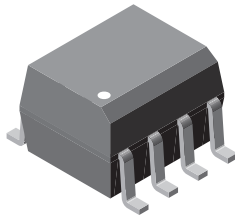
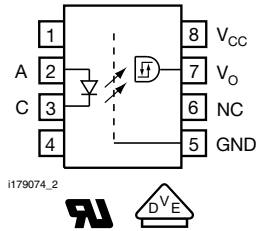


## High Speed Optocoupler, Dual, 5 MBd, in SOIC-8 Package



i179074



i179074\_2



### FEATURES

- Data rate 5 Mbits/s (2.5 Mbit/s over temperature)
- Buffer
- Isolation test voltage, 4000 V<sub>RMS</sub>
- TTL, LSTTL and CMOS compatible
- Internal shield for very high common mode transient immunity
- Wide supply voltage range (4.5 V to 15 V)
- Low input current (1.6 mA to 5 mA)
- Parameters specified from 0 °C to 85 °C
- T<sub>amb</sub> from - 40 °C to 100 °C
- Compliant to RoHS Directive to 2002/95/EC and in accordance WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### DESCRIPTION

The single channel 5 Mb/s SFH6720T and SFH6721T high speed optocoupler consists of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector. The detector incorporates a schmitt-trigger stage for improved noise immunity. A faraday shield provides a common mode transient immunity of 1000 V/μs at V<sub>CM</sub> = 50 V for SFH6720T and 2500 V/μs at V<sub>CM</sub> = 400 V for SFH6721T.

The SFH6720T and SFH6721T uses an industry standard SOIC-8A package.

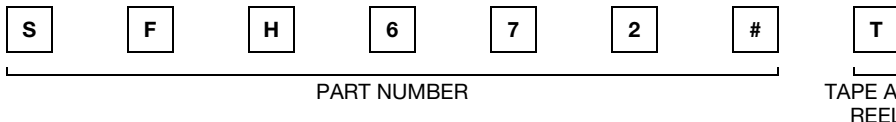
### AGENCY APPROVALS

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

### APPLICATIONS

- Industrial control
- Replace pulse transformers
- Routine logic interfacing
- Motion/power control
- High speed line receiver
- Microprocessor system interfaces
- Computer peripheral interfaces

### ORDERING INFORMATION



| AGENCY CERTIFIED/PACKAGE | CMR (kV/μs)   | CMR (kV/μs) |
|--------------------------|---------------|-------------|
| <b>UL</b>                | <b>1</b>      | <b>2.5</b>  |
| SOIC-8                   | SFH6720T      | SFH6721T    |
| <b>VDE, UL</b>           | <b>1</b>      | <b>2.5</b>  |
| SOIC-8                   | SFH6720-X001T | -           |

### TRUTH TABLE (positive logic)

| PART     | IR DIODE | OUTPUT |
|----------|----------|--------|
| SFH6720T | On       | H      |
|          | Off      | L      |
| SFH6721T | On       | H      |
|          | Off      | L      |

# SFH6720T, SFH6721T



Vishay Semiconductors High Speed Optocoupler, Dual,  
5 MBd, in SOIC-8 Package

| ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |            |               |                    |
|--|---|------------|---------------|--------------------|
| PARAMETER  | TEST CONDITION  | SYMBOL     | VALUE         | UNIT               |
| <b>INPUT</b>   |   |            |               |                    |
| Reverse voltage  |   | $V_R$      | 3             | V                  |
| DC forward current   |   | $I_F$      | 10            | mA                 |
| Surge forward  | $t_p \leq 1\text{ }\mu\text{s}$ , 300 pulses/s                    | $I_{FSM}$  | 1             | mA                 |
| Power dissipation  |   | $P_{diss}$ | 20            | mW                 |
| <b>OUTPUT</b>  |   |            |               |                    |
| Supply voltage   |   | $V_{CC}$   | - 0.5 to + 15 | V                  |
| Output voltage   |   | $V_O$      | - 0.5 to + 15 | V                  |
| Average output current   |   | $I_O$      | 25            | mA                 |
| Power dissipation  |   | $P_{diss}$ | 100           | mW                 |
| <b>COUPLER</b>   |   |            |               |                    |
| Storage temperature range  |   | $T_{stg}$  | - 55 to + 125 | $^{\circ}\text{C}$ |
| Ambient temperature range  |   | $T_{amb}$  | + 85          | $^{\circ}\text{C}$ |
| Isolation test voltage   | $t = 1\text{ s}$  | $V_{ISO}$  | 4000          | $V_{RMS}$          |
| Pollution degree   |   |            | 2             |                    |
| Creepage distance  |   |            | 4             | mm                 |
| Clearance distance   |   |            | 4             | mm                 |
| Comparative tracking index per DIN IEC112/VDE 0303, part 1   |   | CTI        | 175           |                    |
| Isolation resistance   | $V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$  | $R_{IO}$   | $10^{12}$     | $\Omega$           |
|  | $V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$ | $R_{IO}$   | $10^{11}$     | $\Omega$           |
| Lead soldering temperature <sup>(2)</sup>  | $t = 10\text{ s}$   | $T_{sld}$  | 260           | $^{\circ}\text{C}$ |

