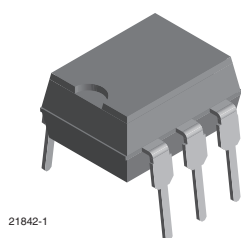
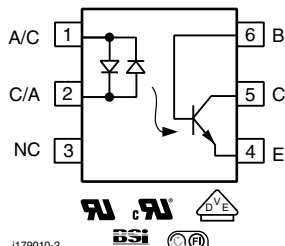


## Optocoupler, Phototransistor Output, AC Input, with Base Connection



21842-1



### FEATURES

- AC or polarity insensitive input
- Built-in reverse polarity input protection
- I/O compatible with integrated circuits
- Industry standard DIP package
- Isolation test voltage: 5300 V<sub>RMS</sub>
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### APPLICATIONS

- Telephone line detection
- AC line motor
- PLC
- Instrumentation

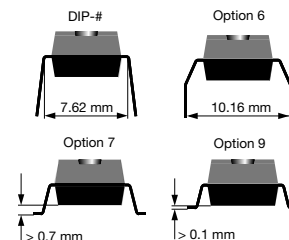
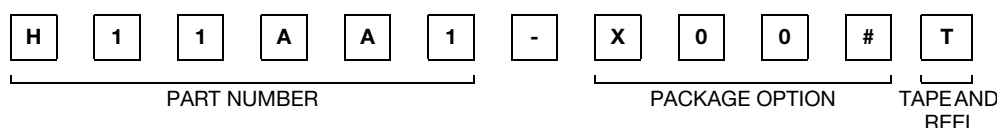
### AGENCY APPROVALS

- UL1577, file no. E52744 system code H, double protection
- CSA 93751
- BSI IEC 60950; IEC 60065
- DIN EN 60747-5-2 (VDE0884)/DIN EN 60747-5-5 (pending), available with option 1
- FIMKO

### DESCRIPTION

The H11AA1 is a bi-directional input optically coupled isolator consisting of two inverse parallel gallium arsenide infrared LEDs coupled to a silicon NPN phototransistor in a 6 pin DIP package. The H11AA1 has a minimum CTR of 20 %, a CTR symmetry of 1:3 and is designed for applications requiring detection or monitoring of AC signals.

### ORDERING INFORMATION



| AGENCY CERTIFIED/PACKAGE | CTR (%)                     |
|--------------------------|-----------------------------|
| UL, cUL, BSI, FIMKO      | ≥ 20                        |
| DIP-6                    | H11AA1                      |
| DIP-6, 400 mil, option 6 | H11AA1-X006                 |
| SMD-6, option 7          | H11AA1-X007T <sup>(1)</sup> |
| SMD-6, option 9          | H11AA1-X009T <sup>(1)</sup> |
| VDE, UL, cUL, BSI, FIMKO | ≥ 20                        |
| DIP-6                    | H11AA1-X001                 |

### Note

- Additional options may be possible, please contact sales office.
- <sup>(1)</sup> Also available in tubes; do not add T to end.

