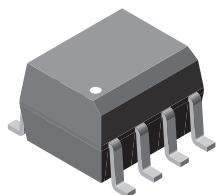
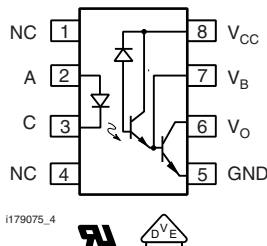




## High Speed Optocoupler, 100 kBd, Low Input Current, High Gain



i179074

RoHS  
COMPLIANT

## DESCRIPTION

Very high current ratio together with 4000  $V_{RMS}$  isolation are achieved by coupling an LED with an integrated high gain photo detector in a SOIC-8 package. Separate pins for the photo diode and output stage enable TTL compatible saturation voltages with high speed operation. Photodarlington operation is achieved by tying the  $V_{CC}$  and  $V_O$  terminals together. Access to the base terminal allows adjustment to the gain bandwidth.

The SFH6318T is ideal for TTL applications since the 300 % minimum current transfer ratio with an LED current of 1.6 mA enables operation with one unit load-in and one unit load-out with a 2.2 k $\Omega$  pull-up resistor.

The SFH6319T is best suited for low power logic applications involving CMOS and low power TTL. A 400 % current transfer ratio with only 0.5 mA of LED current is guaranteed from 0 °C to 70 °C.

## Caution:

Due to the small geometries of this device, it should be handled with electrostatic discharge (ESD) precautions. Proper grounding would prevent damage further and/or degradation which may be induced by ESD.

## FEATURES

- Industry standard SOIC-8 surface mountable package
- High current transfer ratio, 300 %
- Low input current, 0.5 mA
- High output current, 60 mA
- Isolation test voltage, 4000  $V_{RMS}$
- TTL compatible output,  $V_{OL} = 0.1$  V
- Adjustable bandwidth access to base
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

## APPLICATIONS

- Logic ground isolation -TTL/TTL, TTL/CMOS, CMOS/CMOS, CMOS/TTL
- EIA RS 232C line receiver
- Low input current line receiver long lines, party lines
- Telephone ring detector
- 117 VAC line voltage status indication - low input power dissipation
- Low power systems - ground isolation

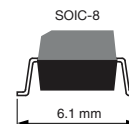
## AGENCY APPROVALS

- UL1577, file no. E52744, system code Y, double protection
- DIN EN 60747-5-5 (VDE 0884-5) available with option 1
- CSA 93751

## ORDERING INFORMATION

S F H 6 3 # # T

PART NUMBER



| AGENCY CERTIFIED/PACKAGE | CTR (%)                 |                         |
|--------------------------|-------------------------|-------------------------|
| UL, CSA                  | ≥ 300                   | ≥ 500                   |
| SOIC-8                   | SFH6318T <sup>(1)</sup> | SFH6319T <sup>(1)</sup> |
| SOIC-8, tube             | SFH6318                 | SFH6319                 |

