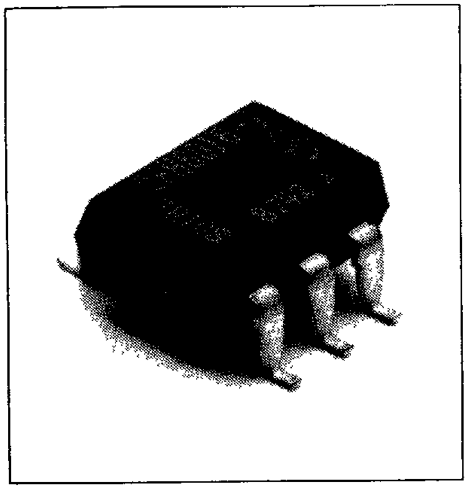
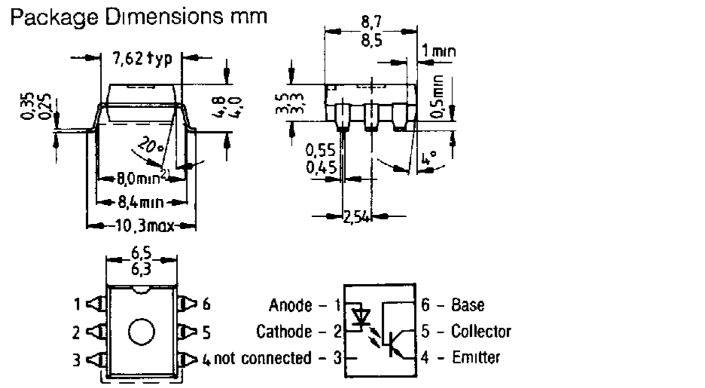
SIEMENS

SFH 6016

5.3 kV TRIOS*® OPTOCOUPLER HIGH RELIABILITY

T-41-83





2) Clearance and creepage distance must be considered in the solder-pad design

—·—·— Clearance and creepage distance 8 0 min

FEATURES

- Isolation Test Voltage: 5300 V
- High Current Transfer Ratios
  at 10 mA: 40-320%
  at 1 mA: 13-90%
- Fast Switching Times
- Minor CTR Degradation
- 100% Burn-In
- Field-Effect Stable by TRIOS
- Temperature Stable
- Good CTR Linearity Depending on Forward Current
- High Collector-Emitter Voltage V_{CEO}=70 V
- Low Saturation Voltage
- Low Coupling Capacitance
- External Base Wiring Possible
- UL Approval #52744
- VDE Approval 0883
- VDE Approval 0884 (Optional with Option 1)
- Confroms to VDE #0805/0806

DESCRIPTION

The optically coupled isolator SFH 6016 features a high current transfer ratio as well as a high isolation voltage As emitter it employs 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 DIP-6 package.

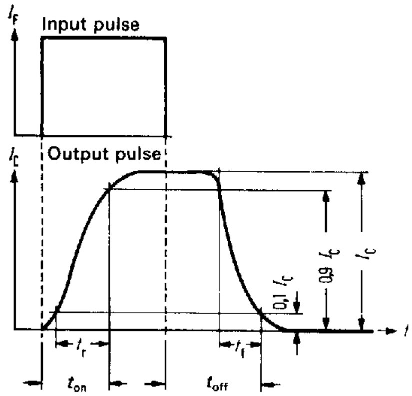
The bent terminal pins are suitable for surface mounting (SMD) The electrical data complies with that of the SFH 601 coupler.

The coupler allows to transfer signals between two electrically isolated circuits. The potential difference between the circuits to be coupled is not allowed to exceed the maximum permissible reference voltages

*TRansparent IOn Shield

T-41-83

Switching times



The figure on the left defines the following times:

Turn-on time (t_{ON})

The turn-on time t_{ON} is the time in which the output current (collector current) I_C rises to 90% of its maximum value after activation of the drive current I_F.