# Vishay Semiconductors Optocoupler, Phototransistor Output, AC Input, with Base Connection

| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                                                                    |            |                 |                        |
|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------|-----------------|------------------------|
| PARAMETER                                                                                              | TEST CONDITION                                                                                                     | SYMBOL     | VALUE           | UNIT                   |
| <b>INPUT</b>                                                                                           |                                                                                                                    |            |                 |                        |
| Forward continuous current                                                                             |                                                                                                                    | $I_F$      | $\pm 60$        | mA                     |
| Power dissipation                                                                                      |                                                                                                                    | $P_{diss}$ | 100             | mW                     |
| Derate linearly from $25\text{ }^{\circ}\text{C}$                                                      |                                                                                                                    |            | 1.3             | mW/ $^{\circ}\text{C}$ |
| <b>OUTPUT</b>                                                                                          |                                                                                                                    |            |                 |                        |
| Power dissipation                                                                                      |                                                                                                                    | $P_{diss}$ | 200             | mW                     |
| Derate linearly from $25\text{ }^{\circ}\text{C}$                                                      |                                                                                                                    |            | 2.6             | mW/ $^{\circ}\text{C}$ |
| Collector emitter breakdown voltage                                                                    |                                                                                                                    | $BV_{CEO}$ | 30              | V                      |
| Emitter base breakdown voltage                                                                         |                                                                                                                    | $BV_{EBO}$ | 5               | V                      |
| Collector base breakdown voltage                                                                       |                                                                                                                    | $BV_{CBO}$ | 70              | V                      |
| <b>COUPLER</b>                                                                                         |                                                                                                                    |            |                 |                        |
| Isolation test voltage (RMS)                                                                           | Between emitter and detector, referred to standard climate $23\text{ }^{\circ}\text{C}/50\%\text{ RH}$ , DIN 50014 | $V_{ISO}$  | 5300            | $V_{RMS}$              |
| Creepage distance                                                                                      |                                                                                                                    |            | $\geq 7$        | mm                     |
| Clearance distance                                                                                     |                                                                                                                    |            | $\geq 7$        | mm                     |
| Comparative tracking index                                                                             | per DIN IEC 112/VDE 0303, part 1                                                                                   | CTI        | 175             |                        |
| Isolation resistance                                                                                   | $V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$                                                   | $R_{IO}$   | $\geq 10^{12}$  | $\Omega$               |
|                                                                                                        | $V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$                                                  | $R_{IO}$   | $\geq 10^{11}$  | $\Omega$               |
| Storage temperature range                                                                              |                                                                                                                    | $T_{stg}$  | $-55$ to $+150$ | $^{\circ}\text{C}$     |
| Operating temperature range                                                                            |                                                                                                                    | $T_{amb}$  | $-55$ to $+100$ | $^{\circ}\text{C}$     |
| Lead soldering time at $260\text{ }^{\circ}\text{C}$                                                   |                                                                                                                    | $T_{sld}$  | 10              | s                      |

**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                                                                                          | $I_F = \pm 10\text{ mA}$                         | $V_F$       |      | 1.2  | 1.5  | V    |
| <b>OUTPUT</b>                                                                                            |                                                  |             |      |      |      |      |
| Collector emitter breakdown voltage                                                                      | $I_C = 1\text{ mA}$                              | $BV_{CEO}$  | 30   |      |      | V    |
| Emitter base breakdown voltage                                                                           | $I_E = 100\text{ }\mu\text{A}$                   | $BV_{EBO}$  | 5    |      |      | V    |
| Collector base breakdown voltage                                                                         | $I_C = 100\text{ }\mu\text{A}$                   | $BV_{CBO}$  | 70   |      |      | V    |
| Collector emitter leakage current                                                                        | $V_{CE} = 10\text{ V}$                           | $I_{CEO}$   |      | 5    | 100  | nA   |
| <b>COUPLER</b>                                                                                           |                                                  |             |      |      |      |      |
| Collector emitter saturation voltage                                                                     | $I_F = \pm 10\text{ mA}$ , $I_C = 0.5\text{ mA}$ | $V_{CEsat}$ |      |      | 0.4  | V    |

**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> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                   |            |      |      |      |      |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------|------|------|------|------|
| PARAMETER                                                                                            | TEST CONDITION                                    | SYMBOL     | MIN. | TYP. | MAX. | UNIT |
| DC current transfer ratio                                                                            | $I_F = \pm 10\text{ mA}$ , $V_{CE} = 10\text{ V}$ | $CTR_{DC}$ | 20   |      |      | %    |
| Symmetry<br>(CTR at $+10\text{ mA}$ )/(CTR at $-10\text{ mA}$ )                                      |                                                   |            | 0.33 | 1    | 3    |      |

