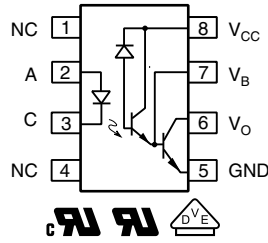
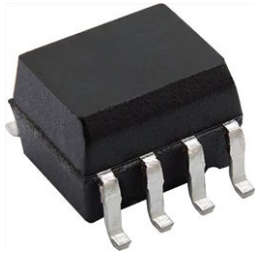




# High Speed Optocoupler, 100 kBd, Low Input Current, High Gain



### FEATURES

- High current transfer ratio, 300 %
- Low input current, 0.5 mA
- High output current, 60 mA
- 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)



RoHS COMPLIANT

### LINKS TO ADDITIONAL RESOURCES



### DESCRIPTION

The SFH6318 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 SFH6319 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.

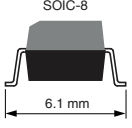
Very high current ratio together with 4000  $V_{RMS}$  isolation are achieved by coupling an LED with an integrated high gain photo detector in a SOIC-8 package. Separate pins for the photo diode and output stage enable TTL compatible saturation voltages with high speed operation. Photodarlington operation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

### 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
- Line voltage status indication - low input power dissipation
- Low power systems - ground isolation

### AGENCY APPROVALS

- [UL1577](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\) available with option 1](#)
- [CSA](#)

| ORDERING INFORMATION  |   |               |
|---|---|---------------|
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">S</div> <div style="border: 1px solid black; padding: 2px 5px;">F</div> <div style="border: 1px solid black; padding: 2px 5px;">H</div> <div style="border: 1px solid black; padding: 2px 5px;">6</div> <div style="border: 1px solid black; padding: 2px 5px;">3</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">-</div> <div style="border: 1px solid black; padding: 2px 5px;">X</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">T</div> </div> |  |               |
| PART NUMBER   | PACKAGE OPTION  | TAPE AND REEL |
| AGENCY CERTIFIED / PACKAGE  | CTR (%)   |               |
| UL, cUL, CSA  | ≥ 300   | ≥ 500         |
| SOIC-8  | SFH6318T  | SFH6319T      |

#### Note

- Additional options may be possible, please contact sales office



| 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) | SFH6318 | $V_{CC}, V_O$ | -0.5 to 7   | V                      |
|   |   | SFH6319 | $V_{CC}, V_O$ | -0.5 to 18  | V                      |
| Input power dissipation   |   |         | $P_{diss}$    | 35          | mW                     |
| Average input current   |   |         | $I_{F(AVG)}$  | 20          | mA                     |
| Peak input current  | 50 % duty cycle;<br>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)   |   |         | $V_{EB0}$     | 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>  |   |         |               |             |                        |
| Storage temperature   |   |         | $T_{stg}$     | -55 to +125 | $^{\circ}\text{C}$     |
| Lead soldering temperature  | $t = 10\text{ s}$                         |         | $T_{sld}$     | 260         | $^{\circ}\text{C}$     |
| Junction temperature  |   |         | $T_j$         | 125         | $^{\circ}\text{C}$     |
| Ambient temperature range   |   |         | $T_{amb}$     | -55 to +100 | $^{\circ}\text{C}$     |
| Total power dissipation   |   |         | $P_{diss}$    | 185         | mW                     |

