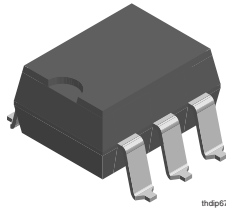
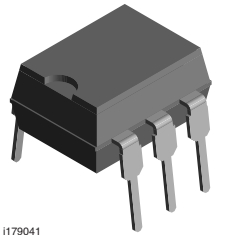


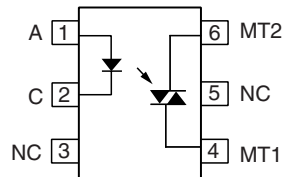
## Optocoupler, Non Zero Crossing Phototriac, 1.5 kV/ $\mu$ s dV/dt, 600 V



m1dp67



i179041



### DESCRIPTION

The VO3052, 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 VAC, with a safety factor or more than two, and is sufficient for as much as 380 V.

### FEATURES

- 1500 V/ $\mu$ s dV/dt minimum 2000 V/ $\mu$ s typical
- 600 V blocking voltage
- 100 mA on-state current
- Low input trigger current
- 6 pin DIP package
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### APPLICATIONS

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

### AGENCY APPROVALS

- UL-file E52744 system code H or J
- CUL - file no. E52744, equivalent to CSA bulletin 5A
- DIN EN 60747-5-5 (VDE 0884) available with option 1
- BSI IEC 60950

| ORDER INFORMATION |  |
|-------------------|--|
| PART              | REMARKS  |
| VO3053            | DIP-6, NZC, 600 V, $I_{ft} = 5$ mA                     |
| VO3052            | DIP-6, NZC, 600 V, $I_{ft} = 10$ mA                    |
| VO3053-X006       | DIP-6 400 mil (option 6), NZC, 600 V, $I_{ft} = 5$ mA  |
| VO3052-X006       | DIP-6 400 mil (option 6), NZC, 600 V, $I_{ft} = 10$ mA |
| VO3053-X007T      | SMD-6 (option 7), NZC, 600 V, $I_{ft} = 5$ mA          |
| VO3052-X007T      | SMD-6 (option 7), NZC, 600 V, $I_{ft} = 10$ mA         |

### Note

For additional information on the available options refer to option information.  
This phototriac should not be used to drive a load directly. It is intended to be a trigger device only.

| ABSOLUTE MAXIMUM RATINGS (1)      |                      |                |              |       |      |
|-----------------------------------|----------------------|----------------|--------------|-------|------|
| PARAMETER                         | TEST CONDITION       | PART           | SYMBOL       | VALUE | UNIT |
| <b>INPUT</b>                      |                      |                |              |       |      |
| Reverse voltage                   |                      |                | $V_R$        | 6.0   | 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 repetitive surge current     | PW = 100 ms, 120 pps |                | $I_{TSM}$    | 1.0   | A    |
| Power dissipation                 |                      |                | $P_{diss}$   | 200   | mW   |
| On-state RMS current              |                      |                | $I_{T(RMS)}$ | 100   | mA   |



| <b>ABSOLUTE MAXIMUM RATINGS (1)</b> |                |      |                   |               |                  |
|-------------------------------------|----------------|------|-------------------|---------------|------------------|
| PARAMETER                           | TEST CONDITION | PART | SYMBOL            | VALUE         | UNIT             |
| <b>COUPLER</b>                      |                |      |                   |               |                  |
| Isolation test voltage              | t = 1.0 s      |      | V <sub>ISO</sub>  | 5300          | V <sub>RMS</sub> |
| Total power dissipation             |                |      | P <sub>tot</sub>  | 300           | mW               |
| Operating temperature               |                |      | T <sub>amb</sub>  | - 40 to + 100 | °C               |
| Storage temperature                 |                |      | T <sub>stg</sub>  | - 55 to + 150 | °C               |
| Soldering temperature (2)           | 10 s           |      | T <sub>slid</sub> | 260           | °C               |

