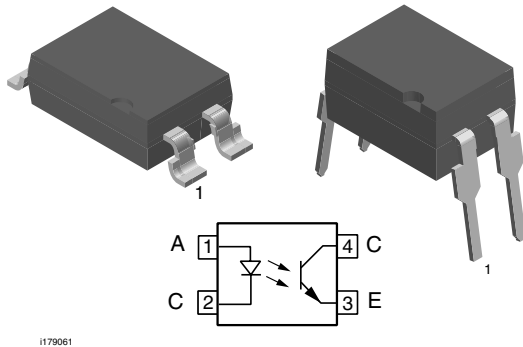


Optocoupler, Phototransistor Output, Low Input Current



1179061

DESCRIPTION

The SFH618A (DIP) and SFH6186 (SMD) feature a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared diode emitter, which is optically coupled to silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 or SMD package.

The coupling devices are designed for signal transmission between two electrically separated circuits. The couplers are end-stackable with 2.54 mm lead spacing. Creepage and clearance distances of > 8.0 mm achieved with option 6. This version complies with IEC 60950 (DIN VDE 0805) for reinforced insulation to an operation voltage of 400 V_{RMS} or DC.

FEATURES

- Good CTR linearity depending on forward current
- Low CTR degradation
- High collector emitter voltage, V_{CEO} = 55 V
- Isolation test voltage, 5300 V_{RMS}
- Low coupling capacitance
- End stackable, 0.100" (2.54 mm) spacing
- High common mode transient immunity
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


RoHS
COMPLIANT

APPLICATIONS

- Telecom
- Industrial controls
- Battery powered equipment
- Office machines

AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- CSA 93751
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending available with option 1
- BSI IEC 60950; IEC 60065
- FIMKO

ORDER INFORMATION

| PART | REMARKS |
|---------------|--|
| SFH618A-2 | CTR 63 to 125 %, DIP-4 |
| SFH618A-3 | CTR 100 to 200 %, DIP-4 |
| SFH618A-4 | CTR 160 to 320 %, DIP-4 |
| SFH618A-5 | CTR 250 to 500 %, DIP-4 |
| SFH6186-2 | CTR 63 to 125 %, SMD-4 |
| SFH6186-3 | CTR 100 to 200 %, SMD-4 |
| SFH6186-4 | CTR 160 to 320 %, SMD-4 |
| SFH6186-5 | CTR 250 to 500 %, SMD-4 |
| SFH618A-3X006 | CTR 100 to 200 %, DIP-4 400 mil (option 6) |
| SFH618A-3X007 | CTR 100 to 200 %, SMD-4 (option 7) |
| SFH618A-4X006 | CTR 160 to 320 %, DIP-4 400 mil (option 6) |
| SFH618A-5X006 | CTR 250 to 500 %, DIP-4 400 mil (option 6) |
| SFH618A-5X007 | CTR 250 to 500 %, SMD-4 (option 7) |

Note

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

| ABSOLUTE MAXIMUM RATINGS ⁽¹⁾ | | | | |
|--|--|------------|----------------|-----------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| INPUT | | | | |
| Reverse voltage | | V_R | 6.0 | V |
| Power dissipation | | P_{diss} | | mW |
| Forward current | | I_F | 60 | mA |
| OUTPUT | | | | |
| Collector emitter voltage | | V_{CE} | 55 | V |
| Emitter collector voltage | | V_{EC} | 7.0 | V |
| Collector current | | I_C | 50 | mA |
| | $t_p \leq 1.0$ ms | I_C | 100 | mA |
| Power dissipation | | P_{diss} | 150 | mW |
| COUPLER | | | | |
| Isolation test voltage between emitter and detector, refer to Climate DIN 40046, part 2, Nov. 74 | | V_{ISO} | 5300 | V_{RMS} |
| Isolation resistance | $V_{IO} = 500$ V, $T_{amb} = 25$ °C | R_{IO} | $\geq 10^{12}$ | Ω |
| | $V_{IO} = 500$ V, $T_{amb} = 100$ °C | R_{IO} | $\geq 10^{11}$ | Ω |
| Storage temperature range | | T_{stg} | - 55 to + 150 | °C |
| Ambient temperature range | | T_{amb} | - 55 to + 100 | °C |
| Junction temperature | | T_j | 100 | °C |
| Soldering temperature ⁽²⁾ | max. 10 s, dip soldering distance to seating plane ≥ 1.5 mm | T_{sld} | 260 | °C |

