

# SIEMENS

# SFH600 SERIES TRIOS®\* PHOTOTRANSISTOR OPTOCOUPLER

## FEATURES

- **High Current Transfer Ratios**  
SFH600-0, 40 to 80%  
SFH600-1, 63 to 125%  
SFH600-2, 100 to 200%  
SFH600-3, 160 to 320%
- **Isolation Test Voltage (1 Sec.), 5300 VACRMS**
- **VCEsat 0.25 (0.4) V, IF=10 mA, IC=2.5 mA**
- **High Quality Premium Device**
- **Long Term Stability**
- **Storage Temperature, -55∞ to +150∞C**
- **Underwriters Lab File #E52744**
- **VDE 0884 Available with Option 1**

## DESCRIPTION

The SFH600 is an optocoupler with a GaAs 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. The potential difference between the circuits to be coupled is not allowed to exceed the maximum permissible insulating voltage.

## Maximum Ratings

### Emitter

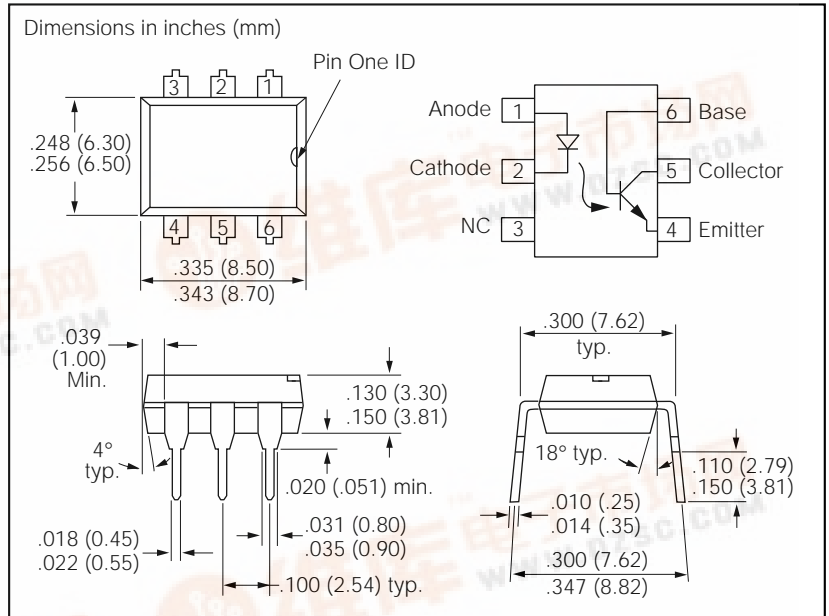
Reverse Voltage..... 6 V  
DC Forward Current..... 60 mA  
Surge Forward Current (t<sub>p</sub>=10 μs)..... 2.5 A  
Total Power Dissipation..... 100 mW

### Detector

Collector-Emitter Voltage ..... 70 V  
Emitter-Base Voltage ..... 7 V  
Collector Current..... 50 mA  
Collector Current (t=1 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 sec.).....5300 VAC<sub>RMS</sub>  
Creepage.....≥7 mm  
Clearance ..... ≥7 mm  
Isolation Thickness between Emitter & 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



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

	Symbol		Unit	Condition
<b>Emitter</b>				
Forward Voltage	V <sub>F</sub>	1.25 (≤1.65)	V	I <sub>F</sub> =60 mA
Breakdown Voltage	V <sub>BR</sub>	≥6	V	I <sub>R</sub> =10 μA
Reverse Current	I <sub>R</sub>	0.01 (≤10)	μA	V <sub>R</sub> =6 V
Capacitance	C <sub>O</sub>	25	pF	V <sub>F</sub> =0 V, f=1 MHz
Thermal Resistance	R <sub>THJamb</sub>	750	°C/W	
<b>Detector</b>				
Capacitance			pF	f=1 MHz
Collector-Emitter	C <sub>CE</sub>	5.2		V <sub>CE</sub> =5 V
Collector-Base	C <sub>CB</sub>	6.5		V <sub>CB</sub> =5 V
Emitter-Base	C <sub>EB</sub>	9.5		V <sub>EB</sub> =5 V
Thermal Resistance	R <sub>THJamb</sub>	500	°C/W	
<b>Package</b>				
Saturation Voltage, Collector-Emitter	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>IO</sub>	0.6	pF	V <sub>IO</sub> =0, f=1 MHz

