

TIL923, TIL924, TIL925  
TIL923A, TIL924A, TIL925A  
SOOS031 – OCTOBER 1991

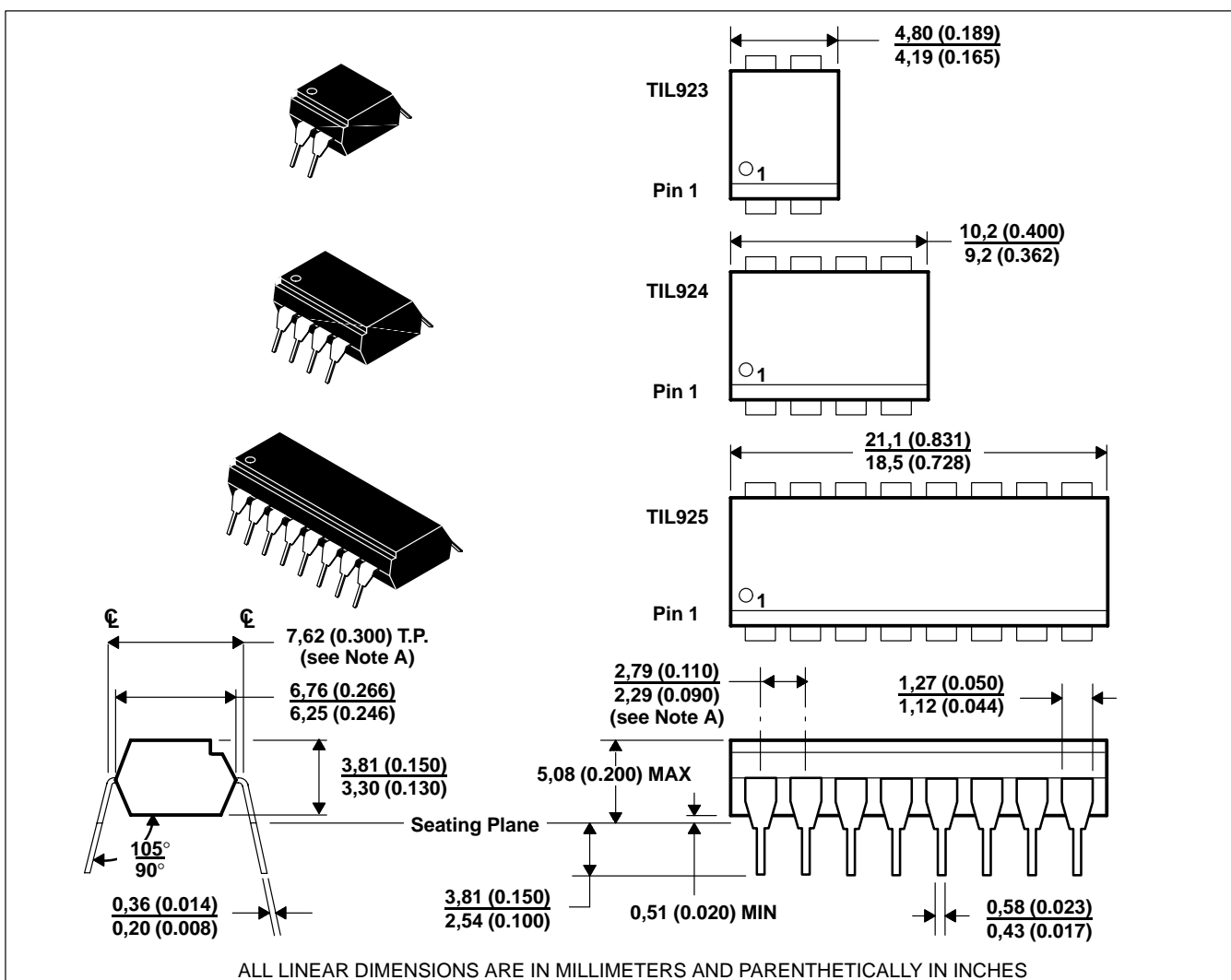
## SINGLE/DUAL/QUAD CHANNEL OPTOCOUPLEDERS/OPTOISOLATORS

- 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



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

PRODUCTION DATA information is 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.



