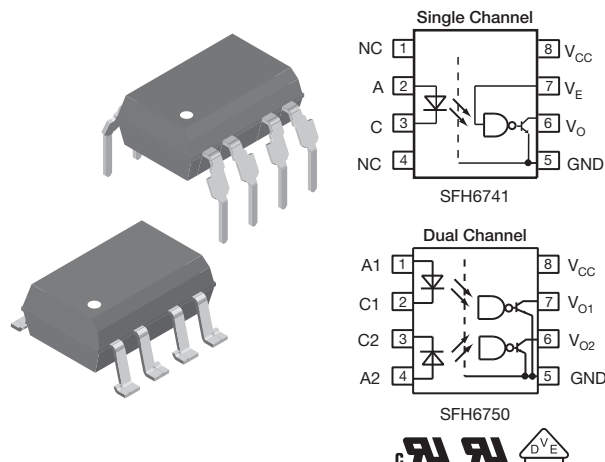


# High Speed Optocoupler, Single and Dual, 10 MBd



## DESCRIPTION

The SFH674x and SFH675x are single and dual channel 10 MBd optocouplers utilizing a high efficient input LED coupled with an integrated optical photodiode IC detector. The detector has an open drain NMOS-transistor output, providing less leakage compared to an open collector Schottky clamped transistor output. For the single channel type, an enable function on pin 7 allows the detector to be strobed. The internal shield provides a guaranteed common mode transient immunity of 5 kV/ $\mu$ s for the SFH6741 and 100 V/ $\mu$ s for the SFH6750.

## FEATURES

- Choice of CMR performance of 5 kV/ $\mu$ s and 100 V/ $\mu$ s
- High speed: 10 MBd typical
- +5 V CMOS compatibility
- Pure tin leads
- Guaranteed AC and DC performance over temperature: -40 °C to +100 °C
- Meets IEC 60068-2-42 (SO<sub>2</sub>) and IEC 60068-2-43 (H<sub>2</sub>S) requirements
- Low input current capability: 5 mA
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

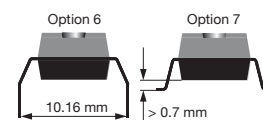
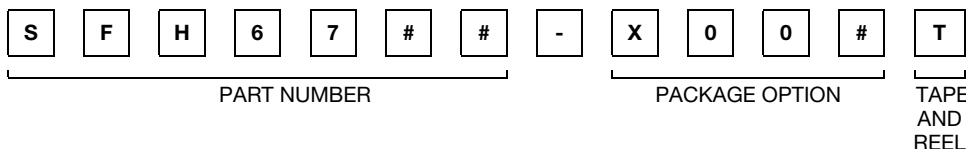
## APPLICATIONS

- Microprocessor system interface
- PLC, ATE input / output isolation
- Computer peripheral interface
- Digital fieldbus isolation: CC-link, DeviceNet, profibus, SDS
- High speed A/D and D/A conversion
- AC plasma display panel level shifting
- Multiplexed data transmission
- Digital control power supply
- Ground loop elimination

## AGENCY APPROVALS

- UL1577 (pending)
- cUL (pending)
- DIN EN 60747-5-5 (VDE 0884) / VDE available with option 1
- Reinforced insulation rating per IEC60950 2.10.5.1
- CQC

## ORDERING INFORMATION



| AGENCY CERTIFIED/PACKAGE | SINGLE CHANNEL    | DUAL CHANNEL      |
|--------------------------|-------------------|-------------------|
|                          | CMR (kV/ $\mu$ s) | CMR (kV/ $\mu$ s) |
| BSI, UL, cUL             | 5                 | 0.1               |
| DIP-8, 400 mil, option 6 | -                 | SFH6750-X006      |
| SMD-8, option 7          | SFH6741-X007T     | SFH6750-X007T     |

### Note

- For additional information on the available options refer to Option Information

**TRUTH TABLE** (positive logic)

| LED | ENABLE | OUTPUT |
|-----|--------|--------|
| On  | H      | L      |
| Off | H      | H      |
| On  | L      | H      |
| Off | L      | H      |
| On  | NC     | L      |
| Off | NC     | H      |

