TYPE 3N34 N-P-N
GROWN-DIFFUSED SILICON TETRODE TRANSISTOR

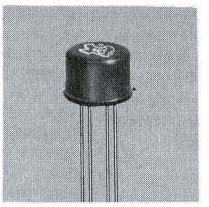
TYPE 3N34
BULLETIN NO. DL-S 960 AUGUST, 1958
REPLACES BULLETIN NO. DL-S 783 AUGUST, 1957

Typical 22db Power Gain at 30 MC

High Gain at High Temperature

Designed for High Frequency • IF Amplifiers

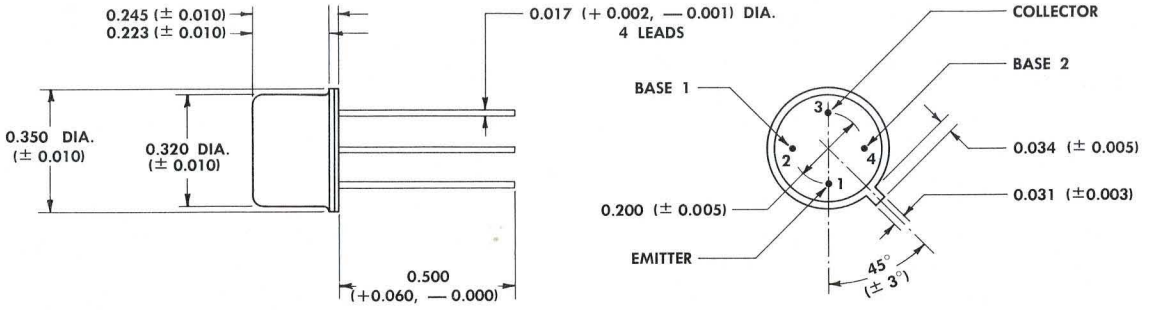
RF Amplifiers • Video Amplifiers • Oscillators



ACTUAL SIZE

mechanical data

Welded case with glass-to-metal hermetic seal between case and leads. Unit weight is 1 gram. These units meet JETEC outline TO-12 dimensions.



ALL CONNECTIONS INSULATED FROM CASE

ALL DIMENSIONS IN INCHES

maximum ratings at T_j = 25°C

Emitter Current	20 mA
Collector Current	20 mA
Base No. 1 Current	5 mA
Base No. 2 Current	5 mA
Collector Dissipation (Derate 1 mW/°C for Advanced Temperatures)	125 mW

junction temperature

Maximum Range	−65°C to +150°C

design characteristics at T_j = 25°C (except as indicated)

		conditions			min	design center	max	unit
I_{CBO}	Collector Cutoff Current	V_{CB} = 20V	I_E = 0	I_{B2} = 0	—	0.005	0.4	μA
	at 150°C	V_{CB} = 20V	I_E = 0	I_{B2} = 0	—	—	40	μA
BV_{CBO}	Breakdown Voltage	I_C = 50μA	I_{B2} = 0	I_E = 0	30	60	—	V
BV_{EBO}	Breakdown Voltage	I_C = 50μA	I_{B2} = 0	I_E = 0	1	—	—	V
BV_{CEO}	Breakdown Voltage	I_C = 1mA	I_{B2} = 0	I_{B1} = 0	30	45	—	V
R_{CS}	Saturation Resistance	I_C = 5mA	I_{B2} = 0	I_{B1} = 1.0mA	—	150	300	Ohm
R_{B1}−R_{B2}	Base-to-Base Resistance	I_B = 100μA	—	—	—	10K	—	Ohm
	low frequency measurements							
h_{fe}*	Current Transfer Ratio	V_C = 20V f = 1000 cps	I_E = −1.3mA	I_{B2} = −100μA	10	25	—	
c_{ob}	Output Capacity	V_C = 20V	I_E = −1.3mA	I_{B2} = −100μA	—	1.5	—	μμf
c_H	Header Capacity	f = IMc			—	0.4	—	μμf
	high frequency measurements							
h_{fe}*	Current Transfer Ratio	V_C = 20V			1.0	4	—	
r_{ies}*	Series Input Resistance	I_E = −1.3mA			20	100	300	Ohm
r_{oep}	Parallel Output Resistance	I_{B2} = −100μA			4K	9K	15K	Ohm
c_{oep}	Parallel Output Capacitance				—	1.5	3	μμf
$f_{\alpha b}$*	Alpha Cutoff Frequency	f = 30Mc			—	100	—	Mc
NF	Noise Figure				—	15	20	db
PG_e†	Power Gain				—	22	—	db

