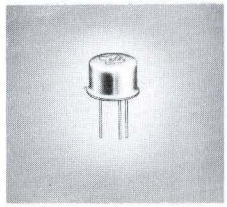
TYPES 2N1141, 2N1142, 2N1143

P-N-P DIFFUSED-BASE MESA GERMANIUM TRANSISTORS

TYPES 2N1141, 2N1142, 2N1143
BULLETIN NO. DL-S 1184, DECEMBER 1959
REPLACES BULLETIN NO. DL-S 1032, JANUARY, 1959



UHF Transistors Manufactured by Gaseous Diffusion

For Reliable RF Applications in the VHF Range

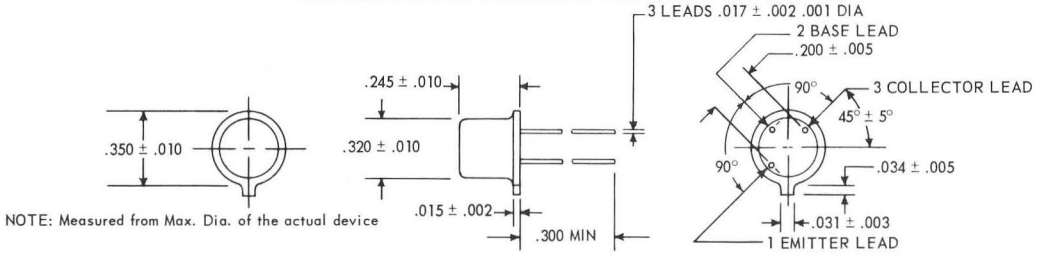
environmental testing

To ensure maximum reliability, stability, and long life, all units are heat cycled from −55°C and room humidity to +95°C and 95% relative humidity for four complete cycles over an eight-hour period. All units are given a stabilization bake at +100°C for one hundred hours, then thoroughly tested for rigid adherence to specified design characteristics. These units meet or exceed the mechanical and environmental requirements of MIL-S-19500B.

mechanical data

Welded case with glass-to-metal hermetic seal between case and leads. Approximate unit weight, 1 gram. These units meet JEDEC outline TO-5. except lead length .300 minimum.

THE COLLECTOR IS GROUNDED INTERNALLY TO THE CASE



NOTE: Measured from Max. Dia. of the actual device

absolute maximum ratings at 25°C case temperature (Unless otherwise specified)*

Storage Temperature	−65°C to +100°C	Collector Current	100 ma
Junction Temperature	+100°C	Base Current	50 ma
Emitter Current	100 ma	Total Device Dissipation	750 mw**

typical design characteristics at 25°C

symbol	parameter	conditions	type	min.	typ.	max.	units
I_{CBO}	Collector Reverse Current	$V_{CB} = -15$ v, $I_E = 0$	All	—	−0.7	−5	μa
I_{EBO}	Emitter Reverse Current	$V_{EB} = -0.5$ v, $I_C = 0$	All	—	−0.2	—	μa
BV_{CBO}	Collector-Base Breakdown Voltage	$I_C = -100$ μa, $I_E = 0$	2N1141 2N1142 2N1143	−35 −30 −25	−40 −40 −40	— — —	v v v
BV_{EBO}	Emitter-Base Breakdown Voltage	$I_E = -100$ μa, $I_C = 0$	2N1141 2N1142 2N1143	−1.0 −0.7 −0.5	−1.6 −1.6 −1.6	— — —	v v v
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = -50$ ma, $I_B = -10$ ma	All	—	—	−2	v
h_{FE}	DC Forward Current Transfer Ratio	$I_C = -10$ ma, $V_{CE} = -10$ v	All	10	40	—	—

*Maximum voltage ratings not specified because exceeding breakdown voltages will not permanently damage transistor characteristics so long as other maximum ratings are not exceeded.

**Derate at 10 mw/°C. This is equivalent to a maximum power rating of 750 mw at a case temperature of 25°C. The power rating in free air at 25°C is 300 mw.

