SIEMENS

# SFH610A/611A/615A/617A

## 5.3 kV TRIOS® OPTOCOUPLER HIGH RELIABILITY

### FEATURES

- **High Current Transfer Ratios at 10 mA: 40–320% at 1 mA: 60% typical (>13)**
- **Low CTR Degradation**
- **Good CTR Linearity Depending on Forward Current**
- **Withstand Test Voltage, 5300 VACRMS**
- **High Collector-Emitter Voltage, VCEO=70 V**
- **Low Saturation Voltage**
- **Fast Switching Times**
- **Field-Effect Stable by TRIOS (TRansparent IOn Shield)**
- **Temperature Stable**
- **Low Coupling Capacitance**
- **End-Stackable, .100"(2.54 mm) Spacing**
- **High Common-Mode Interference Immunity (Unconnected Base)**
- **Underwriters Lab File #52744**
- **VDE 0884 Available with Option 1**
- **SMD Option – See SFH6106/16/56 Data Sheet**

### DESCRIPTION

The SFH61XA features a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 package.

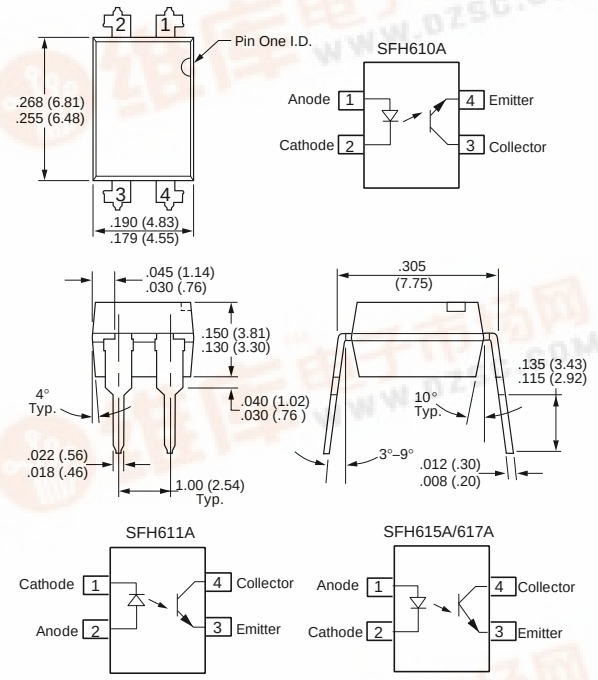
The coupling devices are designed for signal transmission between two electrically separated circuits.

The couplers are end-stackable with 2.54 mm spacing.

Creepage and clearance distances of >8 mm are achieved with option 6. This version complies with IEC 950 (DIN VDE 0805) for reinforced insulation up to an operation voltage of 400 $V_{RMS}$ or DC.

Specifications subject to change.

Package Dimensions in Inches (mm)




### Maximum Ratings

**Emitter**

Reverse Voltage ..... 6 V
DC Forward Current ..... 60 mA
Surge Forward Current (tP≤10 µs) ..... 2.5 A
Total Power Dissipation ..... 100 mW

**Detector**

Collector-Emitter Voltage ..... 70 V
Emitter-Collector Voltage ..... 7 V
Collector Current ..... 50 mA
Collector Current (tP≤1 ms) ..... 100 mA
Total Power Dissipation ..... 150 mW

**Package**

Isolation Test Voltage between Emitter and Detector, refer to Climate DIN 40046, part 2, Nov. 74 ..... 5300 $VAC_{RMS}$
Creepage ..... ≥7 mm
Clearance ..... ≥7 mm
Insulation Thickness between Emitter and Detector ..... ≥0.4 mm
Comparative Tracking Index per DIN IEC 112/VDE0 303, part 1 ..... ≥175
Isolation Resistance
$V_{IO}$=500 V, $T_A$=25°C ..... ≥$10^{12}$ Ω
$V_{IO}$=500 V, $T_A$=100°C ..... ≥$10^{11}$ Ω
Storage Temperature Range ..... –55 to +150°C
Ambient Temperature Range ..... –55 to +100°C
Junction Temperature ..... 100°C
Soldering Temperature (max. 10 s. Dip Soldering Distance to Seating Plane ≥1.5 mm) ..... 260°C

