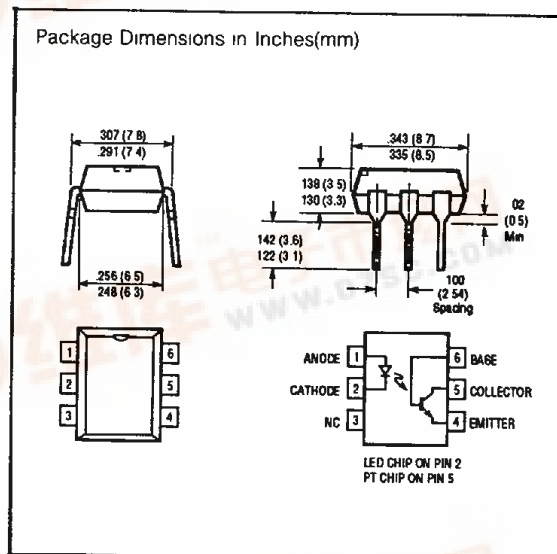
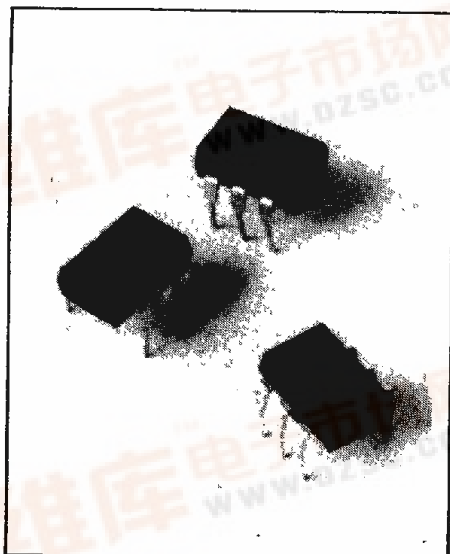


SIEMENS

T-41-83
SFH609 SERIESHIGH RELIABILITY
PHOTOTRANSISTOR
OPTOCOUPLER

FEATURES

- Highest Quality Premium Device
- Built to Conform to VDE Requirements
- Long Term Stability
- High Current Transfer Ratios, 3 Groups
 - SFH 609-1, 40 to 80%
 - SFH 609-2, 63 to 125%
 - SFH 609-3, 100 to 200%
- 5300 Volt Isolation (1 Minute)
- Storage Temperature -40° to $+150^{\circ}\text{C}$
- V_{CEsat} 0.25 (<0.4) Volt
 $I_F = 10\text{ mA}$, $I_C = 2.5\text{ mA}$
- V_{CEO} 90V
- UL Approval #E52744
- VDE Approval #0883

DESCRIPTION

The optically coupled isolator SFH 609 features a high current transfer ratio as well as high isolation voltage, and uses as emitter a GaAs infrared emitting diode which is optically coupled with a silicon planar phototransistor acting as detector. The component is incorporated in a plastic plug-in package 20 A 6 DIN 41866.

The coupling device is suitable for signal transmission between two electrically separated circuits. The potential difference between the circuits to be coupled is not allowed to exceed the maximum permissible isolation voltage.

Maximum Ratings

Emitter (GaAs infrared emitter)

Reverse voltage	V_R	6	V
DC forward current	I_F	60	mA
Surge forward current ($t \leq 10\ \mu\text{s}$)	I_{FSM}	2.5	A
Total power dissipation	P_{tot}	100	mW

Detector (silicon phototransistor)

Collector-emitter voltage ($I_s = 0$)	V_{CEO}	90	V
Emitter-base voltage ($I_C = 0$)	V_{EBO}	7	V
Collector current	I_C	50	mA
Collector current ($t \leq 1\text{ ms}$)	I_{CSM}	100	mA
Total power dissipation	P_{tot}	150	mW

Optocoupler

Storage temperature range	T_{stg}	-40 to $+150$	$^{\circ}\text{C}$
Ambient temperature range	T_{amb}	-40 to $+100$	$^{\circ}\text{C}$
Junction temperature	T_j	100	$^{\circ}\text{C}$
Soldering temperature (max. 10 sec) ¹⁾	T_{sold}	260	$^{\circ}\text{C}$
Isolation voltage (1 min) ²⁾ between emitter and detector referred to standard climate 23/50 DIN 50014	V_{is}	5300	Vdc

AC reference voltage } in acc. with
DC reference voltage } DIN 57883, 6.80
and/or VDE 0883, 6.80

