



# SFH600

## 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 (1.0 s), 5300 V<sub>RMS</sub>**
- $V_{CEsat}$  0.25 ( $\leq 0.4$ ) V,  $I_F=10$  mA,  $I_C=2.5$  mA
- **High Quality Premium Device**
- **Long Term Stability**
- **Storage Temperature, -55° to +150°C**
- **Field Effect Stable by TRIOS (TRansparent IOn Shield)**
- **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 .....	6.0 V
DC Forward Current.....	.60 mA
Surge Forward Current ( $t_p=10$ $\mu$ s) .....	2.5 A
Total Power Dissipation.....	100 mW

#### Detector

Collector-Emitter Voltage.....	70 V
Emitter-Base Voltage.....	7.0 V
Collector Current.....	.50 mA
Collector Current ( $t=1$ ms) .....	100 mA
Power Dissipation .....	150 mW

#### Package

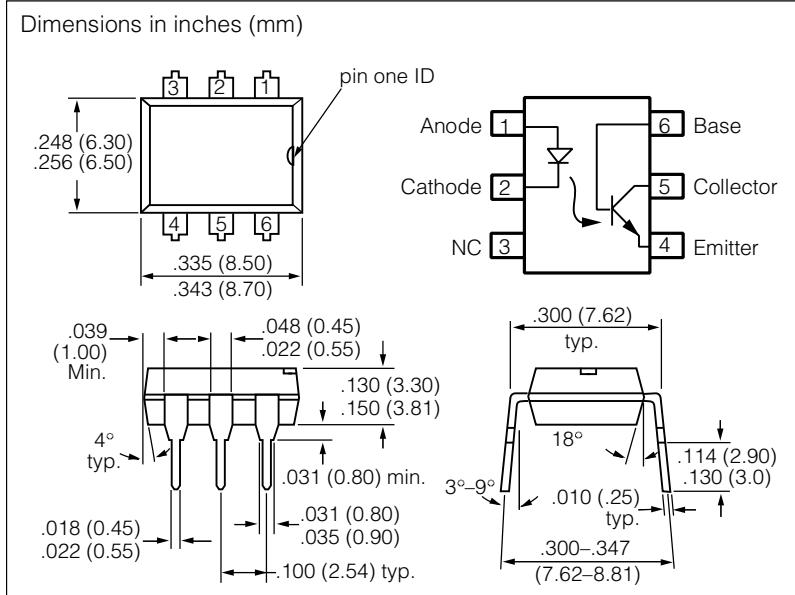
Isolation Test Voltage (between emitter and detector referred to climate DIN 40046, part 2, Nov. 74) ( $t=1.0$ s) .....	5300 V <sub>RMS</sub>
Creepage .....	$\geq 7.0$ mm
Clearance.....	$\geq 7.0$ mm

Isolation Thickness between Emitter & Detector .....	$\geq 0.4$ mm
Comparative Tracking Index per DIN IEC 112/VDE0303, part 1 .....	175
Isolation Resistance .....	

$V_{IO}=500$  V,  $T_A=25^\circ\text{C}$  .....  $\geq 10^{12} \Omega$   
 $V_{IO}=500$  V,  $T_A=100^\circ\text{C}$  .....  $\geq 10^{11} \Omega$

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 $\geq 1.5$ mm) .....	260°C
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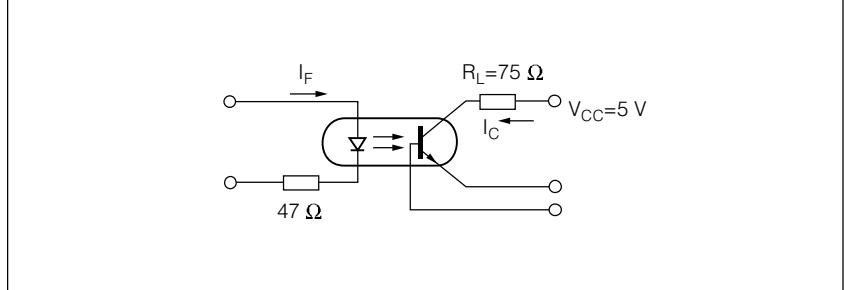
### Characteristics ( $T_A=25^\circ\text{C}$ )

