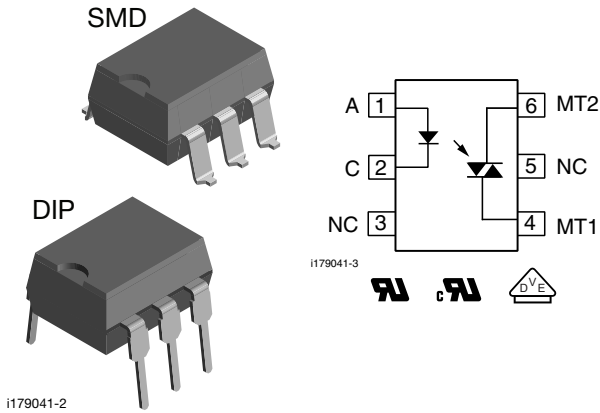


# Optocoupler, Phototriac Output, Non-Zero Crossing, 1.5 kV/μs dV/dt, 600 V



## FEATURES

- 1500 V/μs dV/dt minimum 2000 V/μs typical
- 600 V blocking voltage
- 100 mA on-state current
- Low input trigger current
- 6 pin DIP package
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS COMPLIANT

## APPLICATIONS

- Household appliances
- Triac drive/AC motor drives
- Solenoid/valve controls
- Office automation equipment/machine
- Temperature (HVAC)/lighting controls
- Switching power supply

## DESCRIPTION

The VO3052 and VO3053 triac driver family consists of a GaAs infrared LED optically coupled to a monolithic photosensitive non-zero crossing triac detector chip.

The 600 V blocking voltage permits control of off-line voltages up to 240 V<sub>AC</sub>, with a safety factor or more than two, and is sufficient for as much as 380 V.

## AGENCY APPROVALS

- UL-file E52744 system code H or J
- cUL - file no. E52744, equivalent to CSA bulletin 5A
- DIN EN 60747-5-2 (VDE 0884) available with option 1

| ORDERING INFORMATION  |  |              |
|---|--|--------------|
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">V</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">O</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">3</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">0</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">5</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">-</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">X</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">0</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">T</div> </div> <p style="text-align: center;">PART NUMBER                      PACKAGE OPTION                      TAPE AND REEL</p> | <p>DIP: 7.62 mm<br/>Option 6: 10.16 mm<br/>Option 7: &gt; 0.7 mm<br/>Option 9: &gt; 0.1 mm</p> |              |
| AGENCY CERTIFIED/PACKAGE  | TRIGGER, CURRENT I <sub>FT</sub> (mA)  |              |
| <b>UL, cUL</b>  | <b>5</b>   | <b>10</b>    |
| DIP-6   | VO3053   | VO3052       |
| DIP-6, 400 mil, option 6  | VO3053-X006  | VO3052-X006  |
| SMD-6, option 7   | VO3053-X007T   | VO3052-X007T |
| SMD-6, option 9   | VO3053-X009T   | -            |
| <b>VDE, UL, cUL</b>   | <b>5</b>   | <b>10</b>    |
| DIP-6, 400 mil, option 6  | -  | VO3052-X016  |

| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                      |                |              |               |                    |
|--|----------------------|----------------|--------------|---------------|--------------------|
| PARAMETER  | TEST CONDITION       | PART           | SYMBOL       | VALUE         | UNIT               |
| <b>INPUT</b>   |                      |                |              |               |                    |
| Reverse voltage  |                      |                | $V_R$        | 6             | V                  |
| Forward current - continuous   |                      |                | $I_F$        | 60            | mA                 |
| Power dissipation  |                      |                | $P_{diss}$   | 100           | mW                 |
| <b>OUTPUT</b>  |                      |                |              |               |                    |
| Off state output terminal voltage  |                      | VO3052, VO3053 | $V_{DRM}$    | 600           | V                  |
| Peak non-repetitive surge current  | PW = 100 ms, 120 pps |                | $I_{TSM}$    | 1             | A                  |
| Power dissipation  |                      |                | $P_{diss}$   | 200           | mW                 |
| On-state RMS current   |                      |                | $I_{T(RMS)}$ | 100           | mA                 |
| <b>COUPLER</b>   |                      |                |              |               |                    |
| Isolation test voltage   | t = 1 s              |                | $V_{ISO}$    | 5300          | $V_{RMS}$          |
| Total power dissipation  |                      |                | $P_{tot}$    | 300           | mW                 |
| Operating temperature  |                      |                | $T_{amb}$    | - 55 to + 100 | $^{\circ}\text{C}$ |
| Storage temperature  |                      |                | $T_{stg}$    | - 55 to + 150 | $^{\circ}\text{C}$ |
| Soldering temperature <sup>(1)</sup>   | 10 s                 |                | $T_{sld}$    | 260           | $^{\circ}\text{C}$ |

**Notes**

- 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.

<sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP) "Assembly Instructions" ([www.vishay.com/doc?80054](http://www.vishay.com/doc?80054)).

| <b>THERMAL CHARACTERISTICS</b>                            |                |       |                             |  |
|---|----------------|-------|-----------------------------|--|
| PARAMETER   | SYMBOL         | VALUE | UNIT                        |  |
| Maximum LED junction temperature                          | $T_{jmax}$     | 125   | $^{\circ}\text{C}$          |  |
| Maximum output die junction temperature                   | $T_{jmax}$     | 125   | $^{\circ}\text{C}$          |  |
| Thermal resistance, junction emitter to board             | $\theta_{JEB}$ | 150   | $^{\circ}\text{C}/\text{W}$ |  |
| Thermal resistance, junction emitter to case              | $\theta_{JEC}$ | 139   | $^{\circ}\text{C}/\text{W}$ |  |
| Thermal resistance, junction detector to board            | $\theta_{JDB}$ | 78    | $^{\circ}\text{C}/\text{W}$ |  |
| Thermal resistance, junction detector to case             | $\theta_{JDC}$ | 103   | $^{\circ}\text{C}/\text{W}$ |  |
| Thermal resistance, junction emitter to junction detector | $\theta_{JED}$ | 496   | $^{\circ}\text{C}/\text{W}$ |  |
| Thermal resistance, case to ambient                       | $\theta_{CA}$  | 3563  | $^{\circ}\text{C}/\text{W}$ |  |

**Note**

- The thermal model is represented in the thermal network below. Each resistance value given in this model can be used to calculate the temperatures at each node for a given operating condition. The thermal resistance from board to ambient will be dependent on the type of PCB, layout and thickness of copper traces. For a detailed explanation of the thermal model, please reference Vishay's Thermal Characteristics of Optocouplers application note.



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |        |              |      |      |      |                  |
|--|---|--------|--------------|------|------|------|------------------|
| PARAMETER  | TEST CONDITION  | PART   | SYMBOL       | MIN. | TYP. | MAX. | UNIT             |
| <b>INPUT</b>   |   |        |              |      |      |      |                  |
| Reverse current  | $V_R = 6\text{ V}$  |        | $I_R$        |      |      | 10   | $\mu\text{A}$    |
| Forward voltage  | $I_F = 30\text{ mA}$  |        | $V_F$        |      | 1.2  | 1.5  | V                |
| <b>OUTPUT</b>  |   |        |              |      |      |      |                  |
| Leakage with LED off, either direction   | $V_{DRM} = 600\text{ V}$  |        | $I_{DRM}$    |      | 10   | 500  | nA               |
| Critical rate of rise off-state voltage  | $V_D = 400\text{ V}$  |        | $dV/dt_{cr}$ | 1500 | 2000 |      | V/ $\mu\text{s}$ |
| <b>COUPLER</b>   |   |        |              |      |      |      |                  |
| LED trigger current, current required to latch output  |   | VO3053 | $I_{FT}$     |      |      | 5    | mA               |
|  |   | VO3052 | $I_{FT}$     |      |      | 10   | mA               |
| Peak on-state voltage, either direction  | $I_{TM} = 100\text{ mA peak}$ ,<br>$I_F = \text{rated } I_{FT}$ |        | $V_{TM}$     |      | 1.7  | 3    | V                |
| Holding current, either direction  |   |        | $I_H$        |      | 200  |      | $\mu\text{A}$    |
| Coupling capacitance   | 10 KHz  |        | $C_{IO}$     |      | 0.4  |      | pF               |

**Note**

- 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>SAFETY AND INSULATION RATINGS</b>  |            |           |           |      |                    |  |
|---|------------|-----------|-----------|------|--------------------|--|
| PARAMETER   | SYMBOL     | MIN.      | TYP.      | MAX. | UNIT               |  |
| Climatic classification (according to IEC 68 part 1)                                      |            |           | 55/100/21 |      |                    |  |
| Pollution degree (DIN VDE 0109)   |            |           | 2         |      |                    |  |
| Comparative tracking index  | CTI        | 175       |           |      |                    |  |
| Peak transient overvoltage  | $V_{IOTM}$ | 8000      |           |      | $V_{peak}$         |  |
| Peak working insulation voltage   | $V_{IORM}$ | 890       |           |      | $V_{peak}$         |  |
| Isolation resistance at $T_{amb} = 100\text{ }^{\circ}\text{C}$ , $V_{DC} = 500\text{ V}$ | $R_{IO}$   | $10^{11}$ |           |      | $\Omega$           |  |
| Isolation resistance at $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{DC} = 500\text{ V}$  | $R_{IO}$   | $10^{12}$ |           |      | $\Omega$           |  |
| Partial discharge test voltage (method a, $V_{pd} = V_{IORM} \times 1.875$ )              | $V_{pd}$   | 1669      |           |      | $V_{peak}$         |  |
| Safety rating - power   | $P_{SO}$   |           |           | 500  | mW                 |  |
| Safety rating - input current   | $I_{SI}$   |           |           | 250  | mA                 |  |
| Safety rating - temperature   | $T_{SI}$   |           |           | 175  | $^{\circ}\text{C}$ |  |
| Clearance distance (Standard DIP-6)   |            | 7         |           |      | mm                 |  |
| Creepage distance (Standard DIP-6)  |            | 7         |           |      | mm                 |  |
| Clearance distance (400 mil DIP-6)  |            | 8         |           |      | mm                 |  |
| Creepage distance (400 mil DIP-6)   |            | 8         |           |      | mm                 |  |

