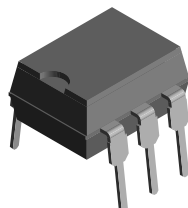
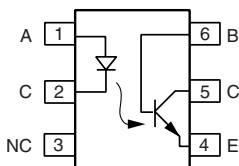


## Optocoupler, Phototransistor Output, With Base Connection, High $BV_{CER}$ Voltage



#179004



### 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.

### FEATURES

- CTR at  $I_F = 10$  mA,  $BV_{CER} = 10$  V:  $\geq 20$  %
- 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<sub>RMS</sub>
- 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



**RoHS**  
COMPLIANT

### AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-2 (VDE0884)  
DIN EN 60747-5-5 pending  
available with option 1
- BSI IEC60950 IEC60065
- 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             |
| <b>INPUT</b>                                         |                                                                                 |       |            |                |                  |
| Reverse voltage                                      |                                                                                 |       | $V_R$      | 6              | V                |
| DC forward current                                   |                                                                                 |       | $I_F$      | 60             | mA               |
| Surge forward current                                | $t \leq 10 \mu s$                                                               |       | $I_{FSM}$  | 2.5            | A                |
| Power dissipation                                    |                                                                                 |       | $P_{diss}$ | 100            | mW               |
| <b>OUTPUT</b>                                        |                                                                                 |       |            |                |                  |
| 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                                 |                                                                                 |       | $V_{BE0}$  | 7              | V                |
| Collector current                                    |                                                                                 |       | $I_C$      | 100            | mA               |
| Power dissipation                                    |                                                                                 |       | $P_{diss}$ | 300            | mW               |
| <b>COUPLER</b>                                       |                                                                                 |       |            |                |                  |
| Isolation test voltage                               | between emitter and detector,<br>refer to climate DIN 50014, part 2,<br>Nov. 74 |       | $V_{ISO}$  | 5300           | $V_{RMS}$        |
| Insulation thickness between emitter<br>and detector |                                                                                 |       |            | $\geq 0.4$     | mm               |
| Creepage distance                                    |                                                                                 |       |            | $\geq 7$       | mm               |
| Clearance distance                                   |                                                                                 |       |            | $\geq 7$       | mm               |
| Comparative tracking index                           | per DIN IEC 112/VDE 0303, part 1                                                |       |            | 175            |                  |
| Isolation resistance                                 | $V_{IO} = 500 \text{ V}, T_{amb} = 25 \text{ }^\circ\text{C}$                   |       | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$         |
|                                                      | $V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ }^\circ\text{C}$                  |       | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$         |
| Storage temperature range                            |                                                                                 |       | $T_{stg}$  | - 55 to + 150  | $^\circ\text{C}$ |
| Operating temperature range                          |                                                                                 |       | $T_{amb}$  | - 55 to + 100  | $^\circ\text{C}$ |
| Junction temperature                                 |                                                                                 |       | $T_j$      | 100            | $^\circ\text{C}$ |
| Soldering temperature                                | max. 10 s, dip soldering: distance<br>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 Rating for extended periods of the time can adversely affect reliability.



# H11D1/H11D2/H11D3/H11D4

Optocoupler, Phototransistor Output, Vishay Semiconductors  
With Base Connection, High  $BV_{CER}$  Voltage

