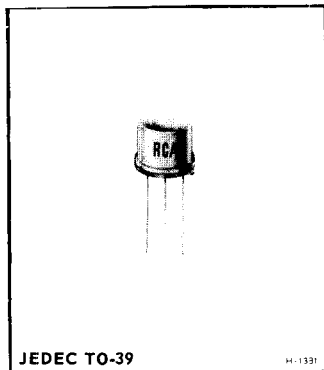


RCA
Solid State
Division

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 $\geq 1/32$ in. (0.8 mm)		
from seating plane for 10 s max.	230	°C

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.

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

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

STATIC

CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS		UNITS
		DC Voltage (V)		DC Current (mA)			Min.	Max.	
		V_{CE}	V_{EB}	I_E	I_B	I_C			
* 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)	θ_{J-C}						-	35.7	°C/W

^a Pulsed through a 25-mH inductor; duty factor = 50%.^b $T_C = 100^\circ\text{C}$.

DYNAMIC

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

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

PERFORMANCE DATA

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

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

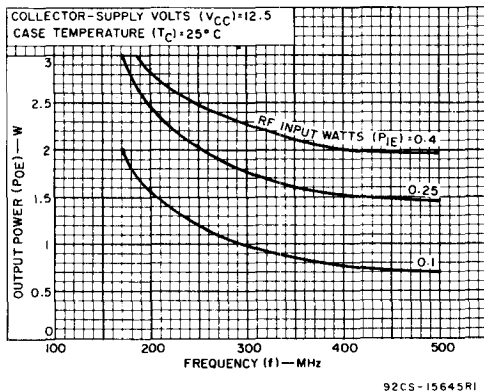


Fig. 1 - Typical power output vs. frequency.

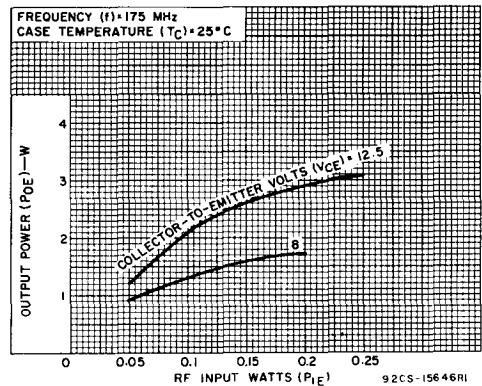


Fig. 2 - Typical power output vs. power input at 175 MHz for circuit shown in Fig.5.

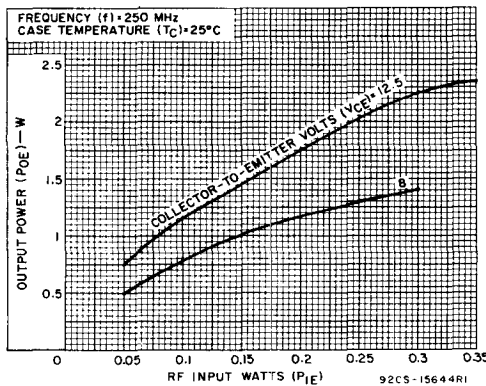


Fig. 3 - Typical power output vs. power input at 250 MHz for circuit shown in Fig.5.