Notes

⁽¹⁾ $T_{amb} = 25$ °C, unless otherwise specified.

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

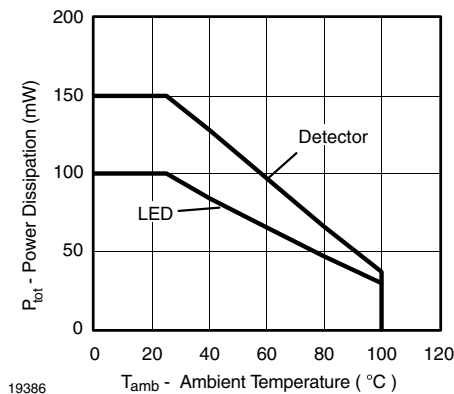


Fig. 1 - Permissible Power Dissipation vs. Ambient Temperature

| ELECTRICAL CHARACTERISTICS | | | | | | | |
|----------------------------|----------------------------|------|------------|------|------|------|---------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| INPUT | | | | | | | |
| Forward voltage | $I_F = 5.0$ mA | | V_F | | 1.1 | 1.5 | V |
| Reverse current | $V_R = 6.0$ V | | I_R | | 0.01 | 10 | μ A |
| Capacitance | $V_R = 0$ V, $f = 1.0$ MHz | | C_O | | 25 | | pF |
| Thermal resistance | | | R_{thja} | | 1070 | | K/W |



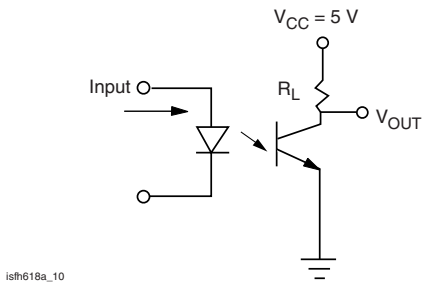
| ELECTRICAL CHARACTERISTICS | | | | | | | |
|---|---|-------------|-------------|------|------|------|------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| OUTPUT | | | | | | | |
| Collector emitter leakage current | $V_{CE} = 10\text{ V}$ | | I_{CEO} | | 10 | 200 | nA |
| Collector emitter capacitance | $V_{CE} = 5.0\text{ V}, f = 1.0\text{ MHz}$ | | C_{CE} | | 7.0 | | pF |
| Thermal resistance | | | R_{thja} | | 500 | | K/W |
| COUPLER | | | | | | | |
| Collector emitter saturation voltage | $I_C = 0.32\text{ mA}, I_F = 1.0\text{ mA}$ | SFH618A-2 | V_{CEsat} | | 0.25 | 0.4 | V |
| | | SFH6186-2 | V_{CEsat} | | 0.25 | 0.4 | V |
| | $I_C = 0.5\text{ mA}, I_F = 1.0\text{ mA}$ | SFH618A-3 | V_{CEsat} | | 0.25 | 0.4 | V |
| | | SFH6186-3 | V_{CEsat} | | 0.25 | 0.4 | V |
| | $I_C = 0.8\text{ mA}, I_F = 1.0\text{ mA}$ | SFH618A-4 | V_{CEsat} | | 0.25 | 0.4 | V |
| | | SFH6186-4 | V_{CEsat} | | 0.25 | 0.4 | V |
| $I_C = 1.25\text{ mA}, I_F = 1.0\text{ mA}$ | SFH618A-5 | V_{CEsat} | | 0.25 | 0.4 | V | |
| | SFH6186-5 | V_{CEsat} | | 0.25 | 0.4 | V | |
| Coupling capacitance | | | C_C | | 0.25 | | pF |

Note $T_{amb} = 25\text{ }^\circ\text{C}$, 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.

