

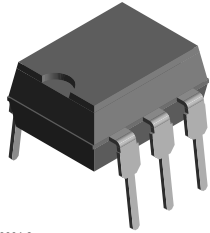


**THE DATASHEET OF**  
**SFH608-4X007**

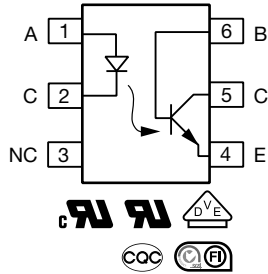




## Optocoupler, Phototransistor Output, Low Input Current, With Base Connection, 5300 V<sub>RMS</sub>



i179004-3



### FEATURES

- Very high CTR at  $I_F = 1.0 \text{ mA}$ ,  $V_{CE} = 0.5 \text{ V}$
- Specified minimum CTR at  $I_F = 0.5 \text{ mA}$
- $V_{CE} = 1.5 \text{ V} \geq 32 \%$  (typ. 120 %)
- Good CTR linearity with forward current
- Low CTR degradation
- High collector-emitter voltage,  $V_{CEO} = 55 \text{ V}$
- Isolation test voltage: 5300 V<sub>RMS</sub>
- Low current input
- Low coupling capacitance
- High common mode transient immunity
- 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



Product Page

### DESCRIPTION

The SFH608 is an optocoupler designed for high current transfer ratio at low input currents with the output transistor saturated. This makes the device ideal for low current switching applications. The SFH608 is packaged in a six pin plastic DIP.

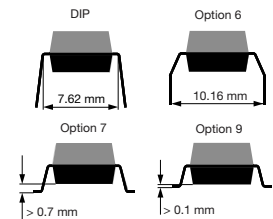
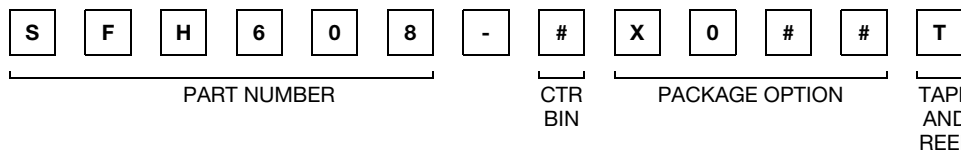
### AGENCY APPROVALS

- [UL 1577](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884\)](#), available with option 1
- [BSI](#)
- [CQC GB4943.1](#)
- [CQC GB8898](#)
- [FIMKO](#)

### APPLICATIONS

- Telecommunications
- Industrial controls
- Office machines
- Microprocessor system interfaces

### ORDERING INFORMATION



| AGENCY CERTIFIED / PACKAGE               | CTR (%)          |                             |                             |                   |
|--|------------------|-----------------------------|-----------------------------|-------------------|
| <b>UL, cUL, BSI, CQC</b>                 | <b>63 to 125</b> | <b>100 to 200</b>           | <b>160 to 320</b>           | <b>250 to 500</b> |
| DIP-6                                    | SFH608-2         | SFH608-3                    | SFH608-4                    | SFH608-5          |
| DIP-6, 400 mil, option 6                 | SFH608-2X006     | SFH608-3X006                | -                           | -                 |
| SMD-6, option 7                          | -                | SFH608-3X007 <sup>(1)</sup> | SFH608-4X007 <sup>(1)</sup> | SFH608-5X007      |
| <b>UL, cUL, BSI, CQC, VDE (option 1)</b> | <b>63 to 125</b> | <b>100 to 200</b>           | <b>160 to 320</b>           | <b>250 to 500</b> |
| DIP-6                                    | -                | SFH608-3X001                | SFH608-4X001                | -                 |
| DIP-6, 400 mil, option 6                 | -                | -                           | SFH608-4X016                | -                 |

