SFH601

TRIOS® Phototransistor Optocoupler

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_{RMS}**
- **V_{CEsat} 0.25 (≤0.4) V, I_F=10 mA, I_C=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 IOn 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

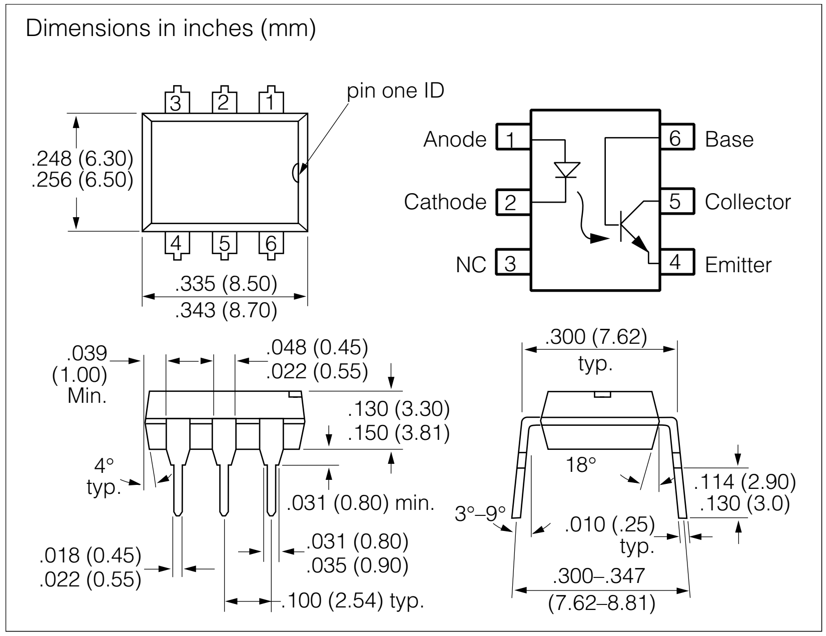
Reverse Voltage ....6.0 V
DC Forward Current ....60 mA
Surge Forward Current (t_p=10 µs) ....2.5 A
Total Power Dissipation ....100 mW

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_{RMS}
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_{IO}=500 V, T_A=25°C .... ≥10^{12} Ω
V_{IO}=500 V, T_A=100°C .... ≥10^{11} 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_A=25°C)

	Symbol		Unit	Condition
Emitter				
Forward Voltage	V_F	1.25 (≤1.65)	V	I_F=60 mA
Breakdown Voltage	V_{BR}	≥6.0	V	I_R=10 µA
Reverse Current	I_R	0.01 (≤10)	µA	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	
Detector				
Capacitance Collector-Emitter Collector-Base Emitter-Base	 C_{CE} C_{CB} C_{EB}	 6.8 8.5 11	pF	f=1.0 MHz V_{CE}=5.0 V V_{CB}=5.0 V V_{EB}=5.0 V
Thermal Resistance	R_{THJamb}	500	K/W	
Package				
Saturation Voltage, Collector-Emitter	V_{CEsat}	0.25 (≤0.4)	V	I_F=10 mA, I_C=2.5 mA
Coupling Capacitance	C_{IO}	0.6	pF	V_{I-O}=0 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 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 (≤ 50)	2.0 (≤ 50)	5.0 (≤ 100)	5.0 (≤ 100)	nA	V_{CE}=10 V

Figure 1. Linear Operation (without saturation)

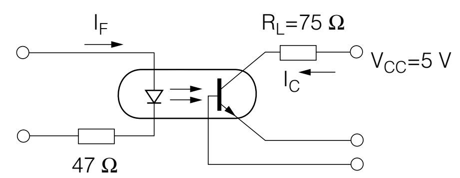


Table 2. I_F=10 mA, V_{CC}=5.0 V, T_A=25°C, Typical

Load Resistance	R_L	75	Ω
Turn-On Time	t_{ON}	3.0	µs
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	kHz

Figure 2. Switching Operation (with saturation)

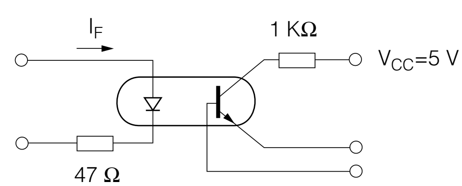


Table 3. Typical

Parameter		Dash No.			Unit
		-1 (I_F=20 mA)	**-2 and -3** (I_F=10 mA)	**-4** (I_F=5.0 mA)	
Turn-On Time	t_{ON}	3.0	4.2	6.0	µs
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 (≤0.4)			V