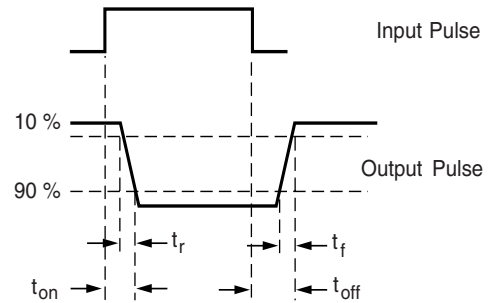
| CURRENT TRANSFER RATIO | | | | | | | |
|-------------------------------|--|-----------|--------|------|------|------|------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| I_C/I_F | $I_F = 1.0\text{ mA}, V_{CE} = 0.5\text{ V}$ | SFH618A-2 | CTR | 63 | | 125 | % |
| | | SFH6186-2 | CTR | 63 | | 125 | % |
| | $I_F = 0.5\text{ mA}, V_{CE} = 1.5\text{ V}$ | SFH618A-2 | CTR | 32 | 75 | | % |
| | | SFH6186-2 | CTR | 32 | 75 | | % |
| | $I_F = 1.0\text{ mA}, V_{CE} = 0.5\text{ V}$ | SFH618A-3 | CTR | 100 | | 200 | % |
| | | SFH6186-3 | CTR | 100 | | 200 | % |
| | $I_F = 0.5\text{ mA}, V_{CE} = 1.5\text{ V}$ | SFH618A-3 | CTR | 50 | 120 | | % |
| | | SFH6186-3 | CTR | 50 | 120 | | % |
| | $I_F = 1.0\text{ mA}, V_{CE} = 0.5\text{ V}$ | SFH618A-4 | CTR | 160 | | 320 | % |
| | | SFH6186-4 | CTR | 160 | | 320 | % |
| | $I_F = 0.5\text{ mA}, V_{CE} = 1.5\text{ V}$ | SFH618A-4 | CTR | 80 | 200 | | % |
| | | SFH6186-4 | CTR | 80 | 200 | | % |
| | $I_F = 1.0\text{ mA}, V_{CE} = 0.5\text{ V}$ | SFH618A-5 | CTR | 250 | | 500 | % |
| | | SFH6186-5 | CTR | 250 | | 500 | % |
| | $I_F = 0.5\text{ mA}, V_{CE} = 1.5\text{ V}$ | SFH618A-5 | CTR | 125 | 300 | | % |
| | | SFH6186-5 | CTR | 125 | 300 | | % |

| SWITCHING CHARACTERISTICS | | | | | | | |
|----------------------------------|---|-----------|------|------|------|---------------|--|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT | |
| Turn on time | $V_{CC} = 5.0\text{ V}, I_C = 2.0\text{ mA}, R_L = 100\ \Omega$ | t_{on} | | 6.0 | | μs | |
| Rise time | $V_{CC} = 5.0\text{ V}, I_C = 2.0\text{ mA}, R_L = 100\ \Omega$ | t_r | | 3.5 | | μs | |
| Turn off time | $V_{CC} = 5.0\text{ V}, I_C = 2.0\text{ mA}, R_L = 100\ \Omega$ | t_{off} | | 5.5 | | μs | |
| Fall time | $V_{CC} = 5.0\text{ V}, I_C = 2.0\text{ mA}, R_L = 100\ \Omega$ | t_f | | 5.0 | | μs | |



isth618a_10

Fig. 2 - Test Circuit



isth618a_12

Fig. 3 - Test Circuit and Waveforms

| 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} | | | 10000 | | | V |
| V_{IORM} | | | 890 | | | V |
| P_{SO} | | | | | 400 | mW |
| I_{SI} | | | | | 275 | mA |
| T_{SI} | | | | | 175 | °C |
| Creepage distance | standard DIP-4 | | 7 | | | mm |
| Clearance distance | standard DIP-4 | | 7 | | | mm |
| Creepage distance | 400 mil DIP-4 | | 8 | | | mm |
| Clearance distance | 400 mil DIP-4 | | 8 | | | mm |
| Insulation thickness, reinforced rated | per IEC 60950 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 °C, unless otherwise specified

