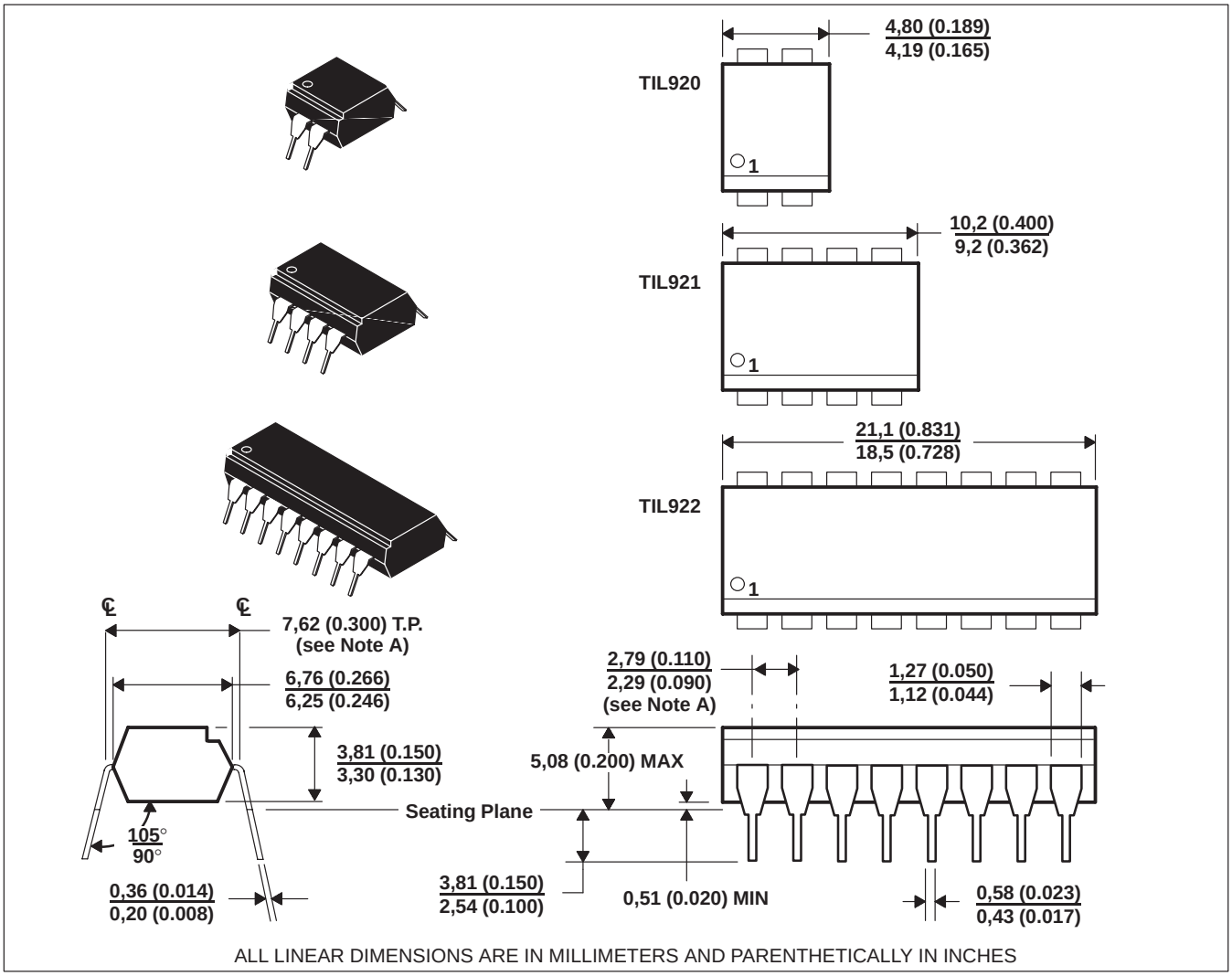
- **AC Signal Input**
- **Gallium-Arsenide Diode Infrared Source**
- **Source Is Optically Coupled to Silicon N-P-N Phototransistor**
- **Choice of One, Two, or Four Channels**
- **Choice of Three Current-Transfer Ratios**
- **High-Voltage Electrical Isolation . . . 7.5 kV Peak (5.3 kV rms)**
- **Plastic 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.