## Note

<sup>(1)</sup> Available in tubes and in tape and reel



| ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                   |          |               |                |                        |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------|---------------|----------------|------------------------|
| PARAMETER                                                                                       | TEST CONDITION                                                    | PART     | SYMBOL        | VALUE          | UNIT                   |
| <b>INPUT</b>                                                                                    |                                                                   |          |               |                |                        |
| Reverse voltage                                                                                 |                                                                   |          | $V_R$         | 3              | V                      |
| Supply and output voltage                                                                       | $V_{CC}$ (pin 8 to 5), $V_O$ (pin 6 to 5)                         | SFH6318T | $V_{CC}, V_O$ | - 0.5 to 7     | V                      |
|                                                                                                 |                                                                   | SFH6319T | $V_{CC}, V_O$ | - 0.5 to 18    | V                      |
| Input power dissipation                                                                         |                                                                   |          | $P_{diss}$    | 35             | mW                     |
| Derate linearly above                                                                           |                                                                   |          |               | 50             | $^{\circ}\text{C}$     |
| Free air temperature                                                                            |                                                                   |          |               | 0.7            | mW/ $^{\circ}\text{C}$ |
| Average input current                                                                           |                                                                   |          | $I_{F(AVG)}$  | 20             | mA                     |
| Peak input current                                                                              | 50 % duty cycle - 1 ms pulse width                                |          | $I_{FRM}$     | 40             | mA                     |
| Peak transient input current                                                                    | $t_p \leq 1\text{ }\mu\text{s}$ , 300 pps                         |          | $I_{FSM}$     | 1              | A                      |
| <b>OUTPUT</b>                                                                                   |                                                                   |          |               |                |                        |
| Output current (pin 6)                                                                          |                                                                   |          | $I_O$         | 60             | mA                     |
| Emitter-base reverse current (pin 5 to 7)                                                       |                                                                   |          |               | 0.5            | V                      |
| Output power dissipation                                                                        |                                                                   |          | $P_{diss}$    | 150            | mW                     |
| Derate linearly from 25 $^{\circ}\text{C}$                                                      |                                                                   |          |               | 2              | mW/ $^{\circ}\text{C}$ |
| <b>COUPLER</b>                                                                                  |                                                                   |          |               |                |                        |
| Isolation test voltage between emitter and detector                                             |                                                                   |          | $V_{ISO}$     | 4000           | $V_{RMS}$              |
| Storage temperature                                                                             |                                                                   |          | $T_{stg}$     | - 55 to + 125  | $^{\circ}\text{C}$     |
| Lead soldering temperature <sup>(1)</sup>                                                       | $t = 10\text{ s}$                                                 |          | $T_{sld}$     | 260            | $^{\circ}\text{C}$     |
| Junction temperature                                                                            |                                                                   |          | $T_j$         | 100            | $^{\circ}\text{C}$     |
| Ambient temperature range                                                                       |                                                                   |          | $T_{amb}$     | - 55 to + 100  | $^{\circ}\text{C}$     |
| Pollution degree (DIN VDE 0110)                                                                 |                                                                   |          |               | 2              |                        |
| Creepage distance                                                                               |                                                                   |          |               | $\geq 4$       | mm                     |
| Clearance distance                                                                              |                                                                   |          |               | $\geq 4$       | mm                     |
| Comparative tracking index per DIN IEC112/VDE 0303, part 1                                      |                                                                   |          | CTI           | 175            |                        |
| Isolation resistance                                                                            | $V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$  |          | $R_{IO}$      | $\geq 10^{12}$ | $\Omega$               |
|                                                                                                 | $V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$ |          | $R_{IO}$      | $\geq 10^{11}$ | $\Omega$               |

**Notes**

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

<sup>(1)</sup> Refer to reflow profile soldering conditions for surface mounted devices.

| ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                         |                               |      |       |      |                        |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------|------|-------|------|------------------------|
| PARAMETER                                                                                         | TEST CONDITION                                                          | SYMBOL                        | MIN. | TYP.  | MAX. | UNIT                   |
| <b>INPUT</b>                                                                                      |                                                                         |                               |      |       |      |                        |
| Forward voltage                                                                                   | $I_F = 1.6\text{ mA}$                                                   | $V_F$                         |      | 1.4   | 1.7  | V                      |
| Temperature coefficient, forward voltage                                                          | $I_F = 1.6\text{ mA}$                                                   | $\Delta V_F / \Delta T_{amb}$ |      | - 1.8 |      | mV/ $^{\circ}\text{C}$ |
| <b>OUTPUT</b>                                                                                     |                                                                         |                               |      |       |      |                        |
| Logic low output voltage <sup>(1)</sup>                                                           | $I_F = 1.6\text{ mA}$ , $I_O = 4.8\text{ mA}$ , $V_{CC} = 4.5\text{ V}$ | $V_{OL}$                      |      | 0.1   | 0.4  | V                      |
|                                                                                                   | $I_F = 1.6\text{ mA}$ , $I_O = 8\text{ mA}$ , $V_{CC} = 4.5\text{ V}$   | $V_{OL}$                      |      | 0.1   | 0.4  | V                      |
|                                                                                                   | $I_F = 5\text{ mA}$ , $I_O = 15\text{ mA}$ , $V_{CC} = 4.5\text{ V}$    | $V_{OL}$                      |      | 0.15  | 0.4  | V                      |
|                                                                                                   | $I_F = 12\text{ mA}$ , $I_O = 24\text{ mA}$ , $V_{CC} = 4.5\text{ V}$   | $V_{OL}$                      |      | 0.25  | 0.4  | V                      |
| Logic high output current <sup>(1)</sup>                                                          | $I_F = 0\text{ mA}$ , $V_O = V_{CC} = 7\text{ V}$                       | $I_{IO}$                      |      | 0.1   | 250  | $\mu\text{A}$          |
|                                                                                                   | $I_F = 0\text{ mA}$ , $V_O = V_{CC} = 18\text{ V}$                      | $I_{IO}$                      |      | 0.05  | 100  | $\mu\text{A}$          |
| Logic low supply current <sup>(1)</sup>                                                           | $I_F = 1.6\text{ mA}$ , $V_O = \text{OPEN}$ , $V_{CC} = 18\text{ V}$    | $I_{CCL}$                     |      | 0.2   | 1.5  | mA                     |
| Logic high supply current <sup>(1)</sup>                                                          | $I_F = 0\text{ mA}$ , $V_O = \text{OPEN}$ , $V_{CC} = 18\text{ V}$      | $I_{CCH}$                     |      | 0.01  | 10   | $\mu\text{A}$          |