**Note**

- 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

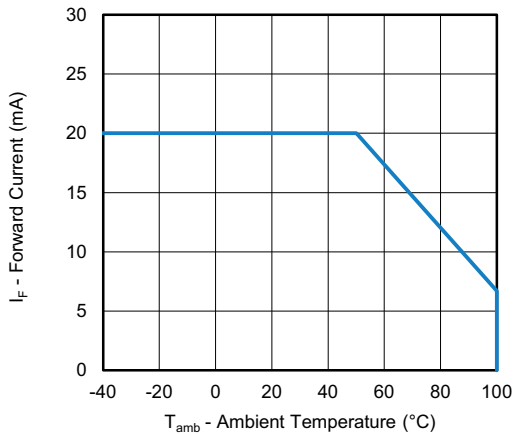


Fig. 1 - Forward Current vs. Ambient Temperature

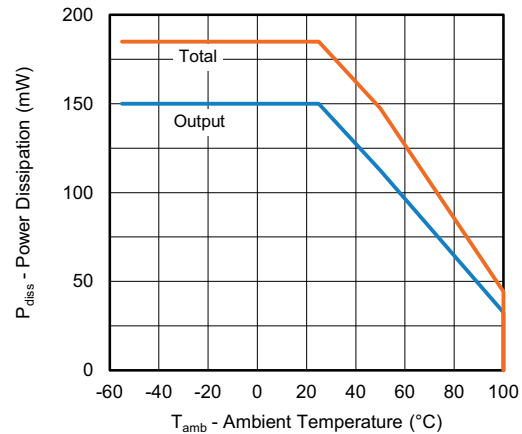


Fig. 2 - Power Dissipation vs. Ambient Temperature



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ ; typical values are at $T_{amb} = 25\text{ }^{\circ}\text{C}$ ) |   |                               |      |        |      |                        |
|--|---|-------------------------------|------|--------|------|------------------------|
| PARAMETER  | TEST CONDITION  | SYMBOL                        | MIN. | TYP.   | MAX. | UNIT                   |
| <b>INPUT</b>   |   |                               |      |        |      |                        |
| Forward voltage  | $I_F = 1.6\text{ mA}$   | $V_F$                         | -    | 1.28   | 1.7  | V                      |
| Temperature coefficient of forward voltage   | $I_F = 1.6\text{ mA}$   | $\Delta V_F / \Delta T_{amb}$ | -    | -2.3   | -    | mV/ $^{\circ}\text{C}$ |
| Input capacitance  | $f = 1\text{ MHz}, V_F = 0$                                       | $C_{IN}$                      | -    | 55     | -    | pF                     |
| <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>  | $I_F = 1.6\text{ mA}, V_O = \text{OPEN}, V_{CC} = 18\text{ V}$    | $I_{CCL}$                     | -    | 0.3    | 1.5  | mA                     |
| Logic high supply current <sup>(1)</sup>   | $I_F = 0\text{ mA}, V_O = \text{OPEN}, V_{CC} = 18\text{ V}$      | $I_{CCH}$                     | -    | 0.0003 | 10   | $\mu\text{A}$          |
| <b>COUPLER</b>   |   |                               |      |        |      |                        |
| Capacitance (input to output) <sup>(2)</sup>   | $f = 1\text{ MHz}$  | $C_{IO}$                      | -    | 0.6    | -    | pF                     |

**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

(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> ( $T_{amb} = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ ; typical values are at $T_{amb} = 25\text{ }^{\circ}\text{C}$ ) |  |         |        |      |      |      |      |
|--|--|---------|--------|------|------|------|------|
| PARAMETER  | TEST CONDITION   | PART    | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Current transfer ratio <sup>(1)</sup>  | $I_F = 1.6\text{ mA}, V_O = 0.4\text{ V}, V_{CC} = 4.5\text{ V}$ | SFH6318 | CTR    | 300  | 2000 | 2600 | %    |
|  | $I_F = 0.5\text{ mA}, V_O = 0.4\text{ V}, V_{CC} = 4.5\text{ V}$ | SFH6319 | CTR    | 400  | 2200 | 3500 | %    |
|  | $I_F = 1.6\text{ mA}, V_O = 0.4\text{ V}, V_{CC} = 4.5\text{ V}$ | SFH6319 | CTR    | 500  | 2000 | 2600 | %    |

