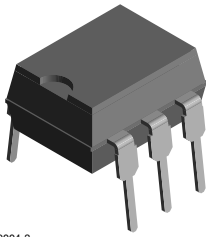
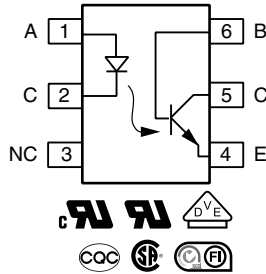


# Optocoupler, Phototransistor Output, With Base Connection



H179004-3



## FEATURES

- Interfaces with common logic families
- Input-output coupling capacitance < 0.5 pF
- 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](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## 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																							
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H	1	1	A	#	-	X	0	0	#	X													
PART NUMBER					PACKAGE OPTION					TAPE AND REEL													
<b>AGENCY CERTIFIED / PACKAGE</b>	<b>CTR (%)</b>																						
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> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		$V_R$	6	V
Forward current		$I_F$	60	mA
Surge current	$t \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	2.5	A
Power dissipation		$P_{diss}$	100	mW
<b>OUTPUT</b>				
Collector emitter breakdown voltage		$V_{CEO}$	70	V
Emitter base breakdown voltage		$V_{EBO}$	7	V
Collector current		$I_C$	50	mA
	$t < 1\text{ ms}$	$I_C$	100	mA
Power dissipation		$P_{diss}$	150	mW
<b>COUPLER</b>				
Storage temperature range		$T_{stg}$	-55 to +150	$^{\circ}\text{C}$
Operating temperature range		$T_{amb}$	-55 to +100	$^{\circ}\text{C}$
Junction temperature		$T_j$	100	$^{\circ}\text{C}$
Soldering temperature	Max. 10 s, dip soldering: distance to seating plane $\geq 1.5\text{ mm}$	$T_{sld}$	260	$^{\circ}\text{C}$

**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> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 10\text{ mA}$	$V_F$	-	1.1	1.5	V
Reverse current	$V_R = 3\text{ V}$	$I_R$	-	-	10	$\mu\text{A}$
Capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$	$C_O$	-	50	-	pF
<b>OUTPUT</b>						
Collector emitter breakdown voltage	$I_C = 1\text{ mA}$ , $I_F = 0\text{ mA}$	$BV_{CEO}$	30	-	-	V
Emitter collector breakdown voltage	$I_E = 100\text{ }\mu\text{A}$ , $I_F = 0\text{ mA}$	$BV_{ECO}$	7	-	-	V
Collector base breakdown voltage	$I_C = 10\text{ }\mu\text{A}$ , $I_F = 0\text{ mA}$	$BV_{CBO}$	70	-	-	V
Collector emitter leakage current	$V_{CE} = 10\text{ V}$ , $I_F = 0\text{ mA}$	$I_{CEO}$	-	5	50	nA
Emitter collector capacitance	$V_{CE} = 0\text{ V}$	$C_{CE}$	-	6	-	pF
<b>COUPLER</b>						
Collector emitter, saturation voltage	$I_{CE} = 0.5\text{ mA}$ , $I_F = 10\text{ mA}$	$V_{CEsat}$	-	-	0.4	V
Capacitance (input-output)		$C_{IO}$	-	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.

<b>CURRENT TRANSFER RATIO</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
$I_C/I_F$	$V_{CE} = 10\text{ V}$ , $I_F = 10\text{ mA}$	$CTR_{DC}$	50	-	-	%

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

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	$t = 1 \text{ min}$	$V_{ISO}$	4420	$V_{RMS}$
Maximum transient isolation voltage		$V_{IOTM}$	8000	$V_{peak}$
Maximum repetitive peak isolation voltage		$V_{IORM}$	890	$V_{peak}$
Isolation resistance	$V_{IO} = 500 \text{ V}, T_{amb} = 25 \text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Output safety power		$P_{SO}$	700	mW
Input safety current		$I_{SI}$	400	mA
Safety temperature		$T_S$	175	$^\circ\text{C}$
Creepage distance			$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Insulation thickness		DTI	$\geq 0.4$	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

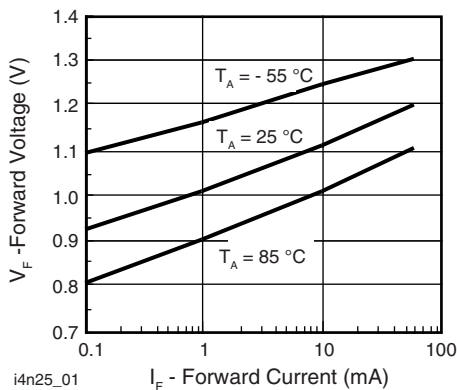
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified)