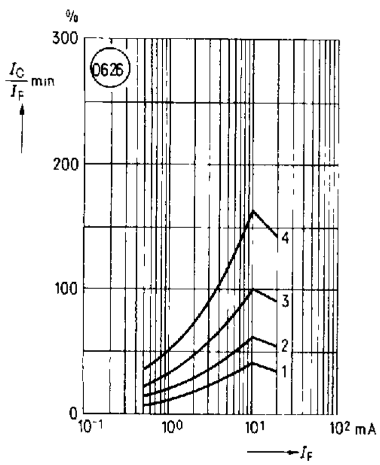
The rise time t_R is the time in which the collector current I_C rises from 10% to 90% of its final value

Turn-off time (t_{OFF})

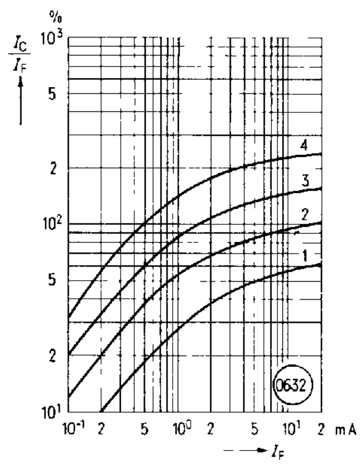
The turn-off time t_{OFF} is the time in which the collector current I_C drops to 10% of its maximum value after deactivation of the drive current I_F.

The fall time t_F is the time in which the collector current I_C drops from 90% to 10% of its maximum value.

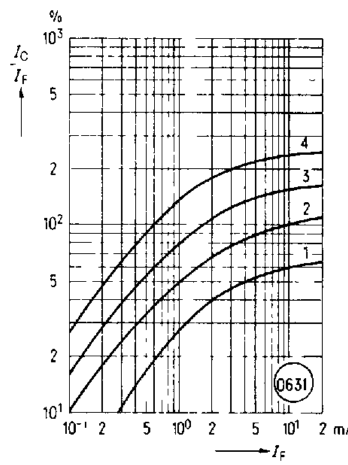
Minimum current transfer ratio versus diode forward current
(T_A=25°C, V_{CE}=5 V)



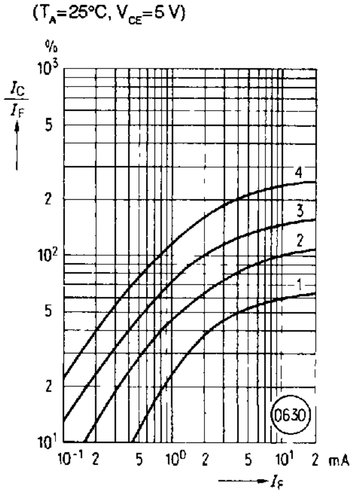
Current transfer ratio (typ.) versus diode forward current
(T_A=25°C, V_{CE}=5 V)



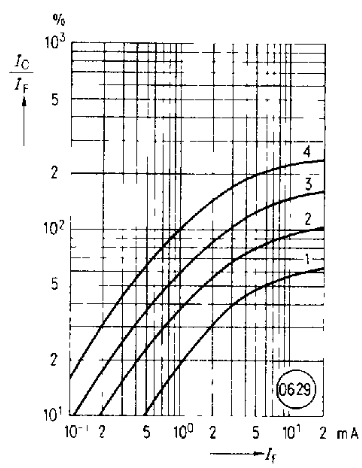
Current transfer ratio (typ.) versus diode forward current
(T_A=0°C, V_{CE}=5 V)



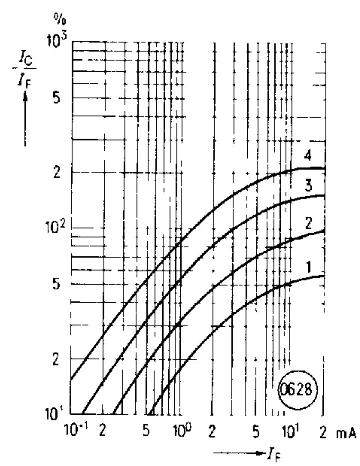
Current transfer ratio (typ.) versus diode forward current
(T_A=25°C, V_{CE}=5 V)



Current transfer ratio (typ.) versus diode forward current
(T_A=50°C, V_{CE}=5 V)



Current transfer ratio (typ.) versus diode forward current
(T_A=75°C, V_{CE}=5 V)



Optocouplers (Optoisolators)

Maximum Ratings

Emitter (GaAs Infrared Emitter)

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

Detector (Silicon Phototransistor)

Collector-Emitter Voltage	70 V
Emitter-Base Voltage	7 V
Collector Current	50 mA
Collector Current (t ≤1 ms)	100 mA
Total Power Dissipation	150 mW

Optocoupler

Storage Temperature Range	-40°C to +150°C
Ambient Temperature Range	-40°C to +100°C
Junction Temperature	100°C
Soldering Temperature (max. 10 s)[1]	260°C
Isolation Test Voltage[2] (between emitter and detector referred to standard climate 23/50 DIN 50014)	5300 VDC
Leakage Path	≥8.2 mm
Air path	≥8.0 mm

