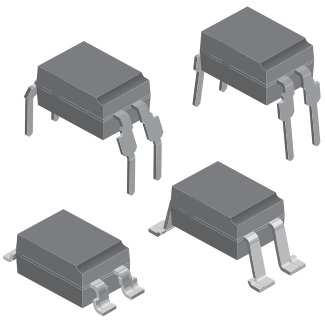
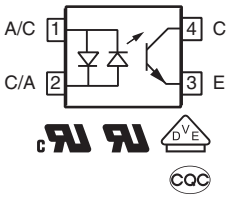
# Optocoupler, Phototransistor Output, AC Input






## FEATURES

- Good CTR linearity depending on forward current
- Isolation test voltage, 5300 $V_{RMS}$
- High collector emitter voltage, $V_{CEO}$ = 70 V
- Low saturation voltage
- Fast switching times
- Low CTR degradation
- Temperature stable
- Low coupling capacitance
- End-stackable, 0.100" (2.54 mm) spacing
- High common-mode interference immunity
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

## DESCRIPTION

The SFH620A (DIP) and SFH6206 (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 a 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 mm are 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.

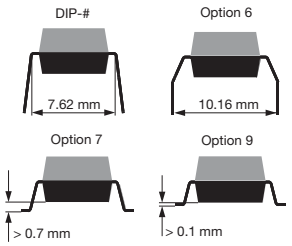
## AGENCY APPROVALS

The safety application model number covering all products in this datasheet is SFH620A and SHF6206. This model number should be used when consulting safety agency documents.

- UL1577, file no. E52744 system code H, double protection
- CSA 93751
- BSI EN 60950, EN 60065
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- CQC GB8898-2011, GB4943.1-2011

## ORDERING INFORMATION

| S | F | H | 6 | 2 | 0 | x | - | # | X | 0 | # | # | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER | | | | | | | | CTR BIN | PACKAGE OPTION | | | | TAPE AND REEL |




| AGENCY CERTIFIED/PACKAGE | CTR (%) ± 10 mA | | | | | |
|---|---|---|---|---|---|---|
| | SFH620A | | | SFH6206 | | |
| **UL, cUL, BSI** | **40 to 125** | **63 to 200** | **100 to 320** | **40 to 125** | **63 to 200** | **100 to 320** |
| DIP-4 | SFH620A-1 | SFH620A-2 | SFH620A-3 | - | - | - |
| DIP-4, 400 mil, option 6 | SFH620A-1X006 | SFH620A-2X006 | SFH620A-3X006 | - | - | - |
| SMD-4, option 7 | - | SFH620A-2X007T (1) | - | - | - | - |
| SMD-4, option 9 | - | - | - | SFH6206-1T (1) | SFH6206-2T (1) | SFH6206-3T (1) |
| **VDE, UL, CUL, BSI** | **40 to 125** | **63 to 200** | **100 to 320** | **40 to 125** | **63 to 200** | **100 to 320** |
| DIP-4 | SFH620A-1X001 | SFH620A-2X001 | SFH620A-3X001 | - | - | - |
| DIP-4, 400 mil, option 6 | - | SFH620A-2X016 | SFH620A-3X016 | - | - | - |
| SMD-4, option 7 | - | SFH620A-2X017T | - | - | - | - |
| SMD-4, option 9 | - | - | - | - | SFH6206-2X001T (1) | SFH6206-3X001T (1) |

**Notes**

- Additional options may be possible, please contact sales office.