## Notes

- (1) 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.
- (2) Refer to reflow profile soldering conditions for surface mounted devices.

| RECOMMENDED OPERATING CONDITIONS <sup>(1)</sup> |                |            |                    |      |      |                    |
|---|----------------|------------|--------------------|------|------|--------------------|
| PARAMETER                                       | TEST CONDITION | SYMBOL     | MIN.               | TYP. | MAX. | UNIT               |
| Supply voltage                                  |                | $V_{CC}$   | 4.5                |      | 15   | V                  |
| Forward input current                           |                | $I_{Fon}$  | 1.6 <sup>(2)</sup> |      | 5    | mA                 |
|   |                | $I_{Foff}$ |                    |      | 0.1  | mA                 |
| Operating temperature                           |                | $T_A$      | - 40               |      | 85   | $^{\circ}\text{C}$ |

## Notes

- (1) A 0.1  $\mu\text{F}$  bypass capacitor connected between pins 5 and 8 must be used.
- (2) We recommended using a 2.2 mA if to permit at least 20 % CTR degradation guard band.

| ELECTRICAL CHARACTERISTICS <sup>(1)</sup> |  |            |      |      |      |               |
|---|--|------------|------|------|------|---------------|
| PARAMETER                                 | TEST CONDITION   | SYMBOL     | MIN. | TYP. | MAX. | UNIT          |
| <b>INPUT</b>                              |  |            |      |      |      |               |
| Forward voltage                           | $I_F = 5\text{ mA}$ , $25\text{ }^{\circ}\text{C}$     | $V_F$      |      | 1.6  | 1.75 | V             |
|   |  | $V_F$      |      |      | 1.9  | V             |
| Input current hysteresis                  | $V_{CC} = 5\text{ V}$ , $I_{HYS} = I_{Fon} - I_{Foff}$ | $I_{HYS}$  | 0.1  |      |      | V             |
| Reverse current                           | $V_R = 3\text{ V}$                                     | $I_R$      |      | 0.5  | 10   | $\mu\text{A}$ |
| Capacitance                               | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$                | $C_O$      |      | 60   |      | pF            |
| Thermal resistance                        |  | $R_{thja}$ |      | 700  |      | K/W           |

