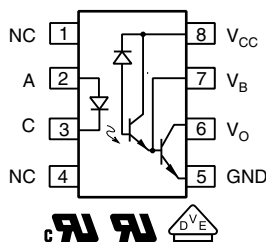
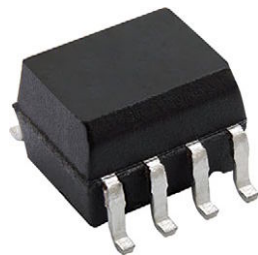


# High Speed Optocoupler, 100 kBd, Low Input Current, High Gain



## FEATURES

- High current transfer ratio, 300 %
- Low input current, 0.5 mA
- High output current, 60 mA
- TTL compatible output,  $V_{OL} = 0.1\text{ V}$
- 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 k $\Omega$  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.

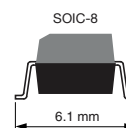
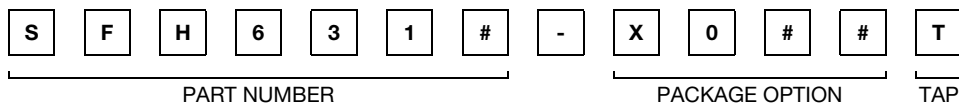
## APPLICATIONS

- 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

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

## ORDERING INFORMATION



| AGENCY CERTIFIED / PACKAGE |  | CTR (%)  |          |
|----------------------------|--|----------|----------|
| UL, cUL                    |  | ≥ 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.

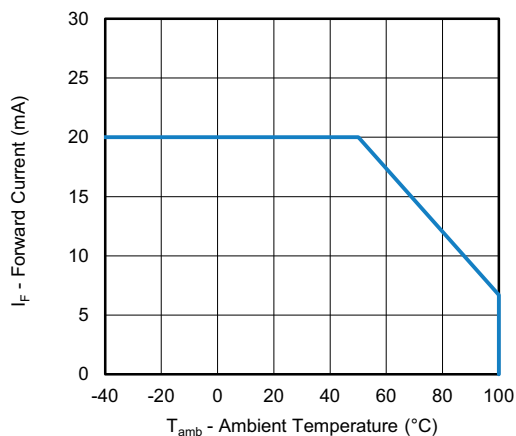


Fig. 1 - Forward Current vs. Ambient Temperature

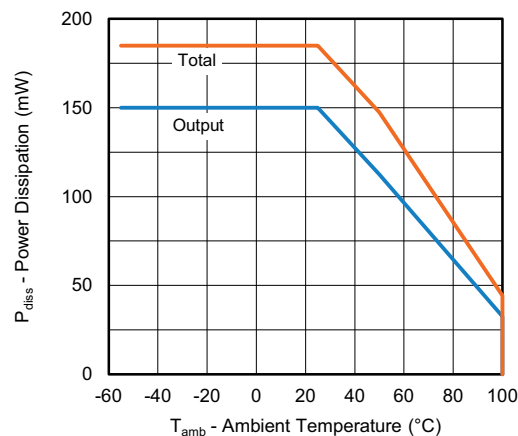


Fig. 2 - Power Dissipation vs. Ambient Temperature



| <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>               | $I_F = 12\text{ mA}$ , $R_L = 270\text{ }\Omega$   | 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>               | $I_F = 12\text{ mA}$ , $R_L = 270\text{ }\Omega$   | 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

