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

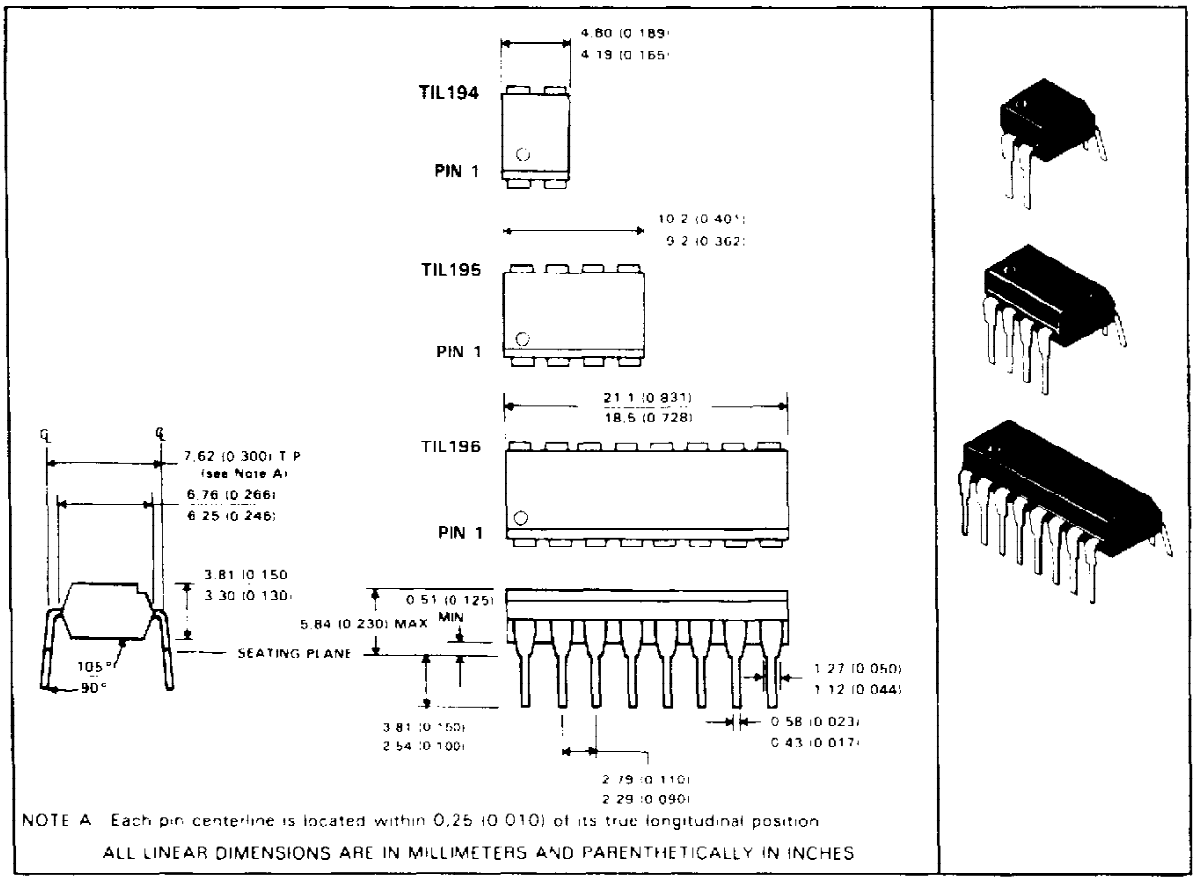
SOES001 D3287 MAY 1989 - REVISED SEPTEMBER 1989

- 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

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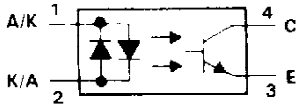
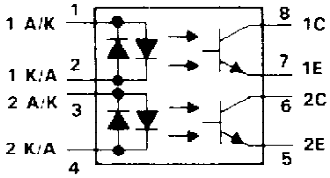
schematic diagrams

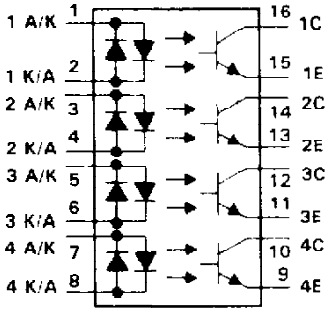
TIL194
(TOP VIEW)



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 $I_{C(on)1}$.

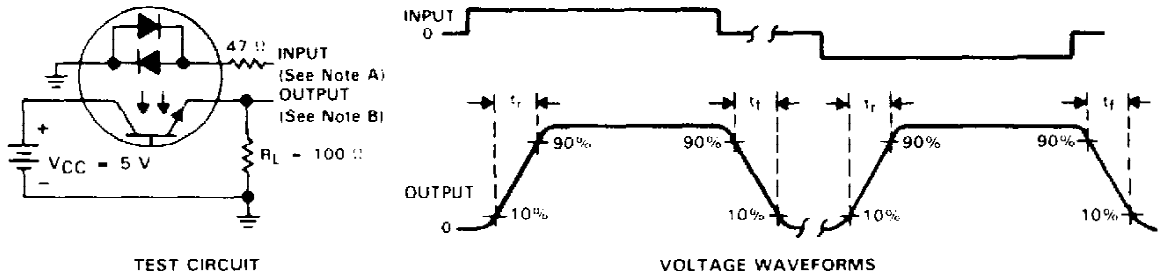
switching characteristics at 25°C free-air temperature