Fig. 1 - Forward Voltage vs. Forward Current

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

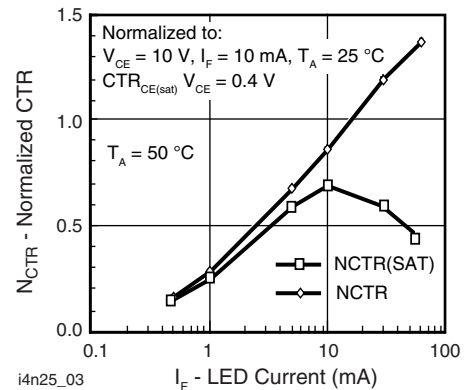
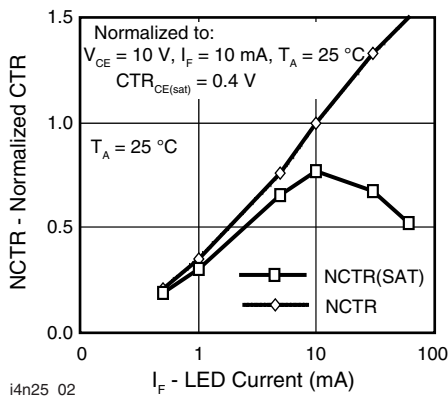


Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current



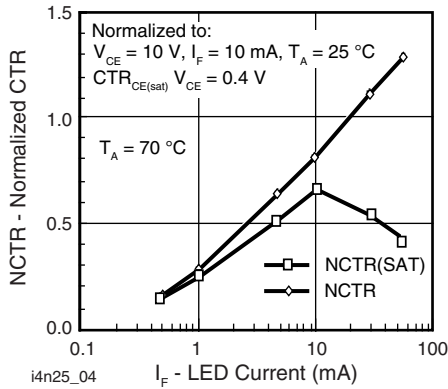


Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

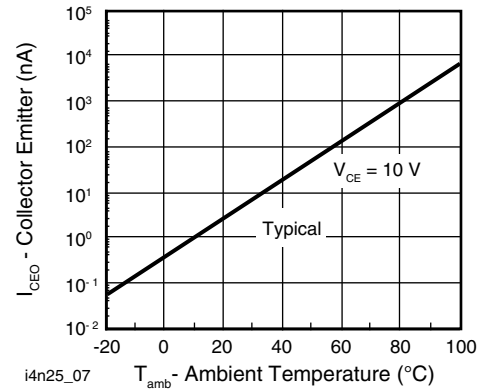


Fig. 7 - Collector Emitter Leakage Current vs. Temperature

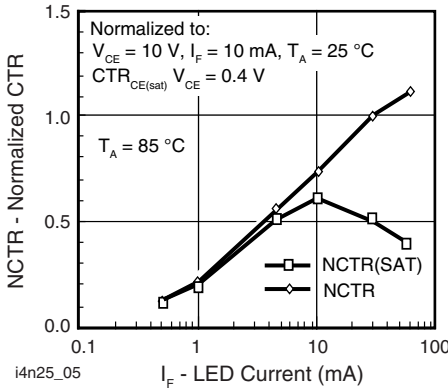


Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current

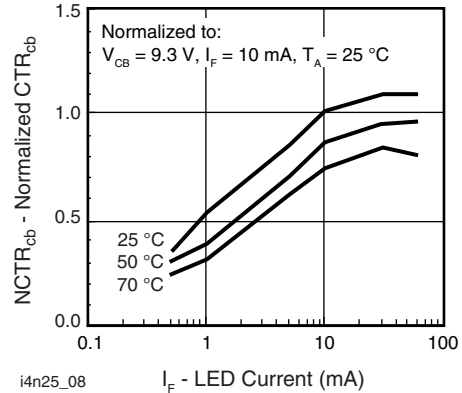


Fig. 8 - Normalized CTR<sub>cb</sub> vs. LED Current and Temperature

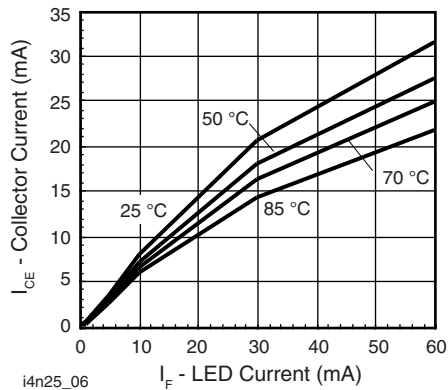


Fig. 6 - Collector Emitter Current vs. Temperature and LED Current

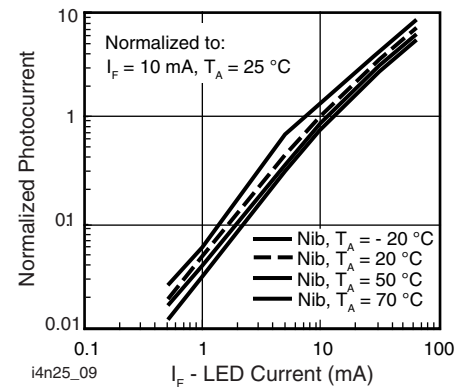


Fig. 9 - Normalized Photocurrent vs. I<sub>F</sub> and Temperature

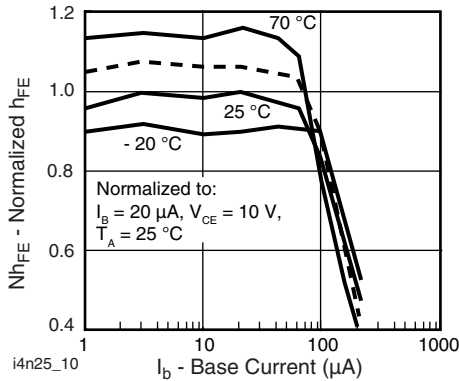


Fig. 10 - Normalized Non-Saturated  $h_{FE}$  vs. Base Current and Temperature

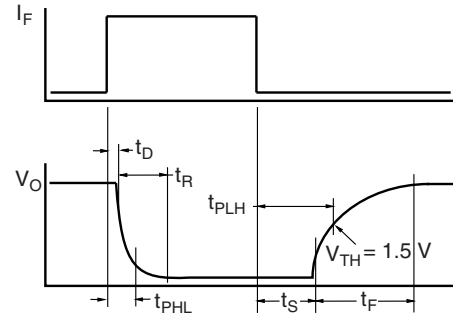