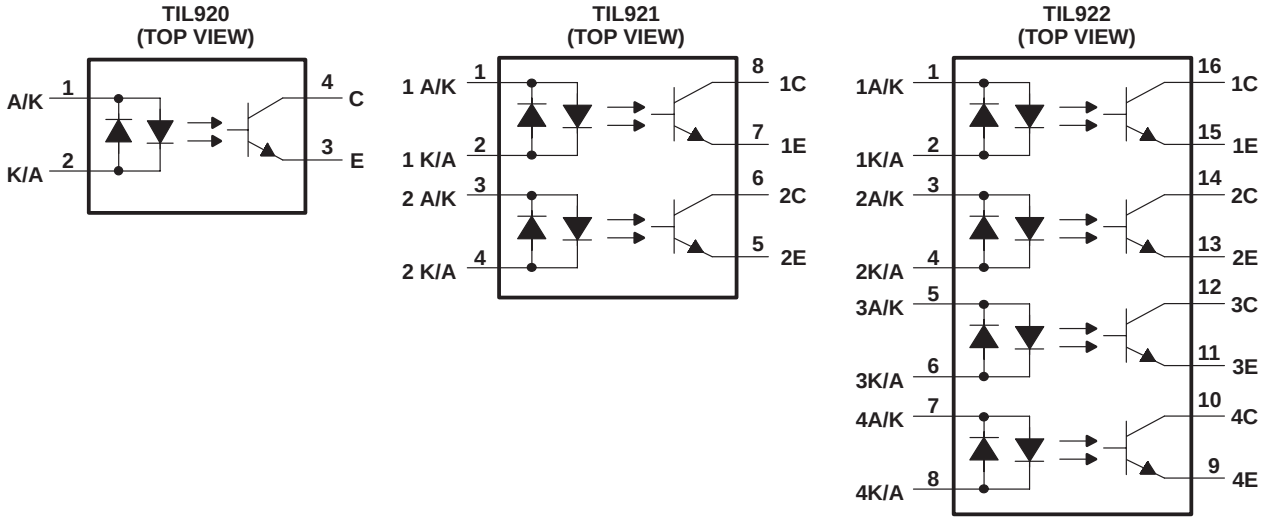
mechanical data



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, T_A = 25°C (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 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 range, 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
$I_{C(off)}$	Off-state collector current		V_{CE} = 24 V,	I_F = 0			100	nA
CTR†	Current transfer ratio	TIL920, TIL921, TIL922	I_F = 5 mA,	V_{CE} = 5 V	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} = ±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	

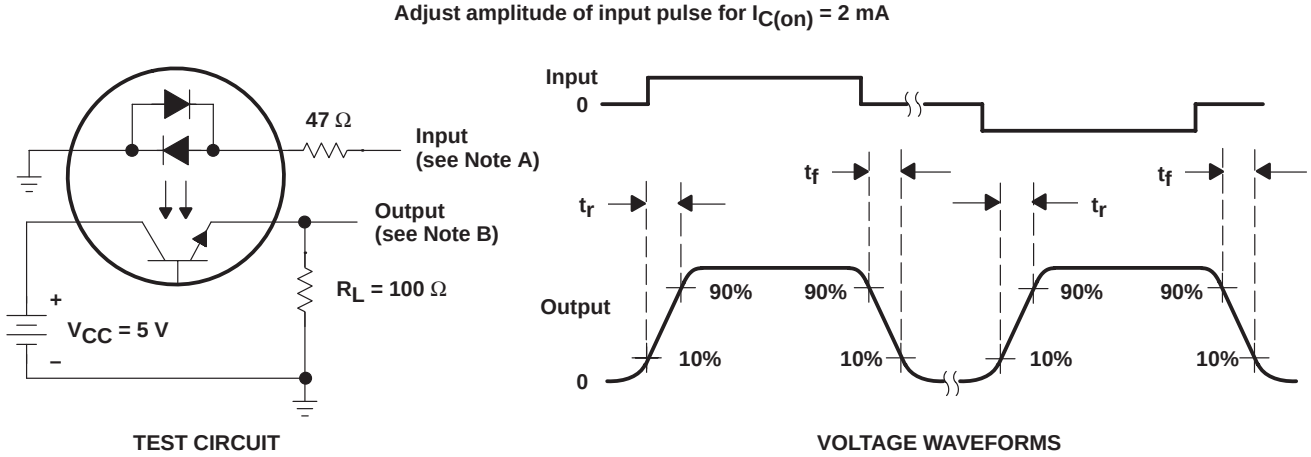
† These parameters apply to either direction of the input current.
NOTES: 6. These parameters are measured between all input-diode leads shorted together and all phototransistor leads shorted together.
7. The higher of the two values of $I_{C(on)}$ generated by the two diodes is taken as $I_{C(on)1}$.