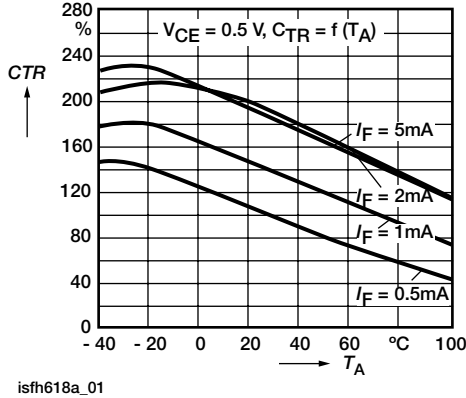


Fig. 4 - Current Transfer Ratio (Typ.)

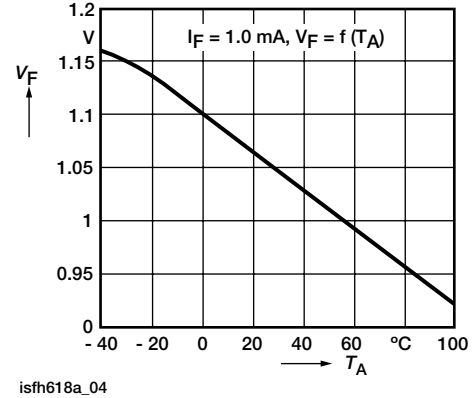


Fig. 7 - Diode Forward Voltage (Typ.)

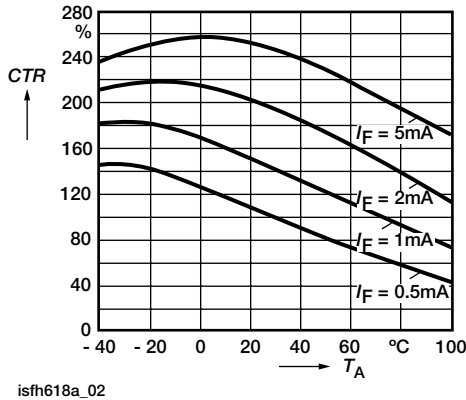


Fig. 5 - Current Transfer Ratio (Typ.)

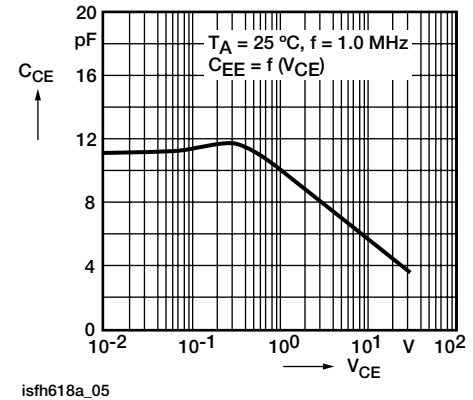


Fig. 8 - Transistor Capacitance

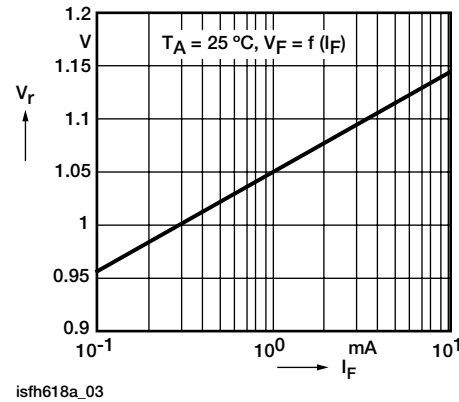


Fig. 6 - Diode Forward Voltage (Typ.)

