

**FEATURES**

- **High Current Transfer Ratios**
  - SFH601-1, 40 to 80%
  - SFH601-2, 63 to 125%
  - SFH601-3, 100 to 200%
  - SFH601-4, 160 to 320%
- **Isolation Test Voltage (1.0 s), 5300 V<sub>RMS</sub>**
- **V<sub>CEsat</sub> 0.25 (≤0.4) V, I<sub>F</sub>=10 mA, I<sub>C</sub>=2.5 mA**
- **Built to conform to VDE Requirements**
- **Highest Quality Premium Device**
- **Long Term Stability**
- **Storage Temperature, -55° to +150°C**
- **Field Effect Stable by TRIOS (TRansparent IO Shield)**
- **Underwriters Lab File #E52744**
- **CECC Approved**
- **VDE 0884 Available with Option 1**

**DESCRIPTION**

The SFH601 is an optocoupler with a Gallium Arsenide LED emitter which is optically coupled with a silicon planar phototransistor detector. The component is packaged in a plastic plug-in case 20 AB DIN 41866.

The coupler transmits signals between two electrically isolated circuits.

**Maximum Ratings****Emitter**

Reverse Voltage ..... 6.0 V  
DC Forward Current ..... 60 mA  
Surge Forward Current (t<sub>p</sub> = 10 μs) ..... 2.5 A  
Total Power Dissipation ..... 100 mW

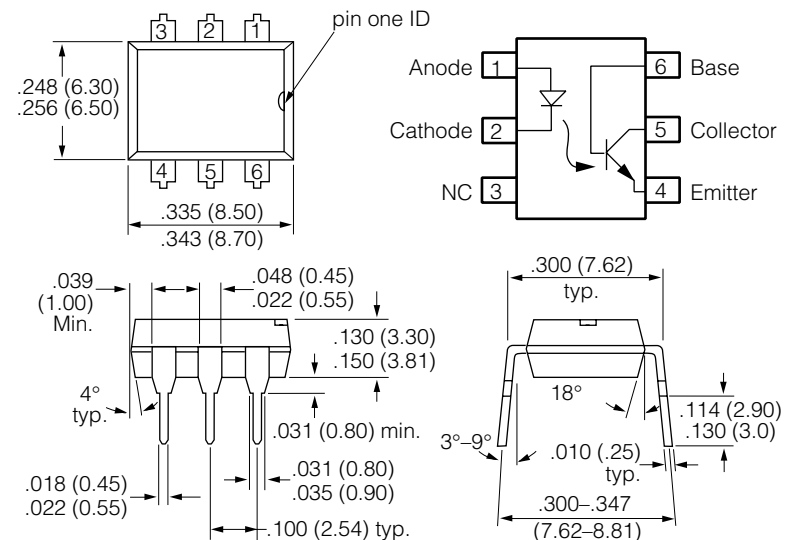
**Detector**

Collector-Emitter Voltage ..... 100 V  
Emitter-Base Voltage ..... 7.0 V  
Collector Current ..... 50 mA  
Collector Current (t = 1.0 ms) ..... 100 mA  
Power Dissipation ..... 150 mW

**Package**

Isolation Test Voltage (between emitter and detector referred to climate DIN 40046, part 2, Nov. 74) (t = 1.0 s) ..... 5300 V<sub>RMS</sub>  
Creepage ..... ≥7.0 mm  
Clearance ..... ≥7.0 mm  
Isolation Thickness between Emitter and Detector ..... ≥0.4 mm  
Comparative Tracking Index per DIN IEC 112/VDE0303, part 1 ..... 175  
Isolation Resistance  
V<sub>IO</sub>=500 V, T<sub>A</sub>=25°C ..... ≥10<sup>12</sup> Ω  
V<sub>IO</sub>=500 V, T<sub>A</sub>=100°C ..... ≥10<sup>11</sup> Ω  
Storage Temperature Range ..... -55°C to +150°C  
Ambient Temperature Range ..... -55°C to +100°C  
Junction Temperature ..... 100°C  
Soldering Temperature (max. 10 s, dip soldering: distance to seating plane ≥1.5 mm) ..... 260°C

Dimensions in inches (mm)

