SIEMENS

SFH601 SERIES
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 Sec.), 5300 VAC_{RMS}**
- **VCEsat 0.25 (≤0.4) V, IF=10 mA, IC=2.5 mA**
- **Built to conform to VDE Requirements**
- **Highest Quality Premium Device**
- **Long Term Stability**
- **Storage Temperature, –55∞ to +150∞C**
- **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 packeged in a plastic plug-in case 20 AB DIN 41866.

The coupler transmits signals between two electrically isolated circuits.

Maximum Ratings

Emitter

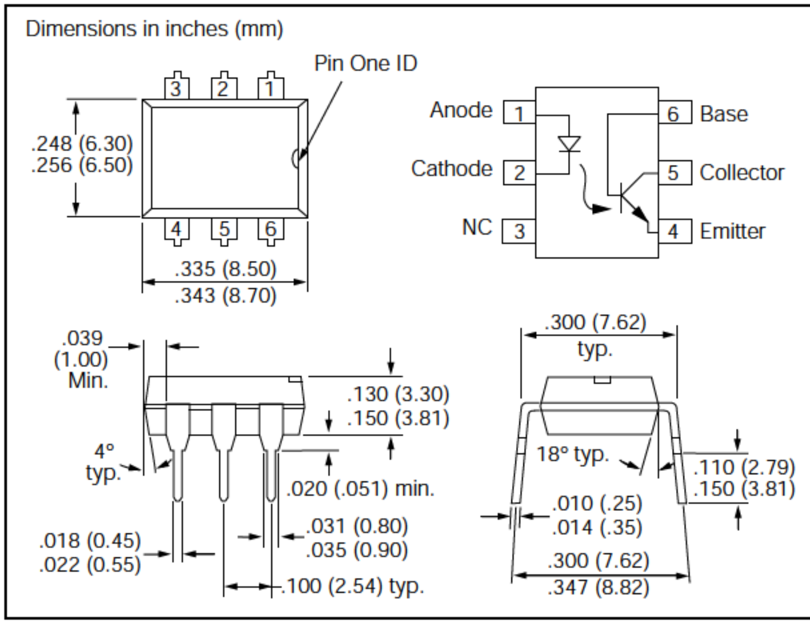
Reverse Voltage.. 6 V
DC Forward Current.................................... 60 mA
Surge Forward Current (t_p=10 µs)................. 2.5 A
Total Power Dissipation............................ 100 mW

Detector

Collector-Emitter Voltage .... 100 V
Emitter-Base Voltage .... 7 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_{RMS}
Creepage...≥7 mm
Clearance ....≥7 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............................... $\geq 10^{12}\ \Omega$
V_{IO}=500 V, T_A=100°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 ≥1.5 mm) ....260°C



Characteristics (T_A=25°C)

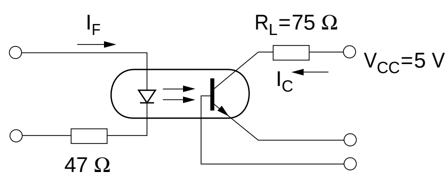
	Symbol		Unit	Condition
Emitter				
Forward Voltage	V_F	1.25 (≤1.65)	V	I_F=60 mA
Breakdown Voltage	V_{BR}	≥6	V	I_R=10 µA
Reverse Current	I_R	0.01 (≤10)	µA	V_R=6 V
Capacitance	C_O	25	pF	V_F=0 V, f=1 MHz
Thermal Resistance	R_{THJamb}	750	°C/W	
Detector				
Capacitance Collector-Emitter Collector-Base Emitter-Base	 C_{CE} C_{CB} C_{EB}	 6.8 8.5 11	pF	f=1 MHz V_{CE}=5 V V_{CB}=5 V V_{EB}=5 V
Thermal Resistance	R_{THJamb}	500	°C/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 MHz

***TRIOS**—**TR**ansparent **IO**n **S**hield

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

	-0	-1	-2	-3	Unit
I_C/I_F at V_{CE}=5 V (I_F=10 mA)	40-80	63-125	100-200	160-320	%
I_C/I_F at V_{CE}=5 V (I_F=1 mA)	30 (>13)	45 (>22)	70 (>34)	90 (>56)	%
Collector-Emitter Leakage Current (V_{CE}=10 V) (I_{CEO})	2 (≤ 50)	2 (≤ 50)	5 (≤ 100)	5 (≤ 100)	nA

