



SFH610A/615A/617A

5.3 kV TRIOS® Optocoupler

High Reliability

FEATURES

- High Current Transfer Ratios
at 10 mA: 40–320%
at 1.0 mA: 60% typical (>13)
- Low CTR Degradation
- Good CTR Linearity Depending on Forward Current
- Withstand Test Voltage, 5300 V_{RMS}
- High Collector-Emitter Voltage, V_{CEO}=70 V
- Low Saturation Voltage
- Fast Switching Times
- Field-Effect Stable by TRIOS (TRansparent IO n 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

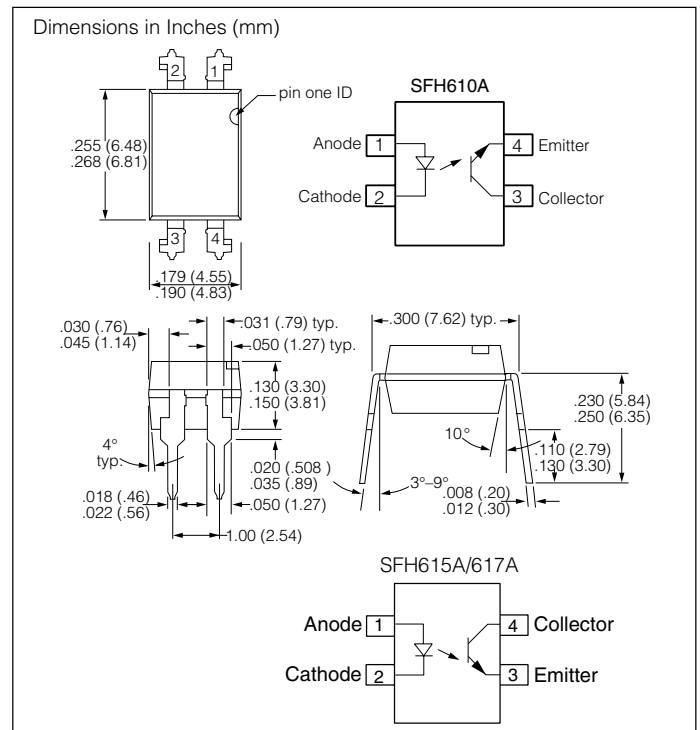
DESCRIPTION

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.



Maximum Ratings

Emitter

| | |
|--|--------|
| Reverse Voltage..... | 6 V |
| DC Forward Current..... | 60 mA |
| Surge Forward Current (t _p ≤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 (t _p ≤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 V _{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 ($T_A=25^\circ\text{C}$)

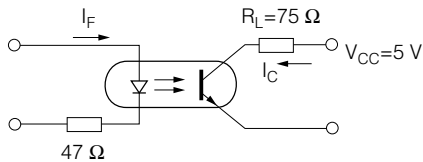
| Description | Symbol | | Unit | Condition |
|--------------------------------------|-------------|----------------------|---------------|--|
| Emitter (IR GaAs) | | | | |
| Forward Voltage | V_F | 1.25 (≤ 1.65) | V | $I_F=60\text{ mA}$ |
| Reverse Current | I_R | 0.01 (≤ 10) | μA | $V_R=6\text{ V}$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

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

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

Switching Times (Typical)

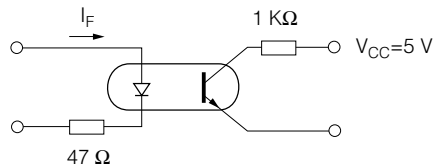
Linear Operation (without saturation)



$I_F=10\text{ mA}$, $V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$

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

Switching Operation (with saturation)



| Parameter | Sym. | Dash No. | | | Unit |
|---------------|-----------|--------------------------|---------------------------------|-------------------------|---------------|
| | | -1 $I_F=20\text{ mA}$ | -2 and -3 $I_F=10\text{ mA}$ | -4 $I_F=5\text{ mA}$ | |
| Turn-on Time | t_{ON} | 3.0 | 4.2 | 6.0 | μs |
| Rise Time | t_R | 2.0 | 3.0 | 4.6 | |
| Turn-off Time | t_{OFF} | 18 | 23 | 25 | |
| Fall Time | t_F | 11 | 14 | 15 | |

Figure 1. Current transfer ratio (typ.) vs. temperature $I_F=10\text{ mA}$, $V_{CE}=5\text{ V}$

