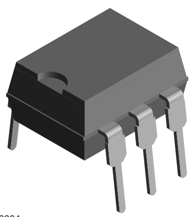
Optocoupler, Phototransistor Output, with Base Connection



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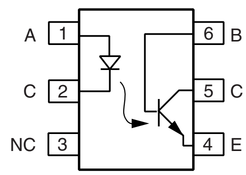


FEATURES

- Interfaces with common logic families
- Input-output coupling capacitance < 0.5 pF
- Industry standard dual-in line 6-pin package
- Isolation test voltage: 5300 V_{RMS}
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

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

DESCRIPTION

The H11Ax family is an industry standard single channel phototransistor coupler. It includes the H11A1/H11A2/H11A3/H11A4/H11A5 couplers.
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.

AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- CSA 93751
- BSI IEC 60950; IEC 60065
- DIN EN 60747-5-5 available with option 1
- FIMKO

ORDER INFORMATION

PART	REMARKS
H11A1	CTR > 50 %, DIP-6
H11A2	CTR > 20 %, DIP-6
H11A3	CTR > 20 %, DIP-6
H11A4	CTR > 10 %, DIP-6
H11A5	CTR > 30 %, DIP-6
H11A1-X006	CTR > 50 %, DIP-6 400 mil (option 6)
H11A1-X007	CTR > 50 %, SMD-6 (option 7)
H11A1-X009	CTR > 50 %, SMD-6 (option 9)

Note
For additional information on the available options refer to option information.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Surge current	t ≤ 10 µs	I_{FSM}	2.5	A
Power dissipation		P_{diss}	100	mW
OUTPUT				
Collector emitter breakdown voltage		V_{CEO}	70	V
Emitter base breakdown voltage		V_{EBO}	7	V
Collector current		I_C	50	mA
	t < 1 ms	I_C	100	mA
Power dissipation		P_{diss}	150	mW
COUPLER				
Isolation test voltage		V_{ISO}	5300	V_{RMS}
Creepage distance			≥ 7	mm
Clearance distance			≥ 7	mm
Insulation thickness between emitter and detector			≥ 0.4	mm
Comparative tracking index	per DIN IEC 112/VDE 0303, part 1		175	
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	≥ 10^{12}	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	≥ 10^{11}	Ω
Storage temperature range		T_{stg}	- 55 to + 150	°C
Operating temperature range		T_{amb}	- 55 to + 100	°C
Junction temperature		T_j	100	°C
Soldering temperature	max. 10 s, dip soldering: distance to seating plane ≥ 1.5 mm	T_{sld}	260	°C

Note

T_{amb} = 25 °C, unless otherwise specified.
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 CHARACTERISTCS							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = 10 mA	H11A1	V_F		1.1	1.5	V
		H11A2	V_F		1.1	1.5	V
		H11A3	V_F		1.1	1.5	V
		H11A4	V_F		1.1	1.5	V
		H11A5	V_F		1.1	1.7	V
Reverse current	V_R = 3 V		I_R			10	µA
Capacitance	V_R = 0 V, f = 1 MHz		C_O		50		pF
OUTPUT							
Collector emitter breakdown voltage	I_C = 1 mA, I_F = 0 mA		BV_{CEO}	30			V
Emitter collector breakdown voltage	I_E = 100 µA, I_F = 0 mA		BV_{ECO}	7			V
Collector base breakdown voltage	I_C = 10 µA, I_F = 0 mA		BV_{CBO}	70			V
Collector emitter leakage current	V_{CE} = 10 V, I_F = 0 mA		I_{CEO}		5	50	nA
Emitter collector capacitance	V_{CE} = 0 V		C_{CE}		6		pF

ELECTRICAL CHARACTERISTCS							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
COUPLER							
Collector emitter, saturation voltage	I_{CE} = 0.5 mA, I_F = 10 mA		V_{CEsat}			0.4	V
Capacitance (input-output)			C_{IO}		0.5		pF

Note

T_{amb} = 25 °C, unless otherwise specified.
Minimum and maximum values were tested requierements. 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**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
DC current transfer ratio	V_{CE} = 10 V, I_F = 10 mA	H11A1	CTR_{DC}	50			%
		H11A2	CTR_{DC}	20			%
		H11A3	CTR_{DC}	20			%
		H11A4	CTR_{DC}	10			%
		H11A5	CTR_{DC}	30			%

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Switching time	I_C = 2 mA, R_L = 100 Ω, V_{CE} = 10 V	t_{on}, t_{off}		3		µs

