TIL194, TIL195, TIL196, TIL194A, TIL195A, TIL196A
TIL194B, TIL195B, TIL196B
AC-INPUT OPTOCOUPLERS

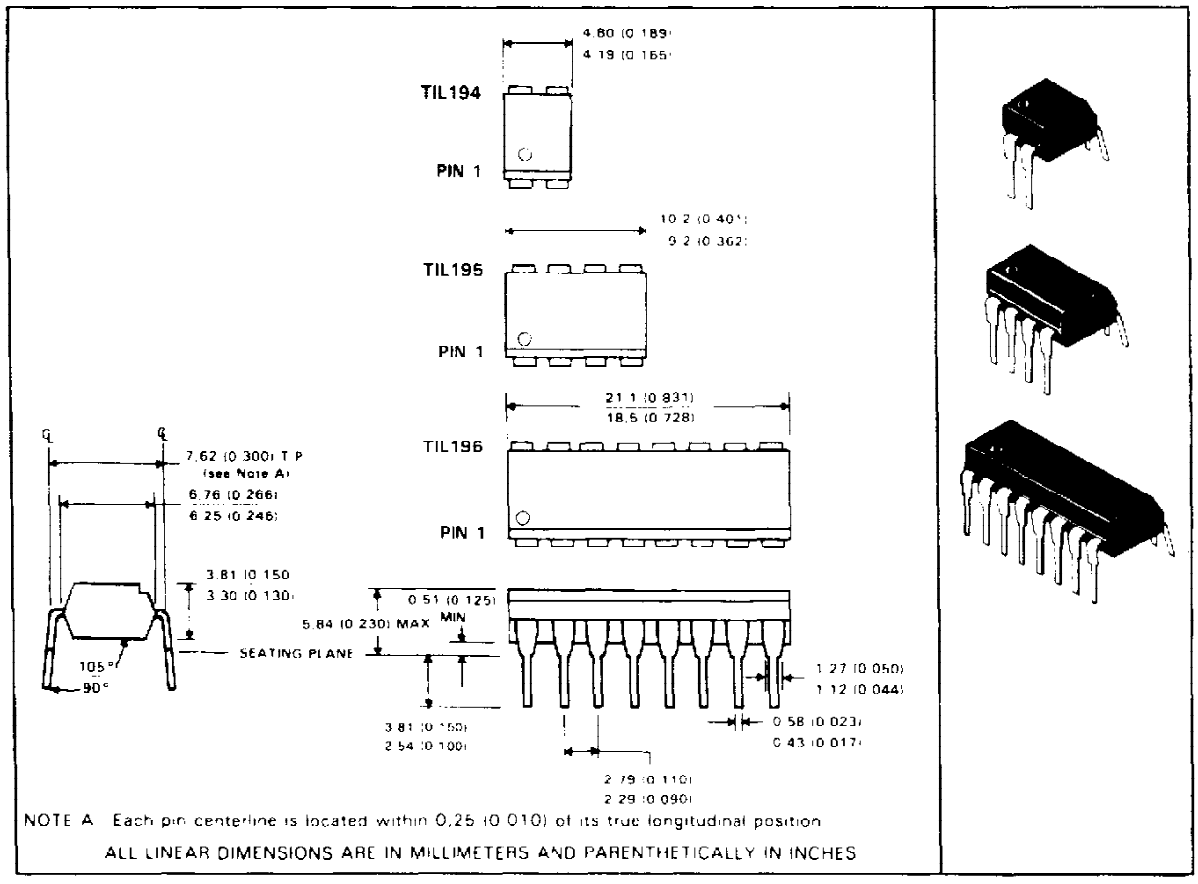
SOES001 D3287 MAY 1989 - REVISED SEPTEMBER 1989