**Note**

- According to DIN EN60747-5-5 (see figure 4). This optocoupler is suitable for safe electrical isolation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

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

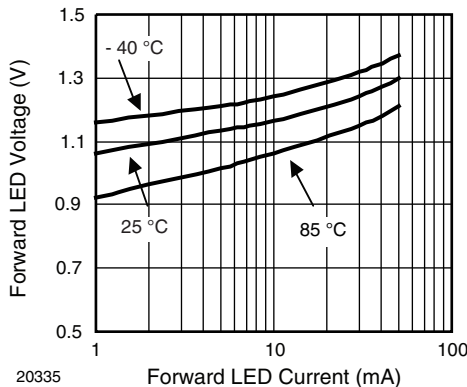


Fig. 1 - Forward Voltage vs. Forward Current

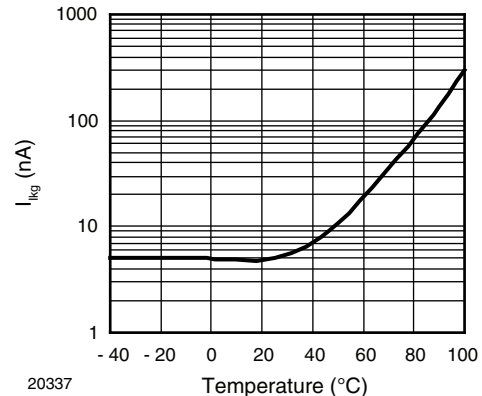


Fig. 2 - Off-State Leakage Current vs. Temperature

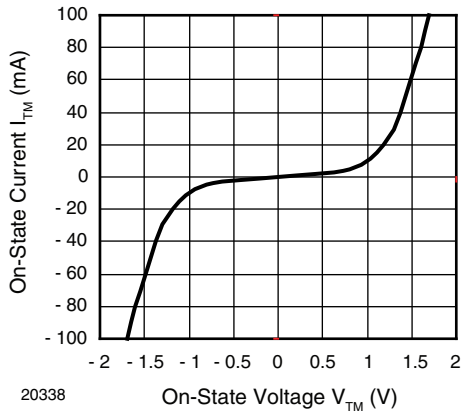


Fig. 3 - On-State Current vs.  $V_{TM}$

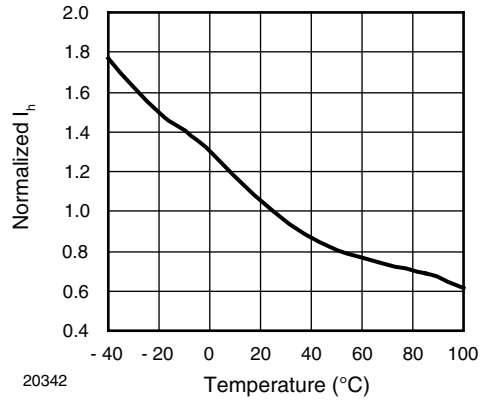


Fig. 6 - Normalized Holding Current vs. Temperature

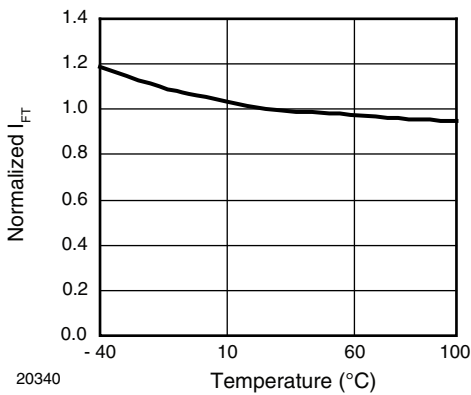


Fig. 4 - Normalized Trigger Current vs. Temperature

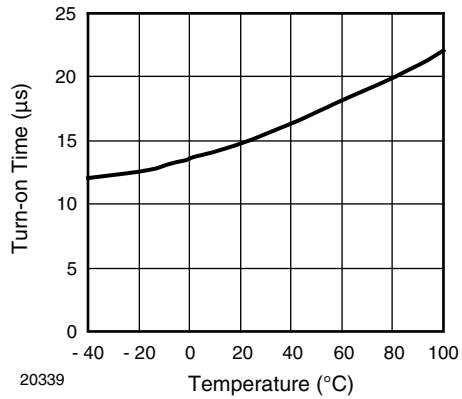


Fig. 7 - Turn-on Time vs. Temperature

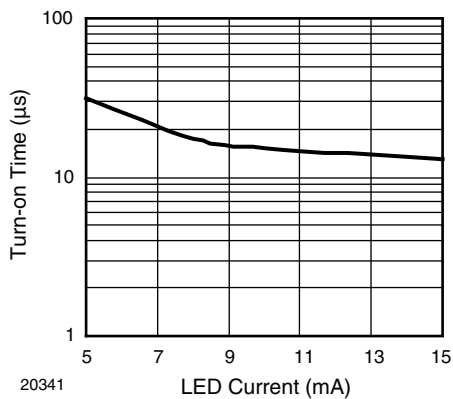


Fig. 5 - Turn-on Time vs. LED Current

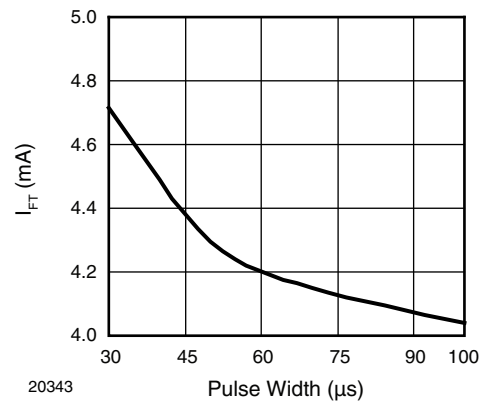
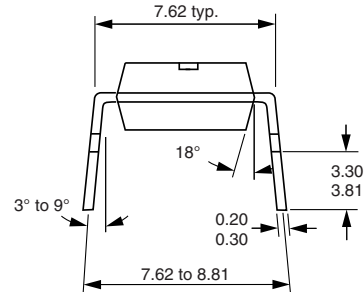