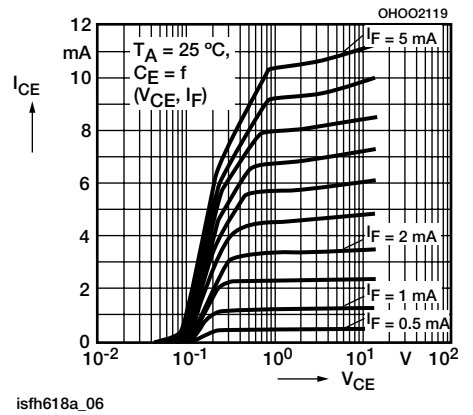


Fig. 9 - Output Characteristics

SFH618A/SFH6186

Vishay Semiconductors Optocoupler, Phototransistor Output,
Low Input Current

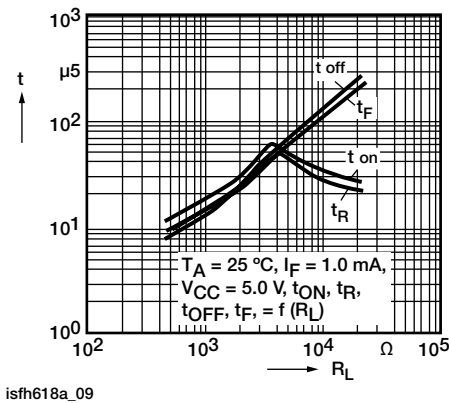
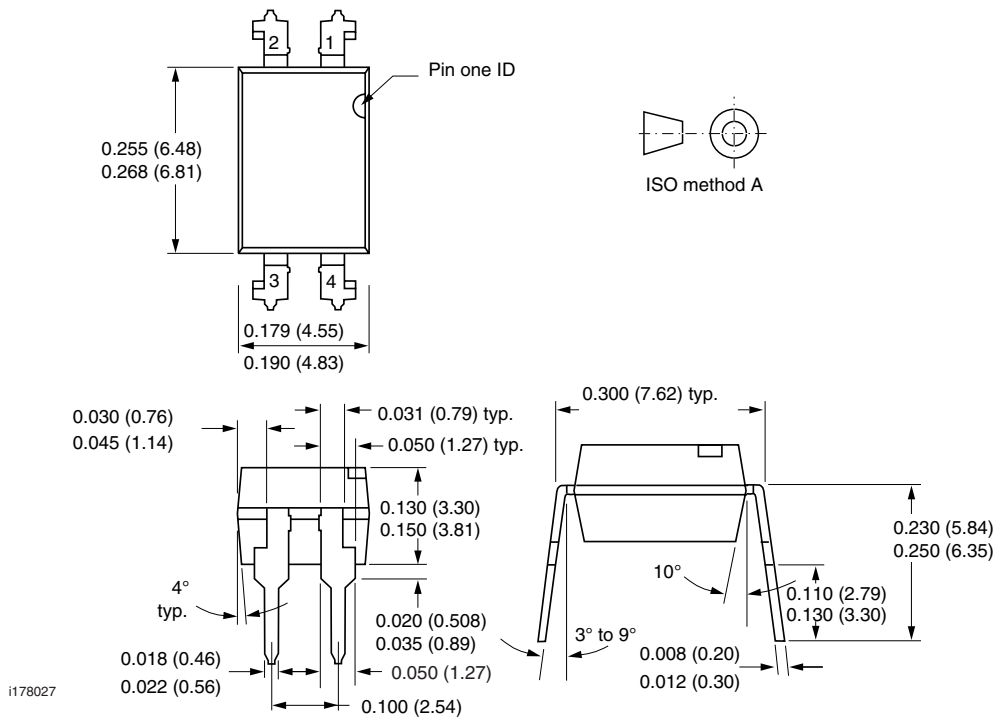


