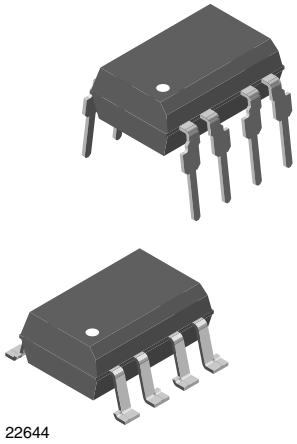
Analog High Speed Coupler, High Noise Immunity, 1 MBd, 15 kV/µs



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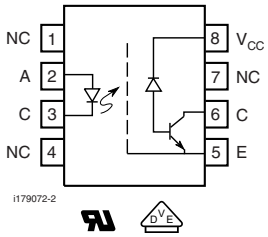


FEATURES

- Direct replacement for HCPL 4503
- High-speed optocoupler without base connection
- Isolation test voltage: 5300 V_{RMS}
- GaAlAs emitter
- Integrated detector with photo diode and transistor
- High data transmission rate: 1 MBit/s
- TTL compatible
- Open collector output
- Good CTR linearity relative to forward current
- Field effect stable
- Low coupling capacitance
- Very high common mode transient immunity dV/dt: ≥ 15 kV/µs at V_{CM} = 1500 V
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION

The SFH6345 is an optocoupler with a GaAlAs infrared emitting diode, optically coupled to an integrated photo detector consisting of a photo diode and a high speed transistor in a DIP-8 plastic package. The device is similar to the 6N135 but has an additional faraday shield on the detector which enhances the input-output dV/dt immunity.

Signals can be transmitted between two electrically separated circuits up to frequencies of 2 MHz. This an ideal solution for industrial communication bus isolation, as well as isolated drive circuit applications such as IPM (intelligent power module) drivers.

APPLICATIONS

- Data communications
- IGBT drivers
- Programmable controllers
- IPM (intelligent power module) drivers

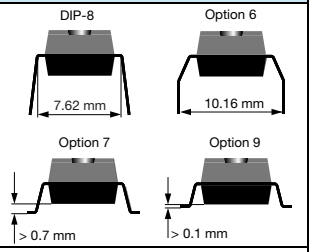
AGENCY APPROVALS

- UL1577, file no. E52744 system code H double protection
- DIN EN 60747-5-2 (VDE0884)/DIN EN 60747-5-5 (pending), available with option 1

ORDERING INFORMATION

S	F	H	6	3	4	5	-	X	0	#	#	T

PART NUMBER — PACKAGE OPTION — TAPE AND REEL



AGENCY CERTIFIED/PACKAGE	CMR (kV/µs)
UL	**≥ 15**
DIP-8	SFH6345
SMD-8, option 7	SFH6345-X007T (1)
SMD-8, option 9	SFH6345-X009T (1)
VDE, UL	
DIP-8	SFH6345-X001
DIP-8, 400 mil, option 6	SFH6345-X016
SMD-8, option 7	SFH6345-X017T (1)
SMD-8, option 9	SFH6345-X019T (1)

Note

(1) Also available in tubes; do not add T to end

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	3	V
DC forward current		I_F	25	mA
Surge forward current	t_p = 1 µs, 300 pulses/s	I_{FSM}	1	A
Power dissipation		P_{diss}	45	mW
OUTPUT				
Supply voltage		V_S	- 0.5 to 30	V
Output voltage		V_O	- 0.5 to 25	V
Output current		I_O	8	mA
Power dissipation		P_{diss}	100	mW
COUPLER				
Isolation test voltage between emitter and detector		V_{ISO}	5300	V_{RMS}
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω
Storage temperature range		T_{stg}	- 55 to + 150	°C
Ambient temperature range		T_{amb}	- 55 to + 125	°C
Junction temperature		T_j	100	°C
Soldering temperature (1)	max. 10 s, max. dip soldering: distance to seating plane ≥ 1.5 mm	T_{sld}	260	°C

Notes

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

(1) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP)

