

#### FEATURES

- **Variety of Current Transfer Ratios at  $I_F=10$  mA**
  - SFH610A/617A-1, 40–80%
  - SFH610A/617A-2, 63–125%
  - SFH610A/617A-3, 100–200%
  - SFH610A/617A-4, 160–320%
- **Low CTR Degradation**
- **Good CTR Linearity Depending on Forward Current**
- **Withstand Test Voltage, 5300 V<sub>RMS</sub>**
- **High Collector-Emitter Voltage,  $V_{CE0}=70$  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**

#### DESCRIPTION

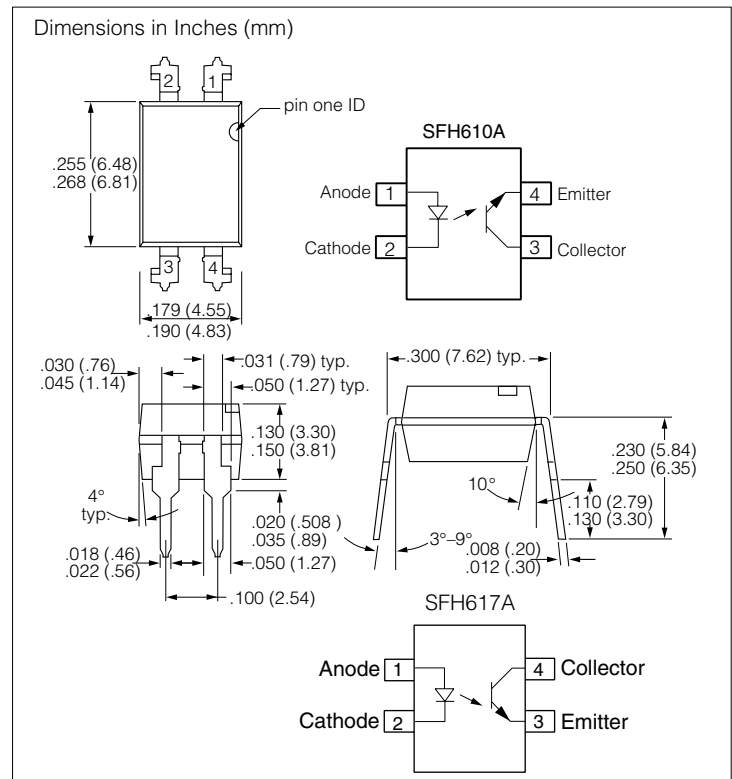
The SFH61XA features a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 package.

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 >8.0 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<sub>RMS</sub> or DC.

Specifications subject to change.



#### Maximum Ratings

##### Emitter

|                                                    |        |
|----------------------------------------------------|--------|
| Reverse Voltage.....                               | 6.0 V  |
| DC Forward Current.....                            | 60 mA  |
| Surge Forward Current ( $t_p \leq 10 \mu s$ )..... | 2.5 A  |
| Total Power Dissipation.....                       | 100 mW |

##### Detector

|                                             |        |
|---------------------------------------------|--------|
| Collector-Emitter Voltage .....             | 70 V   |
| Emitter-Collector Voltage .....             | 7.0 V  |
| Collector Current .....                     | 50 mA  |
| Collector Current ( $t_p \leq 1.0$ ms)..... | 100 mA |
| Total Power Dissipation.....                | 150 mW |

##### Package

|                                                                                                          |                         |
|----------------------------------------------------------------------------------------------------------|-------------------------|
| Isolation Test Voltage between Emitter and Detector,<br>refer to Climate DIN 40046, part 2, Nov. 74..... | 5300 V <sub>RMS</sub>   |
| Creepage.....                                                                                            | $\geq 7.0$ mm           |
| Clearance .....                                                                                          | $\geq 7.0$ mm           |
| Insulation Thickness between Emitter and Detector .....                                                  | $\geq 0.4$ mm           |
| Comparative Tracking Index<br>per DIN IEC 112/VDE0 303, part 1 .....                                     | $\geq 175$              |
| Isolation Resistance                                                                                     |                         |
| $V_{IO}=500$ V, $T_A=25^\circ C$ .....                                                                   | $\geq 10^{12} \Omega$   |
| $V_{IO}=500$ V, $T_A=100^\circ C$ .....                                                                  | $\geq 10^{11} \Omega$   |
| Storage Temperature Range .....                                                                          | $-55$ to $+150^\circ C$ |
| Ambient Temperature Range.....                                                                           | $-55$ to $+100^\circ C$ |
| Junction Temperature .....                                                                               | $100^\circ C$           |
| Soldering Temperature (max. 10 s. Dip Soldering<br>Distance to Seating Plane $\geq 1.5$ mm).....         | $260^\circ C$           |

