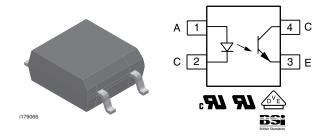


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Optocoupler Phototransistor Output, SOP-4, Mini-Flat Package, 110 °C Rated



FEATURES

- Operating temperature from 55 °C to + 110 °C
- SOP (small outline package)
- Isolation test voltage, 3750 V_{RMS} (1 s)
- Low saturation voltage
- · Fast switching times
- Low coupling capacitance
- End-stackable, 0.100" (2.54 mm) spacing
- Material categorization: for definitions of compliance please see <u>www.vishav.com/doc?99912</u>

ROHS* Available HALOGEN FREE GREEN (5-2008)

DESCRIPTION

The 110 °C rated SFH1690AT, SFH1690BT, SFH1690CT, and SFH1690ABT family has a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a 4 pin 100 mil lead pitch miniflat package. It features a high current transfer ratio, low coupling capacitance, and high isolation voltage.

The coupling devices are designed for signal transmission between two electrically separated circuits. The SFH1690 series is available only on tape and reel. There are 2000 parts per reel.

APPLICATIONS

- PLCs
- Telecommunication

AGENCY APPROVALS

- UL1577, file no. E52744 system code U
- cUL file no. E52744, cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 (pending) available with option 1
- BSI tested to IEC 60065 and IEC 60950-2001

| ORDERING INFORMATION | | | | | | | | |
|---|------------|-----------|----------------|------------|--|--|--|--|
| S F H 1 6 9 0 # # T - X 0 0 1 PART NUMBER TAPE AND REEL VDE OPTION 7.21 mm | | | | | | | | |
| AGENCY CERTIFIED/PACKAGE | | CTR (%) | | | | | | |
| UL, cUL, BSI | 50 to 300 | 50 to 150 | 100 to 300 | 100 to 200 | | | | |
| SOP-4, Mini flat | SFH1690ABT | SFH1690AT | SFH1690BT | SFH1690CT | | | | |
| VDE, UL, cUL, BSI | 50 to 300 | 50 to 150 | 100 to 300 | 100 to 200 | | | | |
| SOP-4, Mini flat | - | - | SFH1690BT-X001 | - | | | | |

Note

• For additional information on the available options refer to option information.

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| ABSOLUTE MAXIMUM RATINGS (T _{amb} = 25 °C, unless otherwise specified) | | | | | | | | |
|--|--|-------------------|---------------|-----------|--|--|--|--|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT | | | | |
| INPUT | | | | | | | | |
| DC forward current | | I _F | 50 | mA | | | | |
| Reverse voltage | | V _R | 6 | V | | | | |
| Surge forward current | t _p ≤ 10 μs | I _{FSM} | 2.5 | Α | | | | |
| Power dissipation | | P _{diss} | 80 | mW | | | | |
| Derate linearly from 25 °C | | | 0.7 | mW/°C | | | | |
| OUTPUT | | | | | | | | |
| Collector emitter voltage | | V _{CEO} | 70 | V | | | | |
| Emitter collector voltage | | V _{ECO} | 7 | V | | | | |
| Collector current | | I _C | 50 | mA | | | | |
| Collector current | t _p ≤ 1 ms | I _C | 100 | mW | | | | |
| Power dissipation | | P _{diss} | 150 | mW | | | | |
| Derate linearly from 25 °C | | | 1.5 | mW/°C | | | | |
| COUPLER | | | | | | | | |
| Isolation test voltage between emitter and detector | t = 1 s | V _{ISO} | 3750 | V_{RMS} | | | | |
| Operating temperature range | | T _{amb} | - 55 to + 110 | °C | | | | |
| Storage temperature range | | T _{stg} | - 55 to + 150 | °C | | | | |
| Soldering temperature | max. 10 s dip soldering distance to seating plane ≥ 1.5 mm | T _{sld} | 260 | °C | | | | |

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.

