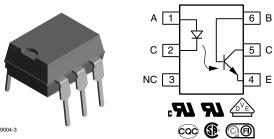


## Optocoupler, Phototransistor Output, With Base Connection



# **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





#### **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 data sheet is covered in Application Note 45.

#### **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

- UL1577, file no. E52744, double protection
- cUL
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- BSI EN 62368-1
- CSA 93751
- CQC: GB 8898-2011, GB 4943.1-2011
- FIMKO

ORDERING INFORMATION	
H 1 1 A # -	PACKAGE OPTION TAPE AND REEL 7.62 mm
AGENCY CERTIFIED / PACKAGE	CTR (%)
UL, cUL, BSI, CSA, FIMKO, CQC	> 50
DIP-6	H11A1
SMD-6, option 9	H11A1-X009T

#### Note

Additional options may be possible, please contact sales office



<b>ABSOLUTE MAXIMUM RATINGS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT		
INPUT						
Reverse voltage		$V_R$	6	V		
Forward current		I <sub>F</sub>	60	mA		
Surge current	t ≤ 10 µs	I <sub>FSM</sub>	2.5	А		
Power dissipation		P <sub>diss</sub>	100	mW		
OUTPUT	•					
Collector emitter breakdown voltage		$V_{CEO}$	70	V		
Emitter base breakdown voltage		V <sub>EBO</sub>	7	V		
Collector current		I <sub>C</sub>	50	mA		
	t < 1 ms	I <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

<b>ELECTRICAL CHARACTERISTICS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
INPUT							
Forward voltage	$I_F = 10 \text{ mA}$	$V_{F}$	-	1.1	1.5	V	
Reverse current	V <sub>R</sub> = 3 V	I <sub>R</sub>	-	-	10	μA	
Capacitance	V <sub>R</sub> = 0 V, f = 1 MHz	Co	=	50	=	pF	
OUTPUT							
Collector emitter breakdown voltage	$I_C = 1 \text{ mA}, I_F = 0 \text{ mA}$	BV <sub>CEO</sub>	30	-	=	V	
Emitter collector breakdown voltage	$I_E = 100 \mu A, I_F = 0 mA$	BV <sub>ECO</sub>	7	-	-	V	
Collector base breakdown voltage	$I_C = 10 \mu A, I_F = 0 \text{ mA}$	BV <sub>CBO</sub>	70	-	-	V	
Collector emitter leakage current	$V_{CE} = 10 \text{ V}, I_F = 0 \text{ mA}$	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 <sub>CE</sub> = 10 V, I <sub>F</sub> = 10 mA	CTR <sub>DC</sub>	50	-	-	%

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$I_C = 2 \text{ mA}, R_L = 100 \Omega, V_{CE} = 10 \text{ V}$	t <sub>on</sub>	-	3	-	μs
Turn-off time		t <sub>off</sub>	-	3	1	μs



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	$V_{RMS}$		
Maximum transient isolation voltage		$V_{IOTM}$	8000	V <sub>peak</sub>		
Maximum repetitive peak isolation voltage		$V_{IORM}$	890	$V_{peak}$		
Isolation resistance	$V_{IO} = 500 \text{ V}, T_{amb} = 25  ^{\circ}\text{C}$	R <sub>IO</sub>	≥ 10 <sup>12</sup>	Ω		
isolation resistance	V <sub>IO</sub> = 500 V, T <sub>amb</sub> = 100 °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		T <sub>S</sub>	175	°C		
Creepage distance			≥ 7	mm		
Clearance distance			≥ 7	mm		
Insulation thickness		DTI	≥ 0.4	mm		

#### Note

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

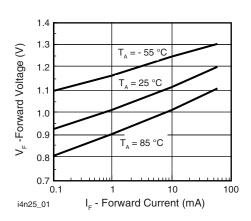


Fig. 1 - Forward Voltage vs. Forward Current

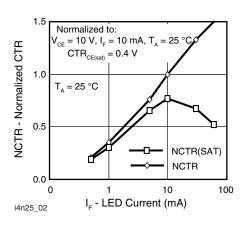


Fig. 2 - Normalized Non-Saturated and Saturated CTR vs. LED Current

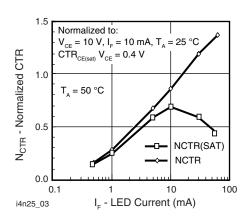
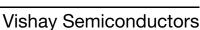


Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current

<sup>•</sup> 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





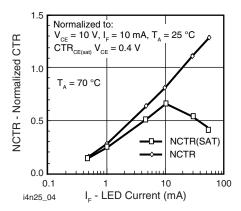


Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

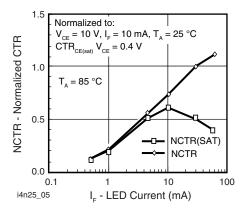


Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current

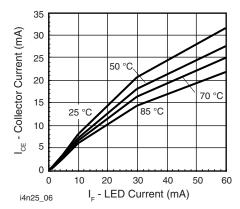


Fig. 6 - Collector Emitter Current vs. Temperature and LED Current

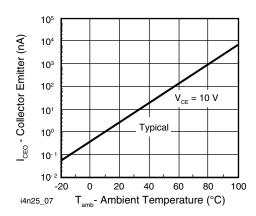


Fig. 7 - Collector Emitter Leakage Current vs. Temperature

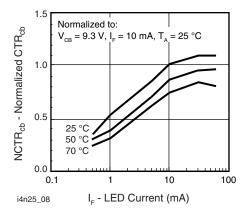


Fig. 8 - Normalized CTR<sub>cb</sub> vs. LED Current and Temperature

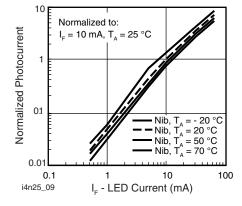


Fig. 9 - Normalized Photocurrent vs.  $\ensuremath{I_{\text{F}}}$  and Temperature





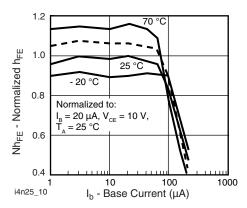


Fig. 10 - Normalized Non-Saturated hFE vs. Base Current and Temperature

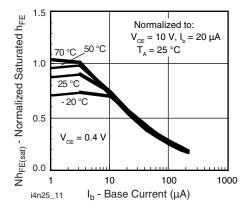


Fig. 11 - Normalized HFE vs. Base Current and Temperature

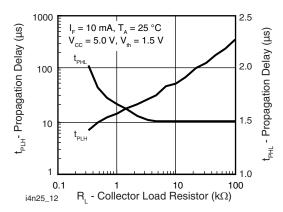


Fig. 12 - Propagation Delay vs. Collector Load Resistor

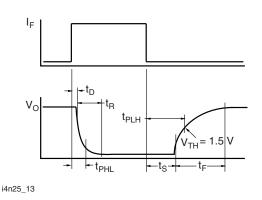


Fig. 13 - Switching Timing

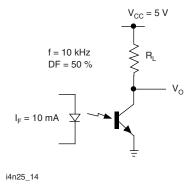
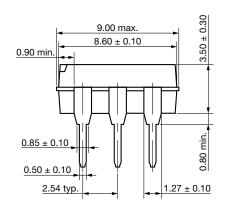


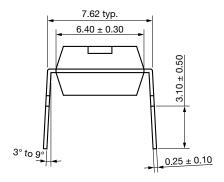
Fig. 14 - Switching Schematic

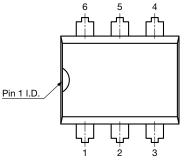


## **PACKAGE DIMENSIONS** in millimeters

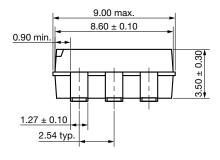
#### DIP-6

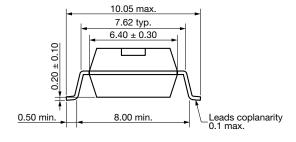


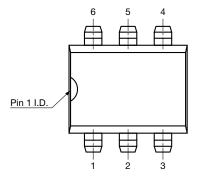


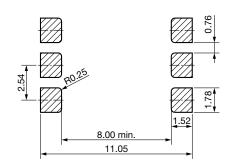


#### Option 9











## **Legal Disclaimer Notice**

Vishay

## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.