| ELECTRICAL CHARACTERISTICS            |                                                                                                     |       |             |      |      |      |               |
|---------------------------------------|-----------------------------------------------------------------------------------------------------|-------|-------------|------|------|------|---------------|
| PARAMETER                             | TEST CONDITION                                                                                      | PART  | SYMBOL      | MIN. | TYP. | MAX. | UNIT          |
| INPUT                                 |                                                                                                     |       |             |      |      |      |               |
| Forward voltage                       | $I_F = 10 \text{ mA}$                                                                               |       | $V_F$       |      | 1.1  | 1.5  | V             |
| Reverse voltage                       | $I_R = 10 \text{ }\mu\text{A}$                                                                      |       | $V_R$       | 6    |      |      | V             |
| Reverse current                       | $V_R = 6 \text{ V}$                                                                                 |       | $I_R$       |      | 0.01 | 10   | $\mu\text{A}$ |
| Capacitance                           | $V_R = 0 \text{ V}$ , $f = 1 \text{ MHz}$                                                           |       | $C_O$       |      | 25   |      | pF            |
| Thermal resistance                    |                                                                                                     |       | $R_{thJA}$  |      | 750  |      | K/W           |
| OUTPUT                                |                                                                                                     |       |             |      |      |      |               |
| Collector emitter breakdown voltage   | $I_{CE} = 1 \text{ mA}$ , $R_{BE} = 1 \text{ M}\Omega$                                              | H11D1 | $BV_{CER}$  | 300  |      |      | V             |
|                                       |                                                                                                     | H11D2 | $BV_{CER}$  | 300  |      |      | V             |
|                                       |                                                                                                     | H11D3 | $BV_{CER}$  | 200  |      |      | V             |
|                                       |                                                                                                     | H11D4 | $BV_{CER}$  | 200  |      |      | V             |
| Emitter base breakdown voltage        | $I_{EB} = 100 \text{ }\mu\text{A}$                                                                  |       | $BV_{EBO}$  | 7    |      |      | V             |
| Collector emitter capacitance         | $V_{CE} = 10 \text{ V}$ , $f = 1 \text{ MHz}$                                                       |       | $C_{CE}$    |      | 7    |      | pF            |
| Collector base capacitance            | $V_{CB} = 10 \text{ V}$ , $f = 1 \text{ MHz}$                                                       |       | $C_{CB}$    |      | 8    |      | pF            |
| Emitter base capacitance              | $V_{EB} = 5 \text{ V}$ , $f = 1 \text{ MHz}$                                                        |       | $C_{EB}$    |      | 38   |      | pF            |
| Thermal resistance                    |                                                                                                     |       | $R_{th}$    |      | 250  |      | K/W           |
| COUPLER                               |                                                                                                     |       |             |      |      |      |               |
| Coupling capacitance                  |                                                                                                     |       | $C_C$       |      | 0.6  |      | pF            |
| Current transfer ratio                | $I_F = 10 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ ,<br>$R_{BE} = 1 \text{ M}\Omega$                   |       | $I_C/I_F$   | 20   |      |      | %             |
| Collector emitter, saturation voltage | $I_F = 10 \text{ mA}$ , $I_C = 0.5 \text{ mA}$ ,<br>$R_{BE} = 1 \text{ M}\Omega$                    |       | $V_{CEsat}$ |      | 0.25 | 0.4  | V             |
| Collector emitter, leakage current    | $V_{CE} = 200 \text{ V}$ , $R_{BE} = 1 \text{ M}\Omega$                                             | H11D1 | $I_{CER}$   |      |      | 100  | nA            |
|                                       |                                                                                                     | H11D2 | $I_{CER}$   |      |      | 100  | nA            |
|                                       | $V_{CE} = 300 \text{ V}$ , $R_{BE} = 1 \text{ M}\Omega$ ,<br>$T_{amb} = 100 \text{ }^\circ\text{C}$ | H11D1 | $I_{CER}$   |      |      | 250  | $\mu\text{A}$ |
|                                       |                                                                                                     | H11D2 | $I_{CER}$   |      |      | 250  | $\mu\text{A}$ |

