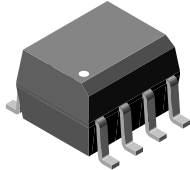
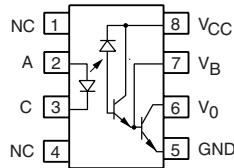




High Speed Optocoupler, 100 kBd, Low Input Current, High Gain



1179070



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 kΩ 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, 800 %
- 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
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



RoHS COMPLIANT

AGENCY APPROVALS

- UL1577, File No. E52744 System Code H or J, Double Protection
- DIN EN 60747-5-2 (VDE0884) Available with Option 1
- CSA 93751

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

ORDER INFORMATION

| PART | REMARKS |
|----------|---------------------------------|
| SFH6318T | CTR 1600 (300 - 2600) %, SOIC-8 |
| SFH6319T | CTR 2000 (400 - 3500) %, SOIC-8 |

Note:

For additional information on the available options refer to Option Information. Product is available only on tape and reel.

| ABSOLUTE MAXIMUM RATINGS ¹⁾ | | | | | |
|---|--|----------|---------------|----------------|-----------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | VALUE | UNIT |
| INPUT | | | | | |
| Reverse input voltage | | | V_R | 3.0 | V |
| Supply and output voltage | V_{CC} (pin 8-5), V_O (pin 6-5) | SFH6318T | V_{CC}, V_O | - 0.5 to 7.0 | V |
| | | SFH6319T | V_{CC}, V_O | - 0.5 to 18 | V |
| Input power dissipation | | | P_{diss} | 35 | mW |
| Derate linearly above | | | | 50 | °C |
| Free air temperature | | | | 0.7 | mW/°C |
| Average input current | | | $I_{F(AVG)}$ | 20 | mA |
| Peak input current | 50 % duty cycle-1.0 ms pulse width | | I_{FRM} | 40 | mA |
| Peak transient input current | $t_p \leq 1.0 \mu s$, 300 pps | | I_{FSM} | 1.0 | A |
| OUTPUT | | | | | |
| Output current (pin 6) | | | I_O | 60 | mA |
| Emitter-base reverse current (pin 5 - 7) | | | | 0.5 | V |
| Output power dissipation | | | P_{diss} | 150 | mW |
| Derate linearly from 25 °C | | | | 2.0 | mW/°C |
| COUPLER | | | | | |
| Isolation test voltage between emitter and detector | | | V_{ISO} | 4000 | V_{RMS} |
| Storage temperature | | | T_{stg} | - 55 to + 125 | °C |
| Lead soldering temperature | $t = 10 s$ | | T_{sld} | 260 | °C |
| Junction temperature | | | T_j | 100 | °C |
| Ambient temperature range | | | T_{amb} | - 55 to + 100 | °C |
| Pollution degree (DIN VDE 0110) | | | | 2 | |
| Creepage distance | | | | ≥ 4.0 | mm |
| Clearance | | | | ≥ 4.0 | mm |
| Comparative tracking index per DIN IEC 112/VDE 0303, part 1 | | | | 175 | |
| Isolation resistance | $V_{IO} = 500 V, T_{amb} = 25 \text{ °C}$ | | R_{IO} | $\geq 10^{12}$ | Ω |
| | $V_{IO} = 500 V, T_{amb} = 100 \text{ °C}$ | | R_{IO} | $\geq 10^{11}$ | Ω |

Note:

¹⁾ $T_{amb} = 25 \text{ °C}$, unless otherwise specified.

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 Rating for extended periods of the time can adversely affect reliability.



| ELECTRICAL CHARACTERISTICS ¹⁾ | | | | | | | |
|--|--|------|-------------------------------------|-----|-----------|-----|---------------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN | TYP. | MAX | UNIT |
| INPUT²⁾ | | | | | | | |
| Input forward voltage | $I_F = 1.6 \text{ mA}$ | | V_F | | 1.4 | 1.7 | V |
| Temperature coefficient, forward voltage | $I_F = 1.6 \text{ mA}$ | | $\frac{\Delta V_F}{\Delta T_{amb}}$ | | -1.8 | | mV/°C |
| OUTPUT²⁾ | | | | | | | |
| Logic low output voltage, (Note 3) | $I_F = 1.6 \text{ mA}, I_O = 4.8 \text{ mA}, V_{CC} = 4.5 \text{ V}$ | | V_{OL} | | 0.1 | 0.4 | V |
| | $I_F = 1.6 \text{ mA}, I_O = 8.0 \text{ mA}, V_{CC} = 4.5 \text{ V}$ | | V_{OL} | | 0.1 | 0.4 | V |
| | $I_F = 5.0 \text{ mA}, I_O = 15 \text{ mA}, V_{CC} = 4.5 \text{ V}$ | | 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, (Note 3) | $I_F = 0 \text{ mA}, V_O = V_{CC} = 7.0 \text{ V}$ | | I_{IO} | | 0.1 | 250 | μA |
| | $I_F = 0 \text{ mA}, V_O = V_{CC} = 18 \text{ V}$ | | I_{IO} | | 0.05 | 100 | μA |
| Logic low supply current, (Note 3) | $I_F = 1.6 \text{ mA}, V_O = \text{OPEN}, V_{CC} = 18 \text{ V}$ | | I_{CCL} | | 0.2 | 1.5 | mA |
| Logic high supply current, (Note 3) | $I_F = 0 \text{ mA}, V_O = \text{OPEN}, V_{CC} = 18 \text{ V}$ | | I_{CCH} | | 0.01 | 10 | μA |
| COUPLER²⁾ | | | | | | | |
| Capacitance (input-output), (Note 4) | $f = 1.0 \text{ MHz}$ | | C_{IO} | | 0.6 | | pF |
| Input capacitance | $f = 1.0 \text{ MHz}, V_F = 0$ | | C_{IN} | | 25 | | pF |
| Resistance (input-output), (Note 4) | $V_{IO} = 500 \text{ VDC}, T_{amb} = 25 \text{ }^\circ\text{C}$ | | R_{IO} | | 10^{12} | | Ω |
| | $V_{IO} = 500 \text{ VDC}, T_{amb} = 100 \text{ }^\circ\text{C}$ | | R_{IO} | | 10^{11} | | Ω |

