SINGLE/DUAL/QUAD CHANNEL OPTOCOUPLERS/OPTOISOLATORS

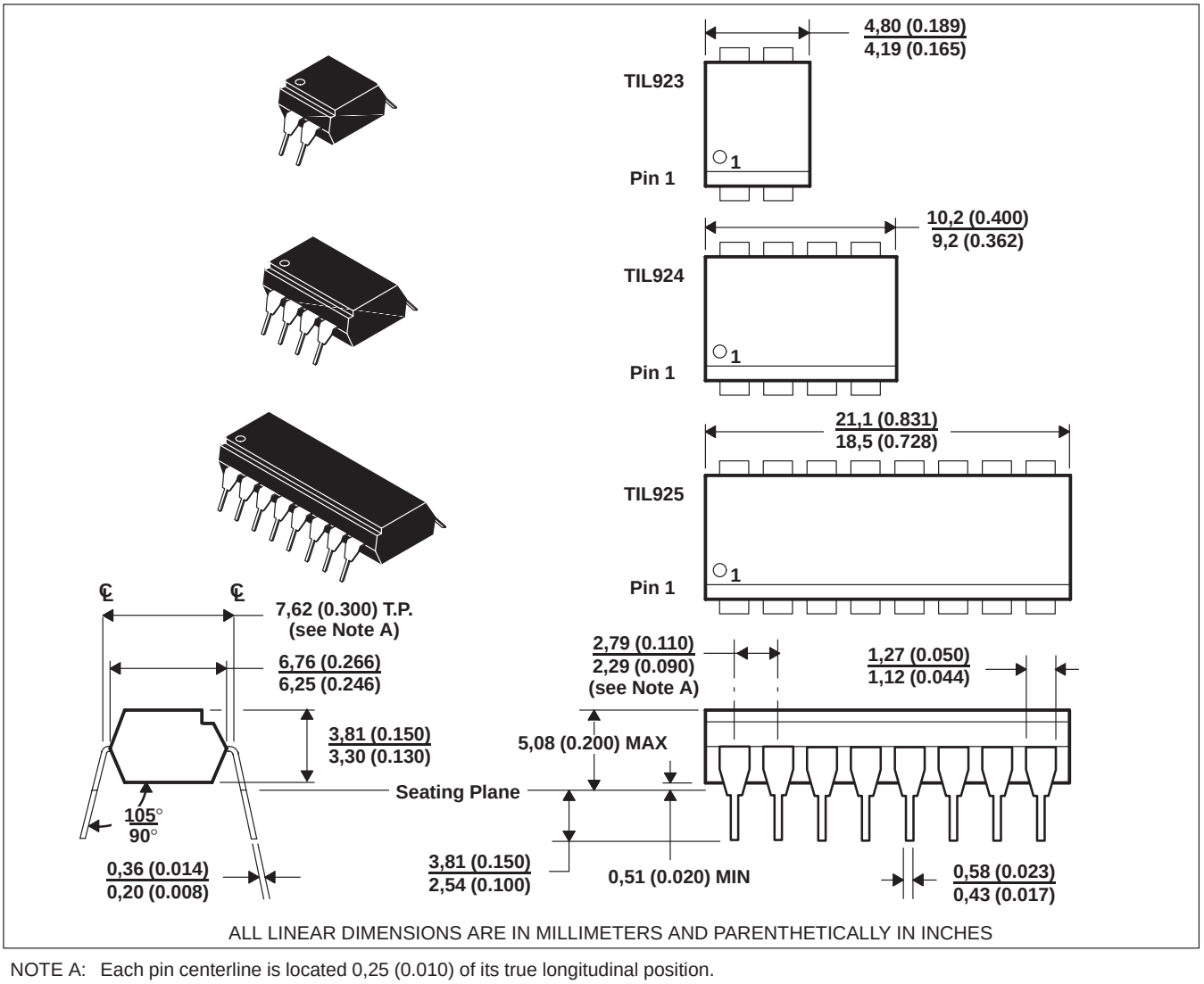
SOOS031 – OCTOBER 1991

- **Gallium-Arsenide Diode Infrared Source**
- **Source Is Optically Coupled to Silicon N-P-N Darlington Phototransistor**
- **Choice of One, Two, or Four Channels**
- **Choice of Two Current-Transfer Ratios**
- **High-Voltage Electrical Isolation . . . 7.5 kV Peak (5.3 kV rms)**
- **Plastic Dual-In-Line Packages**
- **UL Listed – File No. E65085**