- AC Signal Input
- Gallium-Arsenide Diode Infrared Source
- Source Is Optically Coupled to Silicon N-P-N Phototransistor
- Choice of One, Two, or Four Channels
- Choice of Three Current-Transfer Ratios
- High-Voltage Electrical Isolation 3.535 kV Peak (2.5 kV rms)
- Plastic Dual-In-Line Packages
- UL Listed — File #E65085

description

These optocouplers consist of two gallium-arsenide light-emitting diodes connected in a reverse-parallel configuration for ac-input applications and a silicon n-p-n phototransistor per channel. The TIL194 has one channel in a 4-pin package, the TIL195 has two channels in an 8-pin package, and the TIL196 has four channels in a 16-pin package. The standard devices, TIL194, TIL195, and TIL196, are tested for a current-transfer ratio of 20% minimum. Devices selected for a current-transfer ratio of 50% and 100% minimum are designated with the suffix A and B respectively.

mechanical data



NOTE A: Each pin centerline is located within 0.25 (0.010) of its true longitudinal position.

ALL LINEAR DIMENSIONS ARE IN MILLIMETERS AND PARENTHETICALLY IN INCHES

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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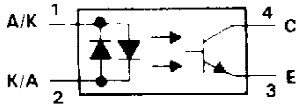
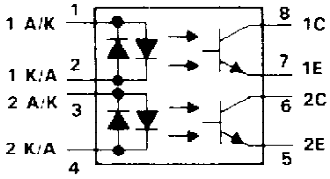
schematic diagrams

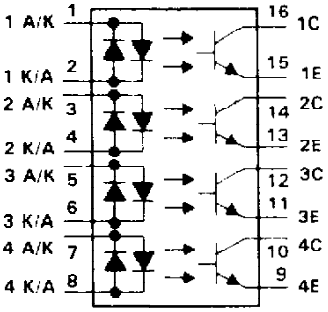
TIL194
(TOP VIEW)



TIL195
(TOP VIEW)



TIL196
(TOP VIEW)



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

Input-to-output voltage (see Note 1) . . . . . ±3.535 kV peak or dc (±2.5 kV rms)
Collector-emitter voltage (see Note 2) . . . . . 35 V
Emitter-collector voltage . . . . . 7 V
Input diode continuous forward current at (or below) 25°C free-air temperature (see Note 3) . . . . . ±50 mA
Continuous power dissipation at (or below) 25°C free-air temperature:
Phototransistor (see Note 4) . . . . . 150 mW
Input diode plus phototransistor per channel (see Note 5) . . . . . 200 mW
Storage temperature range . . . . . −55°C to 125°C
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C

NOTES: 1. This rating applies for sine wave operation at 50 or 60 Hz. Service capability is verified by testing in accordance with UL requirements.
2. This value applies when the base-emitter diode is open circuited.
3. Derate linearly to 100°C free air temperature at the rate of 0.67 mA/°C
4. Derate linearly to 100°C free-air temperature at the rate of 2 mW/°C.
5. Derate linearly to 100°C free-air temperature at the rate of 2.67 mW/°C.

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

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$	Collector-emitter breakdown voltage		I_C = 0.5 mA, I_F = 0	35			V
$V_{(BR)ECO}$	Emitter-collector breakdown voltage		I_C = 100 μA, I_F = 0	7			V
$I_{C(off)}$	Off-state collector current		V_{CE} = 24 V, I_F = 0			100	nA
CTR†	Current transfer ratio	TIL194, TIL195, TIL196	I_F = 5 mA, V_{CE} = 5 V	20%			
		TIL194A, TIL195A, TIL196A		50%			
		TIL194B, TIL195B, TIL196B		100%			
V_F†	Input diode static forward voltage		I_F = 20 mA			1.4	V
$V_{CE(sat)}$†	Collector-emitter saturation voltage		I_F = 5 mA, I_C = 1 mA			0.4	V
C_{io}	Input-to-output capacitance		V_{in-out} = 0, f = 1 MHz, See Note 6		1		pF
r_{io}	Input-to-output internal resistance		V_{in-out} = ±1 kV, See Note 6		10^{11}		Ω
$\frac{I_{C(on)1}}{I_{C(on)2}}$	On-state collector current symmetry ratio (see Note 7)		V_{CE} = 5 V, I_F = 5 mA	1		3	

†These parameters apply to either direction of the input current.
NOTES 6. These parameters are measured between all input diode leads shorted together and all phototransistor leads shorted together
7. The higher of the two values of $I_{C(on)}$ generated by the two diodes is taken as $I_{C(on)1}$.