**Characteristics** ($T_A$=25°C)

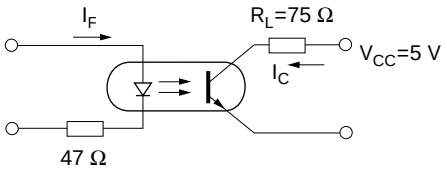
| Description | Symbol | | Unit | Condition |
|---|---|---|---|---|
| **Emitter (IR GaAs)** | | | | |
| Forward Voltage | $V_F$ | 1.25 (≤1.65) | V | $I_F$=60 mA |
| Reverse Current | $I_R$ | 0.01 (≤10) | µA | $V_R$=6 V |
| Capacitance | $C_0$ | 13 | pF | $V_R$=0 V, f=1 MHz |
| Thermal Resistance | $R_{thJA}$ | 750 | K/W | |
| **Detector (Si Phototransistor)** | | | | |
| Capacitance | $C_{CE}$ | 5.2 | pF | $V_{CE}$=5 V, f=1 MHz |
| Thermal Resistance | $R_{thJA}$ | 500 | K/W | |
| **Package** | | | | |
| Collector-Emitter Saturation Voltage | $V_{CESAT}$ | 0.25 (≤0.4) | V | $I_F$=10 mA, $I_C$=2.5 mA |
| Coupling Capacitance | $C_C$ | 0.4 | pF | |

**Current Transfer Ratio** ($I_C/I_F$ at $V_{CE}$=5 V) **and Collector-Emitter Leakage Current by Dash Number**

| Description | -1 | -2 | -3 | -4 | |
|---|---|---|---|---|---|
| $I_C/ I_F$ ($I_F$=10 mA) | 40–80 | 63–125 | 100–200 | 160–320 | % |
| $I_C/ I_F$ ($I_F$=1 mA) | 30 (>13) | 45 (>22) | 70 (>34) | 90 (>56) | % |
| Collector-Emitter Leakage Current, $I_{CEO}$ $V_{CE}$=10 V | 2 (≤50) | 2 (≤50) | 5 (≤100) | 5 (≤100) | nA |

**Switching Times (Typical)**

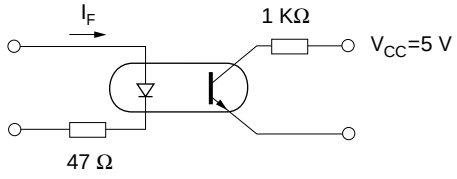
**Linear Operation** (without saturation)




**$I_F$=10 mA, $V_{CC}$=5 V, $T_A$=25°C**

| | | | |
|---|---|---|---|
| Load Resistance | $R_L$ | 75 | Ω |
| Turn-on Time | $t_{ON}$ | 3.0 | µs |
| Rise Time | $t_R$ | 2.0 | µs |
| Turn-off Time | $t_{OFF}$ | 2.3 | µs |
| Fall Time | $t_F$ | 2.0 | µs |
| Cut-off Frequency | $F_{CO}$ | 250 | kHz |

**Switching Operation** (with saturation)




| | | -1 $I_F$=20 mA | -2 and -3 $I_F$=10 mA | -4 $I_F$=5 mA | |
|---|---|---|---|---|---|
| Turn-on Time | $t_{ON}$ | 3.0 | 4.2 | 6.0 | µs |
| Rise Time | $t_R$ | 2.0 | 3.0 | 4.6 | µs |
| Turn-off Time | $t_{OFF}$ | 18 | 23 | 25 | µs |
| Fall Time | $t_F$ | 11 | 14 | 15 | µs |

