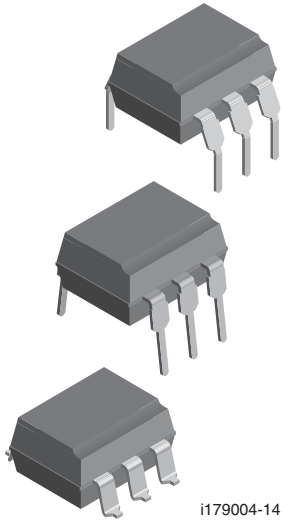
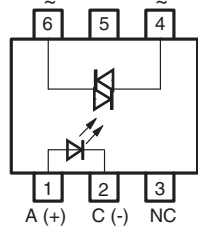


## Optocoupler, Phototriac Output, 400 V<sub>DRM</sub>



i179004-14

Note: pin 5 must not be connected



### FEATURES

- 400 V blocking voltage
- Isolation test voltage, 5000 V<sub>RMS</sub>, t = 1 min
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS COMPLIANT

### APPLICATIONS

- High current triac driver
- Solid-state relay
- Switch small AC loads

### AGENCY APPROVALS

(all parts are certified under base model VO3020)

- UL1577, file no. E52744 double protection
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- FIMKO EN 60950-1
- CQC GB8898-2011, GB4943.1-2011

### DESCRIPTION

The VO3020 series consists of a phototriac optically coupled to a gallium arsenide infrared-emitting diode in a 6-lead plastic dual inline package

| ORDERING INFORMATION  |  |                                  |                |              |              |
|---|--|----------------------------------|----------------|--------------|--------------|
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">V</div> <div style="border: 1px solid black; padding: 2px;">O</div> <div style="border: 1px solid black; padding: 2px;">3</div> <div style="border: 1px solid black; padding: 2px;">0</div> <div style="border: 1px solid black; padding: 2px;">2</div> <div style="border: 1px solid black; padding: 2px;">#</div> <div style="border: 1px solid black; padding: 2px;">-</div> <div style="border: 1px solid black; padding: 2px;">X</div> <div style="border: 1px solid black; padding: 2px;">0</div> <div style="border: 1px solid black; padding: 2px;">0</div> <div style="border: 1px solid black; padding: 2px;">#</div> <div style="border: 1px solid black; padding: 2px;">T</div> </div> |  |                                  |                |              |              |
| PART NUMBER   |  |                                  | PACKAGE OPTION |              |              |
|   |  |                                  | TAPE AND REEL  |              |              |
|   |  |                                  |                |              |              |
| AGENCY CERTIFIED / PACKAGE  |  | TRIGGER CURRENT, I <sub>FT</sub> |                |              |              |
| UL, cUL, CQC  |  | 5 mA                             | 10 mA          | 15 mA        | 30 mA        |
| DIP-6   |  | VO3023                           | VO3022         | VO3021       | VO3020       |
| DIP-6, 400 mil, option 6  |  | VO3023-X006                      | VO3022-X006    | VO3021-X006  | VO3020-X006  |
| SMD-6, option 7   |  | VO3023-X007T                     | VO3022-X007T   | VO3021-X007T | VO3020-X007T |
| VDE, UL, cUL, FIMKO, CQC  |  | 5 mA                             | 10 mA          | 15 mA        | 30 mA        |
| DIP-6   |  | VO3023-X001                      | VO3022-X001    | VO3021-X001  | VO3020-X001  |
| SMD-6, option 7   |  | VO3023-X017T                     | -              | VO3021-X017T | VO3020-X017T |