(1) Also available in tubes; do not add T to end.

| **ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| **INPUT** | | | | |
| DC forward current | | $I_F$ | ± 60 | mA |
| Surge forward current | $t_p \leq 10$ µs | $I_{FSM}$ | ± 2.5 | A |
| Power dissipation | | $P_{diss}$ | 100 | mW |
| **OUTPUT** | | | | |
| Collector emitter voltage | | $V_{CEO}$ | 70 | V |
| Emitter collector voltage | | $V_{ECO}$ | 7 | V |
| Collector current | | $I_C$ | 50 | mA |
| | $t_p \leq 1$ µs | $I_C$ | 100 | mA |
| Power dissipation | | $P_{diss}$ | 150 | mW |
| **COUPLER** | | | | |
| Total power dissipation | | $P_{tot}$ | 250 | mW |
| 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 [1] | max. 10 s, dip soldering distance to seating plane ≥ 1.5 mm | $T_{sld}$ | 260 | °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.

(1) 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 °C, unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **INPUT** | | | | | | | |
| Forward voltage | $I_F$ = ± 60 mA | | $V_F$ | | 1.25 | 1.65 | V |
| Capacitance | $V_R$ = 0 V, f = 1 MHz | | $C_O$ | | 50 | | pF |
| Thermal resistance | | | $R_{thja}$ | | 750 | | K/W |
| **OUTPUT** | | | | | | | |
| Collector emitter capacitance | $V_{CE}$ = 5 V, f = 1 MHz | | $C_{CE}$ | | 6.8 | | pF |
| Thermal resistance | | | $R_{thja}$ | | 500 | | °C/W |
| **COUPLER** | | | | | | | |
| Collector emitter saturation voltage | $I_F$ = ± 10 mA, $I_C$ = 2.5 mA | | $V_{CEsat}$ | | 0.25 | 0.4 | V |
| Coupling capacitance | | | $C_C$ | | 0.2 | | pF |
| Collector emitter leakage current | $V_{CE}$ = 10 V | SFH620A-1 | $I_{CEO}$ | | 2 | 50 | nA |
| | | SFH6206-1 | $I_{CEO}$ | | 2 | 50 | nA |
| | | SFH620A-2 | $I_{CEO}$ | | 2 | 50 | nA |
| | | SFH6206-2 | $I_{CEO}$ | | 2 | 50 | nA |
| | | SFH620A-3 | $I_{CEO}$ | | 5 | 100 | nA |
| | | SFH6206-3 | $I_{CEO}$ | | 5 | 100 | nA |

**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.
  Still air, coupler soldered to PCB or base.

| CURRENT TRANSFER RATIO ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| $I_C/I_F$ | $V_{CE}$ = 5 V, $I_F$ = ± 10 mA | SFH620A-1 | CTR | 40 | | 125 | % |
| | | SFH6206-1 | CTR | 40 | | 125 | % |
| | | SFH620A-2 | CTR | 63 | | 200 | % |
| | | SFH6206-2 | CTR | 63 | | 200 | % |
| | | SFH620A-3 | CTR | 100 | | 320 | % |
| | | SFH6206-3 | CTR | 100 | | 320 | % |
| | $V_{CE}$ = 5 V, $I_F$ = ± 1 mA | SFH620A-1 | CTR | 13 | 30 | | % |
| | | SFH6206-1 | CTR | 13 | 30 | | % |
| | | SFH620A-2 | CTR | 22 | 45 | | % |
| | | SFH6206-2 | CTR | 22 | 45 | | % |
| | | SFH620A-3 | CTR | 34 | 70 | | % |
| | | SFH6206-3 | CTR | 34 | 70 | | % |

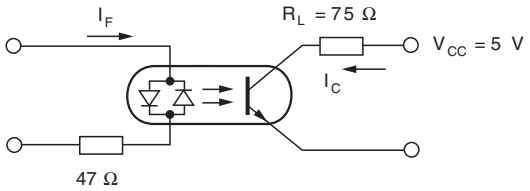



Fig. 1 - Switching Times Linear Operation (without Saturation)

