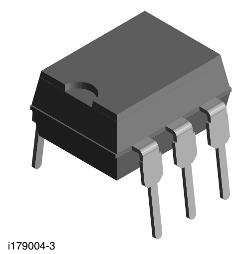
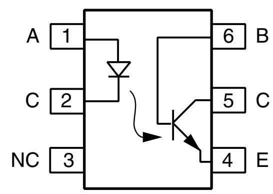
Optocoupler, Phototransistor Output, with Base Connection





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_{RMS}
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS
COMPLIANT

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.

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

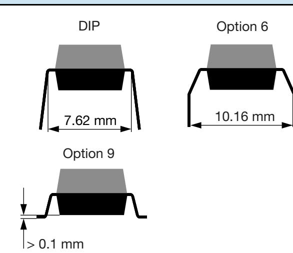
AGENCY APPROVALS

- UL1577, file no. E52744, double protection
- cUL tested to CSA 22.2 bulletin 5A
- CSA 93751
- BSI EN 60950, BSI EN 60065
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- FIMKO
- CQC: GB 8898-2011, GB 4943.1-2011

ORDERING INFORMATION

H	1	1	A	#	-	X	0	0	#	X

PART NUMBER (H11A#) — PACKAGE OPTION (X00#) — TAPE AND REEL (X)



AGENCY CERTIFIED/PACKAGE	CTR (%)
UL, CSA, BSI, FIMKO, CQC	**> 50**
DIP-6	H11A1, H11A1-X001
DIP-6, 400 mil, option 6	H11A1-X006
SMD-6, option 9	H11A1-X009, H11A1-X009T

Note

- Additional options may be possible, please contact sales office.

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
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				
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

- 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**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = 10 mA	H11A1	V_F		1.1	1.5	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
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

- 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**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	V_{CE} = 10 V, I_F = 10 mA	H11A1	CTR_{DC}	50			%

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	I_C = 2 mA, R_L = 100 Ω, V_{CE} = 10 V	t_{on}		3		μs
Turn-off time		t_{off}		3		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_{ISO}	4420	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	10 000	V_{peak}
Maximum repetitive peak isolation voltage		V_{IORM}	890	V_{peak}
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω
Output safety power		P_{SO}	400	mW
Input safety current		I_{SI}	275	mA
Safety temperature		T_S	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_{amb} = 25 °C, unless otherwise specified)