| <b>ELECTRICAL CHARACTERISTICS (1)</b>   |  |            |           |      |      |               |
|---|--|------------|-----------|------|------|---------------|
| PARAMETER   | TEST CONDITION   | SYMBOL     | MIN.      | TYP. | MAX. | UNIT          |
| <b>OUTPUT</b>   |  |            |           |      |      |               |
| Logic low output voltage  | $I_{OL} = 6.4 \text{ mA}$  | $V_{OL}$   |           |      | 0.5  | V             |
| Logic high output voltage   | $I_{OH} = -2.6 \text{ mA}$ ,<br>$V_{OH} = V_{CC} - 1.8 \text{ V}$          | $V_{OH}$   | 2.4       |      |      | V             |
| Output leakage current<br>( $V_{OUT} > V_{CC}$ )  | $V_O = 5.5 \text{ V}$ , $V_{CC} = 4.5 \text{ V}$ ,<br>$I_F = 5 \text{ mA}$ | $I_{OHH}$  |           | 0.5  | 100  | $\mu\text{A}$ |
|   | $V_O = 15 \text{ V}$ , $V_{CC} = 4.5 \text{ V}$ ,<br>$I_F = 5 \text{ mA}$  | $I_{OHH}$  |           | 1    | 500  | $\mu\text{A}$ |
| Logic low supply current  | $V_{CC} = 5.5 \text{ V}$ , $I_F = 0$                                       | $I_{CCL}$  |           | 3.7  | 6    | mA            |
|   | $V_{CC} = 15 \text{ V}$ , $I_F = 0$  | $I_{CCL}$  |           | 4.1  | 6.5  | mA            |
| Logic high supply current   | $V_{CC} = 5.5 \text{ V}$ , $I_F = 5 \text{ mA}$                            | $I_{CCH}$  |           | 3.4  | 4    | mA            |
|   | $V_{CC} = 15 \text{ V}$ , $I_F = 5 \text{ mA}$                             | $I_{CCH}$  |           | 3.7  | 5    | mA            |
| Logic low short circuit output<br>current<br>(output short circuit time $\leq 10 \text{ ms}$ )  | $V_O = V_{CC} = 5.5 \text{ V}$ , $I_F = 0$                                 | $I_{OSL}$  | 25        |      |      | mA            |
|   | $V_O = V_{CC} = 15 \text{ V}$ , $I_F = 0$                                  | $I_{OSL}$  | 40        |      |      | mA            |
| Logic high short circuit output<br>current<br>(output short circuit time $\leq 10 \text{ ms}$ ) | $V_{CC} = 5.5 \text{ V}$ , $V_O = 0 \text{ V}$ ,<br>$I_F = 5 \text{ mA}$   | $I_{OSH}$  |           |      | -10  | mA            |
|   | $V_{CC} = 15 \text{ V}$ , $V_O = 0 \text{ V}$ , $I_F = 5 \text{ mA}$       | $I_{OSH}$  |           |      | -25  | mA            |
| Thermal resistance  |  | $R_{thja}$ |           | 300  |      | K/W           |
| <b>COUPLER</b>  |  |            |           |      |      |               |
| Capacitance (input to output)   | $f = 1 \text{ MHz}$ , pins 1 to 4 and 5 to 8<br>shorted together           | $C_{IO}$   |           | 0.6  |      | pF            |
| Isolation resistance  | $V_{IO} = 500 \text{ V}$ , $T_{amb} = 25 \text{ }^\circ\text{C}$           |            | $10^{12}$ |      |      | $\Omega$      |
|   | $V_{IO} = 500 \text{ V}$ , $T_{amb} = 100 \text{ }^\circ\text{C}$          |            | $10^{11}$ |      |      | $\Omega$      |

**Note**

(1)  $-40 \text{ }^\circ\text{C} \leq T_{amb} \leq 85 \text{ }^\circ\text{C}$ ;  $4.5 \text{ V} \leq V_{CC} \leq 15 \text{ V}$ ;  $1.6 \text{ mA} \leq I_{Fon} \leq 5 \text{ mA}$ ;  $2 \leq V_{EH} \leq 15 \text{ V}$ ;  $0 \leq V_{EL} \leq 0.8 \text{ V}$ ;  $0 \text{ mA} \leq I_{Foff} \leq 0.1 \text{ mA}$ .

Typical values:  $T_{amb} = 25 \text{ }^\circ\text{C}$ ;  $V_{CC} = 5 \text{ V}$ ;  $I_{Fon} = 3 \text{ mA}$  unless otherwise specified.

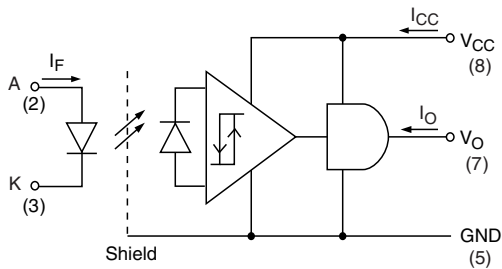
Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

| <b>SWITCHING CHARACTERISTICS (1)</b>                 |                           |           |      |      |      |      |
|--|---------------------------|-----------|------|------|------|------|
| PARAMETER  | TEST CONDITION            | SYMBOL    | MIN. | TYP. | MAX. | UNIT |
| Propagation delay time to logic<br>low output level  | Without peaking capacitor | $t_{PHL}$ |      | 120  |      | ns   |
|  | With peaking capacitor    | $t_{PHL}$ |      | 115  | 300  | ns   |
| Propagation delay time to logic<br>high output level | Without peaking capacitor | $t_{PLH}$ |      | 125  |      | ns   |
|  | With peaking capacitor    | $t_{PLH}$ |      | 90   | 300  | ns   |
| Output rise time                                     | 10 % to 90 %              | $t_r$     |      | 40   |      | ns   |
| Output fall time                                     | 90 % to 10 %              | $t_f$     |      | 10   |      | ns   |

