COMPLIANT

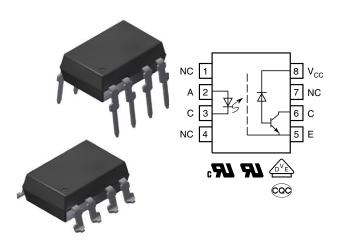
HALOGEN FREE

GREEN



Vishay Semiconductors

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



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.

FEATURES

- 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 <u>www.vishay.com/doc?99912</u>

APPLICATIONS

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

AGENCY APPROVALS

- UL1577 file no. E52744, double protection
- DIN EN 60747-5-5 (VDE0884-5) available with option 1
- cUL components acceptance service no. 5A
- CQC GB8898-2001, GB4943.1-2011

ORDERING INFORMATION				
S F H 6 3 4 5 - >	PACKAGE OPTION TAPE AND REEL Option 7 Option 9			
AGENCY CERTIFIED/PACKAGE	CMR (kV/μs)			
UL, cUL, CQC	≥ 15			
DIP-8	SFH6345			
SMD-8, option 7	SFH6345-X007T ⁽¹⁾			
SMD-8, option 9	SFH6345-X009T ⁽¹⁾			
VDE, UL, cUL, CQC				
DIP-8	SFH6345-X001			
DIP-8, 400 mil, option 6	SFH6345-X016			
SMD-8, option 7	SFH6345-X017T			
SMD-8, option 9	SFH6345-X019T ⁽¹⁾			

Note

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



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ABSOLUTE MAXIMUM RATINGS (T _{amb} = 25 °C, unless otherwise specified)								
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT				
INPUT	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	А				
Power dissipation		P _{diss}	45	mW				
OUTPUT								
Supply voltage		Vs	-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								
Storage temperature range		T _{stg}	-55 to +150	°C				
Ambient temperature range		T _{amb}	-55 to +100	°C				
Junction temperature		Tj	125	°C				
Soldering temperature	max. 10 s, max. dip soldering: distance to seating plane ≥ 1.5 mm	T _{sld}	260	°C				

Note

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

ELECTRICAL CHARACTERISTICS (T _{amb} = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
INPUT							
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	Co	-	30	-	pF	
Thermal resistance		R _{thja}	-	700	-	K/W	
OUTPUT	•						
0 1	$I_F = 0 \text{ V}, V_O = \text{open}, V_{CC} = 15 \text{ V}$	I _{CCH}	-	0.01	1	μA	
Supply current, logic high		I _{CCH} (1)	-	0.01	2	μA	
Output current, output high	$I_F = 0 \text{ V}, V_O = V_{CC} = 5.5 \text{ V}$	I _{OH}	-	0.003	0.5	μΑ	
	I _F = 0 V, V _O = V _{CC} = 15 V	I _{OH}	-	0.01	1	μA	
		I _{OH} ⁽¹⁾	-	-	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	$I_F = 16 \text{ mA}, I_O = 2.4 \text{ mA}, V_{CC} = 4.5 \text{ V}$	V _{OL}	-	0.1	0.4	V	
Logic low supply current	$I_F = 16 \text{ mA}, V_O = \text{open}, V_{CC} = 15 \text{ V}$	I _{CCL}	-	80	200	μA	

Notes

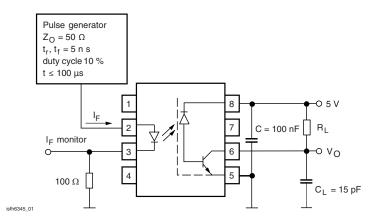
Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements

 $^{^{(1)}}$ 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	$I_F = 16 \text{ mA}, V_O = 0.4 \text{ V}, V_{CC} = 4.5 \text{ V}$	CTR	19	30	-	%
	$I_F = 16 \text{ mA}, V_O = 0.5 \text{ V}, V_{CC} = 4.5 \text{ V},$ $T_{amb} = 0 \text{ °C to } 70 \text{ °C}$	CTR	15	ı	-	%

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 k Ω	t _{PHL}	-	0.3	0.8	μs
Propagation delay time (low to high), see fig. 1	$I_F = 16 \text{ mA}, V_{CC} = 5 \text{ V}, R_L = 1.9 \text{ k}\Omega$	t _{PLH}	-	0.3	0.8	μs



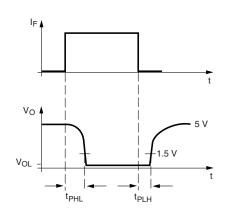


Fig. 1 - Switching Times (Typ.)

