RCA RF TRANSISTORS

2N2857

SILICON N-P-N EPITAXIAL PLANAR TRANSISTOR

For UHF Applications in Industrial and Military Equipment

RCA-2N2857* is a double-diffused epitaxial planar transistor of the silicon n-p-n type. It is extremely useful in low-noise-amplifier, oscillator, and converter applications at frequencies up to 500 Mc with the common-emitter configuration, and up to 1200 Mc with the common-base configuration.

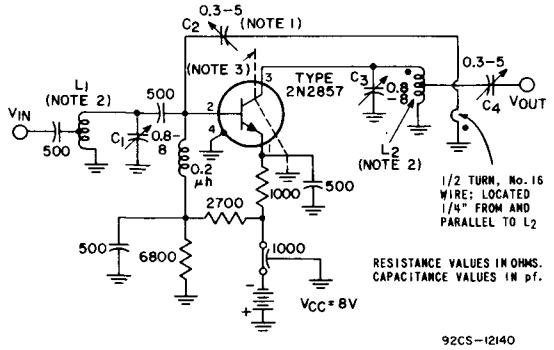
The 2N2857 utilizes a four-lead package which has the same case dimensions as the JEDEC TO-18 package. All active elements of the transistor are insulated from the case, which may be grounded by means of the fourth lead in applications requiring shielding of the device.

Maximum Ratings, *Absolute-Maximum Values:*

COLLECTOR-TO-BASE VOLTAGE, V_{CBO}	30 max.	volts
COLLECTOR-TO-EMITTER VOLTAGE, V_{CEO}	15 max.	volts
EMITTER-TO-BASE VOLTAGE, V_{EBO}	2.5 max.	volts
COLLECTOR CURRENT, I_C	20 max.	ma
TRANSISTOR DISSIPATION, P_T:		
For operation with heat sink:		
At case temperatures** up to 25° C	300 max.	mw
At case temperatures** above 25° C	Derate at 1.72	mw/°C
For operation in free air:		
At free-air temperatures up to 25° C	200 max.	mw
At free-air temperatures above 25° C	Derate at 1.14	mw/°C
TEMPERATURE RANGE:		
Storage and Operating (Junction)	-65 to +200	°C
LEAD TEMPERATURE (During soldering):		
At distances ≥ 1/32 inch from seating surface for 10 seconds max.	230 max.	°C

* Formerly Dev. No. TA-2333

** Measured at center of seating surface.



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NOTE 1: (NEUTRALIZATION PROCEDURE): (A) CONNECT A 450-Mc SIGNAL GENERATOR (WITH Zout = 50 OHMS) TO THE INPUT TERMINALS OF THE AMPLIFIER. (B) CONNECT A 50-OHM R-F VOLTMETER ACROSS THE OUTPUT TERMINALS OF THE AMPLIFIER. (C) APPLY V_{EE} AND V_{CC}, AND WITH THE SIGNAL GENERATOR ADJUSTED FOR 10 mv OUTPUT, TUNE C_1, C_3, AND C_4 FOR MAXIMUM OUTPUT. (D) INTERCHANGE THE CONNECTIONS TO THE SIGNAL GENERATOR AND THE OUTPUT INDICATOR. (E) WITH SUFFICIENT SIGNAL APPLIED TO THE OUTPUT TERMINALS OF THE AMPLIFIER, ADJUST C_2 FOR A MINIMUM INDICATION AT THE INPUT. (F) REPEAT STEPS (A), (B), AND (C) TO DETERMINE IF RETUNING IS NECESSARY.

NOTE 2: L_1 & L_2 — SILVER-PLATED BRASS ROD, 1-1/2" LONG x 1/4" DIA. INSTALL AT LEAST 1/2" FROM NEAREST VERTICAL CHASSIS SURFACE. TAP 1-1/4" FROM CHASSIS END.

NOTE 3: EXTERNAL INTERLEAD SHIELD TO ISOLATE THE COLLECTOR LEAD FROM THE EMITTER AND BASE LEADS.

Fig. 1-Neutralized Amplifier Circuit Used to Measure 450-Mc Power Gain for Type 2N2857.

Features:

- High Gain-Bandwidth Product— f_T = 1000 Mc min.
- High Converter (450-to-30 Mc) Gain— G_C = 15 db typ. for circuit bandwidth of approximately 2 Mc
- High Power Gain as Neutralized Amplifier— G_{pe} = 12.5 db min. at 450 Mc for circuit bandwidth of 20 Mc
- High Power Output as UHF Oscillator— P_O = 30 mw min., 40 mw typ. at 500 Mc = 20 mw typ. at 1 Gc will oscillate at frequencies up to 2 Gc
- Low Device Noise Figure— NF = 4.5 db max. as 450-Mc Amplifier = 7 db typ. as 450-to-30 Mc Converter
- Low Collector-to-Base Time Constant— $r_b'C_c$ = 15 psec max.