description

These optocouplers consist of a gallium-arsenide light-emitting diode and a silicon n-p-n Darlington phototransistor per channel. The TIL923 has one channel in a 4-pin package, the TIL924 has two channels in a 8-pin package, and the TIL925 has four channels in a 16-pin package. The standard devices, TIL923, TIL924, and TIL925, are tested for a current-transfer ratio of 500% minimum. Devices selected for a current-transfer ratio of 1000% are designated with the suffix.

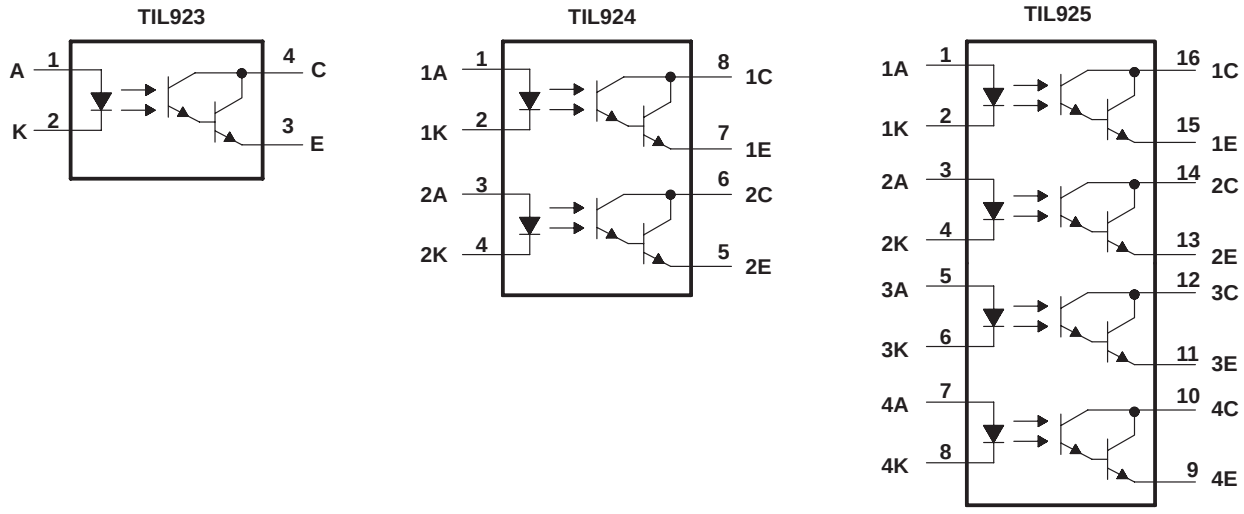
mechanical data



ALL LINEAR DIMENSIONS ARE IN MILLIMETERS AND PARENTHETICALLY IN INCHES

NOTE A: Each pin centerline is located 0,25 (0.010) of its true longitudinal position.

schematic diagrams



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

Input-to-output voltage (see Note 1) . . . . . ±7.5 kV peak or dc (±5.3 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 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
Operating free-air temperature, T_A . . . . . –55°C to 100°C
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, T_A = 25°C (unless otherwise noted)

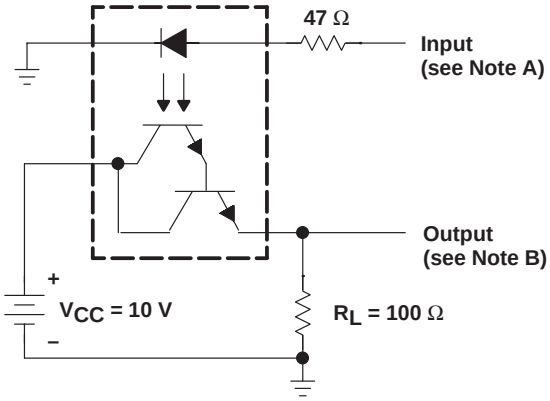
PARAMETER			TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$	Collector-emitter breakdown voltage		I_C = 0.5 mA,	I_F = 0		35			V
$V_{(BR)ECO}$	Emitter-collector breakdown voltage		I_C = 100 µA,	I_F = 0		7			V
I_R	Input diode static reverse current		V_R = 5 V					10	µA
$I_{C(off)}$	Off-state collector current		V_{CE} = 10 V,	I_F = 0				100	nA
CTR	Current transfer ratio	TIL923, TIL924, TIL925	I_F = 2 mA,	V_{CE} = 1 V		500%			
		TIL923A, TIL924A, TIL925A				1000%			
V_F	Input diode static forward voltage		I_F = 20 mA					1.4	V
$V_{CE(sat)}$	Collector-emitter saturation voltage		I_F = 10 mA,	I_C = 50 mA				1	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