| SWITCHING CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| Turn-on time | $R_L$ = 75 Ω, $I_F$ = ± 10 mA, $V_{CC}$ = 5 V | $t_{on}$ | | 3 | | µs |
| Rise time | $R_L$ = 75 Ω, $I_F$ = ± 10 mA, $V_{CC}$ = 5 V | $t_r$ | | 2 | | µs |
| Turn-off time | $R_L$ = 75 Ω, $I_F$ = ± 10 mA, $V_{CC}$ = 5 V | $t_{off}$ | | 2.3 | | µs |
| Fall time | $R_L$ = 75 Ω, $I_F$ = ± 10 mA, $V_{CC}$ = 5 V | $t_f$ | | 2 | | µs |
| Cut-off frequency | $R_L$ = 75 Ω, $I_F$ = ± 10 mA, $V_{CC}$ = 5 V | $t_{ctr}$ | | 208 | | kHz |

| SAFETY AND INSULATION RATINGS | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| Climatic classification | According to IEC 68 part 1 | | 55/115/21 | |
| Pollution degree | According to DIN VDE 0109 | | 2 | |
| Comparative tracking index | Insulation group IIIa | CTI | 175 | |
| Maximum rated withstanding isolation voltage | According to UL1577, t = 1 min | $V_{ISO}$ | 4470 | $V_{RMS}$ |
| Tested withstanding isolation voltage | According to UL1577, t = 1 s | $V_{ISO}$ | 5300 | $V_{RMS}$ |
| Maximum transient isolation voltage | According to DIN EN 60747-5-5 | $V_{IOTM}$ | 8000 | $V_{peak}$ |
| Maximum repetitive peak isolation voltage | According to DIN EN 60747-5-5 | $V_{IORM}$ | 890 | $V_{peak}$ |
| Isolation resistance | $T_{amb}$ = 25 °C, $V_{IO}$ = 500 V | $R_{IO}$ | ≥ $10^{12}$ | Ω |
| | $T_{amb}$ = 100 °C, $V_{IO}$ = 500 V | $R_{IO}$ | ≥ $10^{11}$ | Ω |
| Output safety power | | $P_{SO}$ | 700 | mW |
| Input safety current | | $I_{SI}$ | 400 | mA |
| Input safety temperature | | $T_S$ | 175 | °C |
| Creepage distance | DIP-4 | | ≥ 7 | mm |
| Clearance distance | DIP-4 | | ≥ 7 | mm |
| Creepage distance | DIP-4, 400 mil, option 6 | | ≥ 8 | mm |
| Clearance distance | DIP-4, 400 mil, option 6 | | ≥ 8 | mm |
| Creepage distance | SMD-4, option 7 and option 9 | | ≥ 7 | mm |
| Clearance distance | SMD-4, option 7 and option 9 | | ≥ 7 | mm |
| Insulation thickness | | DTI | ≥ 0.4 | mm |

**Note**

- As per DIN EN 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 °C, unless otherwise specified)