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

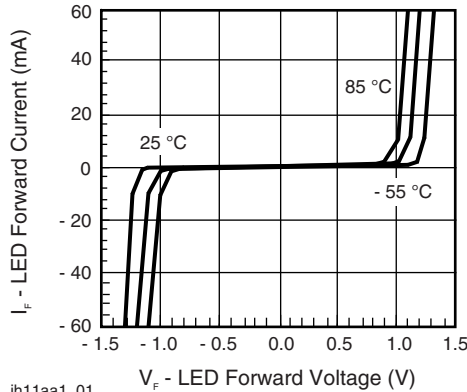


Fig. 1 - LED Forward Current vs. Forward Voltage

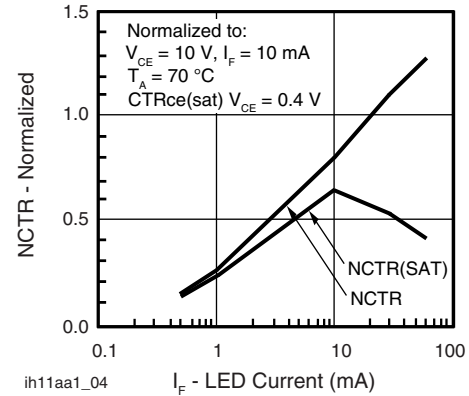


Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

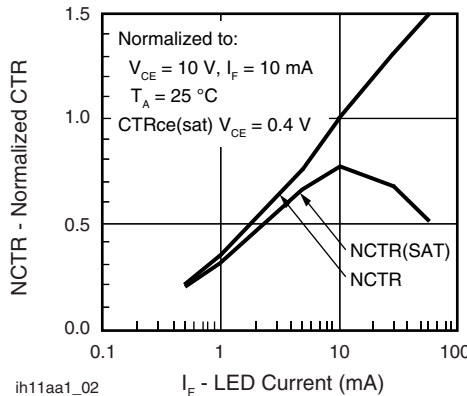


Fig. 2 - Normalized Non-Saturated and Saturated CTR vs. LED Current

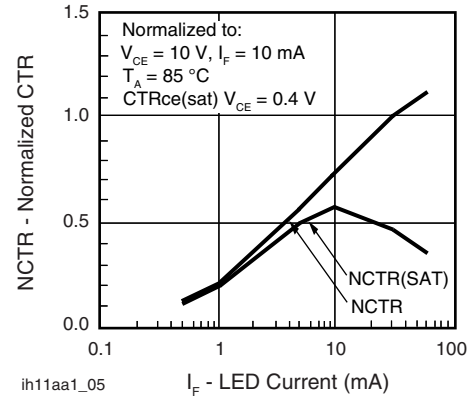


Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current

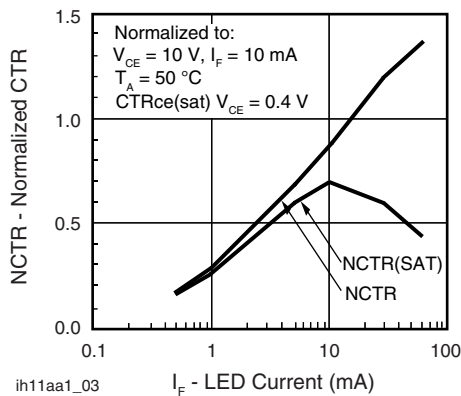


Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current

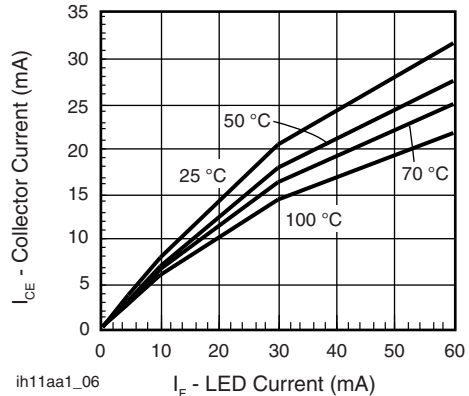


Fig. 6 - Collector Emitter Current vs. Temperature and LED Current

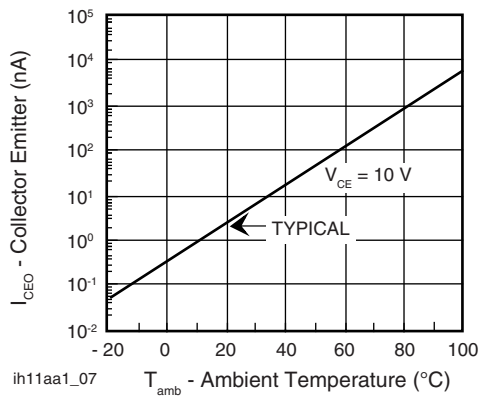