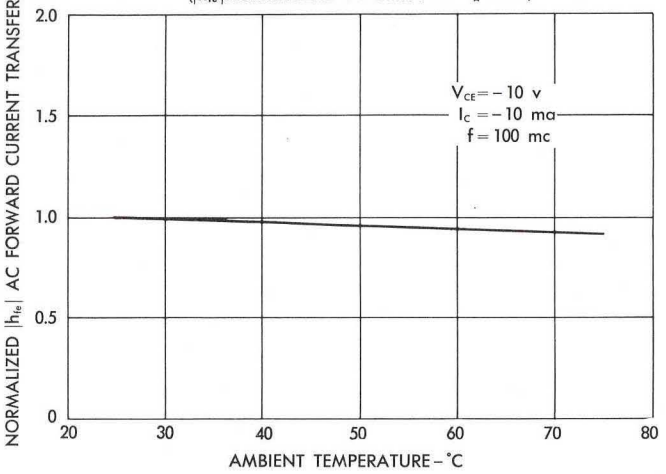
LICENSED UNDER BELL SYSTEM PATENTS

SEMICONDUCTOR-COMPONENTS DIVISION

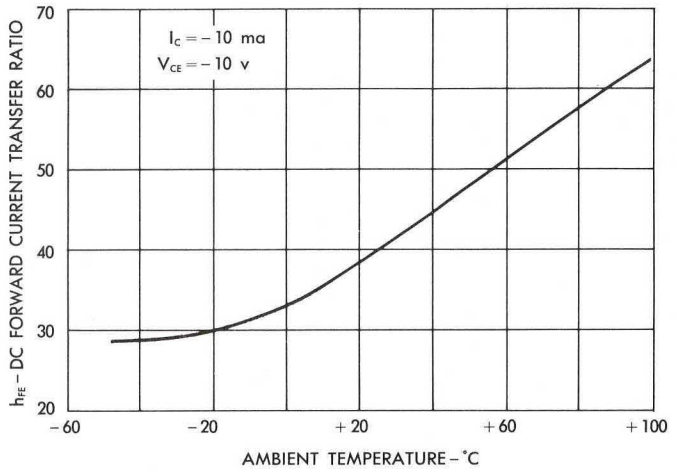
TEXAS INSTRUMENTS
INCORPORATED
SEMICONDUCTOR-COMPONENTS DIVISION
P. O. BOX 312 • 13500 N. CENTRAL EXPRESSWAY
DALLAS, TEXAS

TYPICAL OPERATING CHARACTERISTICS AT 25°C

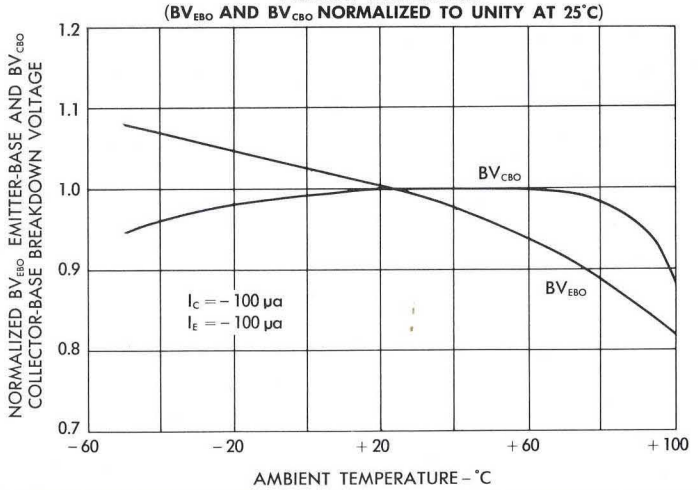
NORMALIZED AC FORWARD CURRENT TRANSFER RATIO vs AMBIENT TEMPERATURE ($|h_{fe}|$ NORMALIZED TO UNITY AT $T_A = 25°C$)



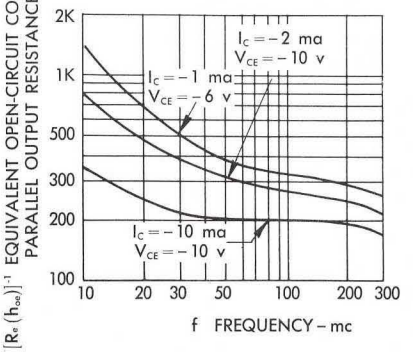
DC FORWARD CURRENT TRANSFER RATIO vs AMBIENT TEMPERATURE