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                  |          |      |           |      |          |
|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------|------|-----------|------|----------|
| PARAMETER                                                                                                | TEST CONDITION                                                   | SYMBOL   | MIN. | TYP.      | MAX. | UNIT     |
| <b>COUPLER</b>                                                                                           |                                                                  |          |      |           |      |          |
| Capacitance (input to output) <sup>(2)</sup>                                                             | $f = 1\text{ MHz}$                                               | $C_{IO}$ |      | 0.6       |      | pF       |
| Input capacitance                                                                                        | $f = 1\text{ MHz}, V_F = 0$                                      | $C_{IN}$ |      | 25        |      | pF       |
| Resistance (input to output) <sup>(2)</sup>                                                              | $V_{IO} = 500\text{ VDC}, T_{amb} = 25\text{ }^{\circ}\text{C}$  | $R_{IO}$ |      | $10^{12}$ |      | $\Omega$ |
|                                                                                                          | $V_{IO} = 500\text{ VDC}, T_{amb} = 100\text{ }^{\circ}\text{C}$ | $R_{IO}$ |      | $10^{11}$ |      | $\Omega$ |

**Notes**

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.  
 $T_{amb} = 0\text{ }^{\circ}\text{C}$  to  $70\text{ }^{\circ}\text{C}$ . Typical values are specified at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .
- (1) Pin 7 open.
- (2) Device considered a two-terminal device: pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.

| <b>CURRENT TRANSFER RATIO</b> |                                                                  |          |        |      |      |      |      |
|-------------------------------|------------------------------------------------------------------|----------|--------|------|------|------|------|
| PARAMETER                     | TEST CONDITION                                                   | PART     | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Current transfer ratio        | $I_F = 1.6\text{ mA}, V_O = 0.4\text{ V}, V_{CC} = 4.5\text{ V}$ | SFH6318T | CTR    | 300  | 1600 | 2600 | %    |
|                               | $I_F = 0.5\text{ mA}, V_O = 0.4\text{ V}, V_{CC} = 4.5\text{ V}$ | SFH6319T | CTR    | 400  | 2000 | 3500 | %    |
|                               | $I_F = 1.6\text{ mA}, V_O = 0.4\text{ V}, V_{CC} = 4.5\text{ V}$ | SFH6319T | CTR    | 500  | 1600 | 2600 | %    |

**Note**

- $T_{amb} = 0\text{ }^{\circ}\text{C}$  to  $70\text{ }^{\circ}\text{C}$ . Typical values are specified at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .  
DC current transfer ratio is defined as the ratio of output collector current,  $I_O$ , to the forward LED input current,  $I_F$  times 100 %. Pin 7 open.

| <b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                 |          |           |      |      |      |               |
|---------------------------------------------------------------------------------------------------------|-------------------------------------------------|----------|-----------|------|------|------|---------------|
| PARAMETER                                                                                               | TEST CONDITION                                  | PART     | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| Propagation delay time to logic low at output                                                           | $I_F = 1.6\text{ mA}, R_L = 2.2\text{ k}\Omega$ | SFH6318T | $t_{PHL}$ |      | 2    | 10   | $\mu\text{s}$ |
| Propagation delay time to logic low at output <sup>(1)</sup>                                            | $I_F = 0.5\text{ mA}, R_L = 4.7\text{ k}\Omega$ | SFH6319T | $t_{PHL}$ |      | 6    | 25   | $\mu\text{s}$ |
| Propagation delay time to logic low at output                                                           | $I_F = 12\text{ mA}, R_L = 270\text{ }\Omega$   | SFH6319T | $t_{PHL}$ |      | 0.6  | 1    | $\mu\text{s}$ |
| Propagation delay time to logic high at output                                                          | $I_F = 1.6\text{ mA}, R_L = 2.2\text{ k}\Omega$ | SFH6318T | $t_{PLH}$ |      | 2    | 35   | $\mu\text{s}$ |
| Propagation delay time to logic high at output <sup>(1)</sup>                                           | $I_F = 0.5\text{ mA}, R_L = 4.7\text{ k}\Omega$ | SFH6319T | $t_{PLH}$ |      | 4    | 60   | $\mu\text{s}$ |
| Propagation delay time to logic high at output                                                          | $I_F = 12\text{ mA}, R_L = 270\text{ }\Omega$   | SFH6319T | $t_{PLH}$ |      | 1.5  | 7    | $\mu\text{s}$ |

**Note**

- (1) Pin 7 open. Using a resistor between pin 5 and 7 will decrease gain and delay time.

