

# TIL920, TIL921, TIL922, TIL920A, TIL921A, TIL922A TIL920B, TIL921B, TIL922B SINGLE/DUAL/QUAD CHANNEL OPTOCOUPLEDERS

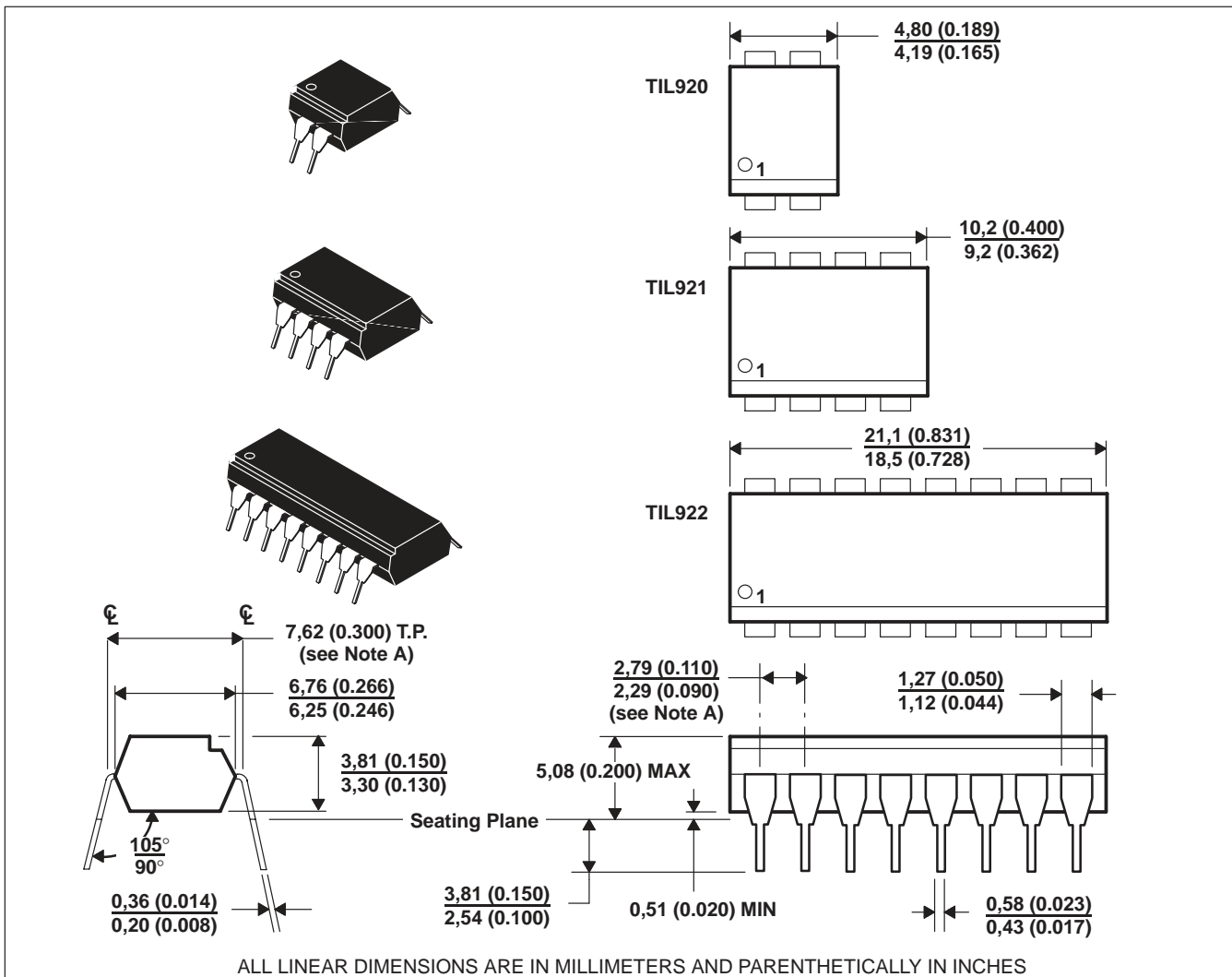
SOOS032-D3908, FEBRUARY 1992

- 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 . . . 7.5 kV Peak (5.3 kV rms)
- Plastic Dual-In-Line Packages
- UL Listed – File No. 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 TIL920 has one channel in a 4-pin package, the TIL921 has two channels in an 8-pin package, and the TIL922 has four channels in a 16-pin package. The standard devices, TIL920, TIL921, and TIL922, 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 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.