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                                              | TEST CONDITION               | SYMBOL     | VALUE                   | UNIT               |
|--------------------------------------------------------|------------------------------|------------|-------------------------|--------------------|
| <b>INPUT</b>                                           |                              |            |                         |                    |
| Average forward current (single channel)               |                              | $I_F$      | 20                      | mA                 |
| Average forward current (per channel for dual channel) |                              | $I_F$      | 15                      | mA                 |
| Reverse input voltage                                  |                              | $V_R$      | 5                       | V                  |
| Enable input voltage (single channel)                  |                              | $V_E$      | $V_{CC} + 0.5\text{ V}$ | V                  |
| Enable input current (single channel)                  |                              | $I_E$      | 5                       | mA                 |
| Surge current                                          | $t = 100\text{ }\mu\text{s}$ | $I_{FSM}$  | 200                     | mA                 |
| <b>OUTPUT</b>                                          |                              |            |                         |                    |
| Supply voltage                                         |                              | $V_{CC}$   | 7                       | V                  |
| Output current                                         |                              | $I_O$      | 50                      | mA                 |
| Output voltage                                         |                              | $V_O$      | 7                       | V                  |
| Output power dissipation (single channel)              |                              | $P_{diss}$ | 85                      | mW                 |
| Output power dissipation per channel (dual channel)    |                              | $P_{diss}$ | 60                      | mW                 |
| <b>COUPLER</b>                                         |                              |            |                         |                    |
| Storage temperature                                    |                              | $T_{stg}$  | -55 to +150             | $^{\circ}\text{C}$ |
| Operating temperature                                  |                              | $T_{amb}$  | -40 to +100             | $^{\circ}\text{C}$ |
| Lead solder temperature (single channel)               | for 10 s                     |            | 260                     | $^{\circ}\text{C}$ |
| Solder reflow temperature <sup>(1)</sup>               | for 1 min                    |            | 260                     | $^{\circ}\text{C}$ |
| Isolation test voltage                                 | $t = 1\text{ min}$           | $V_{ISO}$  | 5300                    | $V_{RMS}$          |

**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 for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP)

**RECOMMENDED OPERATING CONDITIONS**

| PARAMETER                 | TEST CONDITION           | SYMBOL    | MIN. | MAX.     | UNIT               |
|---------------------------|--------------------------|-----------|------|----------|--------------------|
| Operating temperature     |                          | $T_{amb}$ | -40  | 100      | $^{\circ}\text{C}$ |
| Supply voltage            |                          | $V_{CC}$  | 4.5  | 5.5      | V                  |
| Input current low level   |                          | $I_{FL}$  | 0    | 250      | $\mu\text{A}$      |
| Input current high level  |                          | $I_{FH}$  | 5    | 15       | mA                 |
| Logic high enable voltage |                          | $V_{EH}$  | 2    | $V_{CC}$ | V                  |
| Logic low enable voltage  |                          | $V_{EL}$  | 0    | 0.8      | V                  |
| Output pull up resistor   |                          | $R_L$     | 330  | 4K       | $\Omega$           |
| Fanout                    | $R_L = 1\text{ k}\Omega$ | N         |      | 5        | -                  |



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                                        |           |      |       |      |               |
|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------|------|-------|------|---------------|
| PARAMETER                                                                                                | TEST CONDITION                                                                         | SYMBOL    | MIN. | TYP.  | MAX. | UNIT          |
| <b>INPUT</b>                                                                                             |                                                                                        |           |      |       |      |               |
| Input forward voltage                                                                                    | $I_F = 10\text{ mA}$                                                                   | $V_F$     | 1    | 1.4   | 1.7  | V             |
| Reverse current                                                                                          | $V_R = 5\text{ V}$                                                                     | $I_R$     | -    | 0.01  | 10   | $\mu\text{A}$ |
| Input capacitance                                                                                        | $f = 1\text{ MHz}$ , $V_F = 0\text{ V}$                                                | $C_I$     | -    | 55    | -    | pF            |
| <b>OUTPUT</b>                                                                                            |                                                                                        |           |      |       |      |               |
| High level supply current (single channel)                                                               | $V_E = 0.5\text{ V}$ , $I_F = 0\text{ mA}$                                             | $I_{CCH}$ | -    | 4.1   | 7    | mA            |
|                                                                                                          | $V_E = V_{CC}$ , $I_F = 0\text{ mA}$                                                   | $I_{CCH}$ | -    | 3.3   | 6    | mA            |
| High level supply current (dual channel)                                                                 | $I_F = 0\text{ mA}$                                                                    | $I_{CCH}$ | -    | 6.9   | 12   | mA            |
| Low level supply current (single channel)                                                                | $V_E = 0.5\text{ V}$ , $I_F = 10\text{ mA}$                                            | $I_{CCL}$ | -    | 4     | 7    | mA            |
|                                                                                                          | $V_E = V_{CC}$ , $I_F = 10\text{ mA}$                                                  | $I_{CCL}$ | -    | 3.3   | 6    | mA            |
| Low level supply current (dual channel)                                                                  | $I_F = 10\text{ mA}$                                                                   | $I_{CCL}$ | -    | 6.5   | 12   | mA            |
| High level output current                                                                                | $V_E = 2\text{ V}$ , $V_O = 5.5\text{ V}$ ,<br>$I_F = 250\text{ }\mu\text{A}$          | $I_{OH}$  | -    | 0.002 | 1    | $\mu\text{A}$ |
| Low level output voltage                                                                                 | $V_E = 2\text{ V}$ , $I_F = 5\text{ mA}$ ,<br>$I_{OL}(\text{sinking}) = 13\text{ mA}$  | $V_{OL}$  | -    | 0.2   | 0.6  | V             |
| Input threshold current                                                                                  | $V_E = 2\text{ V}$ , $V_O = 5.5\text{ V}$ ,<br>$I_{OL}(\text{sinking}) = 13\text{ mA}$ | $I_{TH}$  | -    | 2.4   | 5    | mA            |
| High level enable current                                                                                | $V_E = 2\text{ V}$                                                                     | $I_{EH}$  | -    | -0.6  | -1.6 | mA            |
| Low level enable current                                                                                 | $V_E = 0.5\text{ V}$                                                                   | $I_{EL}$  | -    | -0.8  | -1.6 | mA            |
| High level enable voltage                                                                                |                                                                                        | $V_{EH}$  | 2    | -     | -    | V             |
| Low level enable voltage                                                                                 |                                                                                        | $V_{EL}$  | -    | -     | 0.8  | V             |

