

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

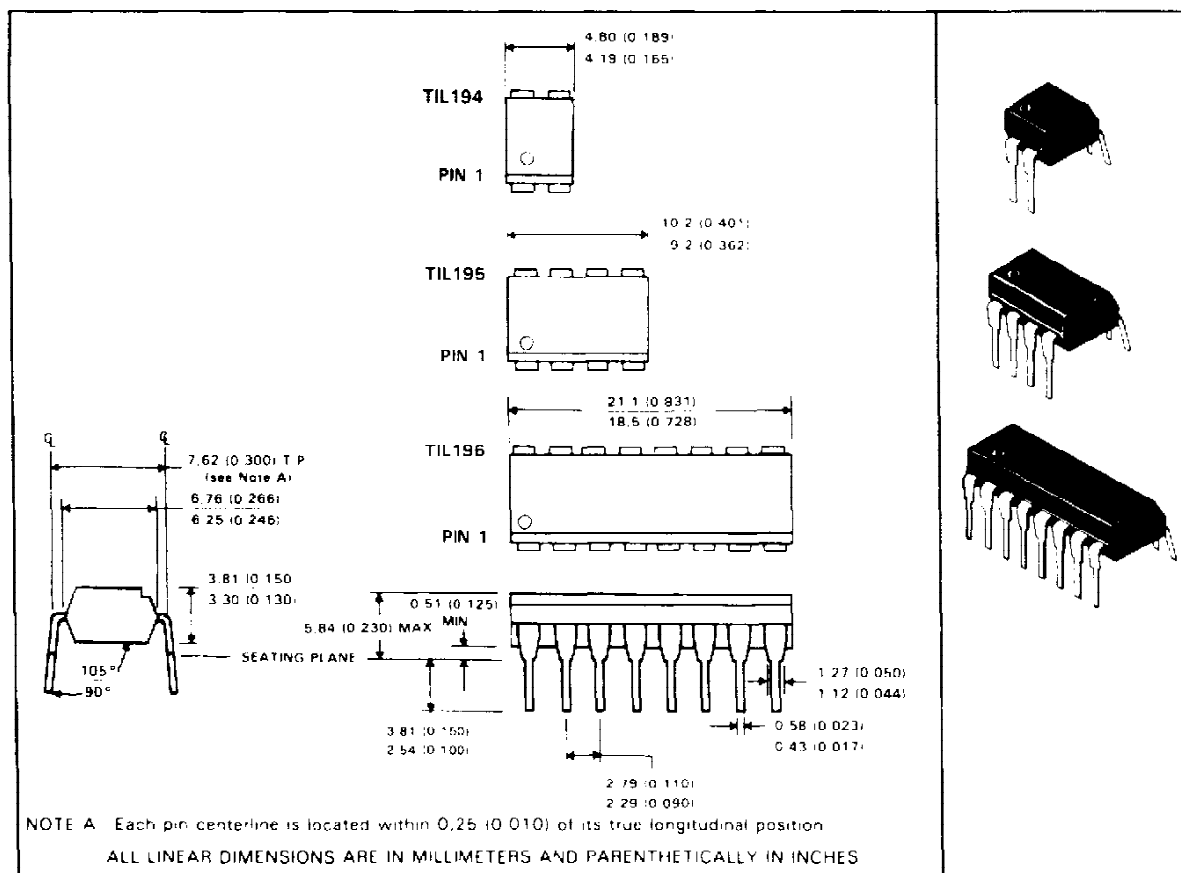
SOES001 03287 MAY 1989 - REVISED SEPTEMBER 1989

- 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 TIL 194 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



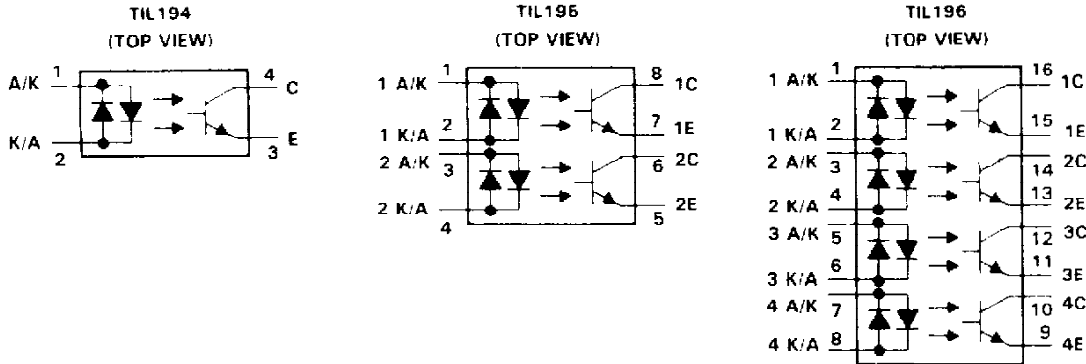
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**TIL194, TIL195, TIL196, TIL194A, TIL195A, TIL196A
TIL194B, TIL195B, TIL196B
AC-INPUT OPTOCOUPLEDERS**