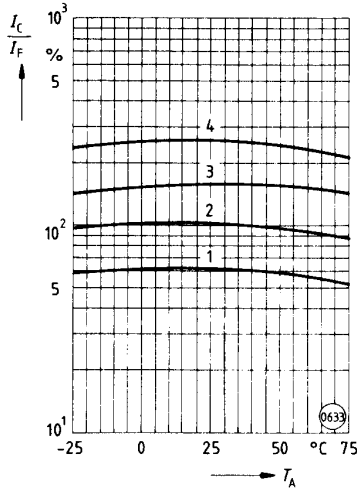


Figure 2. Output characteristics (typ.) Collector current vs. collector-emitter voltage $T_A=25^\circ\text{C}$

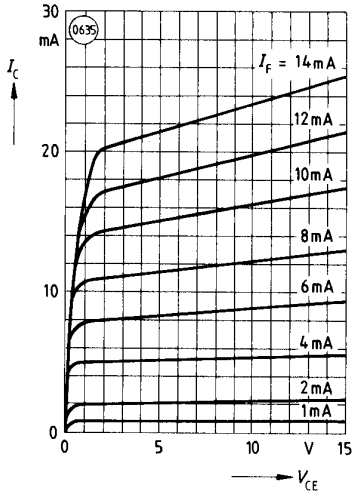


Figure 3. Diode forward voltage (typ.) vs. forward current

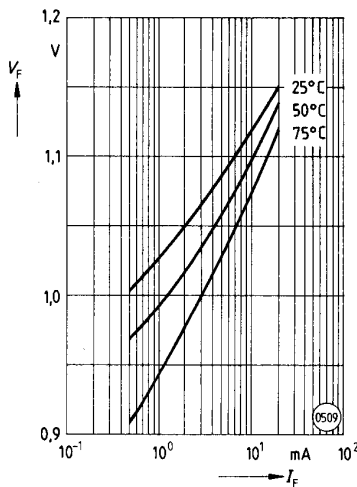


Figure 4. Transistor capacitance (typ.) vs. collector-emitter voltage $T_A=25^\circ\text{C}$, $f=1\text{ MHz}$

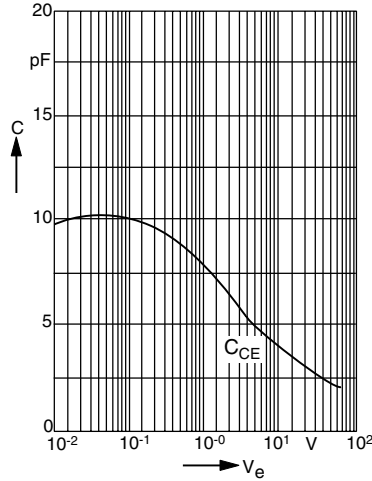


Figure 7. Permissible diode forward current vs. ambient temp.

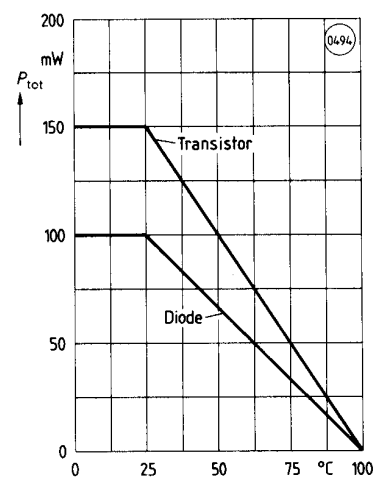


Figure 5. Permissible pulse handling capability. Forward current vs. pulse width Pulse cycle $D=\text{parameter}$, $T_A=25^\circ\text{C}$

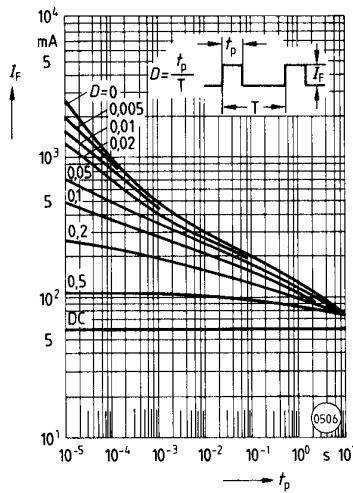


Figure 6. Permissible power dissipation vs. ambient temperature

