

# TIL917, TIL917A, TIL917B, TIL917C, TIL918, TIL918A TIL918B, TIL918C, TIL919, TIL919A, TIL919B, TIL919C SINGLE/DUAL/QUAD CHANNEL OPTOCOUPLEDERS/OPTOISOLATORS

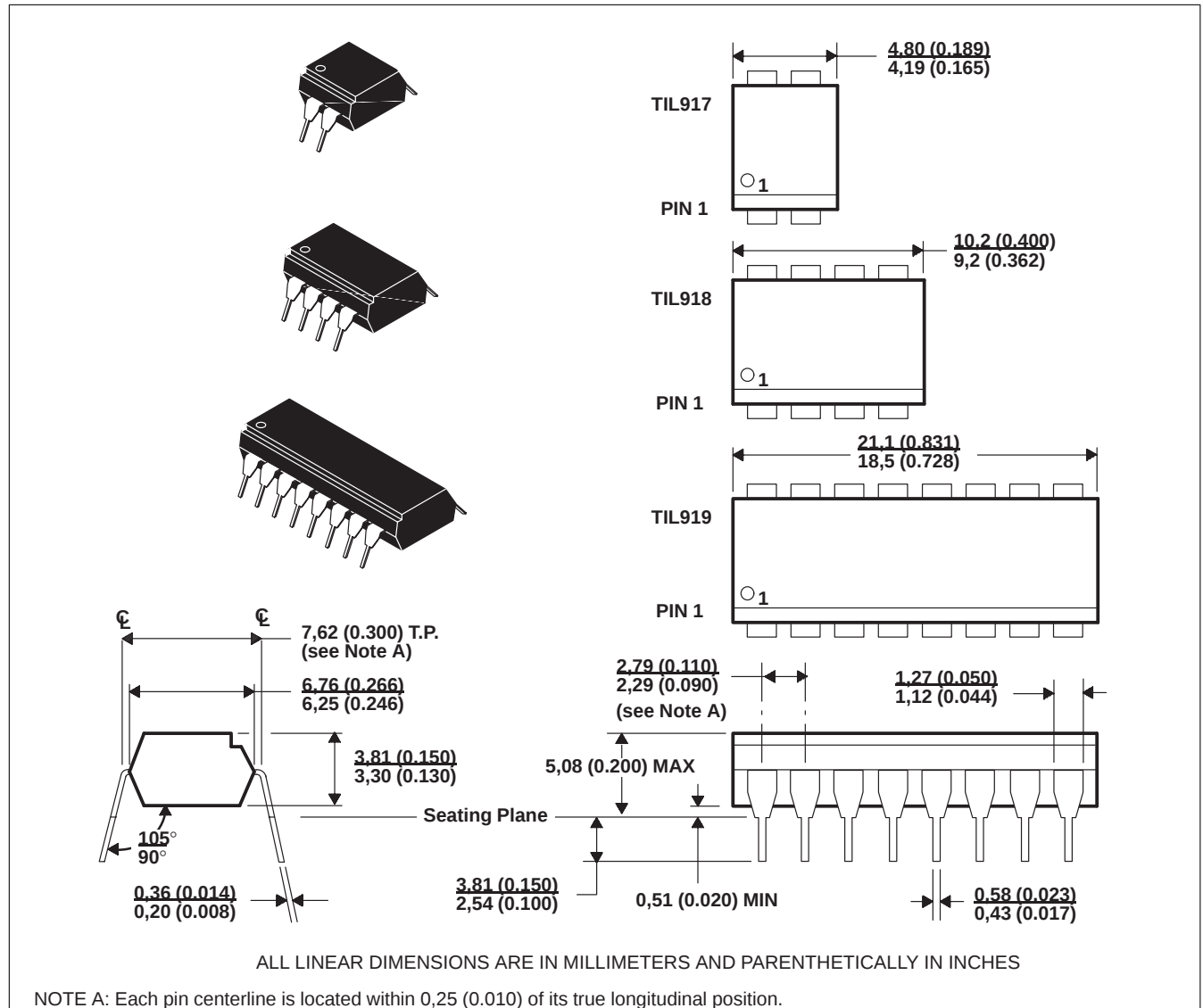
SOOS030 – FEBRUARY 1992

- 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 Four 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 TIL917 has one channel in a 4-pin package, the TIL918 has two channels in an 8-pin package, and the TIL919 has four channels in a 16-pin package. The standard devices, TIL917, TIL918, and TIL919, are tested for a current-transfer ratio of 20% minimum. Devices selected for a current-transfer ratio of 50%, 100%, and 200% minimum are designated with the suffix A, B, and C, respectively.

## mechanical data



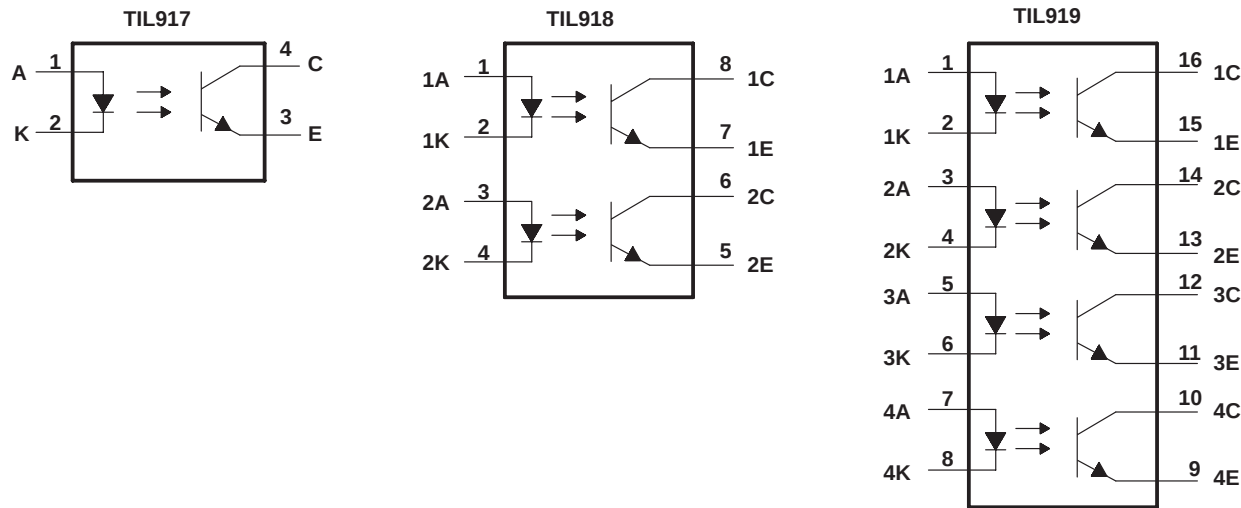
PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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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 reverse voltage                                                                                 | 5 V                                            |
| Input diode continuous forward current at (or below) $25^{\circ}\text{C}$ free-air temperature (see Note 3) | 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, $T_A$                                                                       | $-55^{\circ}\text{C}$ 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  $0.67 \text{ mA}/^{\circ}\text{C}$ .
4. Derate linearly to  $100^{\circ}\text{C}$  free-air temperature at the rate of  $2 \text{ mW}/^{\circ}\text{C}$ .
5. Derate linearly to  $100^{\circ}\text{C}$  free-air temperature at the rate of  $2.67 \text{ mW}/^{\circ}\text{C}$ .

