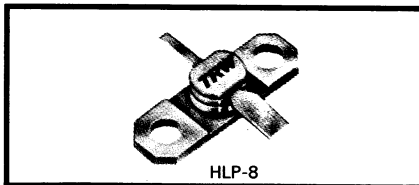


Microwave Power Oscillator Transistors

- 1.2 W at 2.5 GHz
- Up to 3 GHz
- ∞ VSWR



The TRW 62601 is designed for use up to 3 GHz with a typical Pout of 1.2 W at 2.5 GHz.

transistors characterized for Power oscillator applications.

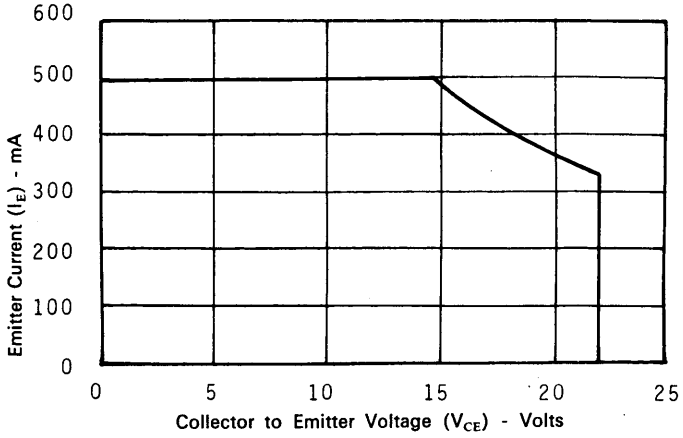
TRW oscillator devices are common collector, diffused ballasted, gold metalized microwave

Their construction enables these devices to be able to withstand an infinite VSWR at any phase and at operating conditions.

Electrical Characteristics ($T_{flange} = 25\text{ }^{\circ}\text{C}$)

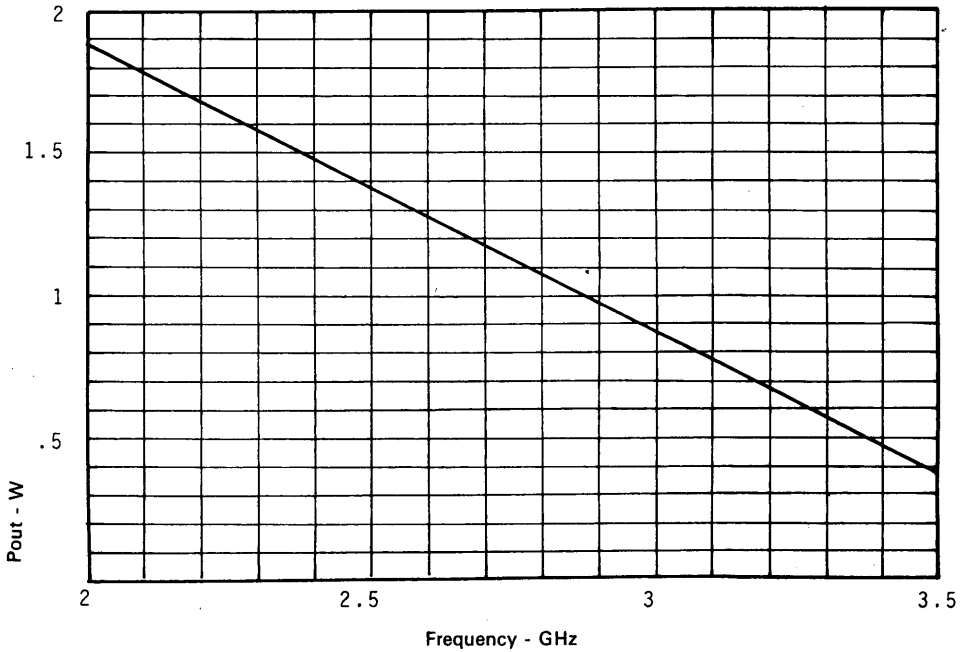
	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
D C Test	BV_{CEO}	Collector - Emitter Breakdown Voltage	$I_C = 20\text{ mA}$	22			V
	BV_{CER}	Collector - Emitter Breakdown Voltage	$R_{BE} = 10\ \Omega$ $I_C = 20\text{ mA}$	50			V
	BV_{EBO}	Emitter - Base Breakdown Voltage	$I_E = 0.25\text{ mA}$	3.5			V
	BV_{CBO}	Collector - Base Breakdown Voltage	$I_C = 1.0\text{ mA}$	45			V
	I_{CBO}	Collector Cutoff Current	$V_{CB} = 28$			0.125	mA
	h_{FE}	Forward Current Transfer Ratio	$V_{CE} = 5.0\text{ V}$ $I_C = 100\text{ mA}$	20		120	
R F Test	C_{ob}	Collector Base Capacitance	$V_{CB} = 28\text{ V}$ $F = 1\text{ MHz}$			5.0	pF
	F_T	Frequency Cutoff	$V_{CE} = 20\text{ V}$ $I_E = 220\text{ mA}$	2.7	3.0		GHz
	P_o	Power output	$F = 2.0\text{ GHz}$ $V_{CE} = 20\text{ V}$ $I_E = 220\text{ mA}$	1.25			W
	VSWR	Mismatch Tolerance	$P_o = 1.25\text{ W}$ $V_{CE} = 20\text{ V}$ $I_E = 220\text{ mA}$		$\infty : 1$		
Operating	θ_{JF}	Thermal Resistance (junction to Flange)				15	$^{\circ}\text{C/W}$
	T_{STG}	Max Junction and Storage Temperature		-65		200	$^{\circ}\text{C}$

D.C. Safe Operating Area



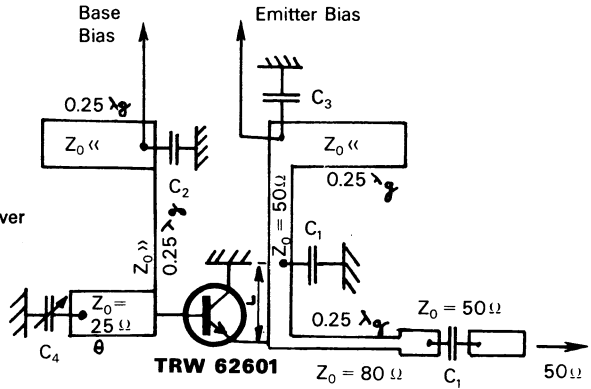
Output Power vs. Frequency

($V_{CE} = 20$ V, $I_E = 220$ mA)