Note:

1) $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified.

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.

2) $T_{amb} = 0 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$. Typical values are specified at $T_{amb} = 25 \text{ }^\circ\text{C}$.

3) Pin 7 open.

4) Device considered a two-terminal device: pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.

| CURRENT TRANSFER RATIO ¹⁾ | | | | | | | |
|---|---|----------|--------|-----|------|------|------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN | TYP. | MAX | UNIT |
| Current Transfer Ratio, (Notes 2 and 3) | $I_F = 1.6 \text{ mA}, V_O = 0.4 \text{ V}, V_{CC} = 4.5 \text{ V}$ | 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:

1) $T_{amb} = 0 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$. Typical values are specified at $T_{amb} = 25 \text{ }^\circ\text{C}$.

2) 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 %.

3) Pin 7 open.

| SWITCHING CHARACTERISTICS ¹⁾ | | | | | | | |
|---|---|----------|-----------|-----|------|-----|---------------|
| 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} | | 2.0 | 10 | μs |
| Propagation delay time to logic low at output, (Notes 2 and 3) | $I_F = 0.5 \text{ mA}, R_L = 4.7 \text{ k}\Omega$ | SFH6319T | t_{PHL} | | 6.0 | 25 | μs |
| Propagation delay time to logic low at output | $I_F = 12 \text{ mA}, R_L = 270 \Omega$ | SFH6319T | t_{PHL} | | 0.6 | 1.0 | μs |
| Propagation delay time to logic high at output | $I_F = 1.6 \text{ mA}, R_L = 2.2 \text{ k}\Omega$ | SFH6318T | t_{PLH} | | 2.0 | 35 | μs |
| Propagation delay time to logic high at output, (Notes 2 and 3) | $I_F = 0.5 \text{ mA}, R_L = 4.7 \text{ k}\Omega$ | SFH6319T | t_{PLH} | | 4.0 | 60 | μs |
| Propagation delay time to logic high at output | $I_F = 12 \text{ mA}, R_L = 270 \Omega$ | SFH6319T | t_{PLH} | | 1.5 | 7.0 | μs |

Note:

1) $T_{amb} = 25 \text{ }^\circ\text{C}$, unless otherwise specified.

2) Pin 7 open.

3) Using a resistor between pin 5 and 7 will decrease gain and delay time.