schematic diagrams



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	$I_C = 100$ μ A, $I_F = 0$	7			V
$I_{C(off)}$	Off-state collector current	$V_{CE} = 24$ V, $I_F = 0$			100	nA
CTR^\dagger	Current transfer ratio	TIL194, TIL195, TIL196		20%		
		TIL194A, TIL195A, TIL196A	$I_F = 5$ mA, $V_{CE} = 5$ V	50%		
		TIL194B, TIL195B, TIL196B		100%		
V_F^\dagger	Input diode static forward voltage	$I_F = 20$ mA			1.4	V
$V_{CE(sat)}^\dagger$	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	$V_{in-out} = \pm 1$ kV, See Note 6		10^{11}		Ω
$I_{C(on)1}$ $I_{C(on)2}$	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 $I_{C(on)1}$.

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

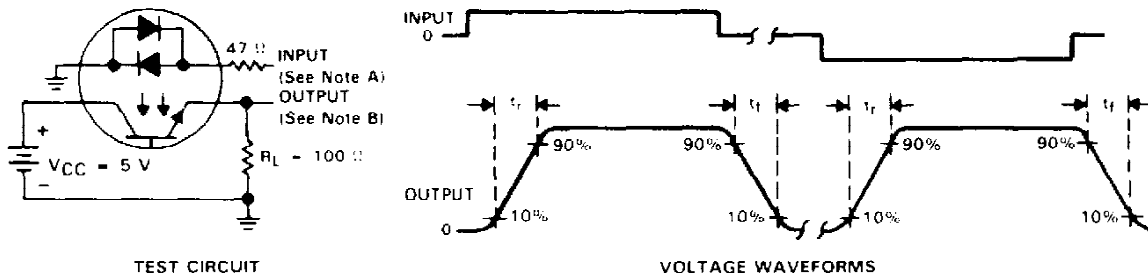
switching characteristics at 25°C free-air temperature

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

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

PARAMETER MEASUREMENT INFORMATION

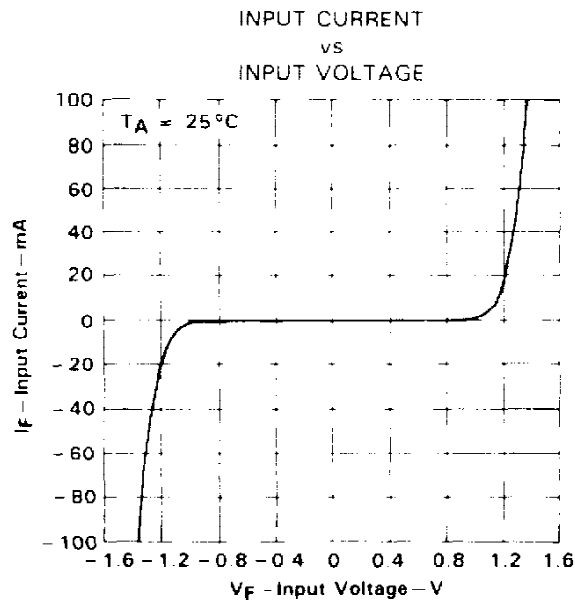
Adjust amplitude of input pulse for $I_{C(on)} = 2 \text{ mA}$



NOTES A The input waveform is supplied by a generator with the following characteristics: $Z_0 = 50 \Omega$, $t_r \leq 15 \text{ ns}$, duty cycle = 1%
 B The output waveform is monitored on an oscilloscope with the following characteristics: $t_r \leq 12 \text{ ns}$, $R_i \geq 1 \text{ M}\Omega$, $C_i < 20 \text{ pF}$

