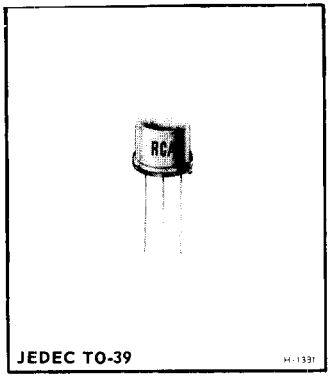
RCA
Solid State
Division

RF Power Transistors

2N5913



Silicon N-P-N Overlay Transistor

12.5-Volt, High-Gain Type for Class-C Amplifiers in VHF/UHF Communications Equipment

Features:

- **High Power Gain, High Power Output . . .**
  At 12.5 V:
  2-W (typ.) output at 470 MHz (7-dB gain)
  2-W (typ.) output at 250 MHz (9-dB gain)
  2-W (typ.) output at 175 MHz (13-dB gain)
  At 8 V:
  1.5-W (typ.) output at 470 MHz (4.8-dB gain)
  1.5-W (typ.) output at 250 MHz (7.0-dB gain)
  1.5-W (typ.) output at 175 MHz (10-dB gain)

MAXIMUM RATINGS, *Absolute-Maximum Values:*

*COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	36	V
COLLECTOR-TO-EMITTER BREAKDOWN VOLTAGE:			
With base shorted to emitter	$V_{(BR)CES}$	36	V
*With base open	$V_{(BR)CEO}$	14	V
*EMITTER-TO-BASE VOLTAGE	V_{EBO}	3.5	V
*CONTINUOUS COLLECTOR CURRENT	I_C	0.33	A
*TRANSISTOR DISSIPATION:	P_T		
At case temperatures up to 75°C.		3.5	W
At case temperatures above 75°C.		Derate at 0.0028	W/°C
*TEMPERATURE RANGE:			
Storage & Operating (Junction)		-65 to +200	°C
*LEAD TEMPERATURE:			
At distances ≥ 1/32 in. (0.8 mm) from seating plane for 10 s max.		230	°C

* In accordance with JEDEC registration data format JS-6 RDF-3/JS-9 RDF-7.

RCA Type 2N5913▲ is an epitaxial silicon n-p-n planar transistor featuring "overlay" emitter electrode construction. It is intended for VHF/UHF mobile, portable, and VHF marine transmitters, as well as UHF CB, sonobuoy, beacon, and other applications where intermediate power output is required at low supply voltage.

▲ Formerly RCA Developmental Type TA7477.

ELECTRICAL CHARACTERISTICS, At Case Temperature (T_C) = 25°C

STATIC

	CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS		UNITS
			DC Voltage (V)		DC Current (mA)					
			V_{CE}	V_{EB}	I_E	I_B	I_C	Min.	Max.	
*	Collector-Cutoff Current									
	Base Connected to Emitter	I_{CES}	12.5			0			1.0[b]	mA
	Base Open	I_{CEO}	10			0			0.3	mA
*	Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$			0		0.5	36	–	V
*	Collector-to-Emitter Breakdown Voltage: With base open	$V_{(BR)CEO}$				0	25[a]	14	–	V
	With base connected to emitter	$V_{(BR)CES}$		0			25[a]	36	–	
*	Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$			0.5		0	3.5	–	V
	Thermal Resistance: (Junction-to-Case)	$\theta_{J\text{-}C}$						–	35.7	°C/W

[a] Pulsed through a 25-mH inductor; duty factor = 50%.

[b] T_C = 100°C.

DYNAMIC

	TEST & CONDITIONS	SYMBOL	FREQUENCY MHz	LIMITS		UNITS
				MINIMUM	TYPICAL	
	Power Output (V_{CC} = 12.5 V): P_{IE} = 0.1 W	P_{OE}	175	1.75		W
*	Large-Signal Common-Emitter Power Gain (V_{CC} = 12.5 V): P_{IE} 0.1 W	G_{PE}	175	12.4		dB
*	Collector Efficiency (V_{CC} = 12.5 V): P_{IE} = 0.1 W	η_C	175	50		%
*	Common-Base Output Capicatance V_{CB} = 12 V	C_{obo}	1	15 (max.)		pF
	Gain-Bandwidth Product V_{CE} = 12 V, I_C = 200 mA	f_T	–	–	900	MHz

* In accordance with JEDEC registration data format JS-6 RDF-3/JS-9 RDF-7.