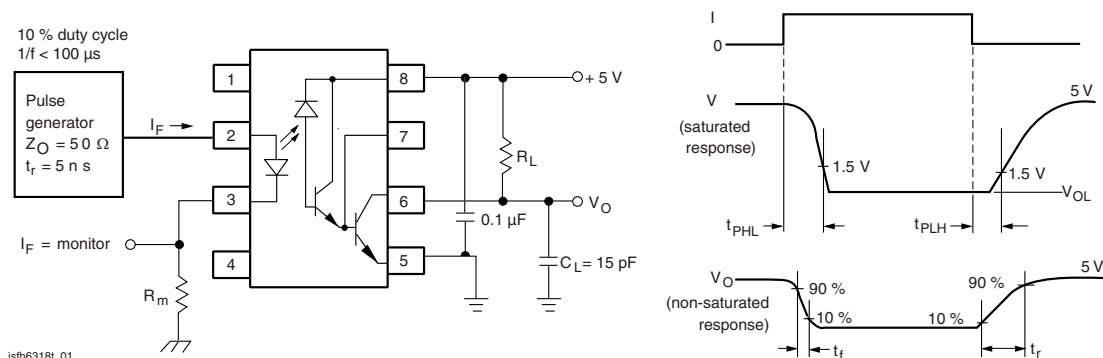


Fig. 1 - Switching Test Circuit

**COMMON MODE TRANSIENT IMMUNITY**

| PARAMETER                                                 | TEST CONDITION                                                                       | SYMBOL   | MIN. | TYP. | MAX. | UNIT       |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------|----------|------|------|------|------------|
| Common mode transient immunity at logic high level output | $I_F = 0 \text{ mA}$ , $R_L = 2.2 \text{ k}\Omega$ , $V_{CM} = 10 \text{ V}_{P-P}$   | $ CM_H $ |      | 1K   |      | V/ $\mu$ s |
| Common mode transient immunity at logic low level output  | $I_F = 1.6 \text{ mA}$ , $R_L = 2.2 \text{ k}\Omega$ , $V_{CM} = 10 \text{ V}_{P-P}$ | $ CM_L $ |      | 1K   |      | V/ $\mu$ s |

**Note**

- Common mode transient immunity in logic high level is the maximum tolerable (positive)  $dV_{CM}/dt$  on the leading edge of the common mode pulse,  $V_{CM}$ , to assure that the output will remain in a logic high state (i.e.  $V_O > 2 \text{ V}$ ) common mode transient immunity in logic low level is the maximum tolerable (negative)  $dV_{CM}/dt$  on the trailing edge of the common mode pulse signal,  $V_{CM}$ , to assure that the output will remain in a logic low state (i.e.  $V_O < 0.8 \text{ V}$ ).
- In applications where  $dv/dt$  may exceed 50,000 V/ $\mu$ s (such as state discharge) a series resistor,  $R_{CC}$  should be included to protect  $I_C$  from destructively high surge currents. The recommended value is refer to figure 2.

