TYPES TIS84, TIS108
N-P-N SILICON TRANSISTORS

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HIGH-FREQUENCY SILECT† TRANSISTORS‡
FOR TV TUNER AND IF APPLICATIONS

Featuring Low-Feedback Capacitance and Forward-AGC Characteristics

- **TIS84 for Tuner RF Amplifiers**
- **TIS108 for IF Amplifiers (Replaces TIS85)**

Rugged, One-Piece Construction with Standard TO-18 100-mil Pin Circle

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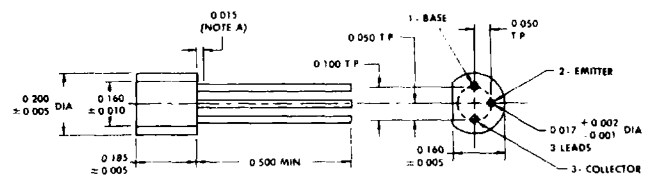
mechanical data

These transistors are encapsulated in a plastic compound specifically designed for this purpose, using a highly mechanized process developed by Texas Instruments. The case will withstand soldering temperatures without deformation. These devices exhibit stable characteristics under high-humidity conditions and are capable of meeting MIL-STD-202C, Method 106B. The transistors are insensitive to light.

Feedback capacitance is minimized by placing the emitter terminal between the base and collector terminals, thus optimizing compatability with advanced high-frequency design.



NOTES: A. Lead diameter is not controlled in this area.
B. Leads having maximum diameter 0.019 shall be within 0.007 of their true positions measured in the gaging plane 0.054 below the seating plane of the device relative to a maximum-diameter package.
C. All dimensions are in inches.

absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

Collector-Base Voltage	40 V
Collector-Emitter Voltage (See Note 1)	30 V
Emitter-Base Voltage	4 V
Continuous Collector Current	50 mA
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 2)	500 mW
Storage Temperature Range	−65°C to 150°C
Lead Temperature 1/16 Inch from Case for 10 Seconds	260°C

electrical characteristics at 25°C free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS	TIS84 MIN	TIS84 MAX	TIS108 MIN	TIS108 MAX	UNIT
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10\ \mu A$, $I_E = 0$	40		40		V
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10$ mA, $I_B = 0$, See Note 3	30		30		V
I_{CBO}	Collector Cutoff Current	$V_{CB} = 10$ V, $I_E = 0$		50		50	nA
		$V_{CB} = 10$ V, $I_E = 0$, $T_A = 85°C$		5		5	µA
I_{EBO}	Emitter Cutoff Current	$V_{EB} = 4$ V, $I_C = 0$		10		10	µA
h_{FE}	Static Forward Current Transfer Ratio	$V_{CE} = 10$ V, $I_C = 4$ mA	30		25		
V_{BE}	Base-Emitter Voltage	$V_{CE} = 10$ V, $I_C = 4$ mA		0.84		0.84	V

NOTES: 1. This value applies when the base-emitter diode is open-circuited.
2. Derate linearly to 150°C free-air temperature at the rate of 4 mW/°C.
3. This parameter must be measured using pulse techniques. $t_w = 300\ \mu s$, duty cycle ≤ 2%.

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‡U. S. Patent No. 3,439,238

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electrical characteristics at 25°C free-air temperature