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, $V_{CM} = 1500 V_{P-P}$, $R_{L} = 1.9 \text{ k}\Omega$, $V_{CC} = 5 \text{ V}$	CM _H	15 000	30 000	-	V/µs
Common mode transient immunity (low), see fig. 2	$I_{O} = 16$ mA, $V_{CM} = 1500$ V_{P-P} , $R_{L} = 1.9$ k Ω , $V_{CC} = 5$ V	CM _L	15 000	30 000	-	V/µs

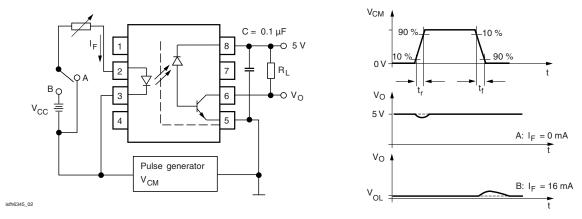


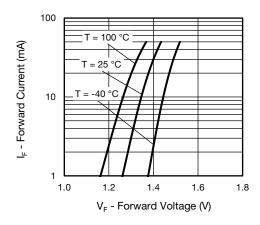
Fig. 2 - Common Mode Transient Immunity



SAFETY AND INSULATION RATINGS (T _{amb} = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT			
Climatic classification	According to IEC 68 part 1		55/100/21				
Pollution degree	According to DIN VDE 0109		2				
Comparative tracking index	Insulation group IIIa	CTI	175				
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V _{ISO}	5300	V _{RMS}			
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V _{IOTM}	8000	V _{peak}			
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V _{IORM}	890	V _{peak}			
Isolation resistance	T _{amb} = 25 °C, V _{IO} = 500 V	R _{IO}	≥ 10 ¹²	Ω			
Isolation resistance	$T_{amb} = 100 ^{\circ}\text{C}, V_{IO} = 500 \text{V}$	R _{IO}	≥ 10 ¹¹	Ω			
Output safety power		P _{SO}	500	mW			
Input safety current		I _{SI}	300	mA			
Input safety temperature		T _S	175	°C			
Creepage distance	DIP-8		≥ 7	mm			
Clearance distance	DIP-8		≥ 7	mm			
Creepage distance	DIP-8, 400 mil, option 6		≥ 8	mm			
Clearance distance	DIP-8, 400 mil, option 6		≥ 8	mm			
Creepage distance	SMD-8, option 7		≥8	mm			
Clearance distance	SMD-8, option 7		≥ 8	mm			
Creepage distance	SMD-8, option 9		≥ 8	mm			
Clearance distance	SMD-8, option 9		≥ 8	mm			
Insulation thickness		DTI	≥ 0.4	mm			

Note

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





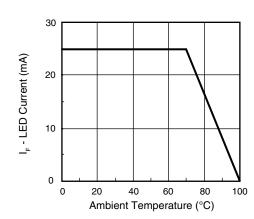


Fig. 4 - Permissible Forward LED Current vs. Temperature

As per IEC 60747-5-5, § 7.4.3.8.2, 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

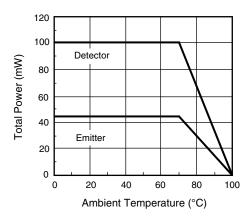


Fig. 5 - Permissible Power Dissipation vs. Temperature

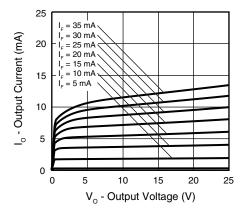


Fig. 6 - Output Current vs. Output Voltage

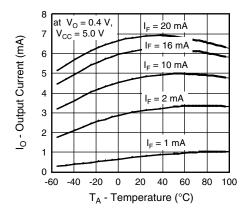


Fig. 7 - Output Current vs. Temperature

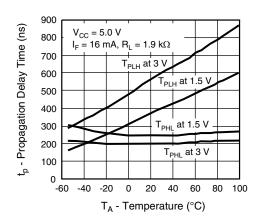


Fig. 8 - Propagation Delay vs. Ambient Temperature

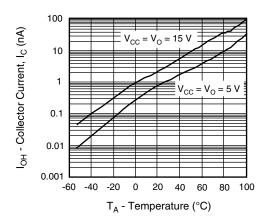


Fig. 9 - Logic High Output Current vs. Temperature

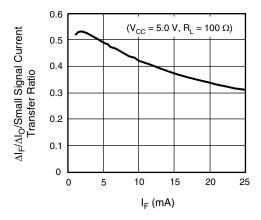
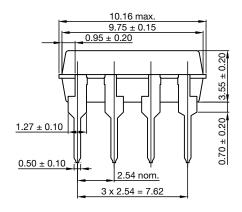
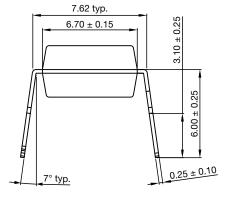


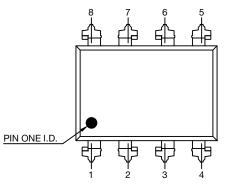
Fig. 10 - Small Signal Current Transfer Ratio vs. Input Current

PACKAGE DIMENSIONS (in millimeters)