**Characteristics (T<sub>A</sub>=25°C)**

|                                       | Symbol              |                 | Unit | Condition                                        |
|---------------------------------------|---------------------|-----------------|------|--------------------------------------------------|
| <b>Emitter</b>                        |                     |                 |      |                                                  |
| Forward Voltage                       | V <sub>F</sub>      | 1.25<br>(≤1.65) | V    | I <sub>F</sub> =60 mA                            |
| Breakdown Voltage                     | V <sub>BR</sub>     | ≥6.0            | V    | I <sub>R</sub> =10 μA                            |
| Reverse Current                       | I <sub>R</sub>      | 0.01 (≤10)      | μA   | V <sub>R</sub> =6.0 V                            |
| Capacitance                           | C <sub>O</sub>      | 25              | pF   | V <sub>F</sub> =0 V<br>f=1.0 MHz                 |
| Thermal Resistance                    | R <sub>THJamb</sub> | 750             | K/W  |                                                  |
| <b>Detector</b>                       |                     |                 |      |                                                  |
| Capacitance                           |                     |                 | pF   | f=1.0 MHz                                        |
| Collector-Emitter                     | C <sub>CE</sub>     | 6.8             |      | V <sub>CE</sub> =5.0 V                           |
| Collector-Base                        | C <sub>CB</sub>     | 8.5             |      | V <sub>CB</sub> =5.0 V                           |
| Emitter-Base                          | C <sub>EB</sub>     | 11              |      | V <sub>EB</sub> =5.0 V                           |
| Thermal Resistance                    | R <sub>THJamb</sub> | 500             | K/W  |                                                  |
| <b>Package</b>                        |                     |                 |      |                                                  |
| Saturation Voltage, Collector-Emitter | V <sub>CEsat</sub>  | 0.25 (≤0.4)     | V    | I <sub>F</sub> =10 mA,<br>I <sub>C</sub> =2.5 mA |
| Coupling Capacitance                  | C <sub>IO</sub>     | 0.6             | pF   | V <sub>IO</sub> =0<br>f=1.0 MHz                  |

Table 1. Current Transfer Ratio and Collector-emitter Leakage Current by Dash Number

| Parameter                                       | Dash No.          |                   |                    |                    | Unit | Condition            |
|-------------------------------------------------|-------------------|-------------------|--------------------|--------------------|------|----------------------|
|                                                 | -1                | -2                | -3                 | -4                 |      |                      |
| $I_C/I_F$ at $V_{CE}=5.0\text{ V}$              | 40-80             | 63-125            | 100-200            | 160-320            | %    | $I_F=10\text{ mA}$   |
| $I_C/I_F$ at $V_{CE}=5.0\text{ V}$              | 30 (>13)          | 45 (>22)          | 70 (>34)           | 90 (>56)           | %    | $I_F=1.0\text{ mA}$  |
| Collector-Emitter Leakage Current ( $I_{CEO}$ ) | 2.0 ( $\leq 50$ ) | 2.0 ( $\leq 50$ ) | 5.0 ( $\leq 100$ ) | 5.0 ( $\leq 100$ ) | nA   | $V_{CE}=10\text{ V}$ |

Figure 1. Linear Operation (without saturation)

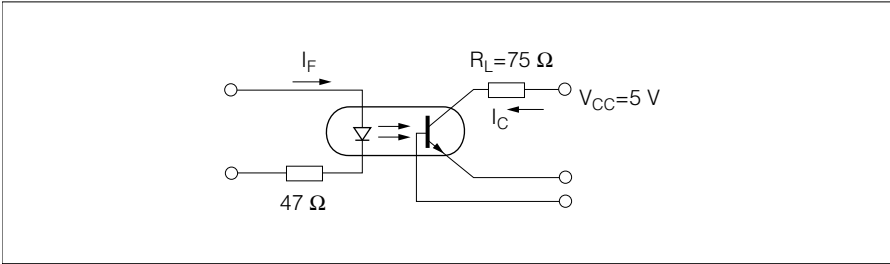


Table 2.  $I_F=10\text{ mA}$ ,  $V_{CC}=5.0\text{ V}$ ,  $T_A=25^\circ\text{C}$ , Typical

|                   |           |     |               |
|-------------------|-----------|-----|---------------|
| 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 | $\text{kHz}$  |

Figure 2. Switching Operation (with saturation)