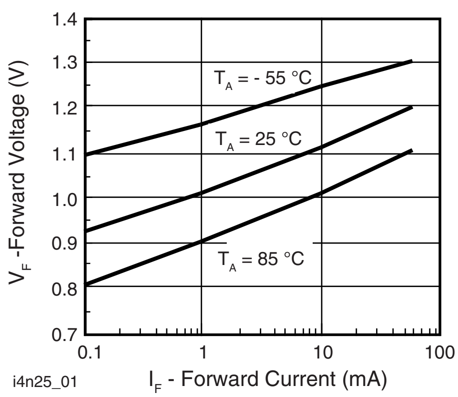


Fig. 1 - Forward Voltage vs. Forward Current

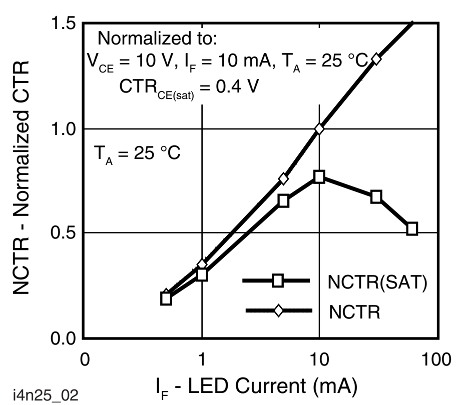


Fig. 2 - Normalized Non-Saturated and Saturated CTR vs. LED Current

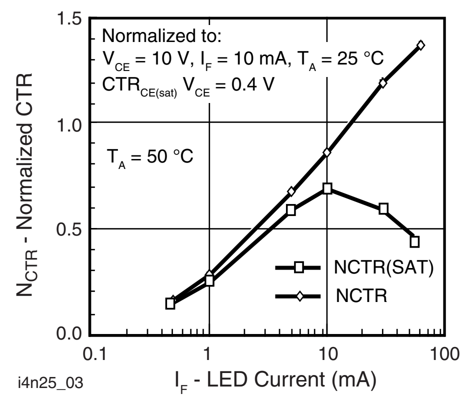


Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current

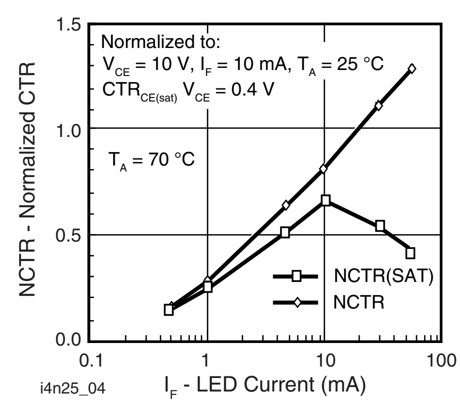


Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

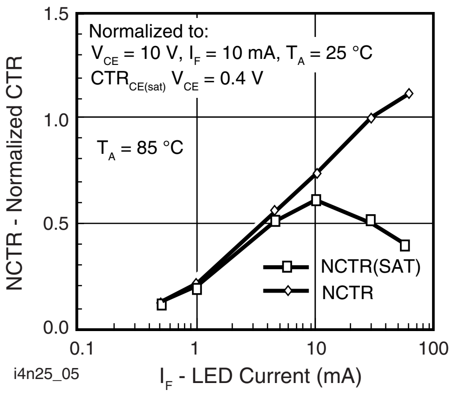


Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current

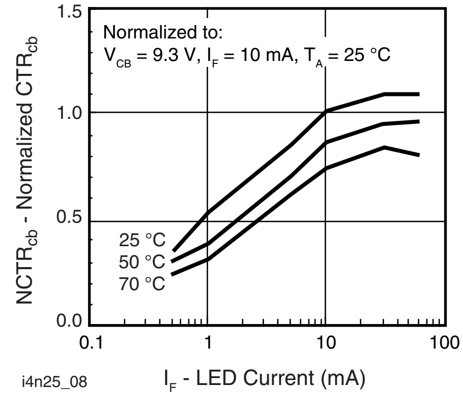


Fig. 8 - Normalized CTR_{cb} vs. LED Current and Temperature

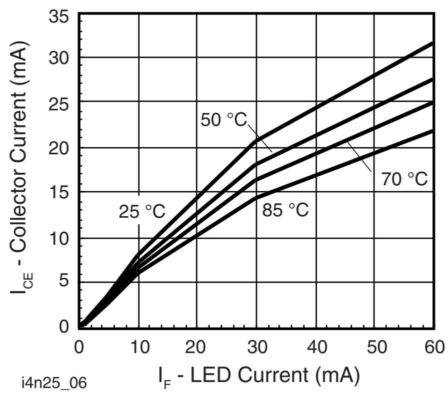


Fig. 6 - Collector Emitter Current vs. Temperature and LED Current

