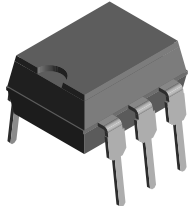
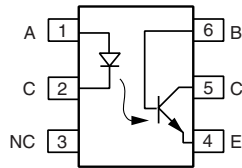


Optocoupler, Phototransistor Output, with Base Connection



i179004



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.

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



RoHS
COMPLIANT

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 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.

H11A1/H11A2/H11A3/H11A4/H11A5



Vishay Semiconductors Optocoupler, Phototransistor Output,
with Base Connection

| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|---|------------|----------------|------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| INPUT | | | | |
| Reverse voltage | | V_R | 6 | V |
| Forward current | | I_F | 60 | mA |
| Surge current | $t \leq 10 \mu\text{s}$ | 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 |
| | $t < 1 \text{ ms}$ | 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 | $V_{IO} = 500 \text{ V}, T_{amb} = 25 \text{ }^\circ\text{C}$ | R_{IO} | $\geq 10^{12}$ | Ω |
| | $V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ }^\circ\text{C}$ | R_{IO} | $\geq 10^{11}$ | Ω |
| 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

$T_{amb} = 25 \text{ }^\circ\text{C}$, 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 CHARACTERISTICS | | | | | | | |
|-------------------------------------|---|-------|------------|------|------|------|---------------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| INPUT | | | | | | | |
| Forward voltage | $I_F = 10 \text{ mA}$ | 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 | $V_R = 3 \text{ V}$ | | I_R | | | 10 | μA |
| Capacitance | $V_R = 0 \text{ V}, f = 1 \text{ MHz}$ | | C_O | | 50 | | pF |
| OUTPUT | | | | | | | |
| Collector emitter breakdown voltage | $I_C = 1 \text{ mA}, I_F = 0 \text{ mA}$ | | BV_{CEO} | 30 | | | V |
| Emitter collector breakdown voltage | $I_E = 100 \mu\text{A}, I_F = 0 \text{ mA}$ | | BV_{ECO} | 7 | | | V |
| Collector base breakdown voltage | $I_C = 10 \mu\text{A}, I_F = 0 \text{ mA}$ | | 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 |



H11A1/H11A2/H11A3/H11A4/H11A5

Optocoupler, Phototransistor Output, Vishay Semiconductors
with Base Connection

| ELECTRICAL CHARACTERISTICS | | | | | | | |
|---------------------------------------|---|------|-------------|------|------|------|------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| COUPLER | | | | | | | |
| 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

$T_{amb} = 25 \text{ }^\circ\text{C}$, unless otherwise specified.

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 |
| DC current transfer ratio | $V_{CE} = 10 \text{ V}$, $I_F = 10 \text{ mA}$ | 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 | $I_C = 2 \text{ mA}$, $R_L = 100 \text{ } \Omega$, $V_{CE} = 10 \text{ V}$ | t_{on} , t_{off} | | 3 | | μs | |

