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HIGH-FREQUENCY SILECT† TRANSISTORS‡ DESIGNED FOR TV MIXER AND NON-AGC IF STAGES

Featuring Low Feedback Capacitance and Full Characterization to Simplify Circuit Design

- TIS86 for Mixer
- TIS87 for Non-AGC IF Amplifier

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

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 compatibility with advanced high-frequency design.

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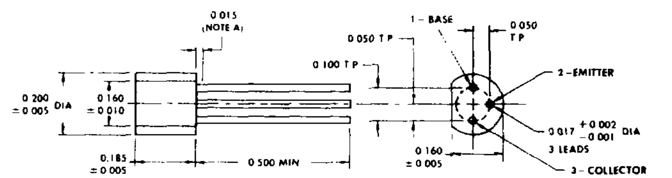

NOTES A Lead diameter is not controlled in this area
B Leads having maximum diameter (0 019) shall be within 0 007 of their true positions measured in the gaging plane 0 054 below the seating plane of the device relative to a maximum-diameter package
C All dimensions are in inches

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

	TIS86	TIS87
Collector-Base Voltage	30 V	45 V
Collector-Emitter Voltage (See Note 1)	30 V	45 V
Emitter-Base Voltage	4 V	4 V
Continuous Collector Current	← 50 mA →	
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 2)	←400 mW→	
Continuous Device Dissipation at (or below) 25°C Lead Temperature (See Note 3)	←700 mW→	
Storage Temperature Range	−65°C to 150°C	
Lead Temperature 1/16 Inch from Case for 10 Seconds	← 260°C →	

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 3.2 mW/deg.
3. Derate linearly to 150°C lead temperature at the rate of 5.6 mW/deg. Lead temperature is measured on the collector lead 1/16 inch from the case.

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‡U. S. Patent No. 3,439,238

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

PARAMETER		TEST CONDITIONS	TIS86 MIN	TIS86 TYP	TIS86 MAX	TIS87 MIN	TIS87 TYP	TIS87 MAX	UNIT
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10\ \mu A$, $I_E = 0$	30			45			V
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 10$ mA, $I_B = 0$, See Note 4	30			45			V
I_{CBO}	Collector Cutoff Current	$V_{CB} = 15$ V, $I_E = 0$			100			100	nA
		$V_{CB} = 15$ V, $I_E = 0$, $T_A = 85°C$			10			10	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	40		200				
		$V_{CE} = 12$ V, $I_C = 12$ mA, See Note 4				30		150	
V_{BE}	Base-Emitter Voltage	$V_{CE} = 12$ V, $I_C = 15$ mA, See Note 4			0.87			0.87	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_B = 1.5$ mA, $I_C = 15$ mA						0.5	V
$\|h_{fe}\|$	Small-Signal Common-Emitter Forward Current Transfer Ratio	$V_{CE} = 10$ V, $I_C = 4$ mA, $f = 100$ MHz	5						
		$V_{CE} = 12$ V, $I_C = 12$ mA, $f = 100$ MHz				5			
$\|y_{fe}\|$	Small-Signal Common-Emitter Forward Transfer Admittance	$V_{CE} = 10$ V, $I_C = 4$ mA, $f = 45$ MHz	90	115					mmho
		$V_{CE} = 12$ V, $I_C = 12$ mA, $f = 45$ MHz				130	200		
ϕ_{yfe}	Phase Angle of Small-Signal Common-Emitter Forward Transfer Admittance	$V_{CE} = 10$ V, $I_C = 4$ mA, $f = 45$ MHz	−7°	−15°	−20°				
		$V_{CE} = 12$ V, $I_C = 12$ mA, $f = 45$ MHz				−18°	−25°	−35°	
C_{ies}	Parallel-Equivalent Common-Emitter Short-Circuit Input Capacitance†	$V_{CE} = 10$ V, $I_C = 4$ mA, $f = 200$ MHz		9					pF
		$V_{CE} = 12$ V, $I_C = 12$ mA, $f = 45$ MHz					25		
C_{res}	Common-Emitter Short-Circuit Reverse Transfer Capacitance†	$V_{CE} = 10$ V, $I_C = 1$ mA, $f = 0.1$ MHz to 1 MHz		0.33	0.45		0.33	0.45	pF
C_{oes}	Parallel-Equivalent Common-Emitter Short-Circuit Output Capacitance†	$V_{CE} = 10$ V, $I_C = 4$ mA, $f = 45$ MHz		1.1					pF
		$V_{CE} = 12$ V, $I_C = 12$ 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		32	60				Ω
		$V_{CE} = 12$ V, $I_C = 12$ mA, $f = 45$ MHz					55	100	
$Re(y_{ie})$	Real Part of Small-Signal Common-Emitter Input Admittance	$V_{CE} = 10$ V, $I_C = 4$ mA, $f = 200$ MHz		8.5	30				mmho
		$V_{CE} = 12$ V, $I_C = 12$ mA, $f = 45$ MHz					5	12	
$Re(y_{oe})$	Real Part of Small-Signal Common-Emitter Output Admittance	$V_{CE} = 10$ V, $I_C = 4$ mA, $f = 45$ MHz		0.02	0.15				mmho
		$V_{CE} = 12$ V, $I_C = 12$ mA, $f = 45$ MHz					0.07	0.2	

NOTE 4: These parameters must be measured using pulse techniques. $t_p = 300\ \mu s$, duty cycle $\leq 2\%$.

†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	TIS86 TYP	TIS86 MAX	UNIT
NF	Spot Noise Figure	$V_{CE} = 10$ V, $I_C = 4$ mA, $R_G = 50\ \Omega$, $f = 200$ MHz	2.5	5	dB

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