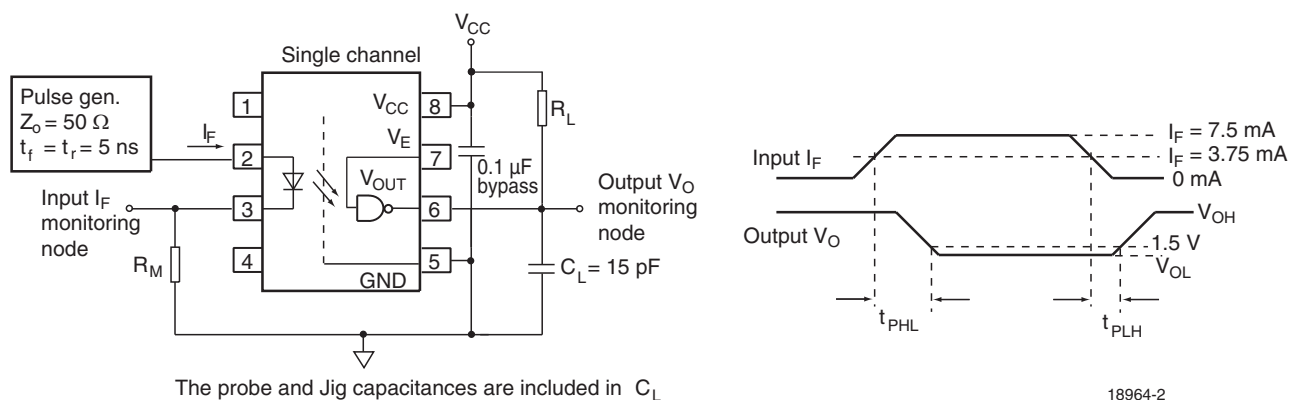
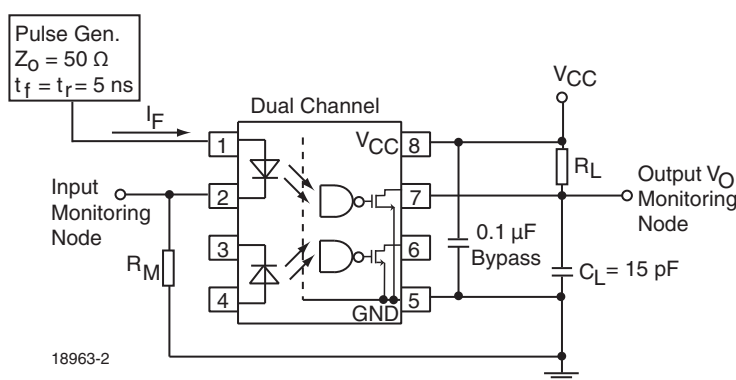
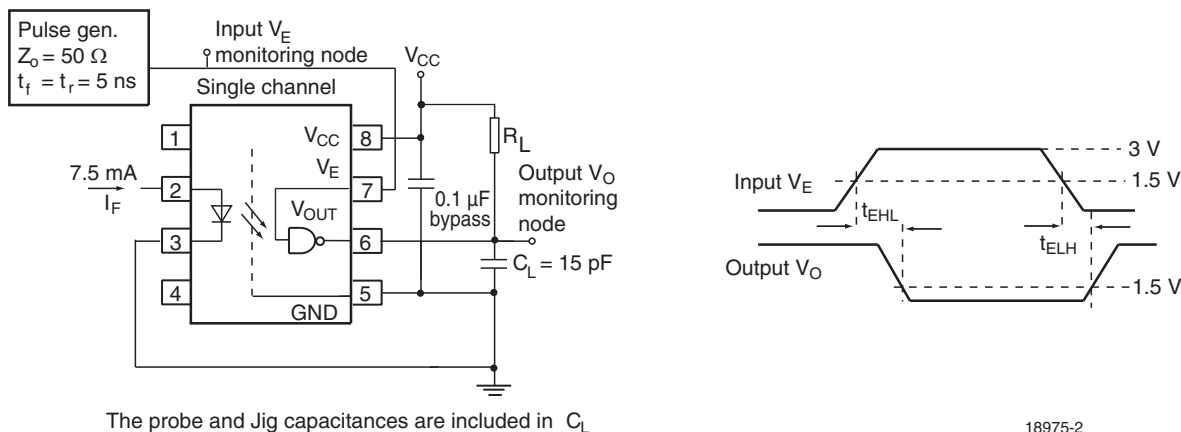
**Note**