### Note

- Additional options may be possible, please contact sales office



| ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified) |                          |                     |             |                  |
|---|--------------------------|---------------------|-------------|------------------|
| PARAMETER   | TEST CONDITION           | SYMBOL              | VALUE       | UNIT             |
| <b>INPUT</b>  |                          |                     |             |                  |
| Reverse voltage   |                          | V <sub>R</sub>      | 6           | V                |
| Forward current   |                          | I <sub>F</sub>      | 50          | mA               |
| Peak surge current  | 100 μs, 200 pps          | I <sub>FSM</sub>    | 0.5         | A                |
| Power dissipation   |                          | P <sub>diss</sub>   | 70          | mW               |
| <b>OUTPUT</b>   |                          |                     |             |                  |
| Peak off-state voltage  |                          | V <sub>DRM</sub>    | 400         | V                |
| RMS on-state current  |                          | I <sub>T(RMS)</sub> | 0.1         | A                |
| Peak non-repetitive surge current   | PW = 100 ms, 120 pps     | I <sub>TSM</sub>    | 1           | A                |
| Power dissipation   |                          | P <sub>diss</sub>   | 300         | mW               |
| <b>COUPLER</b>  |                          |                     |             |                  |
| Isolation voltage   | t = 1 min                | V <sub>ISO</sub>    | 5000        | V <sub>RMS</sub> |
| Total power dissipation   |                          | P <sub>tot</sub>    | 330         | mW               |
| Storage temperature range   |                          | T <sub>stg</sub>    | -55 to +150 | °C               |
| Ambient temperature   |                          | T <sub>amb</sub>    | -40 to +100 | °C               |
| Lead soldering temperature <sup>(1)</sup>                                       | 2 mm from case, t < 10 s | T <sub>slid</sub>   | 260         | °C               |
| Junction temperature  |                          | T <sub>j</sub>      | 125         | °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)

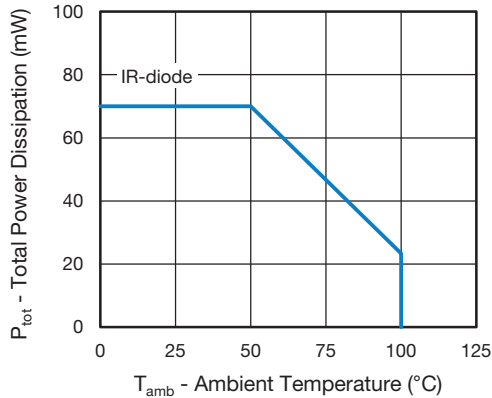


Fig. 1 - Total Power Dissipation vs. Ambient Temperature (IR-Diode)

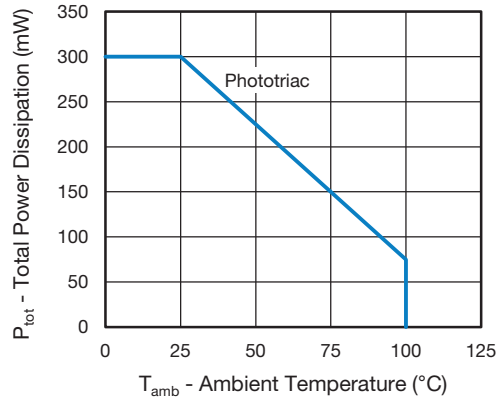


Fig. 2 - Total Power Dissipation vs. Ambient Temperature (Phototriac)