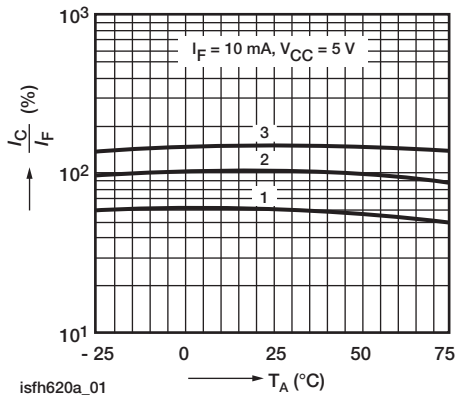



Fig. 2 - Current Transfer Ratio (CTR) vs. Temperature

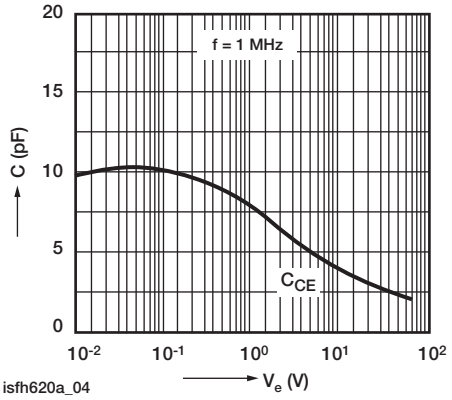



Fig. 5 - Transistor Capacitance (Typ.) vs. Collector Emitter Voltage

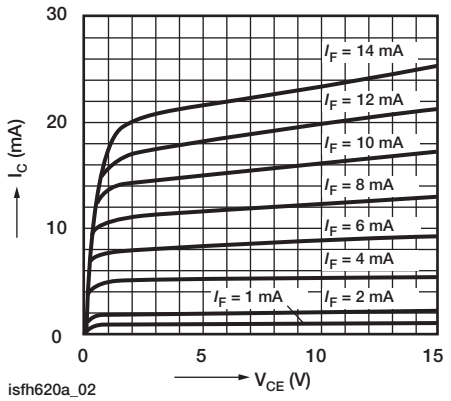



Fig. 3 - Output Characteristics (Typ.) Collector Current vs. Collector Emitter Voltage