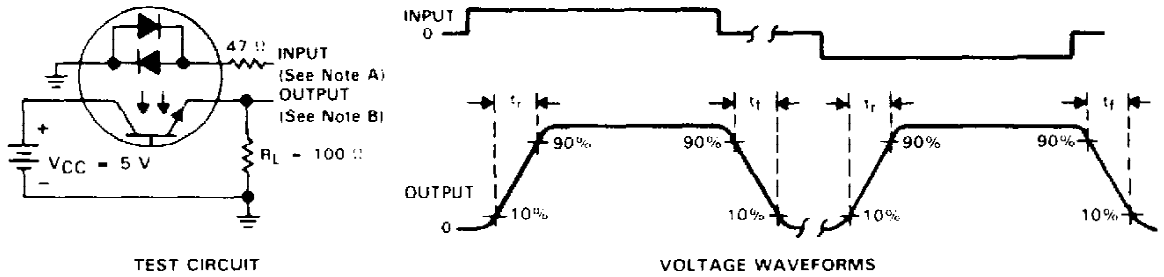
switching characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS	TYP	UNIT
t_r†	Rise time	V_{CC} = 5 V, $I_{C(on)}$ = 2 mA,	6	μs
t_f†	Fall time	R_L = 100 Ω, See Figure 1	6	μs

†These parameters apply to either direction of the input current.

PARAMETER MEASUREMENT INFORMATION

Adjust amplitude of input pulse for $I_{C(on)}$ = 2 mA



TEST CIRCUIT VOLTAGE WAVEFORMS

NOTES A. The input waveform is supplied by a generator with the following characteristics: Z_O = 50 Ω, t_r ≤ 15 ns, duty cycle = 1%.
B. The output waveform is monitored on an oscilloscope with the following characteristics: t_r ≤ 12 ns, R_i ≥ 1 MΩ, C_i < 20 pF.