- 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; all typicals at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = 5.5\text{ V}$ , unless otherwise specified.

| <b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                                                     |                       |      |      |      |      |
|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------|------|------|------|------|
| PARAMETER                                                                                               | TEST CONDITION                                                                                      | SYMBOL                | MIN. | TYP. | MAX. | UNIT |
| Propagation delay time to high output level                                                             | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$                                                    | $t_{PLH}$             | 20   | 48   | 100  | ns   |
| Propagation delay time to low output level                                                              | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$                                                    | $t_{PHL}$             | 25   | 50   | 100  | ns   |
| Pulse width distortion                                                                                  | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$                                                    | $ t_{PHL} - t_{PLH} $ | -    | 2.9  | 35   | ns   |
| Propagation delay skew                                                                                  | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$                                                    | $t_{PSK}$             | -    | 8    | 40   | ns   |
| Output rise time (10 % to 90 %)                                                                         | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$                                                    | $t_r$                 | -    | 23   | -    | ns   |
| Output fall time (90 % to 10 %)                                                                         | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$                                                    | $t_f$                 | -    | 7    | -    | ns   |
| Propagation delay time of enable from $V_{EH}$ to $V_{EL}$                                              | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$ ,<br>$V_{EL} = 0\text{ V}$ , $V_{EH} = 3\text{ V}$ | $t_{ELH}$             | -    | 12   | -    | ns   |
| Propagation delay time of enable from $V_{EL}$ to $V_{EH}$                                              | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$ ,<br>$V_{EL} = 0\text{ V}$ , $V_{EH} = 3\text{ V}$ | $t_{EHL}$             | -    | 11   | -    | ns   |

**Note**

- Over recommended temperature ( $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+100\text{ }^{\circ}\text{C}$ ),  $V_{CC} = 5\text{ V}$ ,  $I_F = 7.5\text{ mA}$  unless otherwise specified; all typicals at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = 5\text{ V}$


Fig. 1 - Single Channel Test Circuit for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_r$  and  $t_f$ 

Fig. 2 - Dual Channel Test Circuit for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_r$  and  $t_f$ 

Fig. 3 - Single Channel Test Circuit for  $t_{EHL}$ , and  $t_{ELH}$

| COMMON MODE TRANSIENT IMMUNITY        |                                                                                                                                                                      |          |      |        |      |                  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|--------|------|------------------|
| PARAMETER                             | TEST CONDITION                                                                                                                                                       | SYMBOL   | MIN. | TYP.   | MAX. | UNIT             |
| Common mode transient immunity (high) | $ V_{CM}  = 10 \text{ V}$ , $V_{CC} = 5 \text{ V}$ , $I_F = 0 \text{ mA}$ , $V_{O(\min.)} = 2 \text{ V}$ , $R_L = 350 \Omega$ , $T_{amb} = 25^\circ\text{C}$ (1)     | $ CM_H $ | 100  | -      | -    | V/ $\mu\text{s}$ |
|                                       | $ V_{CM}  = 50 \text{ V}$ , $V_{CC} = 5 \text{ V}$ , $I_F = 0 \text{ mA}$ , $V_{O(\min.)} = 2 \text{ V}$ , $R_L = 350 \Omega$ , $T_{amb} = 25^\circ\text{C}$ (2)     | $ CM_H $ | 5000 | 10 000 | -    | V/ $\mu\text{s}$ |
|                                       | $ V_{CM}  = 10 \text{ V}$ , $V_{CC} = 5 \text{ V}$ , $I_F = 7.5 \text{ mA}$ , $V_{O(\max.)} = 0.8 \text{ V}$ , $R_L = 350 \Omega$ , $T_{amb} = 25^\circ\text{C}$ (1) | $ CM_L $ | 100  | -      | -    | V/ $\mu\text{s}$ |
|                                       | $ V_{CM}  = 50 \text{ V}$ , $V_{CC} = 5 \text{ V}$ , $I_F = 7.5 \text{ mA}$ , $V_{O(\max.)} = 0.8 \text{ V}$ , $R_L = 350 \Omega$ , $T_{amb} = 25^\circ\text{C}$ (2) | $ CM_L $ | 5000 | 10 000 | -    | V/ $\mu\text{s}$ |