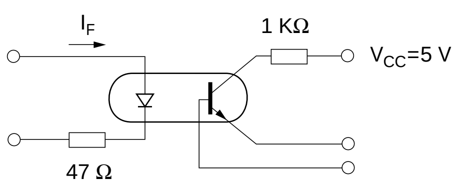
Figure 1. Linear operation (without saturation)



I_F=10 mA, V_{CC}=5 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	µs
Turn-Off Time	t_{OFF}	2.3	µs
Fall Time	t_f	2.0	µs
Cut-off Frequency	F_{CO}	250	kHz

Figure 2. Switching operation (with saturation)



Typical

		-1 (I_F=20 mA)	-2 and -3 (I_F=10 mA)	-4 (I_F=5 mA)	
Turn-On Time	t_{ON}	3.0	4.2	6.0	µs
Rise Time	t_R	2.0	3.0	4.6	µs
Turn-Off Time	t_{OFF}	18	23	25	µs
Fall Time	t_F	11	14	15	µs
	V_{CE-SAT}	0.25 (≤0.4)			V

Figure 3. Current transfer ratio versus diode current
(T_A=–25°C, V_{CE}=5 V) I_C/I_F=f (I_F)

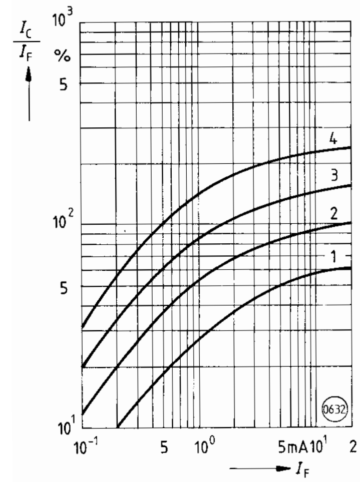


Figure 4. Current transfer ratio versus diode current (T_A=0°C, V_{CE}=5 V) I_C/I_F=f (I_F)

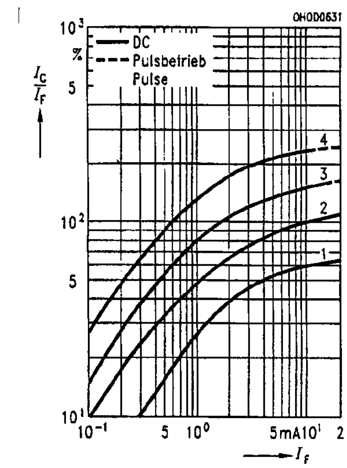


Figure 5. Current transfer ratio versus diode current (T_A=25°C, V_{CE}=5 V)I_C/I_F=f (I_F)

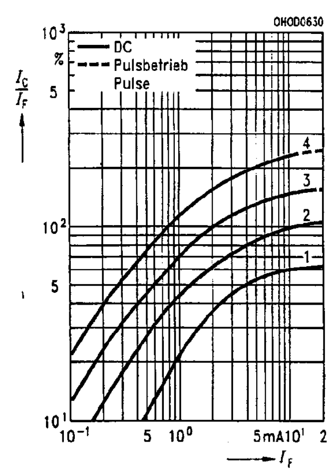


Figure 6. Current transfer ratio versus diode current (T_A=50°C) V_{CE}=5 V, I_C/I_F=f (I_F)

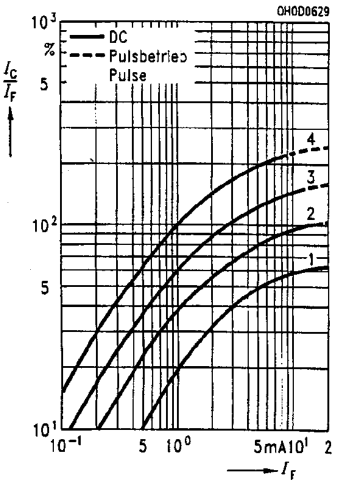


Figure 7. Current transfer ratio versus diode current (T_A=75°C, V_{CE}=5 V) I_C/I_F=f (I_F)

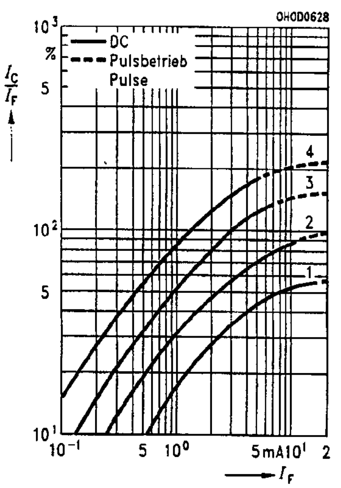


Figure 8. Current transfer ratio versus temperature (I_F=10 mA, V_{CE}=5 V) I_C/I_F=f(T)