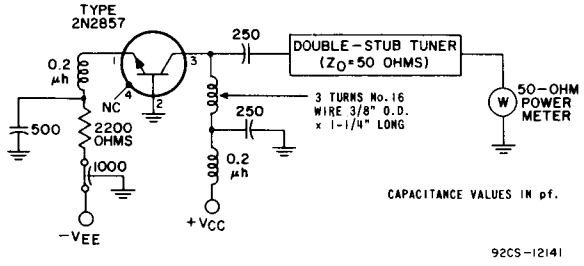

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Fig. 2 - Oscillator Circuit Used to Measure 500-Mc Power Output for Type 2N2857.

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ELECTRICAL CHARACTERISTICS, *At a Free-Air Temperature, T_{FA}, of 25° C:*

Characteristic	Symbol	TEST CONDITIONS							LIMITS			Units
		Frequency f	DC Collector-to-Base Voltage V_{CB}	DC Collector-to-Emitter Voltage V_{CE}	DC Base-to-Emitter Voltage V_{BE}	DC Emitter Current I_E	DC Base Current I_B	DC Collector Current I_C	Type 2N2857			
		Mc	volts	volts	volts	ma	ma	ma	Min.	Typ.	Max.	
Collector-Cutoff Current	I_{CBO}		15			0			-	-	0.01	μa
Collector-to-Base Breakdown Voltage	BV_{CBO}					0		0.001	30	-	-	volts
Collector-to-Emitter Breakdown Voltage	BV_{CEO}						0	3	15	-	-	volts
Emitter-to-Base Breakdown Voltage	BV_{EBO}					0.01		0	2.5	-	-	volts
DC Forward-Current Transfer Ratio	h_{FE}			1				3	30	-	150	
Small-Signal Forward-Current Transfer Ratio	h_{fe}	0.001[a] 100[b]		6 6				2 5	50 10	- -	220 19	
Output Capacitance	C_{ob}	0.140[a] 0.140[b]	10 10			0 0			- -	- -	1.8 1.3	pf pf
Input Capacitance	C_{ib}	0.140[a]			0.5			0	-	1.4	-	pf
Collector-to-Base Time Constant	$r_b'C_c$	31.9[b]	6					2	4	-	15	psec
Small-Signal, Common-Emitter Power Gain in Neutralized Amplifier Circuit (See *Fig. 10*)	G_{pe}	450[b]		6				1.5	12.5	-	19	db
Power Output as Oscillator (See *Fig. 11*)	P_o	500[b]	10			-12			30	-	-	mw
UHF Noise Figure	NF	450[b,c]		6				1.5	-	4	4.5	db

[a] Fourth lead (case) not connected. [b] Fourth lead (case) grounded. [c] Source Resistance, R_g = 50 ohms.

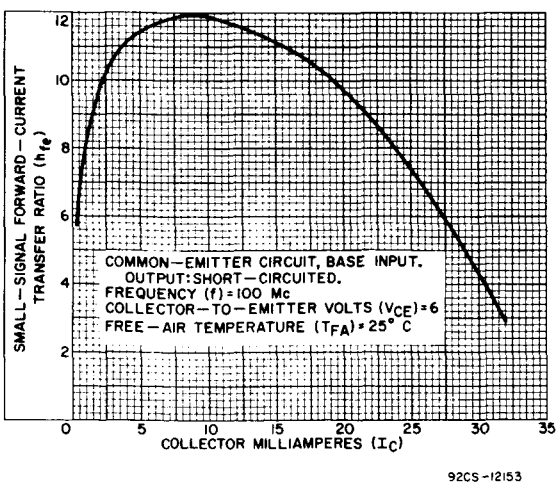
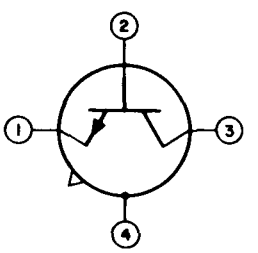


Fig. 3 - Small-Signal Beta Characteristic for Type 2N2857.

TERMINAL DIAGRAM
Bottom View



LEAD 1 – EMITTER
LEAD 2 – BASE
LEAD 3 – COLLECTOR
LEAD 4 – CONNECTED TO CASE

Two-Port Admittance (y) Parameters as Functions of Collector Current (I_C) for Type 2N2857