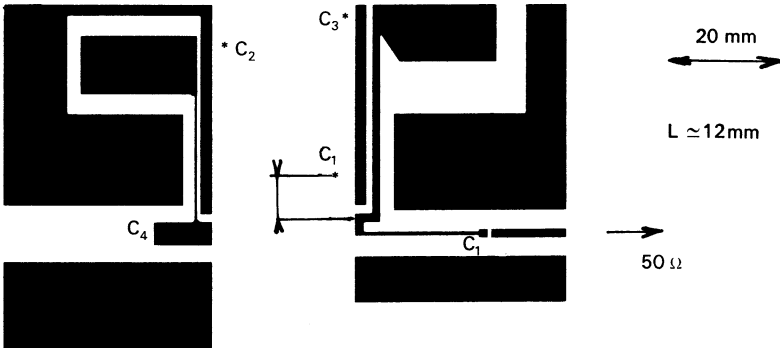


TEST CIRCUIT

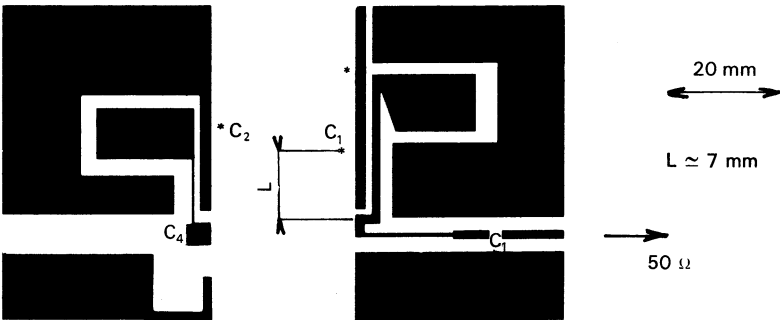
- C_1 : 220 pF (chip)
- C_2 : 220 pF (chip) + 10 nF
- C_3 : 220 pF (chip) + 10 nF + 10 μ F
- C_4 : 0.6-4.5 pF (Frequency tuning)
- L : adjust to obtain the maximum output power
- $\theta = 0.115 \lambda_g$ for $F_o = 2.3$ GHz
- $\theta = 0.06 \lambda_g$ for $F_o = 3$ GHz



PC Board Layout for $F_o = 2.3$ GHz (BW = 500 MHz)



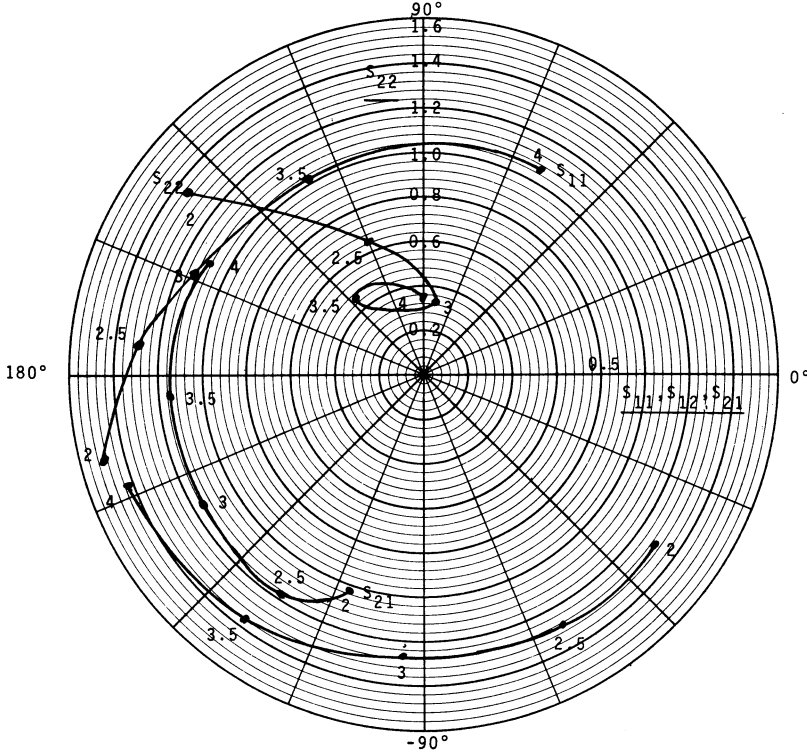
PC Board Layout for $F_o = 3$ GHz (BW = 500 MHz)



* Foil-wrap asterisked edge to ground plane.
 Board material - 0.020" Glass teflon ($E_r = 2.55$)
 Adjust L to obtain the maximum output power

Small Signal S-Parameters

($V_{CE} = 20\text{ V}$, $I_E = 220\text{ mA}$)



Mechanical Specifications

The following are mechanical specifications for this transistor series.

Dimensions: Per outline drawing.

Solderability: Per MIL-STD-750.

Marking: Per MIL-S-19500, "TRW," 4-digit date code, type number.

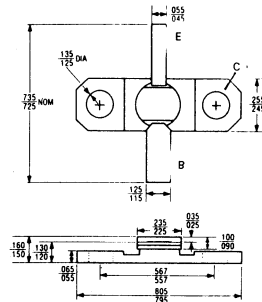
Hermeticity: Per MIL-STD-750, 10^{-7} atmospheres gross and fine leak. (Available on special order screened to 10^{-8} atmospheres.)

Acceleration: Per MIL-STD-750, 20,000G in any plane.

Bond Pull: Per MIL-STD-750, 3 grams min.

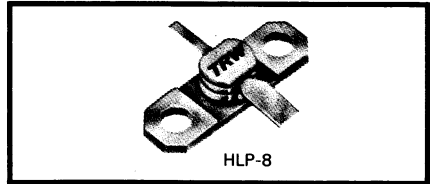
Package: A brazed ceramic package assuring long-term integrity of hermetic seals. Leads of KOVAR base material with minimum 60 microinches of gold plating.

Package Outlines



Microwave Power Oscillator Transistors

- 2 W at 2.5 GHz
- Up to 3 GHz
- ∞ VSWR



The TRW 62602 is designed for use up to 3 GHz with a typical Pout of 2 W at 2.5 GHz.

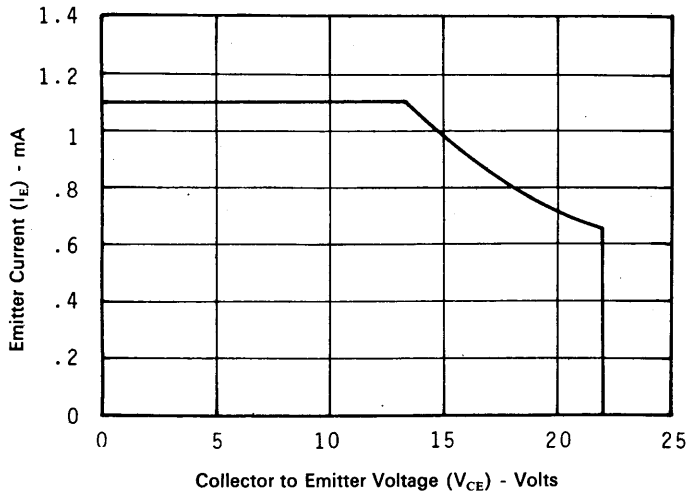
Their construction enables these devices to be able to withstand an infinite VSWR at any phase and at operating conditions.

TRW oscillator devices are common collector, diffused ballasted, gold metalized microwave transistors characterized for Power oscillator applications.