TYPICAL CHARACTERISTICS

$T_{amb} = 25 \text{ }^\circ\text{C}$, unless otherwise specified

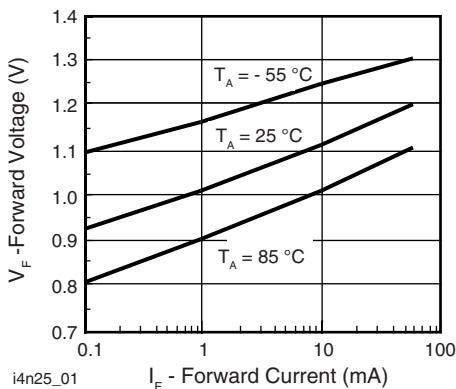


Fig. 1 - Forward Voltage vs. Forward Current

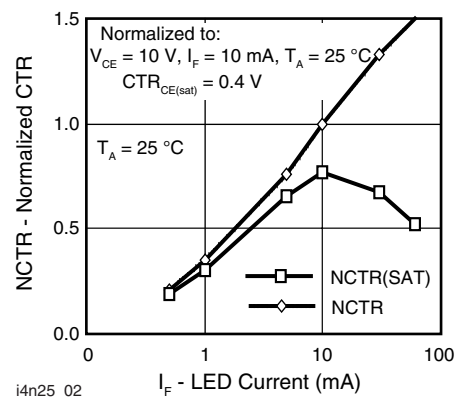


Fig. 2 - Normalized Non-Saturated and Saturated CTR vs. LED Current

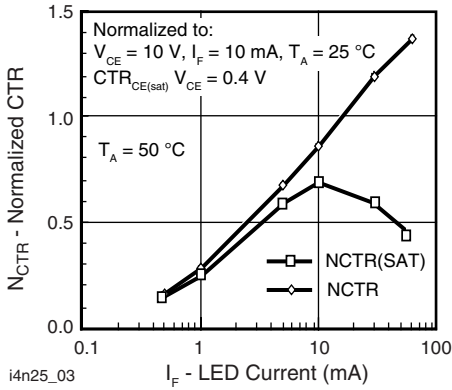


Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current

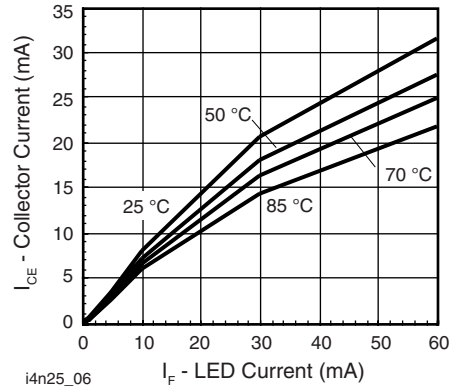


Fig. 6 - Collector Emitter Current vs. Temperature and LED Current

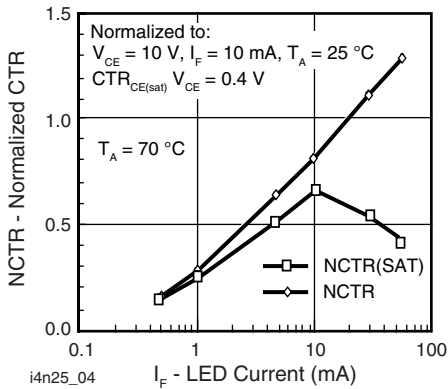


Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

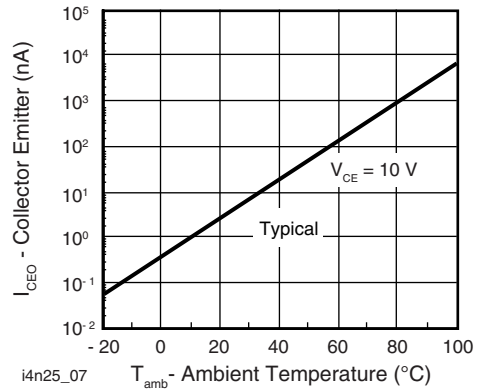


Fig. 7 - Collector Emitter Leakage Current vs. Temperature

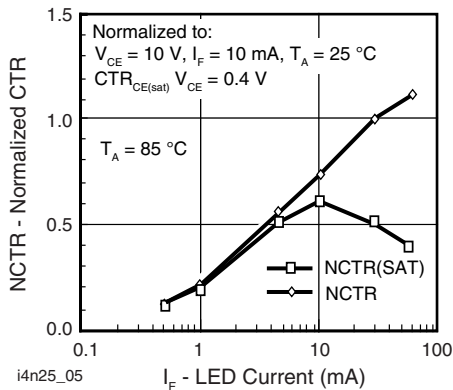


Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current

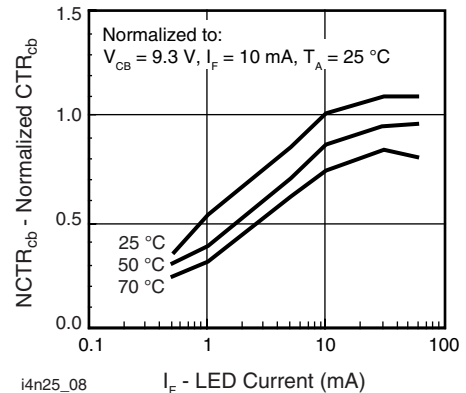


Fig. 8 - Normalized CTR_{cb} vs. LED Current and Temperature

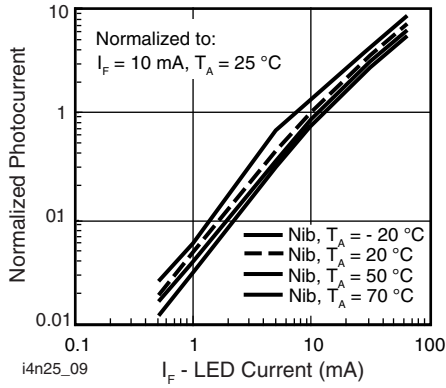


Fig. 9 - Normalized Photocurrent vs. I_F and Temperature

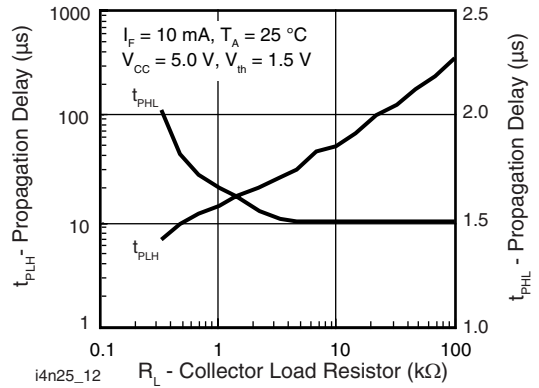


Fig. 12 - Propagation Delay vs. Collector Load Resistor

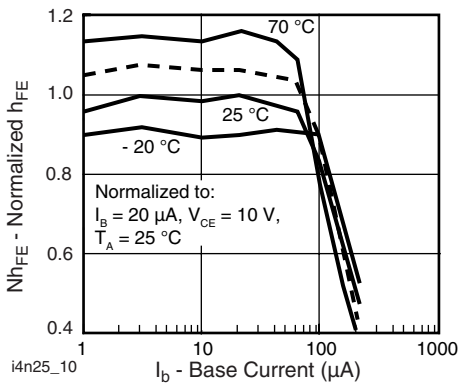


Fig. 10 - Normalized Non-Saturated h_{FE} vs. Base Current and Temperature

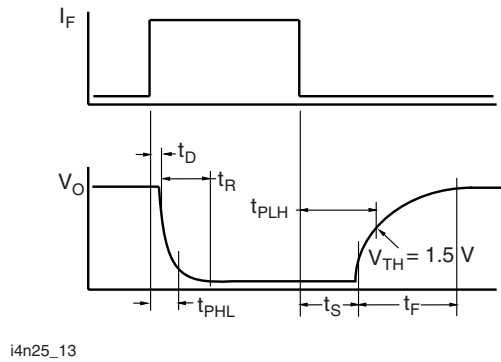


Fig. 13 - Switching Timing

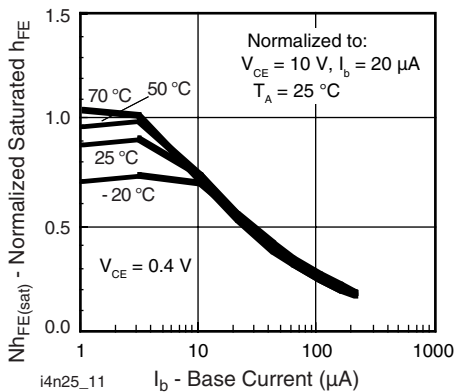


Fig. 11 - Normalized HFE vs. Base Current and Temperature

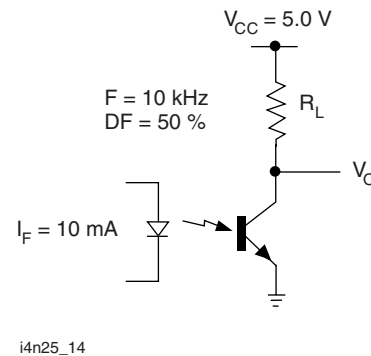


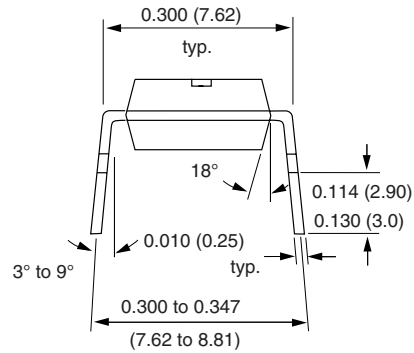
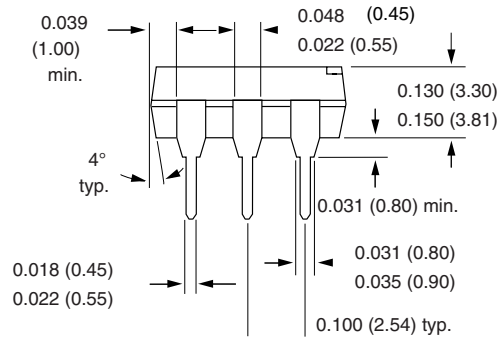
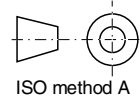