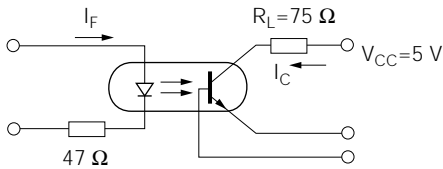
\*TRIOS—Transparent IO Shield



**Current Transfer Ratio and Collector-Emitter Leakage Current by dash number**

	-0	-1	-2	-3	Unit
$I_C/I_F$ at $V_{CE}=5\text{ V}$ ( $I_F=10\text{ mA}$ )	40-80	63-125	100-200	160-320	%
$I_C/I_F$ at $V_{CE}=5\text{ V}$ ( $I_F=1\text{ mA}$ )	30 (>13)	45 (>22)	70 (>34)	90 (>56)	%
Collector-Emitter Leakage Current ( $V_{CE}=10\text{ V}$ ) ( $I_{CEO}$ )	2 ( $\leq$ 35)	2 ( $\leq$ 35)	2 ( $\leq$ 35)	5 ( $\leq$ 70)	nA

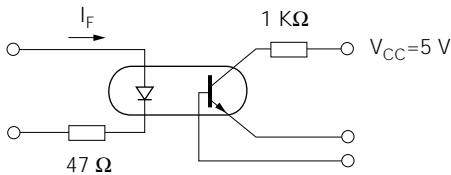
**Figure 1. Linear operation (without saturation)**



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

Load Resistance	$R_L$	75	$\Omega$
Turn-On Time	$t_{ON}$	3.2	$\mu\text{s}$
Rise Time	$t_R$	2.0	$\mu\text{s}$
Turn-Off Time	$t_{OFF}$	3.0	$\mu\text{s}$
Fall Time	$t_f$	2.5	$\mu\text{s}$
Cut-off Frequency	$F_{CO}$	250	kHz

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

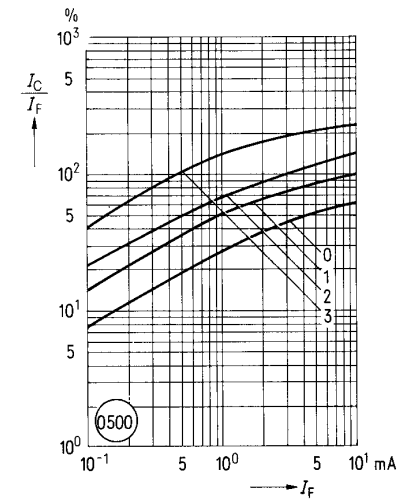


Typical

		-0 ( $I_F=20\text{ mA}$ )	-1 and -2 ( $I_F=10\text{ mA}$ )	-3 ( $I_F=5\text{ mA}$ )	
Turn-On Time	$t_{ON}$	3.7	4.5	5.8	$\mu\text{s}$
Rise Time	$t_R$	2.5	3.0	4.0	$\mu\text{s}$
Turn-Off Time	$t_{OFF}$	19	21	24	$\mu\text{s}$
Fall Time	$t_f$	11	12	14	$\mu\text{s}$
	$V_{CESAT}$	0.25 ( $\leq$ 0.4)			V

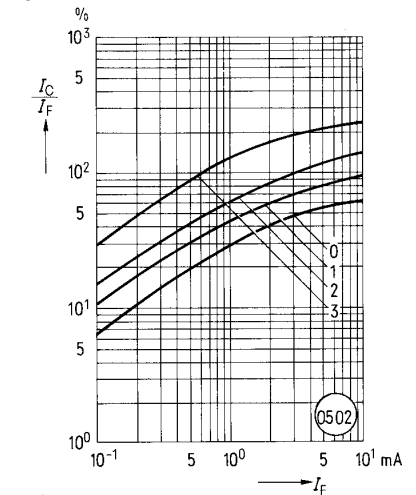
**Figure 3. Current transfer ratio versus diode current**