PERFORMANCE DATA

TYPICAL AMPLIFIER PERFORMANCE (V_{CE} = 12.5 V)

FREQUENCY (f)—MHz	INPUT POWER (P_{IB}) - W	OUTPUT POWER (P_{OB}) - W	COLLECTOR EFFICIENCY η_C	CIRCUIT
175	0.1	2	60	Fig.6
250	0.25	2	65	Fig.6
470	0.4	2	65	Fig.7
156 (Marine Transmitter)	.005	2	-	Fig.8

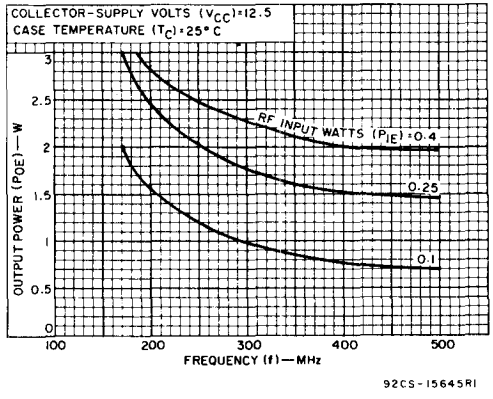


Fig.1 - Typical power output vs. frequency.

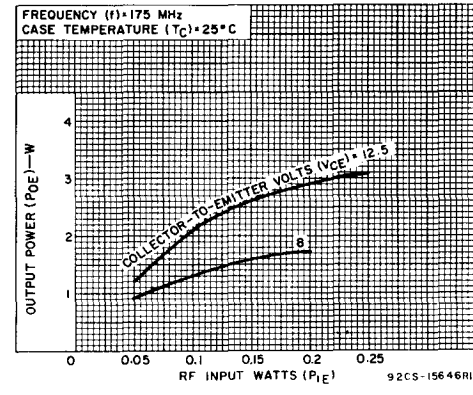


Fig. 2 - Typical power output vs. power input at 175 MHz for circuit shown in Fig.5.

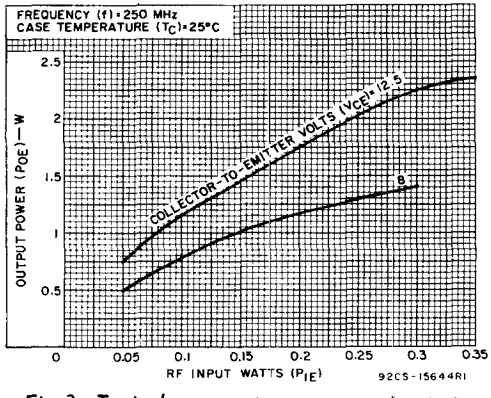


Fig. 3 - Typical power output vs. power input at 250 MHz for circuit shown in Fig.5.