Tracking Resistance

In Accordance with VDE 0110 §6, table 3, and DIN 53480/VDE 0303, part 1	≥100 (group 3)
Isolation Resistance (V_{IO}=500 V)	10^{11} Ω

Notes:
1 Not for wave-soldering
2 DC test voltage in accordance with VDE 0883/6 80

Characteristics (T_A=25°C)

Emitter (GaAs Infrared Emitter)

Forward Voltage (I_F=60 mA)	V_F	1.25 (≤1.65)	V
Breakdown Voltage (I_R=100 µA)	V_{BR}	30 (≥6)	V
Reverse Current (V_R=6 V)	I_R	0.01 (≤10)	µA
Capacitance (V_R=0 V, f=1 MHz)	C_0	40	pF
Thermal Resistance[1]	R_{thJA}	750	K/W

Detector (Silicon Phototransistor)

Capacitance			
(V_{CE}=5 V, f=1 MHz)	C_{CE}	6.8	pF
(V_{CB}=5 V, f=1 MHz)	C_{CB}	8.5	pF
(V_{EB}=5 V, f=1 MHz)	C_{EB}	11	pF
Thermal Resistance[1]	R_{thJA}	500	K/W

Optocoupler

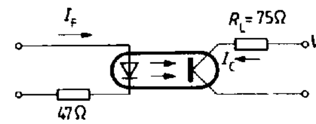
Collector-Emitter Saturation Voltage (I_F=10 mA, I_C=2.5 mA)	V_{CESAT}	0.25 (≤0.4)	V
Coupling Capacitance	C_K	0.55	pF

Note:
1 Static air, coupler soldered to PCB or base

The optocouplers are grouped according to their current transfer ratio I_C/I_F at V_{CE}=5 V, marked by dash numbers

	-1	-2	-3	-4	
I_C/I_F (I_F=10 mA)	40–80	63–125	100–200	160–320	%
I_C/I_F (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

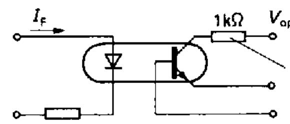
Linear Operation (without saturation)

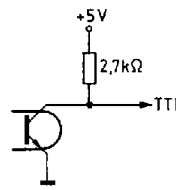


I_F=10 mA, V_{OP}=5 V, T_A=25°C

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 Operation (with saturation)

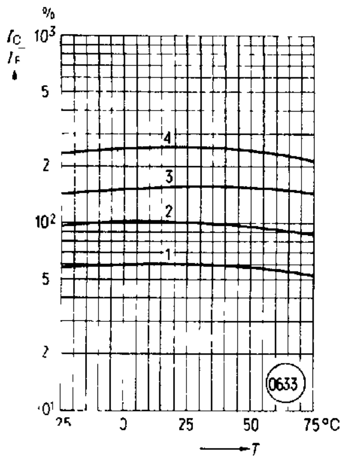




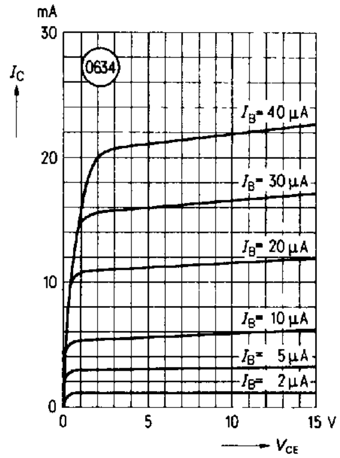
TTL level is observed but no TTL switching times

Group	-1 (I_F=20 mA)	-2 and -3 (I_F=10 mA)	-4 (I_F=5 mA)	
Turn-On Time t_{ON}	3.0 (≤5.5)	4.2 (≤8.0)	6.0 (≤10.5)	µs
Rise Time t_R	2.0 (≤4.0)	3.0 (≤6.0)	4.6 (≤8.0)	µs
Turn-Off Time t_{OFF}	18 (≤34)	23 (≤39)	25 (≤43)	µs
Fall Time t_F	11 (≤20)	14 (≤24)	15 (≤26)	µs
V_{CESAT}		0.25 (≤0.4)		V