| <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>   |  |        |              |      |      |      |                  |
| Forward voltage  | $I_F = 20\text{ mA}$                             |        | $V_F$        | -    | 1.3  | 1.5  | V                |
| Reverse voltage  | $I_R = 10\text{ }\mu\text{A}$                    |        | $V_R$        | 6    | -    | -    | V                |
| Reverse current  | $V_R = 6\text{ V}$                               |        | $I_R$        | -    | -    | 10   | $\mu\text{A}$    |
| Junction capacitance   | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$          |        | $C_j$        | -    | 50   | -    | pF               |
| <b>OUTPUT</b>  |  |        |              |      |      |      |                  |
| Peak off-state current, either direction   | $V_{DRM} = 400\text{ V}^{(1)}$                   |        | $I_{DRM}$    | -    | 10   | 100  | nA               |
| Peak off-state voltage, either direction   | $I_{TM} = 100\text{ mA}$                         |        | $V_{TM}$     | -    | 1.7  | 3    | V                |
| Critical rate of rise of off-state voltage   | $I_F = 0\text{ A}$ , $V_D = 0.67\text{ }V_{DRM}$ |        | $dV/dt_{cr}$ | 100  | -    | -    | V/ $\mu\text{s}$ |
| <b>COUPLER</b> <sup>(2)</sup>  |  |        |              |      |      |      |                  |
| Emitting diode trigger current   | $V_S = 3\text{ V}$ , $R_L = 150\text{ }\Omega$   | VO3020 | $I_{FT}$     | -    | 15   | 30   | mA               |
|  |  | VO3021 | $I_{FT}$     | -    | 8    | 15   | mA               |
|  |  | VO3022 | $I_{FT}$     | -    | 5    | 10   | mA               |
|  |  | VO3023 | $I_{FT}$     | -    | 3    | 5    | mA               |
| Holding current  | $I_F = 10\text{ mA}$ , $V_S \geq 3\text{ V}$     |        | $I_H$        | -    | 200  | -    | $\mu\text{A}$    |

**Notes**

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements
- (1) Test voltage must be applied within dV/dt ratings
- (2)  $I_{FT}$  is defined as a minimum trigger current

| <b>SAFETY AND INSULATION RATINGS</b>                         |   |            |                     |                    |
|--|---|------------|---------------------|--------------------|
| PARAMETER  |   | SYMBOL     | VALUE               | UNIT               |
| <b>MAXIMUM SAFETY RATINGS</b>                                |   |            |                     |                    |
| Output safety power  |   | $P_{SO}$   | 700                 | mW                 |
| Input safety current   |   | $I_{si}$   | 400                 | mA                 |
| Safety temperature   |   | $T_S$      | 175                 | $^{\circ}\text{C}$ |
| Comparative tracking index                                   |   | CTI        | 175                 |                    |
| <b>INSULATION RATED PARAMETERS</b>                           |   |            |                     |                    |
| Maximum withstanding isolation voltage                       |   | $V_{ISO}$  | 5000                | $V_{RMS}$          |
| Maximum transient isolation voltage                          |   | $V_{IOTM}$ | 8000                | $V_{peak}$         |
| Maximum repetitive peak isolation voltage                    |   | $V_{IORM}$ | 890                 | $V_{peak}$         |
|  |   | $V_{IORM}$ | 1140 <sup>(1)</sup> | $V_{peak}$         |
| Insulation resistance  | $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{DC} = 500\text{ V}$  | $R_{IO}$   | $10^{12}$           | $\Omega$           |
| Isolation resistance   | $T_{amb} = 100\text{ }^{\circ}\text{C}$ , $V_{DC} = 500\text{ V}$ | $R_{IO}$   | $10^{11}$           | $\Omega$           |
| Climatic classification (according to IEC 68 part 1)         |   |            | 55 / 115 / 21       |                    |
| Environment (pollution degree in accordance to DIN VDE 0109) |   |            | 2                   |                    |
| Creepage distance (standard DIP-6)                           |   |            | $\geq 7$            | mm                 |
| Creepage distance (400 mil DIP-6)                            |   |            | $\geq 8$            | mm                 |
| Clearance distance (standard DIP-6)                          |   |            | $\geq 7$            | mm                 |
| Clearance distance (400 mil DIP-6)                           |   |            | $\geq 8$            | mm                 |
| Insulation thickness   |   |            | $\geq 0.4$          | mm                 |

**Notes**

- As per DIN EN 60747-5-5, § 7.4.3.8.2, 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
- (1) 400 mil, option 6 only