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

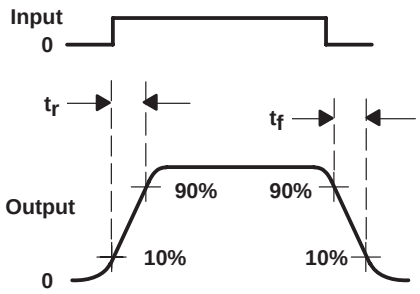
switching characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_r	Rise time	V_{CC} = 10 V, $I_{C(on)}$ = 10 mA, R_L = 100 Ω, See Figure 1		100		µs
t_f	Fall time			100		

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



Adjust amplitude of input pulse for $I_{C(on)}$ = 10 mA

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%, t_w = 500 µs.
B. The output waveform is monitored on an oscilloscope with the following characteristics: t_r ≤ 12 ns, R_{in} ≥ 1 MΩ, C_{in} ≤ 20 pF.

Figure 1. Switching Times

TYPICAL CHARACTERISTICS

FORWARD CURRENT vs FORWARD VOLTAGE

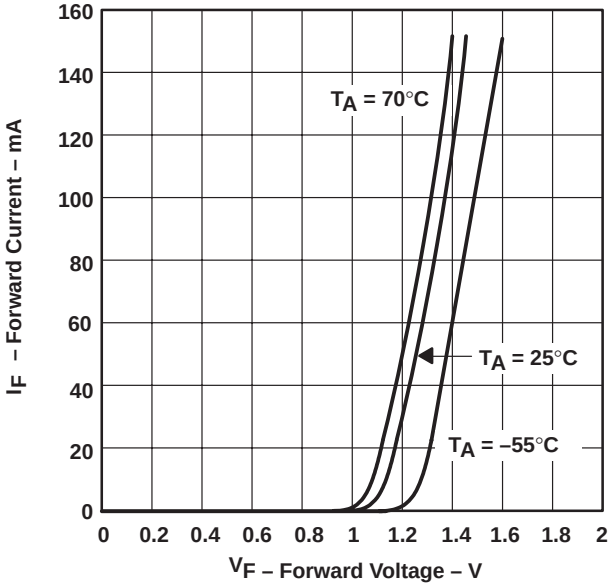
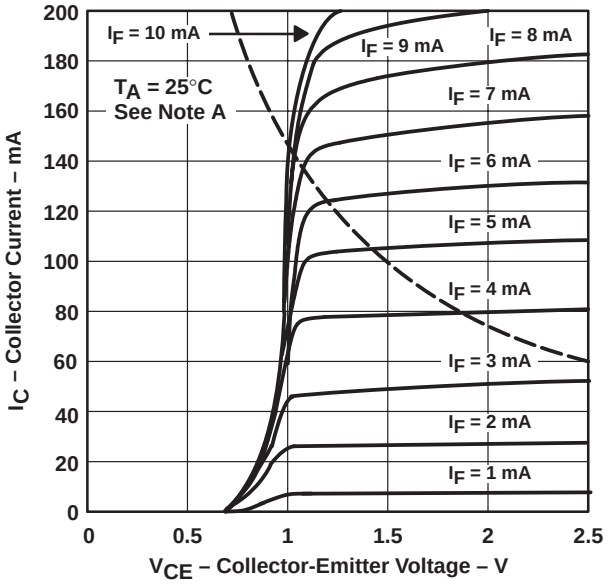