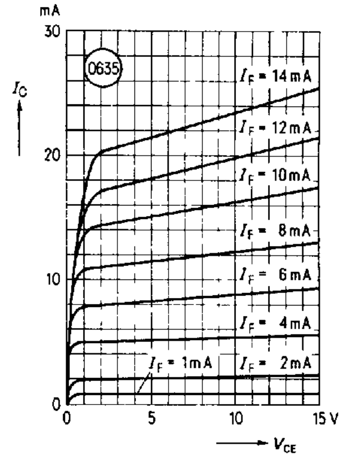
Current transfer ratio (typ.) versus temperature
(I_F= 10 mA, V_{CE}=5 V)



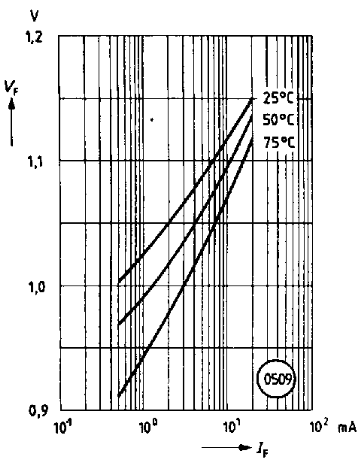
Transistor characteristics Collector current versus collector-emitter voltage
(Current gain B=550, T_A=25°C, I_F=0)



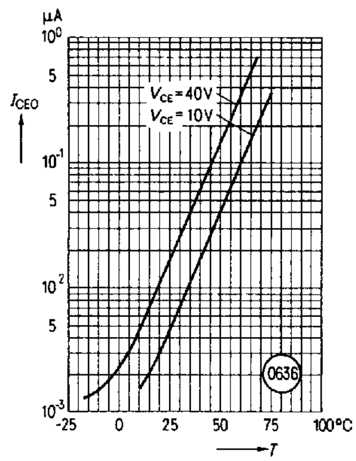
Output characteristics (typ.) Collector current versus collector-emitter voltage
Base not connected (T_A=25°C)



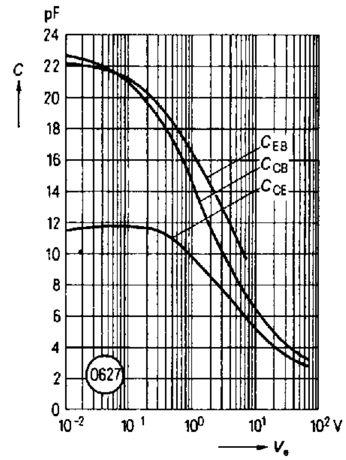
Forward voltage (typ.) of the diode versus forward current



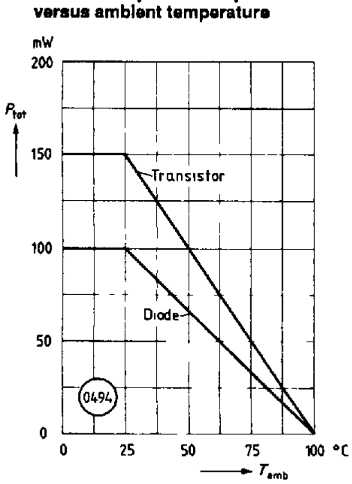
Collector-emitter leakage current (typ.) of the transistor versus temperature(T_A=25°C, I_F=0)



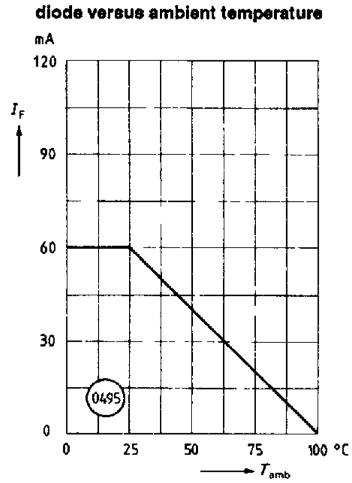
Transistor capacitance (typ.) versus emitter voltage
(T_A=25°C, f =1 MHz)



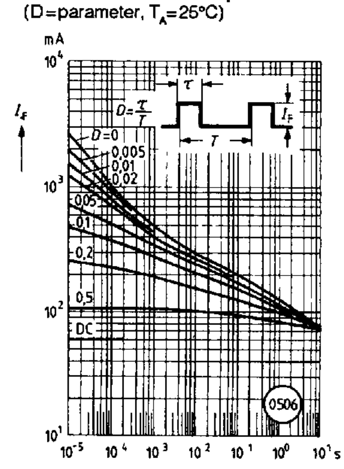
Permissible power dissipation versus ambient temperature