TYPICAL CHARACTERISTICS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

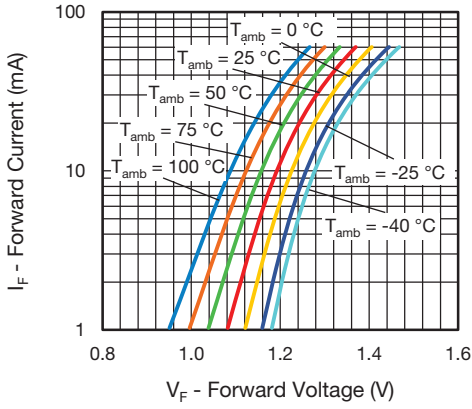


Fig. 3 - Forward Current vs. Forward Voltage

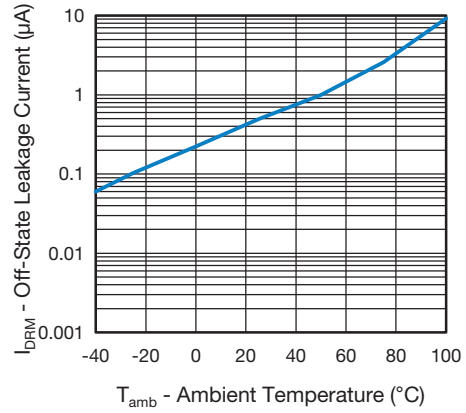


Fig. 6 - Off-State Leakage Current vs. Ambient Temperature

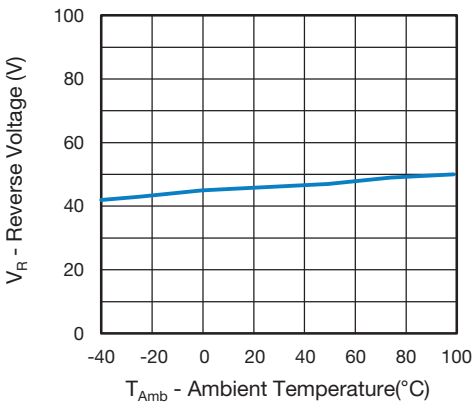


Fig. 4 - Reverse Voltage vs. Ambient Temperature

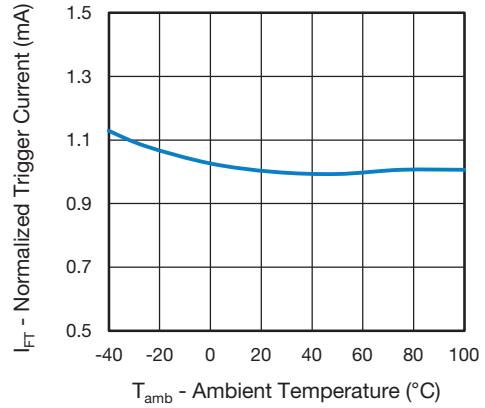


Fig. 7 - Normalized Trigger Current vs. Ambient Temperature