( $T_A=-25\text{ }^\circ\text{C}$ ,  $V_{CE}=5\text{ V}$ )  $I_C/I_F=f(I_F)$



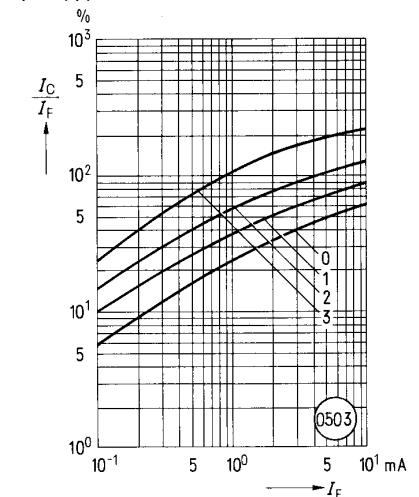
**Figure 4. Current transfer ratio versus diode current**

( $T_A=0\text{ }^\circ\text{C}$ ,  $V_{CE}=5\text{ V}$ )  $I_C/I_F=f(I_F)$

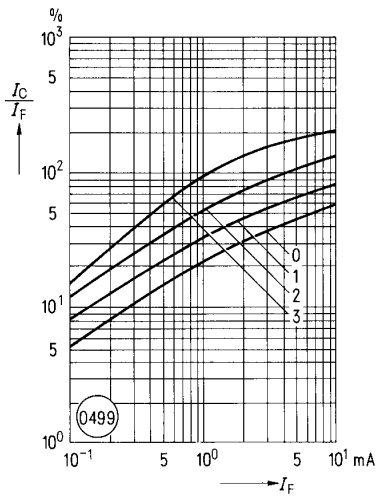


**Figure 5. Current transfer ratio versus diode current**

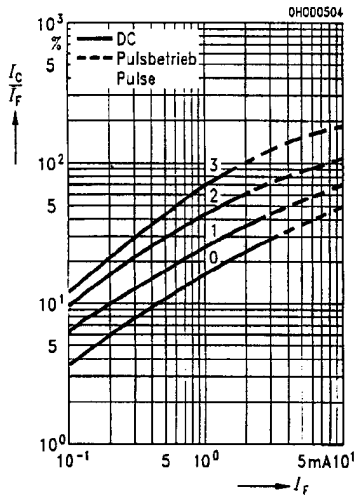
( $T_A=25\text{ }^\circ\text{C}$ ,  $V_{CE}=5\text{ V}$ )  $I_C/I_F=f(I_F)$



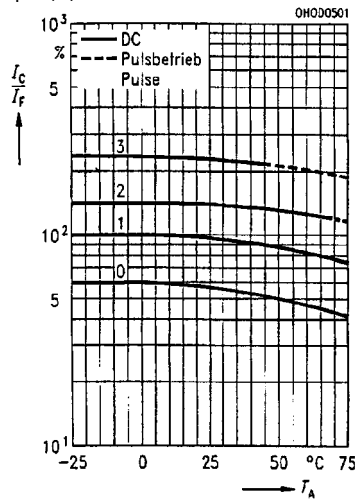
**Figure 6. Current transfer ratio versus diode current** ( $T_A=50^\circ\text{C}$ ,  $V_{CE}=5\text{ V}$ )  
 $I_C/I_F=f(I_F)$



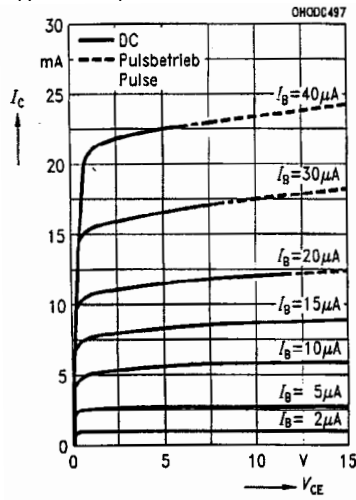
**Figure 7. Current transfer ratio versus diode current** ( $T_A=75^\circ\text{C}$ )  
 $V_{CE}=5\text{ V}$ ,  $I_C/I_F=f(I_F)$