TYPICAL CHARACTERISTICS

T_{amb} = 25 °C, unless otherwise specified

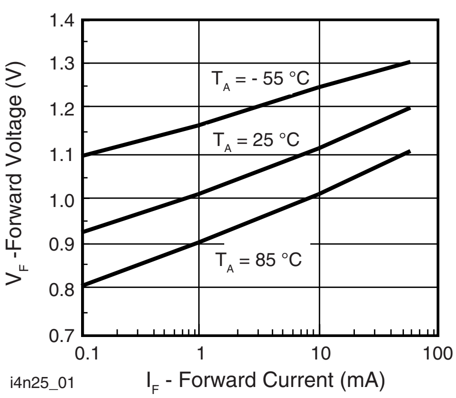


Fig. 1 - Forward Voltage vs. Forward Current

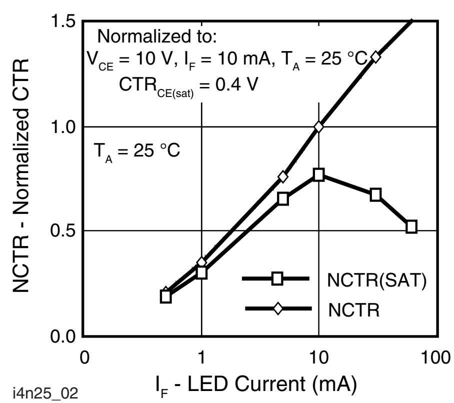


Fig. 2 - Normalized Non-Saturated and Saturated CTR vs. LED Current

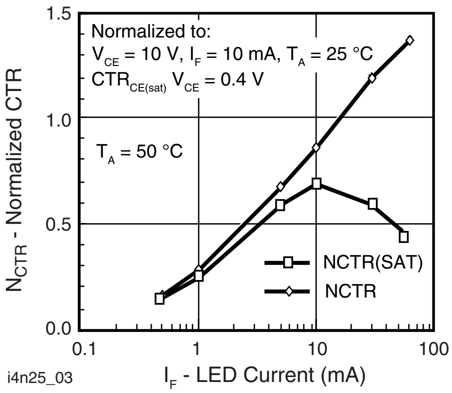


Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current

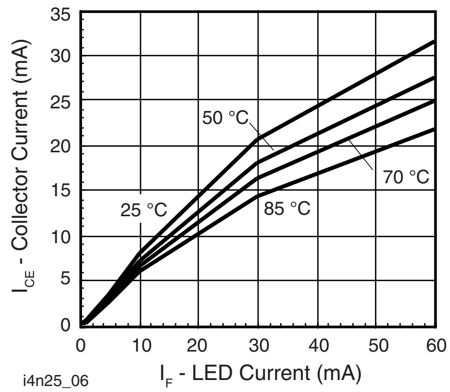


Fig. 6 - Collector Emitter Current vs. Temperature and LED Current

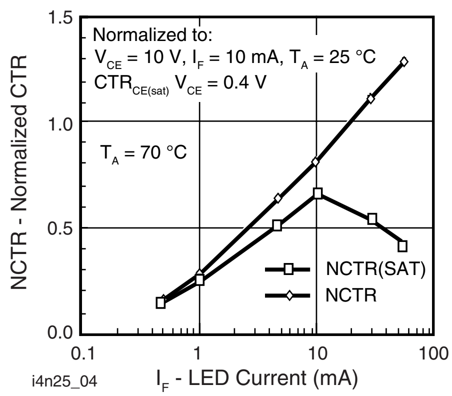


Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

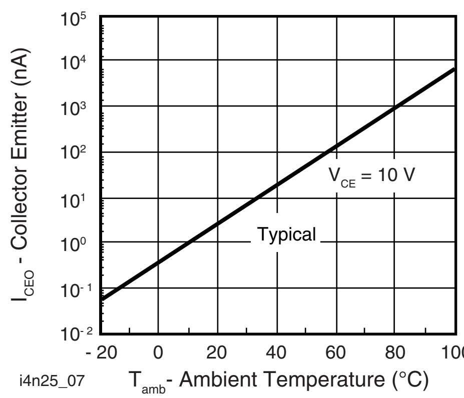