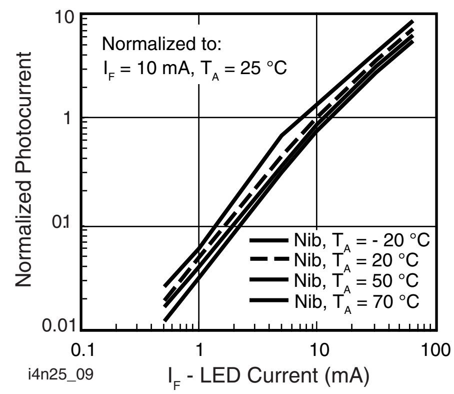


Fig. 9 - Normalized Photocurrent vs. I_F and Temperature

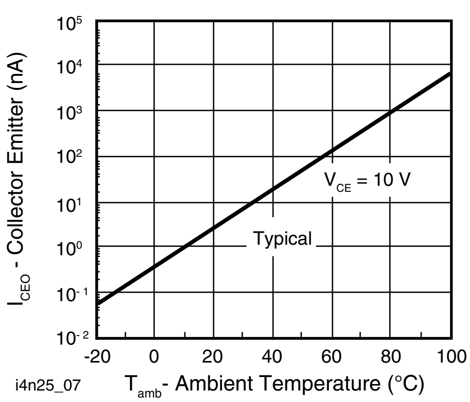


Fig. 7 - Collector Emitter Leakage Current vs. Temperature

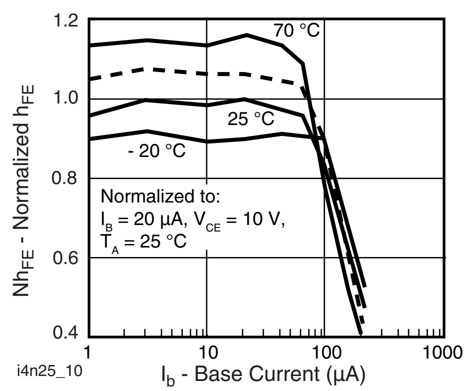


Fig. 10 - Normalized Non-Saturated h_{FE} vs. Base Current and Temperature

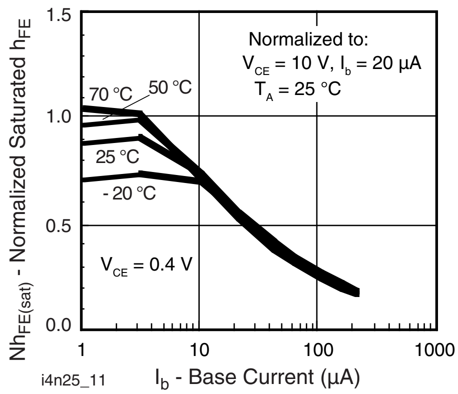


Fig. 11 - Normalized HFE vs. Base Current and Temperature

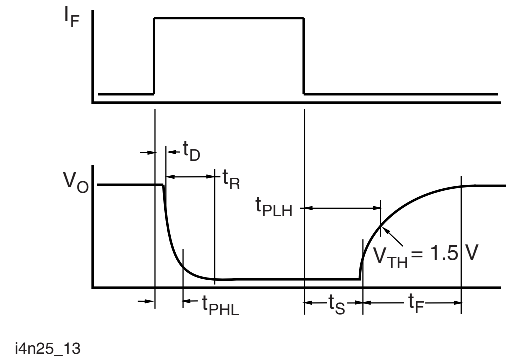


Fig. 13 - Switching Timing

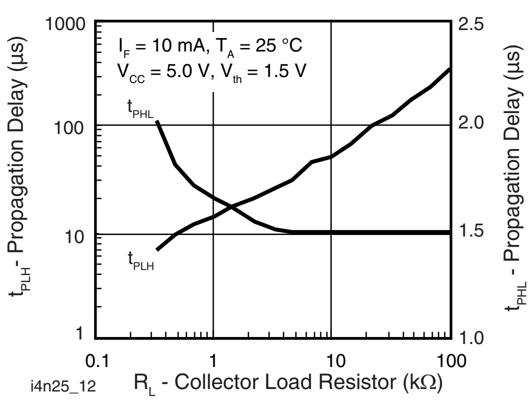


Fig. 12 - Propagation Delay vs. Collector Load Resistor

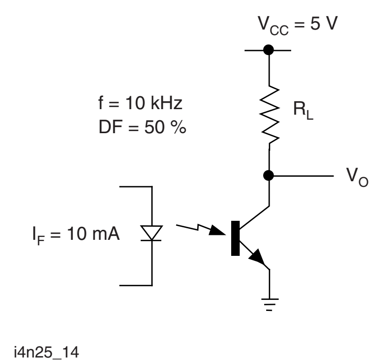
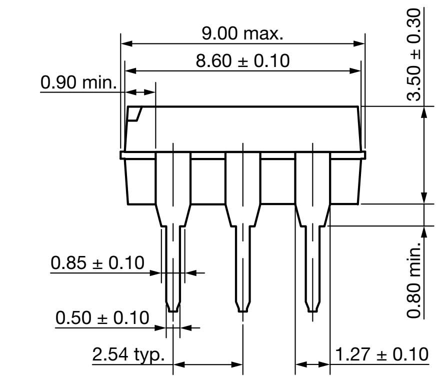
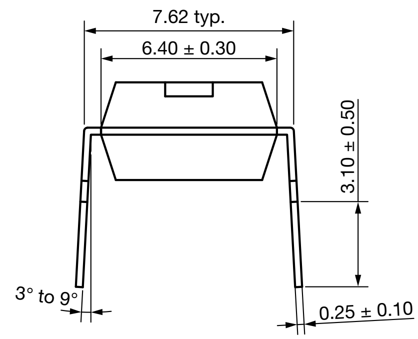