**Notes**

- 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 %

(1) Pin 7 open

| <b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ ) |   |         |           |      |      |      |               |
|---|---|---------|-----------|------|------|------|---------------|
| PARAMETER   | TEST CONDITION                                  | PART    | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| Propagation delay time to low output level                                  | $I_F = 1.6\text{ mA}, R_L = 2.2\text{ k}\Omega$ | SFH6318 | $t_{PHL}$ | -    | 2    | 10   | $\mu\text{s}$ |
| Propagation delay time to low output level <sup>(1)(2)</sup>                | $I_F = 0.5\text{ mA}, R_L = 4.7\text{ k}\Omega$ | SFH6319 | $t_{PHL}$ | -    | 4    | 25   | $\mu\text{s}$ |
| Propagation delay time to high output level <sup>(1)(2)</sup>               | $I_F = 12\text{ mA}, R_L = 270\ \Omega$         | SFH6319 | $t_{PHL}$ | -    | 0.5  | 1    | $\mu\text{s}$ |
| Propagation delay time to high output level                                 | $I_F = 1.6\text{ mA}, R_L = 2.2\text{ k}\Omega$ | SFH6318 | $t_{PLH}$ | -    | 15   | 35   | $\mu\text{s}$ |
| Propagation delay time to high output level <sup>(1)(2)</sup>               | $I_F = 0.5\text{ mA}, R_L = 4.7\text{ k}\Omega$ | SFH6319 | $t_{PLH}$ | -    | 30   | 60   | $\mu\text{s}$ |
| Propagation delay time to high output level <sup>(1)(2)</sup>               | $I_F = 12\text{ mA}, R_L = 270\ \Omega$         | SFH6319 | $t_{PLH}$ | -    | 3    | 7    | $\mu\text{s}$ |

**Notes**

(1) Pin 7 open

(2) Using a resistor between pin 5 and 7 will decrease gain and delay time

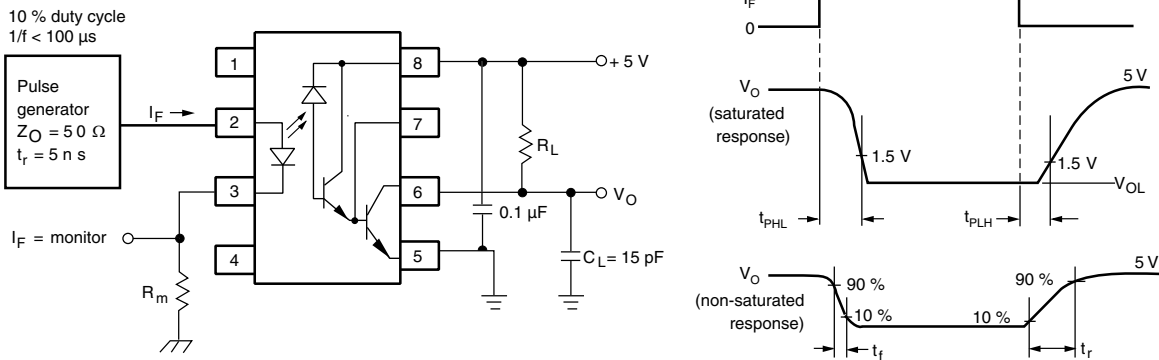


Fig. 3 - Switching Test Circuit

| COMMON MODE TRANSIENT IMMUNITY ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )   |   |          |      |      |      |                  |
|---|---|----------|------|------|------|------------------|
| PARAMETER   | TEST CONDITION  | SYMBOL   | MIN. | TYP. | MAX. | UNIT             |
| Common mode transient immunity at logic high level output <sup>(1)(2)</sup> | $I_F = 0\text{ mA}$ , $R_L = 2.2\text{ k}\Omega$ ,<br>$V_{CM} = 10\text{ V}_{PP}$   | $ CM_H $ | -    | 1000 | -    | V/ $\mu\text{s}$ |
| Common mode transient immunity at logic low level output <sup>(1)(2)</sup>  | $I_F = 1.6\text{ mA}$ , $R_L = 2.2\text{ k}\Omega$ ,<br>$V_{CM} = 10\text{ V}_{PP}$ | $ CM_L $ | -    | 1000 | -    | V/ $\mu\text{s}$ |

**Notes**

- (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.  $V_O > 2\text{ V}$ ) 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 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 Fig. 2.  
 $R_{CC} \equiv [V/(0.15 \times I_F (\text{mA}))]\text{ k}\Omega$ .