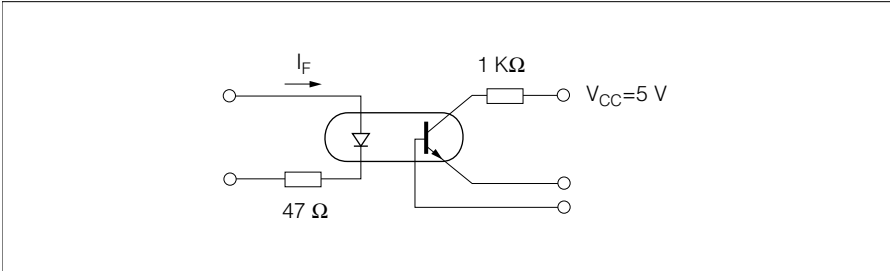


Table 3. Typical

| Parameter     |             | Dash No.                     |                                     |                               | Unit          |
|---------------|-------------|------------------------------|-------------------------------------|-------------------------------|---------------|
|               |             | -1<br>( $I_F=20\text{ mA}$ ) | -2 and -3<br>( $I_F=10\text{ mA}$ ) | -4<br>( $I_F=5.0\text{ mA}$ ) |               |
| 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                            |               |
|               | $V_{CESAT}$ | 0.25 ( $\leq 0.4$ )          |                                     |                               | V             |

Figure 3. Current Transfer Ratio versus Diode Current ( $T_A=-25^\circ\text{C}$ ,  $V_{CE}=5.0\text{ V}$ )

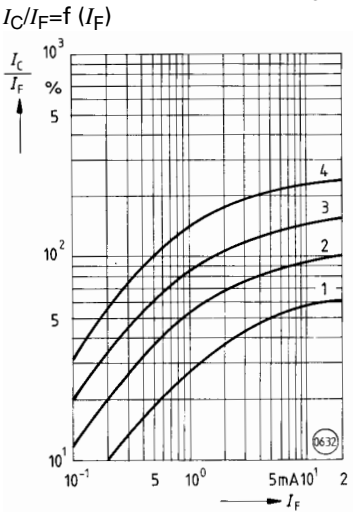


Figure 4. Current Transfer Ratio versus Diode Current ( $T_A=0^\circ\text{C}$ ,  $V_{CE}=5.0\text{ V}$ )

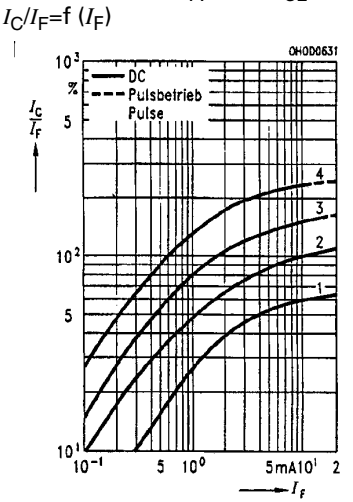
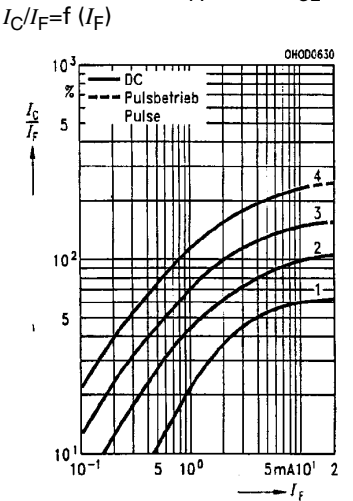
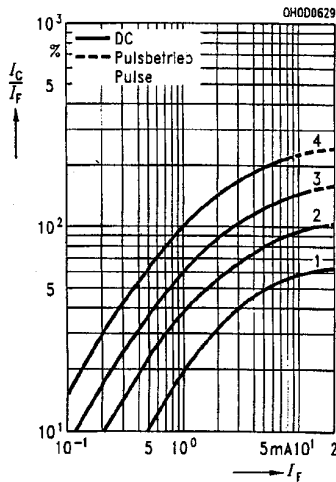


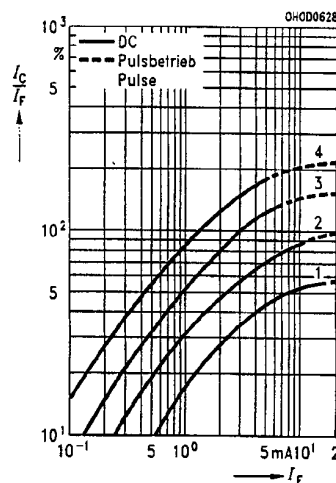
Figure 5. Current Transfer Ratio versus Diode Current ( $T_A=25^\circ\text{C}$ ,  $V_{CE}=5.0\text{ V}$ )



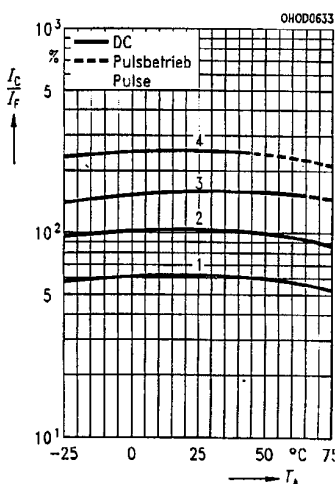
**Figure 6. Current Transfer Ratio versus Diode Current** ( $T_A=50^\circ\text{C}$ ,  $V_{CE}=5.0\text{ V}$ )  $I_C/I_F=f(I_F)$



