TIL191, TIL192, TIL193, TIL191A, TIL192A, TIL193A
TIL191B, TIL192B, TIL193B
OPTOCOUPLERS

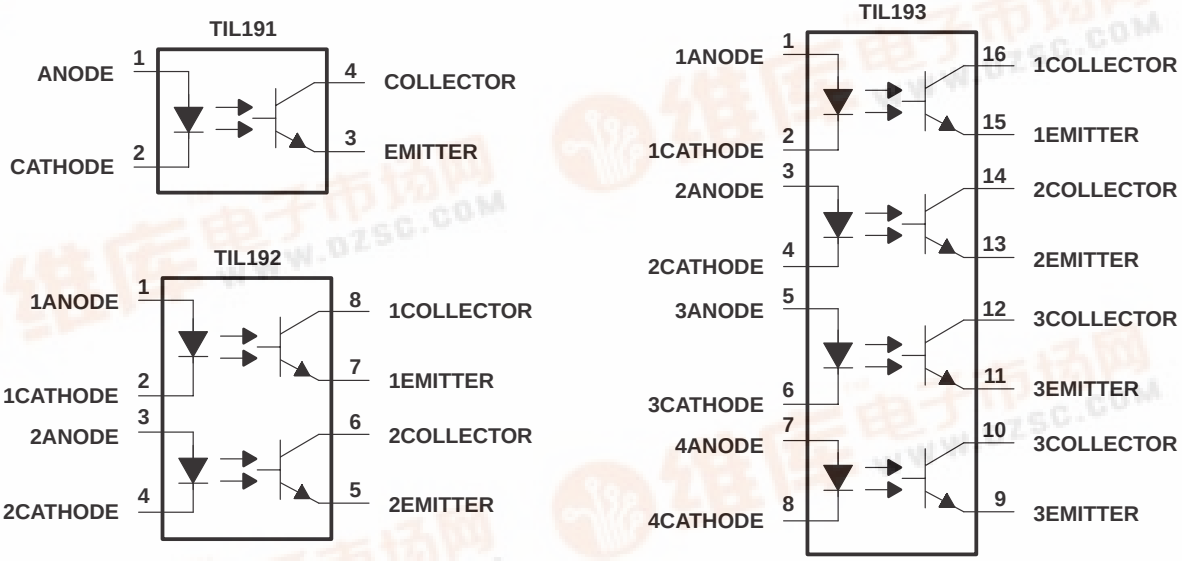
SOES026B – APRIL 1989 – REVISED APRIL 1998

- Gallium-Arsenide-Diode Infrared Source
- Source Is Optically Coupled to Silicon npn 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 one gallium-arsenide light-emitting diode and one silicon npn phototransistor per channel. The TIL191 has a single channel in a 4-pin package, the TIL192 has two channels in an 8-package, and the TIL193 has four channels in a 16-pin package. The standard devices, TIL191, TIL192, and TIL193, 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.

schematic diagrams



absolute maximum ratings at 25°C free-air (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 reverse voltage . . . . . 5 V
Input diode continuous forward current at (or below) 25°C free-air temperature (see Note 3) . . . . . 50 mA
Continuous total 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, T_{stg} . . . . . –55°C to 125°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. This rating applies for sine-wave operation at 50 Hz or 60 Hz. This 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 25°C free-air temperature range (unless otherwise noted)

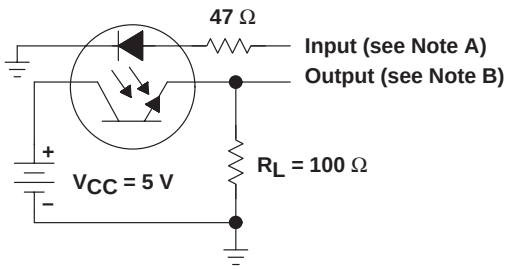
PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$	Collector-emitter breakdown voltage		I_C = 0.5 mA,	I_F = 0	35			V
$V_{(BR)ECO}$	Emitter-collector breakdown voltage		I_C = 100 μA,	I_F = 0	7			V
I_R	Input diode static reverse current		V_R = 5 V				10	μA
$I_{C(off)}$	Off-state collector current		V_{CE} = 24 V,	I_F = 0			100	nA
CTR	Current transfer ratio	TIL191, TIL192, TIL193	I_F = 5 mA,	V_{CE} = 5 V	20%			
		TIL191A, TIL192A, TIL193A			50%			
		TIL191B, TIL192B, TIL193B			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 mA, See Note 6	f = 1 MHz,		1		pF
r_{io}	Input-to-output internal resistance		$V_{in–out}$ = ±1 mA,	See Note 6		10^{11}		Ω

NOTE 6: These parameters are measured between all input diode leads shorted together and all phototransistor leads shorted together.