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT (1)						
Forward voltage	I_F = 16 mA	V_F		1.33	1.9	V
Reverse current	V_R = 3 V	I_R		0.5	10	µA
Capacitance	V_R = 0 V, f = 1 MHz	C_O		30		pF
Thermal resistance		R_{thja}		700		K/W
OUTPUT						
Supply current, logic high	I_F = 0 V, V_O = open, V_{CC} = 15 V	I_{CCH}		0.01	1	µA
		I_{CCH}		0.01	2	µA
Output current, output high	I_F = 0 V, V_O = V_{CC} = 5.5 V	I_{OH}		0.003	0.5	µA
	I_F = 0 V, V_O = V_{CC} = 15 V	I_{OH}		0.01	1	µA
		I_{OH}			50	µA
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz	C_{CE}		3		pF
Thermal resistance		R_{thja}		300		K/W
COUPLER						
Coupling capacitance		C_C		0.6		pF
Collector emitter saturation voltage	I_F = 16 mA, I_O = 2.4 mA, V_{CC} = 4.5 V	V_{OL}		0.1	0.4	V
Logic low supply current	I_F = 16 mA, V_O = open, V_{CC} = 15 V	I_{CCL}		80	200	µA

Notes

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

(1) T_{amb} = 0 °C to 70 °C, unless otherwise specified, typical values T_{amb} = 25 °C.

CURRENT TRANSFER RATIO (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Current transfer ratio	I_F = 16 mA, V_O = 0.4 V, V_{CC} = 4.5 V	I_C/I_F	19	30		%
	I_F = 16 mA, V_O = 0.5 V, V_{CC} = 4.5 V, T_{amb} = 0 °C to 70 °C	I_C/I_F	15			%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Propagation delay time (high to low), see fig. 1	I_F = 16 mA, V_{CC} = 5 V, R_L = 1.9 kΩ	t_{PHL}		0.3	0.8	µs
Propagation delay time (low to high), see fig. 1	I_F = 16 mA, V_{CC} = 5 V, R_L = 1.9 kΩ	t_{PLH}		0.3	0.8	µs

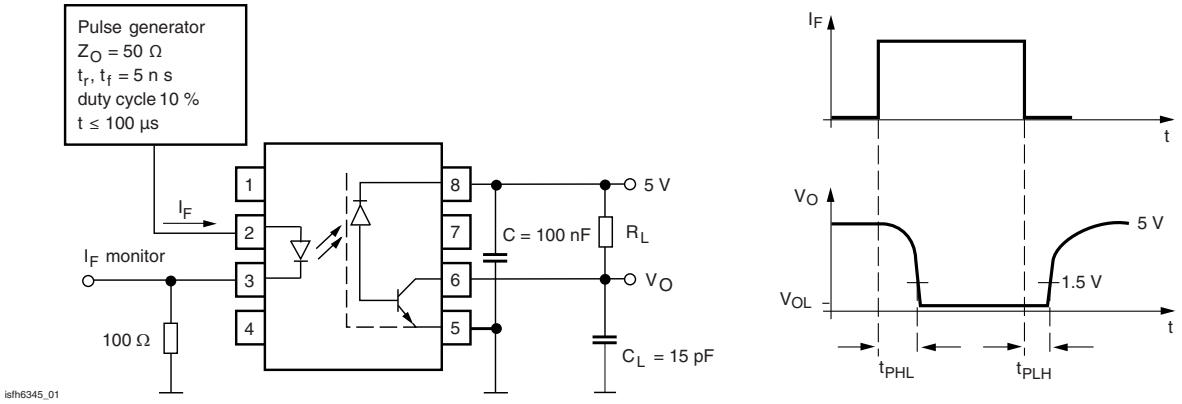


Fig. 1 - Switching Times (Typ.)

COMMON MODE TRANSIENT IMMUNITY (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Common mode transient immunity (high), see fig. 2	I_O = 0 mA, V_{CM} = 1500 V_{P-P}, R_L = 1.9 kΩ, V_{CC} = 5 V	$\|CM_H\|$	15	30		kV/µs
Common mode transient immunity (low), see fig. 2	I_O = 16 mA, V_{CM} = 1500 V_{P-P}, R_L = 1.9 kΩ, V_{CC} = 5 V	$\|CM_L\|$	15	30		kV/µs

