


#### FEATURES

- **Variety of Current Transfer Ratios at  $I_F=10$  mA**
  - SFH615A-1, 40–80%
  - SFH615A-2, 63–125%
  - SFH615A-3, 100–200%
  - SFH615A-4, 160–320%
  - SFH615A-12, 40–125%
  - SFH615A-23, 63–200%
  - SFH615A-34, 100–320%
  - SFH615A-13, 40–200%
  - SFH615A-24, 63–320%
  - SFH615A-14, 40–320%
- **Low CTR Degradation**
- **Good CTR Linearity Depending on Forward Current**
- **Withstand Test Voltage, 5300 V<sub>RMS</sub>**
- **High Collector-Emitter Voltage,  $V_{CEO}=70$  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

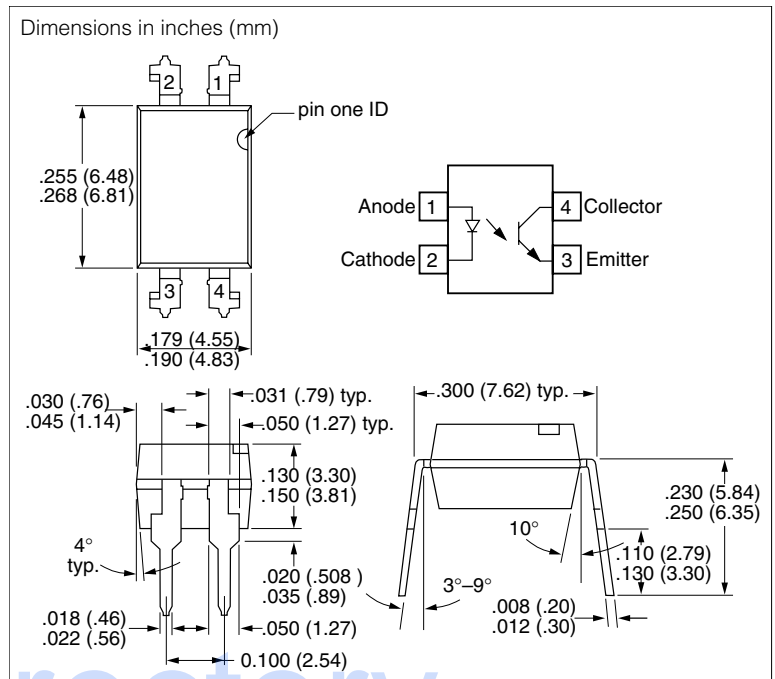
The SFH615A features a large variety of transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 package.

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

The couplers are end-stackable with 2.54 mm lead 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, refer to Climate DIN 40046, part 2, Nov. 74, $t=1.0$ s ..... | 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 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 Distance to Seating Plane $\geq 1.5$ mm) .....                    | $260^\circ C$           |

**Characteristics ( $T_A=25^\circ\text{C}$ )**

| Parameter                            | Sym.        | Value               | Unit          | Condition                                     |
|--------------------------------------|-------------|---------------------|---------------|---|
| <b>Emitter (IR GaAs)</b>             |             |                     |               |   |
| Forward Voltage                      | $V_F$       | 1.25( $\leq 1.65$ ) | V             | $I_F=60\text{ mA}$                            |
| Reverse Current                      | $I_R$       | 0.01( $\leq 10$ )   | $\mu\text{A}$ | $V_R=6.0\text{ V}$                            |
| Capacitance                          | $C_0$       | 13                  | pF            | $V_R=0\text{ V}$ ,<br>$f=1.0\text{ MHz}$      |
| Thermal Resistance                   | $R_{thJA}$  | 750                 | K/W           | —   |
| <b>Detector (Si Phototransistor)</b> |             |                     |               |   |
| Capacitance                          | $C_{CE}$    | 5.2                 | pF            | $V_{CE}=5.0\text{ V}$ ,<br>$f=1.0\text{ MHz}$ |
| Thermal Resistance                   | $R_{thJA}$  | 500                 | K/W           | —   |
| <b>Package</b>                       |             |                     |               |   |
| Collector-Emitter Saturation Voltage | $V_{CEsat}$ | 0.25( $\leq 0.4$ )  | V             | $I_F=10\text{ mA}$ ,<br>$I_C=2.5\text{ mA}$   |
| Coupling Capacitance                 | $C_C$       | 0.4                 | pF            | —   |