**Figure 1. Current transfer ratio (typ.) vs. temperature** $I_F$=10 mA, $V_{CE}$=0.5 V

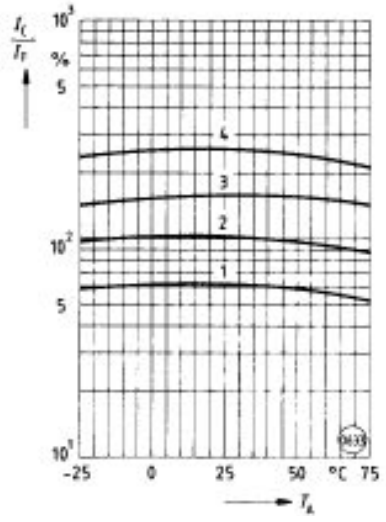



**Figure 2. Output characteristics (typ.) Collector current vs. collector-emitter voltage** $T_A$=25°C

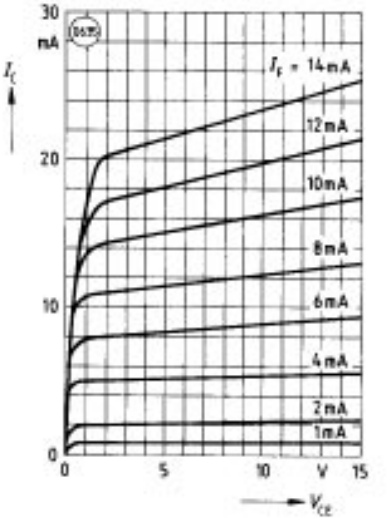



**Figure 3. Diode forward voltage (typ.) vs. forward current**

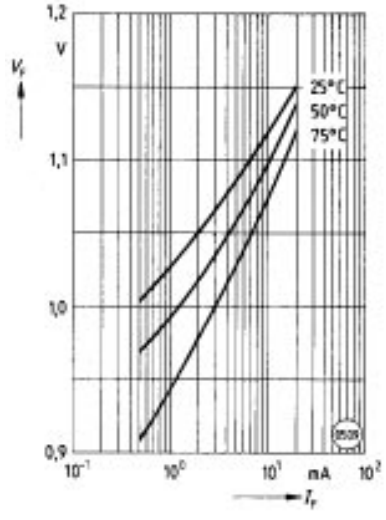



**Figure 4. Transistor capacitance (typ.) vs. collector-emitter voltage** $T_A$=25°C, f=1 MHz

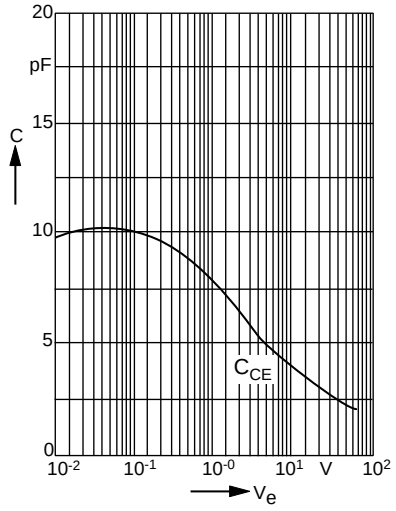



**Figure 5. Permissible pulse handling capability. Forward current vs. pulse width** Pulse cycle D=parameter, $T_A$=25°C

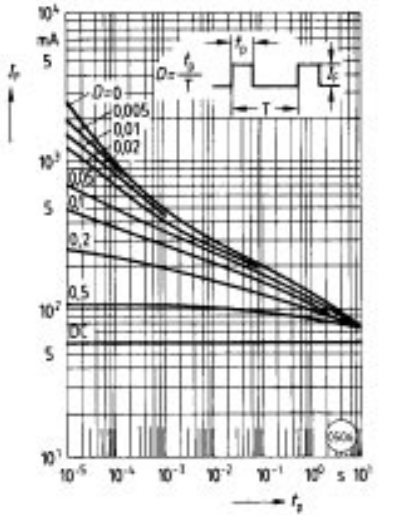



**Figure 6. Permissible power dissipation vs. ambient temperature**

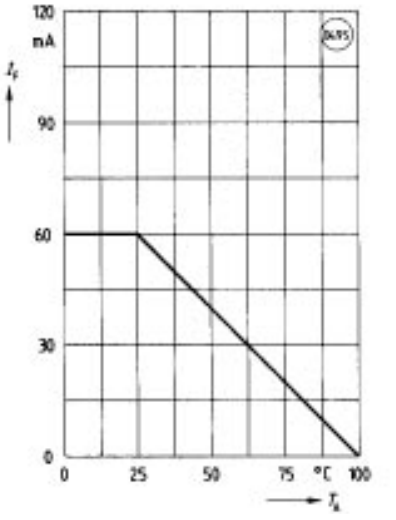



**Figure 7. Permissable diode forward current vs. ambient temp.**