	PARAMETER	TEST CONDITIONS	TIS84 MIN	TIS84 TYP	TIS84 MAX	TIS108 MIN	TIS108 TYP	TIS108 MAX	UNIT
$\lvert h_{fe} \rvert$	Small-Signal Common-Emitter Forward Current Transfer Ratio	$V_{CE} = 10$ V, $I_C = 4$ mA, f = 100 MHz	3.5	6.5		3.5	6.5		
$\lvert y_{fe} \rvert$	Small-Signal Common-Emitter Forward Transfer Admittance	$V_{CE} = 10$ V, $I_C = 4$ mA, f = 200 MHz	60	80					mmho
		$V_{CE} = 10$ V, $I_C = 4$ mA, f = 45 MHz				80	105		
ϕ_{yfe}	Phase Angle of Small-Signal Common-Emitter Forward Transfer Admittance	$V_{CE} = 10$ V, $I_C = 4$ mA, f = 200 MHz	−50°	−60°	−80°				
		$V_{CE} = 10$ V, $I_C = 4$ mA, f = 45 MHz				−10°	−18°	−25°	
C_{ies}	Parallel-Equivalent Common-Emitter Short-Circuit Input Capacitance†	$V_{CE} = 10$ V, $I_C = 4$ mA, f = 200 MHz		11					pF
		$V_{CE} = 10$ V, $I_C = 4$ mA, f = 45 MHz					18		
C_{res}	Common-Emitter Short-Circuit Reverse Transfer Capacitance†	$V_{CE} = 10$ V, $I_C = 1$ mA, f = 0.1 MHz to 1 MHz		0.22	0.4		0.22	0.4	pF
C_{oes}	Parallel-Equivalent Common-Emitter Short-Circuit Output Capacitance†	$V_{CE} = 10$ V, $I_C = 4$ mA, f = 200 MHz		1.1					pF
		$V_{CE} = 10$ V, $I_C = 4$ mA, f = 45 MHz					1.1		
$Re(h_{ie})$	Real Part of Small-Signal Common-Emitter Input Impedance	$V_{CE} = 10$ V, $I_C = 4$ mA, f = 200 MHz		25	60				Ω
		$V_{CE} = 10$ V, $I_C = 4$ mA, f = 45 MHz					50	80	
$Re(y_{ie})$	Real Part of Small-Signal Common-Emitter Input Admittance	$V_{CE} = 10$ V, $I_C = 4$ mA, f = 200 MHz		14	40				mmho
		$V_{CE} = 10$ V, $I_C = 4$ mA, f = 45 MHz					3	6	
$Re(y_{oe})$	Real Part of Small-Signal Common-Emitter Output Admittance	$V_{CE} = 10$ V, $I_C = 4$ mA, f = 200 MHz		0.2	0.5				mmho
		$V_{CE} = 10$ V, $I_C = 4$ mA, f = 45 MHz					0.05	0.2	

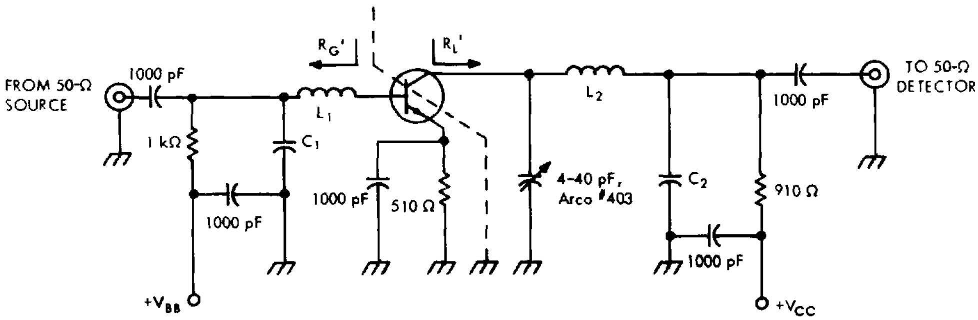
† C_{ies}, C_{res}, and C_{oes} are defined as the imaginary parts of the small-signal, common-emitter, short-circuit admittances divided by $2\pi f$.