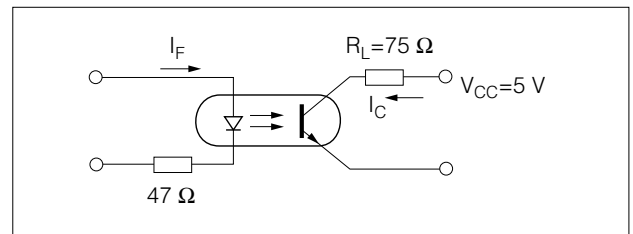
**Current Transfer Ratio ( $I_C/I_F$  at  $V_{CE}=5.0\text{ V}$ ) and Collector-emitter Leakage Current**

| Parameter   | -1               | -2               | -3                | -4                | -12              | -23               | -34               | -13               | -24               | -14               | Unit |
|---|------------------|------------------|-------------------|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| $I_C/I_F$ ( $I_F=10\text{ mA}$ )                                    | 40–80            | 63–125           | 100–200           | 160–320           | 40–125           | 63–200            | 100–320           | 40–200            | 63–320            | 40–320            | %    |
| $I_C/I_F$ ( $I_F=1.0\text{ mA}$ )                                   | 30(>13)          | 45(>22)          | 70(>34)           | 90(>56)           | 30(>13)          | 45(>22)           | 70(>34)           | 30(>13)           | 45(>22)           | 30(>13)           |      |
| Collector-Emitter Leakage Current, $I_{CEO}$ , $V_{CE}=10\text{ V}$ | 2.0( $\leq 50$ ) | 2.0( $\leq 50$ ) | 5.0( $\leq 100$ ) | 5.0( $\leq 100$ ) | 2.0( $\leq 50$ ) | 5.0( $\leq 100$ ) | 5.0( $\leq 100$ ) | 5.0( $\leq 100$ ) | 5.0( $\leq 100$ ) | 5.0( $\leq 100$ ) | nA   |

**Table 1.  $I_F=10\text{ mA}$ ,  $V_{CC}=5.0\text{ V}$ ,  $T_A=25^\circ\text{C}$ , without Saturation**

| Parameter         | Sym.      | Value | Unit          |
|-------------------|-----------|-------|---------------|
| Load Resistance   | $R_L$     | 75    | $\Omega$      |
| Turn-on Time      | $t_{on}$  | 3.0   | $\mu\text{s}$ |
| 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   |               |

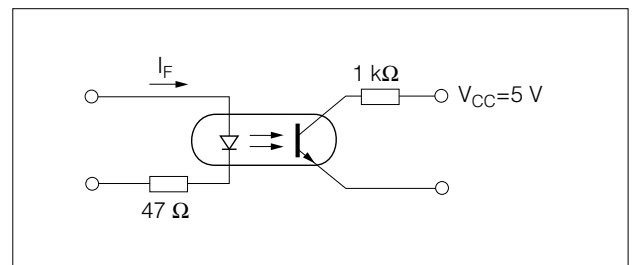
**Figure 1. Switching Times (Typical) Linear Operation (without saturation)**



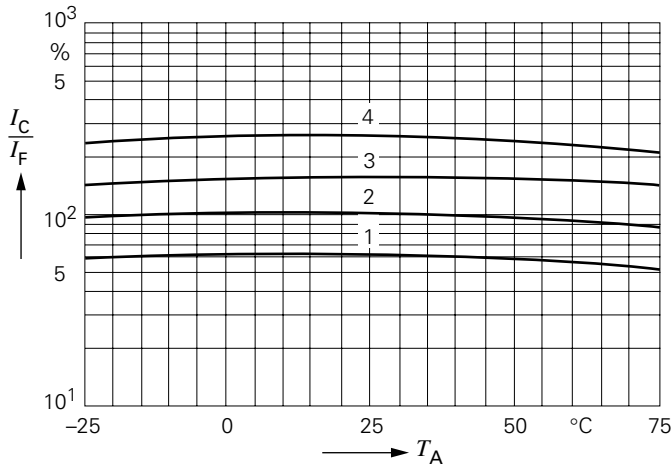
**Table 2.  $V_{CC}=5.0\text{ V}$ ,  $T_A=25^\circ\text{C}$ , with Saturation**

| Parameter       | Sym.      | Switching Time by Dash Numbers     |                                   |                                     | Unit          |
|-----------------|-----------|------------------------------------|-----------------------------------|-------------------------------------|---------------|
|                 |           | -1, -12, -13<br>$I_F=20\text{ mA}$ | -2, -3, -23<br>$I_F=10\text{ mA}$ | -4, -34, -24<br>$I_F=5.0\text{ mA}$ |               |
| Load Resistance | $R_L$     | 1000                               | 1000                              | 1000                                | $\Omega$      |
| Turn-on Time    | $t_{on}$  | 3.0                                | 4.2                               | 6.0                                 | $\mu\text{s}$ |
| 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                                  |               |

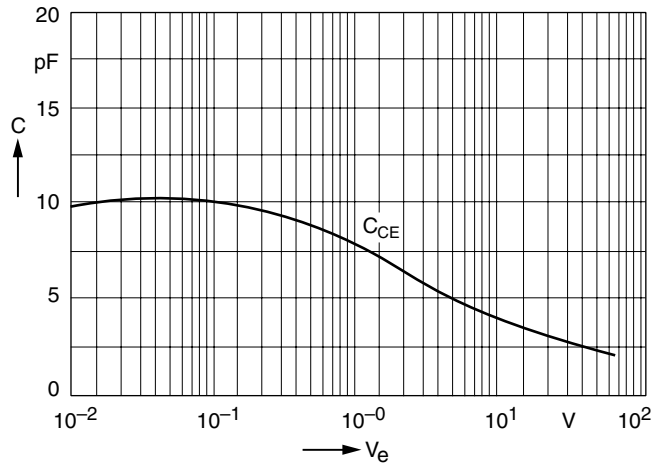
**Figure 2. Switching Operation (with saturation)**