Leakage path	min 8.2	mm
Air path	min 7.3	mm

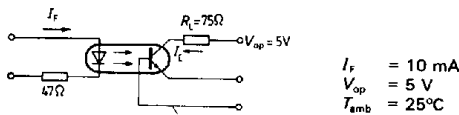
¹⁾ Dip soldering Insertion depth 3.6 mm

²⁾ DC test voltage in accordance with DIN 57883 draft 4/78

CHARACTERISTICS @ 25°C				
Emitter				
Forward voltage ($I_F = 60 \text{ mA}$)	V_F	1.25 (≤ 1.65)	V	
Breakdown voltage ($I_R = 10 \mu\text{A}$)	$V_{(BR)}$	30 (≥ 6)	V	
Reverse current ($V_R = 6 \text{ V}$)	I_R	0.01 (≤ 10)	μA	
Capacitance ($V_R = 0 \text{ V}, f = 1 \text{ MHz}$)	C_O	40	pF	
Thermal resistance	R_{thJA}	750	K/W	
Detector (silicon phototransistor)				
Capacitance ($V_{CE} = 5 \text{ V}; f = 1 \text{ MHz}$)	C_{CE}	6.8	pF	
($V_{CB} = 5 \text{ V}, f = 1 \text{ MHz}$)	C_{CB}	8.5	pF	
($V_{EB} = 5 \text{ V}, f = 1 \text{ MHz}$)	C_{EB}	11	pF	
Thermal resistance	R_{thJA}	500	K/W	
Optocoupler				
Collector-emitter saturation voltage ($I_F = 10 \text{ mA}, I_C = 2.5 \text{ mA}$)	V_{CEsat}	0.25 (≤ 0.4)	V	
Coupling capacitance	C_K	0.30	pF	
The optocouplers are grouped according to their current transfer ratio I_C/I_F at $V_{CE}=5 \text{ V}$ and marked by dash numbers				
Group	-1	-2	-3	
I_C/I_F ($I_F=10 \text{ mA}$)	40-80	63-125	100-200	%
I_C/I_F ($I_F=1 \text{ mA}$)	30 (>13)	45 (>22)	70 (>34)	%
Collector-Emitter Leakage Current (I_{CEO}) ($V_{CE}=10 \text{ V}$)	2 (≤ 50)	2 (≤ 50)	5 (≤ 100)	nA

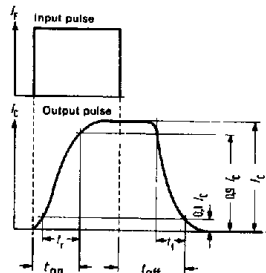
Optocouplers (Optoisolators)

Linear operation (without saturation)

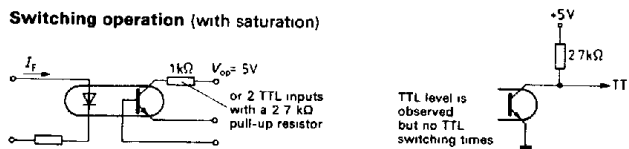


Load resistance	R_L	75	Ω
Turn-on time	t_{on}	3.0 (≤ 5.6)	μs
Rise time	t_r	2.0 (≤ 4.0)	μs
Turn-off time	t_{off}	2.3 (≤ 4.1)	μs
Fall time	t_f	2.0 (≤ 3.5)	μs
Cut-off frequency	f_{co}	250	kHz