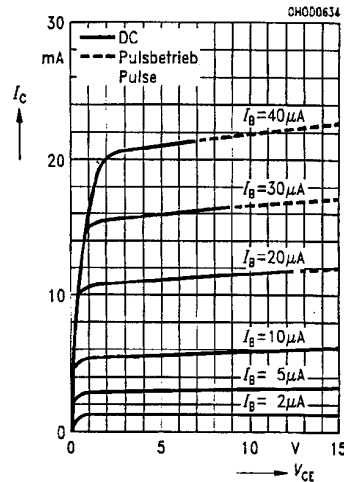
**Figure 7. Current Transfer Ratio versus Diode Current** ( $T_A=75^\circ\text{C}$ ,  $V_{CE}=5.0\text{ V}$ )  $I_C/I_F=f(I_F)$



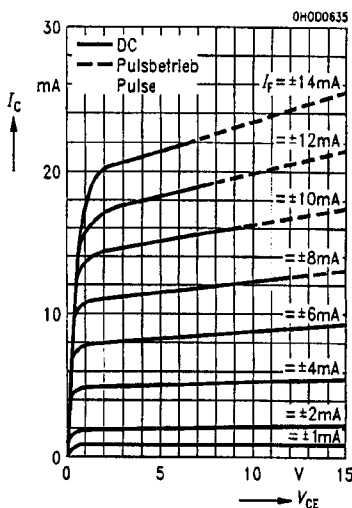
**Figure 8. Current Transfer Ratio versus Temperature** ( $I_F=10\text{ mA}$ ,  $V_{CE}=5.0\text{ V}$ )  $I_C/I_F=f(T)$



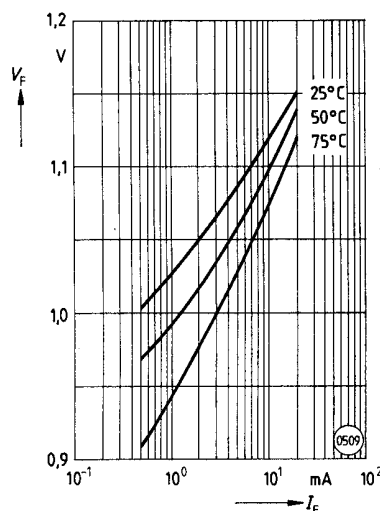
**Figure 9. Transistor Characteristics** (HFE=550)  $I_C=f(V_{CE})$  ( $T_A=25^\circ\text{C}$ ,  $I_F=0$ )



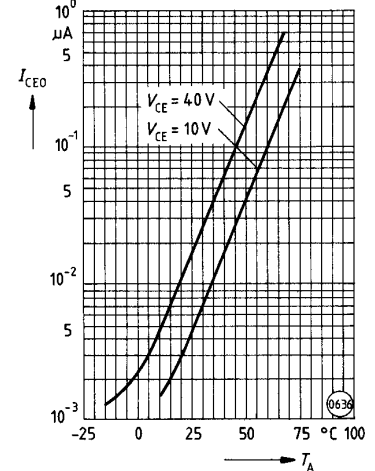
**Figure 10. Output Characteristics** ( $T_A=25^\circ\text{C}$ )  $I_C=f(V_{CE})$



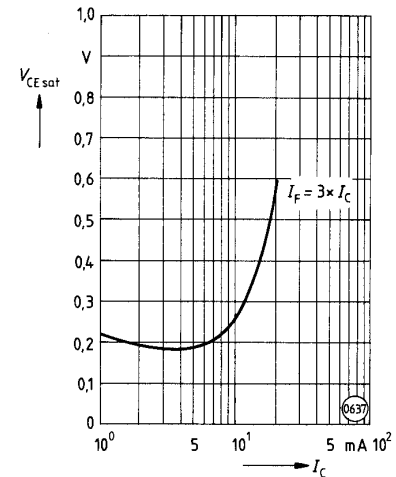
**Figure 11. Forward Voltage**  $V_F=f(I_F)$