switching characteristics, T_A = 25°C

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

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

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT VOLTAGE WAVEFORMS

NOTES: A. The input waveform is supplied by a generator with the following characteristics: Z_O = 50 Ω, $t_r \le 15$ ns, duty cycle = 1%.
B. The output waveform is monitored on an oscilloscope with the following characteristics: $t_r \le 12$ ns, $R_i \ge 1$ MΩ, $C_i \le 20$ pF.

Figure 1. Switching Times

TYPICAL CHARACTERISTICS

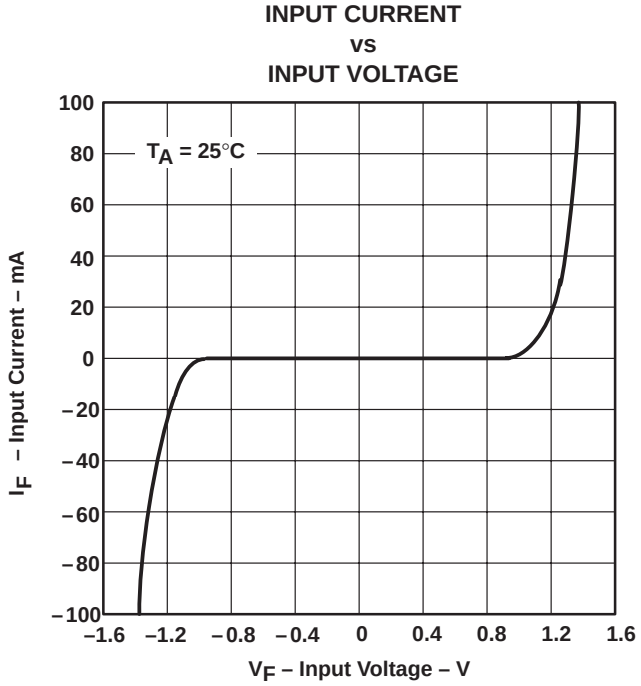


Figure 2

TYPICAL CHARACTERISTICS

COLLECTOR CURRENT vs COLLECTOR-EMITTER VOLTAGE

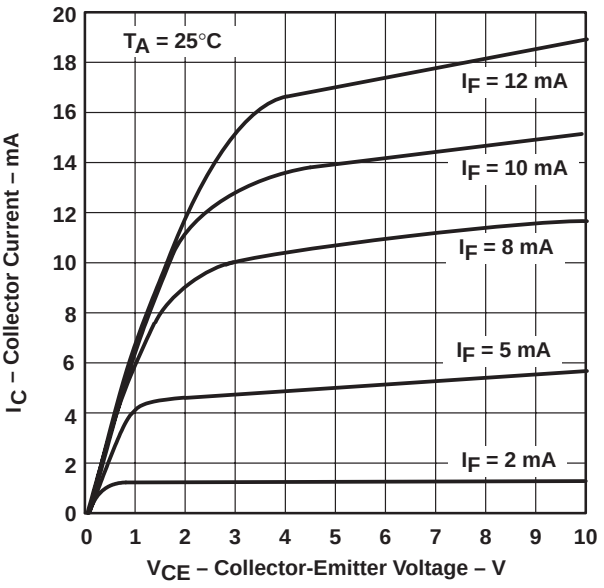


Figure 3

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

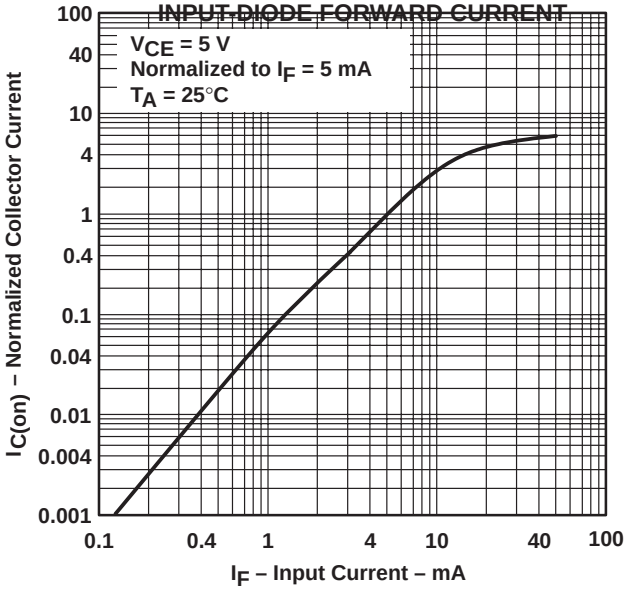