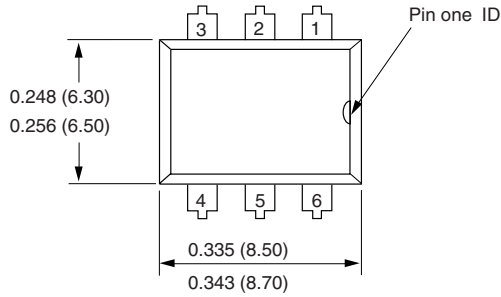
Fig. 14 - Switching Schematic

H11A1/H11A2/H11A3/H11A4/H11A5



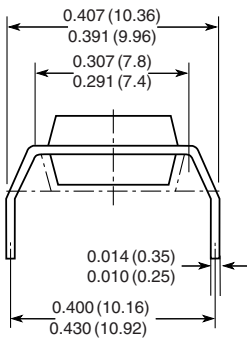
Vishay Semiconductors Optocoupler, Phototransistor Output,
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PACKAGE DIMENSIONS in inches (millimeters)

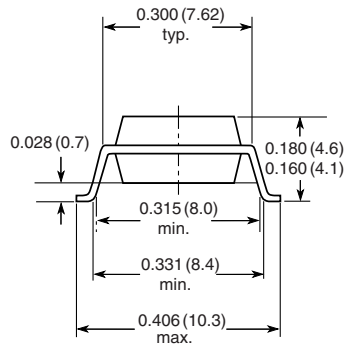


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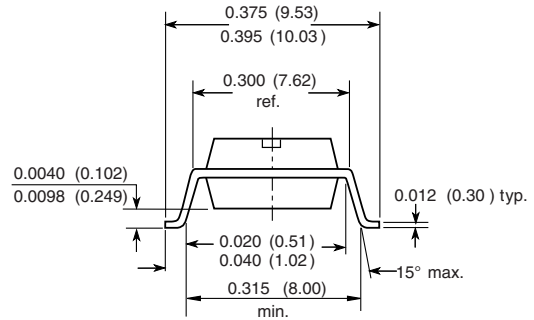
Option 6



Option 7



Option 9



18450



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.

We reserve the right to make changes to improve technical design
and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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



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