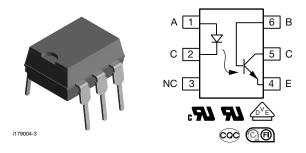
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# **Optocoupler, Phototransistor Output, With Base Connection**



## LINKS TO ADDITIONAL RESOURCES



### DESCRIPTION

The H11A1 is an industry standard single channel phototransistor coupler.

Each optocoupler consists of gallium arsenide infrared LED and a silicon NPN phototransistor.

The isolation performance is accomplished through Vishay double molding isolation manufacturing process. Compliance to DIN EN 60747-5-5 partial discharge isolation specification is available is by ordering option 1.

These isolation processes and the Vishay ISO9001 quality program results in the highest isolation performance available for a commercial plastic phototransistor optocoupler.

The devices are available in lead formed configuration suitable for surface mounting and are available either on tape and reel, or in standard tube shipping containers.

#### Note

• Designing with datasheet is covered in Application Note 45

## FEATURES

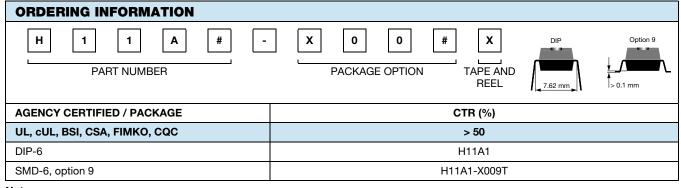
- Interfaces with common logic families
- Input-output coupling capacitance < 0.5 pF</li>
- Industry standard dual-in line 6-pin package
- Isolation rated voltage 4420 V<sub>RMS</sub>
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

### **APPLICATIONS**

- AC mains detection
- · Reed relay driving
- · Switch mode power supply feedback
- Telephone ring detection
- Logic ground isolation
- · Logic coupling with high frequency noise rejection

### AGENCY APPROVALS

- <u>UL 1577</u>
- <u>cUL</u>
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- <u>BSI EN 62368-1</u>
- <u>CQC GB 4943.1</u>
- <u>CQC GB 8898</u>
- <u>FIMKO</u>



#### Note

· Additional options may be possible, please contact sales office

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<b>ABSOLUTE MAXIMUM RATINGS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)								
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT				
INPUT								
Reverse voltage		V <sub>R</sub>	6	V				
Forward current		I <sub>F</sub>	60	mA				
Surge current	t ≤ 10 µs	I <sub>FSM</sub>	2.5	A				
Power dissipation		P <sub>diss</sub>	100	mW				
OUTPUT								
Collector emitter breakdown voltage		V <sub>CEO</sub>	70	V				
Emitter base breakdown voltage		V <sub>EBO</sub>	7	V				
Collector current		Ι <sub>C</sub>	50	mA				
	t < 1 ms	Ι <sub>C</sub>	100	mA				
Power dissipation		P <sub>diss</sub>	150	mW				
COUPLER								
Storage temperature range		T <sub>stg</sub>	-55 to +150	°C				
Operating temperature range		T <sub>amb</sub>	-55 to +100	°C				
Junction temperature		Tj	100	°C				
Soldering temperature	Max. 10 s, dip soldering: distance to seating plane ≥ 1.5 mm	T <sub>sld</sub>	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 <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
INPUT							
Forward voltage	I <sub>F</sub> = 10 mA	V <sub>F</sub>	-	1.1	1.5	V	
Reverse current	V <sub>R</sub> = 3 V	I <sub>R</sub>	-	-	10	μA	
Capacitance	$V_R = 0 V$ , f = 1 MHz	Co	-	50	-	pF	
OUTPUT							
Collector emitter breakdown voltage	$I_{\rm C} = 1  {\rm mA},  I_{\rm F} = 0  {\rm mA}$	BV <sub>CEO</sub>	30	-	-	V	
Emitter collector breakdown voltage	I <sub>E</sub> = 100 μA, I <sub>F</sub> = 0 mA	BV <sub>ECO</sub>	7	-	-	V	
Collector base breakdown voltage	I <sub>C</sub> = 10 μA, I <sub>F</sub> = 0 mA	BV <sub>CBO</sub>	70	-	-	V	
Collector emitter leakage current	V <sub>CE</sub> = 10 V, I <sub>F</sub> = 0 mA	I <sub>CEO</sub>	-	5	50	nA	
Emitter collector capacitance	V <sub>CE</sub> = 0 V	C <sub>CE</sub>	-	6	-	pF	
COUPLER							
Collector emitter, saturation voltage	$I_{CE} = 0.5 \text{ mA}, I_F = 10 \text{ mA}$	V <sub>CEsat</sub>	-	-	0.4	V	
Capacitance (input-output)		C <sub>IO</sub>	-	0.5	-	pF	