	Symbol		Unit	Condition
<b>Emitter</b>				
Forward Voltage	$V_F$	1.25 ( $\leq 1.65$ )	V	$I_F=60$ mA
Breakdown Voltage	$V_{BR}$	$\geq 6.0$		$I_R=10$ $\mu$ A
Reverse Current	$I_R$	0.01 ( $\leq 10$ )	$\mu$ A	$V_R=6.0$ V
Capacitance	$C_O$	25	pF	$V_F=0$ V $f=1.0$ MHz
Thermal Resistance	$R_{THJamb}$	750	K/W	—
<b>Detector</b>				
Capacitance Collector-Emitter	$C_{CE}$	5.2	pF	$f=1.0$ MHz
Collector-Base	$C_{CB}$	6.5		$V_{CE}=5.0$ V
Emitter-Base	$C_{EB}$	9.5		$V_{CB}=5.0$ V
Thermal Resistance	$R_{THJamb}$	500	K/W	—
<b>Package</b>				
Saturation Voltage, Collector-Emitter	$V_{CEsat}$	0.25 ( $\leq 0.4$ )	V	$I_F=10$ mA, $I_C=2.5$ mA
Coupling Capacitance	$C_{IO}$	0.6	pF	$V_{IO}=0$ $f=1.0$ MHz

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

Parameter	Dash No.				Unit	Condition
	-0	-1	-2	-3		
$I_C/I_F$ at $V_{CE}=5.0$ V	40-80	63-125	100-200	160-320	%	$I_F=10$ mA
$I_C/I_F$ at $V_{CE}=5.0$ V	30 (>13)	45 (>22)	70 (>34)	90 (>56)		$I_F=1.0$ mA
Collector-Emitter Leakage Current ( $I_{CEO}$ )	2.0 ( $\leq 35$ )	2.0 ( $\leq 35$ )	2.0 ( $\leq 35$ )	5.0 ( $\leq 70$ )	nA	$V_{CE}=10$ V

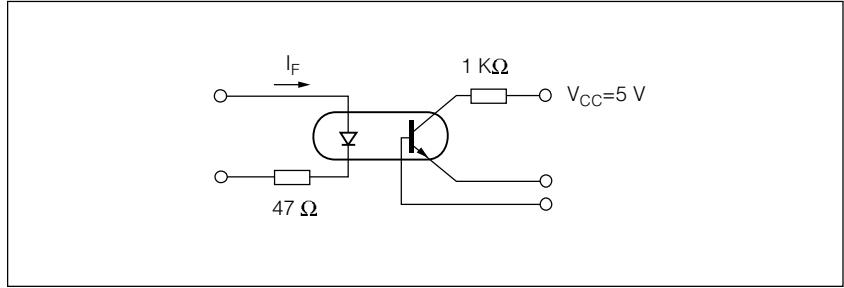
**Figure 1. Linear Operation (without saturation)**



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

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

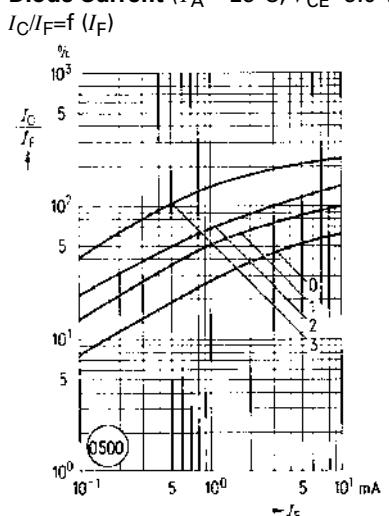
**Figure 2. Switching Operation (with saturation)**