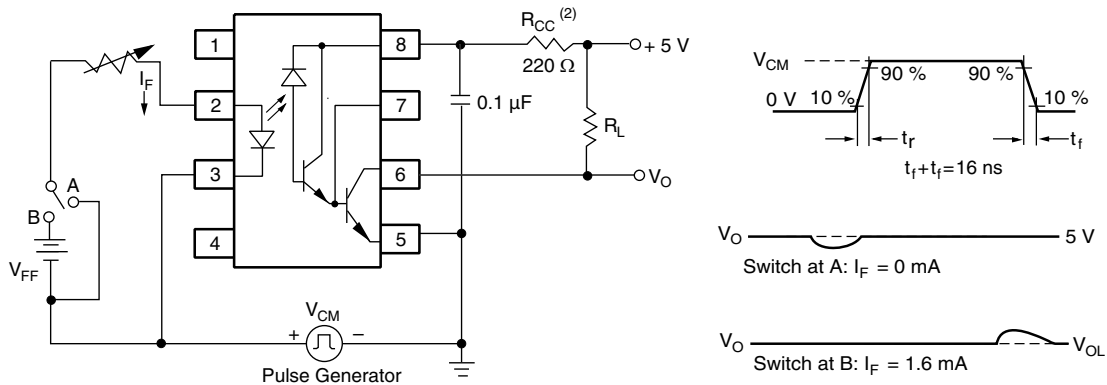


Fig. 4 - Test Circuit for Transient Immunity and Typical Waveforms



| <b>SAFETY AND INSULATION RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |            |                |                    |
|---|--|------------|----------------|--------------------|
| PARAMETER   | TEST CONDITION   | SYMBOL     | VALUE          | UNIT               |
| Climatic classification   | According to IEC 68 part 1   |            | 55 / 100 / 21  |                    |
| Pollution degree  | According to DIN VDE 0109  |            | 2              |                    |
| Comparative tracking index  | Insulation group IIIa  | CTI        | 175            |                    |
| Maximum rated withstanding isolation voltage  | According to UL1577, $t = 1\text{ min}$  | $V_{ISO}$  | 3333           | $V_{RMS}$          |
| Tested withstanding isolation voltage   | According to UL1577, $t = 1\text{ s}$  | $V_{ISO}$  | 4000           | $V_{RMS}$          |
| Maximum transient isolation voltage   | According to DIN EN 60747-5-5  | $V_{IOTM}$ | 6000           | $V_{peak}$         |
| Maximum repetitive peak isolation voltage   | According to DIN EN 60747-5-5  | $V_{IORM}$ | 560            | $V_{peak}$         |
| Isolation resistance  | $V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$   | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$           |
|   | $V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$  | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$           |
|   | $V_{IO} = 500\text{ V}$ , $T_{amb} = T_s$  | $R_{IO}$   | $\geq 10^9$    | $\Omega$           |
| Output safety power   |  | $P_{SO}$   | 350            | mW                 |
| Input safety current  |  | $I_{SI}$   | 150            | mA                 |
| Safety temperature  |  | $T_s$      | 165            | $^{\circ}\text{C}$ |
| Creepage distance   |  |            | $\geq 4$       | mm                 |
| Clearance distance  |  |            | $\geq 4$       | mm                 |
| Insulation thickness  |  | DTI        | $\geq 0.3$     | mm                 |
| Input to output test voltage, method B  | $V_{IORM} \times 1.875 = V_{PR}$ , 100 % production test with $t_M = 1\text{ s}$ , partial discharge $< 5\text{ pC}$ | $V_{PR}$   | 1050           | $V_{peak}$         |
| Input to output test voltage, method A  | $V_{IORM} \times 1.6 = V_{PR}$ , 100 % sample test with $t_M = 10\text{ s}$ , partial discharge $< 5\text{ pC}$      | $V_{PR}$   | 896            | $V_{peak}$         |