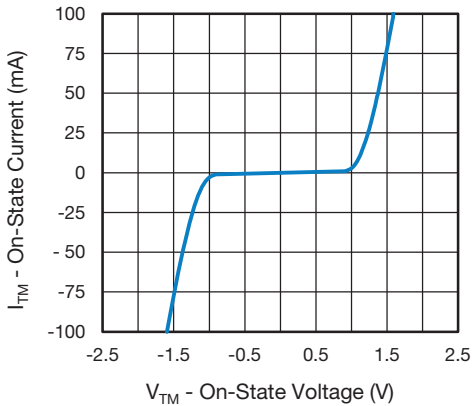


Fig. 5 - On-State Current vs. On-State Voltage

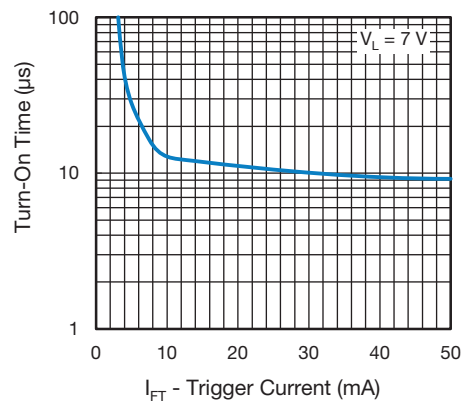


Fig. 8 - Turn-On Time vs. Trigger Current

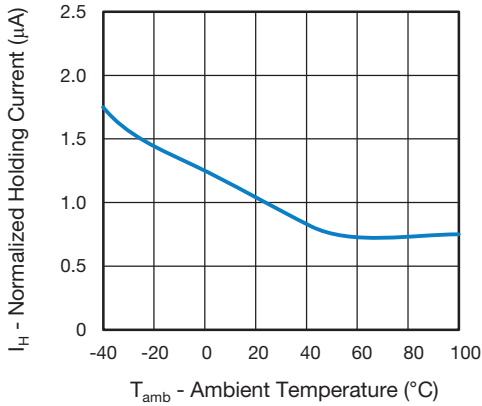


Fig. 9 - Normalized Holding Current vs. Ambient Temperature

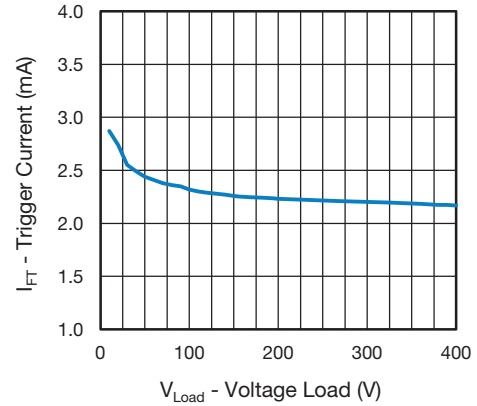


Fig. 12 - Trigger Current vs. Voltage Load

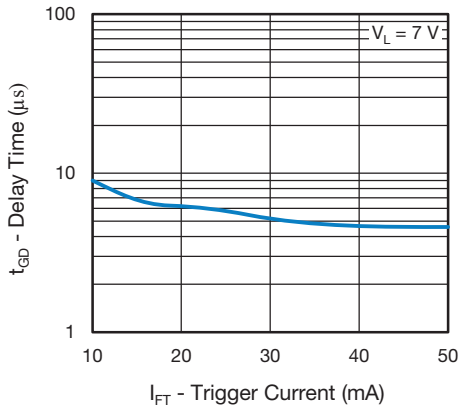


Fig. 10 - Delay Time vs. Trigger Current