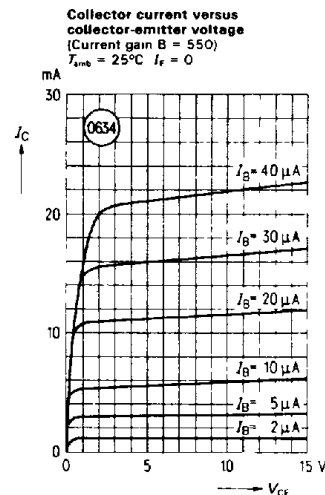
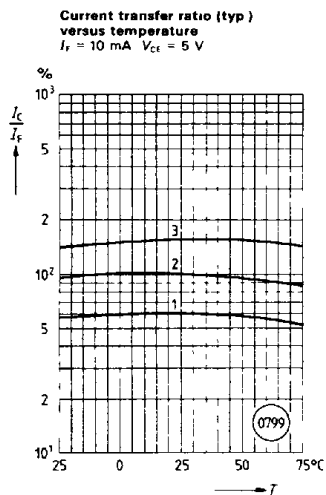
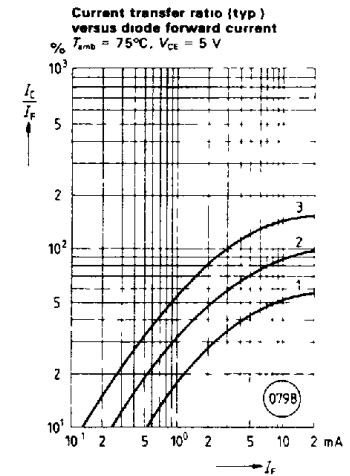
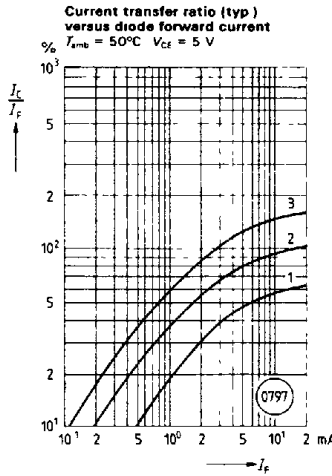
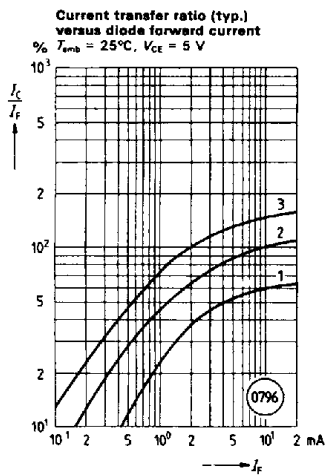
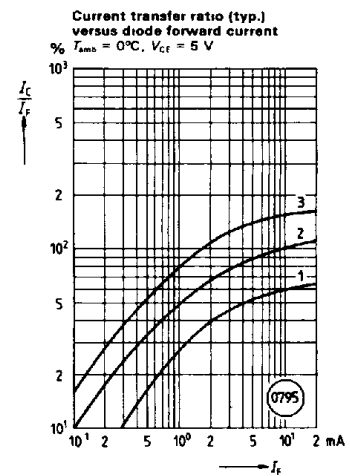
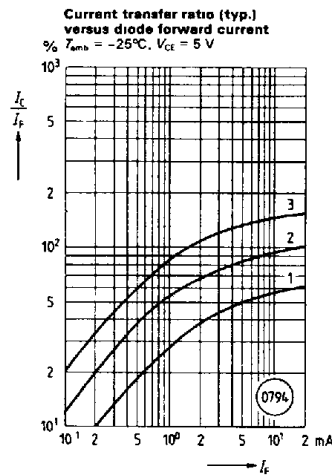
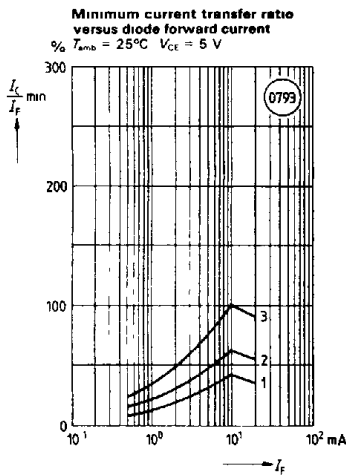
Switching times