* Short Circuit Parameter
† See Page 4

LICENSED UNDER BELL SYSTEM PATENTS

SEMICONDUCTOR—COMPONENTS DIVISION

TEXAS INSTRUMENTS
INCORPORATED
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TYPE 3N34 N-P-N SILICON TETRODE

DESIGN NOTES AND BIBLIOGRAPHY

1. Power Gain $\quad PG_e = 20 \log h_{fe} + 10 \text{ Log } \frac{R_{oep}}{4\, R_{ies}}$
2. Formulae for conversion from series to parallel
   a. $R_{iep} = (1 + Q^2)\, R_{ies}$
   b. $C_{iep} = Q^2/(1 + Q^2)\, C_{ies}$
   c. $C_{ies} = \frac{1}{\omega Q\, R_{ies}}$
3. Input Q Range = 0.8 to 1.4 $\qquad$ Typical Value = 1.1
4. Thermal Resistance

   $\Theta_T = \frac{T_j - T_a}{P_t}$ $\qquad$ Typical Value = 0.6°C/mW

Where T_j = Operating Junction Temperature
T_a = Air Ambient
P_t = Total Power Dissipated
Θ_T = Total Thermal Resistance

Reference: B. Riech, "Transistor Thermal Resistance Measurement," *Electronic Design,* 12-1-56.

qualification testing

Each unit is heat cycled from − 65°C to + 175°C for ten cycles, and then humidity cycled at temperature from − 65C° to + 75C° in air at 95% relative humidity for four cycles. The hermetic seal is tested by subjecting immersed units to hydraulic pressure. Each unit is thoroughly tested to determine the electrical design characteristics. Production samples are life tested periodically to determine the effects of storage and dissipation and ensure maximum attainable reliability.

References to High Frequency Tetrode.

R. L. Wallace, L. G. Schimpf, E. Dickten, "A Junction-Transistor Tetrode for High Frequency Use," *Proceedings of the IRE,* Vol. XL, pp. 1395-1400, November, 1952.

Boyd Cornelison and Willis A. Adcock, "Transistors by Grown-Diffused Technique," *Wescon Meeting,* August 21, 1957.

William C. Brower and Charles E. Earhart, "70 Megacycle Silicon Transistor," *Third Annual Electron Devices Meeting of the IRE,* Washington, D.C., November 1, 1957. Reprinted in *Semiconductor Products,* March-April, 1958.

Roger R. Webster, "Silicon Tetrode Transistors for the 5-40 Mc Region," *National Conference on Aeronautical Electronics,* Dayton, Ohio, May 14, 1956.

Roger R. Webster and R. F. Stewart, "Some Circuit Applications of Silicon Tetrodes," *Wescon Meeting,* August 24, 1956.