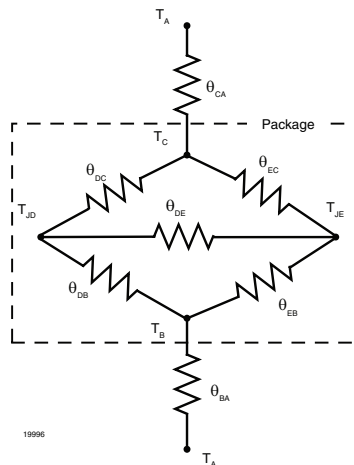
**Notes**

- (1) T<sub>amb</sub> = 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.
- (2) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

| <b>THERMAL CHARACTERISTICS</b>                            |                |                   |       |      |
|---|----------------|-------------------|-------|------|
| PARAMETER   | TEST CONDITION | SYMBOL            | VALUE | UNIT |
| Maximum LED junction temperature                          |                | T <sub>jmax</sub> | 125   | °C   |
| Maximum output die junction temperature                   |                | T <sub>jmax</sub> | 125   | °C   |
| Thermal resistance, junction emitter to board             |                | θ <sub>JEB</sub>  | 150   | °C/W |
| Thermal resistance, junction emitter to case              |                | θ <sub>JEC</sub>  | 139   | °C/W |
| Thermal resistance, junction detector to board            |                | θ <sub>JDB</sub>  | 78    | °C/W |
| Thermal resistance, junction detector to case             |                | θ <sub>JDC</sub>  | 103   | °C/W |
| Thermal resistance, junction emitter to junction detector |                | θ <sub>JED</sub>  | 496   | °C/W |
| Thermal resistance, case to ambient                       |                | θ <sub>CA</sub>   | 3563  | °C/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.



| ELECTRICAL CHARACTERISTICS                               |   |        |           |      |      |      |      |
|--|---|--------|-----------|------|------|------|------|
| PARAMETER  | TEST CONDITION  | PART   | SYMBOL    | MIN. | TYP. | MAX. | UNIT |
| <b>INPUT</b>   |   |        |           |      |      |      |      |
| Reverse current  | $V_R = 6\text{ V}$  |        | $I_R$     |      |      | 10   | μA   |
| 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     | 1500 | 2000 |      | V/μs |
| <b>COUPLER</b>   |   |        |           |      |      |      |      |
| LED trigger current,<br>current required to latch output |   | VO3053 | $I_{FT}$  |      |      | 5    | mA   |
|  |   | VO3052 | $I_{FT}$  |      |      | 10   | mA   |
| Peak on-state voltage,<br>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  |      | μA   |

**Note**

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

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.

| SAFETY AND INSULATION RATINGS   |  |            |          |           |                |            |  |
|---|--|------------|----------|-----------|----------------|------------|--|
| PARAMETER   | TEST CONDITION   | SYMBOL     | MIN.     | TYP.      | MAX.           | UNIT       |  |
| Climatic classification   | IEC 68 part 1  |            |          | 40/100/21 |                |            |  |
| Pollution degree  | DIN VDE 0109   |            |          | 2         |                |            |  |
| Tracking resistance (comparative tracking index)                                | Insulation group IIIa  | CTI        | 175      |           |                |            |  |
| Highest allowable overvoltage   | Transient overvoltage  | $V_{IOTM}$ | 8000     |           |                | $V_{peak}$ |  |
| Maximum working insulation voltage  | Recurring peak voltage   | $V_{IORM}$ | 890      |           |                | $V_{peak}$ |  |
| Insulation resistance at 25 °C  | $V_{IO} = 500\text{ V}$  | $R_{IS}$   |          |           | $\geq 10^{12}$ | Ω          |  |
| Insulation resistance at $T_S$  | $V_{IO} = 500\text{ V}$  | $R_{IS}$   |          |           | $\geq 10^{12}$ | Ω          |  |
| Insulation resistance at 100 °C   | $V_{IO} = 500\text{ V}$  | $R_{IS}$   |          |           | $\geq 10^{12}$ | Ω          |  |
| Partial discharge test voltage  | Method a,<br>$V_{pd} = V_{IORM} \times 1.875$  | $V_{pd}$   |          |           | 1669           | $V_{peak}$ |  |
| Safety limiting values -<br>maximum values allowed in<br>the event of a failure | Output power   | $P_{SO}$   |          |           | 500            | mW         |  |
|   | Input current  | $I_{SI}$   |          |           | 250            | mA         |  |
|   | Case temperature   | $T_{SI}$   |          |           | 175            | °C         |  |
| Minimum external air gap (clearance)  | Measured from input terminals to output terminals, shortest distance through air     |            | $\geq 7$ |           |                | mm         |  |
| Minimum external tracking (creepage)  | Measured from input terminals to output terminals, shortest distance path along body |            | $\geq 7$ |           |                | mm         |  |
| Minimum external air gap (clearance)  | Measured from input terminals to output terminals, shortest distance through air     |            | $\geq 8$ |           |                | mm         |  |
| Minimum external tracking (creepage)  | Measured from input terminals to output terminals, shortest distance path along body |            | $\geq 8$ |           |                | mm         |  |

**Note**

As per IEC 60747-5-2, 7.4.3.8.1, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.