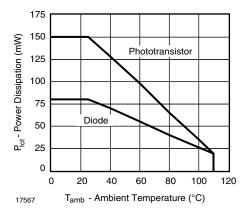


Fig. 1 - Permissible Power Dissipation vs. Temperature

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| ELECTRICAL CHARACTERISTICS (T _{amb} = 25 °C, unless otherwise specified) | | | | | | | | |
|--|---|------|--------------------|------|------|------|------|--|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT | |
| INPUT | | | | | | | | |
| Forward voltage | $I_F = 5 \text{ mA}$ | | V_{F} | | 1.15 | 1.4 | V | |
| Reverse current | V _R = 6 V | | I _R | | 0.01 | 10 | μΑ | |
| Capacitance | $V_R = 0 V$, $f = 1 MHz$ | | Co | | 14 | | pF | |
| OUTPUT | | | | | | | | |
| Collector emitter leakage current | V _{CE} = 20 V | | I _{CEO} | | | 100 | nA | |
| Collector emitter breakdown voltage | I _C = 100 μA | | BV _{CEO} | 70 | | | V | |
| Emitter collector breakdown voltage | I _E = - 10 μA | | BV _{ECO} | 7 | | | V | |
| Collector emitter saturation voltage | I _F = 10 mA, I _C = 2.5 mA | | V _{CEsat} | | 0.25 | 0.4 | V | |
| Collector emitter capacitance | V _{CE} = 5 V, f = 1 MHz | | C _{CE} | | 2.8 | | pF | |
| COUPLER | | | | | | | | |
| Coupling capacitance | f = 1 MHz | | C _C | | 0.3 | | pF | |
| Capacitance (input to output) | | | C _{IO} | | 0.5 | | pF | |

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 (T _{amb} = 25 °C, unless otherwise specified) | | | | | | | | | |
|---|--|------------|-----|---------|-----|-----|---|--|--|
| PARAMETER | TER TEST CONDITION PART SYMBOL MIN. TYP. MAX. UN | | | | | | | | |
| | L 5 A V 5 V | SFH1690ABT | CTR | 50 | | 300 | % | | |
| | | SFH1690AT | CTR | 50 | | 150 | % | | |
| I _C /I _F | $I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$ | SFH1690BT | CTR | 100 300 | 300 | % | | | |
| | | SFH1690CT | CTR | 100 | | 200 | % | | |

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.

| SWITCHING CHARACTERISTICS (T _{amb} = 25 °C, unless otherwise specified) | | | | | | | |
|---|--|------------------|------|------|------|------|--|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT | |
| Rise time | $V_{CC} = 5 \text{ V}, I_{C} = 2 \text{ mA}, R_{L} = 100 \Omega$ | t _r | | 3 | | μs | |
| Fall time | $V_{CC} = 5 \text{ V}, I_{C} = 2 \text{ mA}, R_{L} = 100 \Omega$ | t _f | | 4 | | μs | |
| Turn-on time | $V_{CC} = 5 \text{ V}, I_{C} = 2 \text{ mA}, R_{L} = 100 \Omega$ | t _{on} | | 5 | | μs | |
| Turn-off time | $V_{CC} = 5 \text{ V}, I_{C} = 2 \text{ mA}, R_{L} = 100 \Omega$ | t _{off} | | 3 | | μs | |

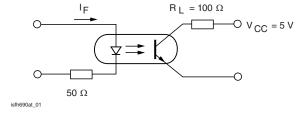


Fig. 2 - Switching Operation (without Saturation)

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| SAFETY AND INSULATION RATINGS | | | | | | | |
|---|--|-------------------|-------|-----------|--------------------|------|--|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT | |
| Climatic classification (according to IEC 68 part 1) | | | | 55/110/21 | | | |
| Pollution degree (DIN VDE 0109) | | | | 2 | | mm | |
| Comparative tracking index per DIN IEC112/ VDE 0303 part 1, group Illa per DIN VDE 6110 175 399 | | | 175 | | 399 | | |
| V _{IOTM} | | V _{IOTM} | 6000 | | | V | |
| V _{IORM} | | V _{IORM} | 707 | | | V | |
| To dell'e e contide e e | V _{IO} = 500 V, T _{amb} = 25 °C | R _{IO} | | | ≥ 10 ¹² | Ω | |
| Isolation resistance | V _{IO} = 500 V, T _{amb} = 100 °C | R _{IO} | | | ≥ 10 ¹¹ | Ω | |
| P _{SO} | | | | | 350 | mW | |
| I _{SI} | | | | | 150 | mA | |
| T _{SI} | | | | | 165 | °C | |
| Creepage distance | | | 5 | | | mm | |
| Clearance distance | | | 5 | | | mm | |
| Insulation thickness between emitter and detector | | | ≥ 0.4 | | | mm | |