**TIL917, TIL917A, TIL917B, TIL917C, TIL918, TIL918A  
TIL918B, TIL918C, TIL919, TIL919A, TIL919B, TIL919C  
SINGLE/DUAL/QUAD CHANNEL OPTOCOUPLEDERS/OPTOISOLATORS**  
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**electrical characteristics,  $T_A = 25^\circ\text{C}$  (unless otherwise noted)**

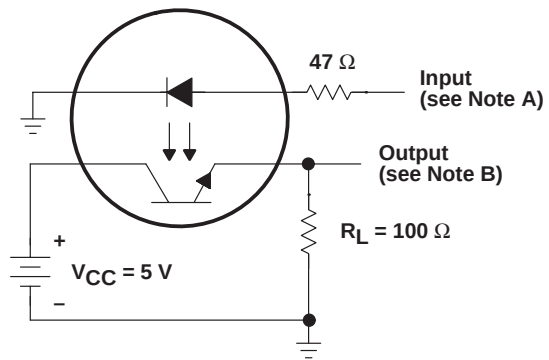
| PARAMETER     |                                      | TEST CONDITIONS                                    | MIN                       | TYP       | MAX       | UNIT          |
|---------------|--------------------------------------|----------------------------------------------------|---------------------------|-----------|-----------|---------------|
| $V_{(BR)CEO}$ | Collector-emitter breakdown voltage  | $I_C = 0.5\text{ mA}$ , $I_F = 0$                  | 35                        |           |           | V             |
| $V_{(BR)ECO}$ | Emitter-collector breakdown voltage  | $I_C = 100\text{ }\mu\text{A}$ , $I_F = 0$         | 7                         |           |           | V             |
| $I_R$         | Input diode static reverse current   | $V_R = 5\text{ V}$                                 |                           |           | 10        | $\mu\text{A}$ |
| $I_{C(off)}$  | Off-state collector current          | $V_{CE} = 24\text{ V}$ , $I_F = 0$                 |                           |           | 100       | nA            |
| CTR           | Current transfer ratio               | $I_F = 5\text{ mA}$ , $V_{CE} = 5\text{ V}$        | TIL917, TIL918, TIL919    |           | 20%       |               |
|               |                                      |                                                    | TIL917A, TIL918A, TIL919A |           | 50%       |               |
|               |                                      |                                                    | TIL917B, TIL918B, TIL919B |           | 100%      |               |
|               |                                      |                                                    | TIL917C, TIL918C, TIL919C |           | 200% 400% |               |
| $V_F$         | Input diode static forward voltage   | $I_F = 20\text{ mA}$                               |                           |           | 1.4       | V             |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $I_F = 5\text{ mA}$ , $I_C = 1\text{ mA}$          |                           |           | 0.4       | V             |
| $C_{io}$      | Input-to-output capacitance          | $V_{in-out} = 0$ , $f = 1\text{ MHz}$ , See Note 6 |                           | 1         |           | pF            |
| $r_{io}$      | Input-to-output internal resistance  | $V_{in-out} = \pm 1\text{ kV}$ , See Note 6        |                           | $10^{11}$ |           | $\Omega$      |

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

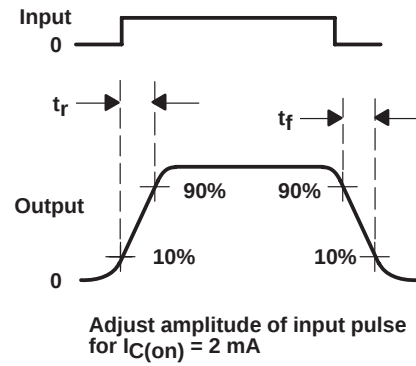
**switching characteristics,  $T_A = 25^\circ\text{C}$**

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

**PARAMETER MEASUREMENT INFORMATION**



**TEST CIRCUIT**



**VOLTAGE WAVEFORMS**

- NOTES: A. The input waveform is supplied by a generator with the following characteristics:  $Z_0 = 50\text{ }\Omega$ ,  $t_r \leq 15\text{ ns}$ , duty cycle = 1%,  $t_W = 500\text{ }\mu\text{s}$ .  
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