FIGURE 1. SWITCHING TIMES

TYPICAL CHARACTERISTICS

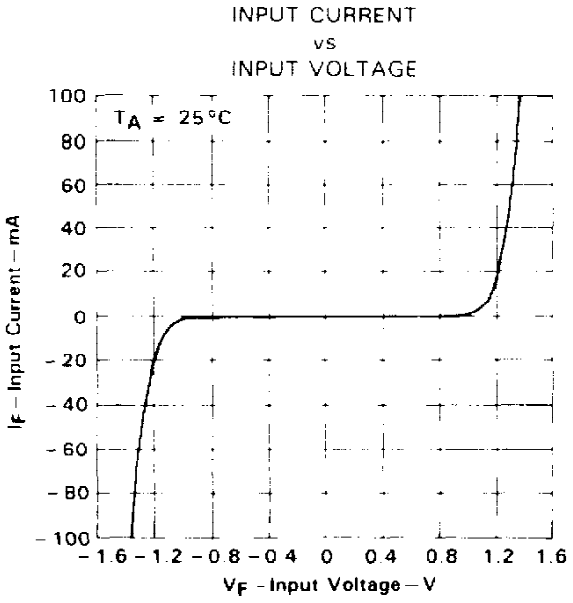


FIGURE 2

TYPICAL CHARACTERISTICS

TIL194, TIL195, TIL196
COLLECTOR CURRENT
vs
COLLECTOR-EMITTER VOLTAGE

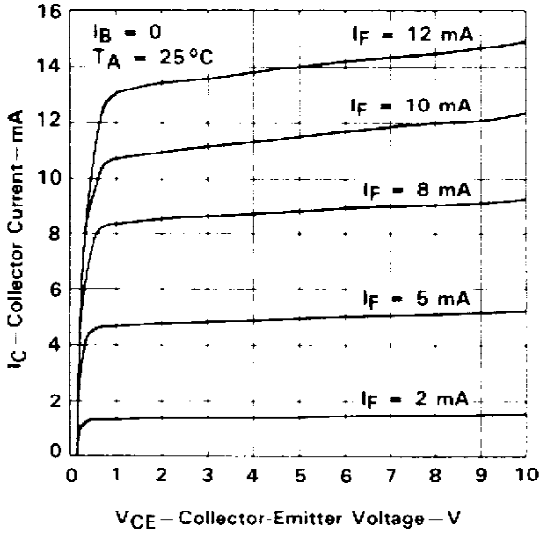


FIGURE 3

NORMALIZED ON-STATE COLLECTOR CURRENT
vs
INPUT-DIODE FORWARD CURRENT

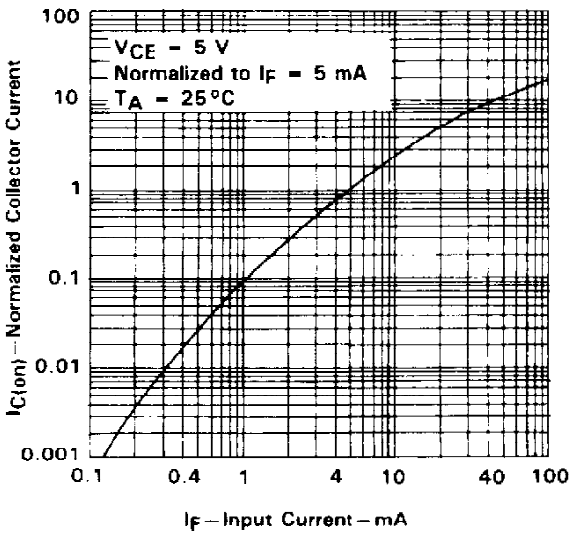


FIGURE 4

RELATIVE ON-STATE COLLECTOR CURRENT
vs
FREE-AIR TEMPERATURE

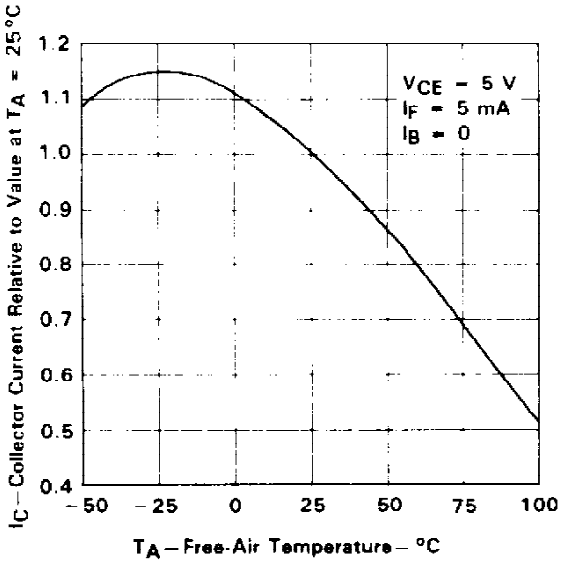


FIGURE 5

TYPICAL COLLECTOR-EMITTER
SATURATION VOLTAGE
vs
FREE-AIR TEMPERATURE

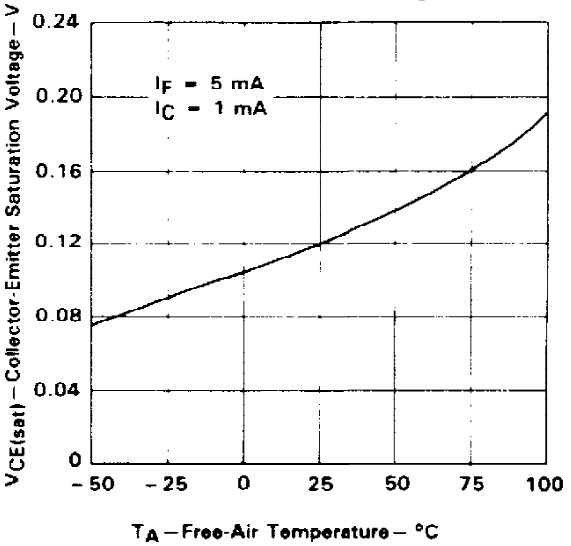


FIGURE 6

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