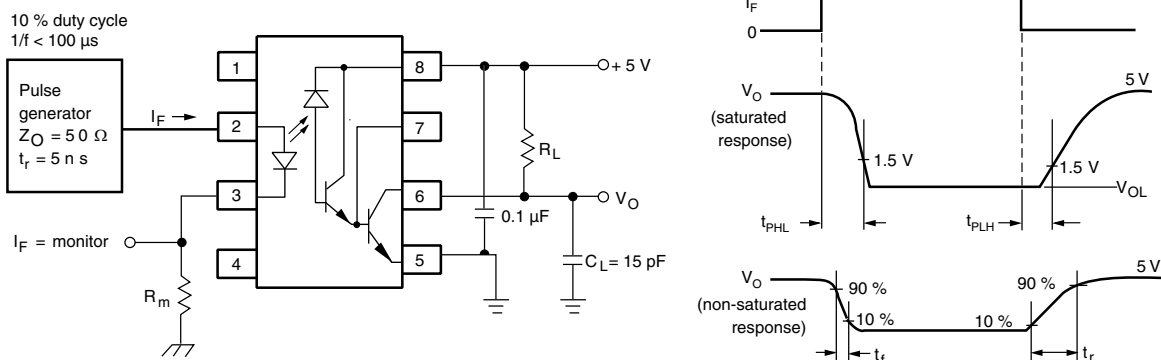


Fig. 3 - Switching Test Circuit

| 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> | $I_F = 0\text{ mA}$ , $R_L = 2.2\text{ k}\Omega$ , $V_{CM} = 10\text{ V}_{PP}$   | $ CM_H $ | -    | 1000 | -    | V/ $\mu$ s |
| Common mode transient immunity at logic low level output <sup>(1)(2)</sup>  | $I_F = 1.6\text{ mA}$ , $R_L = 2.2\text{ k}\Omega$ , $V_{CM} = 10\text{ V}_{PP}$ | $ CM_L $ | -    | 1000 | -    | V/ $\mu$ 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/ $\mu$ 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.  
 $R_{CC} \equiv [V/(0.15 \times I_F (\text{mA}))]\text{ k}\Omega$ .

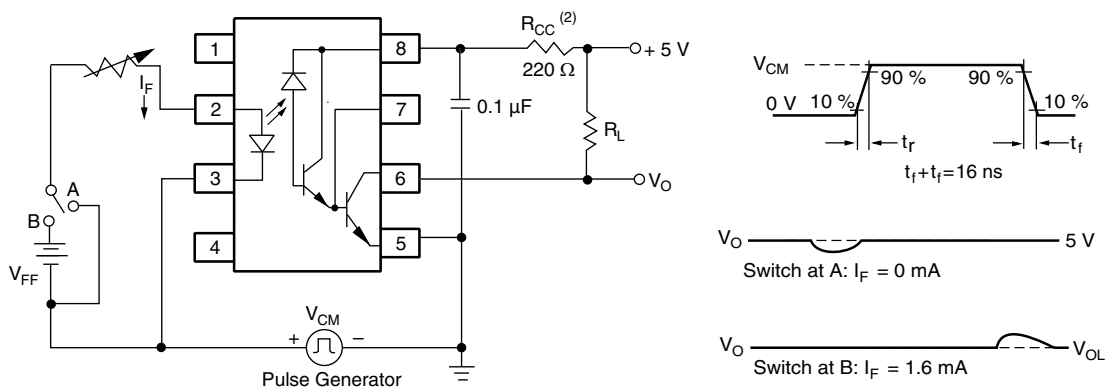


Fig. 4 - Test Circuit for Transient Immunity and Typical Waveforms



| SAFETY AND INSULATION RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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.

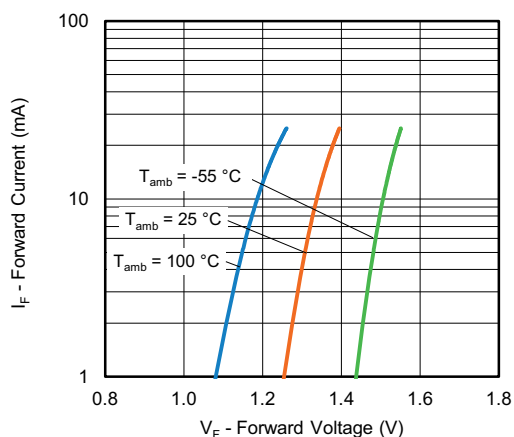
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 5 - Forward Current vs. Forward Voltage