FORWARD CURRENT  
vs  
FORWARD VOLTAGE

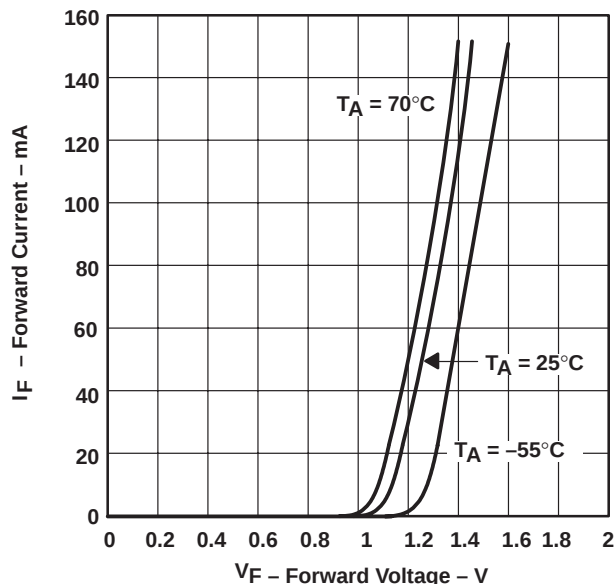


Figure 2

COLLECTOR CURRENT  
vs  
COLLECTOR-EMITTER VOLTAGE

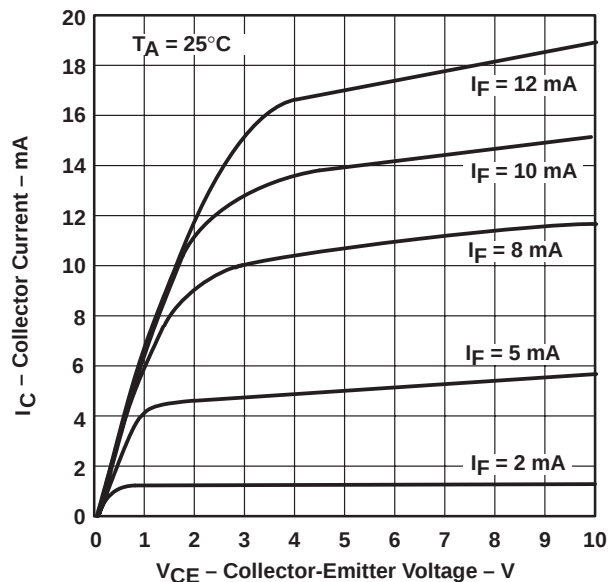


Figure 3

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

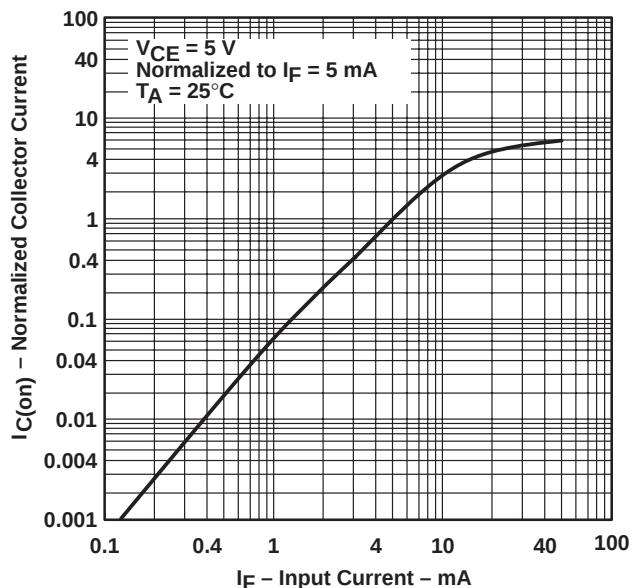


Figure 4

RELATIVE ON-STATE COLLECTOR CURRENT  
vs  
FREE-AIR TEMPERATURE