Figure 2

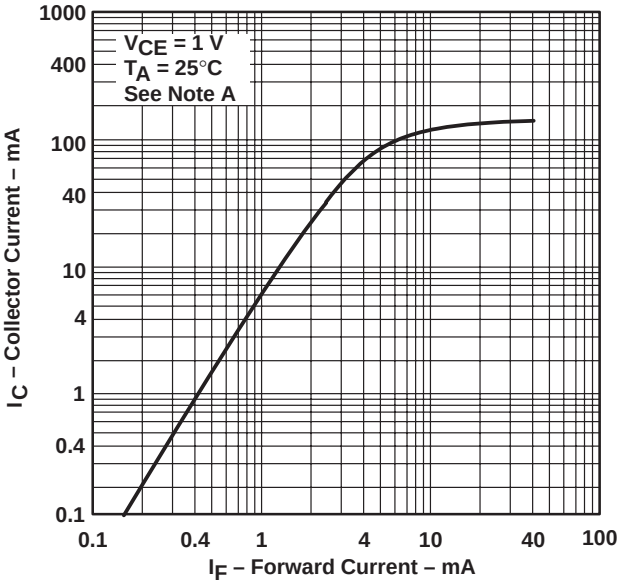
COLLECTOR CURRENT vs COLLECTOR-EMITTER VOLTAGE



NOTE A: Pulse operation is required for operation beyond limits shown by the dashed line.

Figure 3

COLLECTOR CURRENT vs INPUT DIODE FORWARD CURRENT



NOTE A: These parameters are measured using pulse techniques t_W = 1 ms, duty cycle ≤ 2%.

Figure 4

TYPICAL CHARACTERISTICS

RELATIVE ON-STATE COLLECTOR CURRENT vs FREE-AIR TEMPERATURE

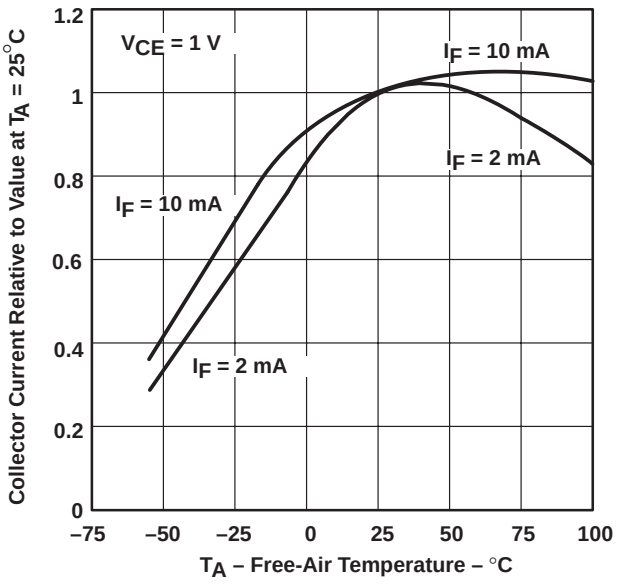


Figure 5

OFF-STATE COLLECTOR CURRENT vs FREE-AIR TEMPERATURE

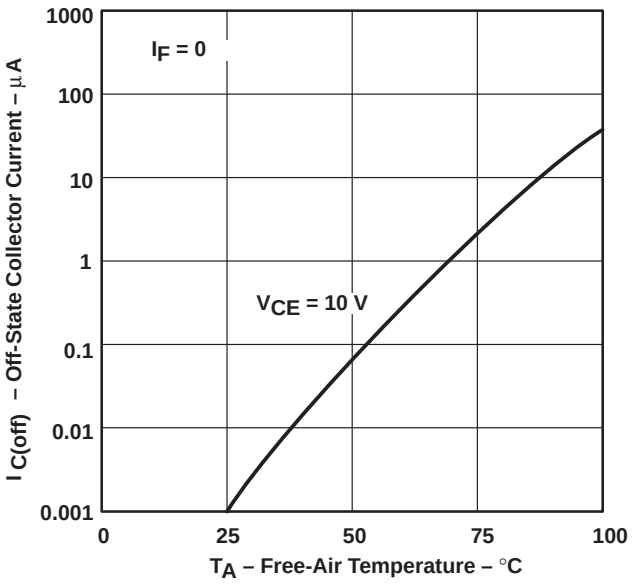


Figure 6

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