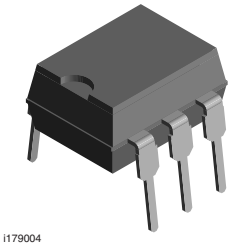
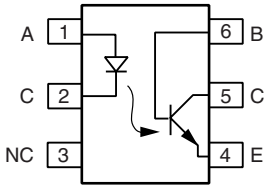
# Optocoupler, Phototransistor Output, with Base Connection, High $BV_{CER}$ Voltage




## FEATURES

- CTR at $I_F$ = 10 mA, $BV_{CER}$ = 10 V: ≥ 20 %
- Good CTR linearly with forward current
- Low CTR degradation
- Very high collector emitter breakdown voltage
  - H11D1/H11D2, $BV_{CER}$ = 300 V
  - H11D3/H11D4, $BV_{CER}$ = 200 V
- Isolation test voltage: 5300 $V_{RMS}$
- Low coupling capacitance
- High common mode transient immunity
- Package with base connection
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

## DESCRIPTION

The H11D1, H11D2, H11D3, H11D4 are optocouplers with very high $BV_{CER}$. They are intended for telecommunications applications or any DC application requiring a high blocking voltage.
The H11D1, H11D2 are identical and the H11D3, H11D4 are identical.

## AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-5 (VDE 0884) available with option 1
- BSI IEC 60950; IEC 60065
- FIMKO

## APPLICATIONS

- Telecommunications
- Replace relays

| ORDER INFORMATION | |
|---|---|
| **PART** | **REMARKS** |
| H11D1 | CTR > 20 %, DIP-6 |
| H11D2 | CTR > 20 %, DIP-6 |
| H11D3 | CTR > 20 %, DIP-6 |
| H11D4 | CTR > 20 %, DIP-6 |
| H11D1-X007 | CTR > 20 %, SMD-6 (option 7) |
| H11D1-X009 | CTR > 20 %, SMD-6 (option 9) |
| H11D2-X007 | CTR > 20 %, SMD-6 (option 7) |
| H11D3-X007 | CTR > 20 %, SMD-6 (option 7) |

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

| ABSOLUTE MAXIMUM RATINGS | | | | | |
|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **VALUE** | **UNIT** |
| **INPUT** | | | | | |
| Reverse voltage | | | $V_R$ | 6 | V |
| DC forward current | | | $I_F$ | 60 | mA |
| Surge forward current | t ≤ 10 µs | | $I_{FSM}$ | 2.5 | A |
| Power dissipation | | | $P_{diss}$ | 100 | mW |


For technical questions, contact: optocoupler.answers@vishay.com
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## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | TEST CONDITION | PART | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|---|
| **OUTPUT** | | | | | |
| Collector emitter voltage | | H11D1 | $V_{CE}$ | 300 | V |
| | | H11D2 | $V_{CE}$ | 300 | V |
| | | H11D3 | $V_{CE}$ | 200 | V |
| | | H11D4 | $V_{CE}$ | 200 | V |
| Collector base voltage | | H11D1 | $V_{CBO}$ | 300 | V |
| | | H11D2 | $V_{CBO}$ | 300 | V |
| | | H11D3 | $V_{CBO}$ | 200 | V |
| | | H11D4 | $V_{CBO}$ | 200 | V |
| Emitter base voltage | | | $V_{BEO}$ | 7 | V |
| Collector current | | | $I_C$ | 100 | mA |
| Power dissipation | | | $P_{diss}$ | 300 | mW |
| **COUPLER** | | | | | |
| Isolation test voltage between emitter and detector | | | $V_{ISO}$ | 5300 | $V_{RMS}$ |
| Insulation thickness between emitter and detector | | | | ≥ 0.4 | mm |
| Creepage distance | | | | ≥ 7 | mm |
| Clearance distance | | | | ≥ 7 | mm |
| Comparative tracking index | per DIN IEC 112/VDE 0303, part 1 | | | 175 | |
| Isolation resistance | $V_{IO}$ = 500 V, $T_{amb}$ = 25 °C | | $R_{IO}$ | $\geq 10^{12}$ | Ω |
| | $V_{IO}$ = 500 V, $T_{amb}$ = 100 °C | | $R_{IO}$ | $\geq 10^{11}$ | 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 | | $V_F$ | | 1.1 | 1.5 | V |
| Reverse voltage | $I_R$ = 10 µA | | $V_R$ | 6 | | | V |
| Reverse current | $V_R$ = 6 V | | $I_R$ | | 0.01 | 10 | µA |
| Capacitance | $V_R$ = 0 V, f = 1 MHz | | $C_O$ | | 25 | | pF |
| Thermal resistance | | | $R_{thJA}$ | | 750 | | K/W |