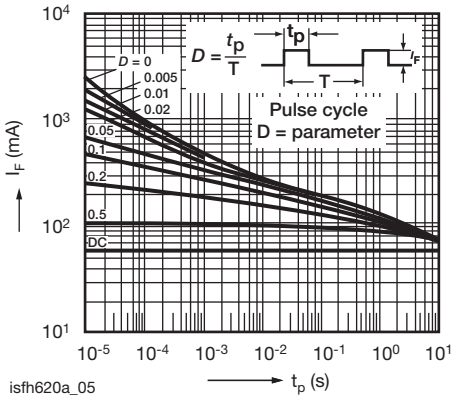



Fig. 6 - Permissible Pulse Handling Capability Forward Current vs. Pulse Width

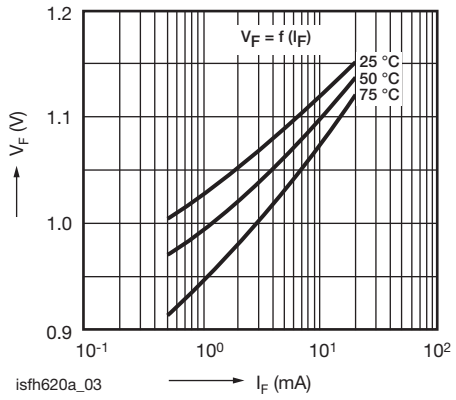



Fig. 4 - Diode Forward Voltage (Typ.) vs. Forward Current

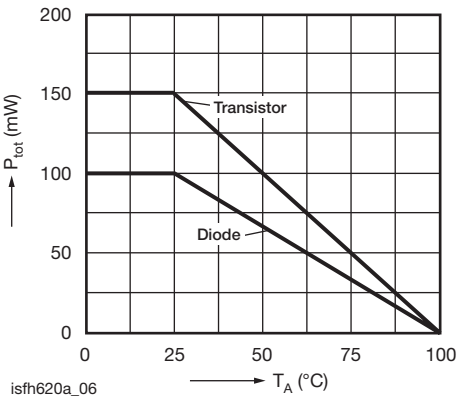



Fig. 7 - Permissible Power Dissipation vs. Ambient Temperature

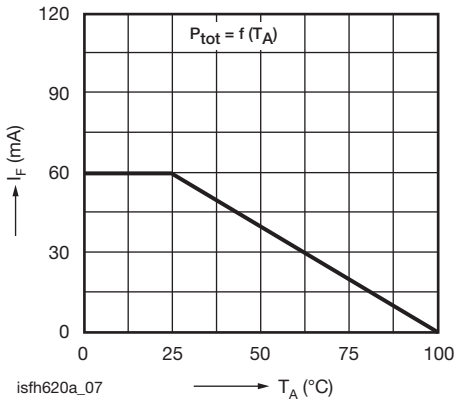
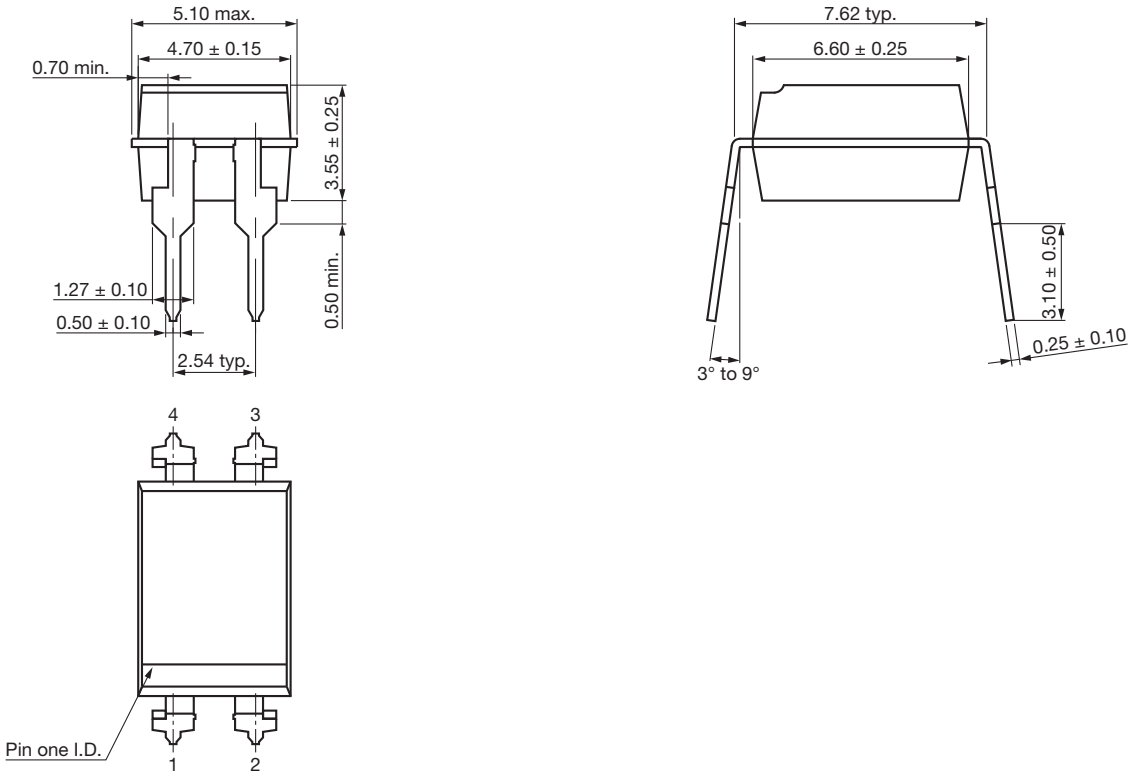