**Notes**

(1) For SFH6750

(2) For SFH6741

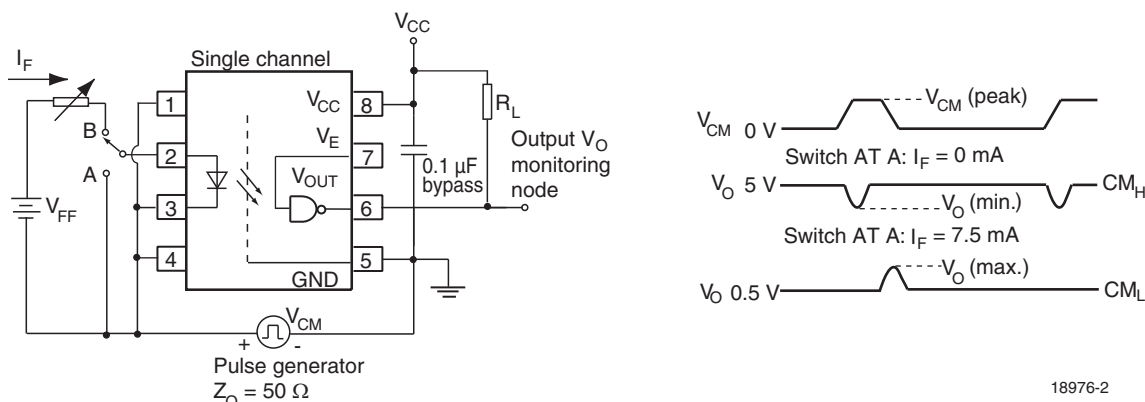


Fig. 4 - Single Channel Test Circuit for Common Mode Transient Immunity

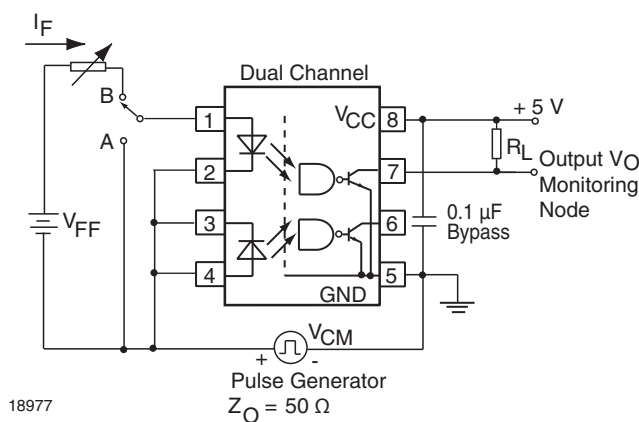


Fig. 5 - Dual Channel Test Circuit for Common Mode Transient Immunity

**SAFETY AND INSULATION RATINGS**

| PARAMETER                              | TEST CONDITION             | SYMBOL     | MIN. | TYP.      | MAX. | UNIT |
|----------------------------------------|----------------------------|------------|------|-----------|------|------|
| Climatic classification                | according to IEC 69 part 1 |            | -    | 40/100/21 | -    |      |
| Comparative tracking index             |                            | CTI        | 175  | -         | 399  |      |
| Peak transient overvoltage             |                            | $V_{IOTM}$ | 8000 | -         | -    | V    |
| Peak insulation voltage                |                            | $V_{IORM}$ | 630  | -         | -    | V    |
| Safety rating - power output           |                            | $P_{SO}$   | -    | -         | 500  | mW   |
| Safety rating - input current          |                            | $I_{SI}$   | -    | -         | 300  | mA   |
| Safety rating - temperature            |                            | $T_{SI}$   | -    | -         | 175  | °C   |
| Creepage distance                      | DIP-8, 400 mil, option 6   |            | 8    | -         | -    | mm   |
| Clearance distance                     |                            |            | 8    | -         | -    | mm   |
| Creepage distance                      | SMD-8, option 7            |            | 8    | -         | -    | mm   |
| Clearance distance                     |                            |            | 8    | -         | -    | mm   |
| Insulation thickness, reinforced rated | per IEC60950.2.10.5.1      |            | 0.4  | -         | -    | mm   |

**Note**

- As per IEC 60747-5-2, §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

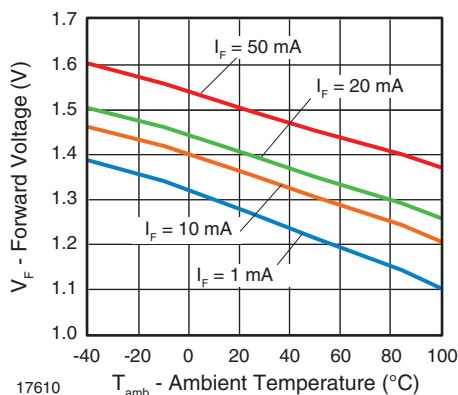
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)