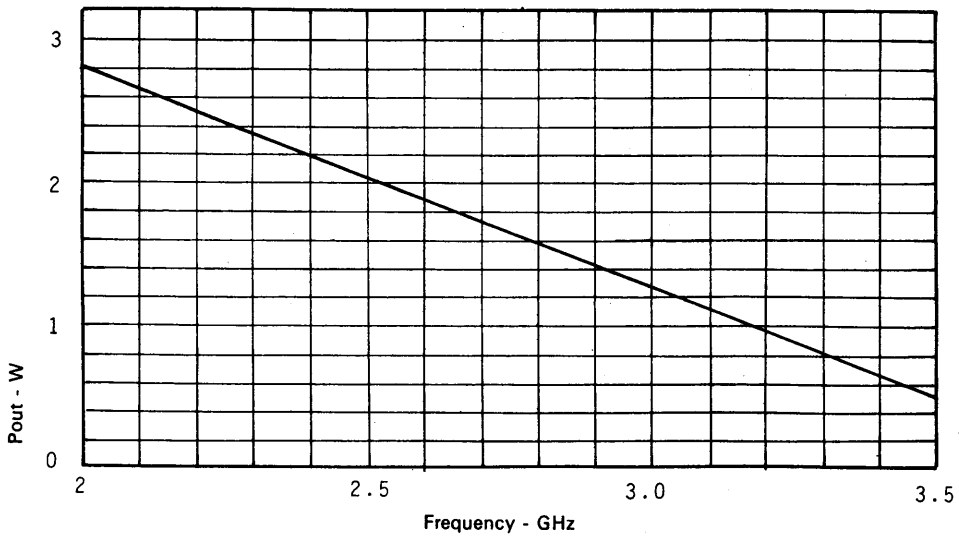
Electrical Characteristics (T_{CASE} = 25 °C)

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC Test	BV _{CEO}	Collector - Emitter Breakdown Voltage	I _C = 40 mA	22			V
	BV _{CER}	Collector - Emitter Breakdown Voltage	R _{BE} = 10 Ω I _C = 40 mA	50			V
	BV _{EBO}	Emitter - Base Breakdown Voltage	I _E = 0.5 mA	3.5			V
	BV _{CBO}	Collector - Base Breakdown Voltage	I _C = 2.0 mA	45			V
	I _{CBO}	Collector Cutoff Current	V _{CB} = 28 V			0.25	mA
	h _{FE}	Forward Current Transfer Ratio	V _{CE} = 5.0 V I _C = 200 mA	20		120	
RF Test	C _{ob}	Collector Base Capacitance	V _{CB} = 28 V F = 1 MHz			7.0	pF
	F _T	Frequency Cutoff	V _{CE} = 20 V I _E = 440 mA	2.7	3.0		GHz
	P _o	Power output	F = 2.00 GHz V _{CE} = 20 V I _E = 440 mA	2.5			W
	VSWR	Mismatch Tolerance	P _o = 2.5 W V _{CE} = 20 V I _E = 440 mA		$\infty : 1$		
Operating	θ_{jF}	Thermal Resistance (junction to Flange)				8.5	°C/W
	T _{STG}	Max Junction and Storage Temperature		-65		200	°C

D.C. Safe Operating Area

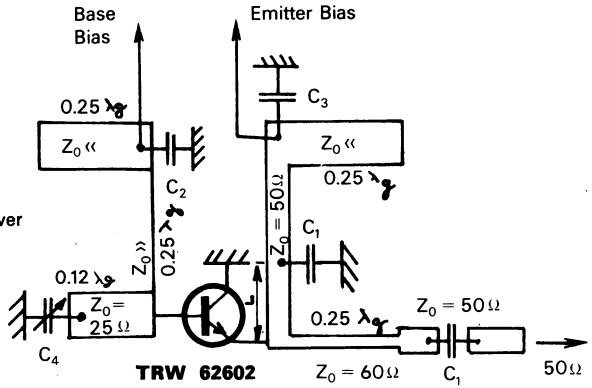


Output Power vs. Frequency
 ($V_{CE} = 20$ V, $I_E = 440$ mA)

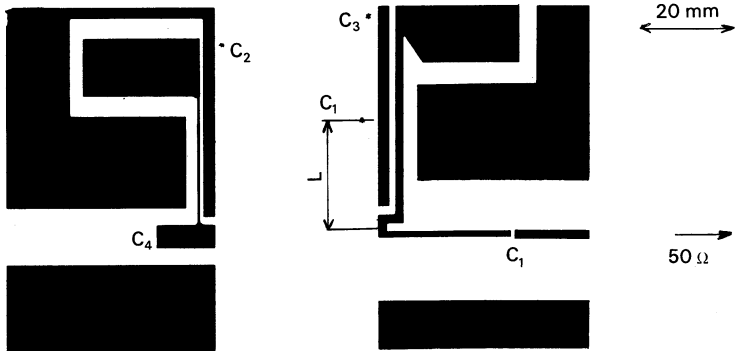


TEST CIRCUIT

- C₁: 220 pF (chip)
- C₂: 220 pF (chip) + 10 nF
- C₃: 220 pF (chip) + 10 nF + 10 μF
- C₄: 0.6-4.5 pF (Frequency tuning)
- L : adjust to obtain the maximum output power



PC Board Layout for Fo = 2.3 GHz (BW = 500 MHz)

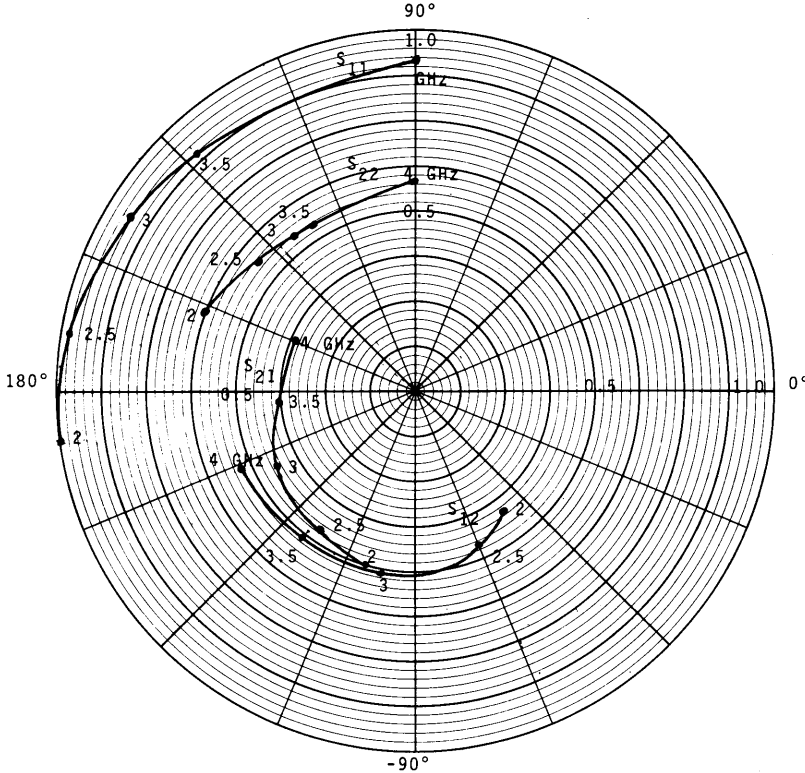


* Foil-wrap asterisked edge to ground plane.
 Board material :-0.020" Glass teflon (Er = 2.55)
 Adjust L to obtain the maximum output power

For F = 2 GHz	L = 24 mm
F = 2.3 GHz	L = 19 mm
F = 2.5 GHz	L = 14 mm

Small Signal S-Parameters

($V_{CE} = 20\text{ V}$, $I_E = 440\text{ mA}$)



Mechanical Specifications

The following are mechanical specifications for this transistor series.

Dimensions: Per outline drawing.

Solderability: Per MIL-STD-750.

Marking: Per MIL-S-19500, "TRW," 4-digit date code, type number.

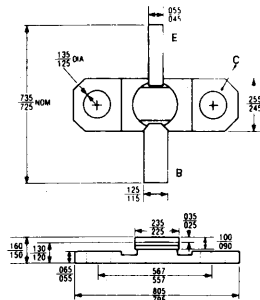
Hermeticity: Per MIL-STD-750, 10^{-7} atmospheres gross and fine leak. (Available on special order screened to 10^{-8} atmospheres.)