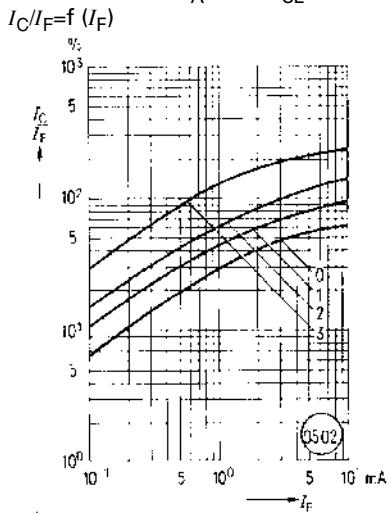
**Table 2. Typical**

Parameter		Dash No.			Unit
		-0 ( $I_F=20$ mA)	-1 and -2 ( $I_F=10$ mA)	-3 ( $I_F=5.0$ mA)	
Turn-On Time	$t_{ON}$	3.7	4.5	5.8	μs
Rise Time	$t_R$	2.5	3.0	4.0	
Turn-Off Time	$t_{OFF}$	19	21	24	
Fall Time	$t_f$	11	12	14	
	$V_{CESAT}$	0.25 ( $\leq 0.4$ )			V

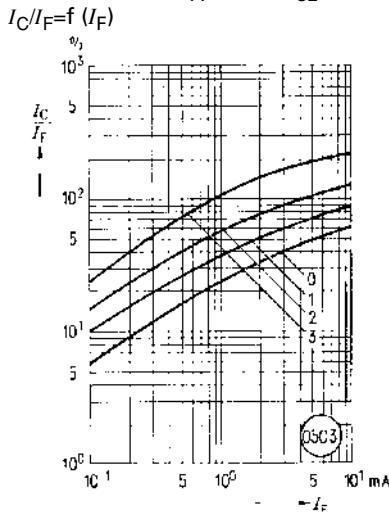
**Figure 3. Current Transfer Ratio versus Diode Current ( $T_A=-25^\circ\text{C}$ ,  $V_{CE}=5.0$  V)**



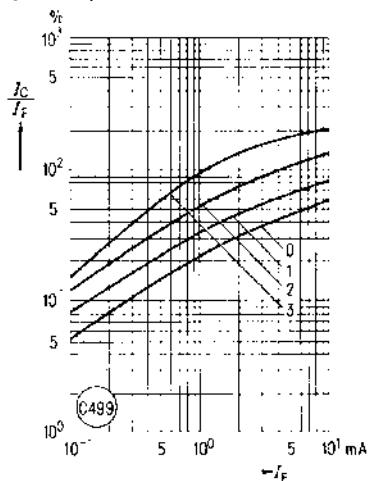
**Figure 4. Current Transfer Ratio versus Diode Current ( $T_A=0^\circ\text{C}$ ,  $V_{CE}=5.0$  V)**



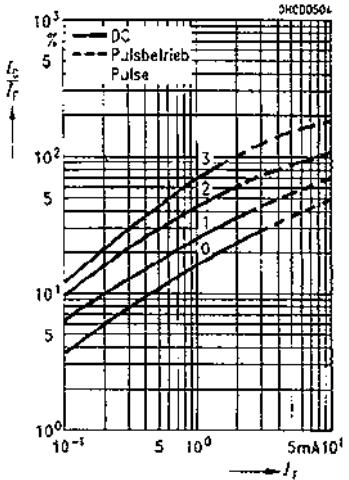
**Figure 5. Current Transfer Ratio versus Diode Current ( $T_A=25^\circ\text{C}$ ,  $V_{CE}=5.0$  V)**



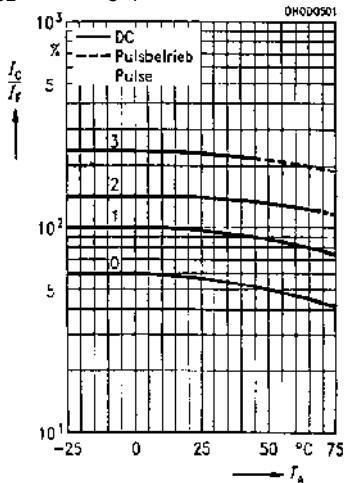
**Figure 6. Current Transfer Ratio versus Diode Current ( $T_A=50^\circ\text{C}$ ,  $V_{CE}=5.0$  V)  $I_C/I_F=f(I_F)$**