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

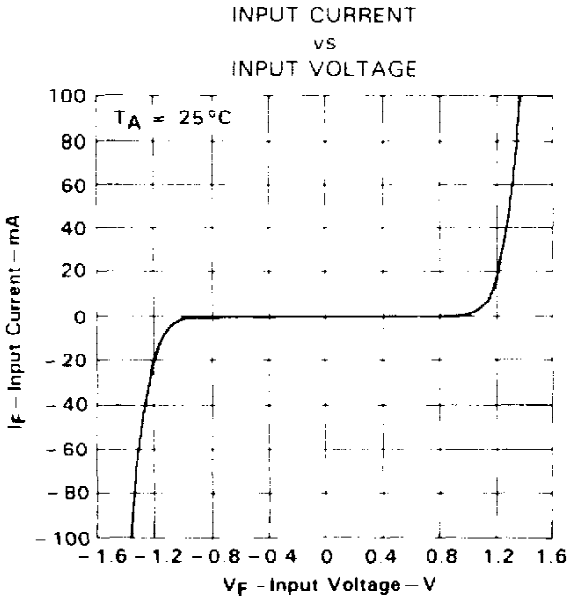


FIGURE 2

TYPICAL CHARACTERISTICS

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

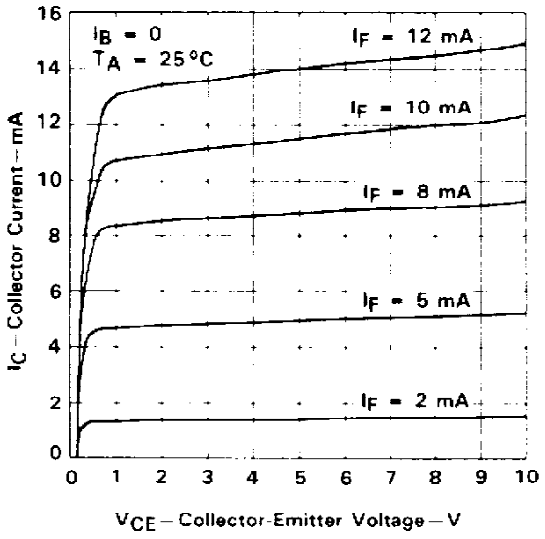


FIGURE 3

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

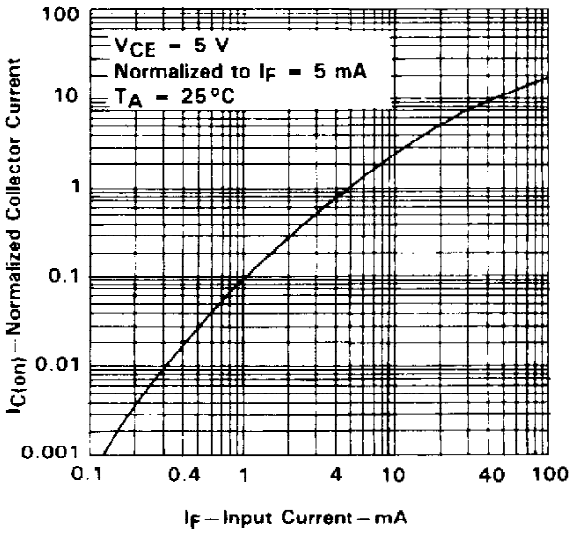


FIGURE 4

RELATIVE ON-STATE COLLECTOR CURRENT
vs
FREE-AIR TEMPERATURE

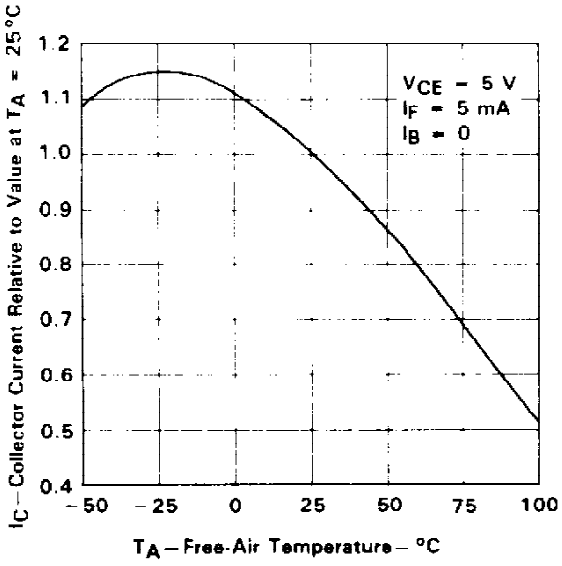


FIGURE 5

TYPICAL COLLECTOR-EMITTER
SATURATION VOLTAGE
vs
FREE-AIR TEMPERATURE

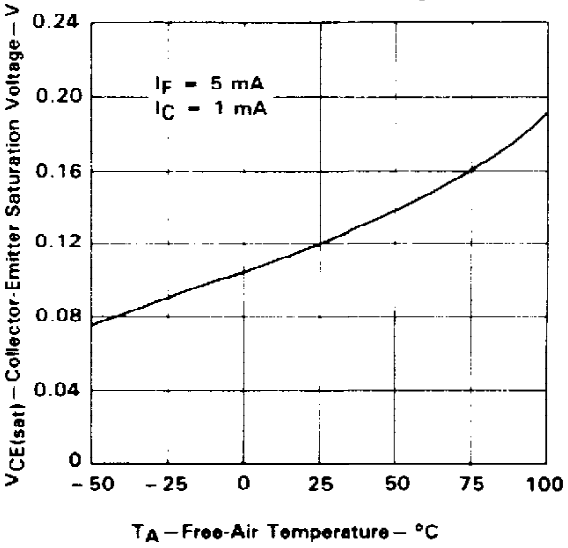


FIGURE 6

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