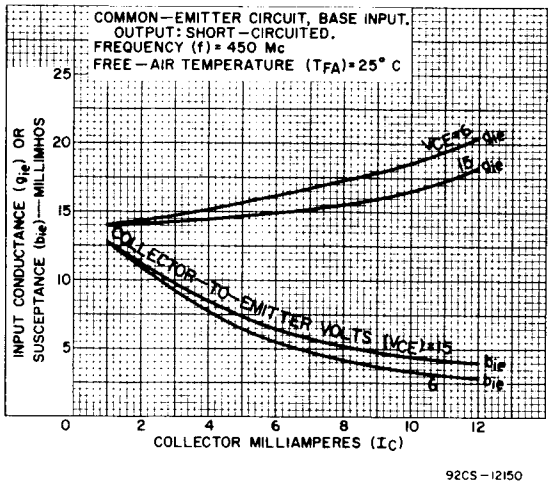


Fig. 4 - Input Admittance (y_{ie})

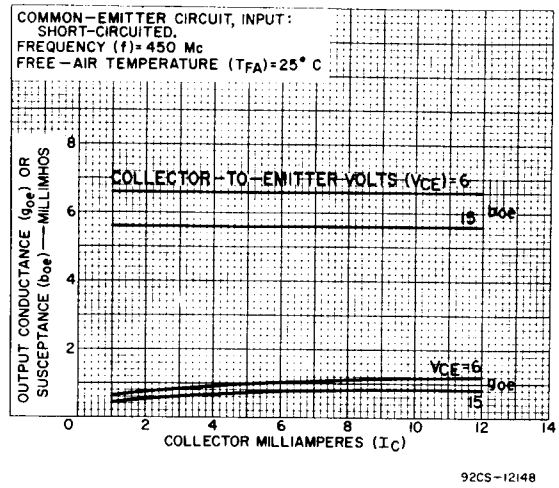


Fig. 6 - Output Admittance (y_{oe})

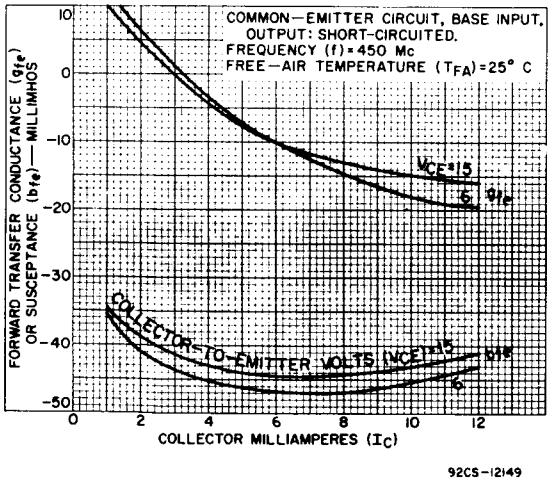


Fig. 5 - Forward Transadmittance (y_{fe})

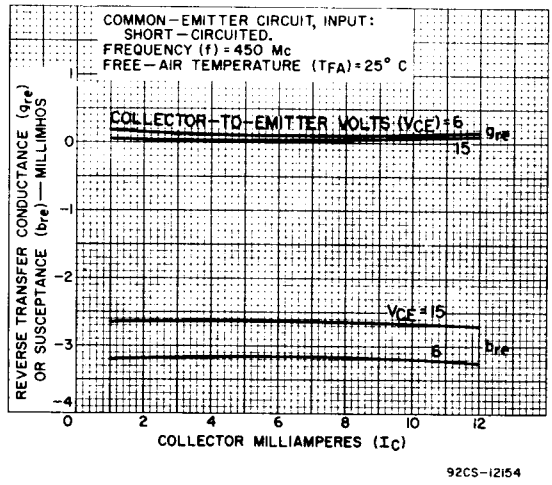
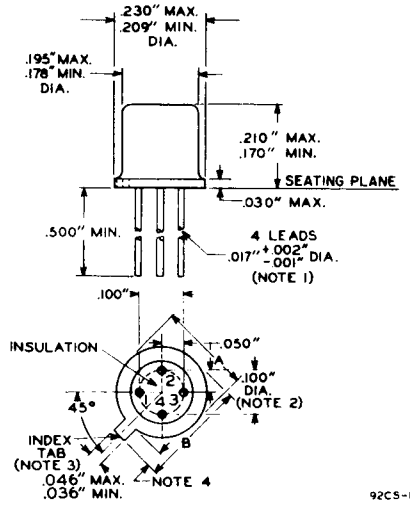


Fig. 7 - Reverse Transadmittance (y_{re})

DIMENSIONAL OUTLINE



NOTE 1: THE SPECIFIED LEAD DIAMETER APPLIES IN THE ZONE BETWEEN 0.050" AND 0.250" FROM THE SEATING PLANE. FROM 0.250" TO THE END OF THE LEAD A MAXIMUM DIAMETER OF 0.021" IS HELD. OUTSIDE OF THESE ZONES, THE LEAD DIAMETER IS NOT CONTROLLED.