FIGURE 1. SWITCHING TIMES

TYPICAL CHARACTERISTICS



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

TYPICAL CHARACTERISTICS

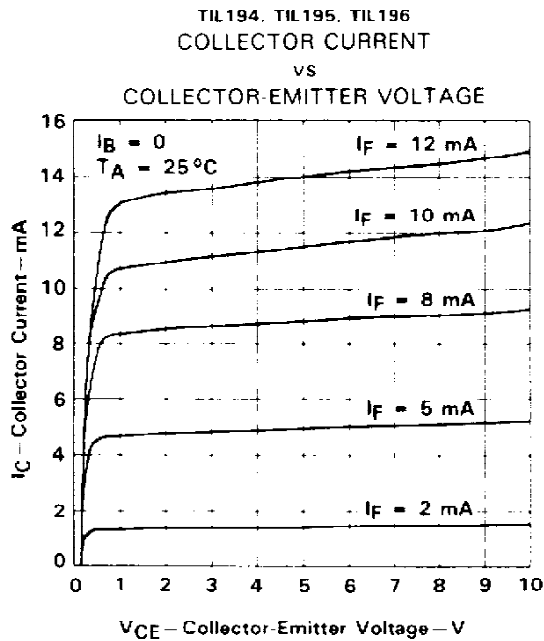


FIGURE 3

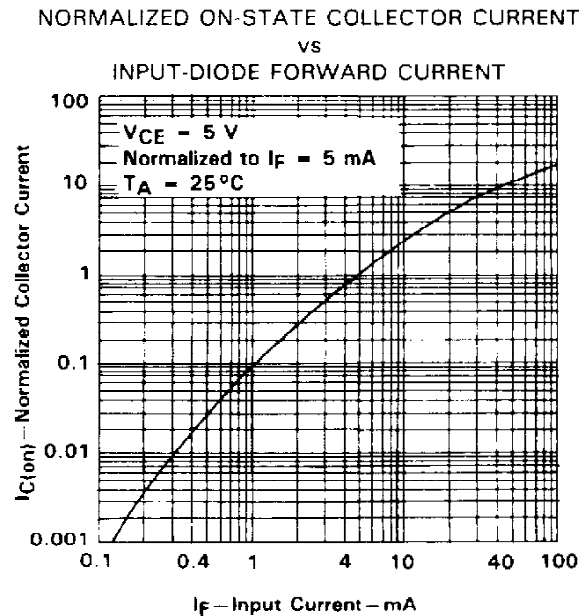


FIGURE 4

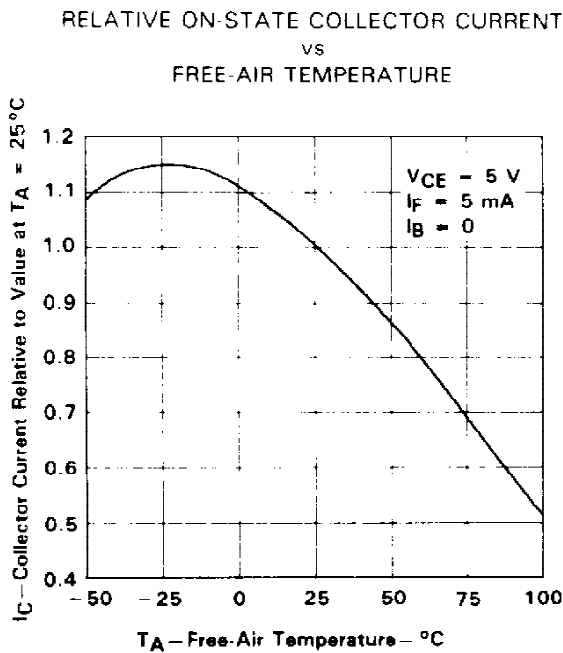


FIGURE 5

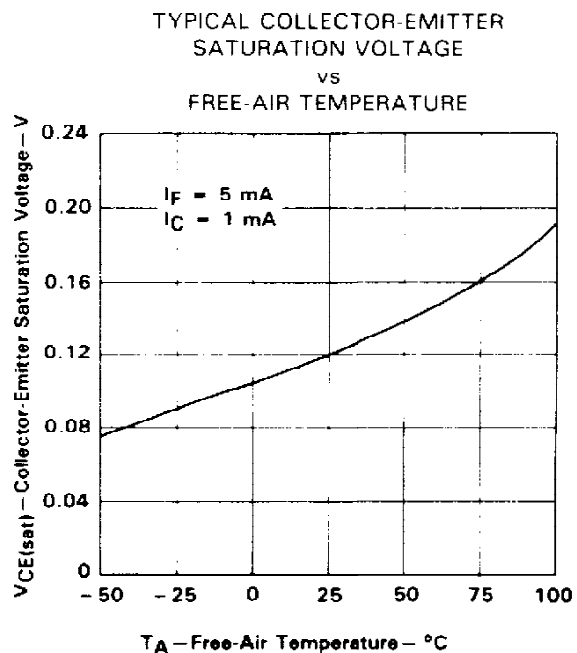


FIGURE 6

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