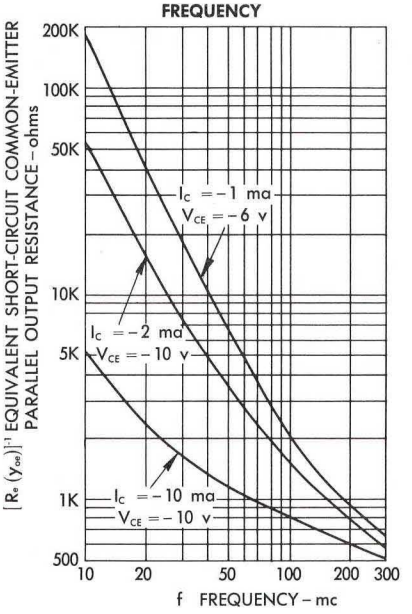
NORMALIZED EMITTER-BASE AND COLLECTOR-BASE BREAKDOWN VOLTAGE vs AMBIENT TEMPERATURE (BV_{EBO} AND BV_{CBO} NORMALIZED TO UNITY AT 25°C)



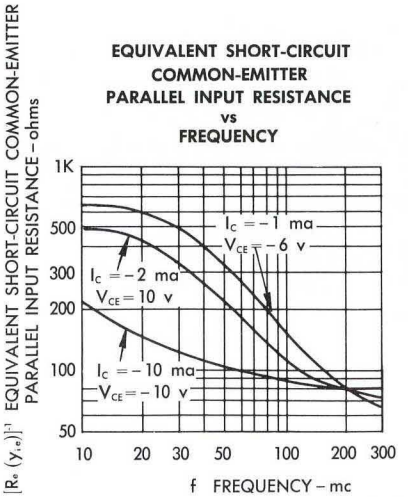
EQUIVALENT OPEN-CIRCUIT COMMON-EMITTER PARALLEL OUTPUT RESISTANCE vs FREQUENCY



EQUIVALENT SHORT-CIRCUIT COMMON-EMITTER PARALLEL OUTPUT RESISTANCE vs FREQUENCY



EQUIVALENT SHORT-CIRCUIT COMMON-EMITTER PARALLEL INPUT RESISTANCE vs FREQUENCY

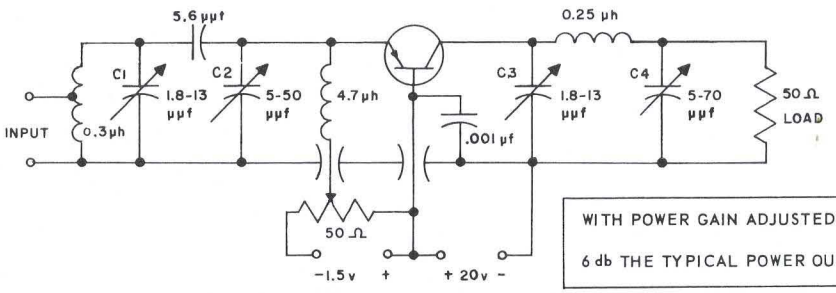


TEXAS INSTRUMENTS
INCORPORATED
SEMICONDUCTOR-COMPONENTS DIVISION
P. O. BOX 312 • 13500 N. CENTRAL EXPRESSWAY
DALLAS, TEXAS

SC350A
PRINTED IN U.S.A.

TYPICAL DESIGN AND OPERATING CHARACTERISTICS AT 25°C

100 mc AMPLIFIER (Class C)