NOTE 2: MAXIMUM DIAMETER LEADS AT A GAUGING PLANE 0.054" + 0.001" - 0.000" BELOW SEATING PLANE TO BE WITHIN 0.007" OF THEIR TRUE LOCATION RELATIVE TO MAX. WIDTH TAB AND TO THE MAXIMUM 0.230" DIAMETER MEASURED WITH A SUITABLE GAUGE. WHEN GAUGE IS NOT USED, MEASUREMENT WILL BE MADE AT SEATING PLANE.

NOTE 3: FOR VISUAL ORIENTATION ONLY.

NOTE 4: TAB LENGTH TO BE 0.028" MINIMUM - 0.048" MAXIMUM, AND WILL BE DETERMINED BY SUBTRACTING DIAMETER A FROM DIMENSION B.

Two-Port Admittance (y) Parameters as Functions of Frequency (f) for Type 2N2857

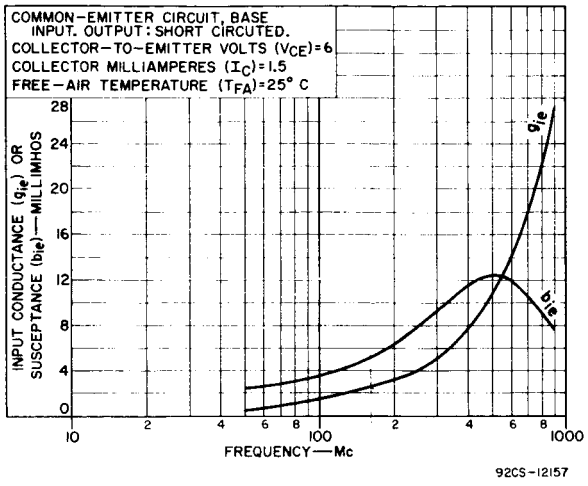


Fig. 8 - Input Admittance (y_{ie})

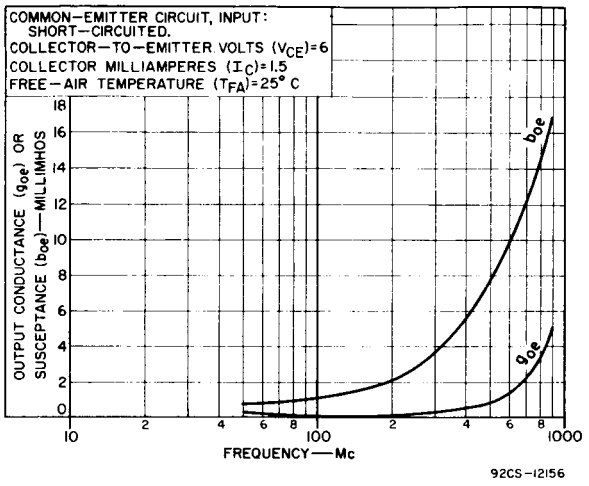


Fig. 10 - Output Admittance (y_{oe})

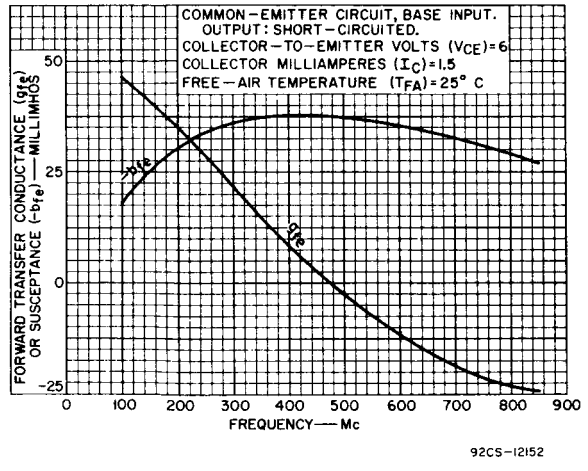


Fig. 9 - Forward Transadmittance (y_{fe})

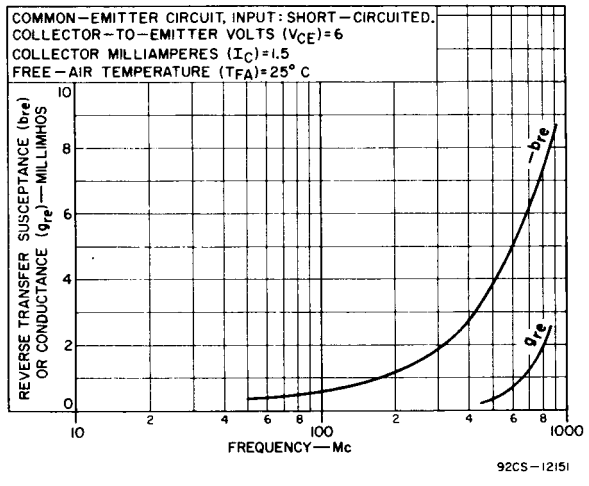


Fig. 11 - Reverse Transadmittance (y_{re})

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