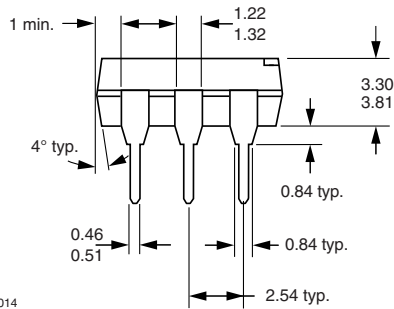
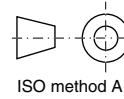
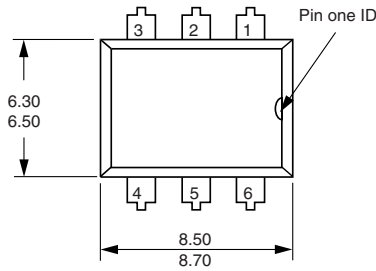


Fig. 8 - Trigger Current vs. Pulse Width

**PACKAGE DIMENSIONS** in millimeters

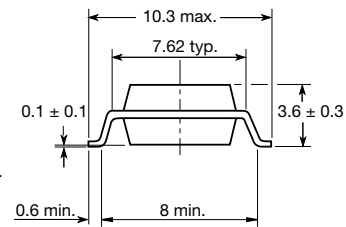
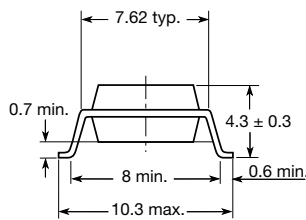
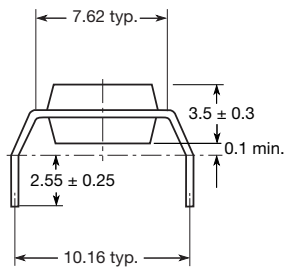


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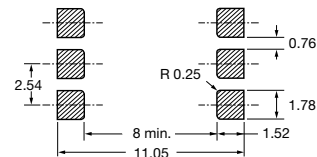
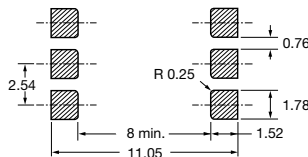
**Option 6**

**Option 7**

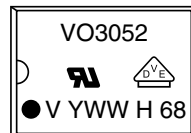
**Option 9**



20802-24



**PACKAGE MARKING**



**Notes**

- 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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- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
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- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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