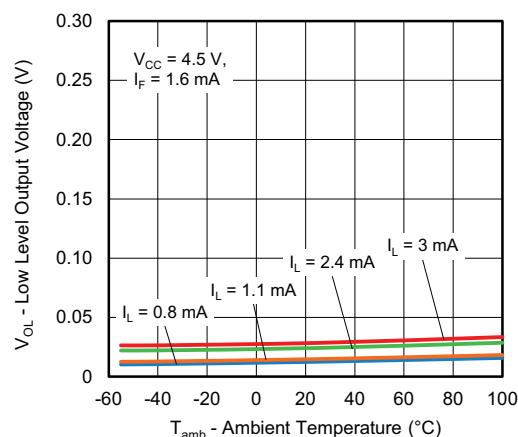


Fig. 8 - Low Level Output Voltage vs. Ambient Temperature

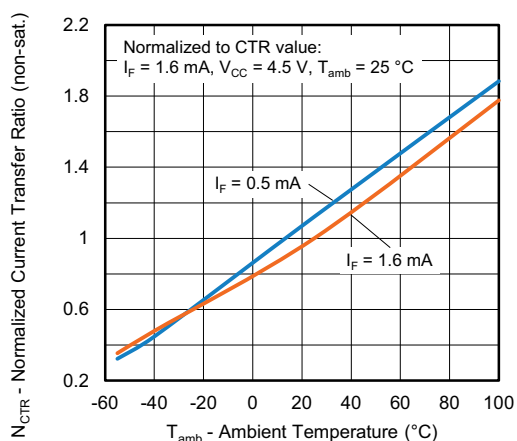


Fig. 6 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

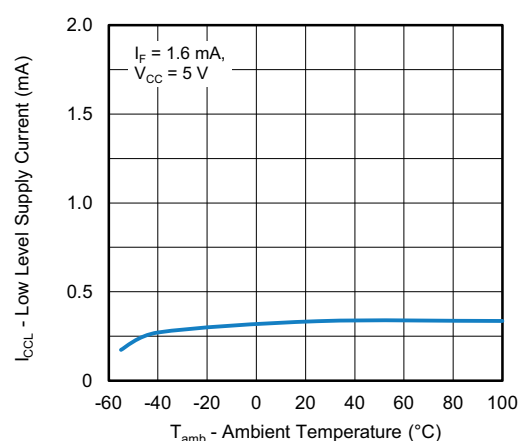


Fig. 9 - Low Level Supply Current vs. Ambient Temperature

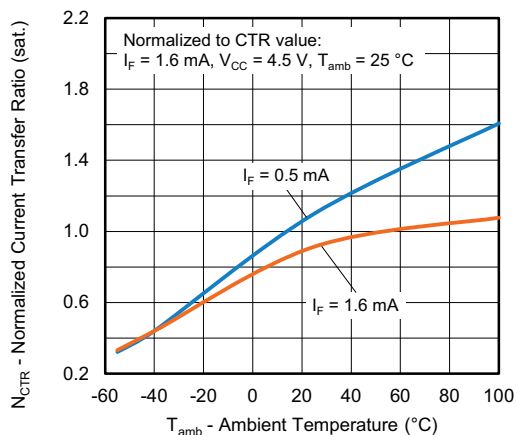


Fig. 7 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature



**PACKAGE DIMENSIONS** (in millimeters)

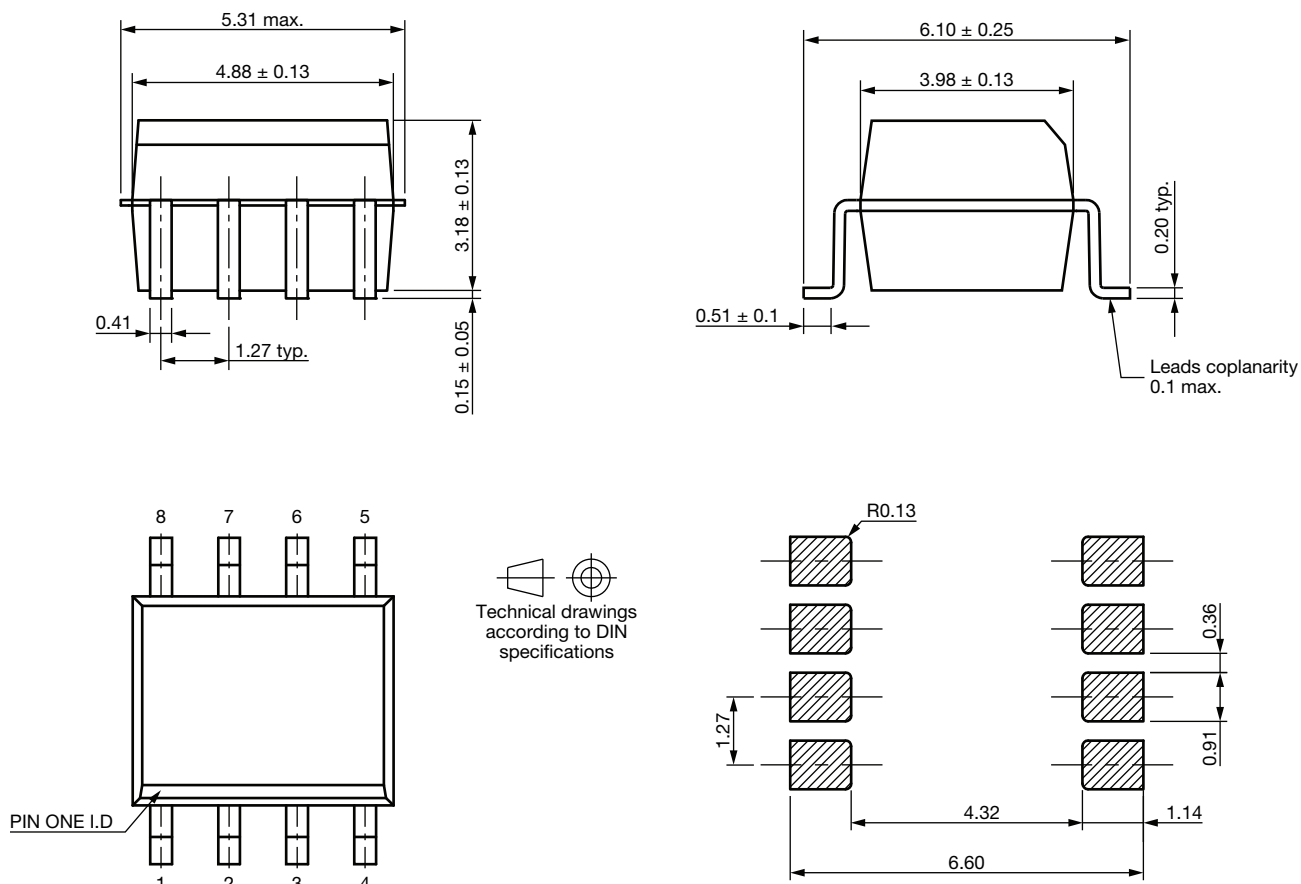


Fig. 10 - Package Drawing

**PACKAGE MARKING**

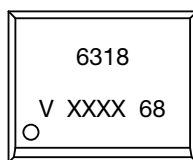


Fig. 11 - Example of SFH6318

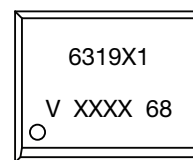


Fig. 12 - Example of SFH6319-X001T

**Notes**

- XXXX = LMC (lot marking code)
- "X1" is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking

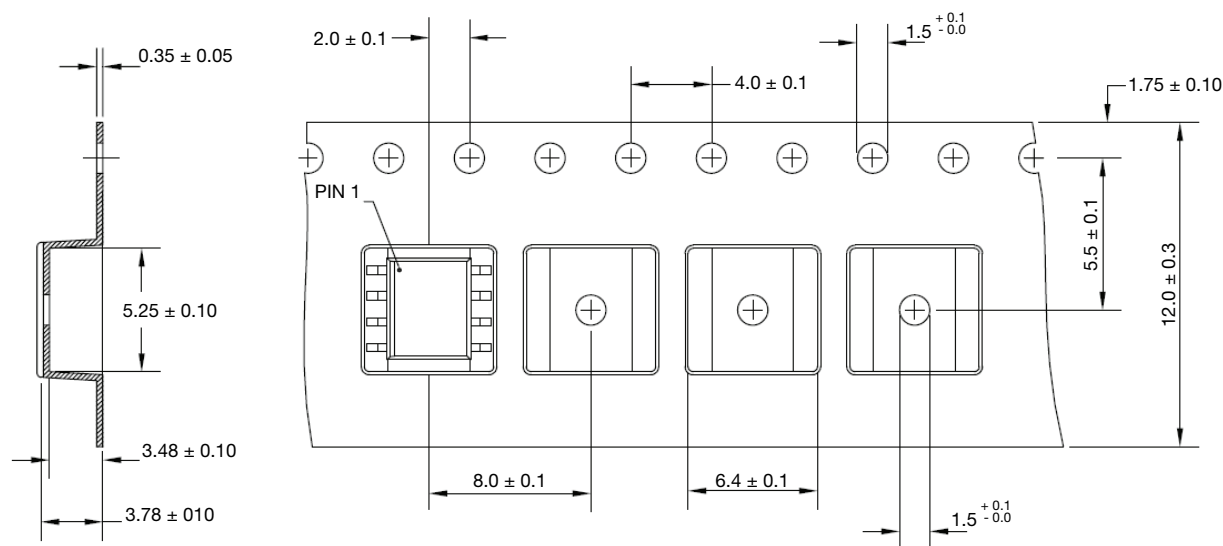
**PACKING INFORMATION** (in millimeters)