Acceleration: Per MIL-STD-750, 20,000G in any plane.

Bond Pull: Per MIL-STD-750, 3 grams min.

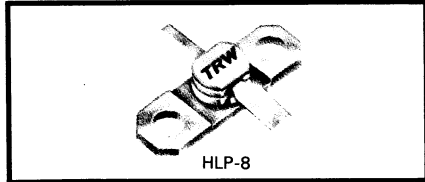
Package: A brazed ceramic package assuring long-term integrity of hermetic seals. Leads of KOVAR base material with minimum 60 microinches of gold plating.

PACKAGE OUTLINE



Microwave Power Oscillator Transistors

- 430 mW at 3 GHz
- Up to 3.5 GHz
- ∞ VSWR



The TRW 63601 is designed for use up to 3.5 GHz with a typical Pout of 430 mW at 3 GHz.

transistors characterized for Power oscillator applications.

TRW oscillator devices are common collector, diffused ballasted, gold metalized microwave

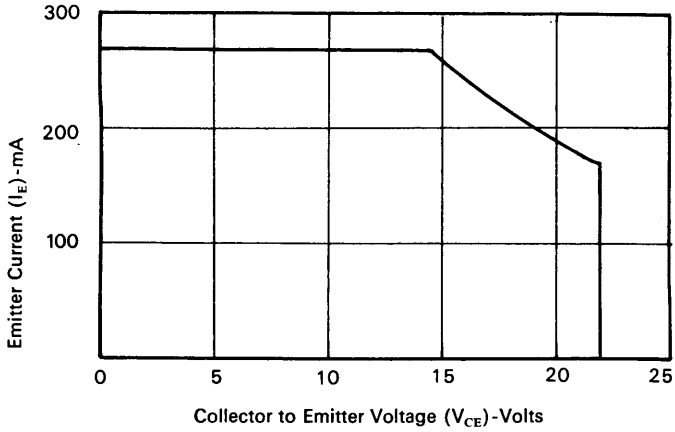
Their construction enables these devices to be able to withstand an infinite VSWR at any phase and at operating conditions.

Electrical Characteristics ($T_{flange} = 25\text{ }^{\circ}\text{C}$)

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
D C Test	BV_{CEO}	Collector - Emitter Breakdown Voltage	$I_C = 10\text{ mA}$	20			V
	BV_{CER}	Collector - Emitter Breakdown Voltage	$R_{BE} = 10\ \Omega$ $I_C = 10\text{ mA}$	50			V
	BV_{EBO}	Emitter - Base Breakdown Voltage	$I_E = 0.25\text{ mA}$	3.5			V
	BV_{CBO}	Collector - Base Breakdown Voltage	$I_C = 1.0\text{ mA}$	45			V
	I_{CBO}	Collector Cutoff Current	$V_{CB} = 28\text{ V}$			0.250	mA
	h_{FE}	Forward Current Transfer Ratio	$V_{CE} = 5.0\text{ V}$ $I_C = 100\text{ mA}$	15		120	
R F Test	C_{ob}	Collector Base Capacitance	$V_{CB} = 28\text{ V}$ $F = 1\text{ MHz}$			3.5	μF
	F_T	Frequency Cutoff	$V_{CE} = 20\text{ V}$ $I_E = 120\text{ mA}$	3.0	3.3		GHz
	P_o	Power output	$F = 2.3\text{ GHz}$ $V_{CE} = 20\text{ V}$ $I_E = 120\text{ mA}$	0.6			W
	VSWR	Mismatch Tolerance	$P_o = 0.6\text{ W}$ $V_{CE} = 20\text{ V}$ $I_E = 120\text{ mA}$		$\infty : 1$		
Operating	θ_{jF}	Thermal Resistance (junction to Flange)				32	$^{\circ}\text{C/W}$
	T_{STG}	Max Junction and Storage Temperature		- 65		200	$^{\circ}\text{C}$