Fig. 13 - Switching Timing

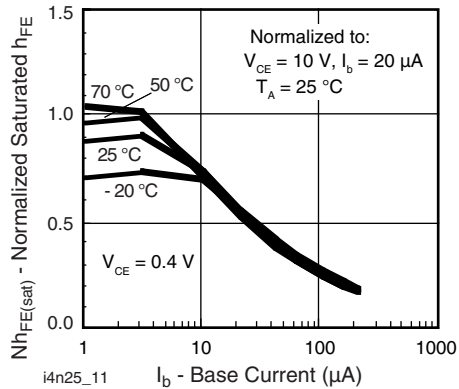


Fig. 11 - Normalized HFE vs. Base Current and Temperature

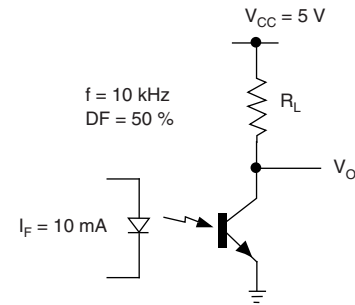


Fig. 14 - Switching Schematic

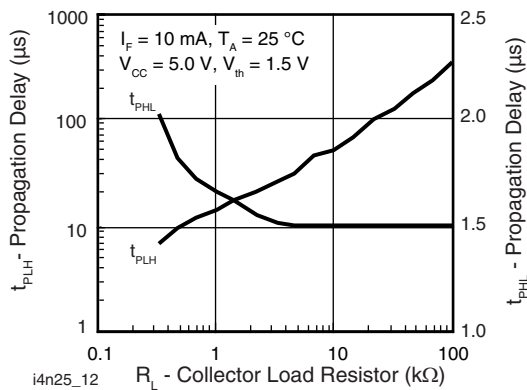
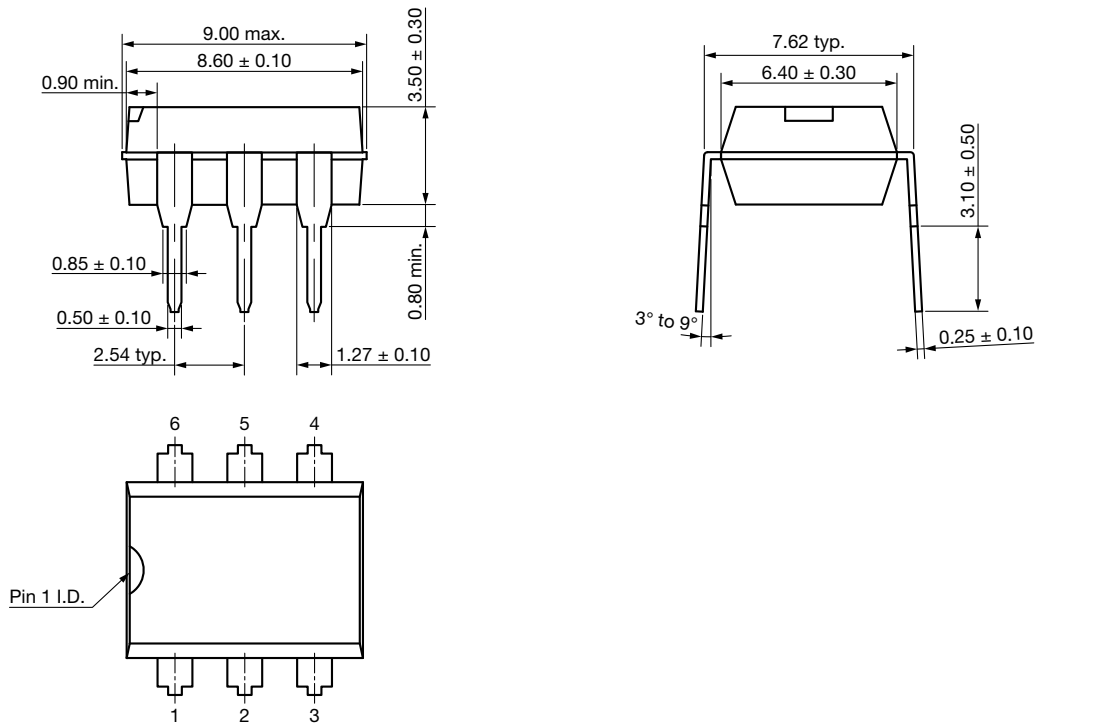


Fig. 12 - Propagation Delay vs. Collector Load Resistor

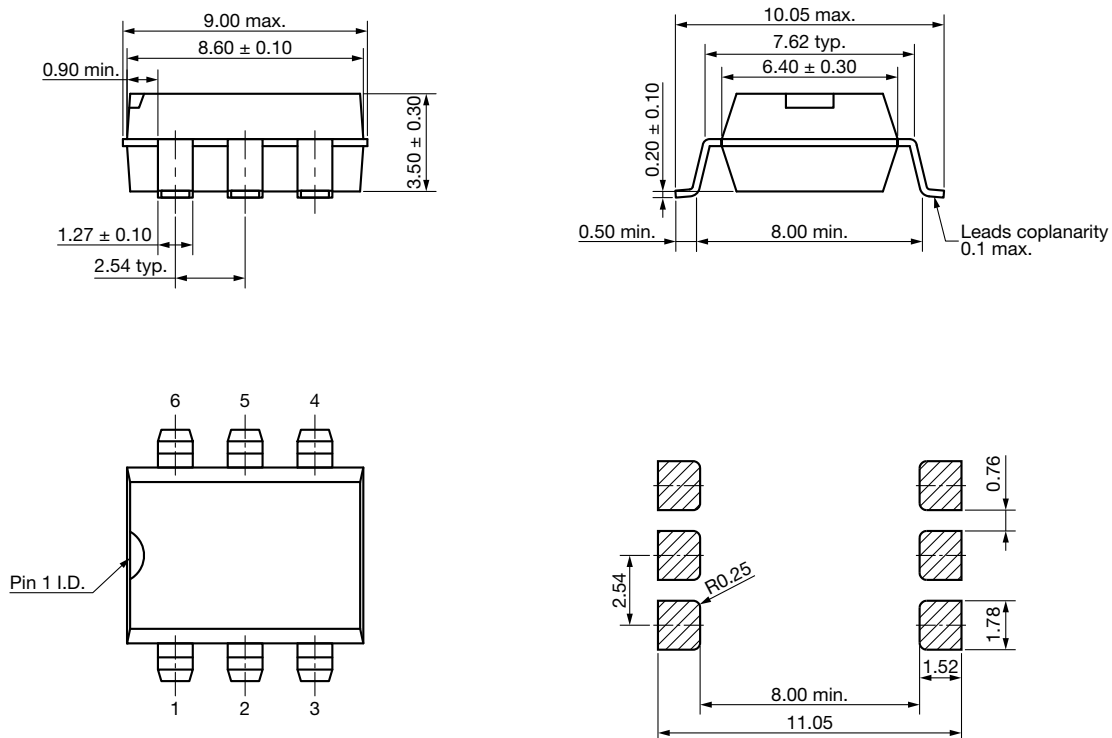


PACKAGE DIMENSIONS in millimeters

DIP-6



Option 9





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