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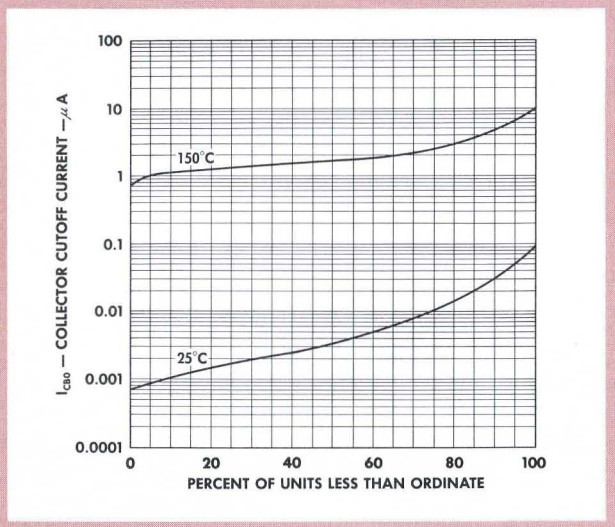
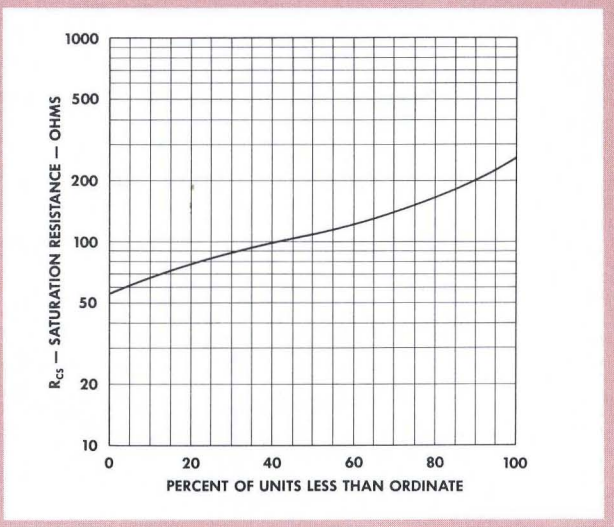
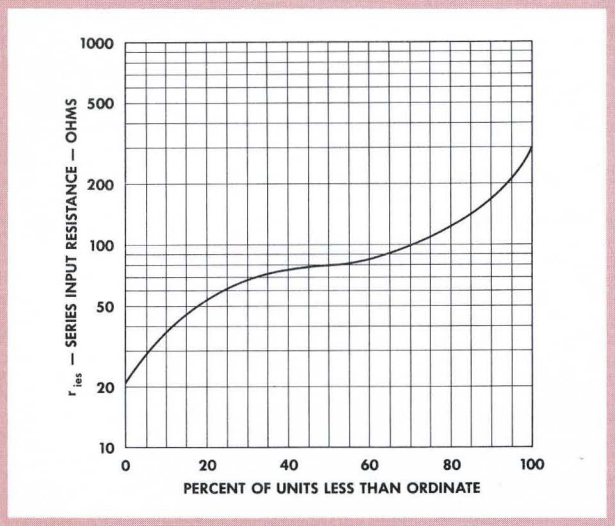
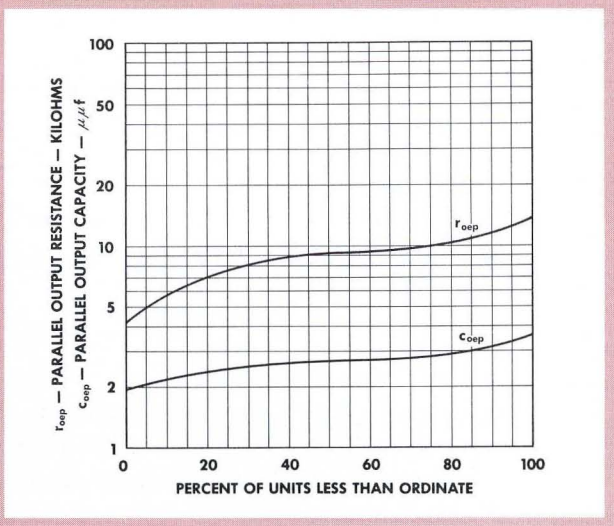
TYPE 3N34 N-P-N SILICON TETRODE