Figure 3. Current Transfer Ratio versus Diode Current (T_A=–25°C, V_{CE}=5.0 V) I_C/I_F=f (I_F)

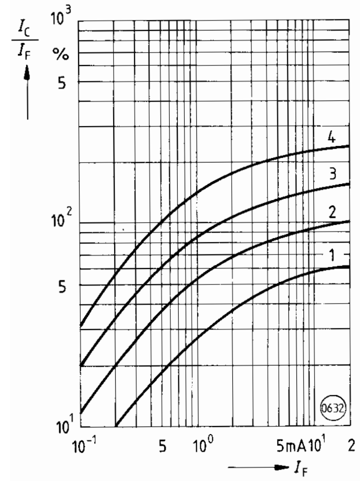


Figure 4. Current Transfer Ratio versus Diode Current (T_A=0°C, V_{CE}=5.0 V) I_C/I_F=f (I_F)

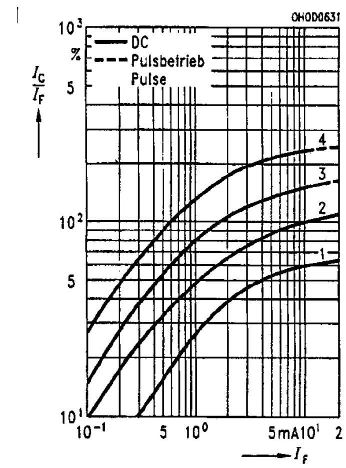


Figure 5. Current Transfer Ratio versus Diode Current (T_A=25°C, V_{CE}=5.0 V) I_C/I_F=f (I_F)

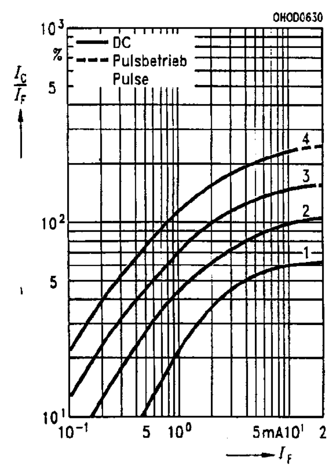


Figure 6. Current Transfer Ratio versus Diode Current (T_A=50°C, V_{CE}=5.0 V) I_C/I_F=f (I_F)

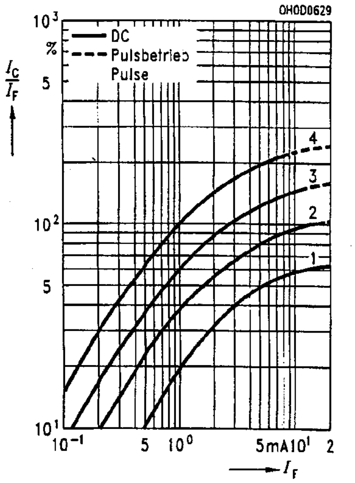


Figure 7. Current Transfer Ratio versus Diode Current (T_A=75°C, V_{CE}=5.0 V) I_C/I_F=f (I_F)

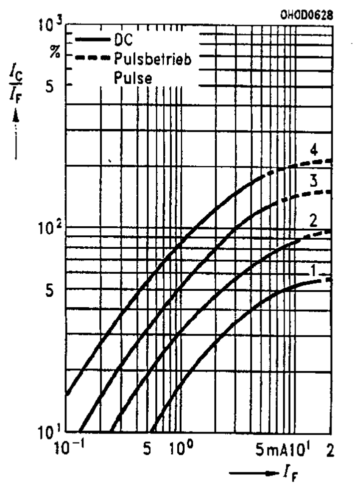


Figure 8. Current Transfer Ratio versus Temperature (I_F=10 mA, V_{CE}=5.0 V) I_C/I_F=f(T)