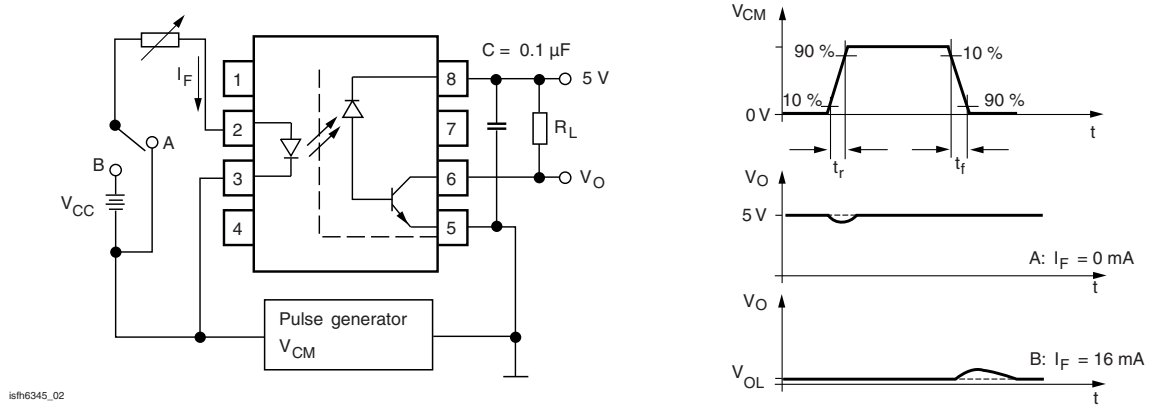


Fig. 2 - Common Mode Transient Immunity

SAFETY AND INSULATION RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Climatic classification	IEC 68 part 1			55/100/21		
Comparative tracking index		CTI	175		399	
V_{IOTM}			8000			V
V_{IORM}			890			V
P_{SO}					500	mW
I_{SI}					300	mA
T_{SI}					175	°C
Creepage distance	Standard DIP-8		7			mm
Clearance distance	Standard DIP-8		7			mm
Creepage distance	400 mil DIP-8		8			mm
Clearance distance	400 mil DIP-8		8			mm

Note

- According to DIN EN 60747-5-2 (VDE 0884), this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