**Note**

- As per IEC 60747-5-5, § 7.4.3.8.2, 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

**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

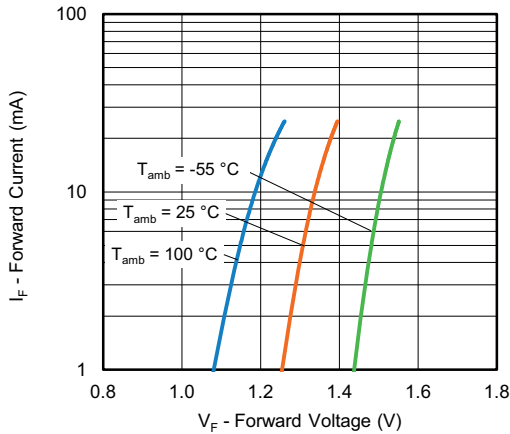


Fig. 5 - Forward Current vs. Forward Voltage

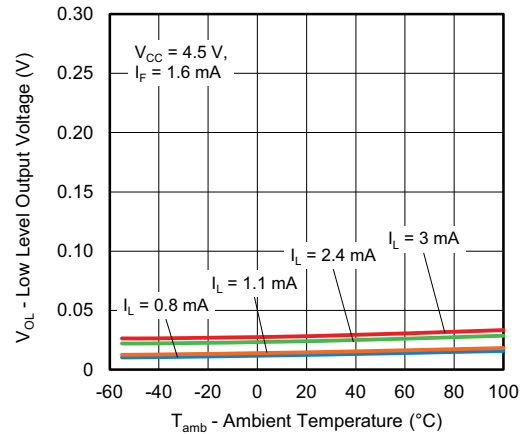


Fig. 8 - Low Level Output Voltage vs. Ambient Temperature

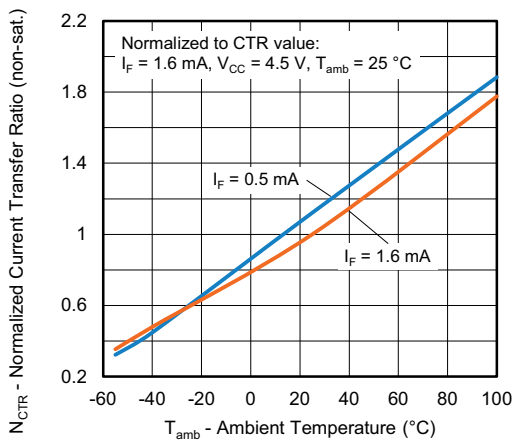


