

**N-P-N TYPES TIS90, TIS90M, TIS92, TIS92M
P-N-P TYPES TIS91, TIS91M, TIS93, TIS93M
COMPLEMENTARY SILICON TRANSISTORS**
BULLETIN NO. DL-S 7310224, JULY 1967—REVISED MARCH 1973

SILECT† COMPLEMENTARY TRANSISTORS‡

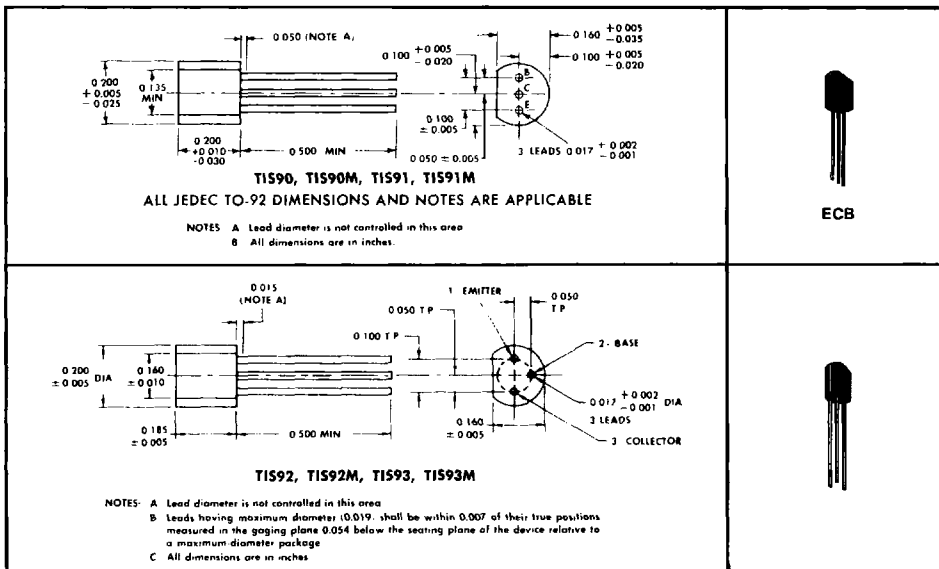
**Available in Matched Complementary Pairs (TIS90M thru TIS93M)
for Complementary-Symmetry or Other Class-B Audio-Amplifier Applications**

- Supplied in Color-Coded h_{FE} Brackets of 3-dB-Maximum Range
- 1.6-W Rating at 25°C Case Temperature

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.

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

Collector-Base Voltage	40 V
Collector-Emitter Voltage (See Note 1)	40 V
Emitter-Base Voltage	5 V
Continuous Collector Current	400 mA
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 2)	625 mW
Continuous Device Dissipation at (or below) 25°C Lead Temperature (See Note 3)	1.25 W
Continuous Device Dissipation at (or below) 25°C Case-and-Lead Temperature (See Note 4)	1.6 W
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 5 mW/°C.
3. Derate linearly to 150°C lead temperature at the rate of 10 mW/°C. Lead temperature is measured on the collector lead 1/16 inch from the case.
4. This rating applies with the entire case (including the leads) maintained at 25°C. Derate linearly to 150°C case-and-lead temperature at the rate of 12.8 mW/°C.

§ Voltages and currents apply to the n-p-n transistors. For the p-n-p transistors the values are the same, but the polarities are reversed.

† Trademark of Texas Instruments
‡ U.S. Patent No. 3,439,238

**N-P-N TYPES USE CHIP N24
P-N-P TYPES USE CHIP P20**

N-P-N TYPES TIS90, TIS90M, TIS92, TIS92M P-N-P TYPES TIS91, TIS91M, TIS93, TIS93M COMPLEMENTARY SILICON TRANSISTORS

electrical characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS†	N-P-N			P-N-P			UNIT
		TIS90, TIS90M TIS92, TIS92M			TIS91, TIS91M TIS93, TIS93M			
		MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CBO}$ Collector-Base Breakdown Voltage	$I_C = 100 \mu A, I_E = 0$	40			-40			V
$V_{(BR)CEO}$ Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ mA}, I_B = 0, \text{ See Note 5}$	40			-40			V
$V_{(BR)EBO}$ Emitter-Base Breakdown Voltage	$I_E = 100 \mu A, I_C = 0$	5			-5			V
I_{CBO} Collector Cutoff Current	$V_{CB} = 20 \text{ V}, I_E = 0$			100			-100	nA
I_{EBO} Emitter Cutoff Current	$V_{EB} = 3 \text{ V}, I_C = 0$			100			-100	nA
h_{FE} Static Forward Current Transfer Ratio	$V_{CE} = 2 \text{ V}, I_C = 50 \text{ mA}, \text{ See Note 5}$	100	160	300	100	160	300	
V_{BE} Base-Emitter Voltage	$V_{CE} = 2 \text{ V}, I_C = 50 \text{ mA}, \text{ See Note 5}$	0.6	0.77	1	-0.6	-0.76	-1	V
$V_{CE(sat)}$ Collector-Emitter Saturation Voltage	$I_B = 5 \text{ mA}, I_C = 50 \text{ mA}, \text{ See Note 5}$		0.04	0.25		-0.06	-0.25	V
	$I_B = 20 \text{ mA}, I_C = 200 \text{ mA}, \text{ See Note 5}$		0.17			-0.23		V

NOTE 5: These parameters must be measured using pulse techniques. $t_p = 300 \mu s$, duty cycle $\leq 2\%$.

†Test condition voltages and currents apply to the n-p-n transistors. For the p-n-p transistors the values are the same, but the polarities are reversed.

PARAMETER COLOR-CODE INFORMATION

To facilitate matching and identification these transistors are color-coded in h_{FE} brackets, each having a maximum spread of 3 dB as shown in the table below. No guarantee is made as to distribution of h_{FE} values, except that equal numbers of n-p-n and p-n-p devices will be shipped in any given bracket when matched complementary pairs are ordered.

COLOR CODE	YELLOW	GREEN	BLUE	VIOLET	GRAY
h_{FE} Range, $V_{CE} = 2 \text{ V}, I_C = 50 \text{ mA}$	100 - 125	115 - 150	140 - 190	170 - 235	215 - 300

ORDERING INFORMATION — To order matched complementary pairs, order the same quantity each of TIS90M and TIS91M or TIS92M and TIS93M. Devices may be ordered separately by specifying TIS90, TIS91, TIS92, or TIS93.

THERMAL INFORMATION

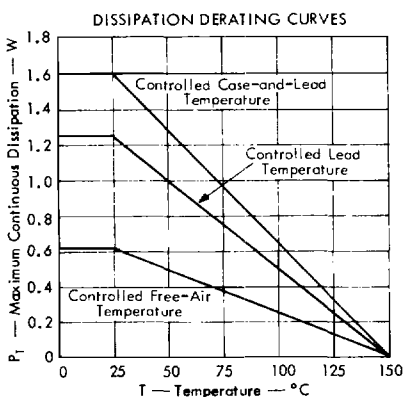


FIGURE 1