Fig. 7 - Collector Emitter Leakage Current vs. Temperature

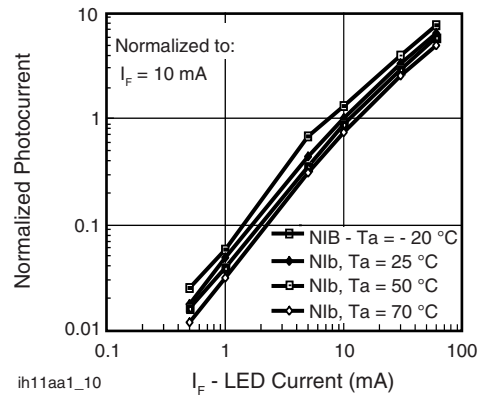


Fig. 10 - Normalized Photocurrent vs. LED Current

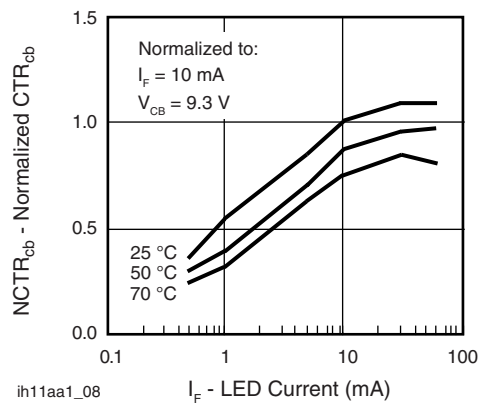


Fig. 8 - Normalized CTR<sub>cb</sub> vs. LED Current and Temperature

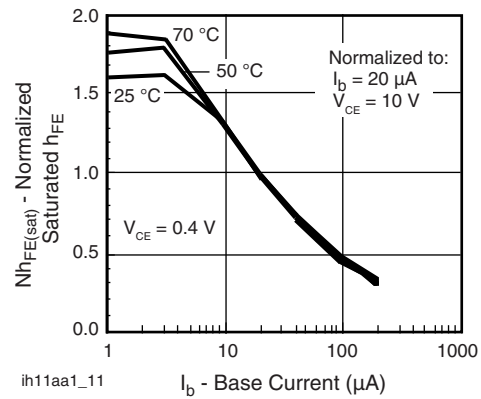


Fig. 11 - Normalized Saturated  $h_{FE}$  vs. Base Current and Temperature

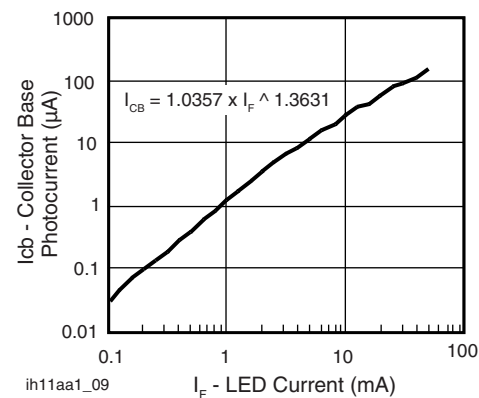


Fig. 9 - Collector Base Photocurrent vs. LED Current

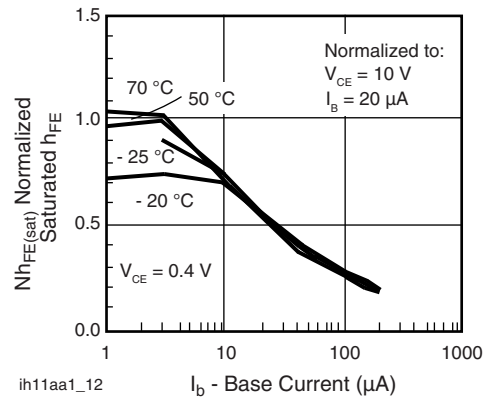


Fig. 12 - Normalized Saturated  $h_{FE}$  vs. Base Current and Temperature

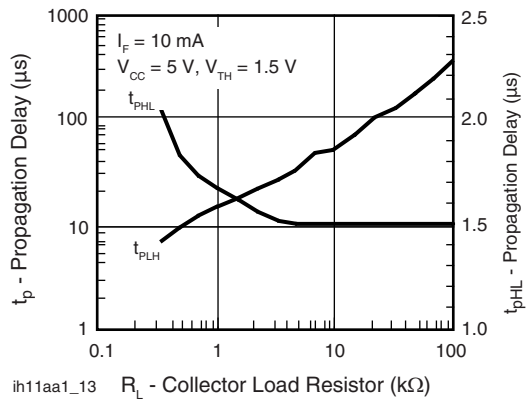
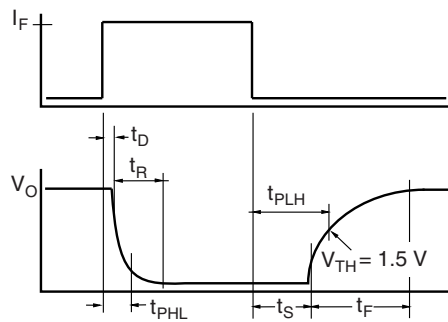
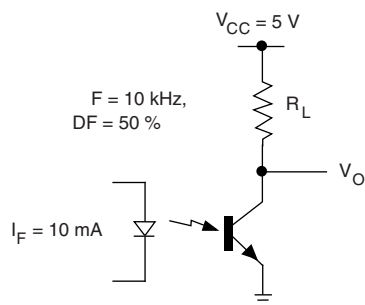


