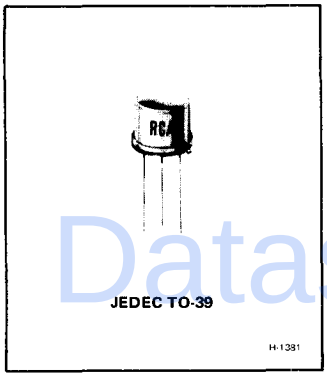
RCA
Solid State
Division

RF Power Transistors

2N4427



Silicon N-P-N Overlay Transistor

High-Gain Driver for VHF-UHF

Features:

- **1 W output with 10 dB gain (min.) at 175 MHz**
  V_{CC} = 12 V
- **0.4 W output with 5 dB gain (typ.) at 470 MHz**
  V_{CC} = 12 V

RCA-2N4427 is an epitaxial silicon n-p-n planar transistor of the "overlay" emitter electrode construction. It is intended for class A, B, or C amplifier, frequency-multiplier, or oscillator circuits; it may be used in output, driver, or pre-driver stages in vhf and uhf equipment.

In the overlay structure, a number of individual emitter sites are connected in parallel and used in conjunction with a single base and collector region. When compared with other structures, this arrangement provides a substantial increase in emitter periphery for higher current or power, and a corresponding decrease in emitter and collector areas for lower input and output capacitances. The overlay structure thus offers greater power output, gain, efficiency, and frequency capability.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

* COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	40	V
* COLLECTOR-TO-EMITTER VOLTAGE:			
With base open	V_{CEO}	20	V
* EMITTER-TO-BASE VOLTAGE	V_{EBO}	2	V
* CONTINUOUS COLLECTOR CURRENT	I_C	0.4	A
* CONTINUOUS BASE CURRENT	I_B	0.4	A
* TRANSISTOR DISSIPATION:	P_T		
At case temperatures up to 100°C		2	W
At case temperatures above 100°C		*See Fig. 14*	
* TEMPERATURE RANGE:			
Storage & Operating (Junction)		−65 to 200	°C
* LEAD TEMPERATURE (During soldering):			
At distances ≥ 1/32 in. (0.8 mm) from insulating wafer for 10 s max.		230	°C

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

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

	Characteristic	Symbol	TEST CONDITIONS							Limits		Units
			DC Voltage (V)				DC Current (mA)					
			V_{BE}	V_{EB}	V_{CB}	V_{CE}	I_E	I_B	I_C	Min.	Max.	
*	Collector-Cutoff Current:											
	With base open	I_{CEO}				12		0		–	0.02	mA
	With base-emitter junction reverse-biased	I_{CEV}	–1.5			40				–	0.1	
	T_C = 150°C		–1.5			12				–	5	
*	Emitter-Cutoff Current	I_{EBO}		2						–	0.1	mA
	Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$					0		0.1	40	–	V
*	Collector-to-Emitter Sustaining Voltage:											
	With base open	$V_{CEO(sus)}$						0	5	20	–	V
	With external base-to-emitter resistance (R_{BE}) = 10Ω	$V_{CER(sus)}$							5	40	–	
	Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$					0.1		0	2	–	V
*	Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$						20	100	–	0.5	V
*	DC Forward Current Transfer Ratio	h_{FE}				5 5			360 100	5 10	– 200	
*	Magnitude of Common-Emitter Small-Signal, Short-Circuit Forward Current Transfer Ratio (f = 200 MHz)	$\lvert h_{fe} \rvert$				15			50	2.5	–	
*	Collector-to-Base Capacitance (f = 1 MHz)	C_{ob}			12		0			–	4	pF
	RF Power Output Class C Amplifier, Unneutralized (f = 175 MHz, P_{IE} = 0.1 W, $\eta_C \geq$ 50%) See Fig. 2	P_{OE}			12 (V_{CC})					1	–	W
*	Available Amplifier Signal Input Power (f = 175 MHz, P_{OE} = 1 W, Z_{IN} = 50 Ω) See Fig. 2	P_i			12 (V_{CC})					–	0.1	W
*	Collector Efficiency (f = 175 MHz, P_{OE} = 1 W, Z_{IN} = 50 Ω) See Fig. 2	η_C			12 (V_{CC})					50	–	%
	Thermal Resistance Junction-to-Case	$R_{\theta JC}$								–	50	°C/W

* In accordance with JEDEC registration data format JS–6 RDF–3.