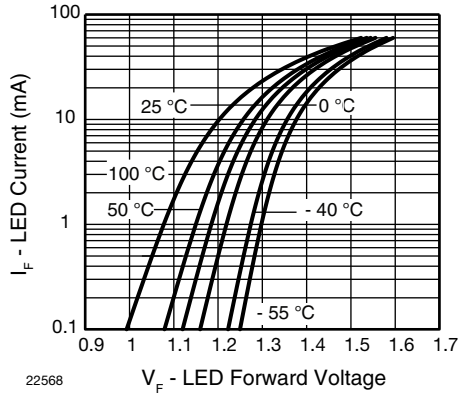


Fig. 3 - LED Forward Current vs. Forward Voltage

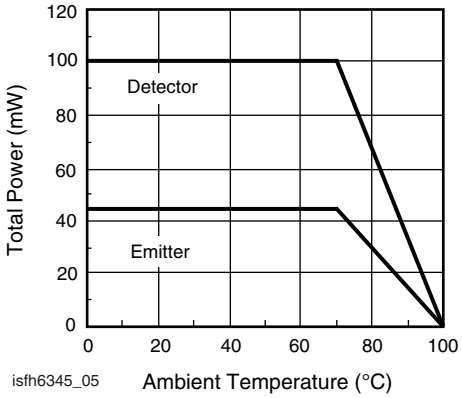


Fig. 5 - Permissible Power Dissipation vs. Temperature

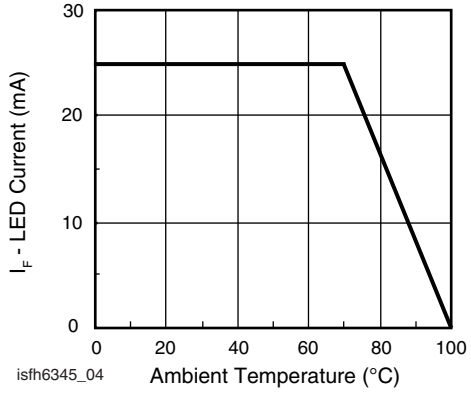


Fig. 4 - Permissible Forward LED Current vs. Temperature

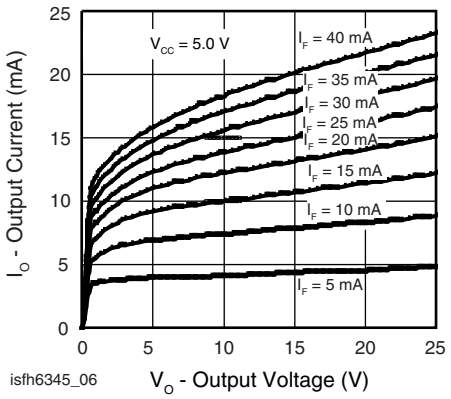


Fig. 6 - Output Current vs. Output Voltage

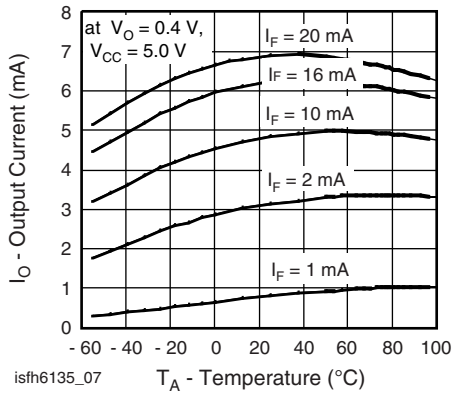


Fig. 7 - Output Current vs. Temperature

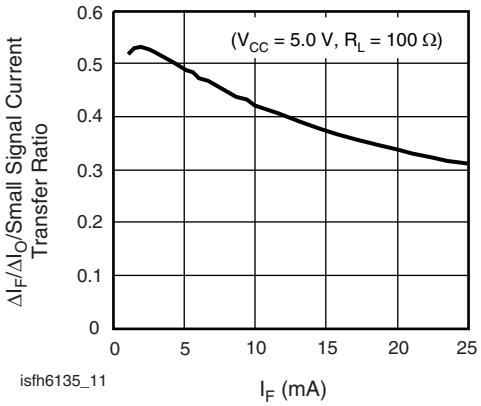


Fig. 10 - Small Signal Current Transfer Ratio vs. Input Current