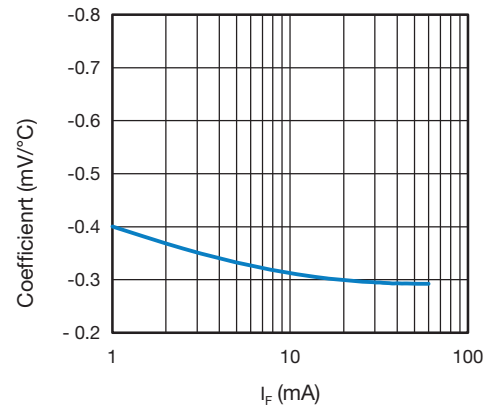


Fig. 13 - Coefficient vs. Forward Current

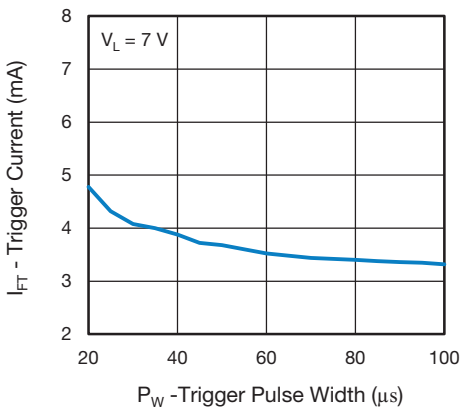


Fig. 11 - Trigger Current vs. Trigger Pulse Width

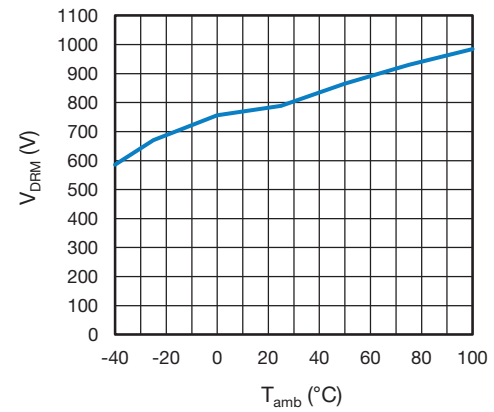


Fig. 14 - Peak Off-State Voltage vs. Ambient Temperature

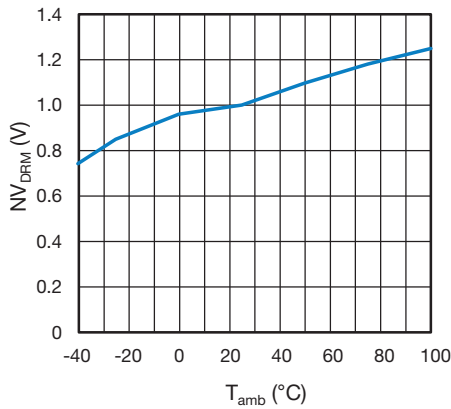
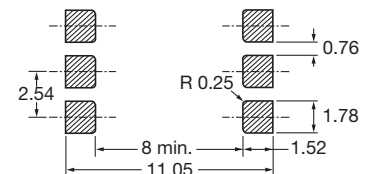
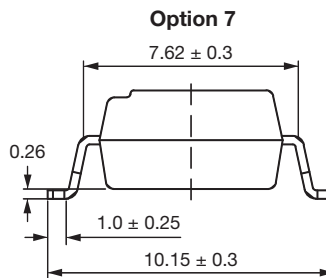
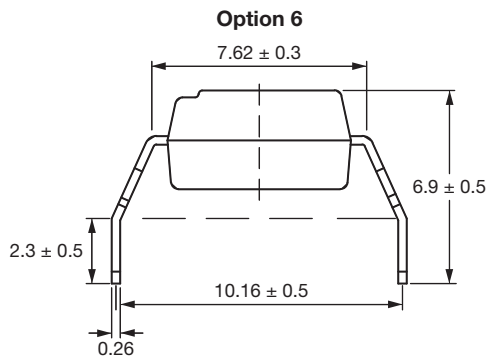
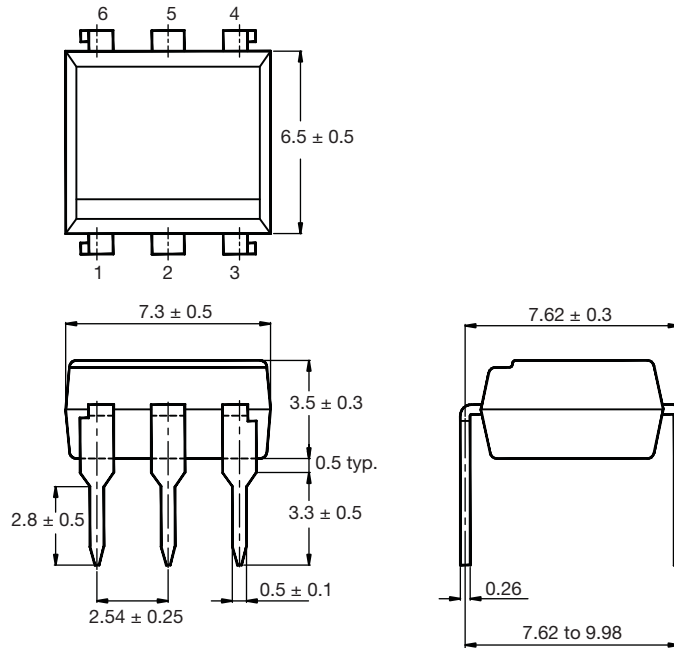