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

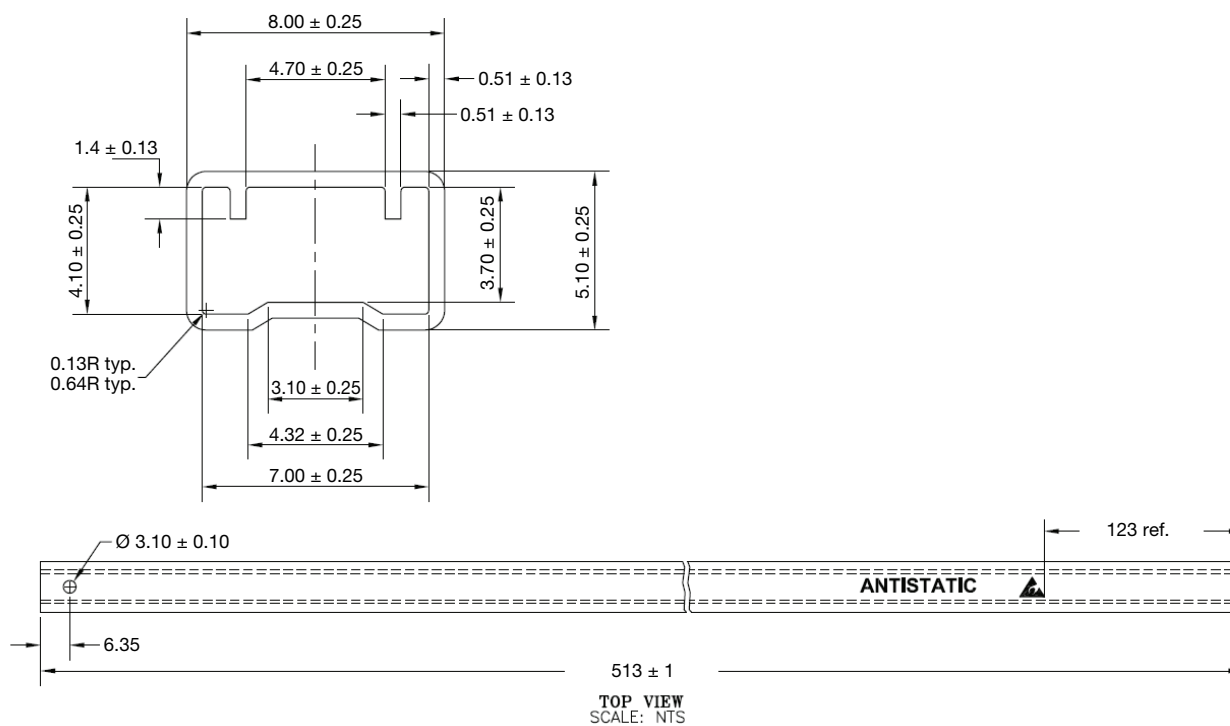


Fig. 14 - Tube Packing

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



## SOLDER PROFILE

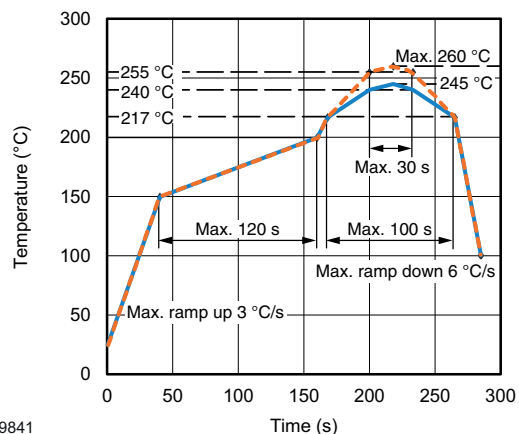


Fig. 15 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

## 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



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.