leakage	V_{CB} = 24 V			10	mA
	H_{FE}	DC fwd Cur. gain	V_{CE} = 10 V, I_E = 100 mA	20		100	
RF TEST	P_{OUT}	Output Power	V_{CE} = 24 V, F = 960 MHz P_{IN} = 5,3 W I_Q (TOT) ≃ 150 mA	30			W
	η_C	Collector efficiency	V_{CE} = 24 V, F = 960 MHz P_{OUT} = 30 W		50 %		
	C_{OB}	Collector base capacitance (Each side)	V_{CB} = 24 V F = 1 MHz		17	25	pF
THERMAL	R_{TH} JC	Thermal Resistance Junction-Case	T_{CASE} = 70° Measured under DC conditions hottest point		3		°C/W
	T_{STG}	Storage		−65		+200	

BROADBAND PUSH-PULL AMPLIFIER

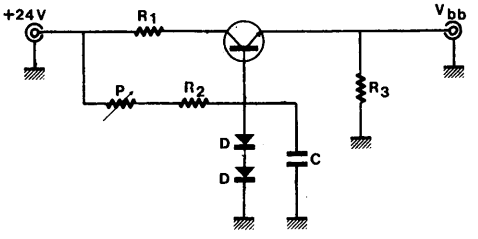


COMPONENTS LIST

C_1 = C'_1 = 15 pF ATC chip capacitor
C_2 = 2.2 pF ATC chip capacitor
C_3 = 4.7 pF ATC chip capacitor
C_4 = C_7 = 0 – 4 pF Johanson variable capacitor
C_5 = 12 pF ATC chip capacitor
C_6 = 5.6 pF ATC chip capacitor
C_8 = C'_8 = 27 pF ATC chip capacitor
C_9 = 12 pF ATC chip capacitor
C_{10} = 0.1 μF chip capacitor
C_{11} = 330 pF chip capacitor
B_1 = B'_1 = 50 Ω Balun stripline
L = 3 nH line on one side coated printed circuit.
l_1 = l_3 = 5 mm
l_2 = l_4 = 10 mm

Material: teflon glass 1/50 inch. ϵ_r = 2.43

CLASS AB BIAS CIRCUIT

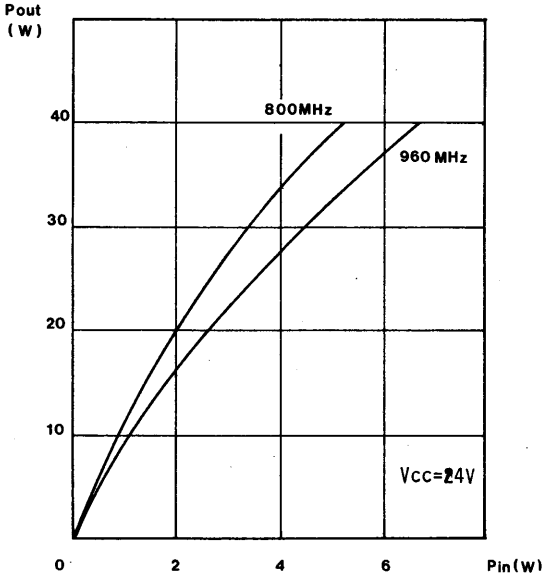


COMPONENTS LIST

R_1 = 100 Ω (3 W)
R_2 = 5. KΩ (1/4 W)
R_3 = 75 Ω (1/4 W)

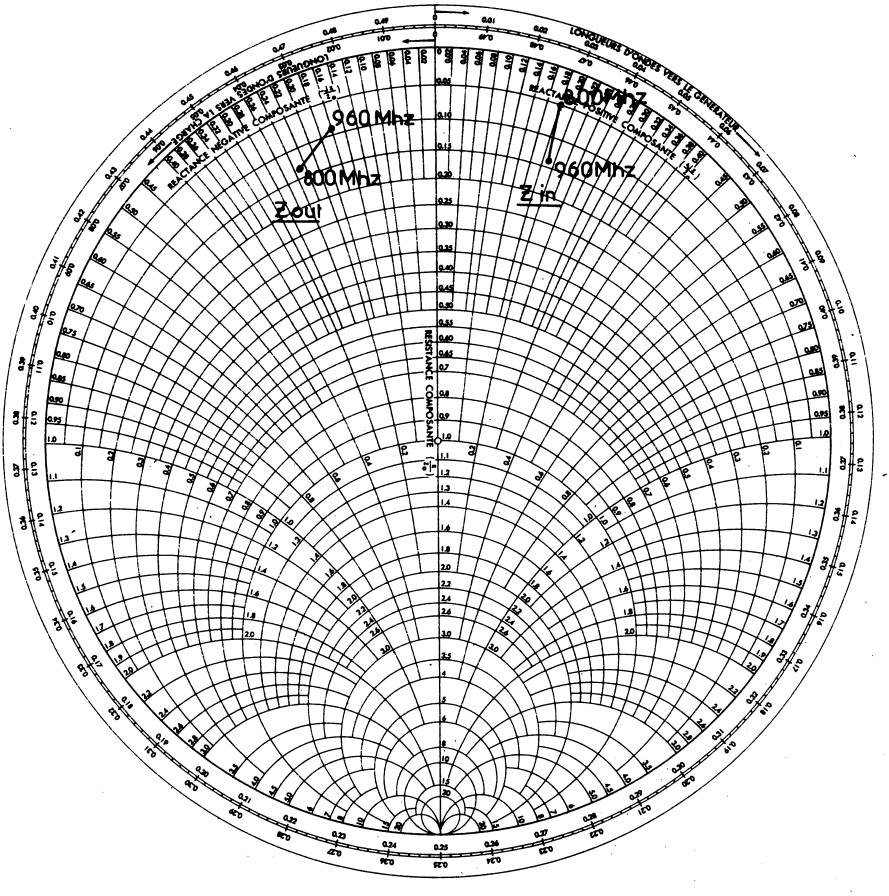
P = 1 KΩ
C = 1 nF
D = 1 N 4148 (or equivalent)
T = BD 135 (or equivalent)

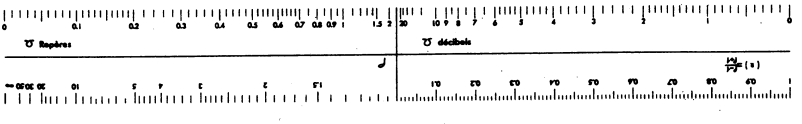
TYPICAL TRANSFER CHARACTERISTICS



B

IMPEDANCES





N° 361