C1 – INPUT TUNING

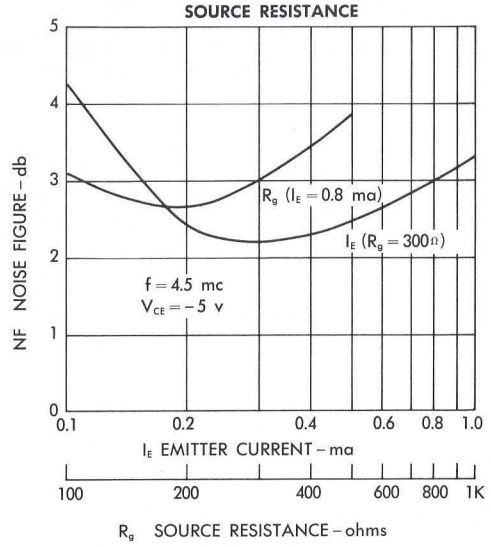
C2 – FEEDBACK ADJ

C3 – TUNING

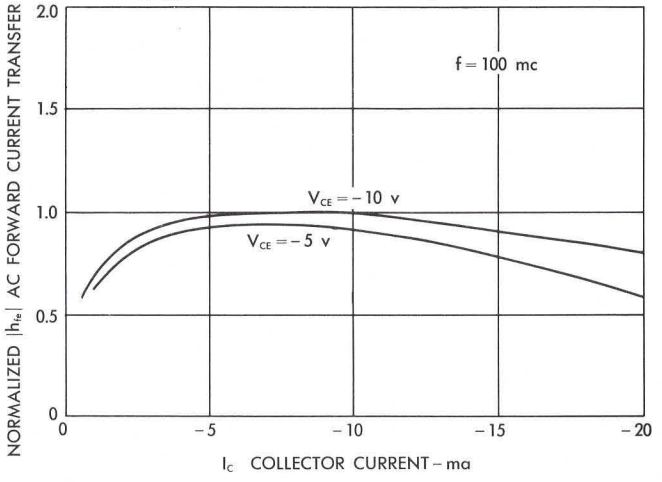
C4 – MATCHING

WITH POWER GAIN ADJUSTED FOR	2N1141	2N1142	2N1143
6 db THE TYPICAL POWER OUTPUT IS	185 mw	175 mw	165 mw

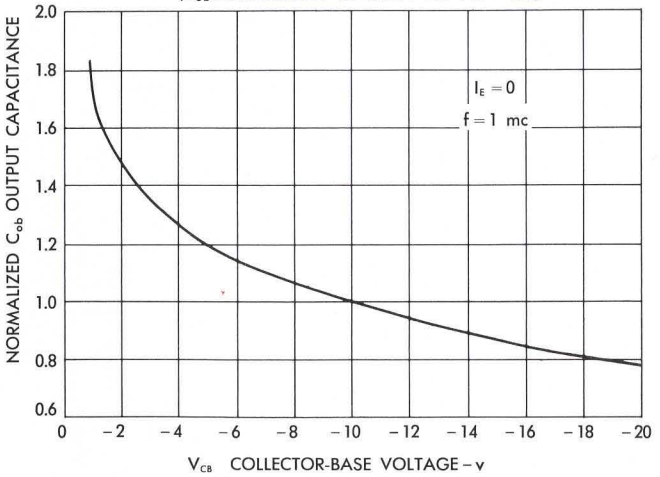
NOISE FIGURE vs EMITTER CURRENT AND SOURCE RESISTANCE



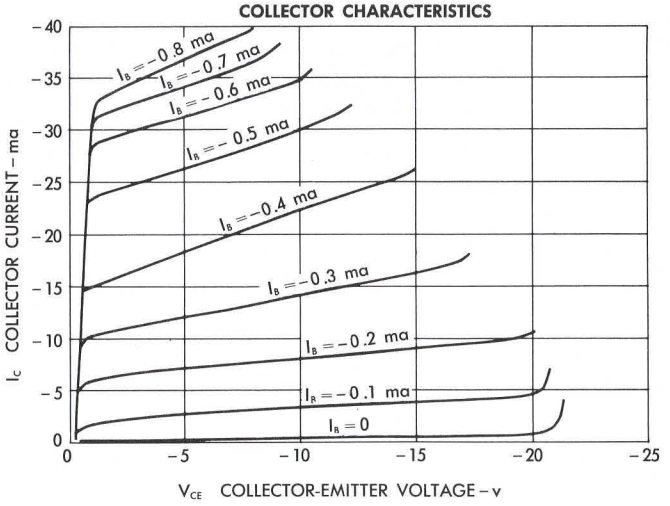
NORMALIZED AC FORWARD CURRENT TRANSFER RATIO vs COLLECTOR CURRENT ($|h_{fe}|$ NORMALIZED TO UNITY AT I_C = −10ma, V_{CE} = −10v)



NORMALIZED OUTPUT CAPACITANCE vs COLLECTOR-BASE VOLTAGE (C_{ob} NORMALIZED TO UNITY AT V_{CB} = −10v)