Fig. 6 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

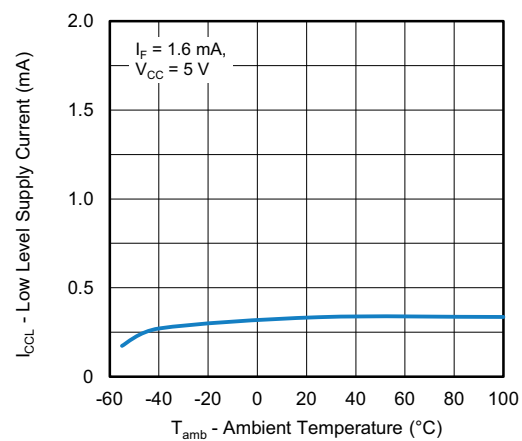


Fig. 9 - Low Level Supply Current vs. Ambient Temperature

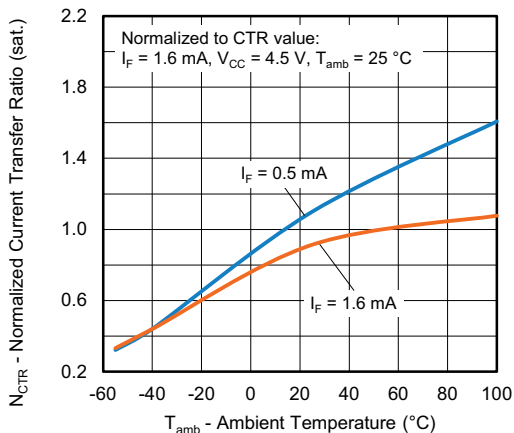


Fig. 7 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

## PACKAGE DIMENSIONS (in millimeters)

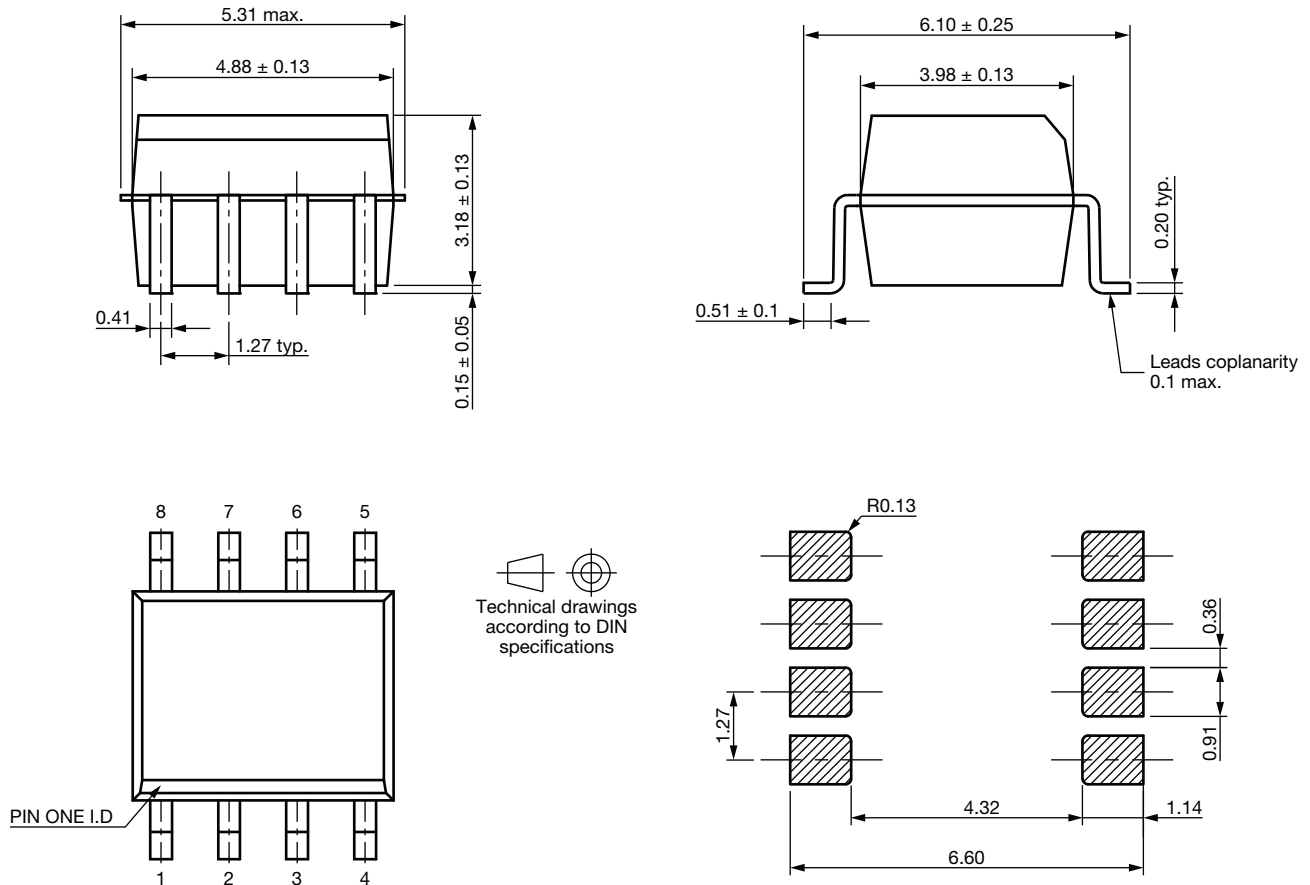


Fig. 10 - Package Drawing

## PACKAGE MARKING

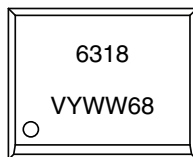