**TYPICAL CHARACTERISTICS**

T<sub>amb</sub> = 25 °C, unless otherwise specified

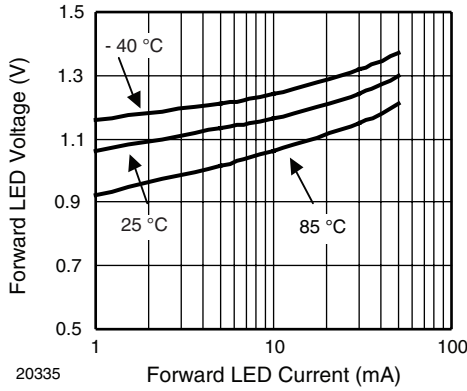


Fig. 1 - Forward Voltage vs. Forward Current

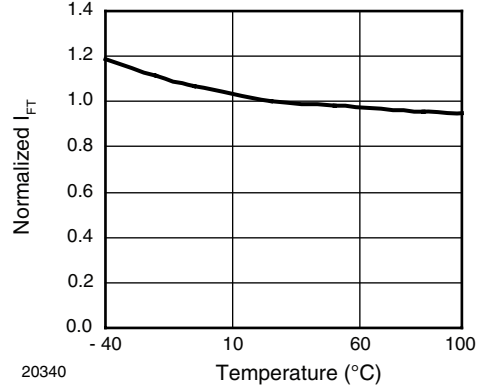


Fig. 4 - Normalized Trigger Current vs. Temperature

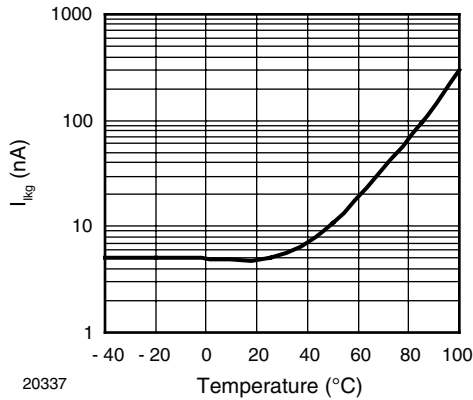


Fig. 2 - Off-State Leakage Current vs. Temperature

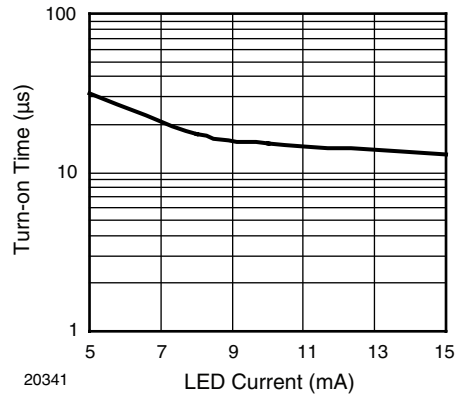


Fig. 5 - Turn-on Time vs. LED Current

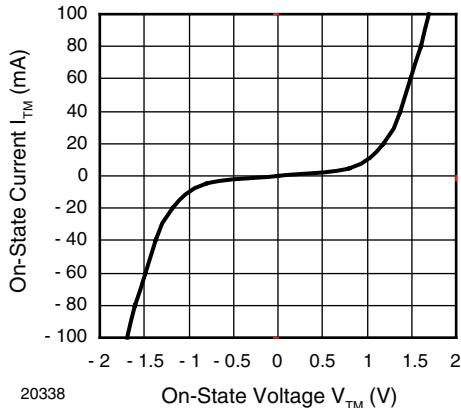