Fig. 13 - Propagation Delay vs. Collector Load Resistor



ih11aa1\_14

Fig. 14 - Switching Waveform



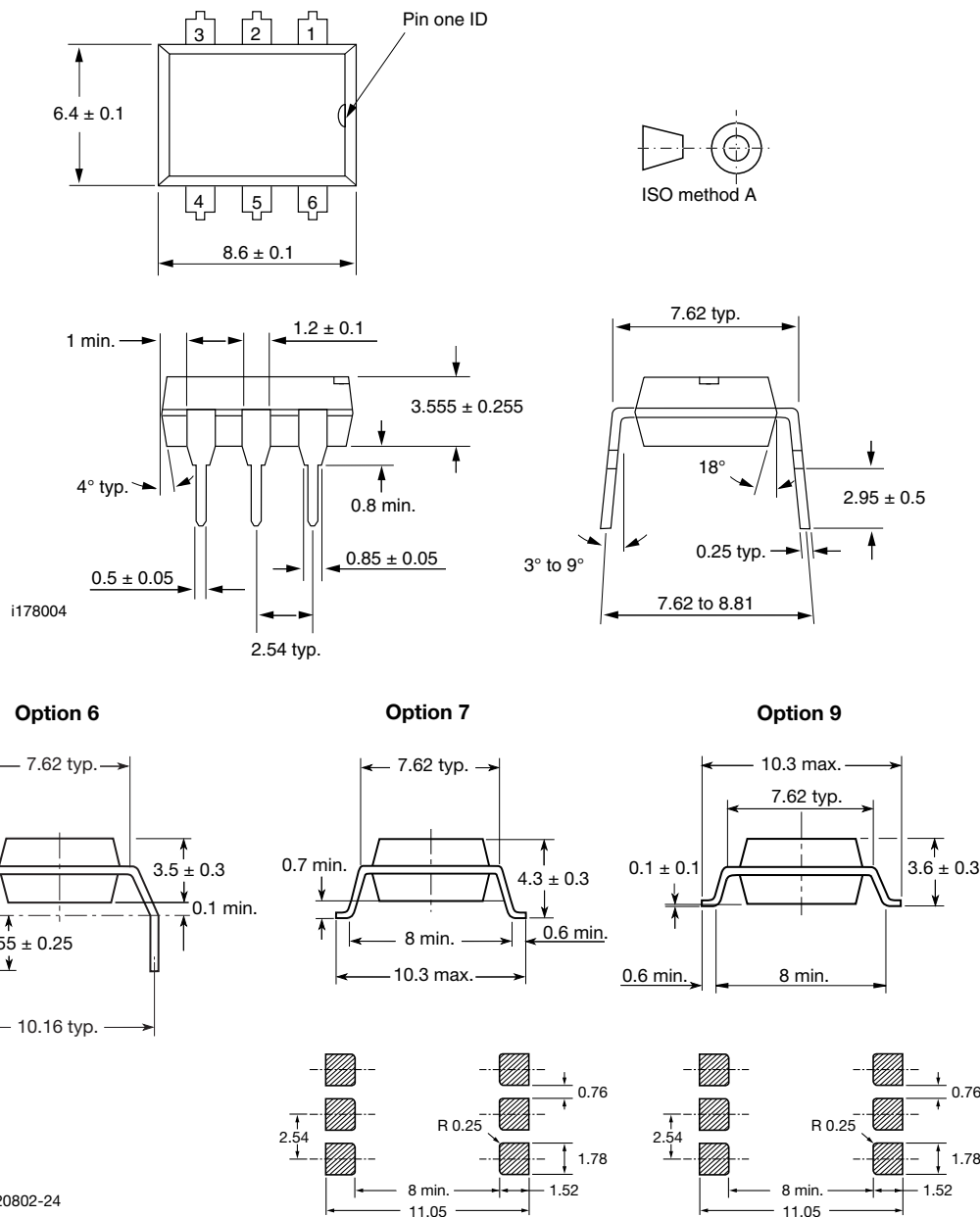
ih11aa1\_15

Fig. 15 - Switching Schematic

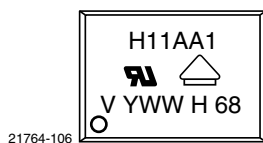
Vishay Semiconductors Optocoupler, Phototransistor Output,  
AC Input, with Base Connection



### PACKAGE DIMENSIONS in millimeters



## PACKAGE MARKING



## Notes

- 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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