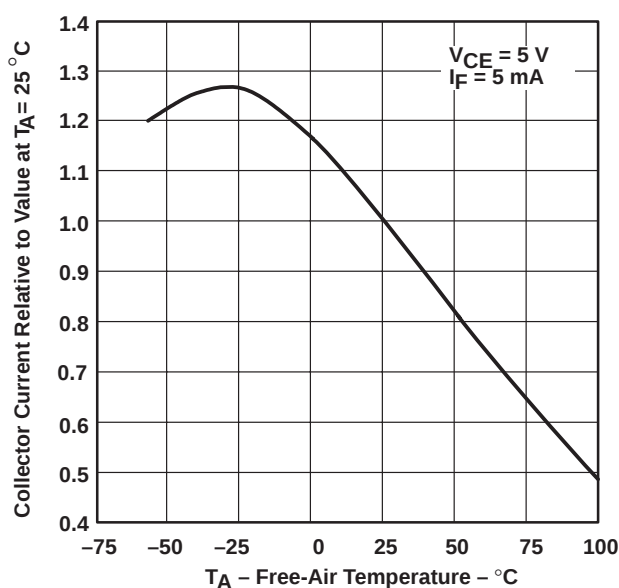


Figure 5

## TYPICAL CHARACTERISTICS

TYPICAL COLLECTOR-EMITTER SATURATION VOLTAGE  
VS  
FREE-AIR TEMPERATURE

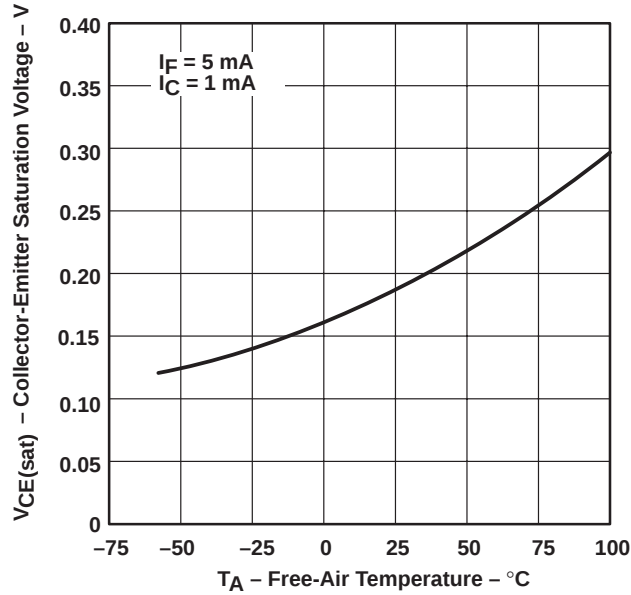


Figure 6

## APPLICATION INFORMATION

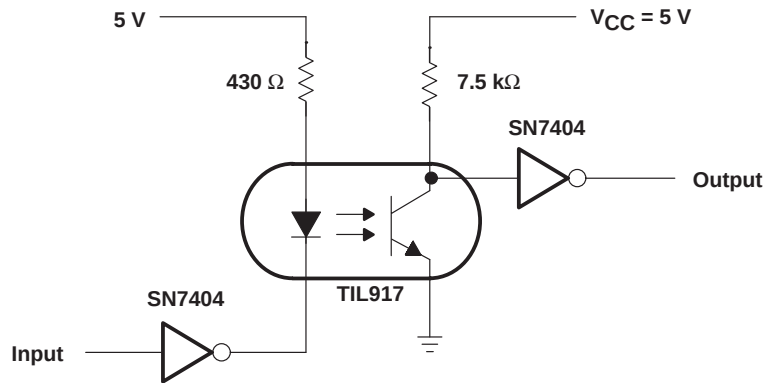


Figure 7. Data Transmission Circuit

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