Fig. 3 - On-State Current vs. V<sub>TM</sub>

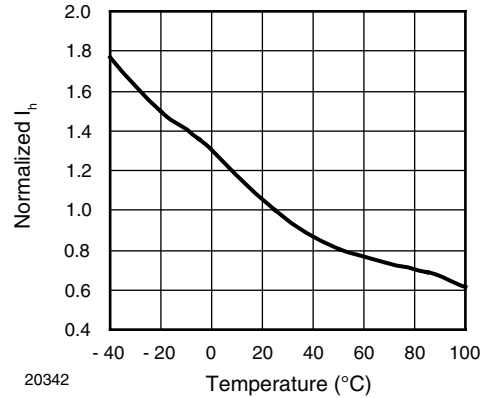


Fig. 6 - Normalized Holding Current vs. Temperature

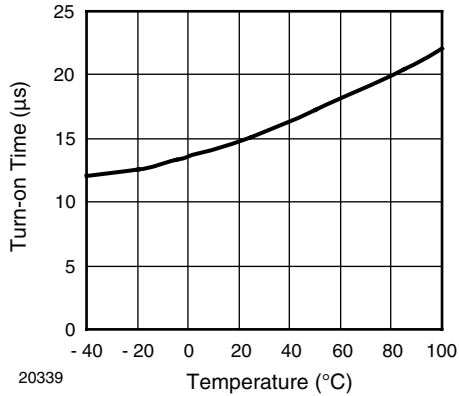


Fig. 7 - Turn-on Time vs. Temperature

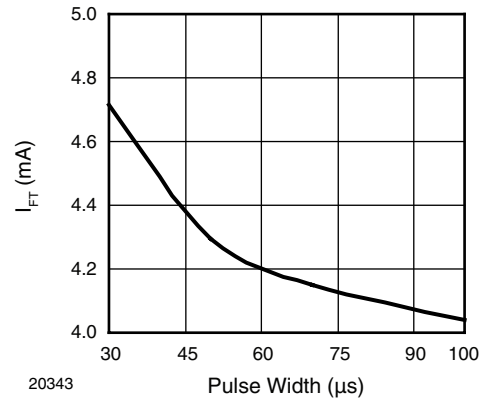
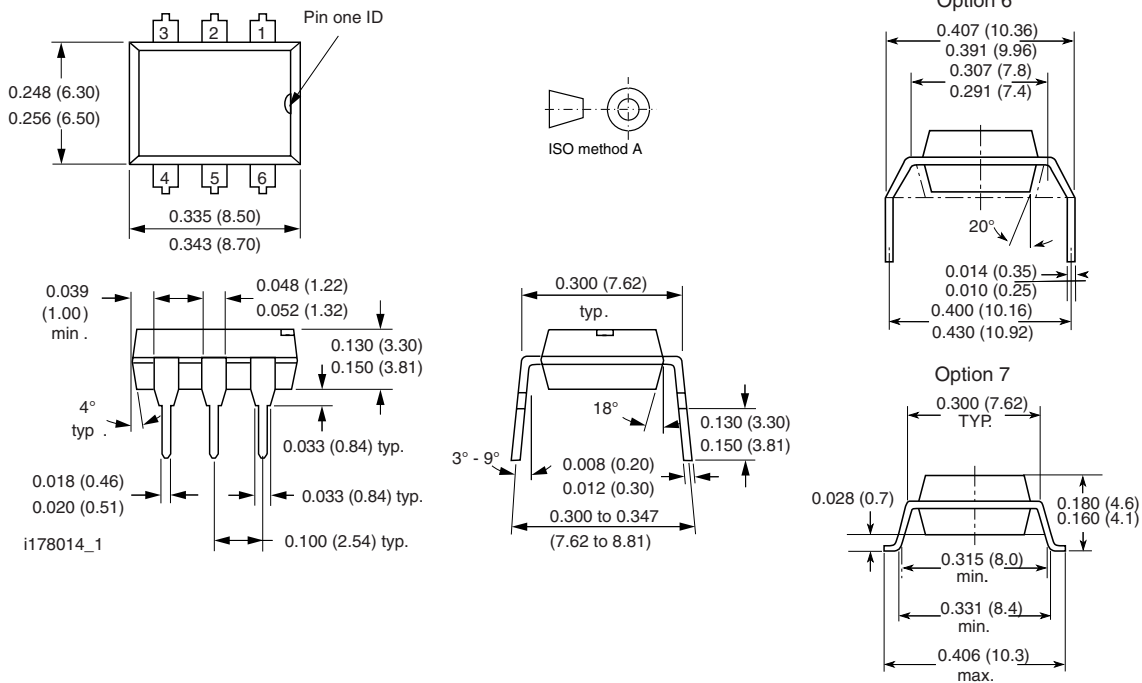


Fig. 8 - Trigger Current vs. Pulse Width

## PACKAGE DIMENSIONS in inches (millimeters)



**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.

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