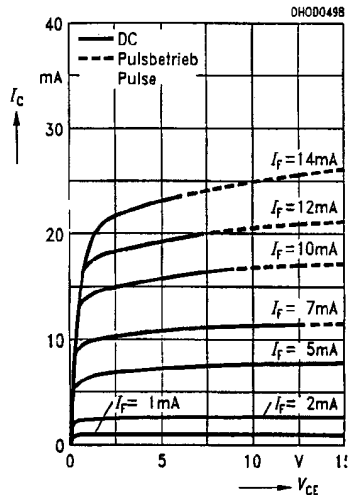
**Figure 8. Current transfer ratio versus temperature** ( $I_F=10\text{ mA}$ ,  $V_{CE}=5\text{ V}$ )  
 $I_C/I_F=f(T)$



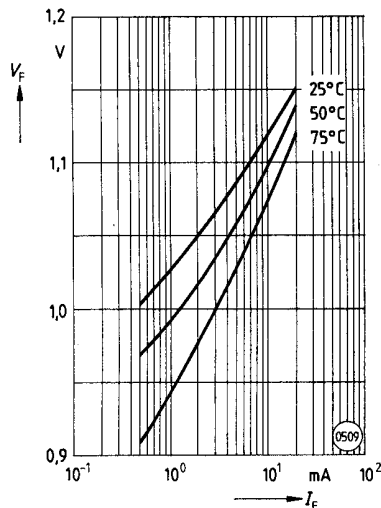
**Figure 9. Transistor characteristics** (HFE =550) SFH600-2, -3  $I_C=f(V_{CE})$   
( $T_A=25^\circ\text{C}$ ,  $I_F=0$ )



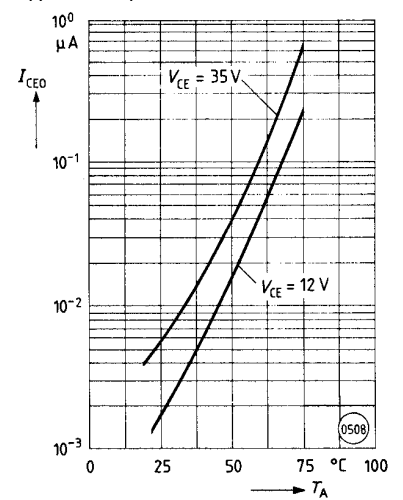
**Figure 10. Output characteristics** SFH600-2, -3 ( $T_A=25^\circ\text{C}$ )  $I_C=f(V_{CE})$



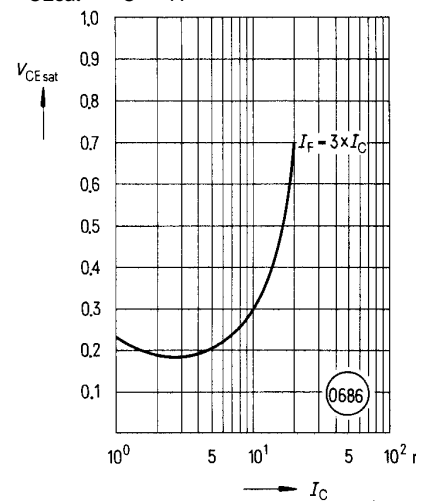
**Figure 11. Forward voltage**  $V_F=f(I_F)$



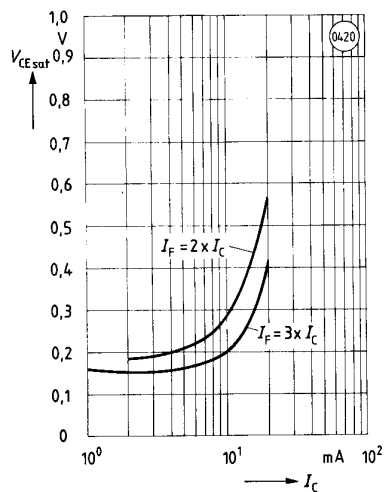
**Figure 12. Collector emitter off-state current**  $I_{CEO}=f(V, T)$   
( $T_A=25^\circ\text{C}$ ,  $I_F=0$ )