Fig. 7 - Collector Emitter Leakage Current vs. Temperature

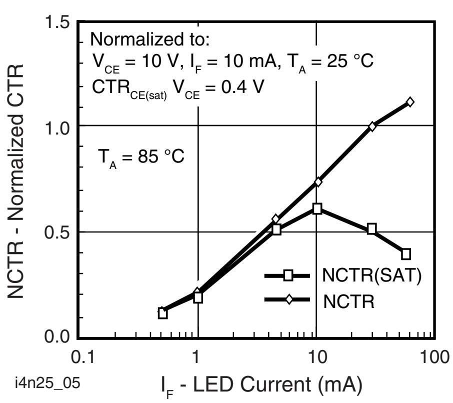


Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current

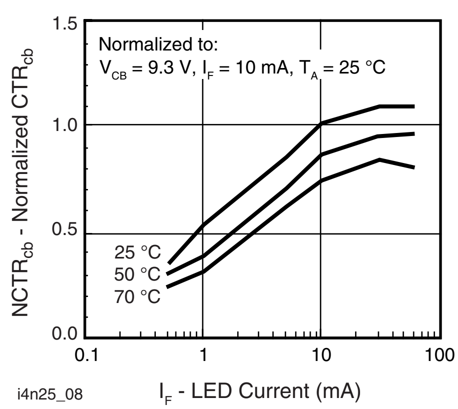


Fig. 8 - Normalized CTR_{cb} vs. LED Current and Temperature

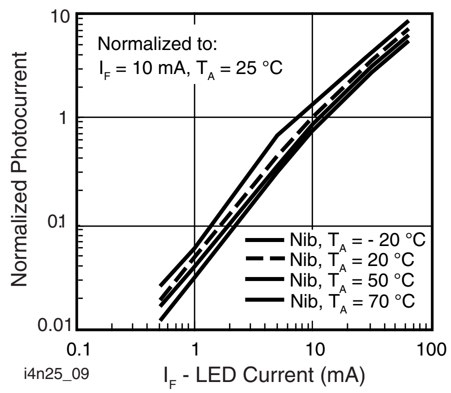


Fig. 9 - Normalized Photocurrent vs. I_F and Temperature

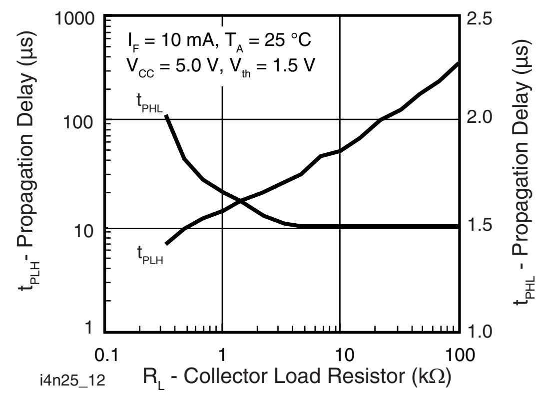


Fig. 12 - Propagation Delay vs. Collector Load Resistor

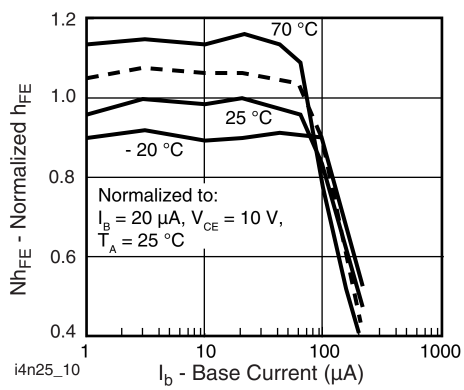


Fig. 10 - Normalized Non-Saturated h_{FE} vs. Base Current and Temperature

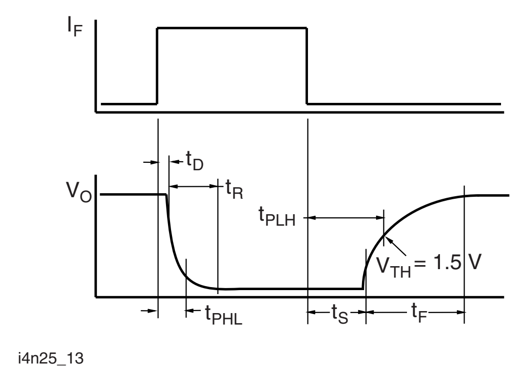