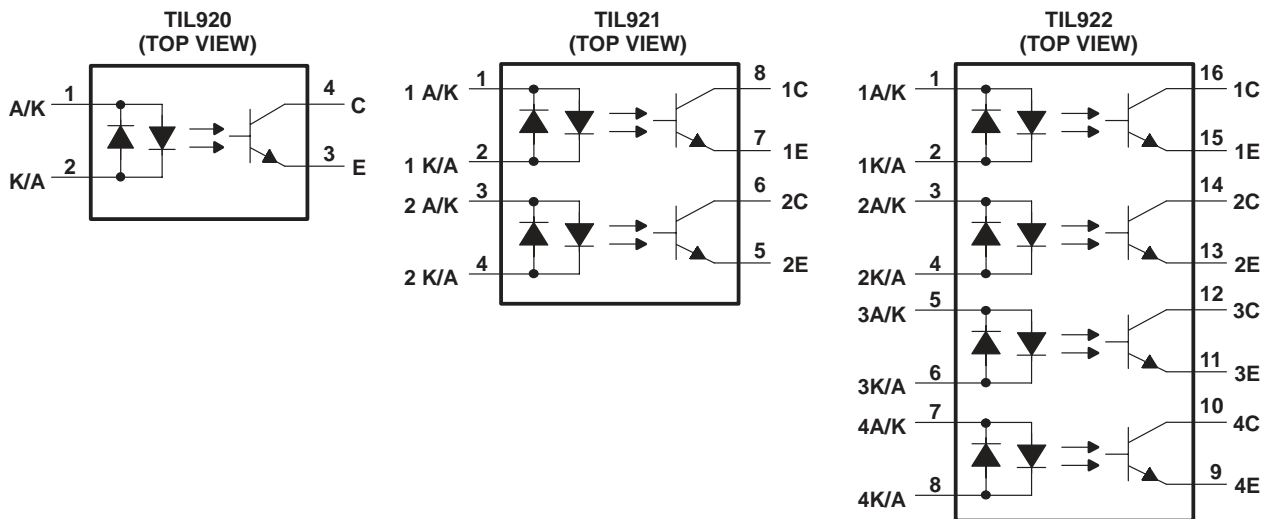
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## schematic diagrams



## absolute maximum ratings, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

Input-to-output voltage (see Note 1)	$\pm 7.5$ kV peak or dc ( $\pm 5.3$ kV rms)
Collector-emitter voltage (see Note 2)	35 V
Emitter-collector voltage	7 V
Input diode continuous forward current at (or below) $25^\circ\text{C}$ free-air temperature (see Note 3)	$\pm 50$ mA
Continuous power dissipation at (or below) $25^\circ\text{C}$ free-air temperature:	
Phototransistor (see Note 4)	150 mW
Input diode plus phototransistor per channel (see Note 5)	200 mW
Operating free-air temperature range, $T_A$	$-55^\circ\text{C}$ to $100^\circ\text{C}$
Storage temperature range	$-55^\circ\text{C}$ to $125^\circ\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	$260^\circ\text{C}$

- 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  $100^\circ\text{C}$  free-air temperature at the rate of  $0.67$  mA/ $^\circ\text{C}$ .  
 4. Derate linearly to  $100^\circ\text{C}$  free-air temperature at the rate of  $2$  mW/ $^\circ\text{C}$ .  
 5. Derate linearly to  $100^\circ\text{C}$  free-air temperature at the rate of  $2.67$  mW/ $^\circ\text{C}$ .

## electrical characteristics, $T_A = 25^\circ\text{C}$ (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	$I_C = 100$ $\mu\text{A}$ , $I_F = 0$	7			V
$I_{C(off)}$	Off-state collector current	$V_{CE} = 24$ V, $I_F = 0$			100	nA
CTR $\dagger$	Current transfer ratio	$I_F = 5$ mA, $V_{CE} = 5$ V	TIL920, TIL921, TIL922		20%	
	TIL920A, TIL921A, TIL922A		50%			
	TIL920B, TIL921B, TIL922B		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	$V_{in-out} = \pm 1$ kV, See Note 6		$10^{11}$		$\Omega$
$I_{C(on)1}$ $I_{C(on)2}$	On-state collector current symmetry ratio (see Note 7)	$V_{CE} = 5$ V, $I_F = 5$ mA	1		3	

$\dagger$  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  $I_{C(on)1}$ .