operating characteristics at 25°C free-air temperature

	PARAMETER	TEST CONDITIONS	TIS84 MIN	TIS84 TYP	TIS84 MAX	TIS108 MIN	TIS108 TYP	TIS108 MAX	UNIT
NF	Spot Noise Figure	$V_{CE} = 10$ V, $I_C = 3$ mA, $R_G = 50\ \Omega$, f = 200 MHz		2.8	3.3				dB
		$V_{CE} = 10$ V, $I_C = 3$ mA, $R_G = 50\ \Omega$, f = 45 MHz					3	6	dB
G_{pe}	Unneutralized Small-Signal Common-Emitter Insertion Power Gain	$V_{CC} = 12$ V, $I_C \approx 2.5$ mA, $V_{BB} = 2.1$ V, $R_G' = 150\ \Omega$, $R_L' = 1\ k\Omega$, f = 200 MHz, See Figure 1	12	16	18				dB
		$V_{CC} = 12$ V, $I_C \approx 4.5$ mA, $V_{BB} = 2.6$ V, $R_G' = 500\ \Omega$, $R_L' = 250\ \Omega$, f = 45 MHz, See Figure 1				25	30	33	dB
$V_{BB(GC)}$	Gain-Control Base-Supply Voltage	$V_{CC} = 12$ V, $R_G' = 150\ \Omega$, $R_L' = 1\ k\Omega$, $\Delta G_{pe} = -30$ dB‡, f = 200 MHz, See Figure 1	3.7		4.6				V
		$V_{CC} = 12$ V, $R_G' = 500\ \Omega$, $R_L' = 250\ \Omega$, $\Delta G_{pe} = -30$ dB‡, f = 45 MHz, See Figure 1				3.5		4.5	V

‡ ΔG_{pe} is defined as the change in G_{pe} from the value at $V_{BB} = 2.1$ V at 200 MHz or from the value at $V_{BB} = 2.6$ V at 45 MHz.

PARAMETER MEASUREMENT INFORMATION



COMPONENTS FOR f = 45 MHz

- C_1: 36 pF
- C_2: 47 pF
- L_1: 8 T #20 enameled copper wire, close-wound on 1/4″ diameter form
- L_2: 10 T #20 enameled copper wire, close-wound on 1/4″ diameter form

COMPONENTS FOR f = 200 MHz

- C_1: 18 pF
- C_2: 270 pF
- L_1: 2 T #20 enameled copper wire, 1/8″ pitch, wound on 7/32″ diameter form
- L_2: 2 T #14 enameled copper wire, 1/8″ pitch, wound on 7/32″ diameter form

FIGURE 1 — POWER-GAIN AND GAIN-CONTROL-VOLTAGE TEST CIRCUIT

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TYPICAL CHARACTERISTICS

TIS84
SPOT NOISE FIGURE
vs
COLLECTOR CURRENT

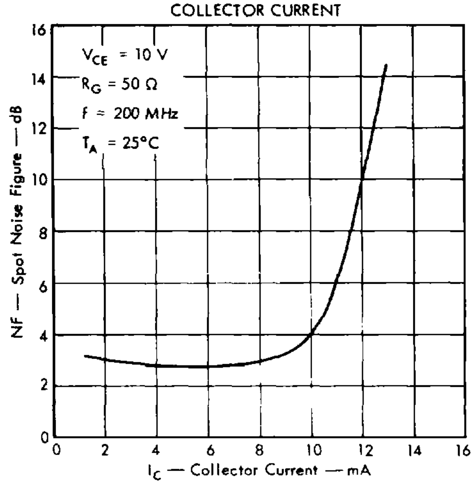

FIGURE 2

TIS84
RELATIVE SMALL-SIGNAL COMMON-EMITTER POWER GAIN
vs
GAIN-CONTROL BASE-SUPPLY VOLTAGE

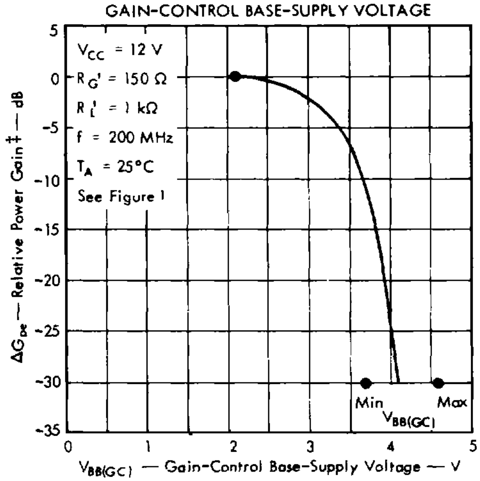

FIGURE 3

‡ΔG_{pe} is defined as the change in G_{pe} from the value at V_{BB} = 2.1 V at 200 MHz or from the value at V_{BB} = 2.6 V at 45 MHz.

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