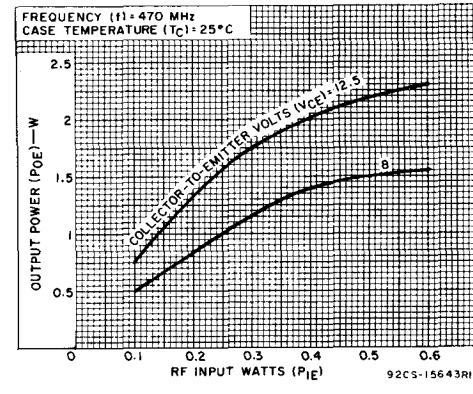
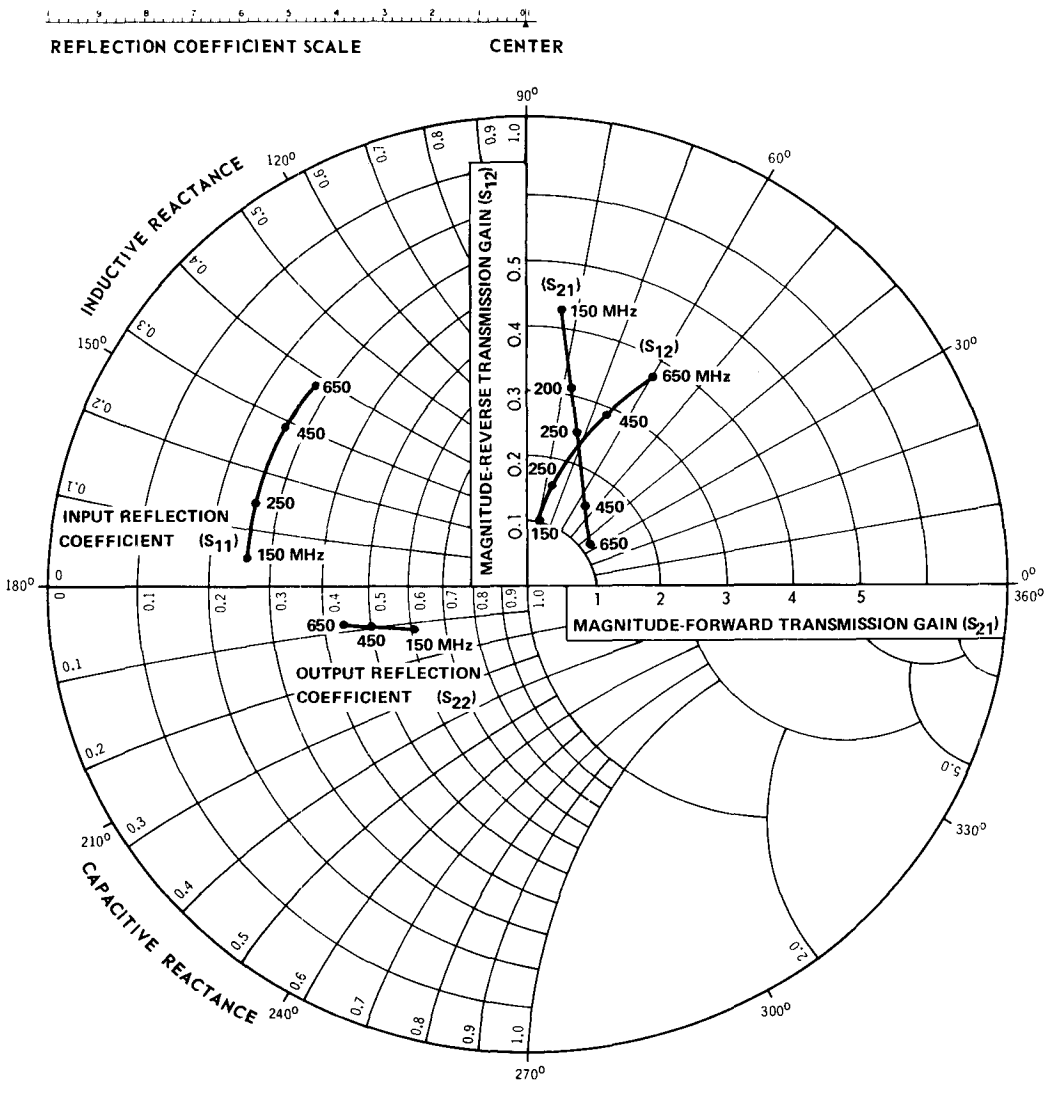


Fig. 4 - Typical power output vs. power input at 470 MHz for circuit shown in Fig.7.

DESIGN DATA

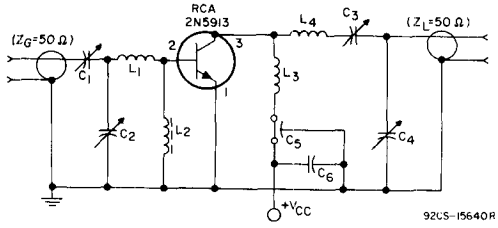


Collector-to-Emitter Voltage (V_{CE}) = 12.5 V
Collector-Current (I_C) = 100 mA
Case Temperature (T_C) = 25°C

92CM-16066

Fig. 5 - Typical S parameters vs. frequency.

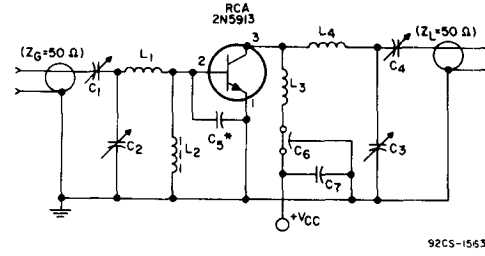
APPLICATION DATA



C_1, C_2, C_3, & C_4: 7-35 pF, ARCO 403, or equivalent
C_5: 1,000 pF, feed-through
C_6: 0.005 μF, disc ceramic

L_1: 2 turns No.16 wire, 3/16 in. ID, 1/4 in. long
L_2: Z = 450 ohms; Ferroxcube VK200-09/3B, or equivalent
L_3: 2 turns No.14 wire, 1/4 in. ID, 5/16 in. long
L_4: 3 turns No.14 wire, 3/8 in. ID, 3/8 in. long

Fig. 6 - 175/250-MHz amplifier test circuit for measurement of power output.