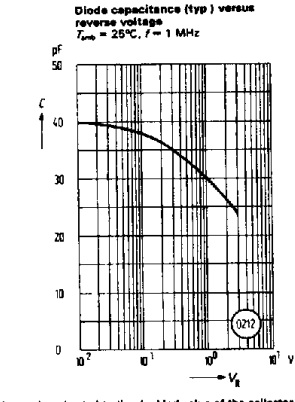
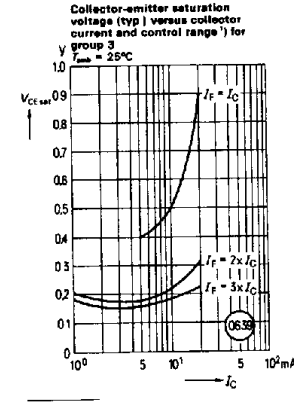
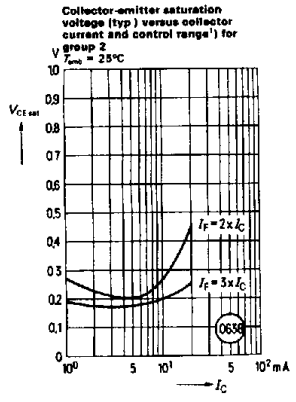
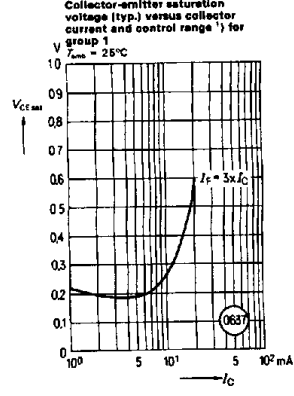
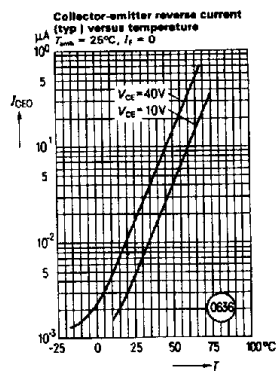
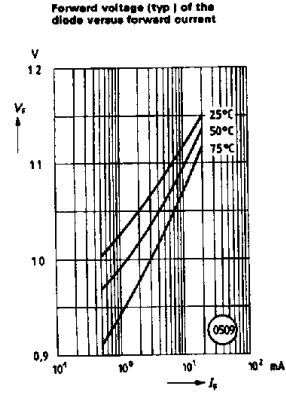
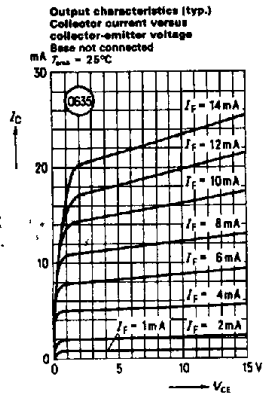


Switching operation (with saturation)

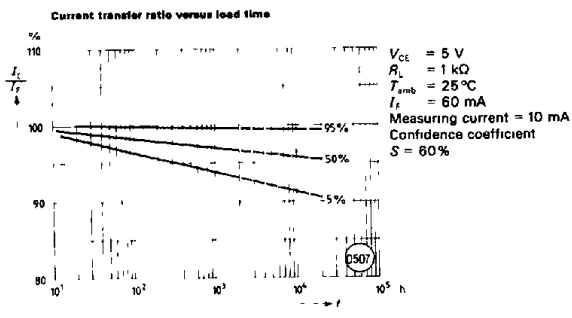
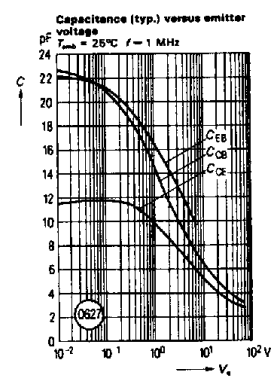
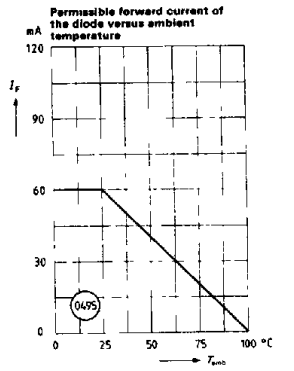
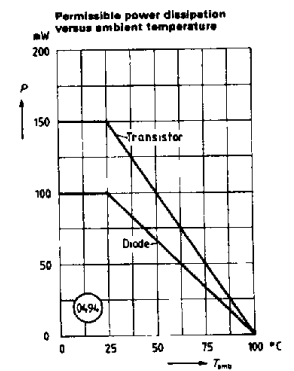
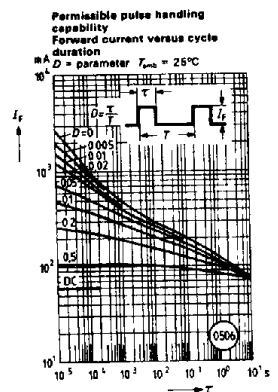


Group	1		2 and 3	
	$I_F = 20 \text{ mA}$	$I_F = 10 \text{ mA}$	$I_F = 20 \text{ mA}$	$I_F = 10 \text{ mA}$
Turn-on time	t_{on}	3.0 (≤ 5.5)	4.2 (≤ 8.0)	μs
Rise time	t_r	2.0 (≤ 4.0)	3.0 (≤ 6.0)	μs
Turn-off time	t_{off}	18 (≤ 34)	23 (≤ 39)	μs
Fall time	t_f	11 (≤ 20)	14 (≤ 24)	μs
	V_{CEsat}	0.25 (≤ 0.4)		V





¹⁾ $I_F = 2 \times I_C$ means that the current flow of the diode has to be adjusted to the doubled value of the collector current.



Optocouplers (Optoisolators)