Fig. 6 - Forward Voltage vs. Ambient Temperature

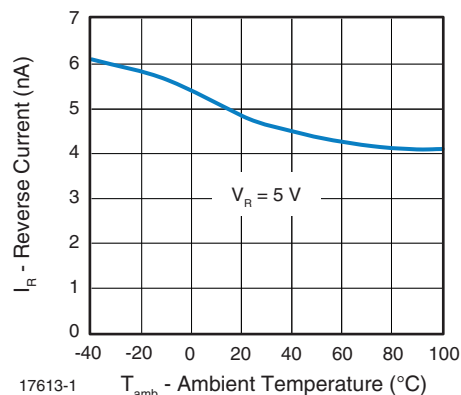


Fig. 8 - Reverse Current vs. Ambient Temperature

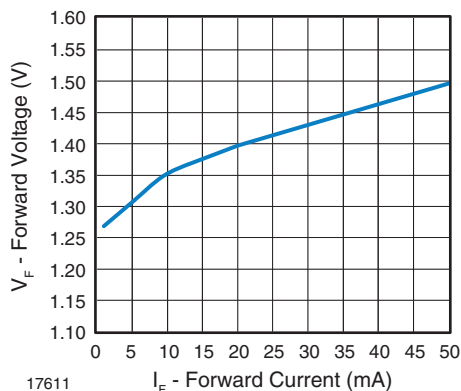


Fig. 7 - Forward Voltage vs. Forward Current

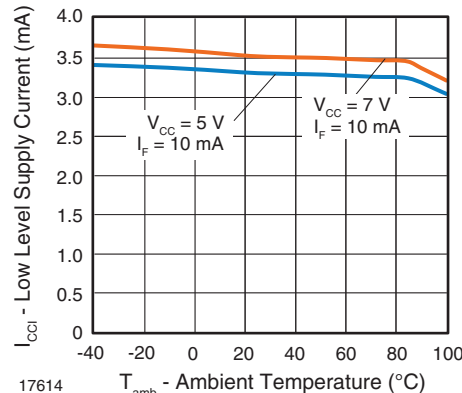


Fig. 9 - Low Level Supply Current vs. Ambient Temperature

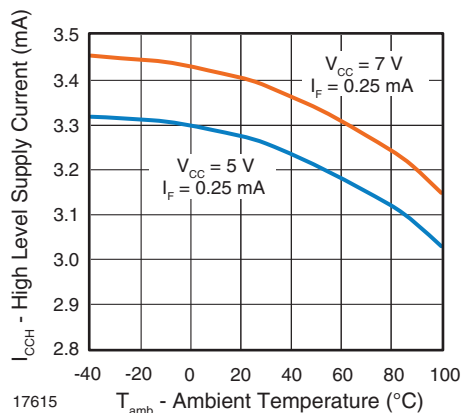


Fig. 10 - High Level Supply Current vs. Ambient Temperature

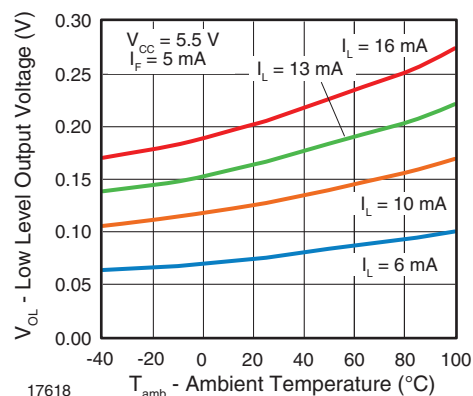


Fig. 13 - Low Level Output Voltage vs. Ambient Temperature

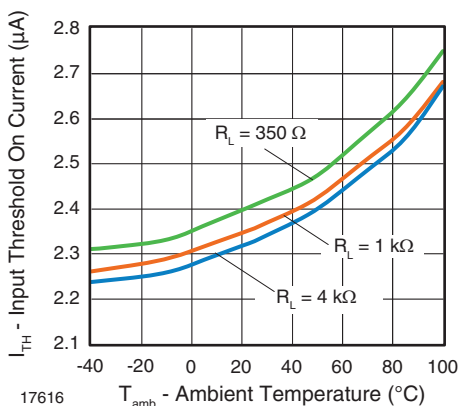


Fig. 11 - Input Threshold On Current vs. Ambient Temperature

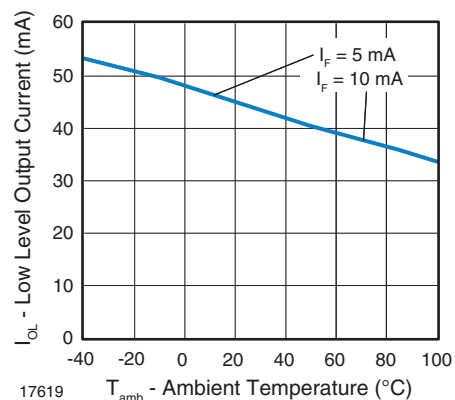


Fig. 14 - Low Level Output Current vs. Ambient Temperature