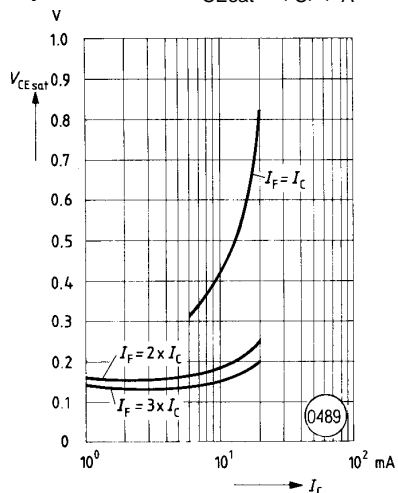
**Figure 13. Saturation voltage versus collector current and modulation depth** SFH600-0  
 $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



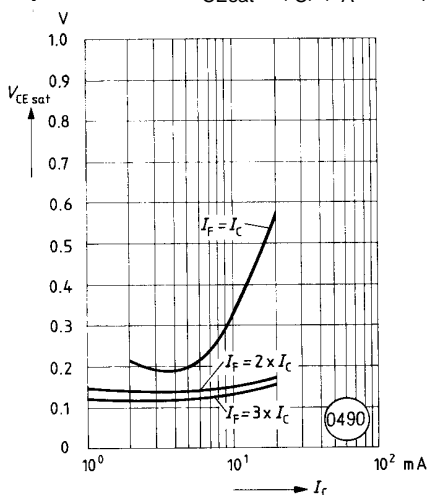
**Figure 14. Saturation voltage versus collector current and modulation depth SFH600-1**  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



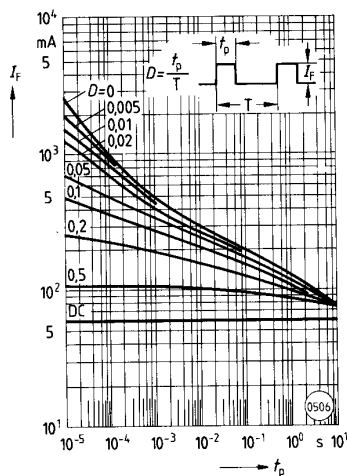
**Figure 15. Saturation voltage versus collector current and modulation depth SFH600-2**  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



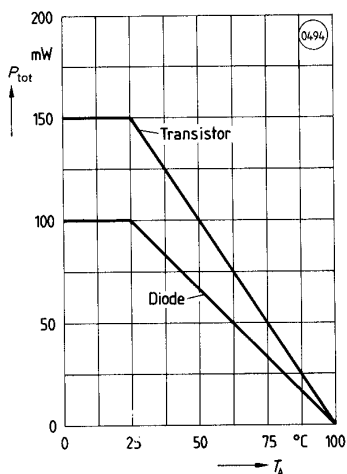
**Figure 16. Saturation voltage versus collector current and modulation depth SFH600-3**  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



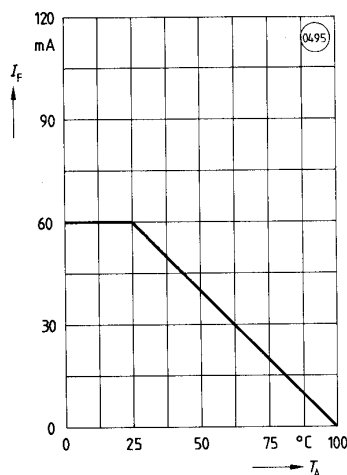
**Figure 17. Permissible pulse load**  $D=\text{parameter}$ ,  $T_A=25^\circ\text{C}$ ,  $I_F=f(t_p)$



**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**  $C=f(V_O)$  ( $T_A=25^\circ\text{C}$ ,  $f=1\text{ MHz}$ )