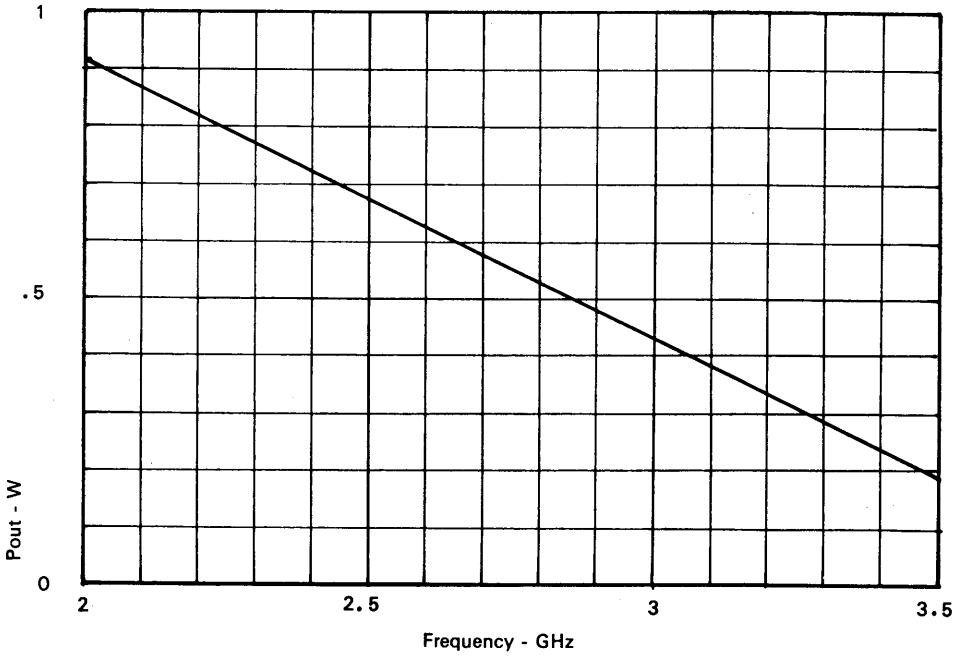
D.C. Safe Operating Area

$T_{flange} = 75\text{ }^{\circ}\text{C}$



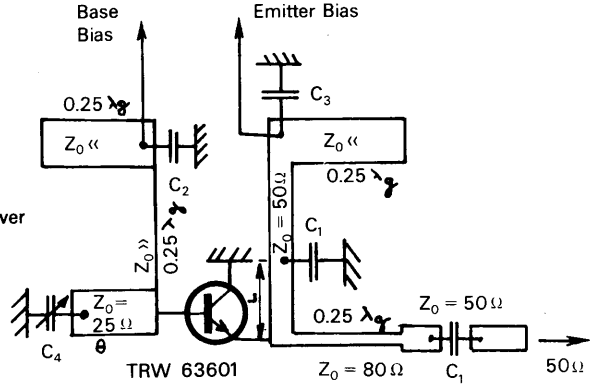
Output Power vs. Frequency

$(V_{CE} = 20\text{ V}, I_E = 120\text{ mA})$

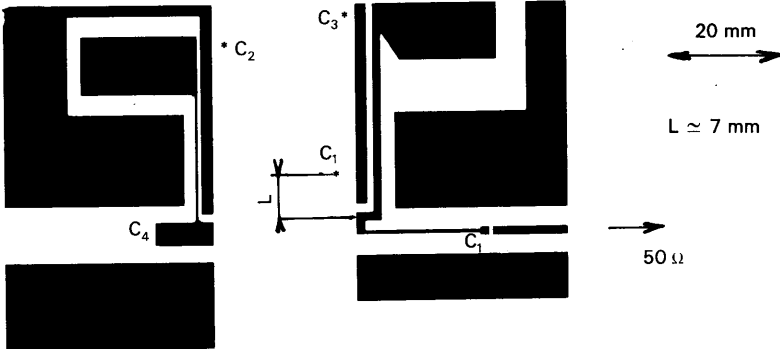


TEST CIRCUIT

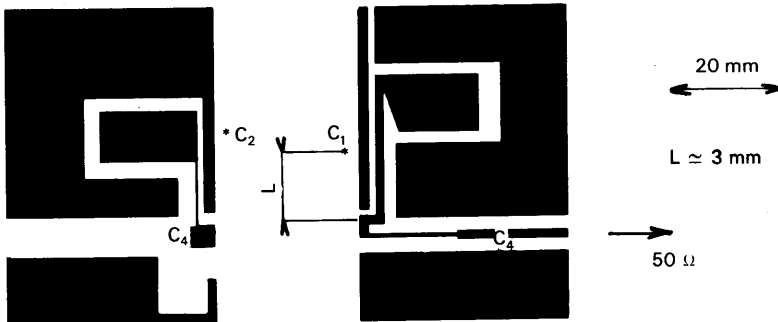
- C_1 : 220 pF (chip)
- C_2 : 220 pF (chip) + 10 nF
- C_3 : 220 pF (chip) + 10 nF + 10 μ F
- C_4 : 0.6-4.5 pF (Frequency tuning)
- L : adjust to obtain the maximum output power
- $\theta = 0.115 \lambda g$ for $F_o = 2.3$ GHz
- $\theta = 0.06 \lambda g$ for $F_o = 3$ GHz



PC Board Layout for $F_o = 2.3$ GHz (BW = 500 MHz)



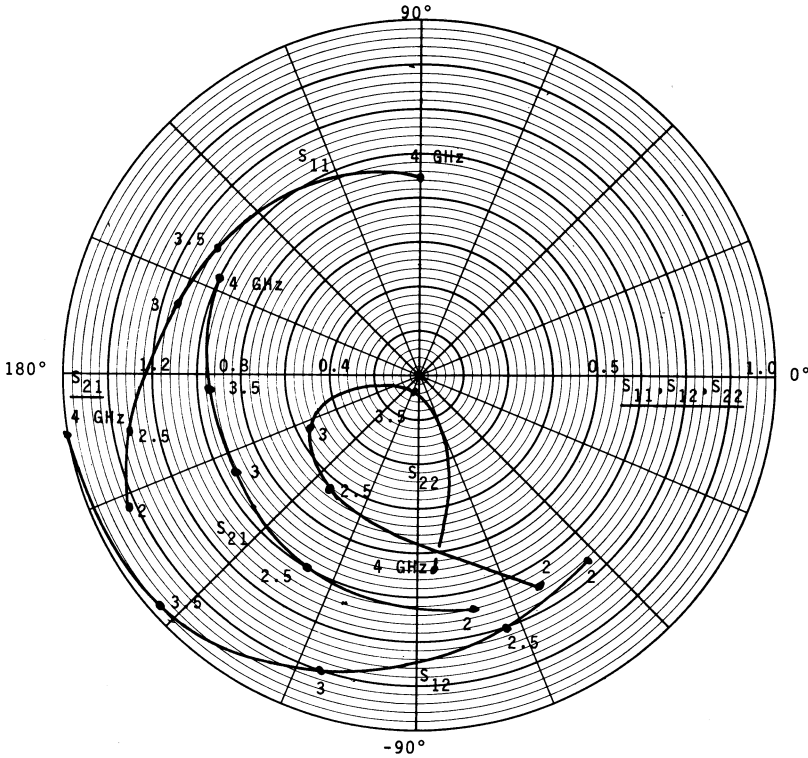
PC Board Layout for $F_o = 3$ GHz (BW = 500 MHz)



- * Foil-wrap asterisked edge to ground plane.
- Board material ≥ 0.020 " Glass teflon ($E_r = 2.55$)
- Adjust L to obtain the maximum output power

Small Signal S-Parameters

($V_{CE} = 20\text{ V}$, $I_E = 120\text{ mA}$)



Mechanical Specifications

The following are mechanical specifications for this transistor series.

Dimensions: Per outline drawing.

Solderability: Per MIL-STD-750.

Marking: Per MIL-S-19500, "TRW," 4-digit date code, type number.

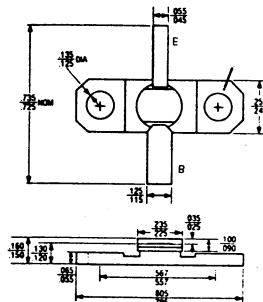
Hermeticity: Per MIL-STD-750, 10^{-7} atmospheres gross and fine leak. (Available on special order screened to 10^{-8} atmospheres.)

Acceleration: Per MIL-STD-750, 20,000G in any plane.

Bond Pull: Per MIL-STD-750, 3 grams min.

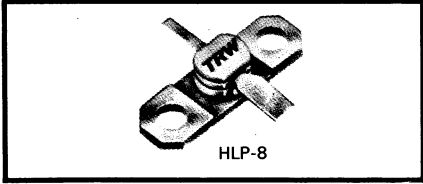
Package: A brazed ceramic package assuring long-term integrity of hermetic seals. Leads of KOVAR base material with minimum 60 microinches of gold plating.

Package Outlines



Microwave Power Transistors

- 850 mW at 3 GHz
- Up to 3.5 GHz
- ∞ VSWR



The TRW 63602 is designed for use up to 3.5 GHz with a typical Pout of 850 mW at 3 GHz.

transistors characterized for Power oscillator applications.

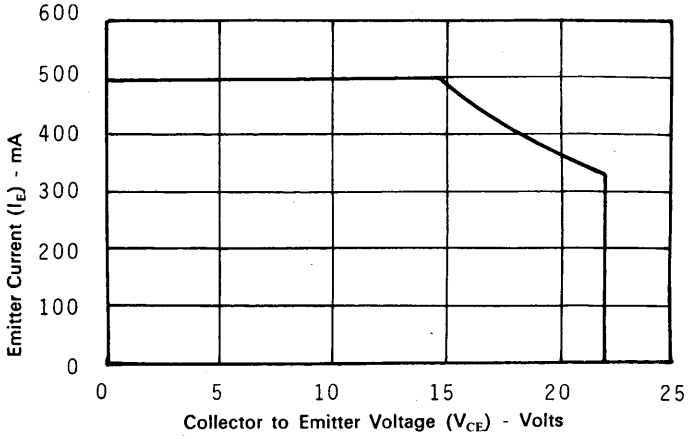
TRW oscillator devices are common collector, diffused ballasted, gold metalized microwave

Their construction enables these devices to be able to withstand an infinite VSWR at any phase and at operating conditions.