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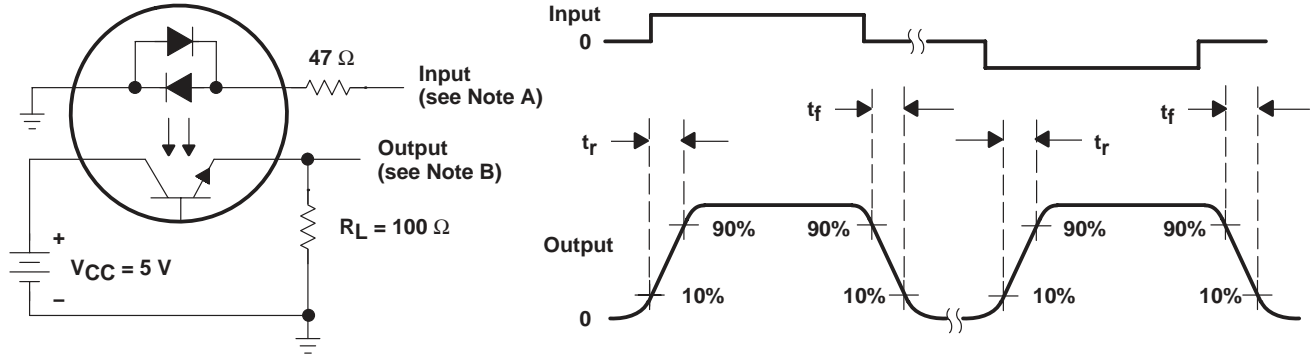
switching characteristics,  $T_A = 25^\circ\text{C}$

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

† 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:  $Z_O = 50\ \Omega$ ,  $t_r \leq 15\text{ ns}$ , duty cycle = 1%.  
 B. The output waveform is monitored on an oscilloscope with the following characteristics:  $t_r \leq 12\text{ ns}$ ,  $R_i \geq 1\text{ M}\Omega$ ,  $C_i \leq 20\text{ pF}$ .

Figure 1. Switching Times

TYPICAL CHARACTERISTICS

INPUT CURRENT  
 vs  
 INPUT VOLTAGE

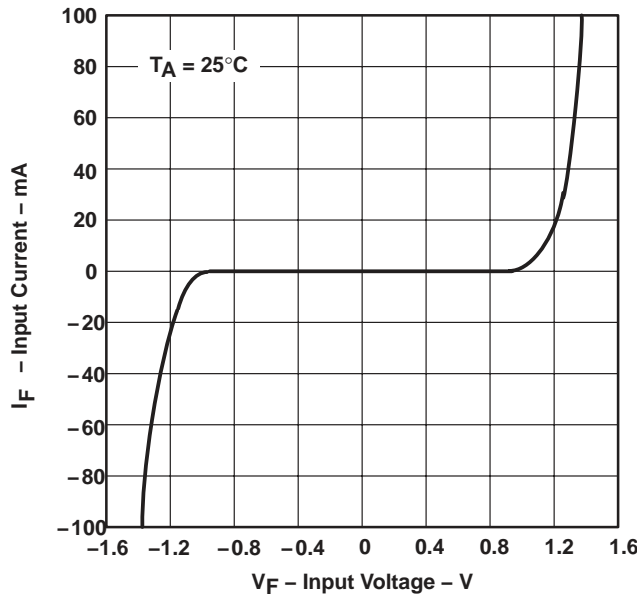


Figure 2

TIL920, TIL921, TIL922, TIL920A, TIL921A, TIL922A  
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TYPICAL CHARACTERISTICS