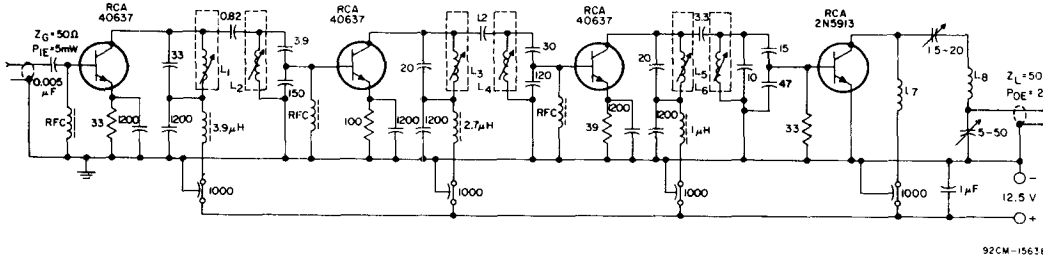


C_1, C_2, C_3: 0.9-7 pF, ARCO 400, or equivalent
C_4: 7-35 pF, ARCO 903, or equivalent
C_5: 22 pF, ± 5% silver mica
C_6: 470 pF, feed-through
C_7: 0.1 μF, disc ceramic

L_1, L_3, L_4: 1 turn No.18 wire 1/4 in. ID, 1/8 in. long
L_2: 0.39 μH, Nytronics Deci-Ductor, or equivalent

* Mount C_5 as close as possible to base and emitter pins.

Fig. 7 - 470-MHz amplifier test circuit for measurement of power output.



L_1 - L_2: 10-1/2 turns, close-wound, #22 enameled wire
L_3 - L_4: 4-1/2 turns, close-wound, #22 enameled wire
L_5 - L_6: 1-1/2 turns, 1/4 in. length, #20 bare wire
L_7: 2 turns, 3/16-in. length, 3/16-in. dia., #20 bare wire
L_8: 2-1/2 turns, 1/4-in. length, #20 bare wire

All coils on slug-tuned forms 15/64-in. O.D. Corbonyl* S.F. 10-32 threaded slug or equivalent, with 1/2-in. x 1/2-in. x 1-in. shield cans.

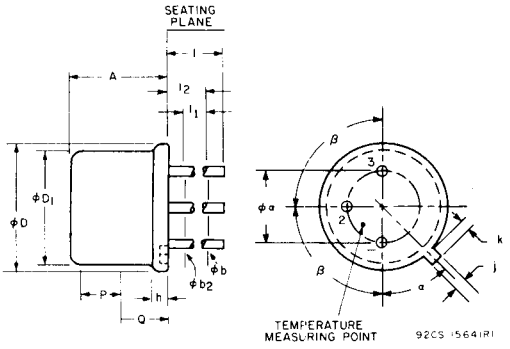
RFC: 4 turns, #30 enameled wire on Ferroxcube† ferrite bead #56-590-65/48, or equivalent

All capacitor values are in picofarads unless otherwise specified.
All resistances are in ohms and are 1/4-watt types.

* Arnold Magnetics Corp., Los Angeles, Cal.
† Ferroxcube Corp. of America, Saugerties, N.Y.

Fig. 8 - Typical circuit for a frequency-multiplier chain (f_{IN} = 13 MHz, f_{OUT} = 156 MHz) for 156-MHz marine-radio transmitter.

DIMENSIONAL OUTLINE
JEDEC No.TO-39



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
ϕa	.190	.210	4.83	5.33	
A	.240	.260	6.10	6.60	
ϕb	.016	.021	.406	.533	2
ϕb_2	.016	.019	.406	.483	2
ϕD	.350	.370	8.89	9.40	
ϕD_1	.315	.335	8.00	8.51	
h	.009	.125	.229	3.18	
j	.028	.034	.711	.864	
k	.029	.040	.737	1.02	3
l	.500		12.70		2
l_1		.050		1.27	2
l_2	.250		6.35		2
P	.100		2.54		1
Q					4
α	45^0 NOMINAL				
β	90^0 NOMINAL				

Note 1: This zone is controlled for automatic handling. The variation in actual diameter within this zone shall not exceed .010 in (.254 mm).

Note 2: (Three leads) ϕb_2 applies between l_1 and l_2. ϕb applies between l_2 and .5 in (12.70 mm) from seating plane. Diameter is uncontrolled in l_1 and beyond .5 in (12.70 mm) from seating plane.

Note 3: Measured from maximum diameter of the actual device.

Note 4: Details of outline in this zone optional.

TERMINAL CONNECTIONS

LEAD 1 – EMITTER
LEAD 2 – BASE
LEAD 3 – COLLECTOR, CASE