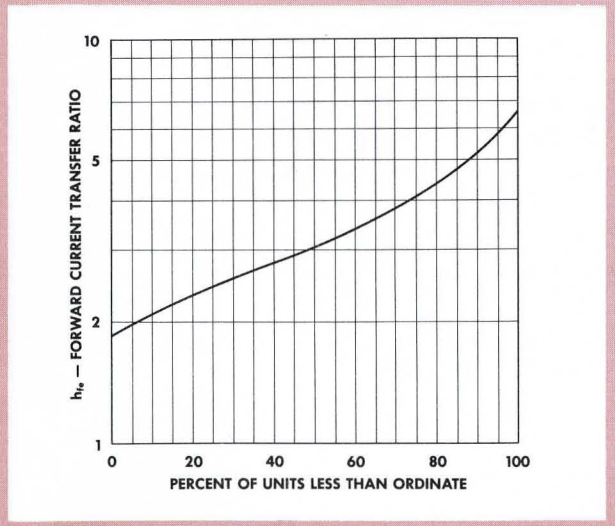
TYPICAL PRODUCTION DISTRIBUTIONS

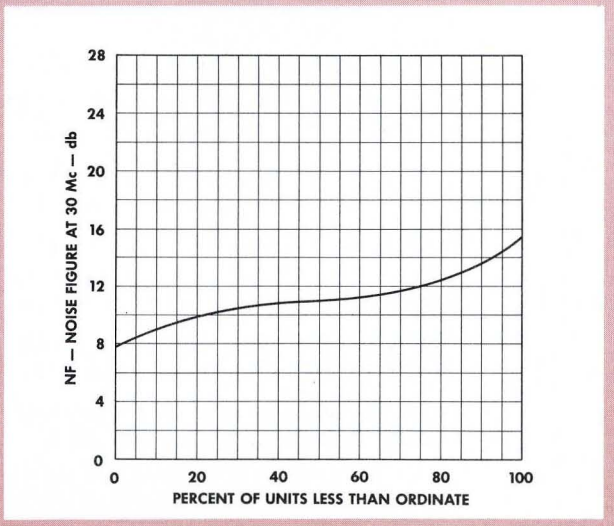






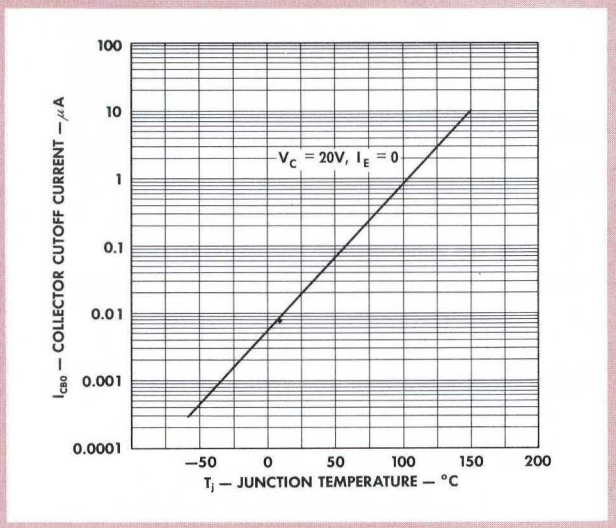


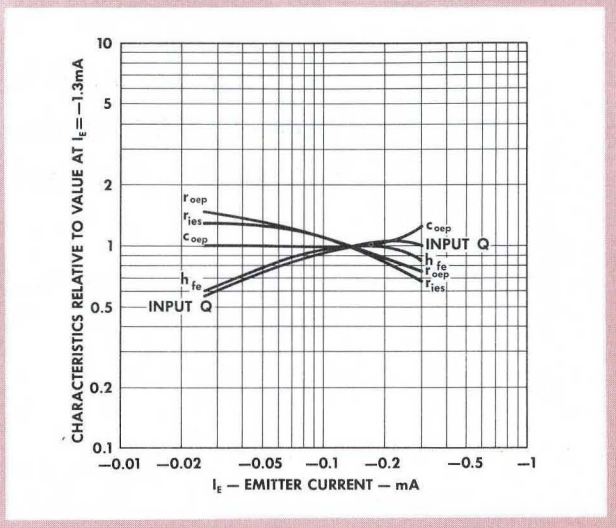


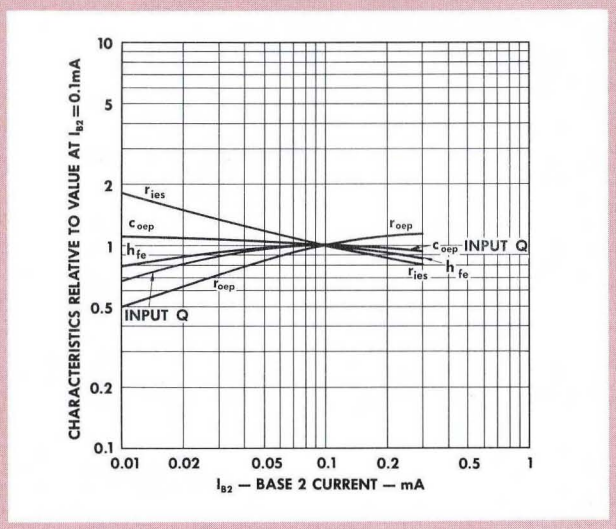