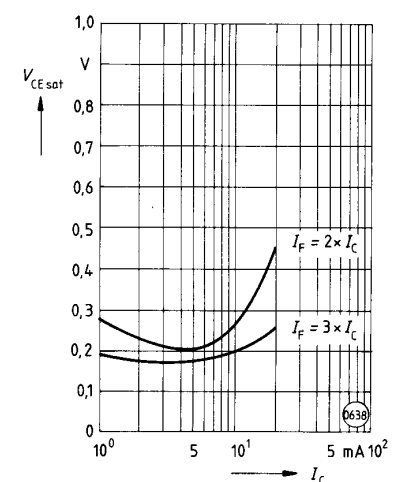
**Figure 12. Collector Emitter Off-state Current**  $I_{CEO}=f(V, T)$  ( $T_A=25^\circ\text{C}$ ,  $I_F=0$ )



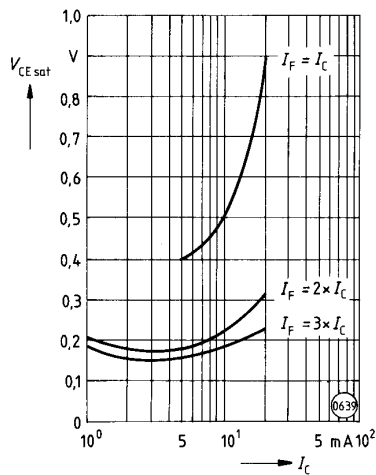
**Figure 13. Saturation Voltage versus Collector Current and Modulation Depth** SFH601-1  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



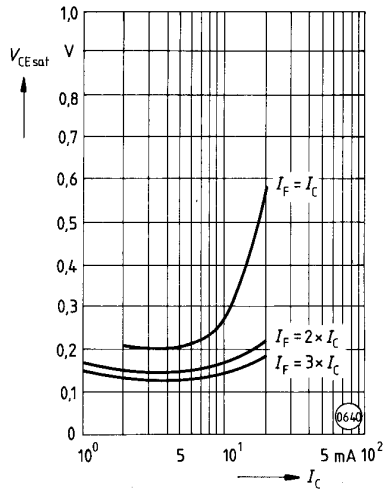
**Figure 14. Saturation Voltage versus Collector Current and Modulation Depth** SFH601-2  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



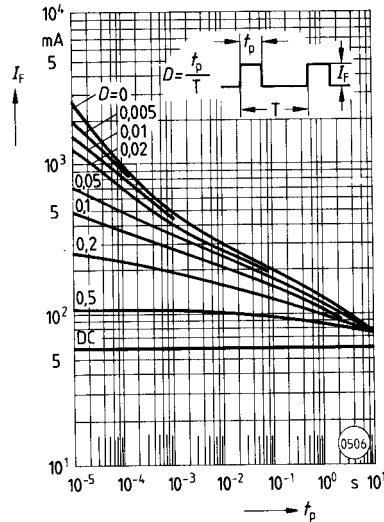
**Figure 15. Saturation Voltage versus Collector Current and Modulation Depth SFH601-3**  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



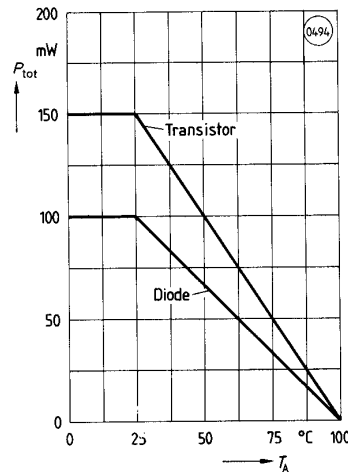
**Figure 16. Saturation Voltage versus Collector Current and Modulation Depth SFH601-4**  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



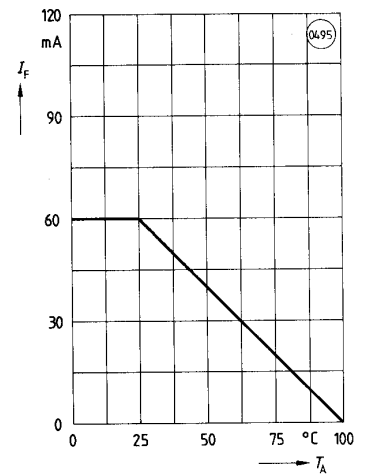
**Figure 17. Permissible Pulse Load**  $D=\text{parameter}$ ,  $T_A=25^\circ\text{C}$ ,  $I_F=f(t_p)$



**Figure 18. Permissible Power Dissipation for Transistor and Diode**  $P_{tot}=f(T_A)$



**Figure 19. Permissible Forward Current Diode**  $P_{tot}=f(T_A)$



**Figure 20. Transistor Capacitance**  $C=f(V_O)$  ( $T_A=25^\circ\text{C}$ ,  $f=1.0\text{ MHz}$ )