## 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 |
| Current transfer ratio | $I_F = 10 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ ,<br>$R_{BE} = 1 \text{ M}\Omega$ |      | CTR    | 20   |      |      | %    |

| SWITCHING CHARACTERISTICS |                                                                                                                      |                  |      |      |      |      |
|---------------------------|----------------------------------------------------------------------------------------------------------------------|------------------|------|------|------|------|
| PARAMETER                 | TEST CONDITION                                                                                                       | SYMBOL           | MIN. | TYP. | MAX. | UNIT |
| Turn-on time              | I <sub>C</sub> = 2 mA (to be adjusted by varying I <sub>F</sub> ),<br>R <sub>L</sub> = 100 Ω, V <sub>CC</sub> = 10 V | t <sub>on</sub>  |      | 5    |      | μs   |
| Rise time                 | I <sub>C</sub> = 2 mA (to be adjusted by varying I <sub>F</sub> ),<br>R <sub>L</sub> = 100 Ω, V <sub>CC</sub> = 10 V | t <sub>r</sub>   |      | 2.5  |      | μs   |
| Turn-off time             | I <sub>C</sub> = 2 mA (to be adjusted by varying I <sub>F</sub> ),<br>R <sub>L</sub> = 100 Ω, V <sub>CC</sub> = 10 V | t <sub>off</sub> |      | 6    |      | μs   |
| Fall time                 | I <sub>C</sub> = 2 mA (to be adjusted by varying I <sub>F</sub> ),<br>R <sub>L</sub> = 100 Ω, V <sub>CC</sub> = 10 V | t <sub>f</sub>   |      | 5.5  |      | μs   |

## Note

Switching times measurement-test circuit and waveforms

## TYPICAL CHARACTERISTICS

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

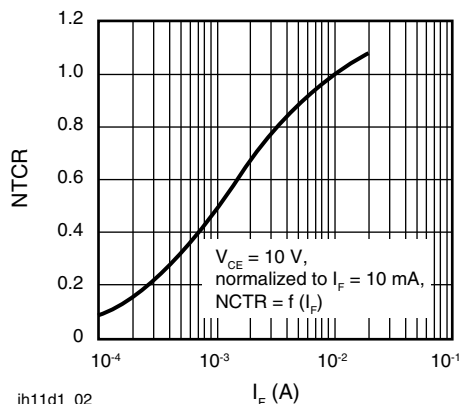


Fig. 1 - Current Transfer Ratio (typ.)

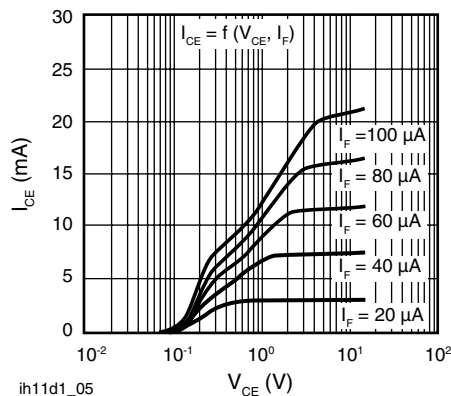


Fig. 4 - Output Characteristics

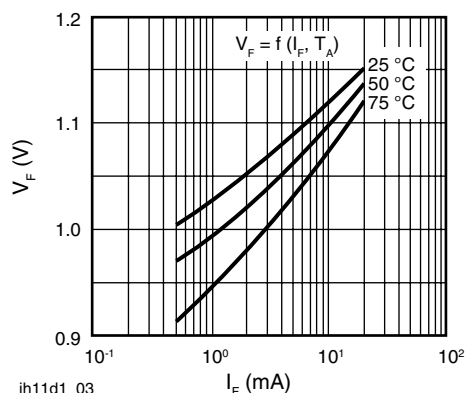


Fig. 2 - Diode Forward Voltage (typ.)

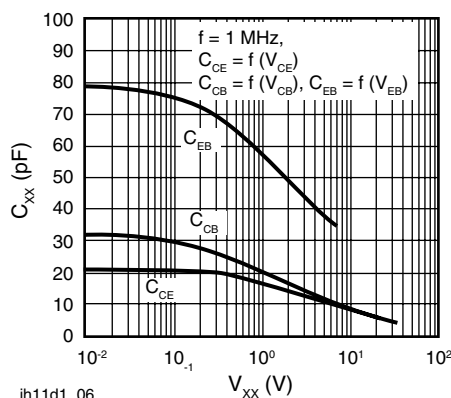


Fig. 5 - Transistor Capacitances (typ.)