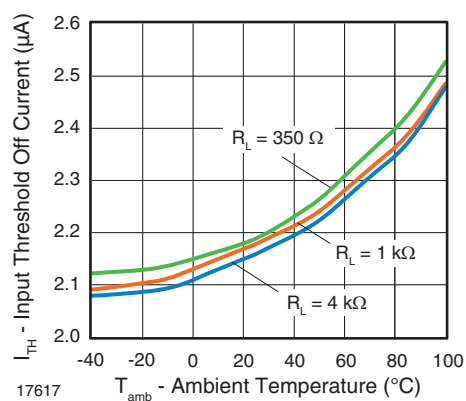


Fig. 12 - Input Threshold Off Current vs. Ambient Temperature

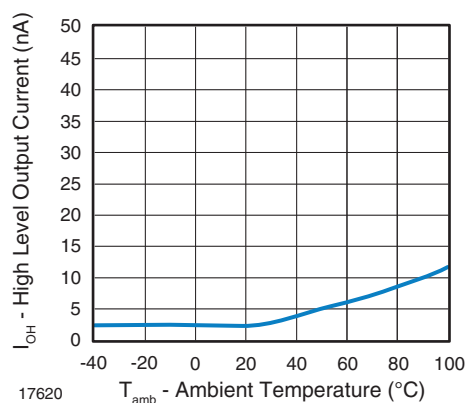


Fig. 15 - High Level Output Current vs. Ambient Temperature

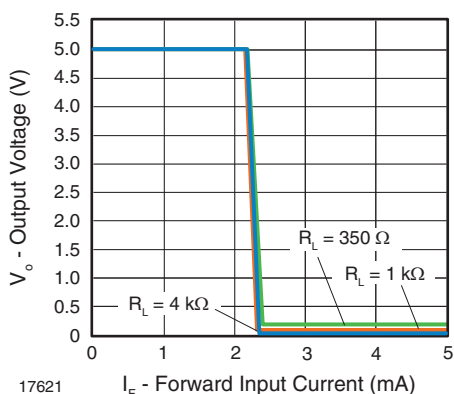


Fig. 16 - Output Voltage vs. Forward Input Current

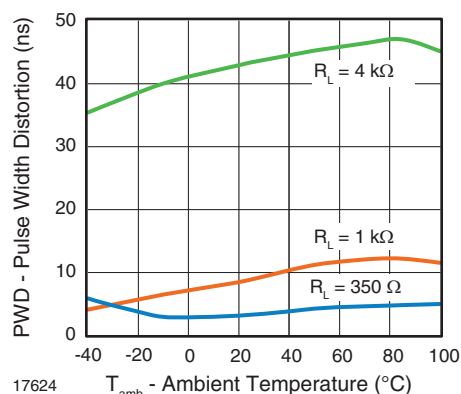


Fig. 19 - Pulse Width Distortion vs. Ambient Temperature

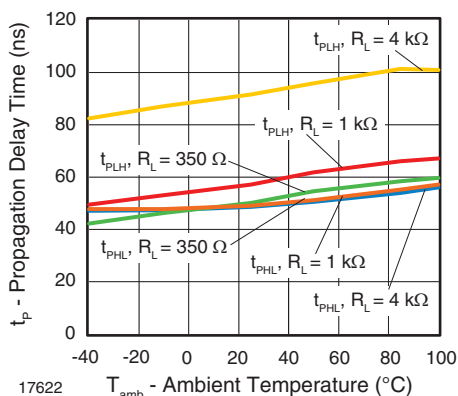


Fig. 17 - Propagation Delay vs. Ambient Temperature

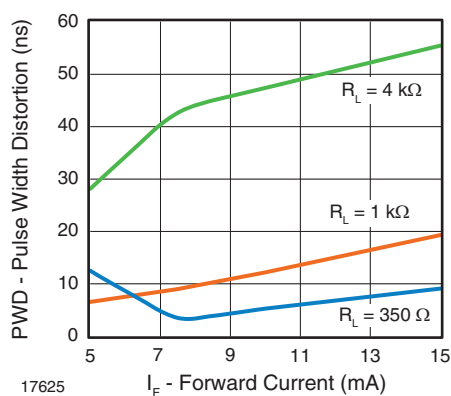


Fig. 20 - Pulse Width Distortion vs. Forward Current

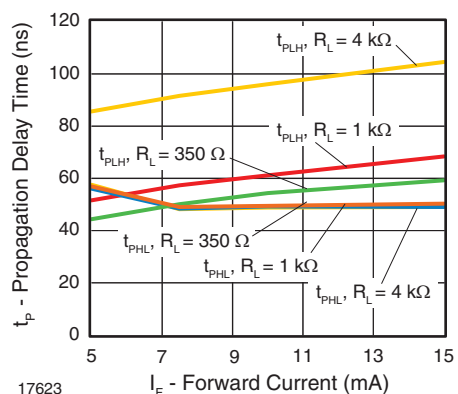


Fig. 18 - Propagation Delay vs. Forward Current

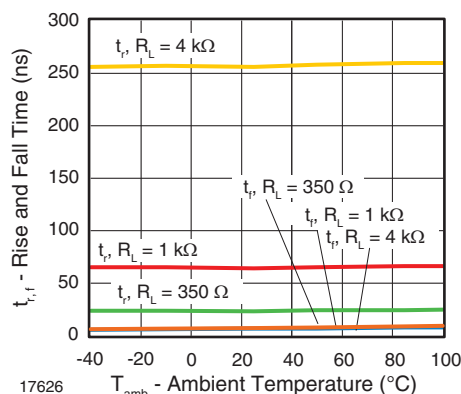