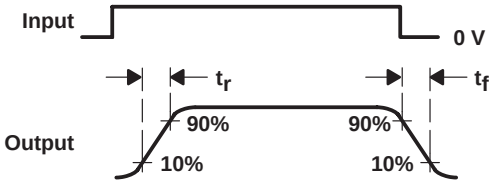
switching characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	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		

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



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

VOLTAGE WAVEFORMS

NOTES: A. The input waveform is supplied by a generator with the following characteristics: Z_{OUT} = 50 Ω, $t_r \le 15$ ns, duty cycle ≈ 1%, t_W = 100 μs.
B. The output waveform is monitored on a oscilloscope with the following characteristic: $t_r \le 12$ ns, $R_{in} \ge 1$ MΩ, $C_{in} \le 20$ pF.

Figure 1. Switching Times

TYPICAL CHARACTERISTICS

FORWARD CURRENT vs FORWARD VOLTAGE

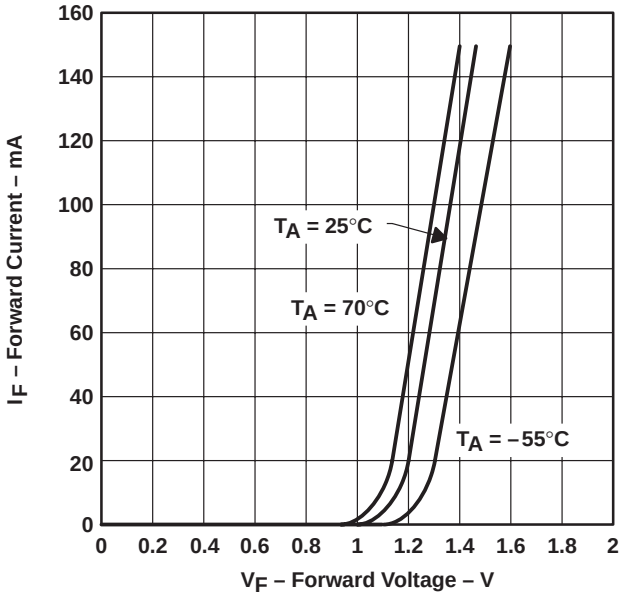


Figure 2

TIL191, TIL192, TIL193
COLLECTOR CURRENT vs COLLECTOR-EMITTER VOLTAGE

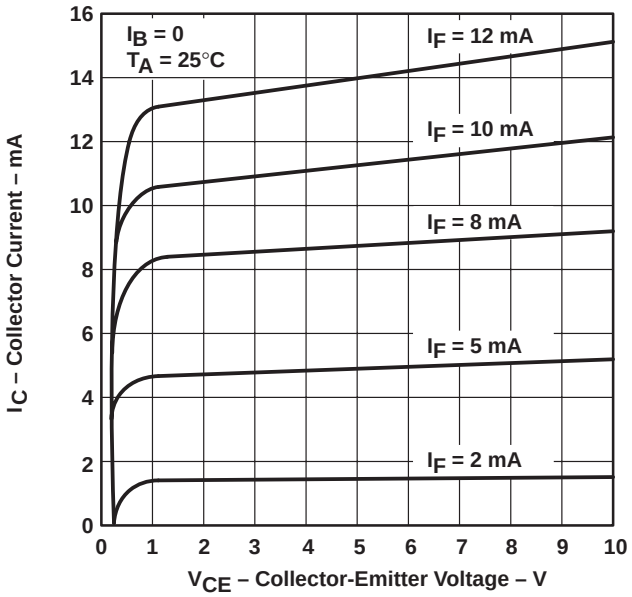


Figure 3

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

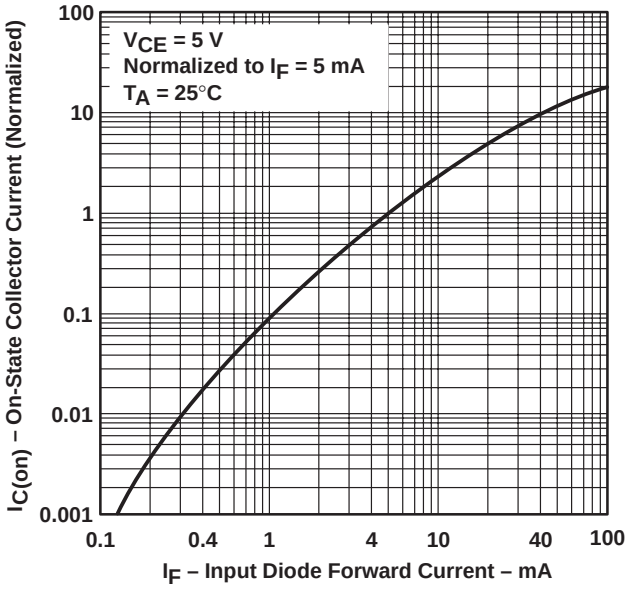


Figure 4

ON-STATE COLLECTOR CURRENT (RELATIVE TO VALUE AT 25°C) vs FREE-AIR TEMPERATURE