Electrical Characteristics ($T_{flange} = 25\text{ }^{\circ}\text{C}$)

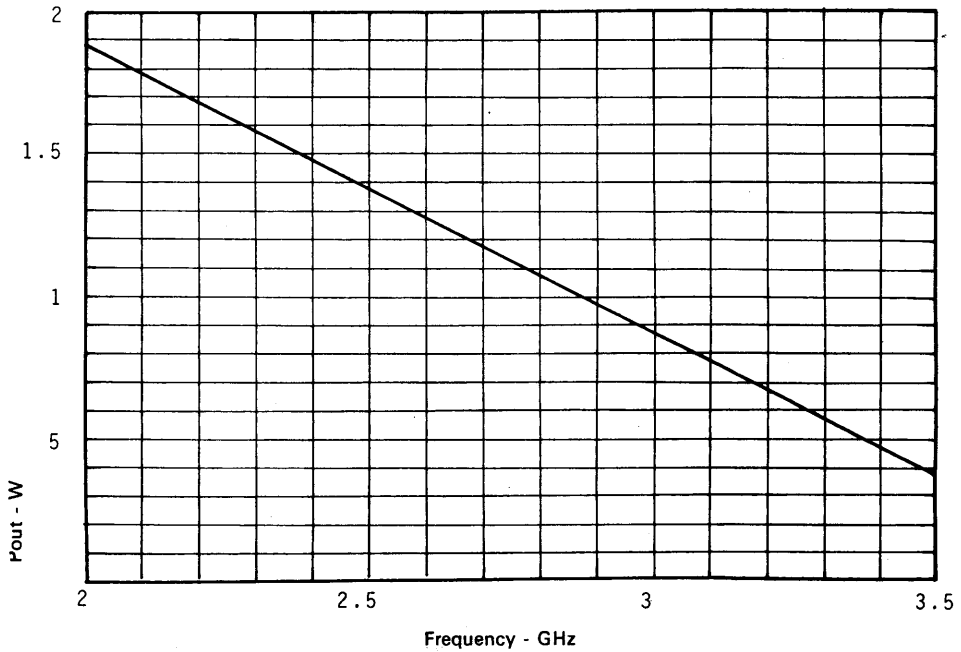
	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
D C Test	BV_{CEO}	Collector - Emitter Breakdown Voltage	$I_C = 20\text{ mA}$	20			V
	BV_{CER}	Collector - Emitter Breakdown Voltage	$R_{BB} = 10\ \Omega$ $I_C = 20\text{ mA}$	50			V
	BV_{EBO}	Emitter - Base Breakdown Voltage	$I_E = 0.5\text{ mA}$	3.5			V
	BV_{CBO}	Collector - Base Breakdown Voltage	$I_C = 2.0\text{ mA}$	45			V
	I_{CBO}	Collector Cutoff Current	$V_{CB} = 28\text{ V}$			0.5	mA
	h_{FE}	Forward Current Transfer Ratio	$V_{CE} = 5.0\text{ V}$ $I_C = 200\text{ mA}$	15		120	
R F Test	C_{ob}	Collector Base Capacitance	$V_{CB} = 28\text{ V}$ $F = 1\text{ MHz}$			5.5	pF
	F_T	Frequency Cutoff	$V_{CE} = 20\text{ V}$ $I_E = 230\text{ mA}$	3	3.3		GHz
	P_o	Power output	$F = 2.3\text{ GHz}$ $V_{CE} = 20\text{ V}$ $I_E = 230\text{ mA}$	1.2			W
	VSWR	Mismatch Tolerance	$P_o = 1.2\text{ W}$ $V_{CE} = 20\text{ V}$ $I_E = 230\text{ mA}$			$\infty : 1$	
Operating	θ_{jF}	Thermal Resistance (junction to Flange)				17	$^{\circ}\text{C/W}$
	T_{STG}	Max Junction and Storage Temperature		-65		200	$^{\circ}\text{C}$

D.C. Safe Operating Area



Output Power vs. Frequency

($V_{CE} = 20$ V, $I_E = 230$ mA)



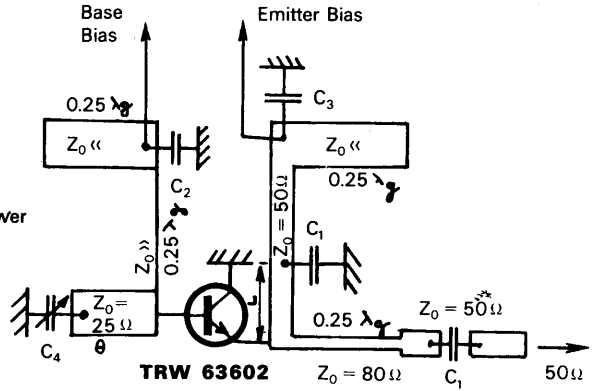
TEST CIRCUIT

- C₁: 220 pF (chip)
- C₂: 220 pF (chip) + 10 nF
- C₃: 220 pF (chip) + 10 nF + 10 μF
- C₄: 0.6-4.5 pF (Frequency tuning)

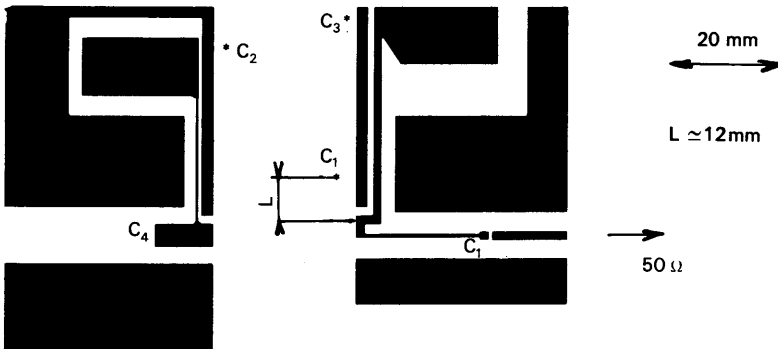
L : adjust to obtain the maximum output power

$\theta = 0.115 \lambda_g$ for $F_o = 2.3$ GHz

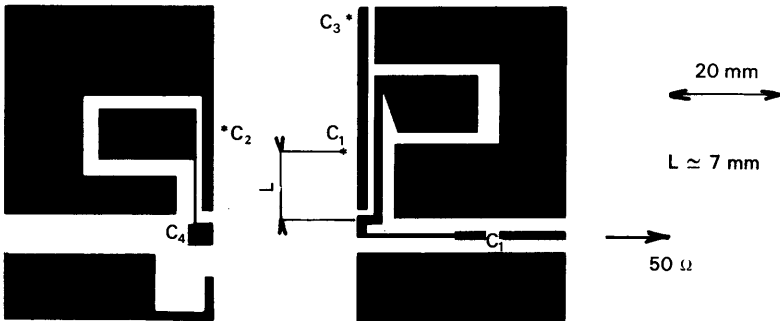
$\theta = 0.06 \lambda_g$ for $F_o = 3$ GHz



PC Board Layout for $F_o = 2.3$ GHz (BW = 500 MHz)