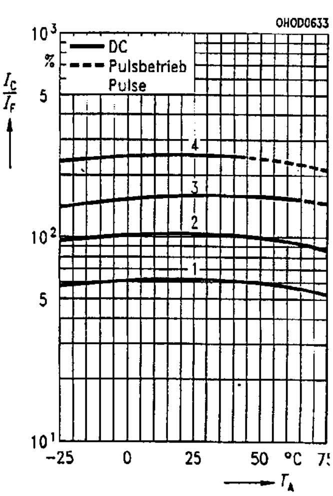


Figure 9. Transistor characteristics (HFE =550) I_C=f(V_{CE}) (T_A=25°C, I_F=0)

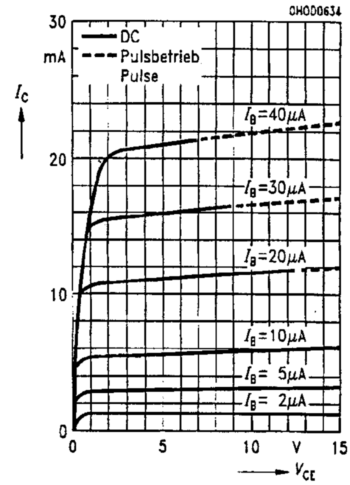


Figure 10. Output characteristics I_C=f(V_{CE})(T_A=25°C)

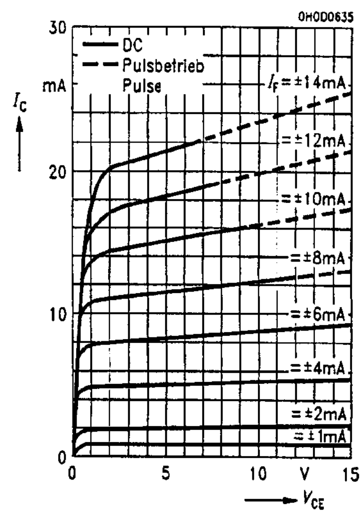


Figure 11. Forward voltage V_F=f (I_F)

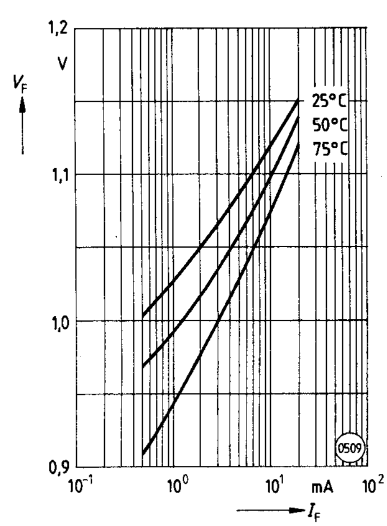


Figure 12. Collector emitter off-state current I_{CEO}=f (V, T) (T_A=25°C, I_F=0)

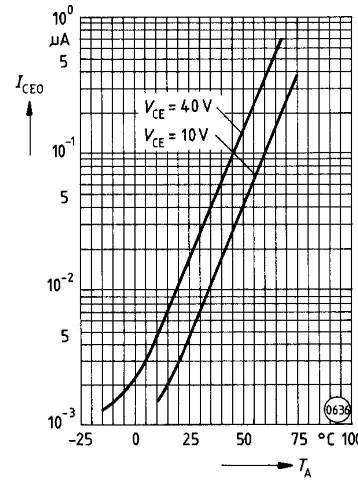


Figure 13. Saturation voltage versus collector current and modulation depthSFH601-1 V_{CEsat}=f (I_C) (T_A=25°C)

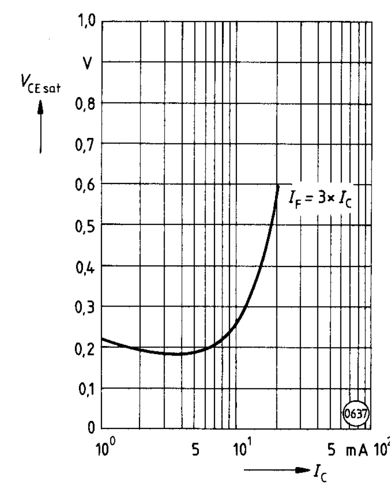


Figure 14. Saturation voltage versus collector current and modulation depthSFH601-2 V_{CEsat}=f (I_C) (T_A=25°C)