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## ELECTRICAL CHARACTERISTCS

| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| **OUTPUT** | | | | | | | |
| Collector emitter breakdown voltage | $I_{CE}$ = 1 mA, $R_{BE}$ = 1 MΩ | H11D1 | $BV_{CER}$ | 300 | | | V |
| | | H11D2 | $BV_{CER}$ | 300 | | | V |
| | | H11D3 | $BV_{CER}$ | 200 | | | V |
| | | H11D4 | $BV_{CER}$ | 200 | | | V |
| Emitter base breakdown voltage | $I_{EB}$ = 100 µA | | $BV_{EBO}$ | 7 | | | V |
| Collector emitter capacitance | $V_{CE}$ = 10 V, f = 1 MHz | | $C_{CE}$ | | 7 | | pF |
| Collector base capacitance | $V_{CB}$ = 10 V, f = 1 MHz | | $C_{CB}$ | | 8 | | pF |
| Emitter base capacitance | $V_{EB}$ = 5 V, f = 1 MHz | | $C_{EB}$ | | 38 | | pF |
| Thermal resistance | | | $R_{th}$ | | 250 | | K/W |
| **COUPLER** | | | | | | | |
| Coupling capacitance | | | $C_C$ | | 0.6 | | pF |
| Current transfer ratio | $I_F$ = 10 mA, $V_{CE}$ = 10 V, $R_{BE}$ = 1 MΩ | | $I_C/I_F$ | 20 | | | % |
| Collector emitter, saturation voltage | $I_F$ = 10 mA, $I_C$ = 0.5 mA, $R_{BE}$ = 1 MΩ | | $V_{CEsat}$ | | 0.25 | 0.4 | V |
| Collector emitter, leakage current | $V_{CE}$ = 200 V, $R_{BE}$ = 1 MΩ | H11D1 | $I_{CER}$ | | | 100 | nA |
| | | H11D2 | $I_{CER}$ | | | 100 | nA |
| | $V_{CE}$ = 300 V, $R_{BE}$ = 1 MΩ, $T_{amb}$ = 100 °C | H11D1 | $I_{CER}$ | | | 250 | µA |
| | | H11D2 | $I_{CER}$ | | | 250 | µA |

**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 |
|---|---|---|---|---|---|---|---|
| Current transfer ratio | $I_F$ = 10 mA, $V_{CE}$ = 10 V, $R_{BE}$ = 1 MΩ | | CTR | 20 | | | % |

## SWITCHING CHARACTERISTICS

| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Turn-on time | $I_C$ = 2 mA (to be adjusted by varying $I_F$), $R_L$ = 100 Ω, $V_{CC}$ = 10 V | $t_{on}$ | | 5 | | µs |
| Rise time | $I_C$ = 2 mA (to be adjusted by varying $I_F$), $R_L$ = 100 Ω, $V_{CC}$ = 10 V | $t_r$ | | 2.5 | | µs |
| Turn-off time | $I_C$ = 2 mA (to be adjusted by varying $I_F$), $R_L$ = 100 Ω, $V_{CC}$ = 10 V | $t_{off}$ | | 6 | | µs |
| Fall time | $I_C$ = 2 mA (to be adjusted by varying $I_F$), $R_L$ = 100 Ω, $V_{CC}$ = 10 V | $t_f$ | | 5.5 | | µs |

**Note**

Switching times measurement-test circuit and waveforms




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## TYPICAL CHARACTERISTICS

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

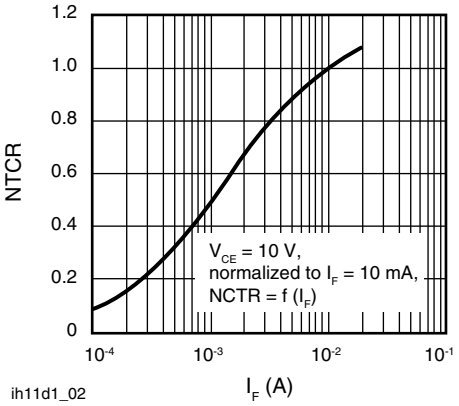


Fig. 1 - Current Transfer Ratio (typ.)