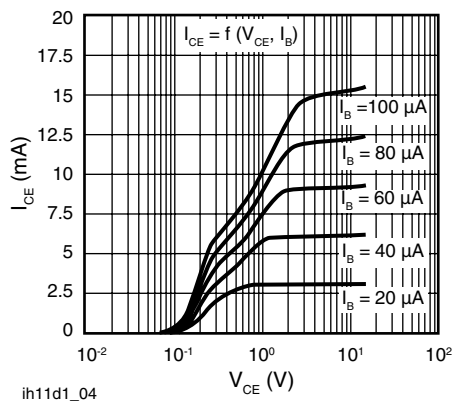


Fig. 3 - Output Characteristics

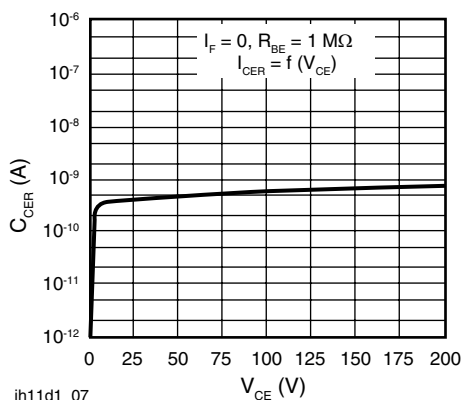


Fig. 6 - Collector Emitter Leakage Current (typ.)