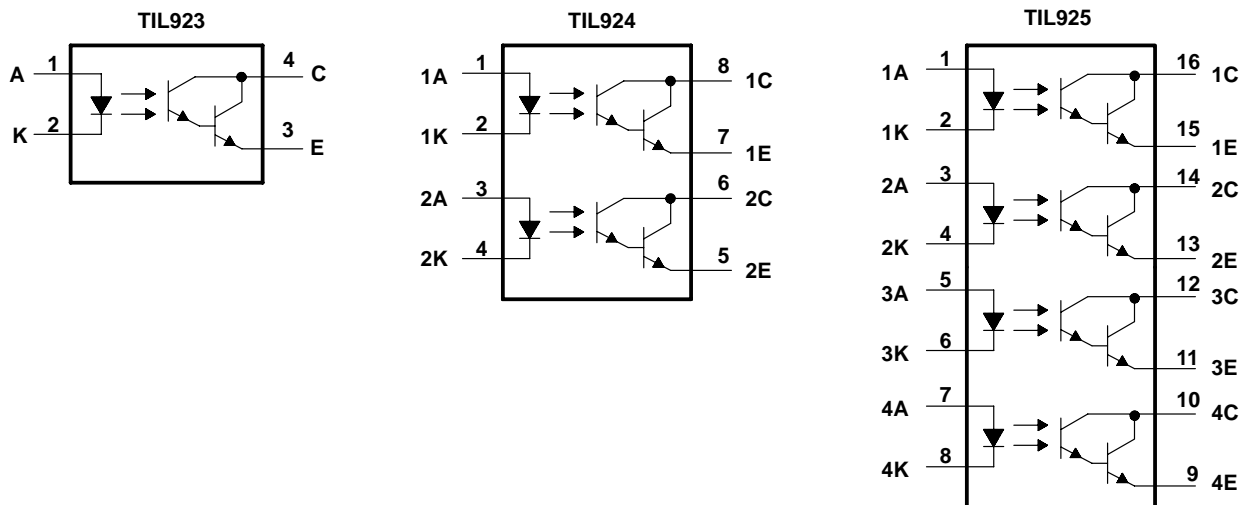
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**schematic diagrams**



**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 <sub>A</sub>	.....	–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<sub>A</sub> = 25°C (unless otherwise noted)**

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V <sub>(BR)CEO</sub>	Collector-emitter breakdown voltage	I <sub>C</sub> = 0.5 mA, I <sub>F</sub> = 0	35			V
V <sub>(BR)ECO</sub>	Emitter-collector breakdown voltage	I <sub>C</sub> = 100 μA, I <sub>F</sub> = 0	7			V
I <sub>R</sub>	Input diode static reverse current	V <sub>R</sub> = 5 V			10	μA
I <sub>C(off)</sub>	Off-state collector current	V <sub>CE</sub> = 10 V, I <sub>F</sub> = 0			100	nA
CTR	Current transfer ratio	TIL923, TIL924, TIL925	I <sub>F</sub> = 2 mA, V <sub>CE</sub> = 1 V		500%	
		TIL923A, TIL924A, TIL925A			1000%	
V <sub>F</sub>	Input diode static forward voltage	I <sub>F</sub> = 20 mA			1.4	V
V <sub>CE(sat)</sub>	Collector-emitter saturation voltage	I <sub>F</sub> = 10 mA, I <sub>C</sub> = 50 mA			1	V
C <sub>io</sub>	Input-to-output capacitance	V <sub>in-out</sub> = 0, f = 1 MHz, See Note 6		1		pF
r <sub>io</sub>	Input-to-output internal resistance	V <sub>in-out</sub> = ±1 kV, See Note 6		10 <sup>11</sup>		Ω

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



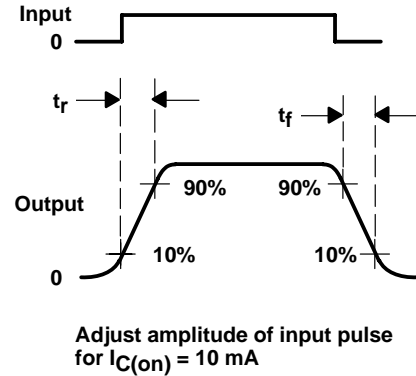
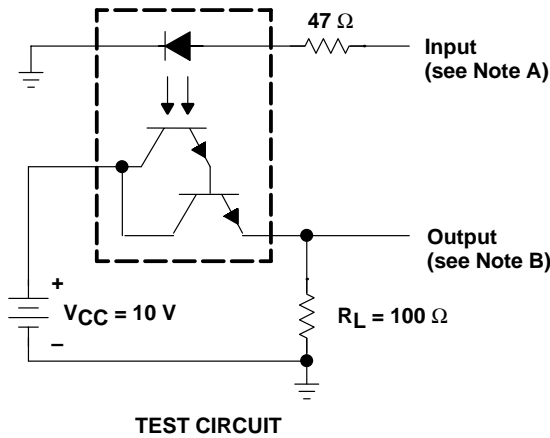
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switching characteristics at 25°C free-air temperature