### Notes

- Additional options may be possible, please contact sales office
- <sup>(1)</sup> Also available in tubes; do not add T to end



| ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |            |             |                    |
|---|--|------------|-------------|--------------------|
| PARAMETER   | TEST CONDITION   | SYMBOL     | VALUE       | UNIT               |
| <b>INPUT</b>  |  |            |             |                    |
| Reverse voltage   |  | $V_R$      | 6           | V                  |
| DC forward current  |  | $I_F$      | 50          | mA                 |
| Surge forward current   | $t_p \leq 10\text{ }\mu\text{s}$   | $I_{FSM}$  | 2.5         | A                  |
| Total power dissipation   |  | $P_{diss}$ | 70          | mW                 |
| <b>OUTPUT</b>   |  |            |             |                    |
| Collector emitter voltage   |  | $V_{CEO}$  | 55          | V                  |
| Collector base voltage  |  | $V_{CBO}$  | 55          | V                  |
| Emitter base voltage  |  | $V_{EBO}$  | 7           | V                  |
| Collector current   |  | $I_C$      | 50          | mA                 |
| Surge collector current   | $t_p \leq 1.0\text{ ms}$   |            | 100         | mA                 |
| Total power dissipation   |  | $P_{diss}$ | 150         | mW                 |
| <b>COUPLER</b>  |  |            |             |                    |
| Storage temperature range   |  | $T_{stg}$  | -55 to +150 | $^{\circ}\text{C}$ |
| Operating temperature range   |  | $T_{amb}$  | -55 to +100 | $^{\circ}\text{C}$ |
| Soldering temperature <sup>(1)</sup>  | Max. 10 s, dip soldering; distance to seating plane $\geq 1.5\text{ mm}$ | $T_{sld}$  | 260         | $^{\circ}\text{C}$ |

**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).

| ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |          |             |      |      |      |               |
|---|--|----------|-------------|------|------|------|---------------|
| PARAMETER   | TEST CONDITION                               | PART     | SYMBOL      | MIN. | TYP. | MAX. | UNIT          |
| <b>INPUT</b>  |  |          |             |      |      |      |               |
| Forward voltage   | $I_F = 5\text{ mA}$                          |          | $V_F$       | -    | 1.1  | 1.5  | V             |
| Reverse voltage   | $I_R = 10\text{ }\mu\text{A}$                |          | $V_R$       | 6    | -    | -    | V             |
| Reverse current   | $V_R = 6\text{ V}$                           |          | $I_R$       | -    | 0.01 | 10   | $\mu\text{A}$ |
| Capacitance   | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$      |          | $C_O$       | -    | 25   | -    | pF            |
| Thermal resistance  |  |          | $R_{thja}$  | -    | 1070 | -    | K/W           |
| <b>OUTPUT</b>   |  |          |             |      |      |      |               |
| Collector emitter voltage   | $I_{CE} = 10\text{ }\mu\text{A}$             |          | $V_{CEO}$   | 55   | -    | -    | V             |
| Emitter base voltage  | $I_{EB} = 10\text{ }\mu\text{A}$             |          | $V_{EBO}$   | 7    | -    | -    | V             |
| Collector emitter capacitance   | $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$   |          | $C_{CE}$    | -    | 10   | -    | pF            |
| Collector base capacitance  | $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$   |          | $C_{CB}$    | -    | 16   | -    | pF            |
| Emitter base capacitance  | $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$   |          | $C_{EB}$    | -    | 10   | -    | pF            |
| Thermal resistance  |  |          | $R_{thja}$  | -    | 500  | -    | K/W           |
| Collector emitter leakage current   | $V_{CE} = 10\text{ V}$                       |          | $I_{CEO}$   | -    | 10   | 200  | nA            |
| <b>COUPLER</b>  |  |          |             |      |      |      |               |
| Coupling capacitance  |  |          | $C_C$       | -    | 0.6  | -    | pF            |
| Saturation voltage, collector emitter   | $I_C = 0.32\text{ mA}$ , $I_F = 1\text{ mA}$ | SFH608-2 | $V_{CEsat}$ | -    | 0.25 | 0.4  | V             |
|   | $I_C = 0.5\text{ mA}$ , $I_F = 1\text{ mA}$  | SFH608-3 | $V_{CEsat}$ | -    | 0.25 | 0.4  | V             |
|   | $I_C = 0.8\text{ mA}$ , $I_F = 1\text{ mA}$  | SFH608-4 | $V_{CEsat}$ | -    | 0.25 | 0.4  | V             |
|   | $I_C = 1.25\text{ mA}$ , $I_F = 1\text{ mA}$ | SFH608-5 | $V_{CEsat}$ | -    | 0.25 | 0.4  | 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.