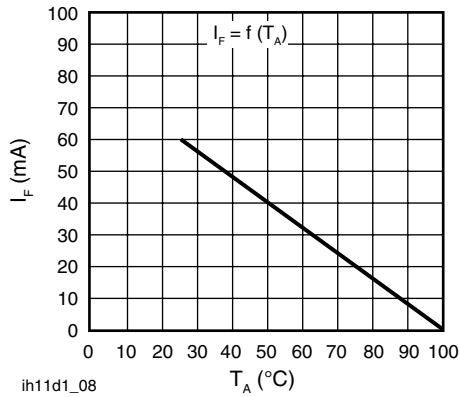


Fig. 7 - Permissible Loss Diode

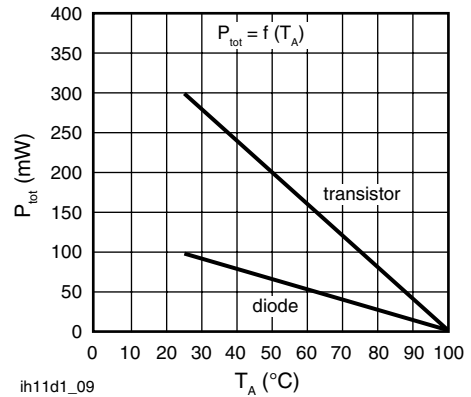


Fig. 8 - Permissible Power Dissipation

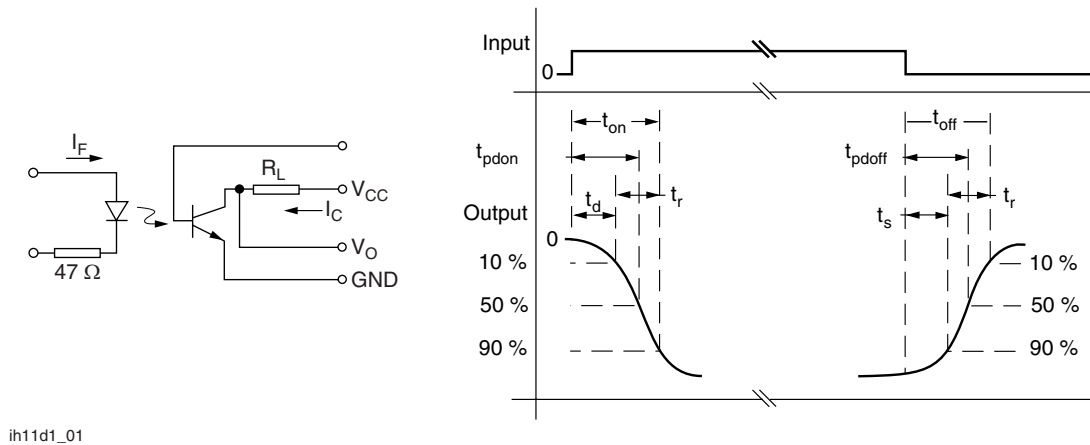


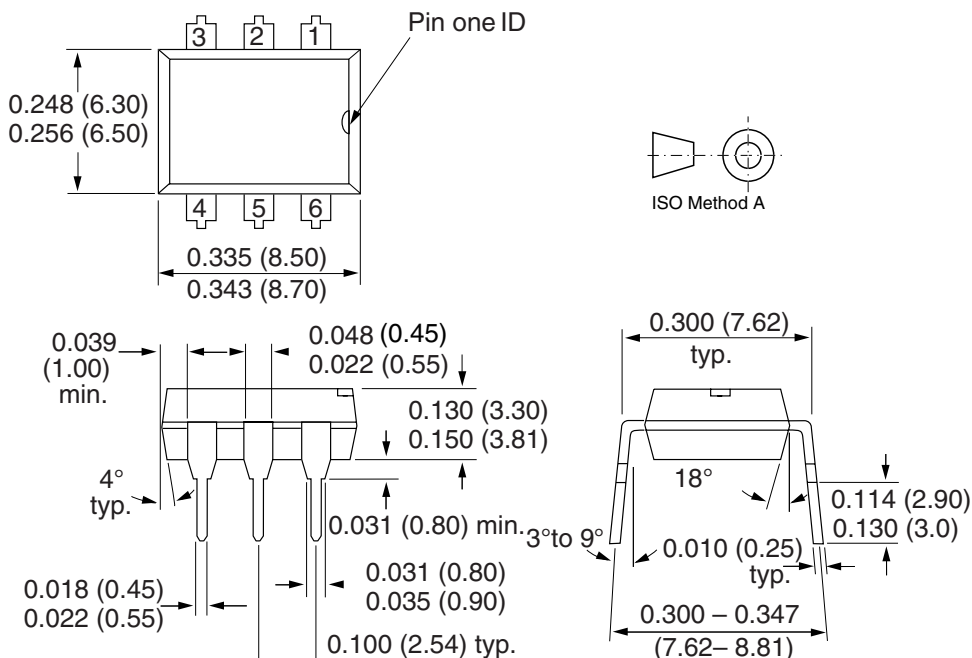
Fig. 9 Switching Times Measurement-Test Circuit and Waveform

# H11D1/H11D2/H11D3/H11D4



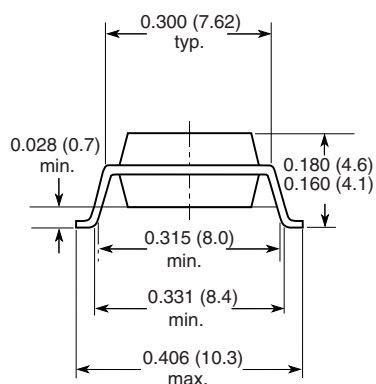
Vishay Semiconductors Optocoupler, Phototransistor Output,  
With Base Connection, High  $BV_{CER}$  Voltage

## PACKAGE DIMENSIONS in inches (millimeters)

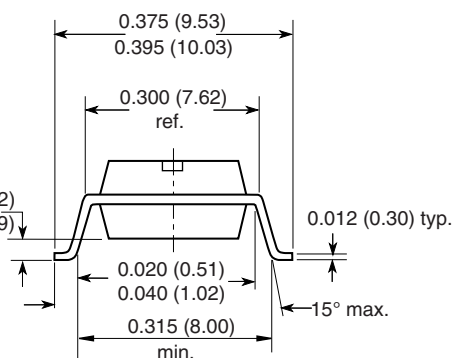


i178004

### Option 7



### Option 9



18494

**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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