**Note**

(1)  $0 \text{ }^\circ\text{C} \leq T_{amb} \leq 85 \text{ }^\circ\text{C}$ ;  $4.5 \text{ V} \leq V_{CC} \leq 15 \text{ V}$ ;  $1.6 \text{ mA} \leq I_{Fon} \leq 5 \text{ mA}$ ;  $0 \text{ mA} \leq I_{Foff} \leq 0.1 \text{ mA}$

Typical values:  $T_{amb} = 25 \text{ }^\circ\text{C}$ ;  $V_{CC} = 5 \text{ V}$ ;  $I_{Fon} = 3 \text{ mA}$  unless otherwise specified. A  $0.1 \mu\text{F}$  bypass capacitor connected between pins 5 and 8 must be used.



isfh6720\_00

| COMMON MODE TRANSIENT IMMUNITY (1)            |  |          |          |        |      |      |                  |
|---|--|----------|----------|--------|------|------|------------------|
| PARAMETER                                     | TEST CONDITION                                   | PART     | SYMBOL   | MIN.   | TYP. | MAX. | UNIT             |
| Logic high common mode transient immunity (2) | $ V_{CM}  = 50 \text{ V}, I_F = 1.6 \text{ mA}$  | SFH6720T | $ CM_H $ | 1000   |      |      | V/ $\mu\text{s}$ |
|   | $ V_{CM}  = 300 \text{ V}, I_F = 1.6 \text{ mA}$ | SFH6721T | $ CM_H $ | 5000   |      |      | V/ $\mu\text{s}$ |
| Logic low common mode transient immunity (2)  | $ V_{CM}  = 50 \text{ V}, I_F = 0 \text{ mA}$    | SFH6720T | $ CM_L $ | 1000   |      |      | V/ $\mu\text{s}$ |
|   | $ V_{CM}  = 1000 \text{ V}, I_F = 0 \text{ mA}$  | SFH6721T | $ CM_L $ | 10 000 |      |      | V/ $\mu\text{s}$ |

**Note**

(1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ ,  $V_{CC} = 5 \text{ V}$ . (2)

(2)  $CM_H$  is the maximum slew rate of a common mode voltage  $V_{CM}$  at which the output voltage remains at logic high level ( $V_O > 2 \text{ V}$ ).  $CM_L$  is the maximum slew rate of a common mode voltage  $V_{CM}$  at which the output voltage remains at logic low level ( $V_O < 0.8 \text{ V}$ ).