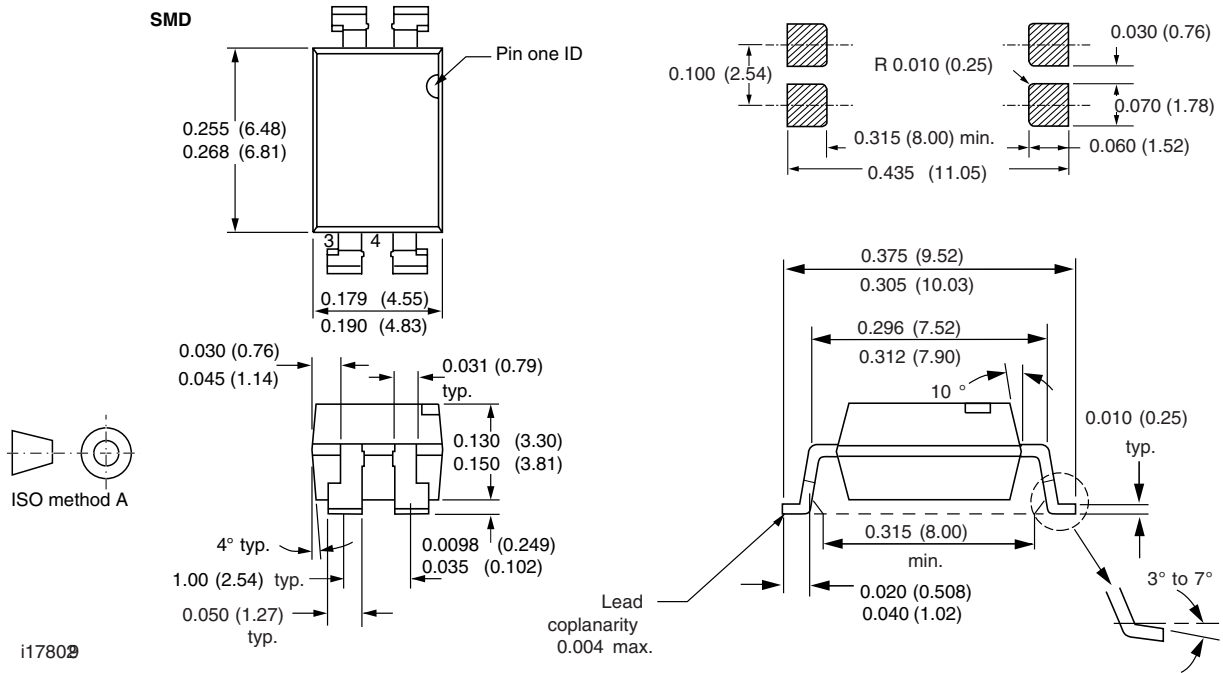
Fig. 10 - Switching Times (Typ.)

PACKAGE DIMENSIONS in inches (millimeters)

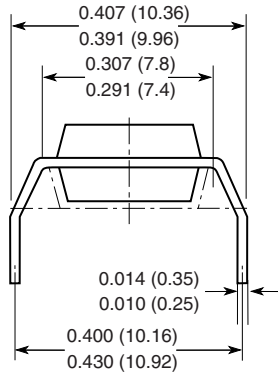




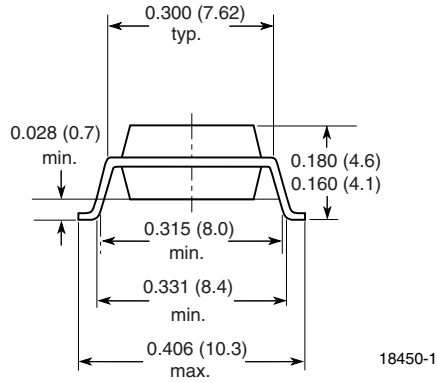
Optocoupler, Phototransistor Output, Vishay Semiconductors
Low Input Current



Option 6



Option 7



OZONE DEPLETING SUBSTANCES POLICY STATEMENT

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

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2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

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