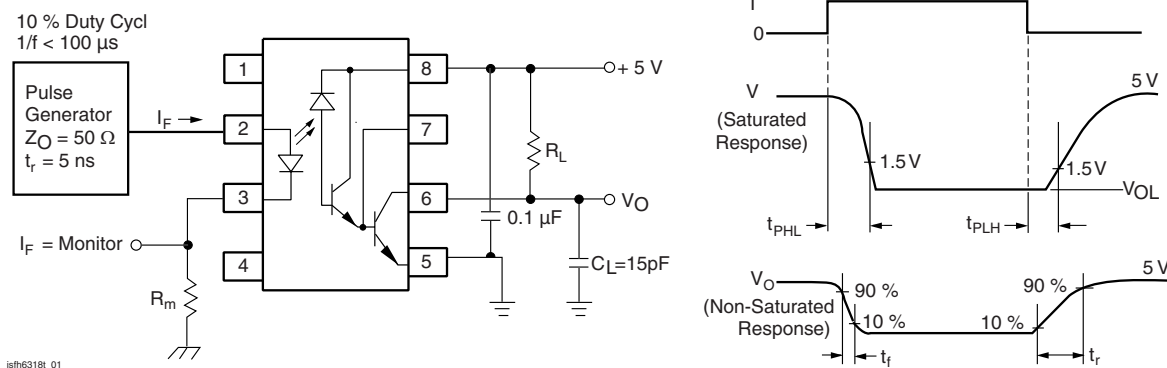


Figure 1. Switching Test Circuit

| COMMON MODE TRANSIENT IMMUNITY | | | | | | | |
|--|---|------|------------|-----|------|-----|------------------------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN | TYP. | MAX | UNIT |
| Common mode transient immunity at logic high level output, (Notes 1 and 2) | $I_F = 0 \text{ mA}, R_L = 2.2 \text{ k}\Omega,$ $V_{CM} = 10 \text{ V}_{P-P}$ | | ICM_{HI} | | 1K | | $\text{V}/\mu\text{s}$ |
| Common mode transient immunity at logic low level output, (Notes 1 and 2) | $I_F = 1.6 \text{ mA}, R_L = 2.2 \text{ k}\Omega,$ $V_{CM} = 10 \text{ V}_{P-P}$ | | ICM_{LI} | | 1K | | $\text{V}/\mu\text{s}$ |

Note:

1) 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. $V_O > 2.0 \text{ V}$) 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. $V_O < 0.8 \text{ V}$).

2) In applications where dv/dt may exceed 50,000 $\text{V}/\mu\text{s}$ (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.

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

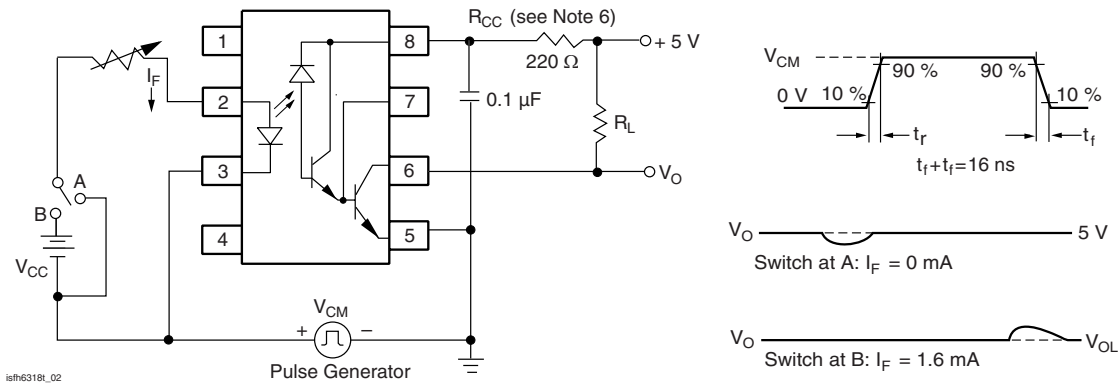


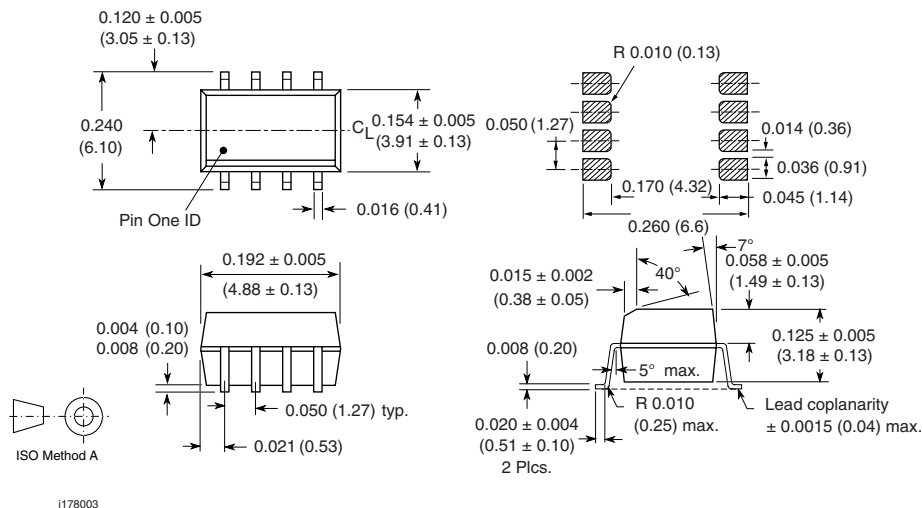
Figure 2. Test Circuit for Transient Immunity and Typical Waveforms

| SAFETY AND INSULATION RATINGS ¹⁾ | | | | | | |
|--|-----------------------|--------|------|-----------|-----|------|
| 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 | °C |
| Creepage | | | 4 | | | mm |
| Clearance | | | 4 | | | mm |
| Insulation thickness, reinforced rated | per IEC60950 2.10.5.1 | | 0.2 | | | mm |

Note:

¹⁾ As per IEC60747-5-2, §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 inches (millimeters)



Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

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Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

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and may do so without further notice.

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