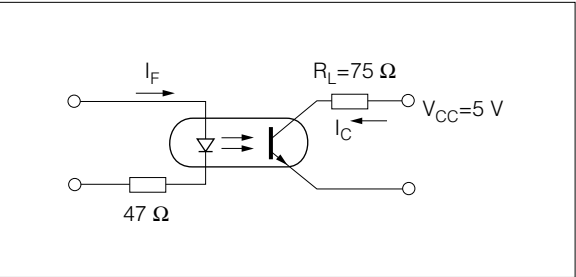
Characteristics (T<sub>A</sub>=25°C)

| Description                          | Symbol             |              | Unit | Condition                                     |
|--------------------------------------|--------------------|--------------|------|-----------------------------------------------|
| <b>Emitter (IR GaAs)</b>             |                    |              |      |                                               |
| Forward Voltage                      | V <sub>F</sub>     | 1.25 (≤1.65) | V    | I <sub>F</sub> =60 mA                         |
| Reverse Current                      | I <sub>R</sub>     | 0.01 (≤10)   | μA   | V <sub>R</sub> =6.0 V                         |
| Capacitance                          | C <sub>0</sub>     | 13           | pF   | V <sub>R</sub> =0 V, f=1.0 MHz                |
| Thermal Resistance                   | R <sub>thJA</sub>  | 750          | K/W  |                                               |
| <b>Detector (Si Phototransistor)</b> |                    |              |      |                                               |
| Capacitance                          | C <sub>CE</sub>    | 5.2          | pF   | V <sub>CE</sub> =5 V, f=1.0 MHz               |
| Thermal Resistance                   | R <sub>thJA</sub>  | 500          | K/W  |                                               |
| <b>Package</b>                       |                    |              |      |                                               |
| Collector-Emitter Saturation Voltage | V <sub>CEsat</sub> | 0.25 (≤0.4)  | V    | I <sub>F</sub> =10 mA, I <sub>C</sub> =2.5 mA |
| Coupling Capacitance                 | C <sub>C</sub>     | 0.4          | pF   |                                               |

Current Transfer Ratio (I<sub>C</sub>/I<sub>F</sub> at V<sub>CE</sub>=5.0 V) and Collector-Emitter Leakage Current by Dash Number

| Description                                                                  | -1        | -2        | -3         | -4         |    |
|------------------------------------------------------------------------------|-----------|-----------|------------|------------|----|
| I <sub>C</sub> /I <sub>F</sub> (I <sub>F</sub> =10 mA)                       | 40–80     | 63–125    | 100–200    | 160–320    | %  |
| I <sub>C</sub> /I <sub>F</sub> (I <sub>F</sub> =1.0 mA)                      | 30 (>13)  | 45 (>22)  | 70 (>34)   | 90 (>56)   |    |
| Collector-Emitter Leakage Current, I <sub>CEO</sub><br>V <sub>CE</sub> =10 V | 2.0 (≤50) | 2.0 (≤50) | 5.0 (≤100) | 5.0 (≤100) | nA |

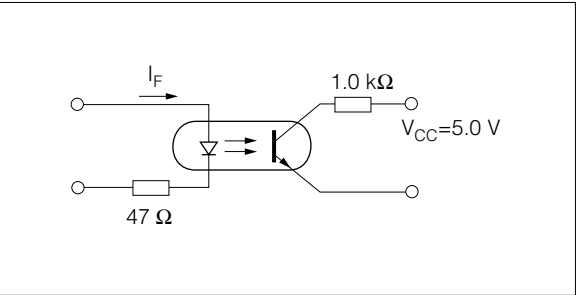
Figure 1. Switching Times (Typical)  
Linear Operation (without saturation)



I<sub>F</sub>=10 mA, V<sub>CC</sub>=5.0 V, T<sub>A</sub>=25°C

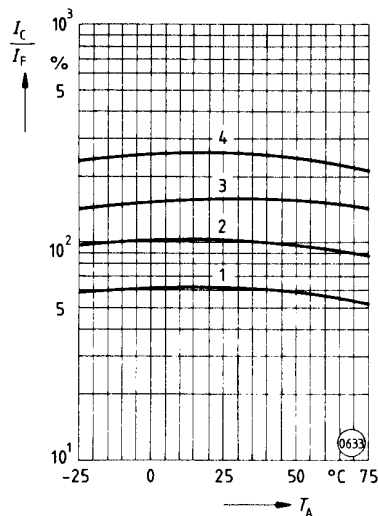
|                   |                  |     |     |
|-------------------|------------------|-----|-----|
| Load Resistance   | R <sub>L</sub>   | 75  | Ω   |
| Turn-on Time      | t <sub>ON</sub>  | 3.0 | μs  |
| Rise Time         | t <sub>R</sub>   | 2.0 |     |
| Turn-off Time     | t <sub>OFF</sub> | 2.3 |     |
| Fall Time         | t <sub>F</sub>   | 2.0 |     |
| Cut-off Frequency | F <sub>CO</sub>  | 250 | kHz |

Figure 2. Switching Operation  
(with saturation)