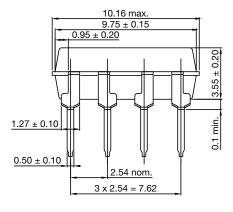
DIP-6

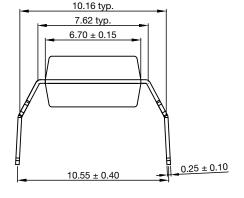


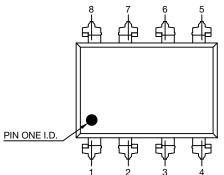




DIP-6, Option 6



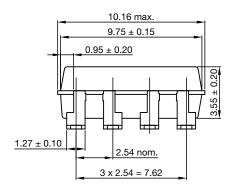


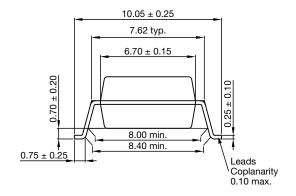


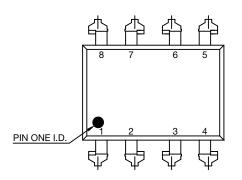
Rev. 2.3, 26-Jul-2019 6 Document Number: 83680

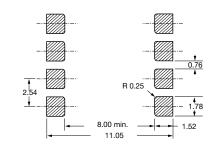


SMD-6, Option 7

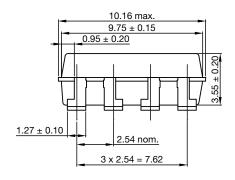


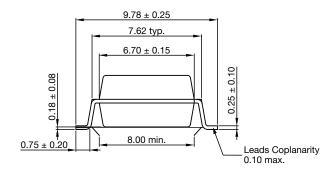


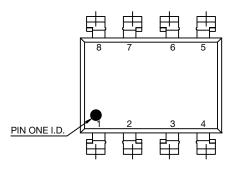


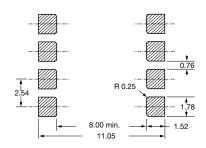


SMD-6, Option 9









PACKAGE MARKING



Fig. 11 - SFH6345

Notes

- The VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking

PACKAGING INFORMATION (in millimeters)

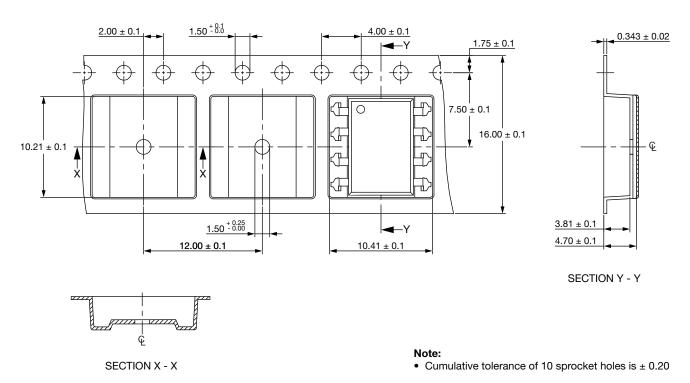


Fig. 12 - Tape and Reel Packing for SMD-8, Option 7 (1000 pieces on reel)



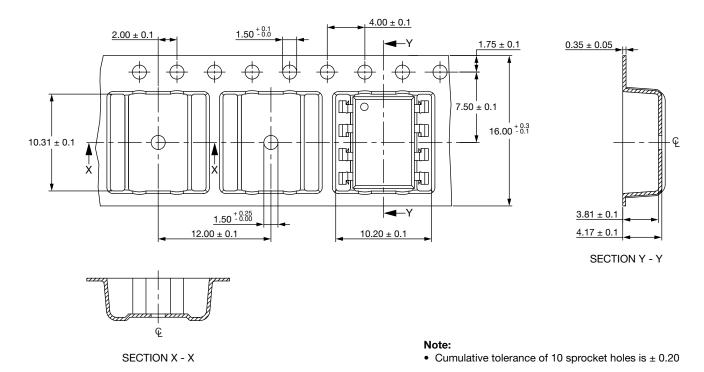


Fig. 13 - Tape and Reel Packing for SMD-8, Option 9 (1000 pieces on reel)

SOLDER PROFILES

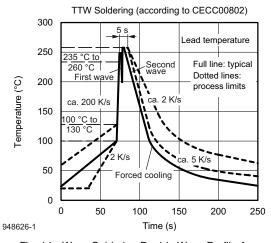


Fig. 14 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP-8 Devices

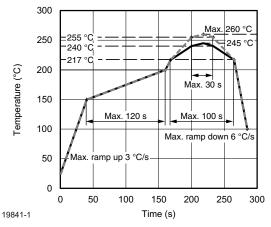


Fig. 15 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD-8 Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2 Floor life: unlimited

Conditions: T_{amb} < 30 °C, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020

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