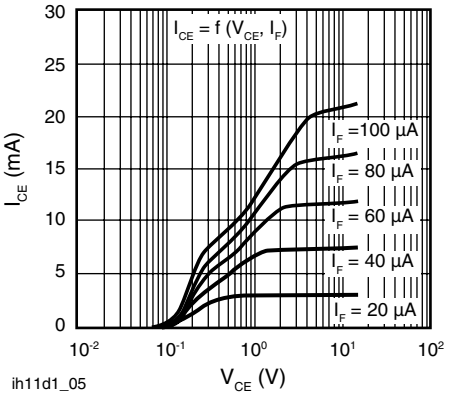


Fig. 4 - Output Characteristics

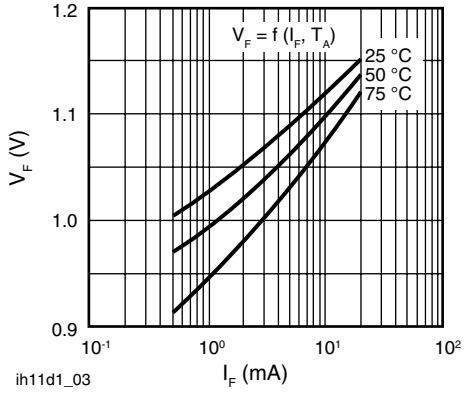


Fig. 2 - Diode Forward Voltage (typ.)

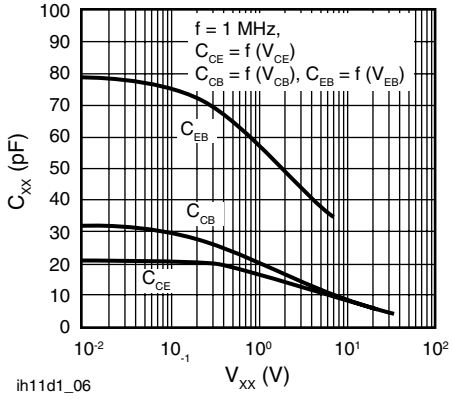


Fig. 5 - Transistor Capacitances (Typ.)

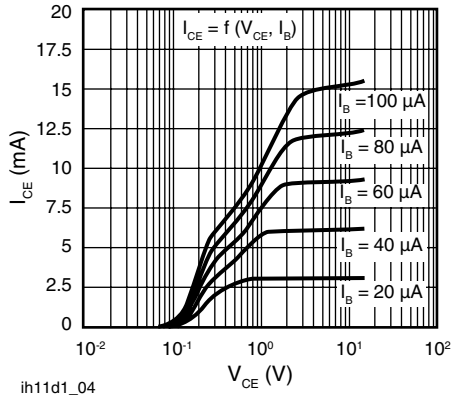


Fig. 3 - Output Characteristics

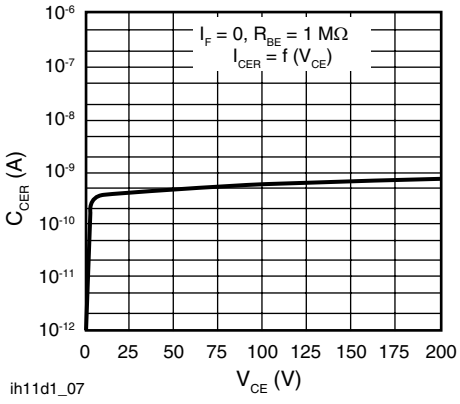


Fig. 6 - Collector Emitter Leakage Current (Typ.)



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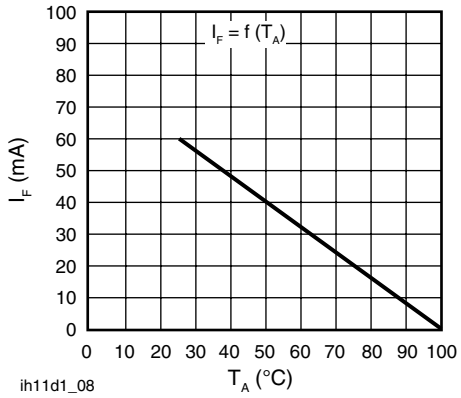