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

**Note**

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

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

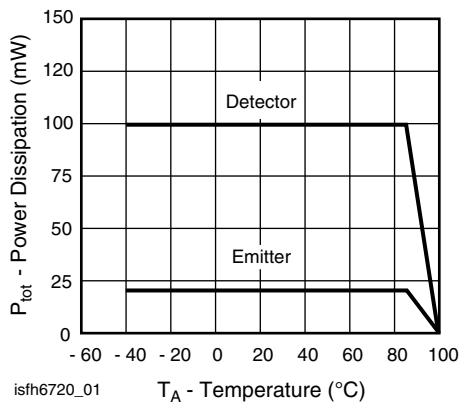


Fig. 1 - Permissible Total Power Dissipation vs. Temperature

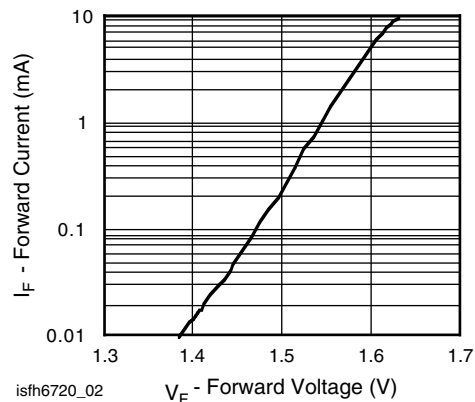


Fig. 2 - Typical Input Diode Forward Current vs. Forward Voltage

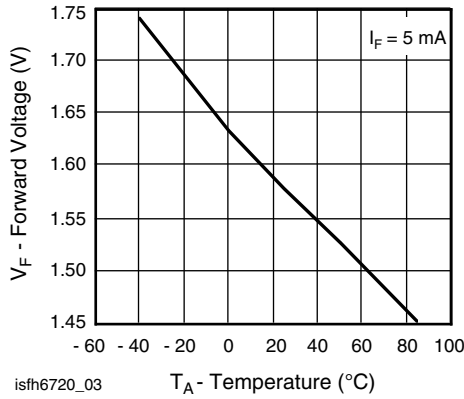


Fig. 3 - Typical Forward Input Voltage vs. Temperature

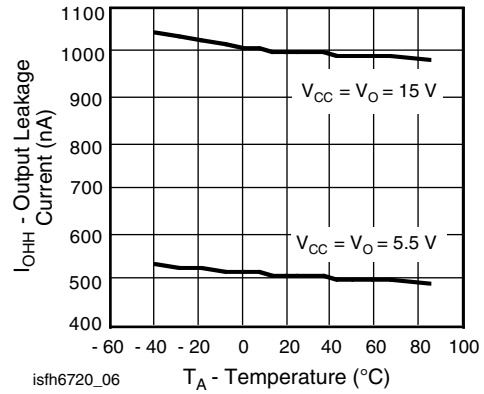


Fig. 6 - Typical Output Leakage Current vs. Temperature

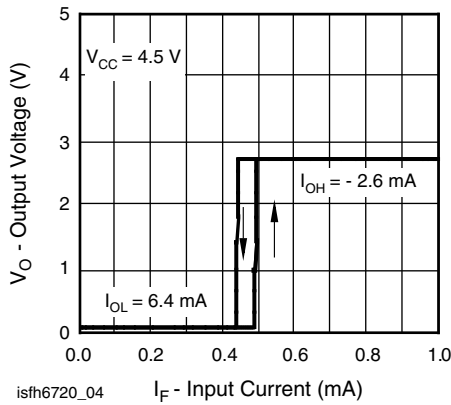


Fig. 4 - Typical Output Voltage vs. Forward Input Current

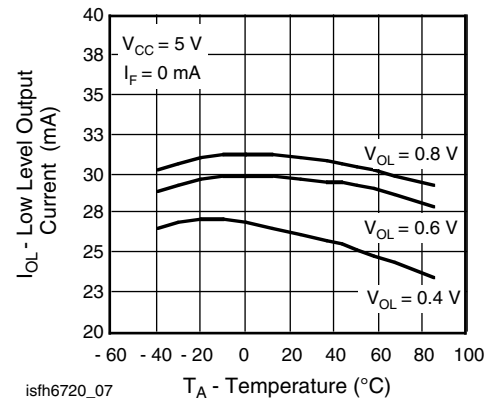