Fig. 13 - Switching Timing

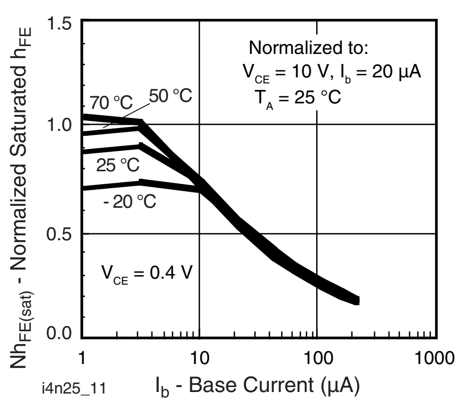


Fig. 11 - Normalized HFE vs. Base Current and Temperature

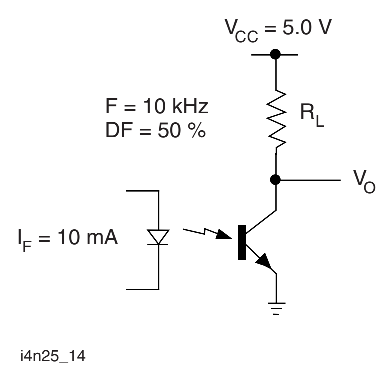
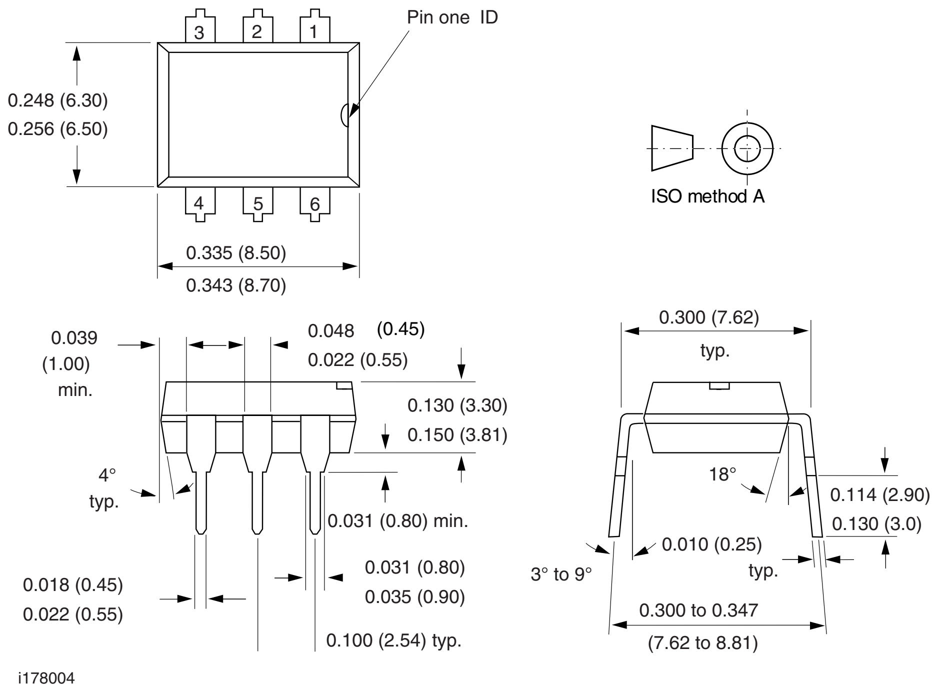
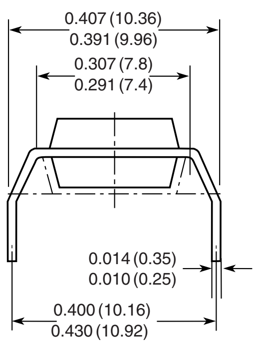


Fig. 14 - Switching Schematic

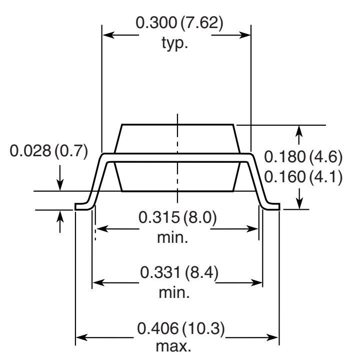
PACKAGE DIMENSIONS in inches (millimeters)



Option 6



Option 7



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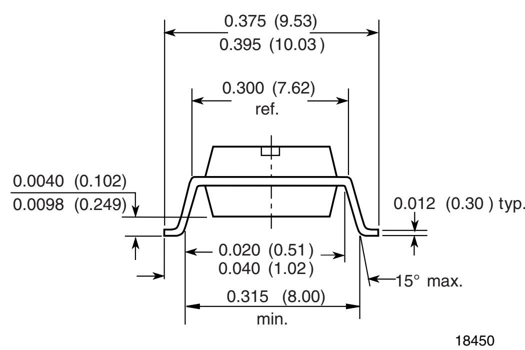

OZONE DEPLETING SUBSTANCES POLICY STATEMENT

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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