175 MHz OPERATION

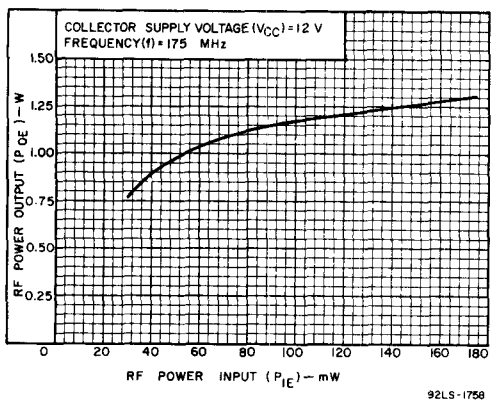
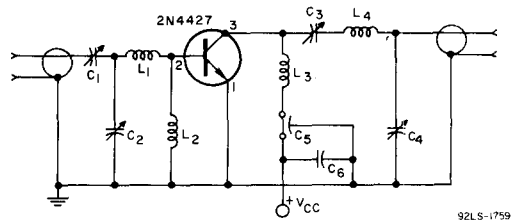


Fig.1—Power output vs. power input.



C_1, C_2, C_3, & C_4: 3-15 pF trimmer, ARCO 403 or equivalent
C_5: 1,000 pF feedthrough
C_6: 0.01 μF disc.
L_1: 2 turns No.16 wire, 3/16 in. (4.76 mm) ID, 1/4 in. (6.35 mm) long
L_2: Ferrite choke, Z = 450 Ω
L_3: 2 turns No.16 wire, 1/4 in. (6.35 mm) ID, 1/4 in. (6.35 mm) long
L_4: 4 turns No.16 wire, 3/8-in. (9.52 mm) ID, 3/8 in. (9.52 mm) long

Fig.2—175-MHz rf amplifier circuit for power-output test.

470 MHz OPERATION

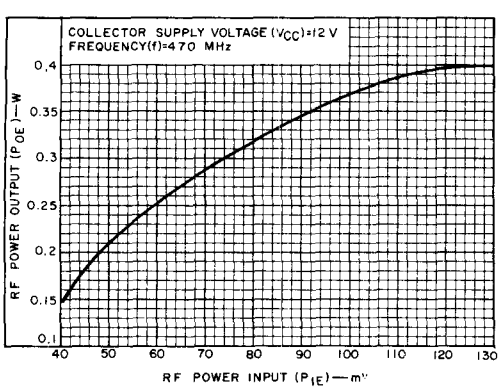
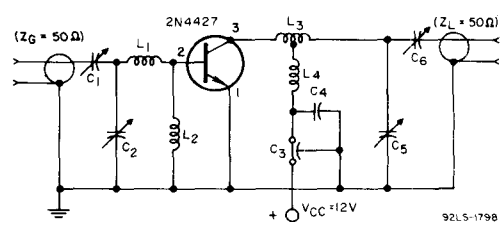


Fig.3—Power output vs. power input.



C_1, C_2, C_5, & C_6: 0.9–7 pF trimmer, ARCO 400, or equivalent
C_3: 1000 pF feedthrough
C_4: 0.02 μF disc.
L_1: 1 turn No.20 wire, 3/16 in. (4.76 mm) ID, Space wire diameter
L_2: 0.47 μH Nytronics Corp., or equivalent
L_3: 2 turns No.18 wire, 1/4 in. (6.35 mm) ID, Space wire diameter C.T.
L_4: 2 turns No.20 wire, 3/16 in. (4.76 mm) ID, Space wire diameter

Fig.4—470-MHz rf amplifier circuit.

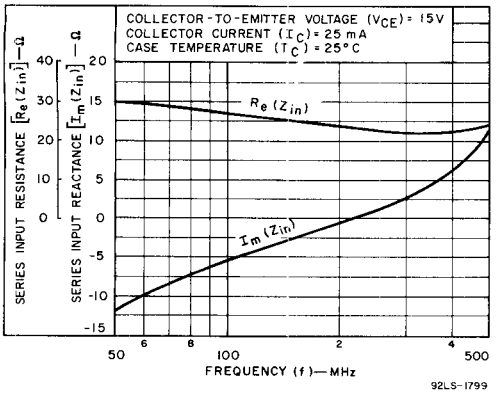


Fig.5—Series input impedance vs. frequency.