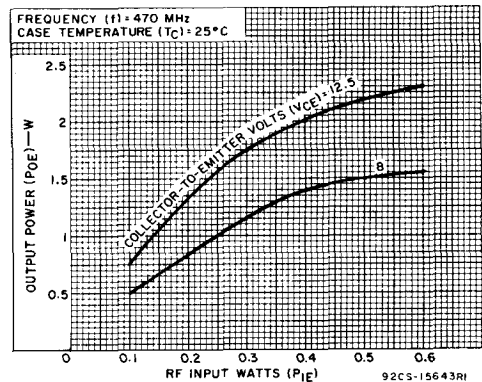
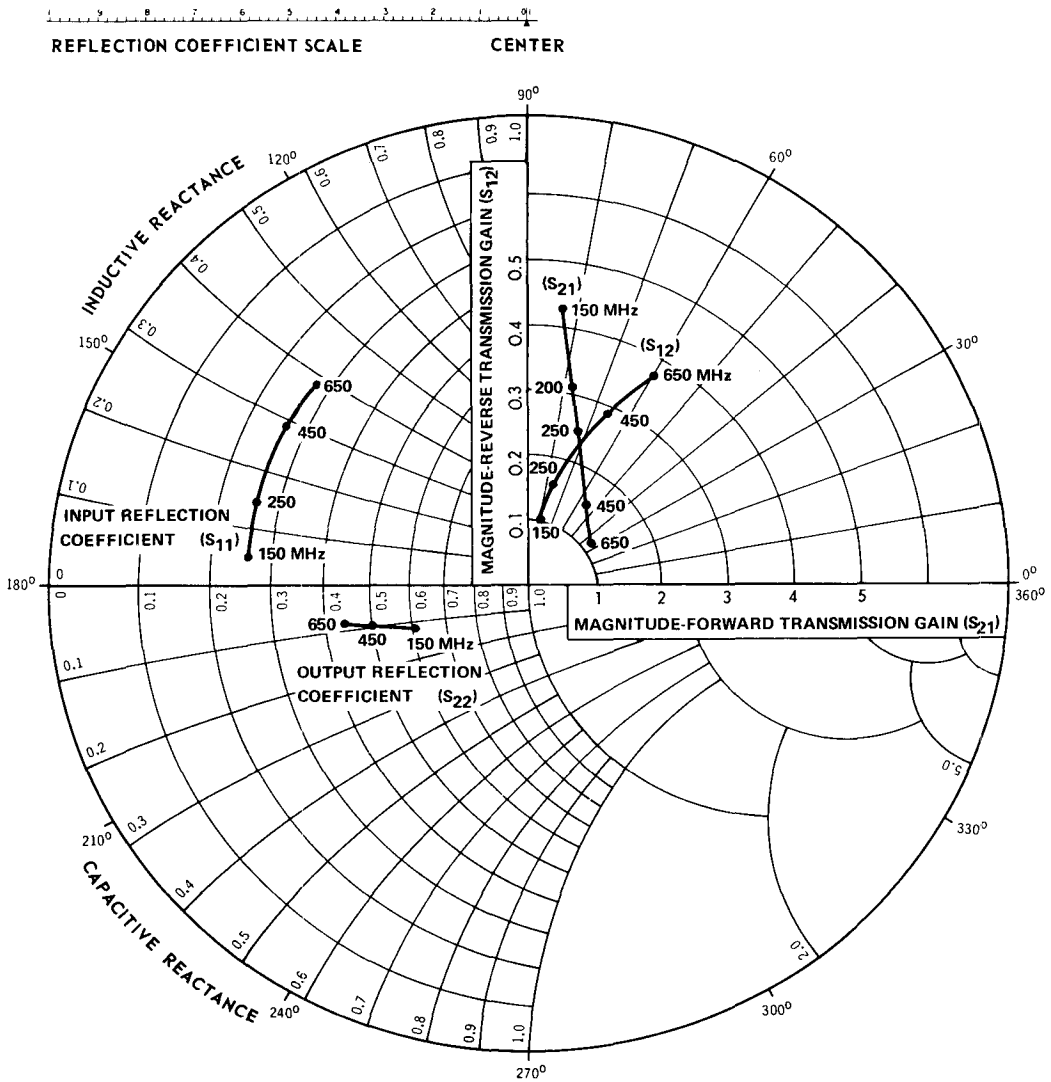


Fig. 4 - Typical power output vs. power input at 470 MHz for circuit shown in Fig.7.

DESIGN DATA

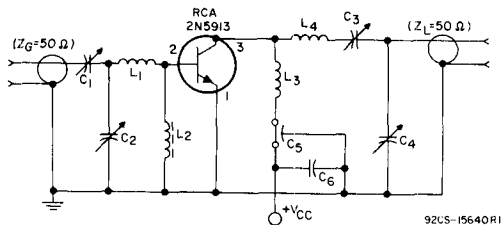


Collector-to-Emitter Voltage (V_{CE}) = 12.5 V
 Collector-Current (I_C) = 100 mA
 Case Temperature (T_C) = 25°C

92CM-16066

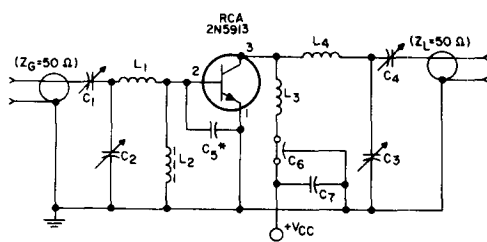
Fig. 5 - Typical S parameters vs. frequency.