Note

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

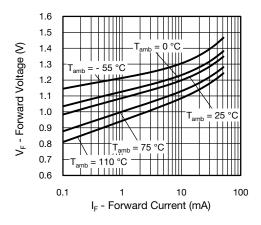


Fig. 3 - Forward Voltage vs. Forward Current

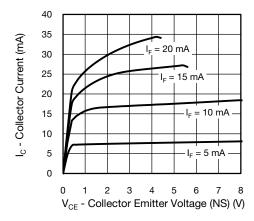


Fig. 4 - Collector Current vs. Collector Emitter Voltage (NS)

[•] 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.

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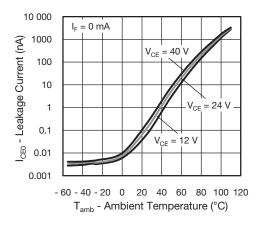


Fig. 5 - Leakage Current vs. Ambient Temperature

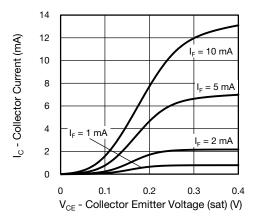


Fig. 6 - Collector Current vs. Collector Emitter Voltage (sat)

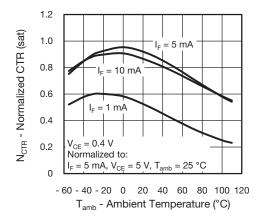


Fig. 7 - Normalized Current Transfer Ratio (sat) vs.
Ambient Temperature

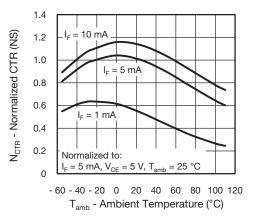


Fig. 8 - Normalized Current Transfer Ratio (NS) vs. Ambient Temperature

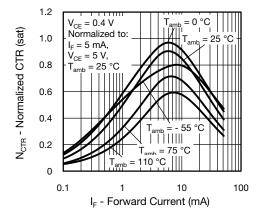


Fig. 9 - Normalized CTR (sat) vs. Forward Current

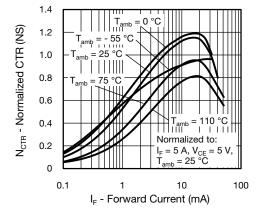


Fig. 10 - Normalized CTR (NS) vs. Forward Current

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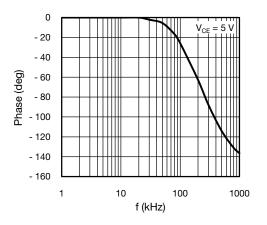


Fig. 11 - F_{CTR} vs. Phase Angle

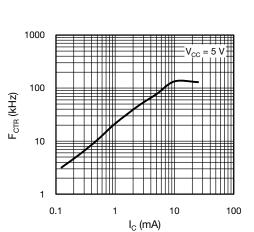


Fig. 12 - F_{CTR} vs. Collector Current

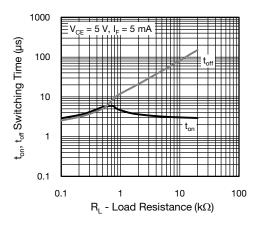


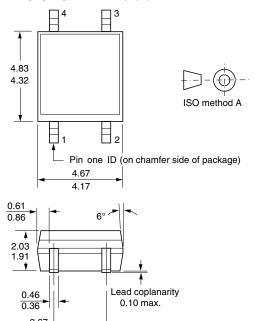
Fig. 13 - Switching Time vs. Load Resistance

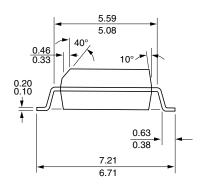


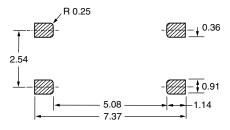
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PACKAGE DIMENSIONS in millimeters

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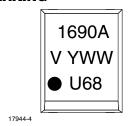






i178037

PACKAGE MARKING



(example for SFH1690AT)

1690B V YWW •U68X1

(example for SFH1690BT-X001)

Notes

- The marking of the SFH1690ABT will either show 1690A or 1690B on the first line.
- Tape and reel suffix (T) is not part of the package marking.



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