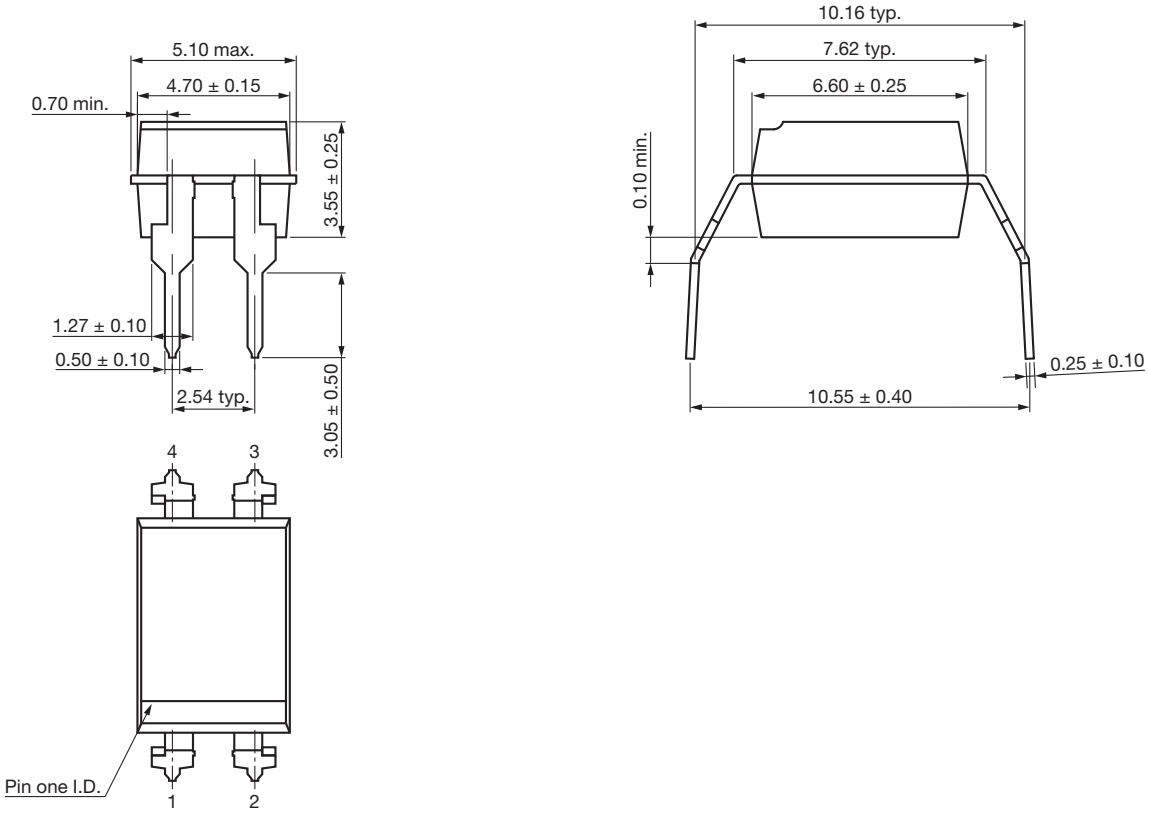

Fig. 8 - Permissible Diode Forward Current vs. Ambient Temperature

## **PACKAGE DIMENSIONS** in millimeters

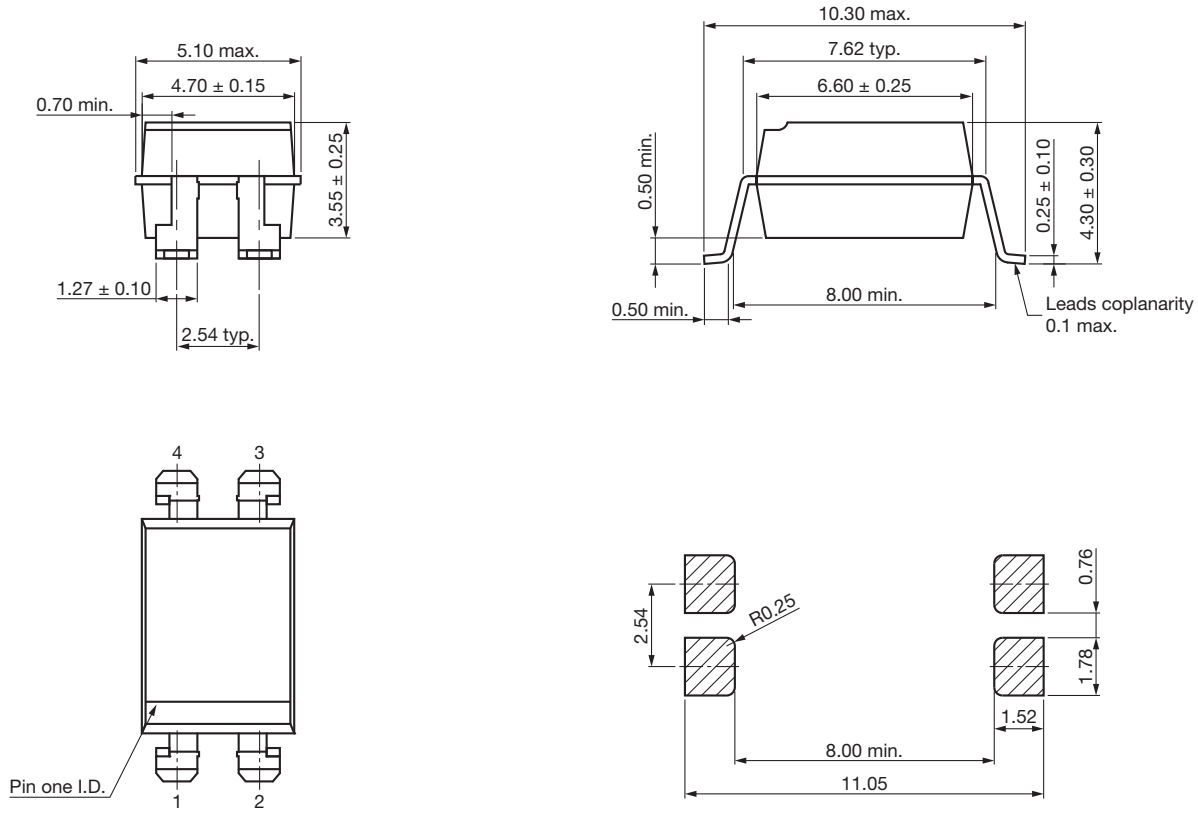
### DIP-4, Standard



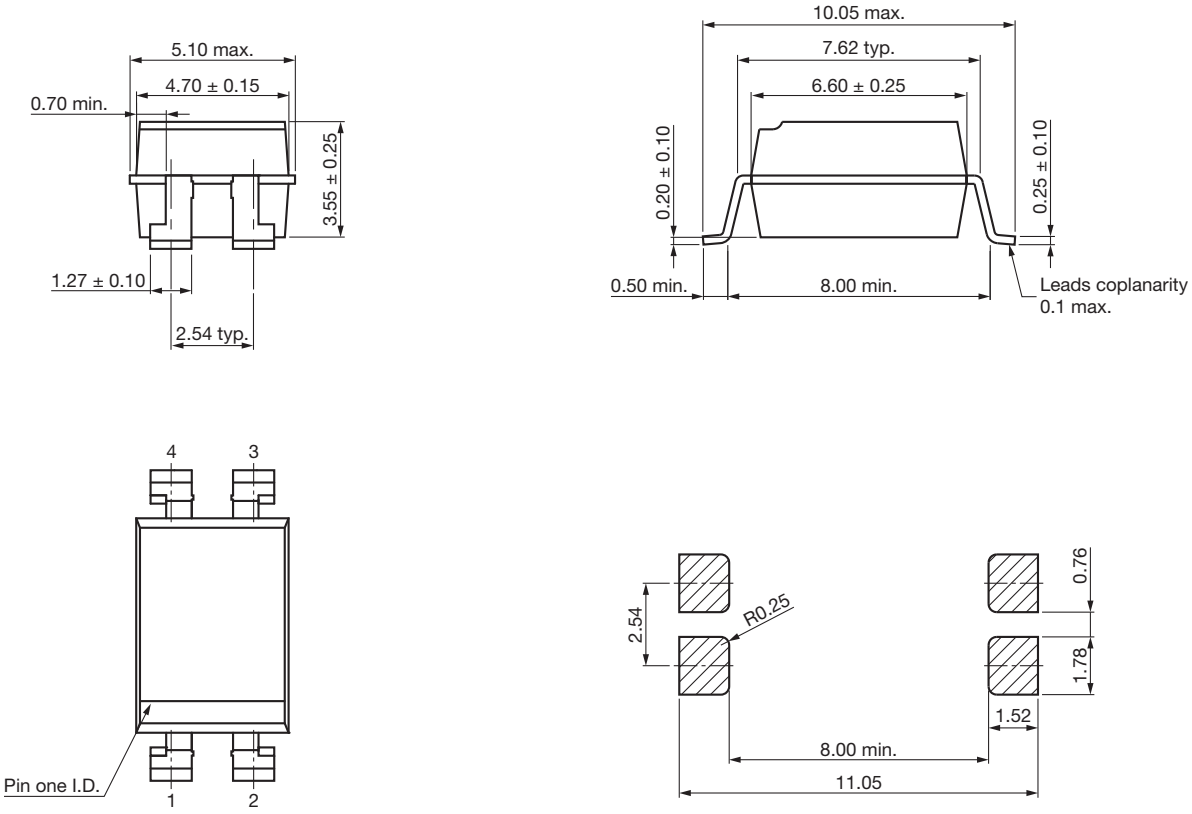
**DIP-4, Option 6**



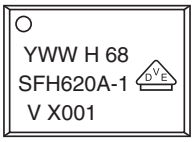

**SMD-4, Option 7**



**SMD-4, Option 9**




## PACKAGE MARKING (example)




**Notes**

- Only options 1 and 7 are reflected in the package marking.
- The VDE logo is only marked on option1 parts.
- Tape and reel suffix (T) is not part of the package marking.