Fig. 15 - Normalized Off-State Voltage M2/M1 vs. Ambient Temperature

**PACKAGE DIMENSIONS** in millimeters



**PACKAGE MARKING**

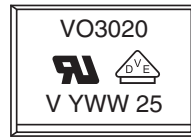


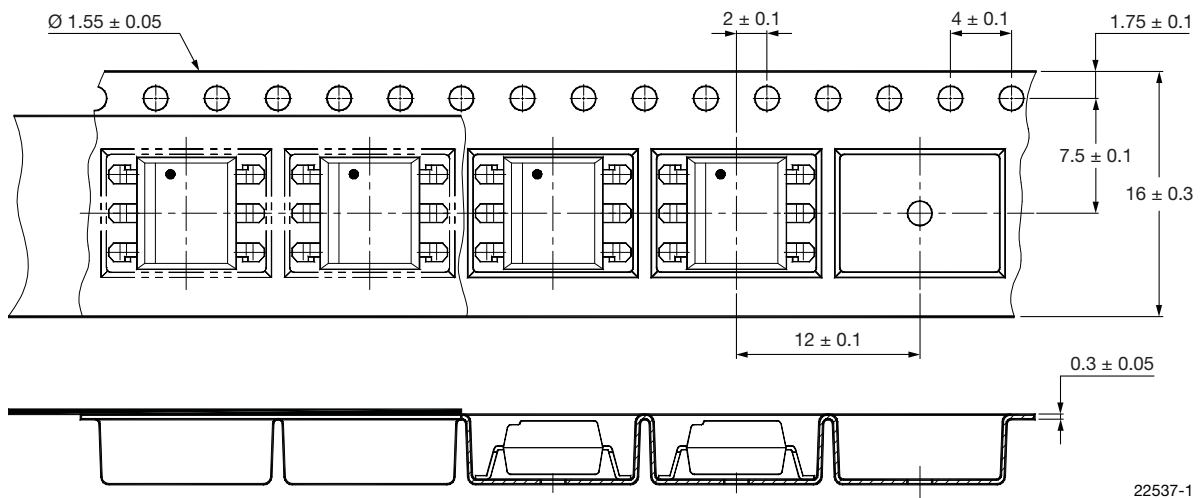
Fig. 16 - Example VO3020-X017T

**Notes**

- VDE logo is only marked on option 1 parts. Option information is not marked on the part
- Tape and reel suffix (T) is not part of the package marking

**PACKING INFORMATION**

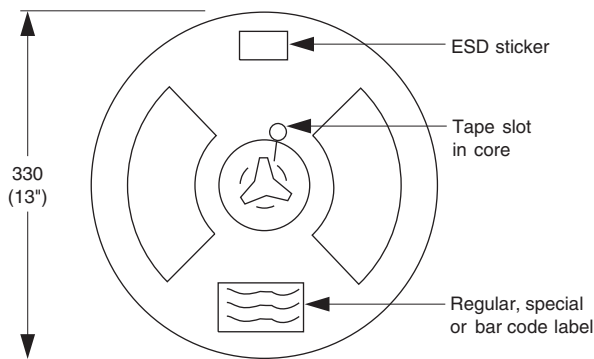
| DEVICES PER TUBE |            |           |           |
|------------------|------------|-----------|-----------|
| TYPE             | UNITS/TUBE | TUBES/BOX | UNITS/BOX |
| DIP-6            | 50         | 40        | 2000      |



22537-1

Fig. 17 - Tape and Reel Drawing, 1000 Units per Reel

**REEL DIMENSIONS** in millimeters



17999

Fig. 18 - Reel Dimensions



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