| CURRENT TRANSFER RATIO  |  |          |        |      |      |      |      |
|-------------------------|--|----------|--------|------|------|------|------|
| PARAMETER               | TEST CONDITION                                 | PART     | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Coupling transfer ratio | $I_F = 1 \text{ mA}, V_{CC} = 0.5 \text{ V}$   | SFH608-2 | CTR    | 63   | -    | 125  | %    |
|                         | $I_F = 0.5 \text{ mA}, V_{CC} = 1.5 \text{ V}$ | SFH608-2 | CTR    | 32   | 75   | -    | %    |
|                         | $I_F = 1 \text{ mA}, V_{CC} = 0.5 \text{ V}$   | SFH608-3 | CTR    | 100  | -    | 200  | %    |
|                         | $I_F = 0.5 \text{ mA}, V_{CC} = 1.5 \text{ V}$ | SFH608-3 | CTR    | 50   | 120  | -    | %    |
|                         | $I_F = 1 \text{ mA}, V_{CC} = 0.5 \text{ V}$   | SFH608-4 | CTR    | 160  | -    | 320  | %    |
|                         | $I_F = 0.5 \text{ mA}, V_{CC} = 1.5 \text{ V}$ | SFH608-4 | CTR    | 80   | 200  | -    | %    |
|                         | $I_F = 1 \text{ mA}, V_{CC} = 0.5 \text{ V}$   | SFH608-5 | CTR    | 250  | -    | 500  | %    |
|                         | $I_F = 0.5 \text{ mA}, V_{CC} = 1.5 \text{ V}$ | SFH608-5 | CTR    | 125  | 300  | -    | %    |

| SWITCHING CHARACTERISTICS |   |           |      |      |      |               |  |
|---------------------------|---|-----------|------|------|------|---------------|--|
| PARAMETER                 | TEST CONDITION  | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |  |
| Turn-on time              | $I_C = 2 \text{ mA}$ (to adjust by $I_F$ ),<br>$R_L = 100 \Omega, V_{CC} = 5 \text{ V}$ | $t_{on}$  | -    | 8    | -    | $\mu\text{s}$ |  |
| Rise time                 | $I_C = 2 \text{ mA}$ (to adjust by $I_F$ ),<br>$R_L = 100 \Omega, V_{CC} = 5 \text{ V}$ | $t_r$     | -    | 5    | -    | $\mu\text{s}$ |  |
| Turn-off time             | $I_C = 2 \text{ mA}$ (to adjust by $I_F$ ),<br>$R_L = 100 \Omega, V_{CC} = 5 \text{ V}$ | $t_{off}$ | -    | 7.5  | -    | $\mu\text{s}$ |  |
| Fall time                 | $I_C = 2 \text{ mA}$ (to adjust by $I_F$ ),<br>$R_L = 100 \Omega, V_{CC} = 5 \text{ V}$ | $t_f$     | -    | 7    | -    | $\mu\text{s}$ |  |

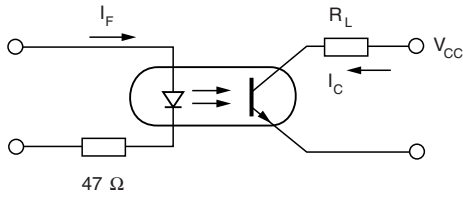
| SAFETY AND INSULATION RATINGS                |  |            |                |                  |
|--|--|------------|----------------|------------------|
| PARAMETER                                    | TEST CONDITION   | SYMBOL     | VALUE          | UNIT             |
| Climatic classification                      | According to IEC 68 part 1                                     |            | 55 / 100 / 21  |                  |
| Comparative tracking index                   |  | CTI        | 175            |                  |
| Maximum rated withstanding isolation voltage | $t = 1 \text{ min}$  | $V_{ISO}$  | 4420           | $V_{RMS}$        |
| Maximum transient isolation voltage          |  | $V_{IOTM}$ | 8000           | V                |
| Maximum repetitive peak isolation voltage    |  | $V_{IORM}$ | 890            | V                |
| Isolation resistance                         | $V_{IO} = 500 \text{ V}, T_{amb} = 25 \text{ }^\circ\text{C}$  | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$         |
|  | $V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ }^\circ\text{C}$ | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$         |
| Output safety power                          |  | $P_{SO}$   | 700            | mW               |
| Input safety current                         |  | $I_{SI}$   | 400            | mA               |
| Input safety temperature                     |  | $T_{SI}$   | 175            | $^\circ\text{C}$ |
| Creepage distance                            | Standard DIP-4   |            | $\geq 7$       | mm               |
| Clearance distance                           | Standard DIP-4   |            | $\geq 7$       | mm               |
| Creepage distance                            | 400 mil DIP-4  |            | $\geq 8$       | mm               |
| Clearance distance                           | 400 mil DIP-4  |            | $\geq 8$       | mm               |
| Insulation thickness                         |  | DTI        | $\geq 0.4$     | mm               |