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

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input waveform is supplied by a generator with the following characteristics:  $Z_O = 50\ \Omega$ ,  $t_r \leq 15\text{ ns}$ , duty cycle = 1%,  $t_W = 500\ \mu\text{s}$ .  
B. The output waveform is monitored on an oscilloscope with the following characteristics:  $t_r \leq 12\text{ ns}$ ,  $R_{in} \geq 1\text{ M}\Omega$ ,  $C_{in} \leq 20\text{ pF}$ .

Figure 1. Switching Times

TYPICAL CHARACTERISTICS

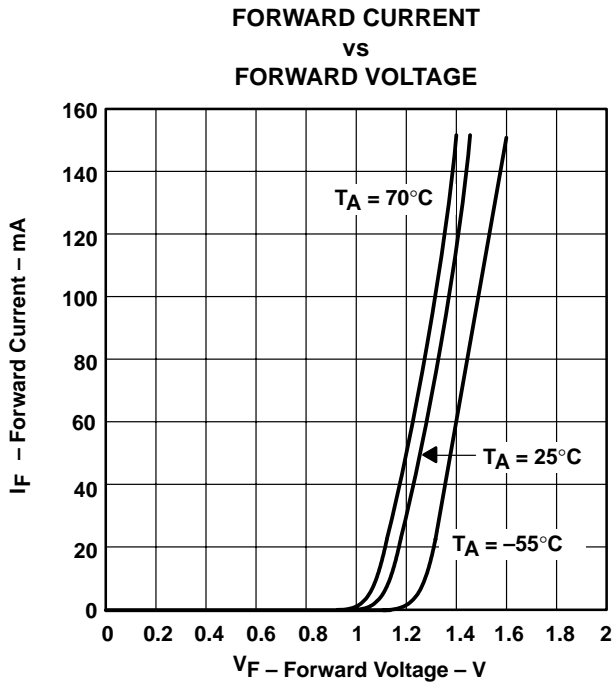
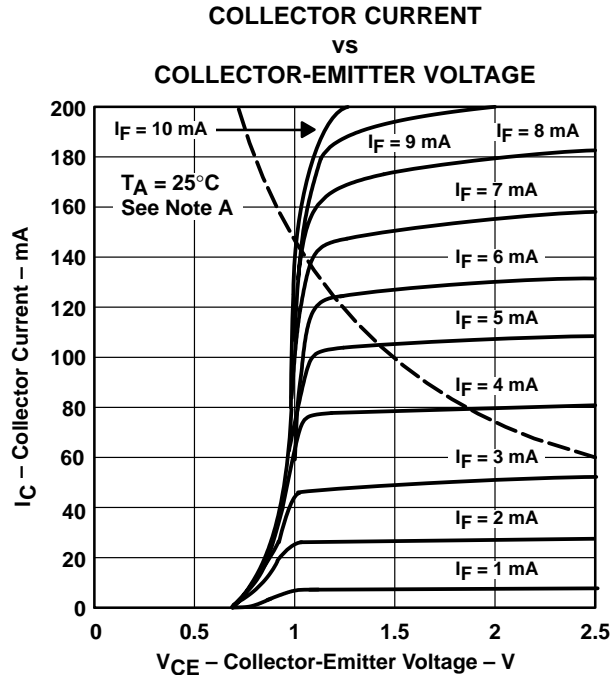
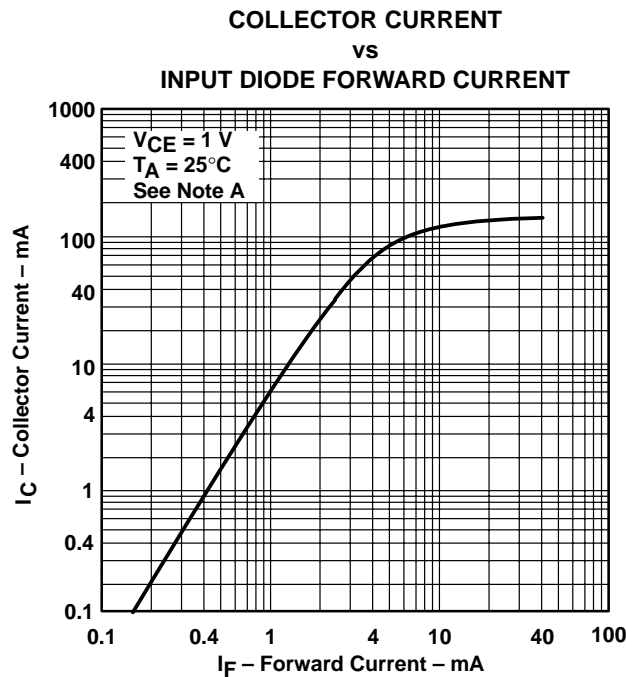