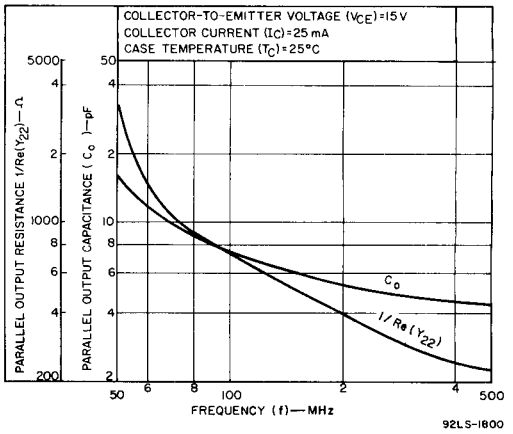


Fig.6—Parallel output resistance & capacitance vs. frequency.

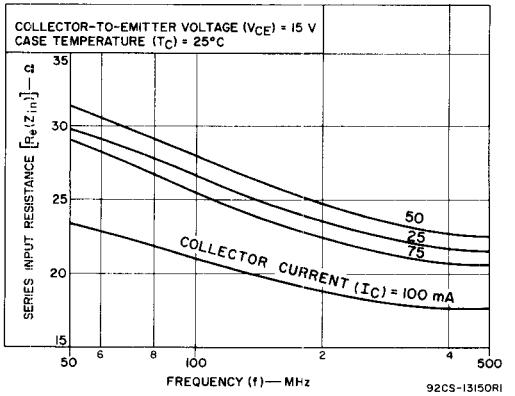


Fig.7—Series input resistance vs. frequency.

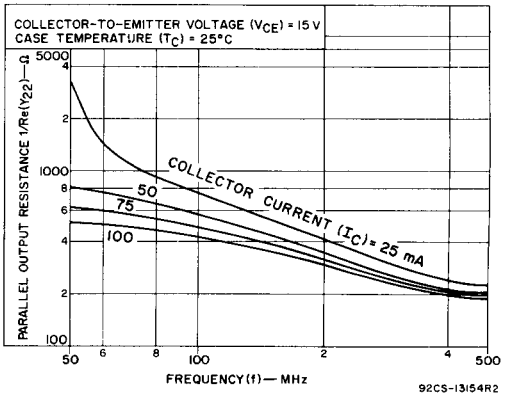


Fig.8—Parallel output resistance vs. frequency.

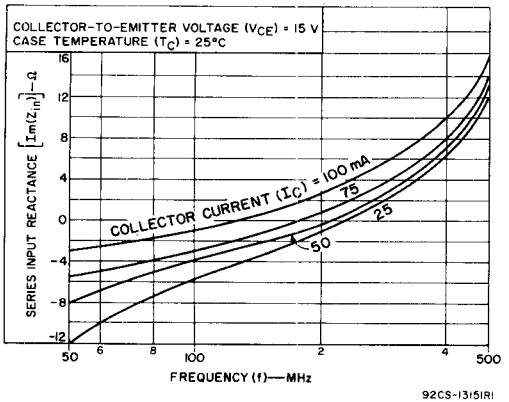


Fig.9—Series input reactance vs. frequency.

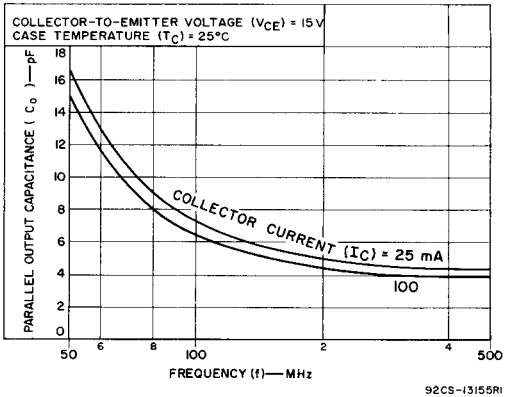


Fig.10—Parallel output capacitance vs. frequency.