## SOLDER PROFILES

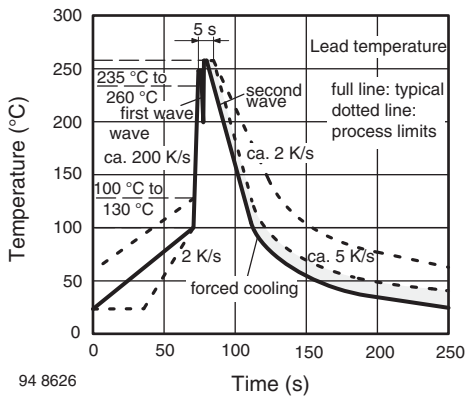



Fig. 9 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP-8 Devices

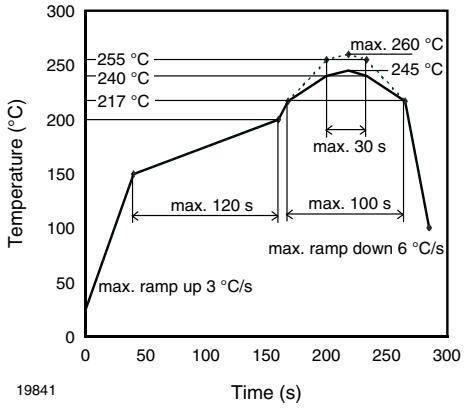



Fig. 10 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD-8 Devices

## HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: $T_{amb}$ < 30 °C, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020

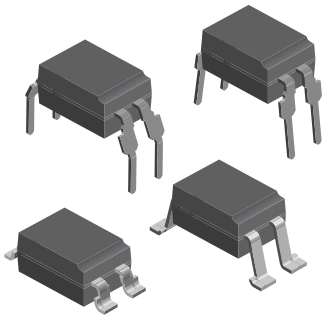
# Footprint and Schematic Information for SFH6206

The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

Note that the 3D models for these parts can be found on the Vishay product page.

| PART NUMBER | FOOTPRINT / SCHEMATIC |
|---|---|
| SFH6206-1T | www.snapeda.com/parts/SFH6206-1T/Vishay/view-part |
| SFH6206-2T | www.snapeda.com/parts/SFH6206-2T/Vishay/view-part |
| SFH6206-2X001T | www.snapeda.com/parts/SFH6206-2X001T/Vishay/view-part |
| SFH6206-3T | www.snapeda.com/parts/SFH6206-3T/Vishay/view-part |
| SFH6206-3X001T | www.snapeda.com/parts/SFH6206-3X001T/Vishay/view-part |

For technical issues and product support, please contact optocoupleranswers@vishay.com.



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