Fig. 7 - Typical Low Level Output Current vs. Temperature

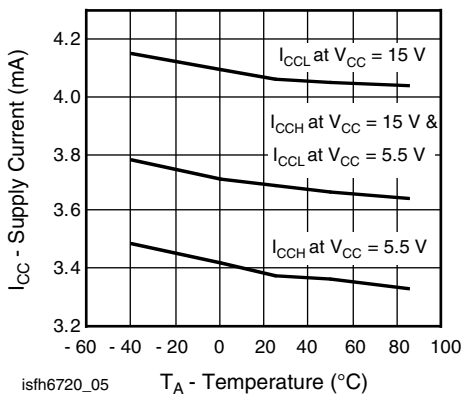


Fig. 5 - Typical Supply Current vs. Temperature

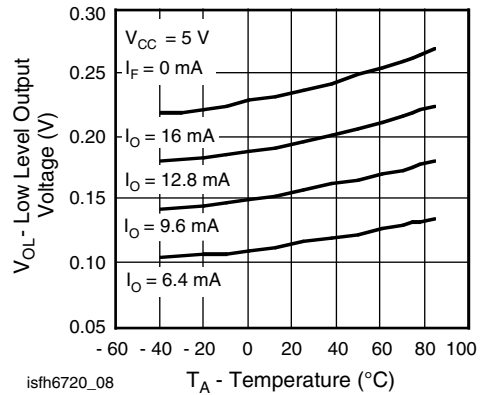


Fig. 8 - Typical Low Level Output Voltage vs. Temperature

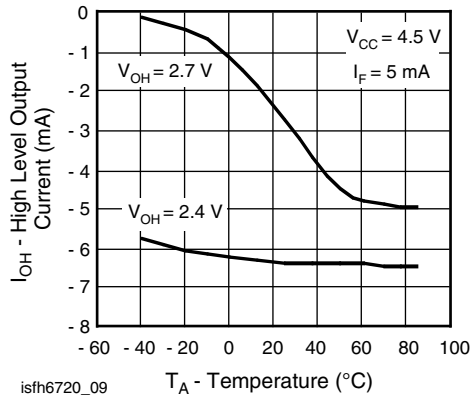


Fig. 9 - Typical High Level Output Current vs. Temperature

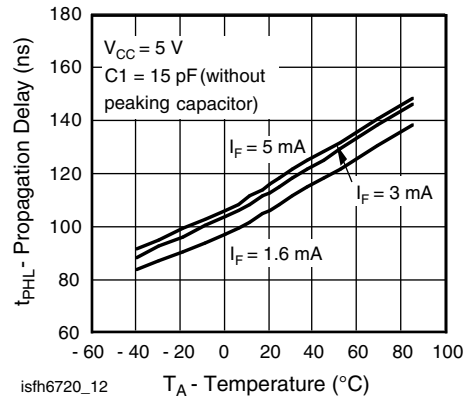


Fig. 12 - Typical Propagation Delays to Logic Low vs. Temperature

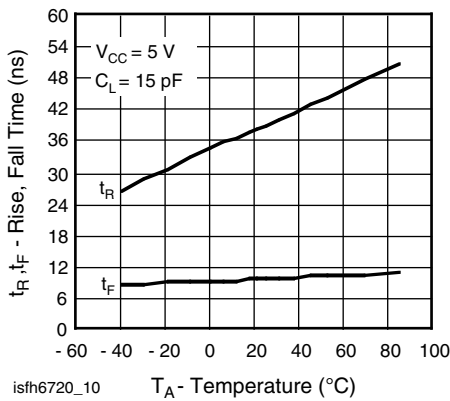


Fig. 10 - Rise and Fall Time vs. Ambient Temperature

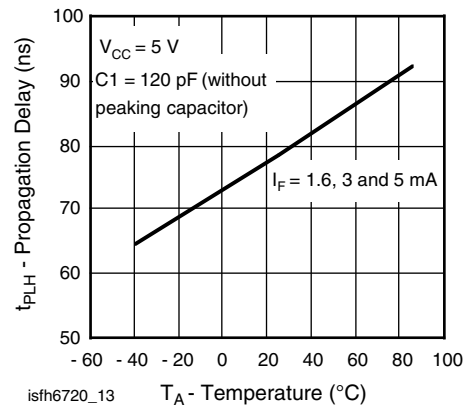


Fig. 13 - Typical Propagation Delays to Logic High vs. Temperature

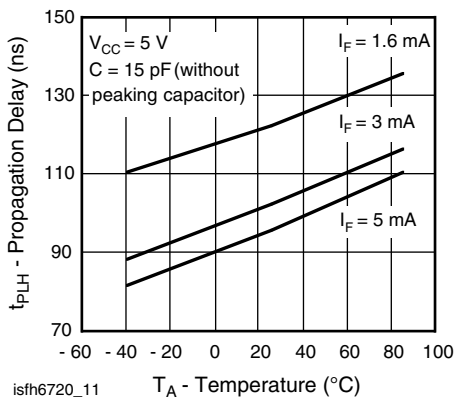