Fig. 7 - Permissible Loss Diode

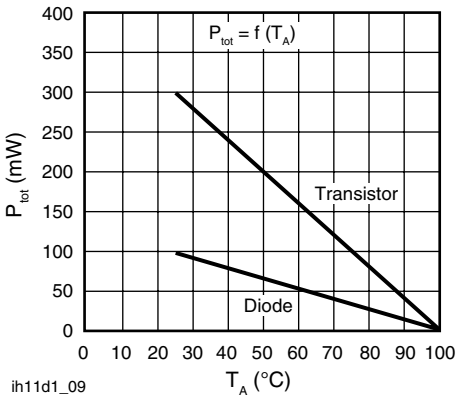



Fig. 8 - Permissible Power Dissipation

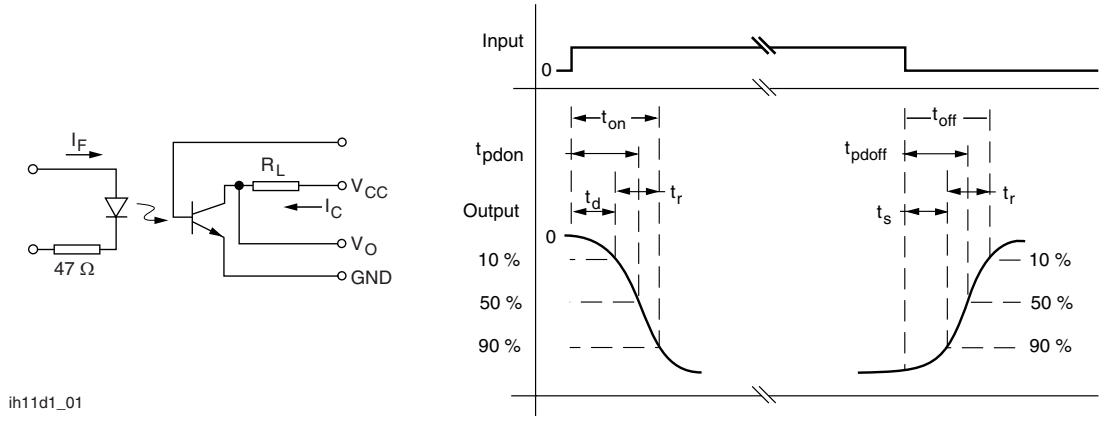
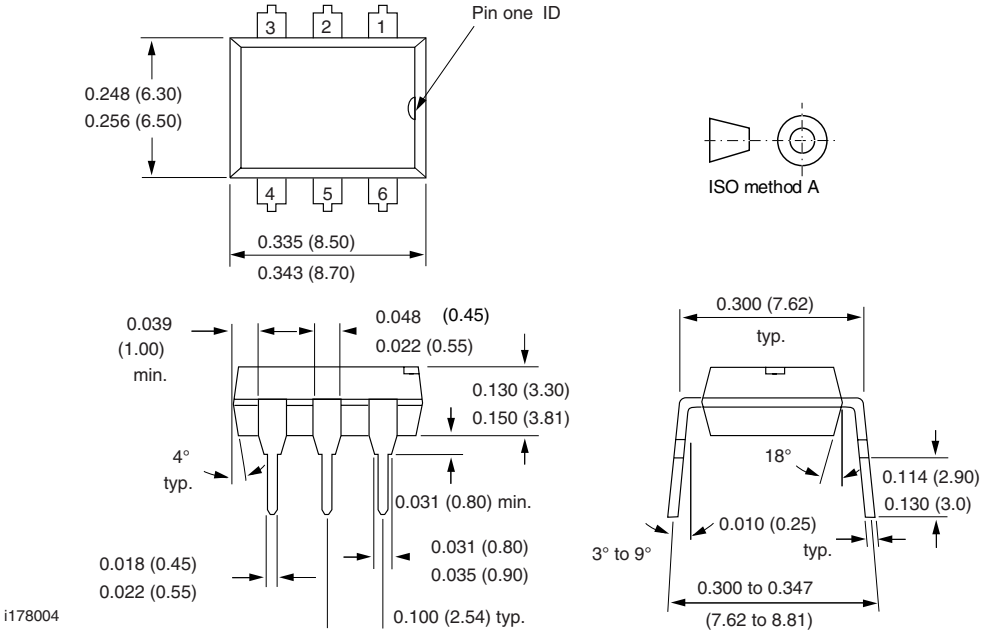



Fig. 9 - Switching Times Measurement-Test Circuit and Waveform

## **PACKAGE DIMENSIONS** in inches (millimeters)







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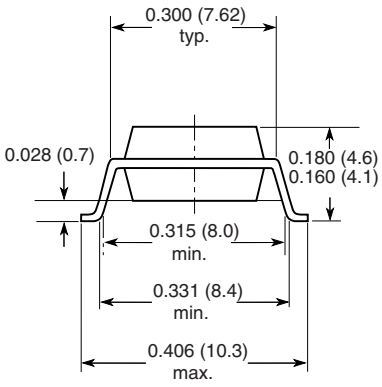
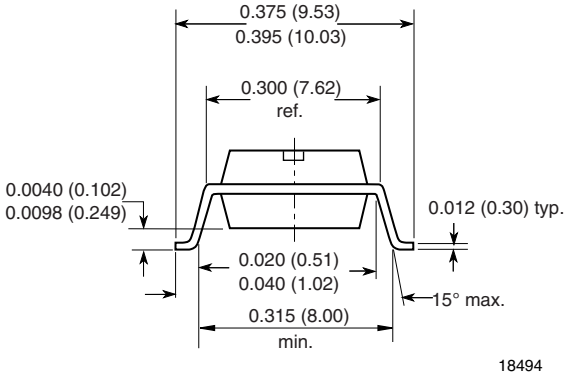
**Option 7**




**Option 9**



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

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