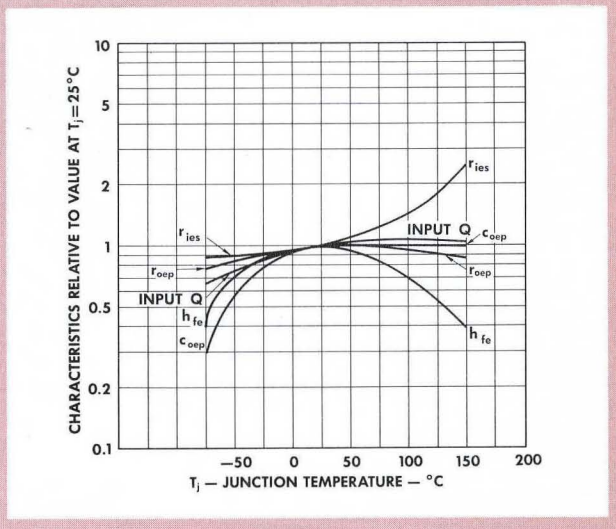
TYPE 3N34 N-P-N SILICON TETRODE

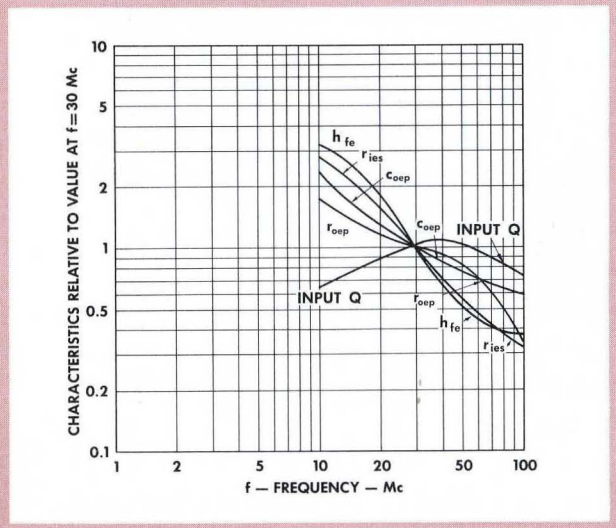
TYPICAL CHARACTERISTICS

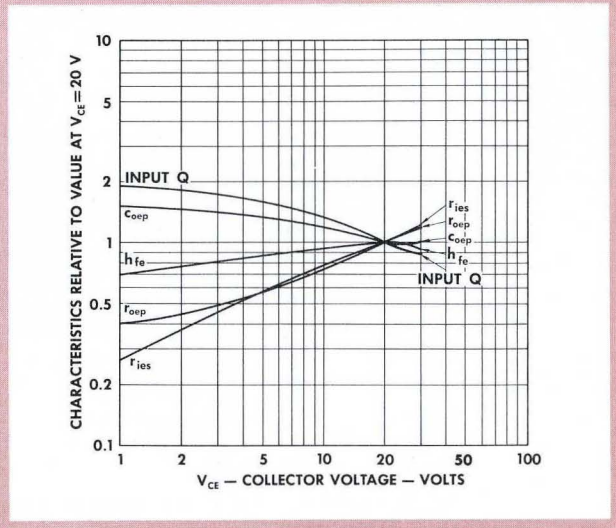












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