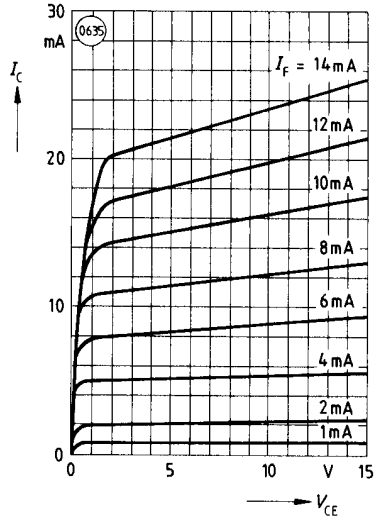


| Parameter     | Sym.             | Dash No.                    |                                    |                              | Unit |
|---------------|------------------|-----------------------------|------------------------------------|------------------------------|------|
|               |                  | -1<br>I <sub>F</sub> =20 mA | -2 and -3<br>I <sub>F</sub> =10 mA | -4<br>I <sub>F</sub> =5.0 mA |      |
| Turn-on Time  | t <sub>ON</sub>  | 3.0                         | 4.2                                | 6.0                          | μs   |
| Rise Time     | t <sub>R</sub>   | 2.0                         | 3.0                                | 4.6                          |      |
| Turn-off Time | t <sub>OFF</sub> | 18                          | 23                                 | 25                           |      |
| Fall Time     | t <sub>F</sub>   | 11                          | 14                                 | 15                           |      |

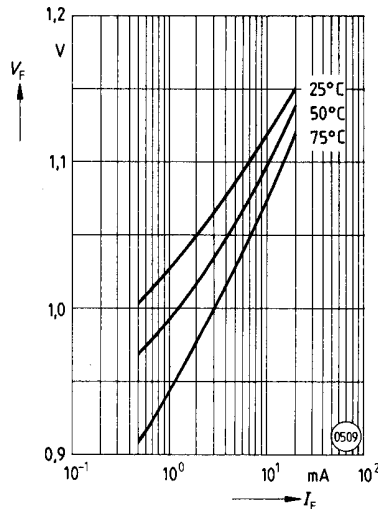
**Figure 3. Current Transfer Ratio (typ.) vs. Temperature**  $I_F=10\text{ mA}$ ,  $V_{CC}=5.0\text{ V}$



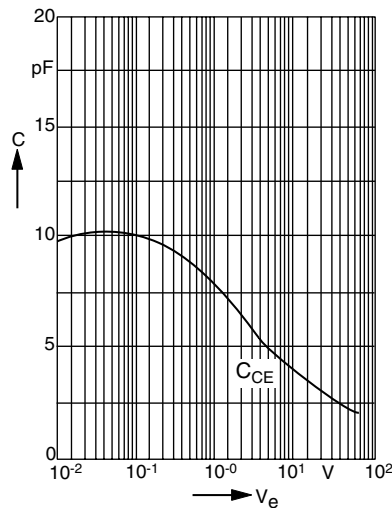
**Figure 4. Output Characteristics (typ.) Collector Current vs. Collector-emitter Voltage**  $T_A=25^\circ\text{C}$



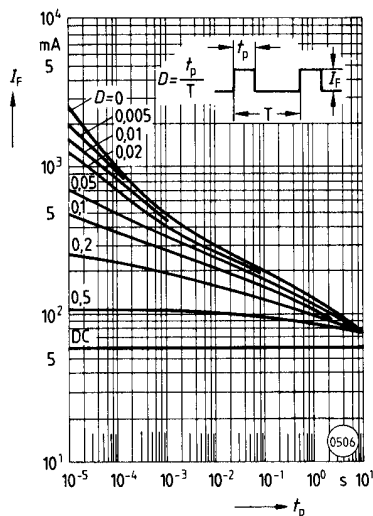
**Figure 5. Diode Forward Voltage (typ.) vs. Forward Current**



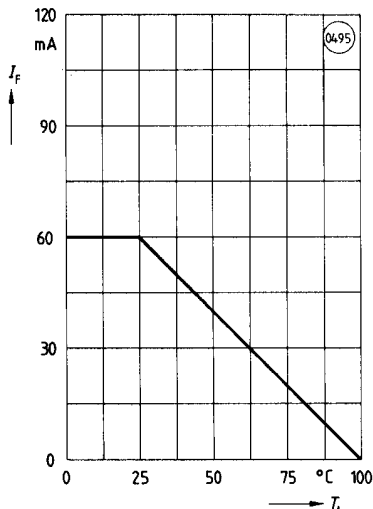
**Figure 6. Transistor capacitance (typ.) vs. collector-emitter voltage**  $T_A=25^\circ\text{C}$ ,  $f=1.0\text{ MHz}$



**Figure 7. Permissible Pulse Handling Capability. Forward Current vs. Pulse Width** Pulse cycle  $D=\text{parameter}$ ,  $T_A=25^\circ\text{C}$



**Figure 8. Permissible Power Dissipation vs. Ambient Temperature**



**Figure 9. Permissible Diode Forward Current vs. Ambient Temperature**