**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.

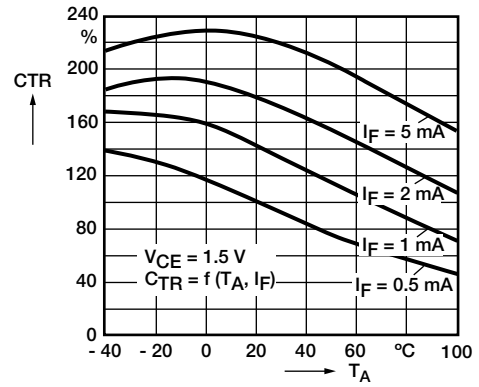


**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)



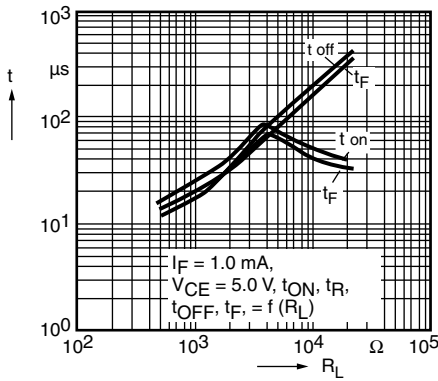
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Fig. 1 - Switching Schematic



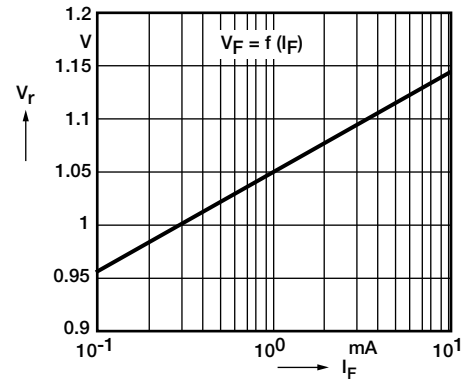
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Fig. 4 - Current Transfer Ratio (typ.)



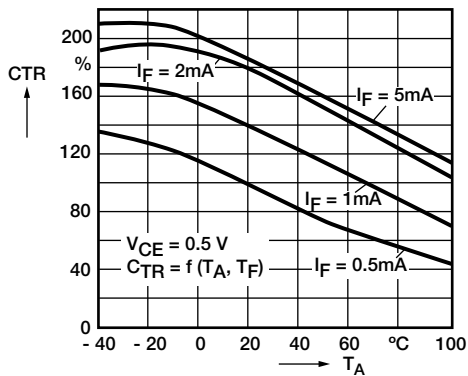
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Fig. 2 - Switching Times



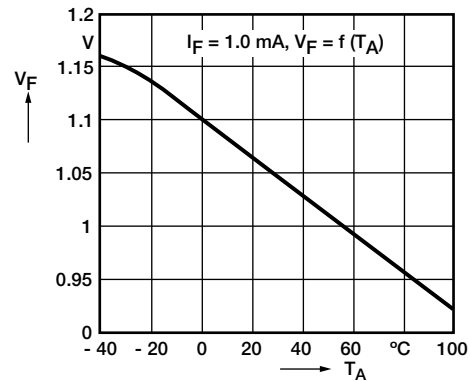
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Fig. 5 - Diode Forward Voltage (typ.)