Fig. 11 - Typical Propagation Delays to Logic High vs. Temperature

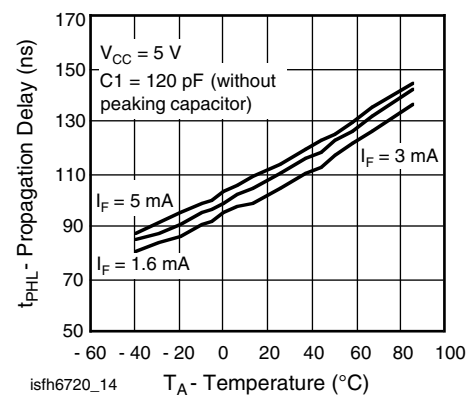


Fig. 14 - Typical Propagation Delays to Logic Low vs. Temperature

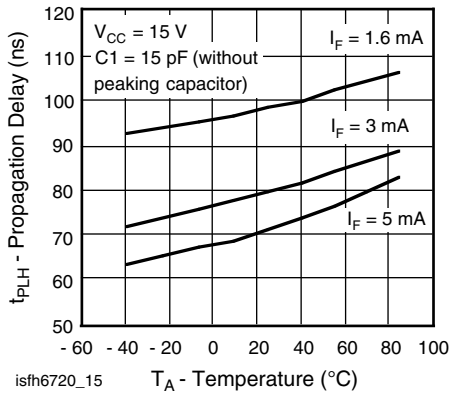


Fig. 15 - Typical Propagation Delays to Logic High vs. Temperature

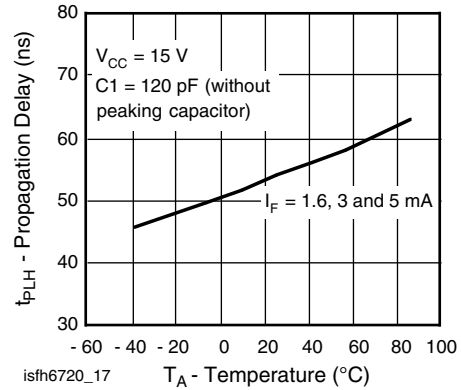


Fig. 17 - Typical Propagation Delays to Logic High vs. Temperature

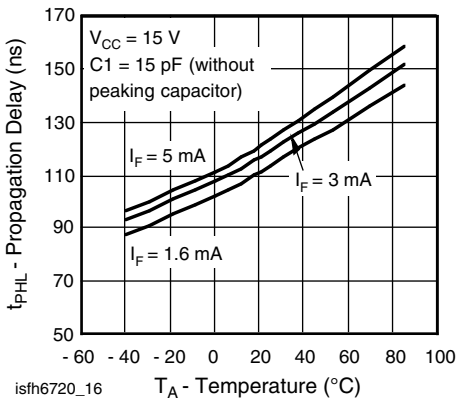


Fig. 16 - Typical Propagation Delays to Logic Low vs. Temperature

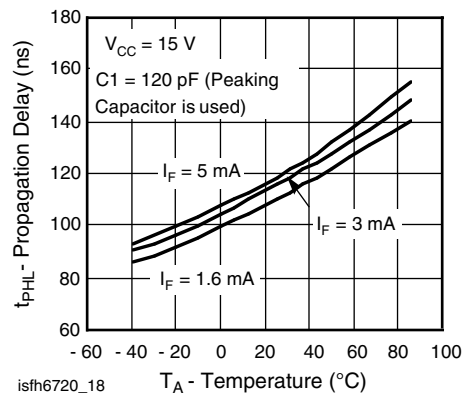


Fig. 18 - Typical Propagation Delays to Logic Low vs. Temperature

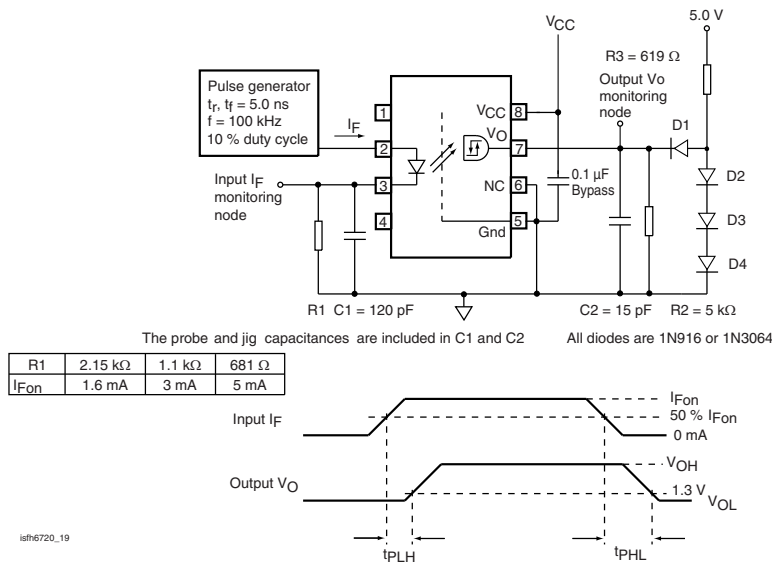


Fig. 19 - Test Circuit for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_R$  and  $t_f$