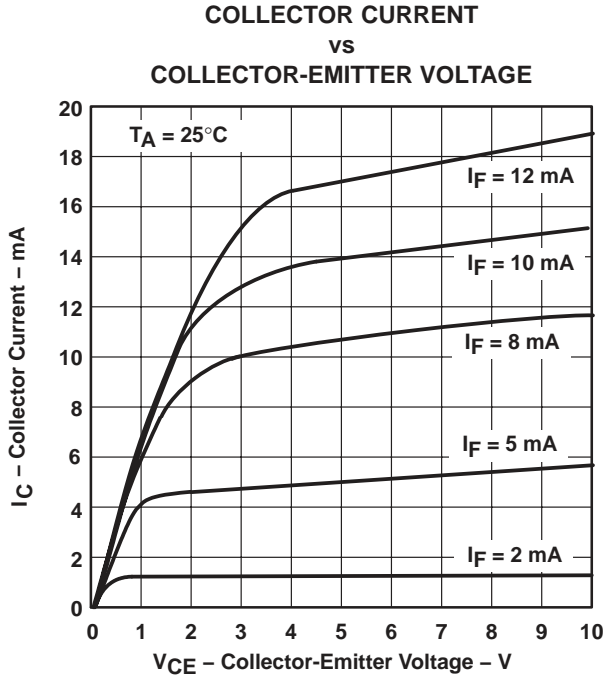


Figure 3

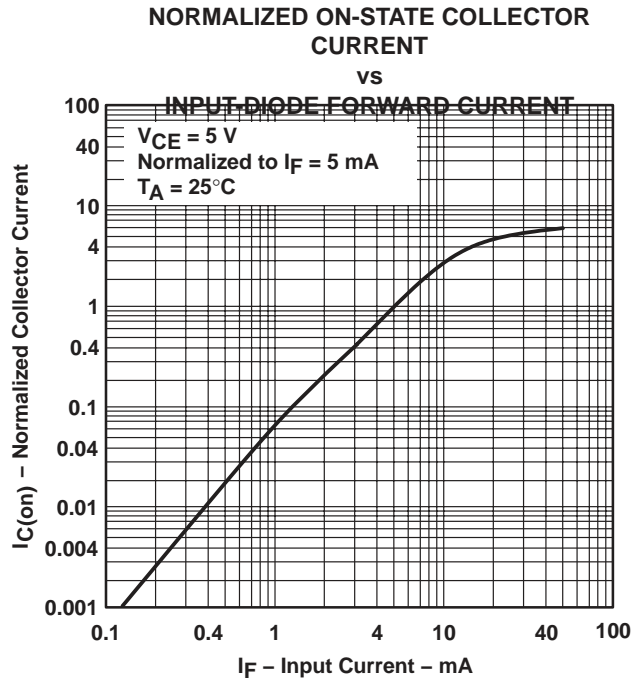


Figure 4

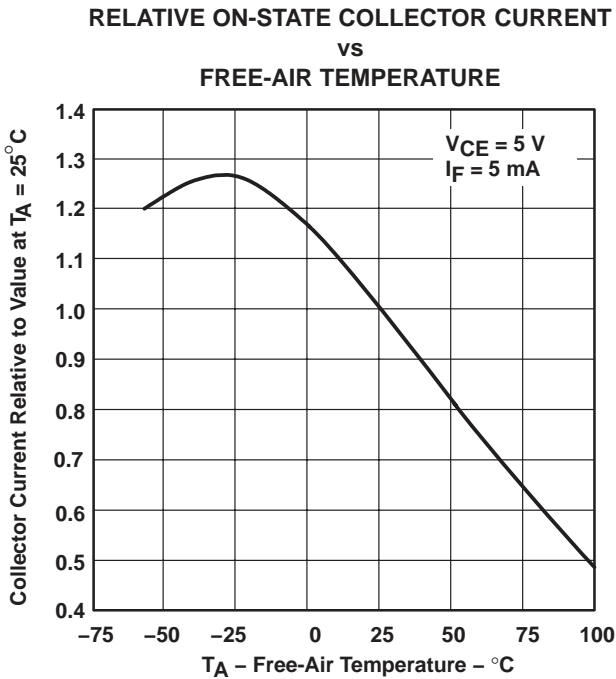


Figure 5

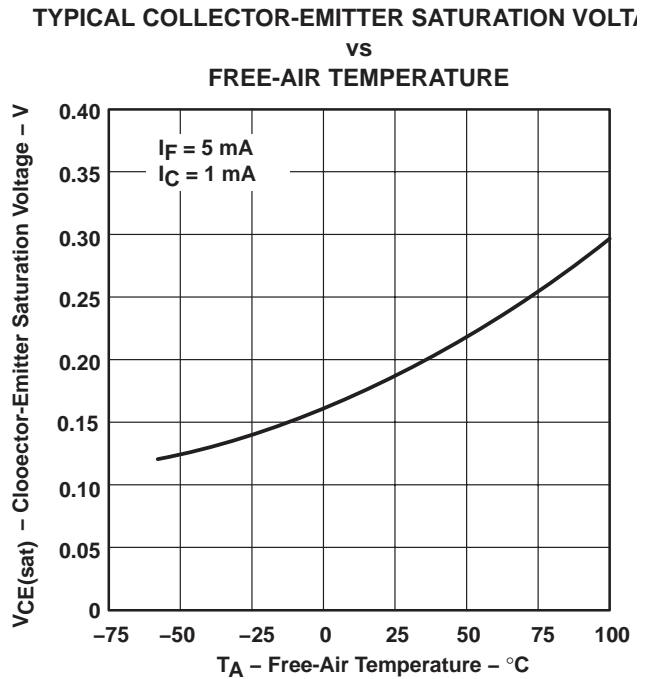


Figure 6

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