Fig. 21 - Rise and Fall Time vs. Ambient Temperature

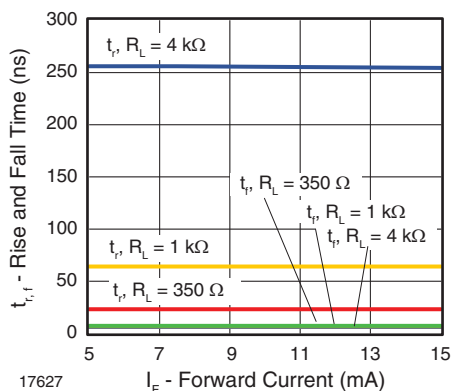


Fig. 22 - Rise and Fall Time vs. Forward Current

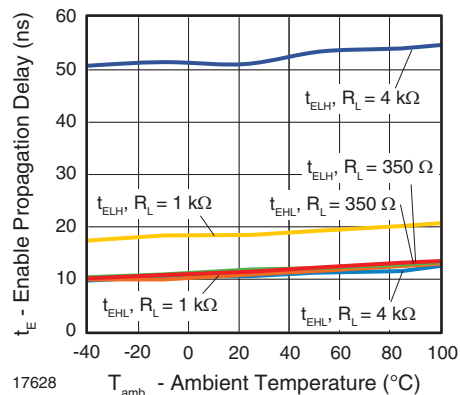
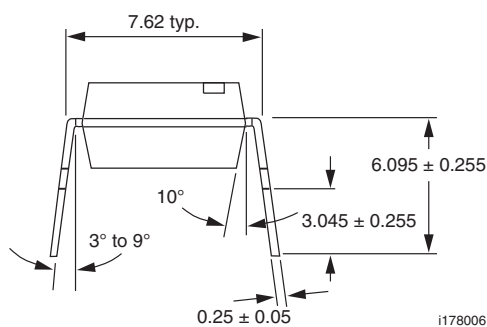
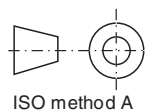
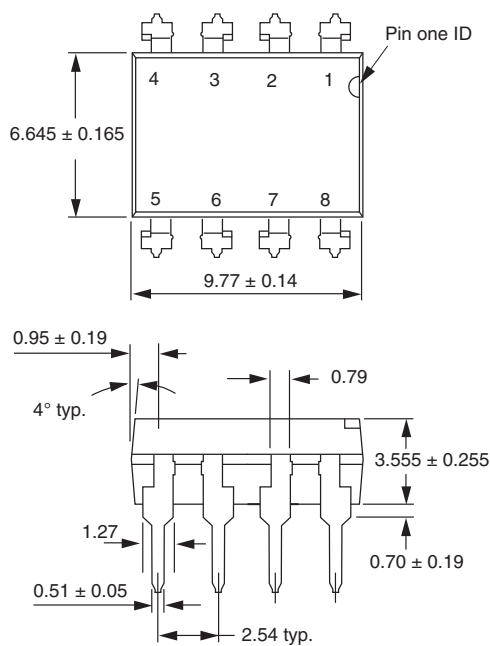
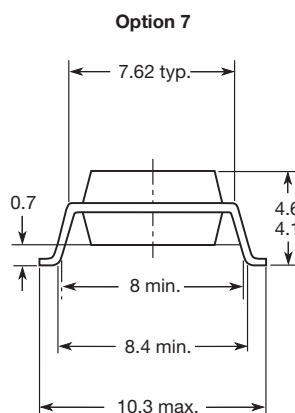
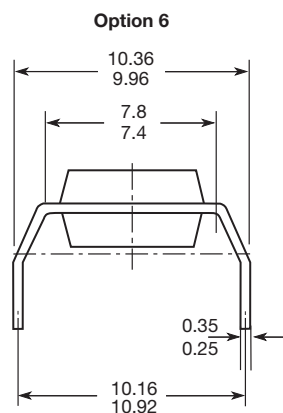


Fig. 23 - Enable Propagation Delay vs. Ambient Temperature

### PACKAGE DIMENSIONS in millimeters

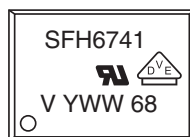


1178006





## PACKAGE MARKING (for example)



### Notes

- VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking



## Disclaimer

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