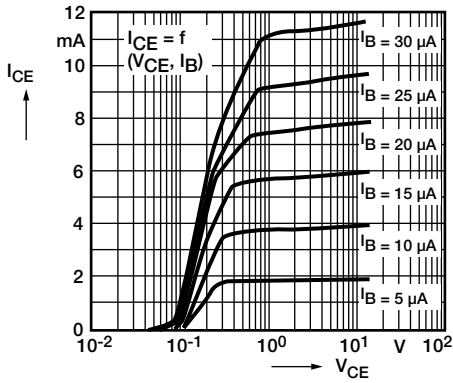
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Fig. 3 - Current Transfer Ratio (typ.)



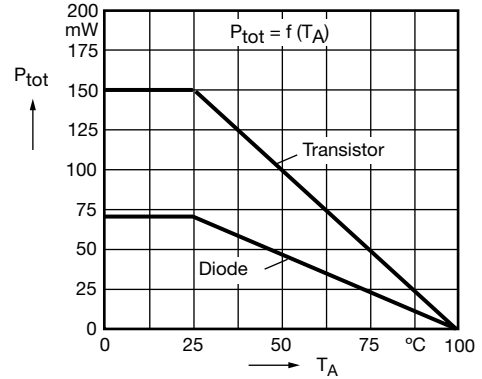
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Fig. 6 - Diode Forward Voltage (typ.)



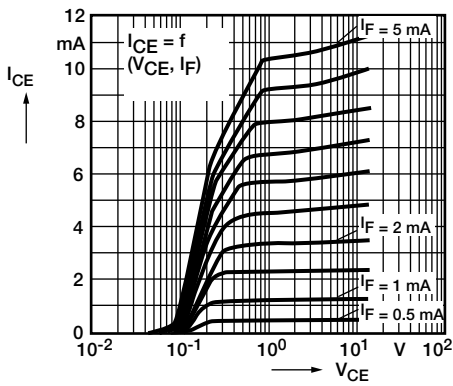
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Fig. 7 - Output Characteristics



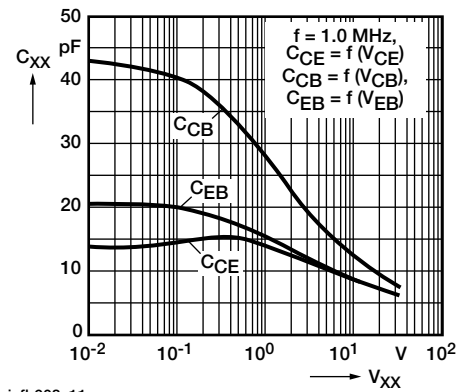
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Fig. 10 - Permissible Power Dissipation for Transistor and Diode



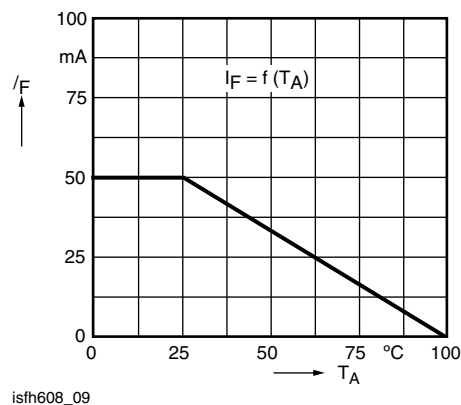
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Fig. 8 - Output Characteristics



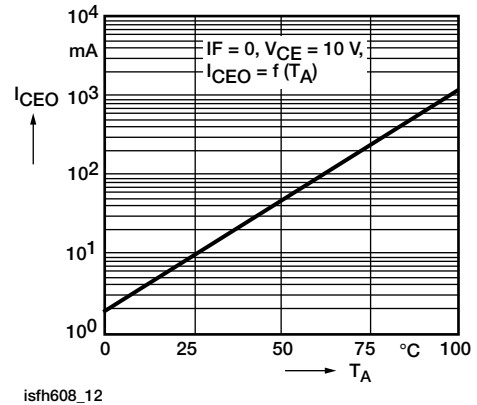
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Fig. 11 - Transistor Capacitance



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Fig. 9 - Permissible Forward Current Diode



isfh608\_12

Fig. 12 - Collector Emitter Leakage Current vs. Temperature







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