$$R_{CC} \equiv [(IV)/0.15 I_F (\text{mA})] \text{ k}\Omega.$$

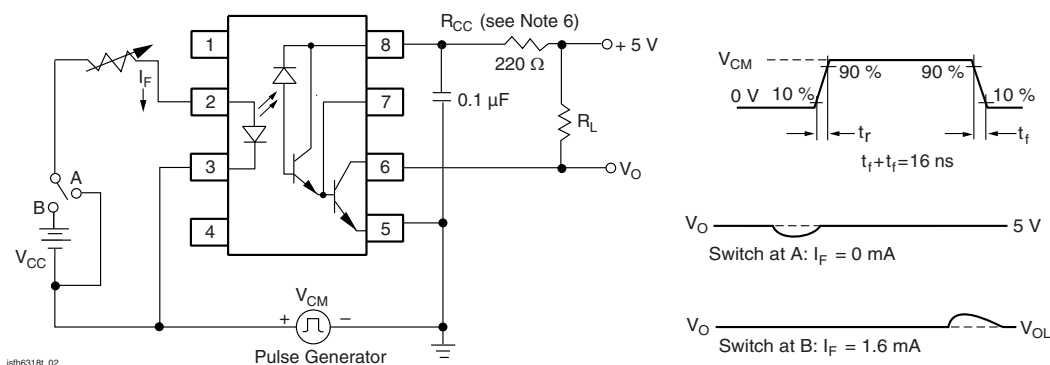


Fig. 2 - Test Circuit for Transient Immunity and Typical Waveforms

**SAFETY AND INSULATION RATINGS**

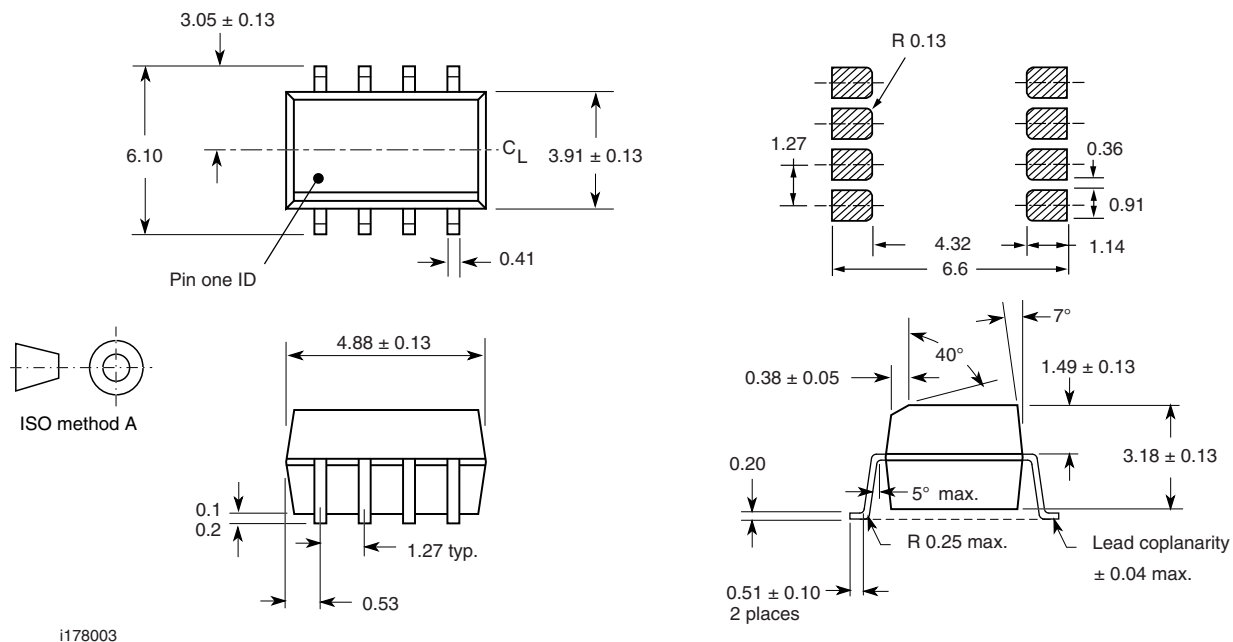
| PARAMETER                  | TEST CONDITION             | SYMBOL | MIN. | TYP.      | MAX. | UNIT               |
|----------------------------|----------------------------|--------|------|-----------|------|--------------------|
| Climatic Classification    | according to IEC 68 part 1 |        |      | 55/100/21 |      |                    |
| Comparative Tracking Index |                            | CTI    | 175  |           | 399  |                    |
| $V_{IOTM}$                 |                            |        | 6000 |           |      | V                  |
| $V_{IORM}$                 |                            |        | 560  |           |      | V                  |
| $P_{SO}$                   |                            |        |      |           | 350  | mW                 |
| $I_{SI}$                   |                            |        |      |           | 150  | mA                 |
| $T_{SI}$                   |                            |        |      |           | 165  | $^{\circ}\text{C}$ |
| Creepage distance          |                            |        | 4    |           |      | mm                 |
| Clearance distance         |                            |        | 4    |           |      | mm                 |
| Insulation thickness       |                            |        | 0.2  |           |      | mm                 |

**Note**

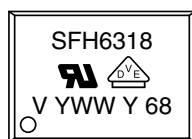
- As per IEC 60747-5-5, §7.4.3.8.1, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.



**PACKAGE DIMENSIONS** in millimeters



**PACKAGE MARKING** (example)





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