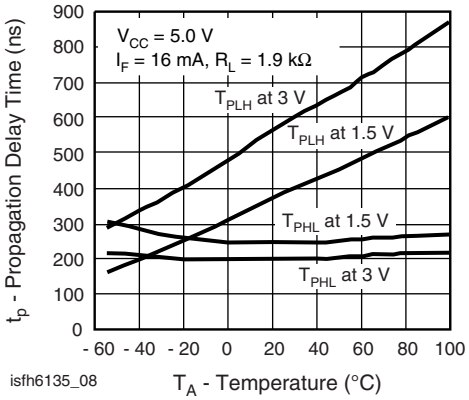


Fig. 8 - Propagation Delay vs. Ambient Temperature

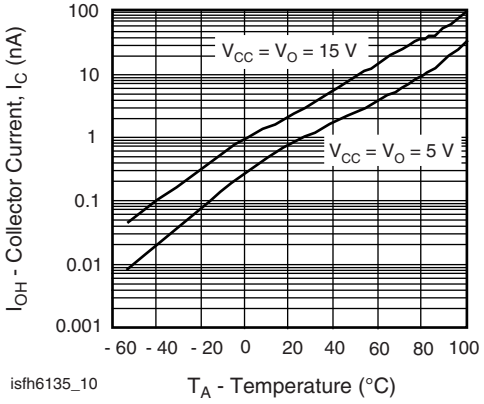
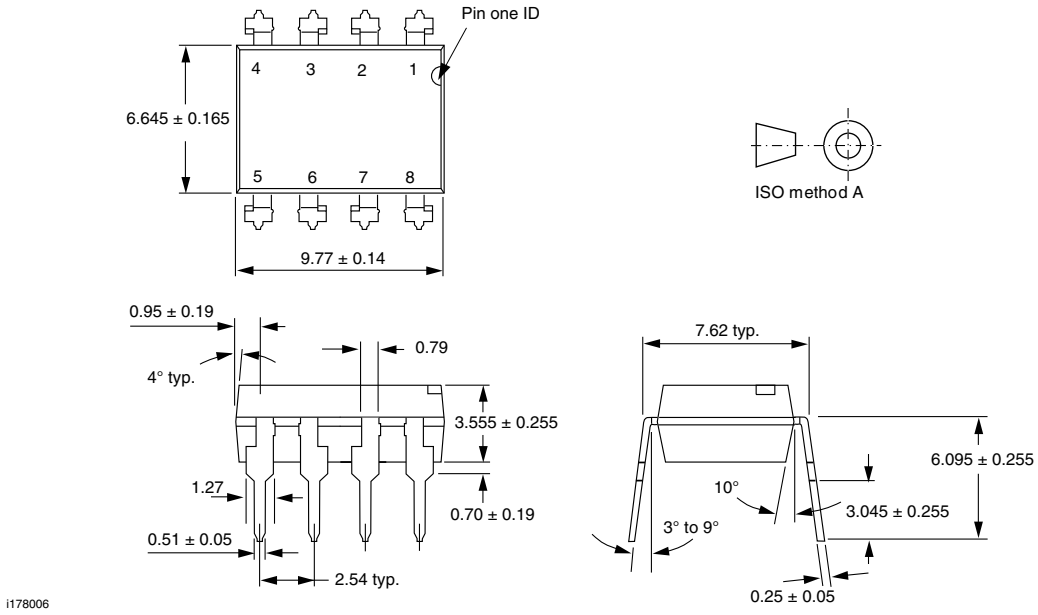
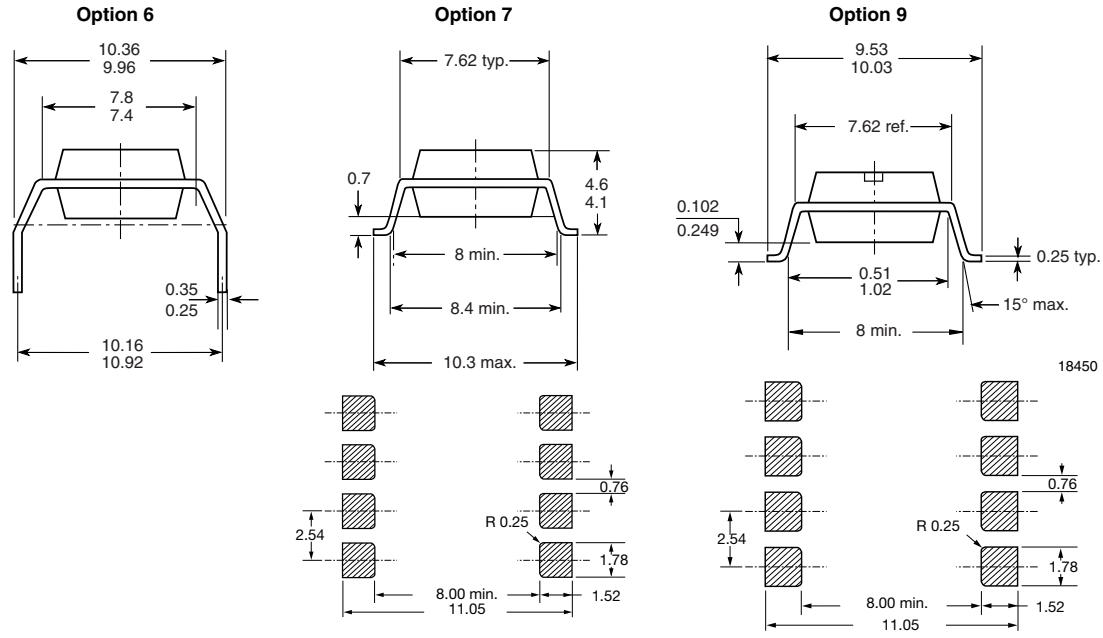


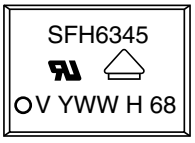
Fig. 9 - Logic High Output Current vs. Temperature

PACKAGE DIMENSIONS in millimeters





PACKAGE MARKING



Notes

- Only options 1, and 7 are reflected in the package marking.
- The VDE logo is only marked on option 1 parts.
- Tape and reel suffix (T) is not part of the package marking.

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