Figure 4

RELATIVE ON-STATE COLLECTOR CURRENT vs FREE-AIR TEMPERATURE

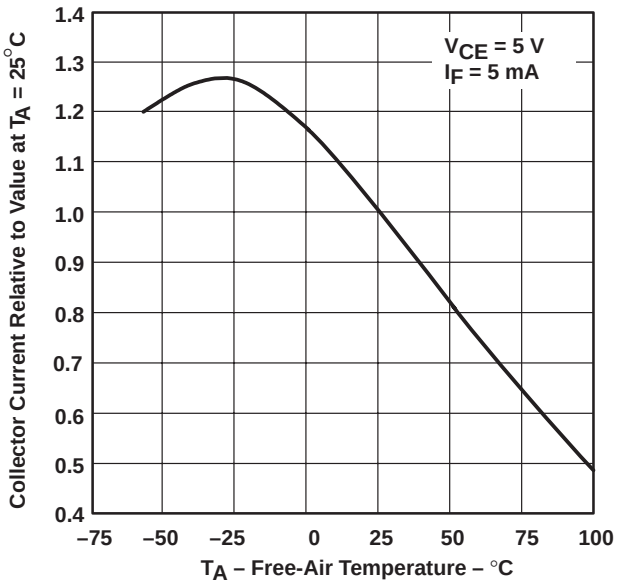


Figure 5

TYPICAL COLLECTOR-EMITTER SATURATION VOLTA vs FREE-AIR TEMPERATURE

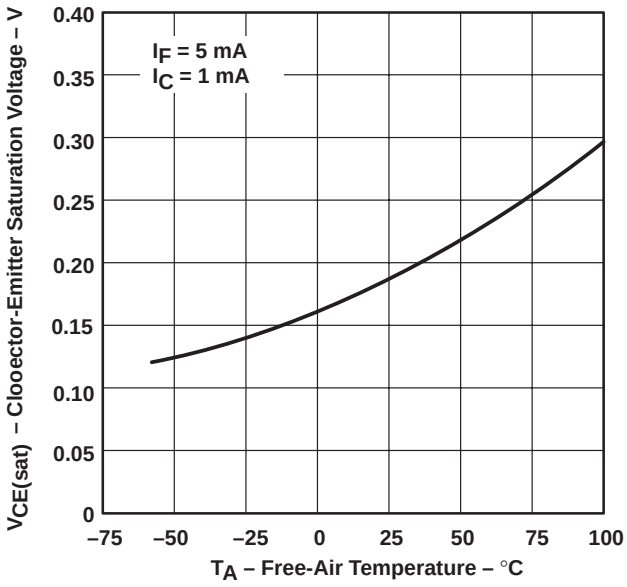


Figure 6

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
TIL920	OBSOLETE	PDIP	N	4		TBD	Call TI	Call TI
TIL920A	OBSOLETE	PDIP	N	4		TBD	Call TI	Call TI
TIL920B	OBSOLETE	PDIP	N	4		TBD	Call TI	Call TI
TIL921	OBSOLETE	PDIP	N	4		TBD	Call TI	Call TI
TIL921A	OBSOLETE	PDIP	N	4		TBD	Call TI	Call TI
TIL921B	OBSOLETE	PDIP	N	4		TBD	Call TI	Call TI
TIL922	OBSOLETE	PDIP	N	8		TBD	Call TI	Call TI
TIL922A	OBSOLETE	PDIP	N	8		TBD	Call TI	Call TI
TIL922B	OBSOLETE	PDIP	N	8		TBD	Call TI	Call TI

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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