Fig. 11 - Example of SFH6318

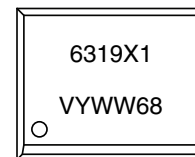


Fig. 12 - Example of SFH6319-X001T

### Notes

- “YWW” is the date code marking (Y = year code, WW = week code)
- “X1” is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking

**PACKING INFORMATION** (in millimeters)

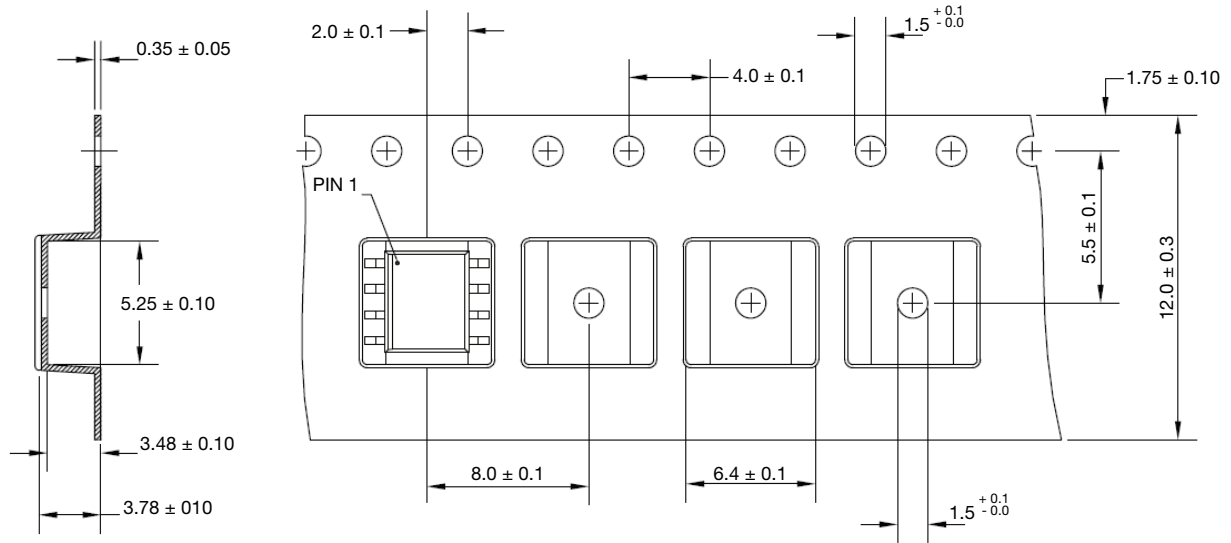


Fig. 13 - Tape and Reel Packing (2000 pieces on reel)