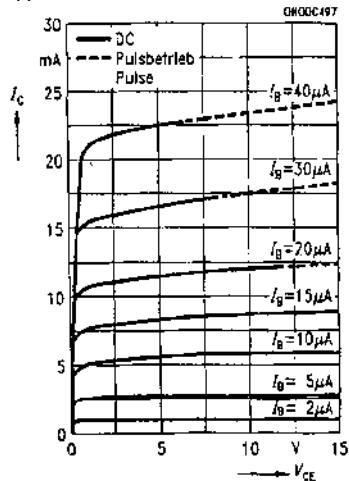
**Figure 7. Current Transfer Ratio versus Diode Current ( $T_A=75^\circ\text{C}$ ,  $V_{CE}=5.0$  V)  $I_C/I_F=f(I_F)$**



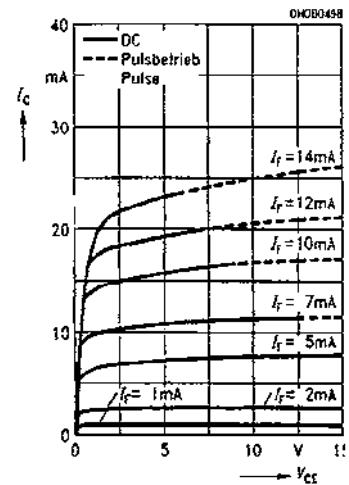
**Figure 8. Current Transfer Ratio versus Temperature ( $I_F=10$  mA,  $V_{CE}=5.0$  V)  $I_C/I_F=f(T)$**



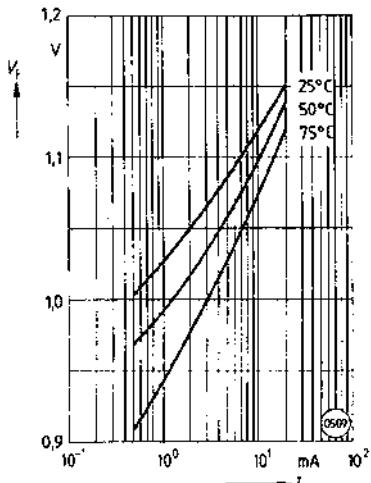
**Figure 9. Transistor Characteristics (HFE = 550) SFH600-2, -3  $I_C=f(V_{CE})$  ( $T_A=25^\circ\text{C}$ ,  $I_F=0$ )**



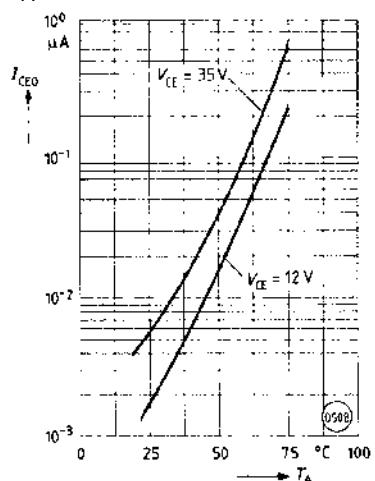
**Figure 10. Output Characteristics SFH600-2, -3 ( $T_A=25^\circ\text{C}$ )  $I_C=f(V_{CE})$**



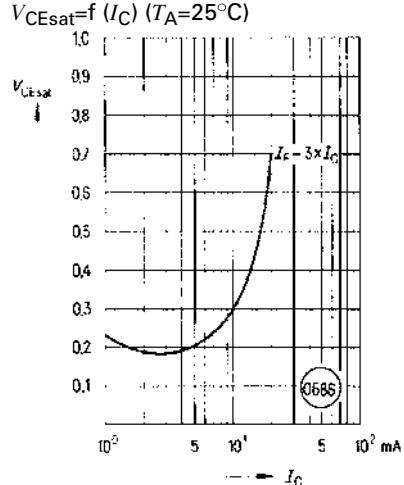
**Figure 11. Forward Voltage  $V_F=f(I_F)$**