APPLICATION DATA



- C₁, C₂, C₃, & C₄: 7-35 pF, ARCO 403, or equivalent
- C₅: 1,000 pF, feed-through
- C₆: 0.005 μF, disc ceramic
- L₁: 2 turns No.16 wire, 3/16 in. ID, 1/4 in. long
- L₂: Z = 450 ohms; Ferroxcube VK200-09/3B, or equivalent
- L₃: 2 turns No.14 wire, 1/4 in. ID, 5/16 in. long
- L₄: 3 turns No.14 wire, 3/8 in. ID, 3/8 in. long

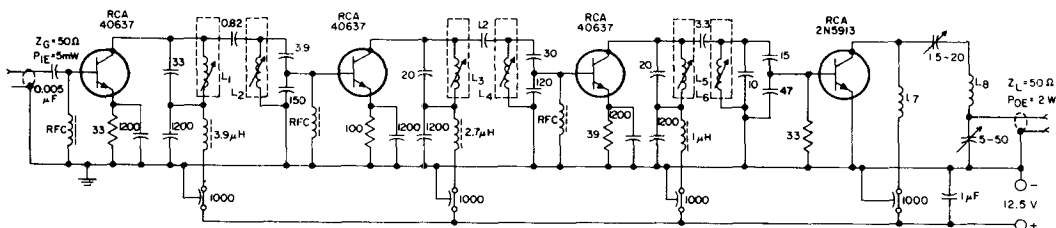
Fig. 6 - 175/250-MHz amplifier test circuit for measurement of power output.



- C₁, C₂, C₃: 0.9-7 pF, ARCO 400, or equivalent
- C₄: 7-35 pF, ARCO 903, or equivalent
- C₅: 22 pF, ± 5% silver mica
- C₆: 470 pF, feed-through
- C₇: 0.1 μF, disc ceramic
- L₁, L₃, L₄: 1 turn No.18 wire 1/4 in. ID, 1/8 in. long
- L₂: 0.39 μH, Nytronics Deciductor, or equivalent

* Mount C₅ as close as possible to base and emitter pins.

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



- L₁ - L₂: 10-1/2 turns, close-wound, #22 enameled wire
- L₃ - L₄: 4-1/2 turns, close-wound, #22 enameled wire
- L₅ - L₆: 1-1/2 turns, 1/4 in. length, #20 bare wire
- L₇: 2 turns, 3/16-in. length, 3/16-in. dia., #20 bare wire
- L₈: 2-1/2 turns, 1/4-in. length, #20 bare wire
- RFC: 4 turns, #30 enameled wire on Ferroxcube† ferrite bead #56-590-65/48, or equivalent

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.

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

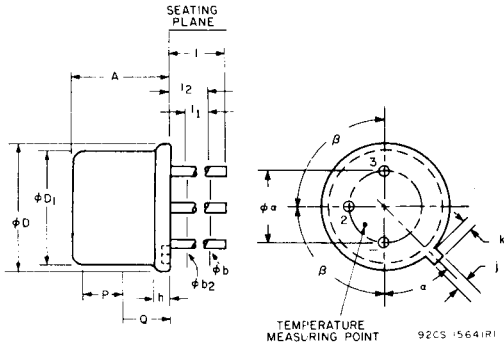
* Arnold Magnetics Corp., Los Angeles, Cal.

† Ferroxcube Corp. of America, Saugerties, N.Y.

Fig. 8 - Typical circuit for a frequency-multiplier chain ($f_{IN} = 13 \text{ MHz}$, $f_{OUT} = 156 \text{ MHz}$) 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° NOMINAL				
β	90° 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 l₁ and l₂. ϕb applies between l₂ and .5 in (12.70 mm) from seating plane. Diameter is uncontrolled in l₁ 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