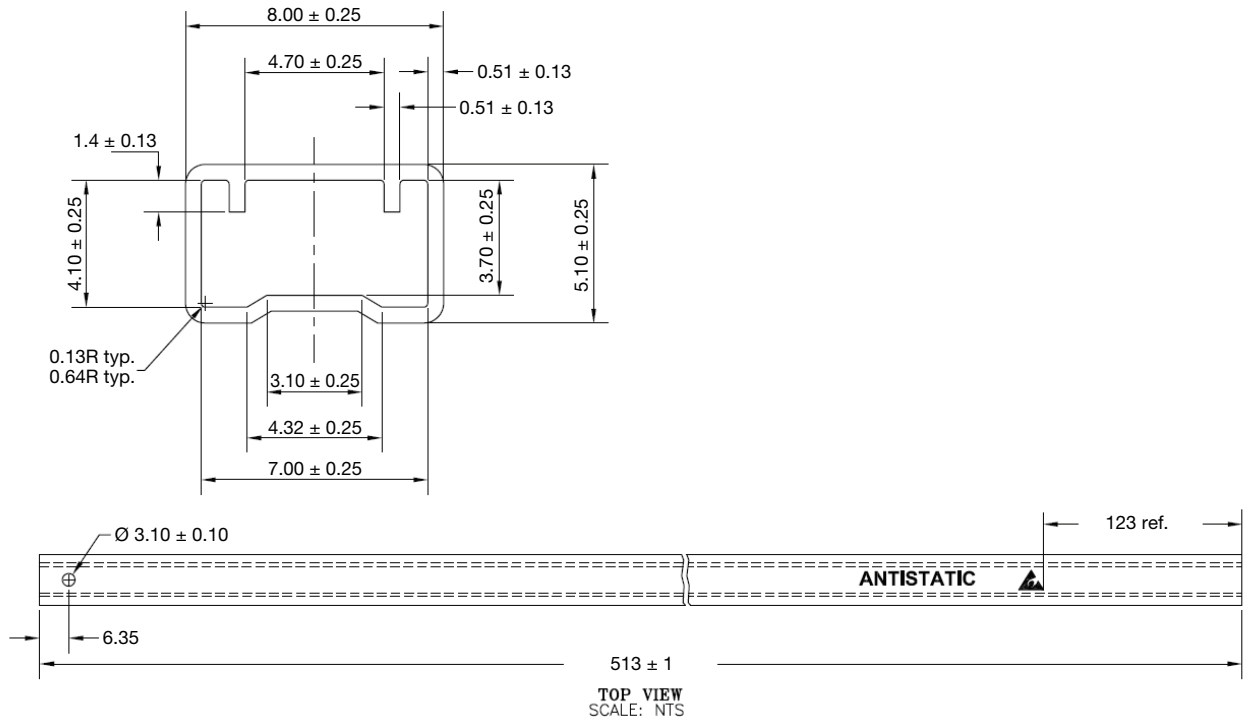


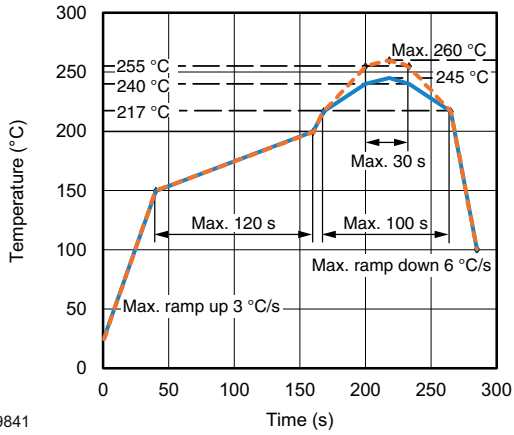
Fig. 14 - Tube Packing

| DEVICE PER TUBE |            |           |           |
|-----------------|------------|-----------|-----------|
| TYPE            | UNITS/TUBE | TUBES/BOX | UNITS/BOX |
| SOIC-8          | 100        | 30        | 3000      |





**SOLDER PROFILE**



19841

Fig. 15 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

**HANDLING AND STORAGE CONDITIONS**

ESD level: HBM class 2

Floor life: unlimited

Conditions:  $T_{amb} < 30\text{ °C}$ , RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



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