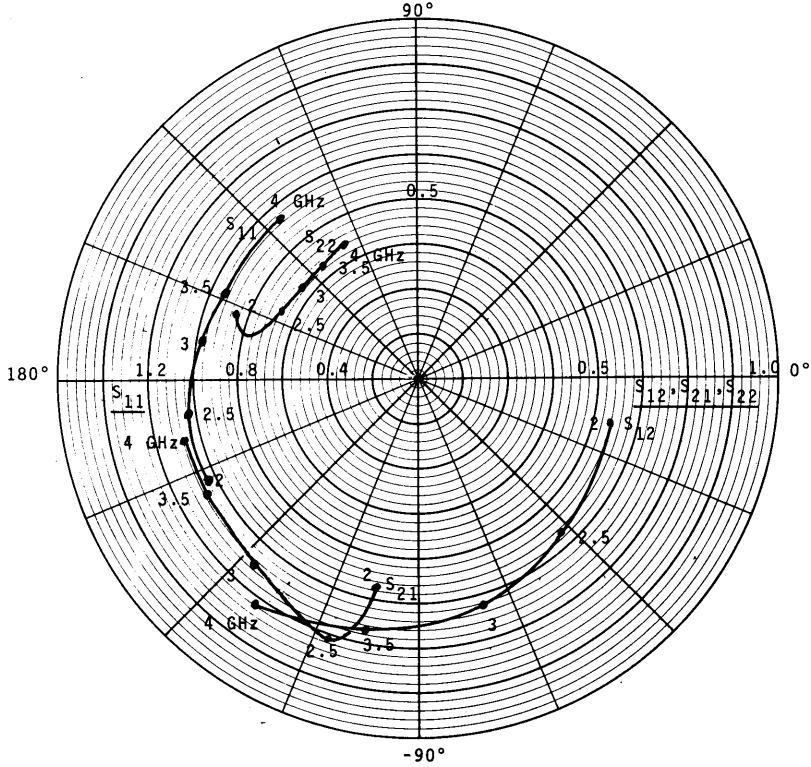
PC Board Layout for $F_o = 3$ GHz (BW = 500 MHz)



* Foil-wrap asterisked edge to ground plane.
 Board material :- 0.020" Glass teflon (Er = 2.55)
 Adjust L to obtain the maximum output power

Small Signal S-Parameters

($V_{CE} = 20\text{ V}$, $I_E = 230\text{ mA}$)

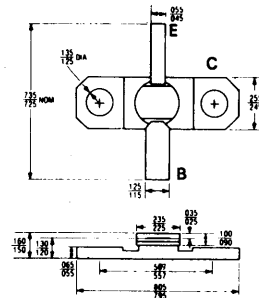


Mechanical Specifications

The following are mechanical specifications for this transistor series.

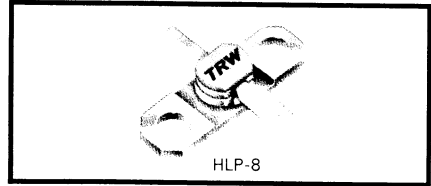
- Dimensions: Per outline drawing.
- Solderability: Per MIL-STD-750.
- Marking: Per MIL-S-19500, "TRW," 4-digit date code, type number.
- Hermeticity: Per MIL-STD-750, 10^{-7} atmospheres gross and fine leak. (Available on special order screened to 10^{-8} atmospheres.)
- Acceleration: Per MIL-STD-750, 20,000G in any plane.
- Bond Pull: Per MIL-STD-750, 3 grams min.
- Package: A brazed ceramic package assuring long-term integrity of hermetic seals. Leads of KOVAR base material with minimum 60 microinches of gold plating.

Package Outlines



Microwave Power Oscillator Transistors

- 350 mW at 4 GHz
- Up to 5 GHz
- ∞ VSWR



The TRW 64601 is designed for use up to 5 GHz with a typical Pout of 350 mW at 4 GHz.

transistors characterized for Power oscillator applications.

TRW oscillator devices are common collector, diffused ballasted, gold metalized microwave

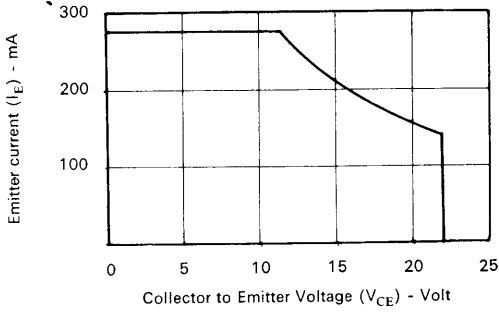
Their construction enables these devices to be able to withstand an infinite VSWR at any phase and at operating conditions.

Electrical Characteristics ($T_{CASE} = 25\text{ }^{\circ}\text{C}$)

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
D C Test	BV_{CEO}	Collector - Emitter Breakdown Voltage	$I_C = 10\text{ mA}$	22			V
	BV_{CER}	Collector - Emitter Breakdown Voltage	$R_{BE} = 10\ \Omega$ $I_C = 10\text{ mA}$	50			V
	BV_{EBO}	Emitter - Base Breakdown Voltage	$I_E = 0.25\text{ mA}$	3.5			V
	BV_{CBO}	Collector - Base Breakdown Voltage	$I_C = 1.0\text{ mA}$	45			V
	I_{CBO}	Collector Cutoff Current	$V_{CB} = 28$			0.25	mA
	h_{FE}	Forward Current Transfer Ratio	$V_{CE} = 5.0\text{ V}$ $I_C = 100\text{ mA}$	20		120	
R. F. Test	C_{ob}	Collector Base Capacitance	$V_{CB} = 28\text{ V}$ $F = 1\text{ MHz}$			3.5	pF
	F_T	Frequency Cutoff	$V_{CE} = 20\text{ V}$ $I_E = 120\text{ mA}$	4.0	4.5		GHz
	P_o	Power output	$F = 4\text{ GHz}$ $V_{CE} = 20\text{ V}$ $I_E = 120\text{ mA}$	0.300	0.350		W
	VSWR	Mismatch Tolerance	$P_o = 0.300\text{ W}$ $V_{CE} = 20\text{ V}$ $I_E = 120\text{ mA}$		$\infty : 1$		
Operating	θ_{JF}	Thermal Resistance (junction to Flange)				40	$^{\circ}\text{C/W}$
	T_{STG}	Max Junction and Storage Temperature		-65		100	$^{\circ}\text{C}$

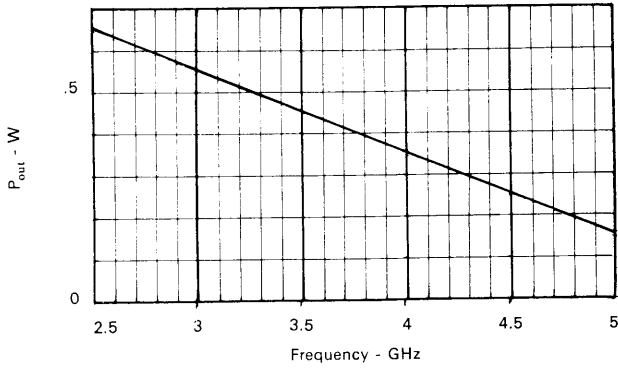
DC Safe Operating Area

$T_{Flange} = 75\text{ }^{\circ}\text{C}$



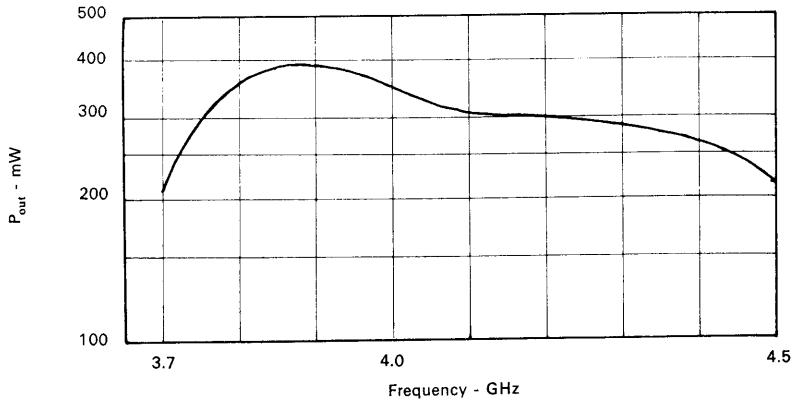
Output Power V_S Frequency

($V_{CE} = 20\text{ V}$, $I_E = 120\text{ mA}$)