# SFH6720T, SFH6721T

Vishay Semiconductors

High Speed Optocoupler, Dual,  
5 MBd, in SOIC-8 Package

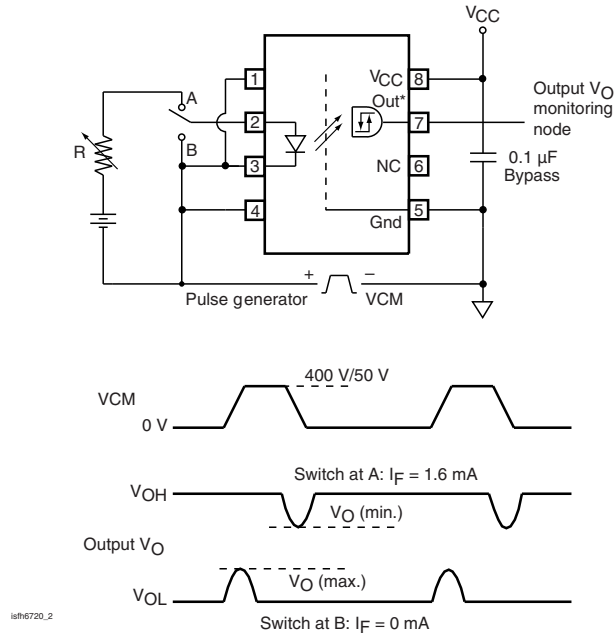
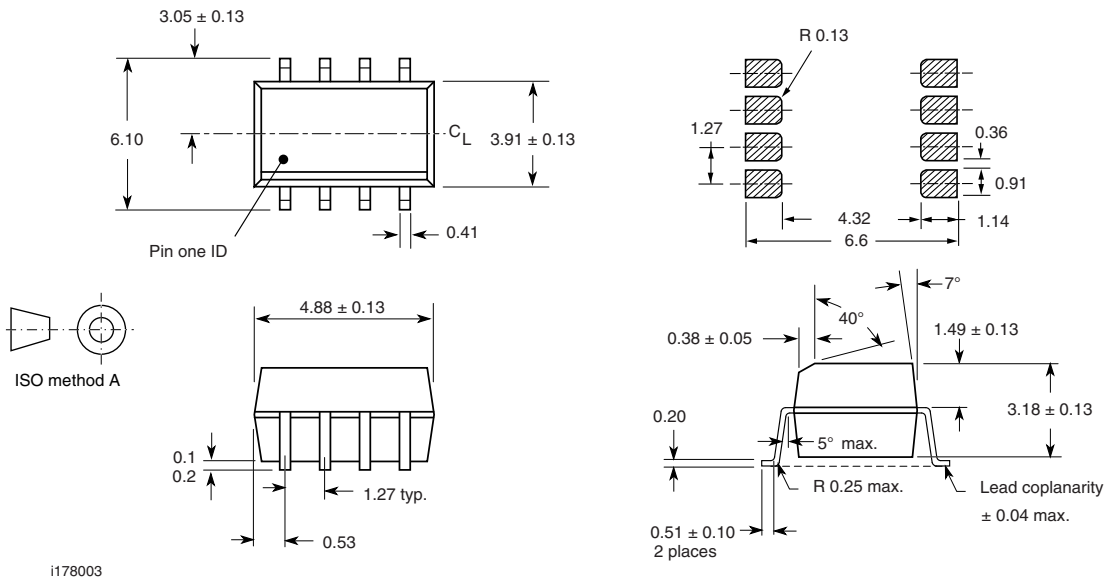


Fig. 20 - Test Circuit for Common Mode Transient Immunity and Typical Waveforms

## PACKAGE DIMENSIONS millimeters







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## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**