Permissible forward current of the diode versus ambient temperature

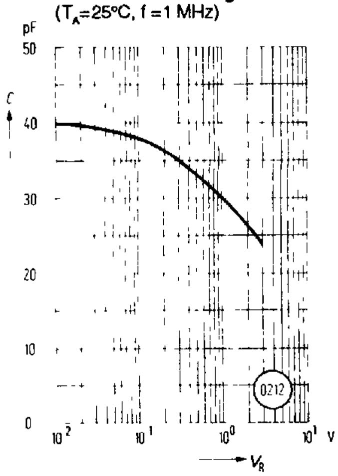


Permissible pulse handling capability Forward current versus pulse width
(D=parameter, T_A=25°C)

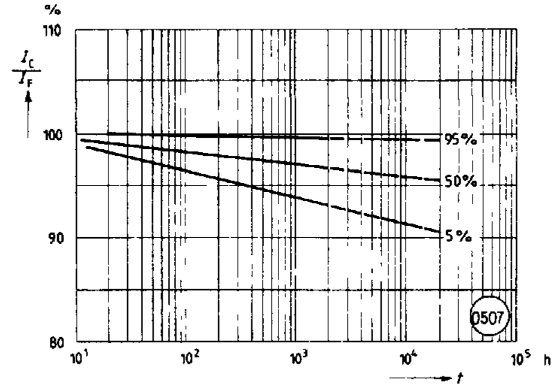


Optocouplers (Optoisolators)

Diode capacitance (typ.) versus reverse voltage
(T_A=25°C, f =1 MHz)

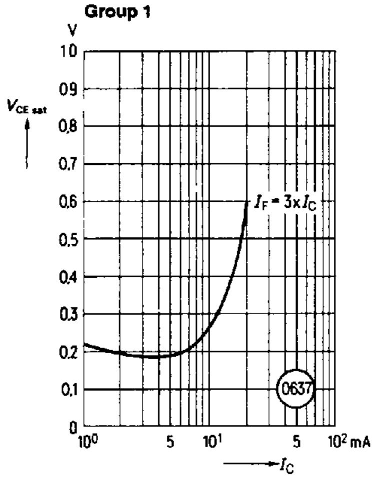


Current transfer ratio versus load time
(V_{CE}=5 V, R_L=1 kΩ, T_A=25°C, I_F=60 mA, Measuring current=10 mA, Confidence coefficient S=60%)

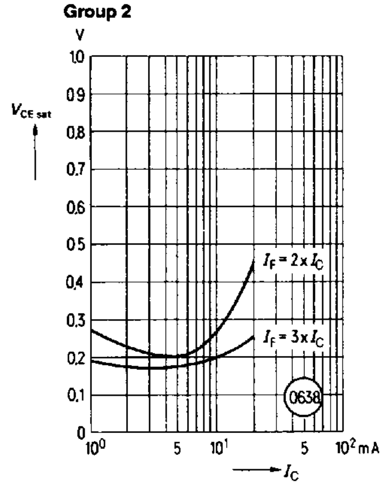


Collector-emitter saturation voltage (typ.) versus collector current and control range [1] for: (T_A=25°C)

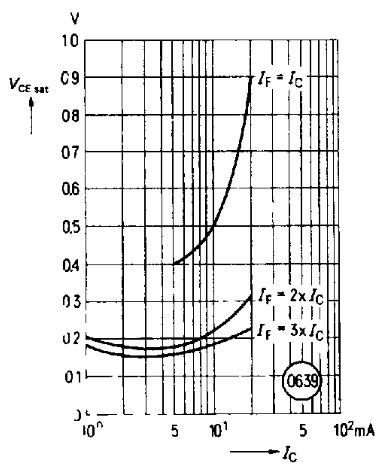
Group 1



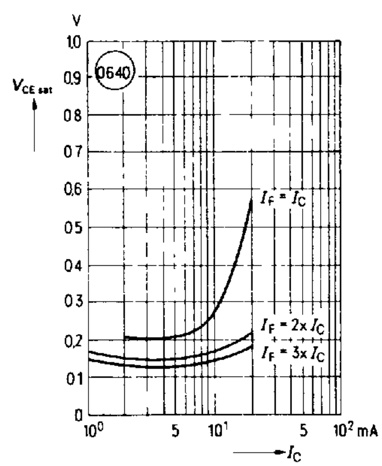
Group 2



Group 3



Group 4



Note:
1 I_F=2 × I_C means that the current flow of the diode has to be adjusted to twice the value of the collector current