#### Note

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

CURRENT TRANSFER RATIO						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
I <sub>C</sub> /I <sub>F</sub>	$V_{CE} = 10 \text{ V}, \text{ I}_{F} = 10 \text{ mA}$	CTR <sub>DC</sub>	50	-	-	%

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$I_{C}$ = 2 mA, $R_{L}$ = 100 $\Omega,V_{CE}$ = 10 V	t <sub>on</sub>	-	3	-	μs
Turn-off time		t <sub>off</sub>	-	3	-	μs

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SAFETY AND INSULATION RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT		
Climatic classification	According to IEC 68 part 1		55 / 100 / 21			
Comparative tracking index		CTI	175			
Maximum rated withstanding isolation voltage	t = 1 min	V <sub>ISO</sub>	4420	V <sub>RMS</sub>		
Maximum transient isolation voltage		VIOTM	8000	V <sub>peak</sub>		
Maximum repetitive peak isolation voltage		V <sub>IORM</sub>	890	V <sub>peak</sub>		
Isolation resistance	$V_{IO} = 500 \text{ V}, \text{ T}_{amb} = 25 ^{\circ}\text{C}$	R <sub>IO</sub>	≥ 10 <sup>12</sup>	Ω		
Isolation resistance	$V_{IO} = 500 \text{ V}, \text{ T}_{amb} = 100 ^{\circ}\text{C}$	R <sub>IO</sub>	≥ 10 <sup>11</sup>	Ω		
Output safety power		P <sub>SO</sub>	700	mW		
Input safety current		I <sub>SI</sub>	400	mA		
Safety temperature		Ts	175	°C		
Creepage distance			≥7	mm		
Clearance distance			≥7	mm		
Insulation thickness		DTI	≥ 0.4	mm		

Note

• 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.

## TYPICAL CHARACTERISTICS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

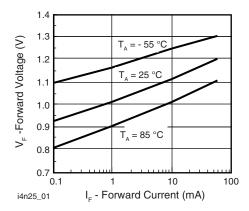


Fig. 1 - Forward Voltage vs. Forward Current

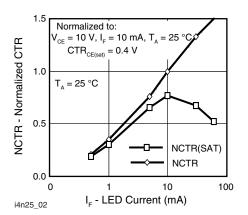


Fig. 2 - Normalized Non-Saturated and Saturated CTR vs. LED Current

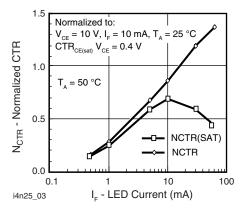


Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current

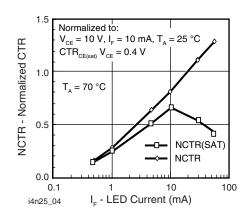
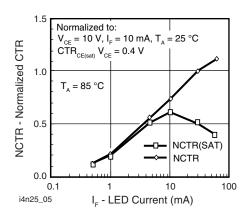