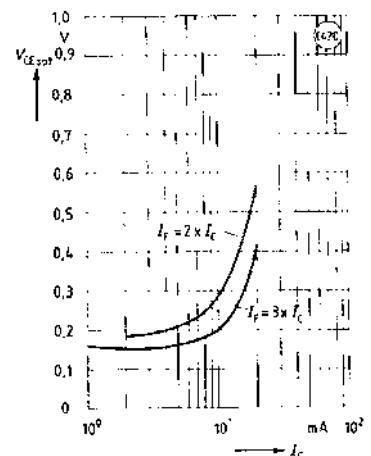
**Figure 12. Collector Emitter Off-state Current  $I_{CEO}=f(V, T)$  ( $T_A=25^\circ\text{C}$ ,  $I_F=0$ )**



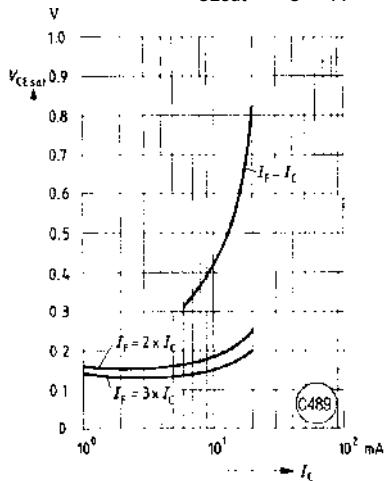
**Figure 13. Saturation Voltage versus Collector Current and Modulation Depth SFH600-0  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )**



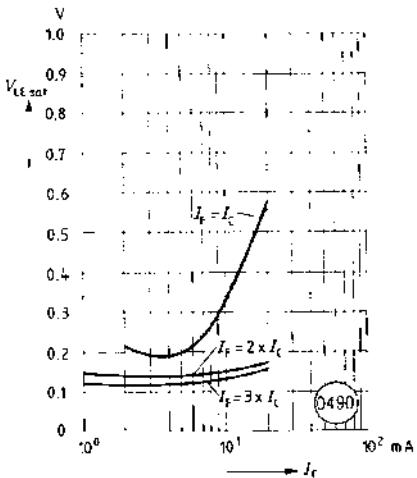
**Figure 14. Saturation Voltage versus Collector Current and Modulation Depth SFH600-1  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )**



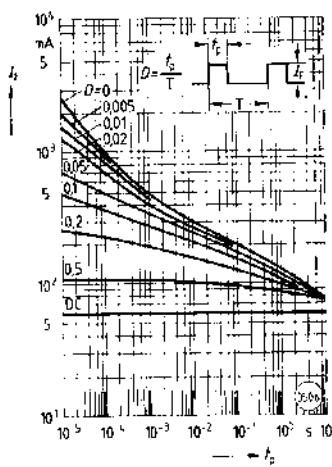
**Figure 15. Saturation Voltage versus Collector Current and Modulation Depth SFH600-2**  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



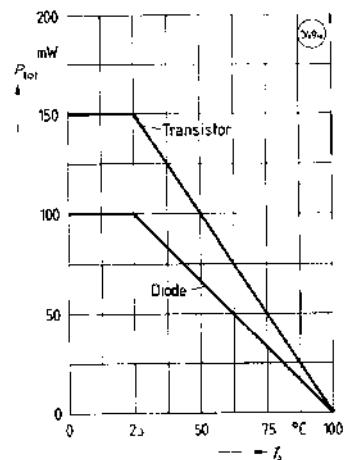
**Figure 16. Saturation Voltage versus Collector Current and Modulation Depth SFH600-3**  $V_{CEsat}=f(I_C)$  ( $T_A=25^\circ\text{C}$ )



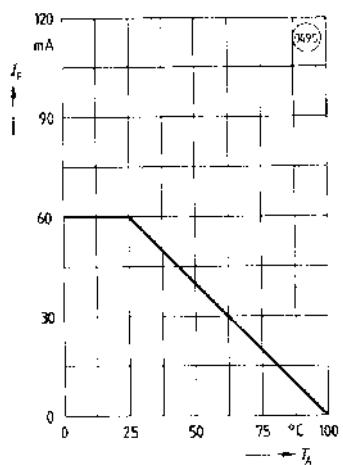
**Figure 17. Permissible Pulse Load D-parameter,  $T_A=25^\circ\text{C}$ ,  $I_F=f(t_p)$**



**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  $C=f(V_O)$  ( $T_A=25^\circ\text{C}$ ,  $f=1.0 \text{ MHz}$ )**