COLLECTOR CHARACTERISTICS



TYPES 2N1141, 2N1142, 2N1143

TYPICAL DESIGN CHARACTERISTICS AT 25°C

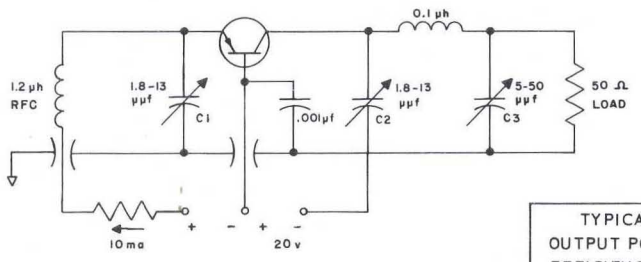
symbol	parameter	conditions	type	min.	typ.	max.	units
h_{ib}	AC Common-Base Input Resistance	$I_C = -10$ ma, $V_{CB} = -10$ v, f = 1 kc	All	—	3.6	—	ohms
h_{rb}	AC Common-Base Reverse Voltage Feedback Ratio	$I_C = -10$ ma, $V_{CB} = -10$ v, f = 1 kc	All	—	2×10^{-3}	—	—
h_{ob}	AC Common-Base Output Conductance	$I_C = -10$ ma, $V_{CB} = -10$ v, f = 1 kc	All	—	40	—	μmhos
h_{fb}	AC Common-Base Forward Current Transfer Ratio	$I_C = -10$ ma, $V_{CB} = -10$ v, f = 1 kc	All	—	0.980	—	—
$\lvert h_{fe} \rvert$	AC Common-Emitter Forward Current Transfer Ratio	$I_C = -10$ ma, $V_{CE} = -10$ v, f = 100 mc	2N1141 2N1142 2N1143	12 10 8	13.5 11.5 9.5	— — —	db db db
$f_{\alpha b}$	Common-Base Alpha Cutoff Frequency	$I_C = -10$ ma, $V_{CB} = -10$ v	2N1141 2N1142 2N1143	— — —	750 600 480	— — —	mc mc mc
C_{Tc}	Collector Transition Capacitance (See Note)	$V_{CB} = -10$ v, $I_E = 0$, f = 1 mc	2N1141 2N1142 2N1143	— — —	1.2 1.4 1.5	1.5 — —	$\mu\mu$f $\mu\mu$f $\mu\mu$f
$r_b' C_c$	Collector-Base Time Constant	$V_{CB} = -10$ v, $I_E = 3$ ma, f = 30 mc	2N1141 2N1142 2N1143	— — —	30 40 50	— — —	ohm -$\mu\mu$f ohm -$\mu\mu$f ohm -$\mu\mu$f
$Re(h_{ie})$	Real Part Common-Emitter Input Impedance	$V_{CE} = -10$ v, $I_C = -10$ ma, f = 250 mc	2N1141 2N1142 2N1143	— — —	65 80 110	70 — —	ohms ohms ohms
C_{Te}	Emitter Transition Capacitance (See Note)	$V_{EB} = -0.5$ v, $I_C = 0$, f = 1 mc	All	—	2.5	—	$\mu\mu$f

NOTE: Parasitic Capacities of the Header are: $C_{cb} = 0.6$ $\mu\mu$f, $C_{eb} = 0.3$ $\mu\mu$f, $C_{ce} = 0.6$ $\mu\mu$f

typical operating characteristics at 25°C

symbol	parameter	conditions	type	min.	typ.	max.	units
NF	Common-Emitter Noise Figure	$I_E = 0.8$ ma, $V_{CE} = -5$ v, f = 4.5 mc, Rg = 300 ohms	2N1141 2N1142 2N1143	— — —	3.0 3.5 4.0	— — —	db db db
NF	Common-Emitter Noise Figure	$I_E = 1$ ma, $V_{CE} = -10$ v, f = 100 mc, Rg = 75 ohms	2N1141	—	4.5	—	db
NF	Common-Emitter Noise Figure	$I_E = 1$ ma, $V_{CE} = -10$ v, f = 200 mc, Rg = 50 ohms	2N1141	—	6.5	—	db
η	Oscillator Efficiency	$I_C = -10$ ma, $V_{CE} = -20$ v, f = 400 mc	2N1141	—	13	—	%

200 mc OSCILLATOR



C1 – FEEDBACK ADJ

C2 – TUNING

C3 – MATCHING ADJ

TYPICAL	2N1141	2N1142	2N1143
OUTPUT POWER	85 mw	75 mw	70 mw
EFFICIENCY	43%	38%	35%

TEXAS INSTRUMENTS
INCORPORATED
SEMICONDUCTOR-COMPONENTS DIVISION
P. O. BOX 312 • 13500 N. CENTRAL EXPRESSWAY
DALLAS, TEXAS