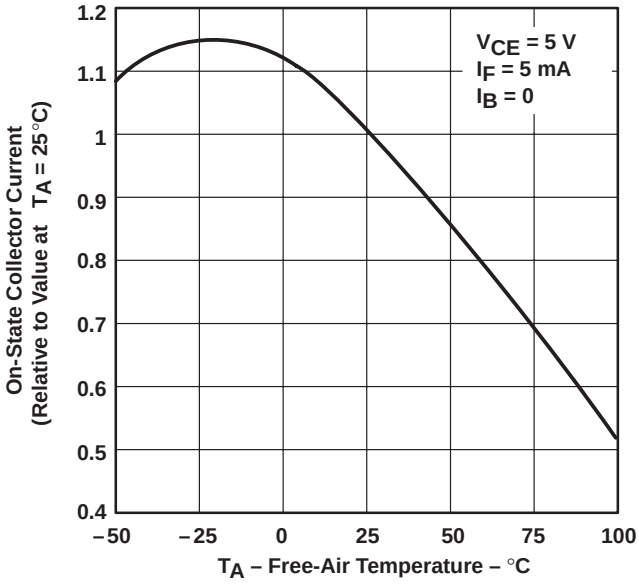


Figure 5

TYPICAL CHARACTERISTICS

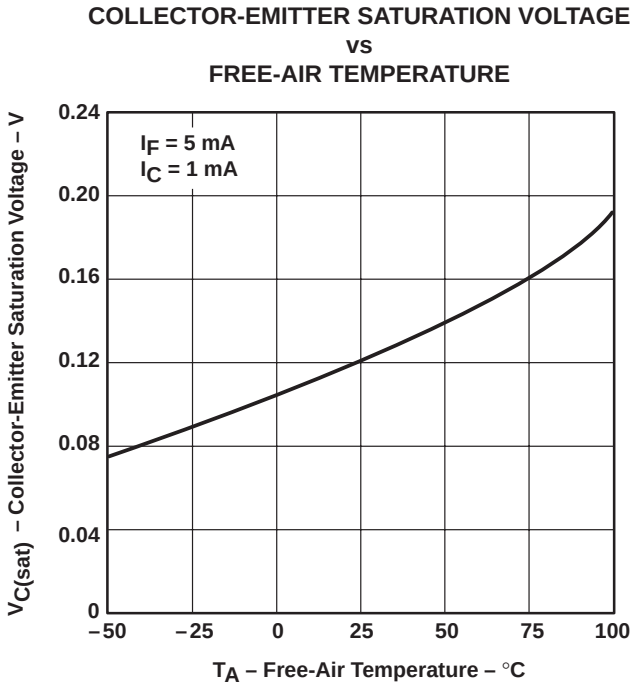


Figure 6

APPLICATION INFORMATION

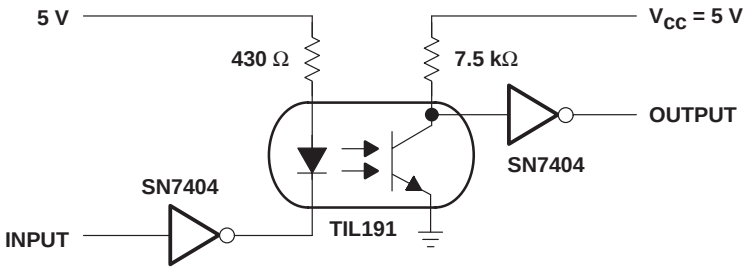
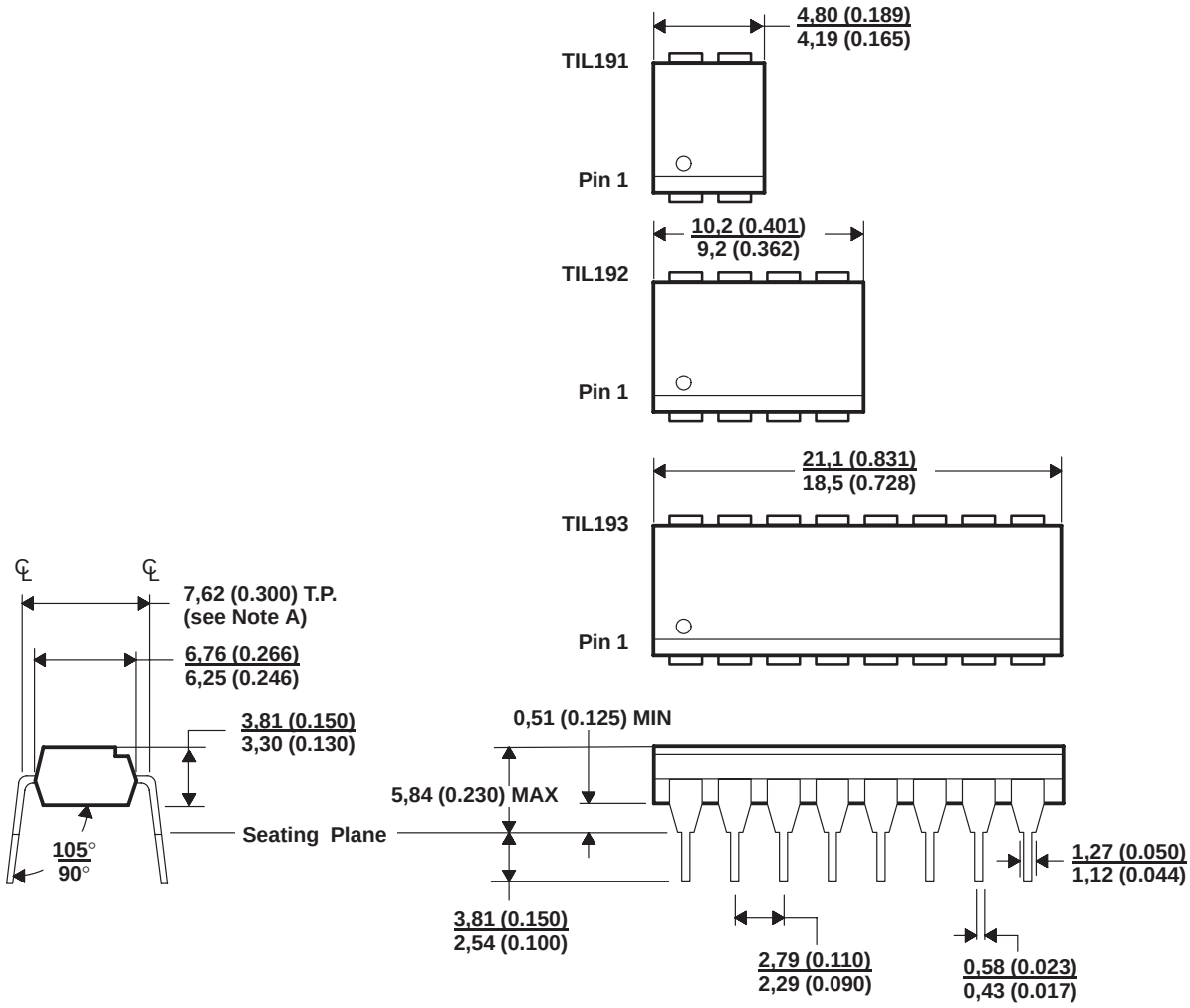


Figure 7

MECHANICAL INFORMATION



NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.
B. All linear dimensions are given in millimeters and parenthetically given in inches.

Figure 8. Mechanical Information

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