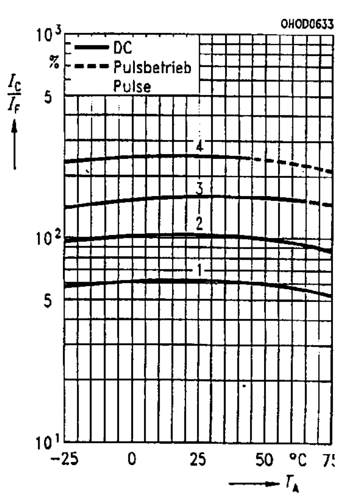


Figure 9. Transistor Characteristics (HFE=550) I_C=f(V_{CE}) (T_A=25°C, I_F=0)

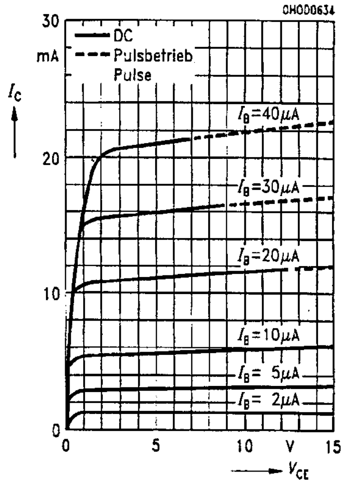


Figure 10. Output Characteristics (T_A=25°C) I_C=f(V_{CE})

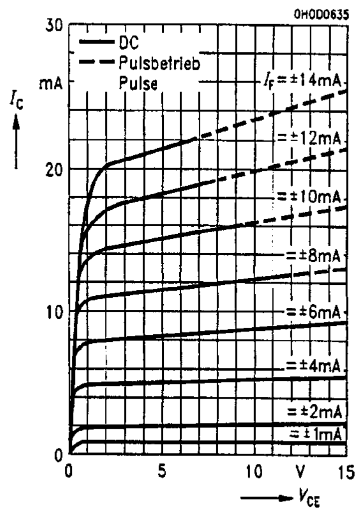


Figure 11. Forward Voltage V_F=f (I_F)

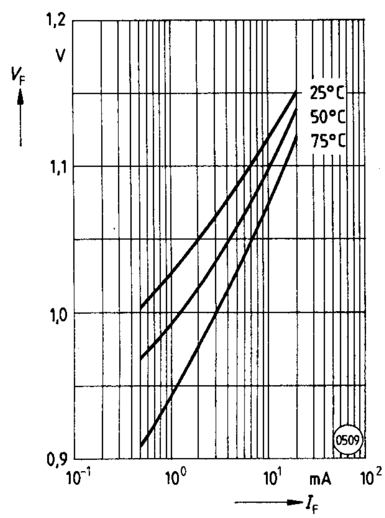


Figure 12. Collector Emitter Off-state Current I_{CEO}=f (V, T) (T_A=25°C, I_F=0)

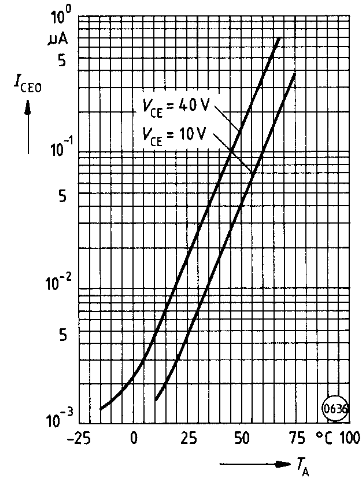


Figure 13. Saturation Voltage versus Collector Current and Modulation Depth SFH601-1 V_{CEsat}=f (I_C) (T_A=25°C)

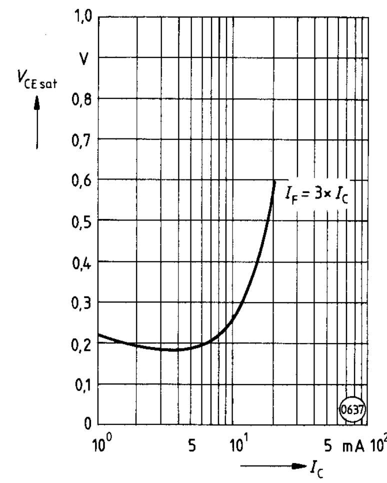


Figure 14. Saturation Voltage versus Collector Current and Modulation Depth SFH601-2 V_{CEsat}=f (I_C) (T_A=25°C)