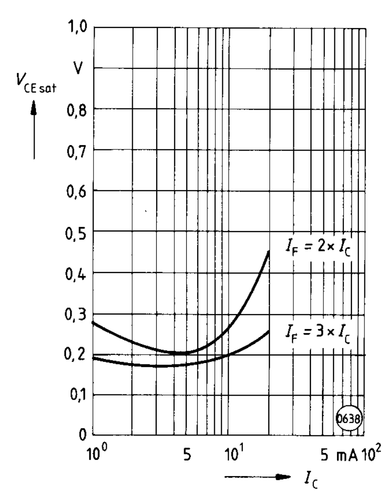


Figure 15. Saturation voltage versus collector current and modulation depth SFH601-3 V_{CEsat}=f (I_C) (T_A=25°C)

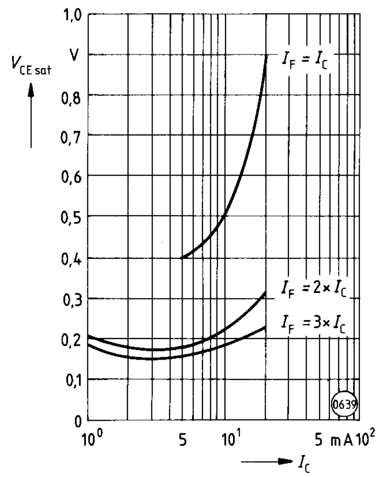


Figure 16. Saturation voltage versus collector current and modulation depth SFH601-4 V_{CEsat}=f (I_C) (T_A=25°C)

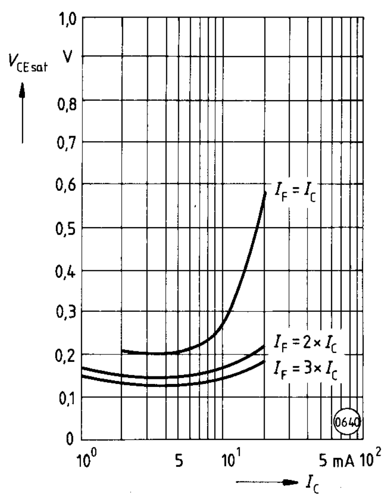


Figure 17. Permissible pulse load
D=parameter, T_A=25°C, I_F=f (t_p)

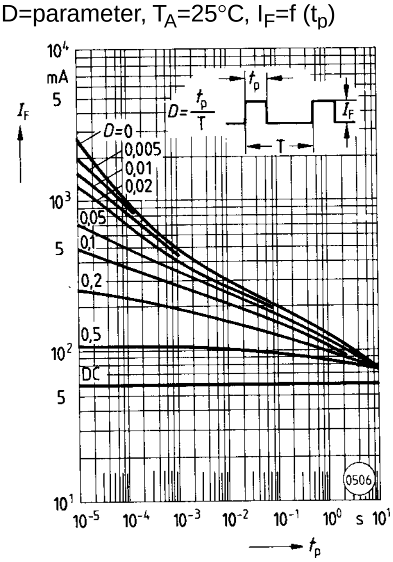


Figure 18. Permissible power dissipation for transistor and diode
P_{tot}=f (T_A)

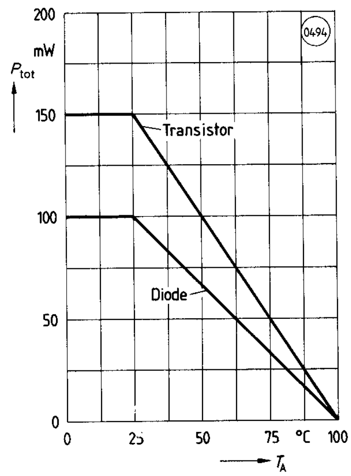


Figure 19. Permissible forward current diode P_{tot}=f (T_A)

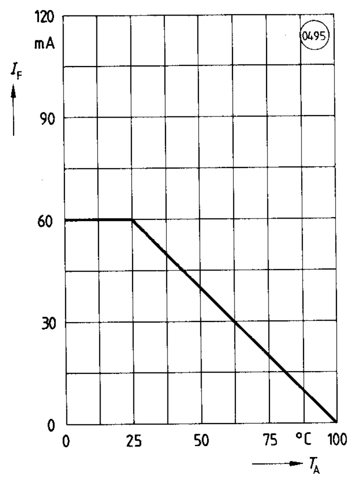


Figure 20. Transistor capacitance
C=f(V_O) (T_A=25°C, f=1 MHz)