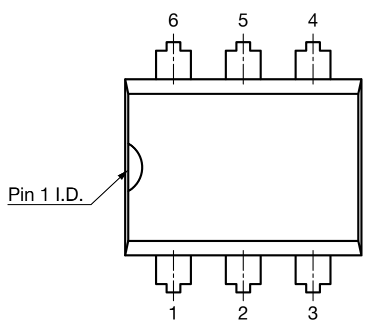
Fig. 14 - Switching Schematic

PACKAGE DIMENSIONS in millimeters

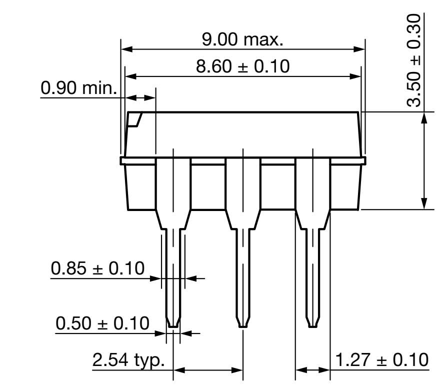
DIP-6

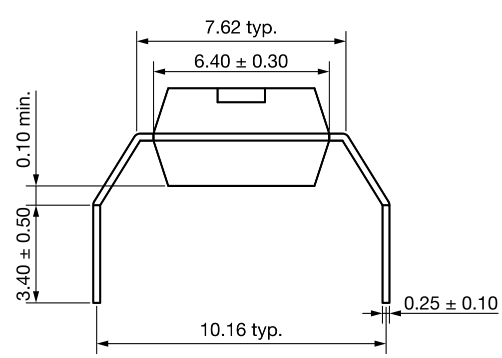


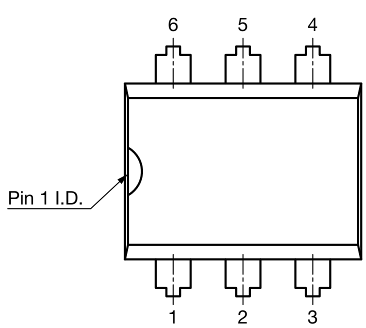




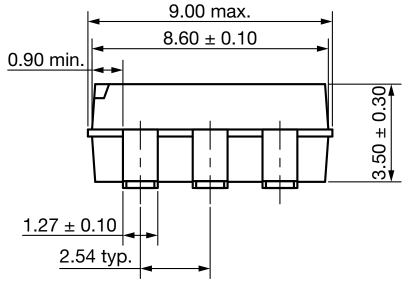
Option 6

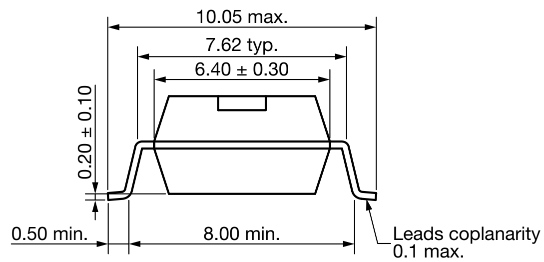


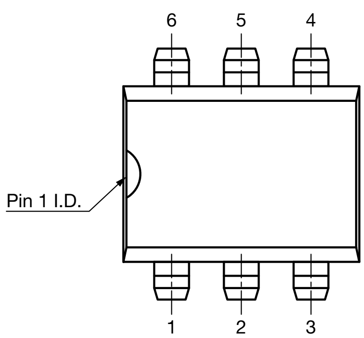


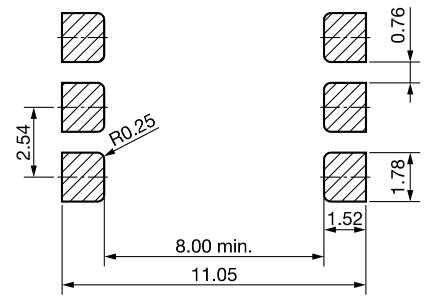


Option 9


9.00 max.
8.60 ± 0.10
0.90 min.
3.50 ± 0.30
1.27 ± 0.10
2.54 typ.


10.05 max.
7.62 typ.
6.40 ± 0.30
0.20 ± 0.10
0.50 min.
8.00 min.
Leads coplanarity
0.1 max.


6
5
4
Pin 1 I.D.
1
2
3


0.76
2.54
R0.25
1.78
1.52
8.00 min.
11.05

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