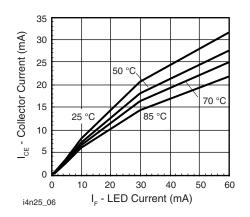
Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

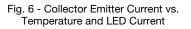
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Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current





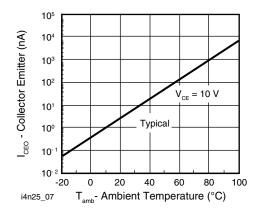


Fig. 7 - Collector Emitter Leakage Current vs. Temperature

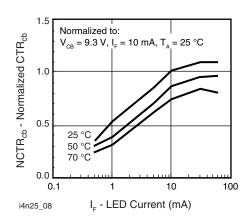


Fig. 8 - Normalized CTR<sub>cb</sub> vs. LED Current and Temperature

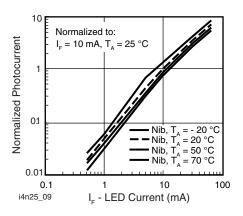


Fig. 9 - Normalized Photocurrent vs.  ${\rm I}_{\rm F}$  and Temperature

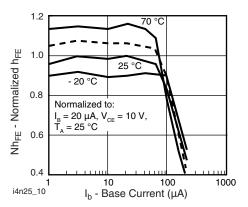


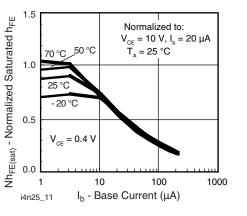
Fig. 10 - Normalized Non-Saturated  $h_{\text{FE}}$  vs. Base Current and Temperature

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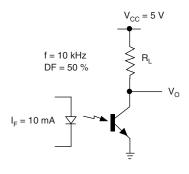
Fig. 13 - Switching Timing



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Fig. 11 - Normalized HFE vs. Base Current and Temperature



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Fig. 14 - Switching Schematic

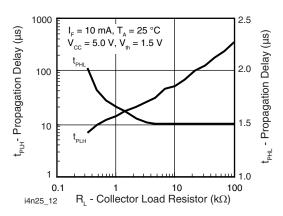
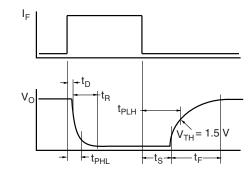


Fig. 12 - Propagation Delay vs. Collector Load Resistor



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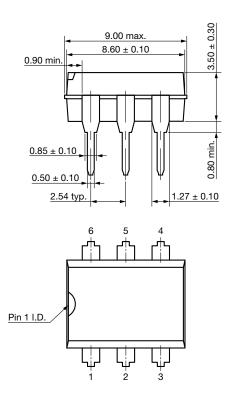
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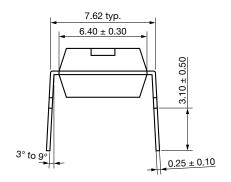


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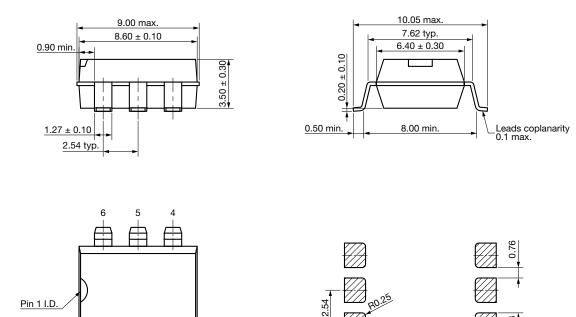
## **PACKAGE DIMENSIONS** in millimeters

DIP-6





#### **Option 9**



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6 For technical questions, contact: <u>optocoupleranswers@vishay.com</u> Document Number: 83730

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## PACKAGE MARKING



#### Notes

- XXXX = LMC (lot marking code)
- Only options 1 and 7 are reflected in the package marking
- The VDE Logo is only marked on option1 parts
- Tape and reel suffix (T) is not part of the package marking



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