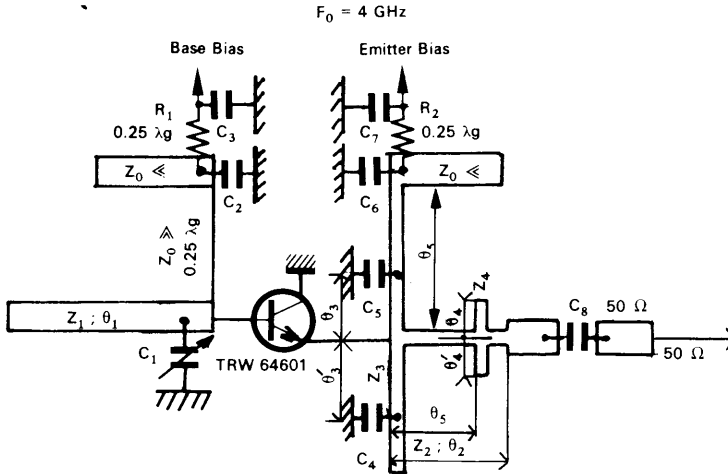


P_{out} V_S Frequency with a Fixed tuned output circuit

Oscillator circuit : TF; $V_{CE} = 20\text{ V}$; $I_E = 120\text{ mA}$

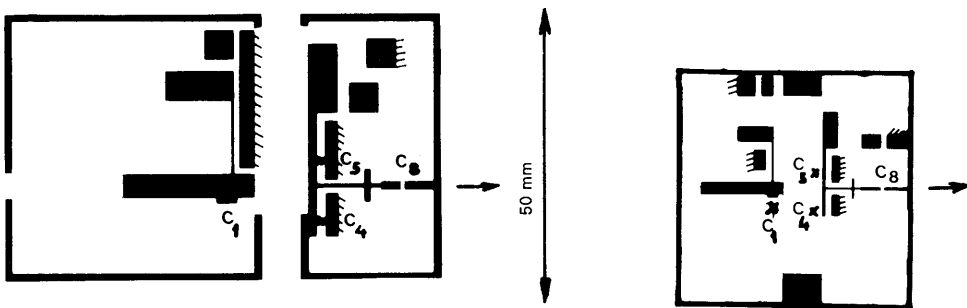


Test circuit



- $Z_1 = 23.5 \Omega$ $\theta_1 = 0.52 \lambda g$
 - $Z_2 = 80/67 \Omega$ $\theta_2 = 0.25 \lambda g$
 - $Z_3 = 50 \Omega$ $\theta_3 = 0.095 \lambda g$; $\theta'_3 = 0.140 \lambda g$
 - $Z_4 = 62 \Omega$ $\theta_4 = 0.05 \lambda g$
 - $\theta_5 = 0.18 \lambda g$
 - $R_1 = 160 \Omega$
 - $R_2 = 1 \Omega$
 - $C_1 = 0.4 - 2.5 \text{ pF}$
 - $C_2 = C_6 = 100 \text{ pF (chip) + 10 nF}$
 - $C_3 = C_7 = 10 \text{ nF}$
 - $C_4 = C_5 = C_8 = 33 \text{ pF (chip)}$
- Adjust θ_3 and θ'_3 to obtain the maximum output power

P_c Board layout For F₀ = 4 GHz (BW = 700 MHz)

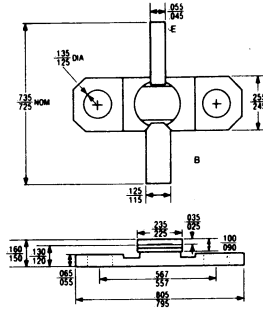


//// Foil wrap edge to ground plane

Board Material : 0.020" Glass teflon;
E_r = 2.55

Board Material : 0.025"
Epsilon 10; E_r = 10.2

Package Outlines



Mechanical Specifications

The following are mechanical specifications for this transistor series.

Dimensions: Per outline drawing.

Solderability: Per MIL-STD-750.

Marking: Per MIL-S-19500, "TRW," 4-digit date code, type number.

Hermeticity: Per MIL-STD-750, 10^{-7} atmospheres gross and fine leak. (Available on special order screened to 10^{-8} atmospheres.)

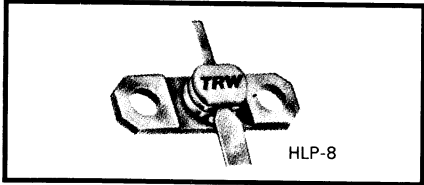
Acceleration: Per MIL-STD-750, 20,000G in any plane.

Bond Pull: Per MIL-STD-750, 3 grams min.

Package: A brazed ceramic package assuring long-term integrity of hermetic seals. Leads of KOVAR base material with minimum 60 microinches of gold plating.

Microwave Power Oscillator Transistors

- 650 mW at 4 GHz
- Up to 4 GHz
- ∞ VSWR



The TRW 64602 is designed for use up to 5 GHz with a typical P_{out} of 650 mW at 4 GHz.

transistors characterized for Power oscillator applications.

TRW oscillator devices are common collector, diffused ballasted, gold metalized microwave

Their construction enables these devices to be able to withstand an infinite VSWR at any phase and at operating conditions.

Electrical Characteristics ($T_{case} = 25\text{ }^{\circ}\text{C}$)

	SYMBOL	CHARACTERISTICS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC TEST	BV_{CEO}	Collector - Emitter Breakdown Voltage	$I_C = 20\text{ mA}$	22			V
	BV_{CER}	Collector - Emitter Breakdown Voltage	$I_C = 20\text{ mA}$ $R_{BB} = 10\ \Omega$	50			V
	BV_{EBO}	Emitter - Base Breakdown Voltage	$I_E = 0.5\text{ V}$	3.5			V
	BV_{CBO}	Collector - Base Breakdown Voltage	$I_C = 2\text{ mA}$	45			V
	I_{CBO}	Collector Cutoff Current	$V_{CE} = 28\text{ V}$			0.5	mA
RF TEST	H_{FE}	Forward Current Transfer Ratio	$V_{CE} = 5\text{ V}$ $I_C = 200\text{ mA}$	20		120	
	C_{OB}	Collector Base Capacitance	$V_{CB} = 28\text{ V}$ $F = 1\text{ MHz}$			5.5	pF
	P_O	Power output	$V_{CE} = 20\text{ V}$ $F = 4\text{ GHz}$ $I_C = 240\text{ mA}$	550	650		mW
	VSWR	Mismatch Tolerance	$V_{CE} = 20\text{ V}$ $F = 4\text{ GHz}$ $I_C = 240\text{ mA}$		$\infty : 1$		
THERMAL	θ_{JF}	Thermal Resistance Junction to Flange				20	$^{\circ}\text{C/W}$
	T_{STG} & T_J	Max Junction & Storage Temperature		- 65		+ 200	$^{\circ}\text{C}$