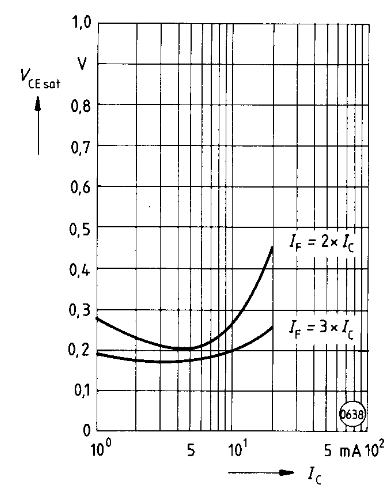


Figure 15. Saturation Voltage versus Collector Current and Modulation Depth SFH601-3 V_{CEsat}=f (I_C) (T_A=25°C)

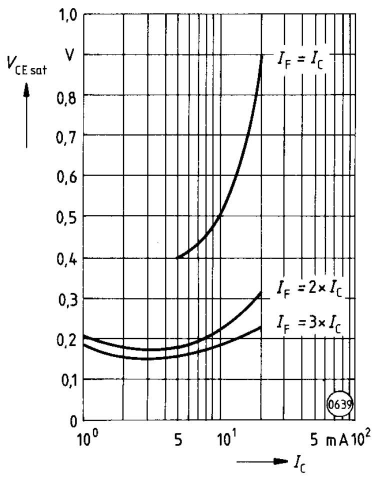


Figure 16. Saturation Voltage versus Collector Current and Modulation Depth SFH601-4 V_{CEsat}=f (I_C) (T_A=25°C)

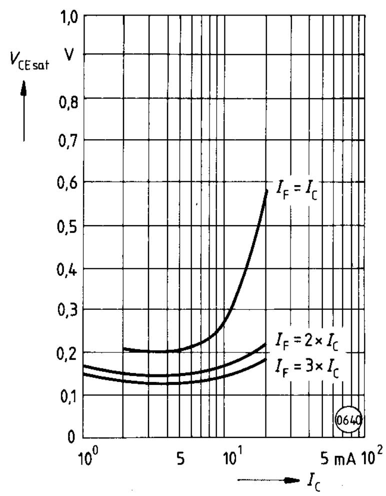


Figure 17. Permissible Pulse Load
D=parameter, T_A=25°C, I_F=f (t_p)

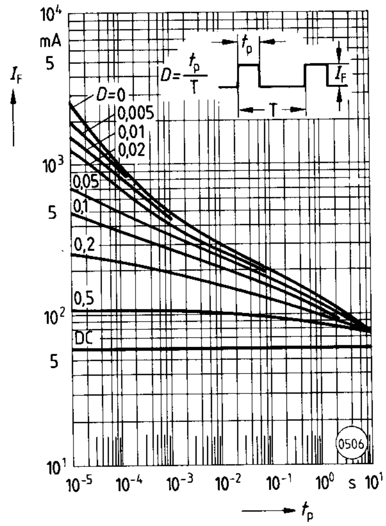


Figure 18. Permissible Power Dissipation for Transistor and Diode
P_{tot}=f (T_A)

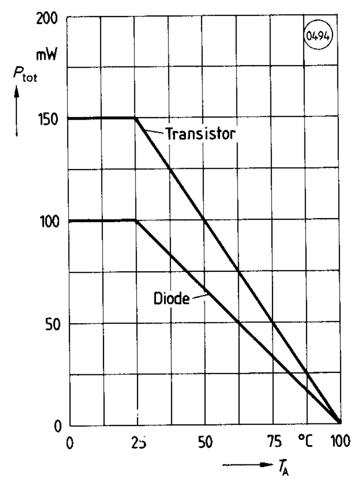


Figure 19. Permissible Forward Current Diode P_{tot}=f (T_A)

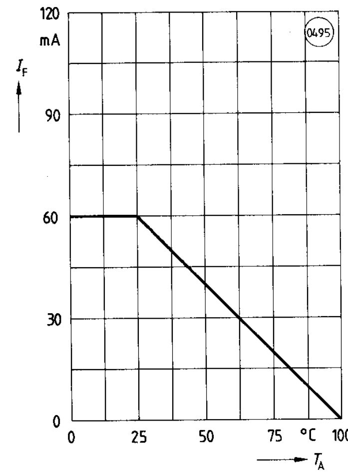


Figure 20. Transistor Capacitance
C=f(V_O) (T_A=25°C, f=1.0 MHz)