Figure 2



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

Figure 3



NOTE A: These parameters are measured using pulse techniques  $t_w = 1$  ms, duty cycle  $\leq 2\%$ .

Figure 4

TYPICAL CHARACTERISTICS

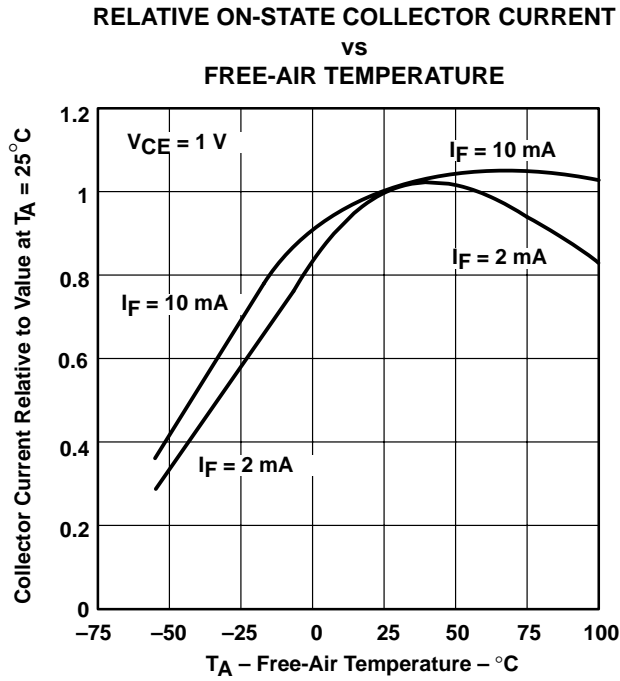


Figure 5

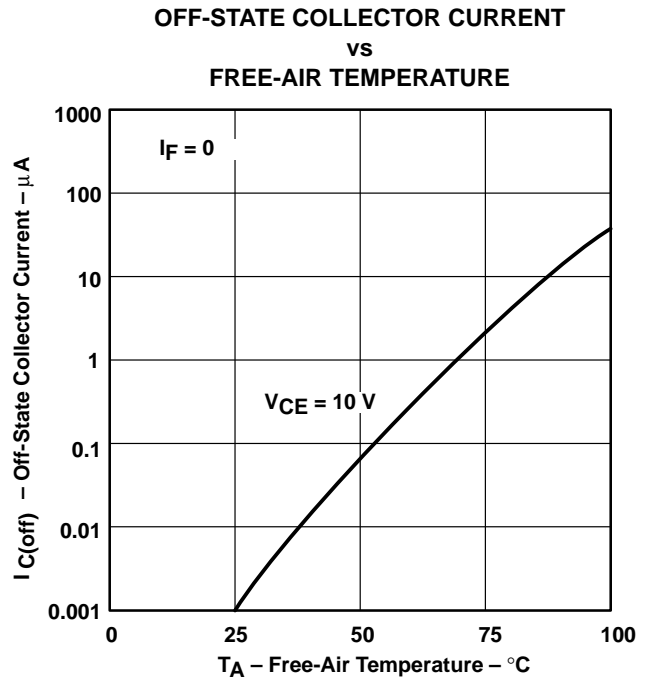


Figure 6

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