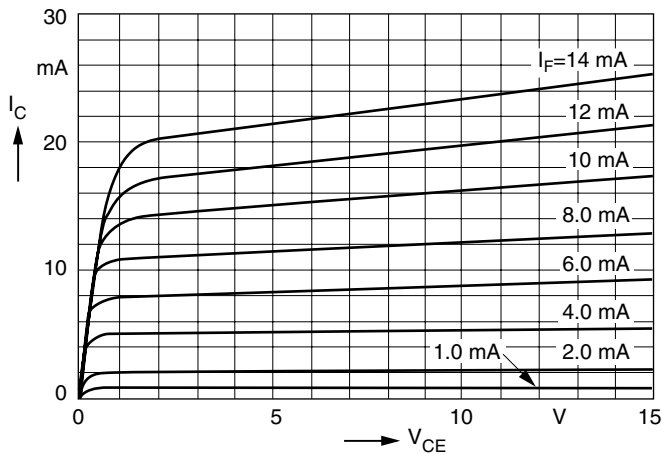
**Figure 3. Current Transfer Ratio (typical) vs. Temperature**  
 $I_F=10\text{ mA}$ ,  $V_{CE}=5.0\text{ V}$



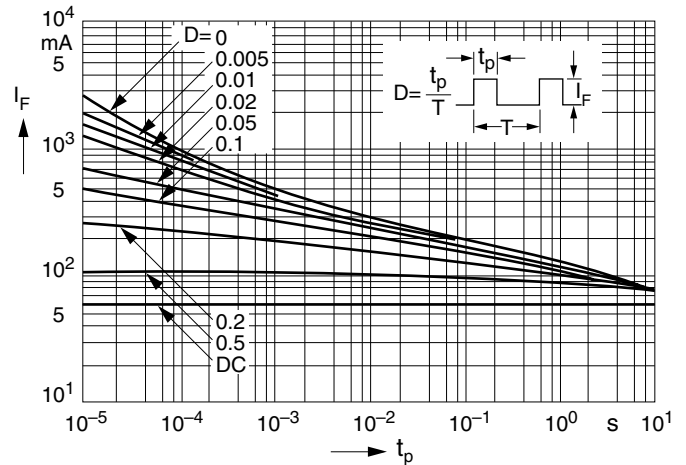
**Figure 6. Transistor Capacitance (typical) vs. Collector-emitter Voltage**  
 $T_A=25^\circ\text{C}$ ,  $f=1.0\text{ MHz}$



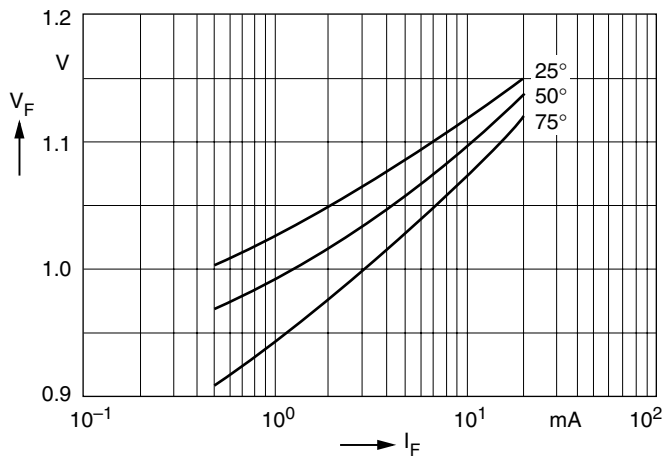
**Figure 4. Output Characteristics (typical) Collector Current vs. Collector-emitter Voltage**  
 $T_A=25^\circ\text{C}$



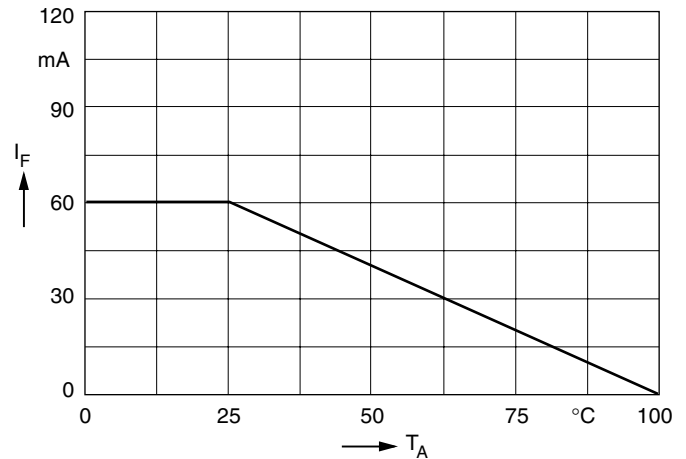
**Figure 7. Permissible Pulse Handling Capability. Forward Current vs. Pulse Width**  
 Pulse cycle  $D$ =parameter,  $T_A=25^\circ\text{C}$



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



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



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