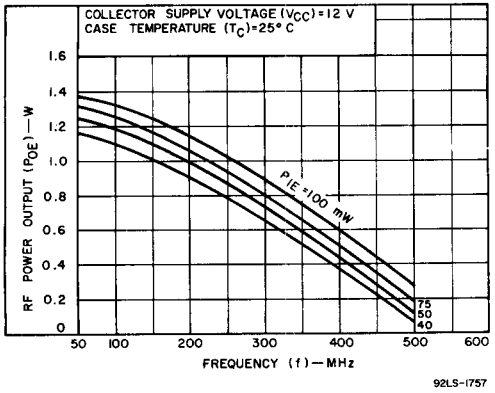


Fig.11– Power output vs. frequency.

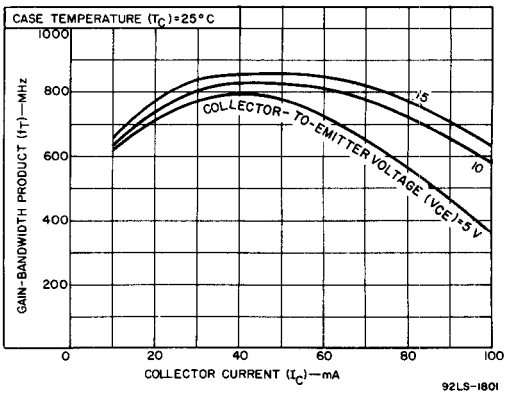


Fig.12–Gain-bandwidth product vs. collector current.

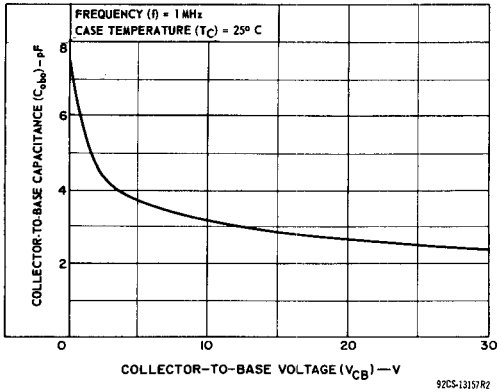


Fig.13–Variation of collector-to-base capacitance.

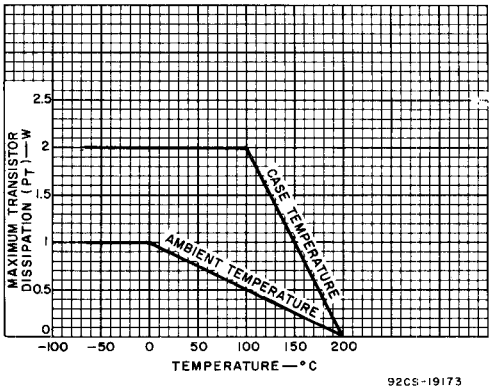
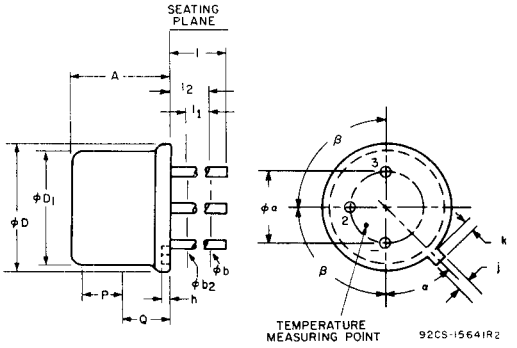


Fig.14– Dissipation derating curve.

DIMENSIONAL OUTLINE
JEDEC No. TO-39



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
ϕa	0.190	0.210	4.83	5.33	
A	0.240	0.260	6.10	6.60	
ϕb	0.016	0.021	0.406	0.533	2
ϕb_2	0.016	0.019	0.406	0.483	2
ϕD	0.350	0.370	8.89	9.40	
ϕD_1	0.315	0.335	8.00	8.51	
h	0.009	0.041	0.229	1.04	
j	0.028	0.034	0.711	0.864	
k	0.029	0.040	0.737	1.02	3
l	0.500		12.70		2
l_1		0.050		1.27	2
l_2	0.250		6.35		2
P	0.100		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 0.010 in (0.254 mm).

Note 2: (Three leads) ϕb_2 applies between l_1 and l_2. ϕb applies between l_2 and 0.5 in (12.70 mm) from seating plane. Diameter is uncontrolled in l_1 and beyond 0.5 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