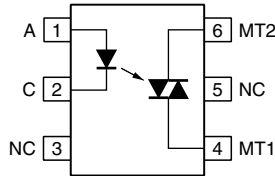


Optocoupler, Phototriac Output, 400 V_{DRM}



23043



FEATURES

- 400 V blocking voltage
- Isolation test voltage, 5000 V_{RMS}, t = 1 min
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

APPLICATIONS

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

AGENCY APPROVALS

- [UL](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#), available with option "1"
- [CQC GB8898-2011](#)
- [CQC GB4943.1-2011](#)
- [FIMKO](#)

LINKS TO ADDITIONAL RESOURCES



3D Models



Design Tools



Related Documents



SPICE Models



Footprints

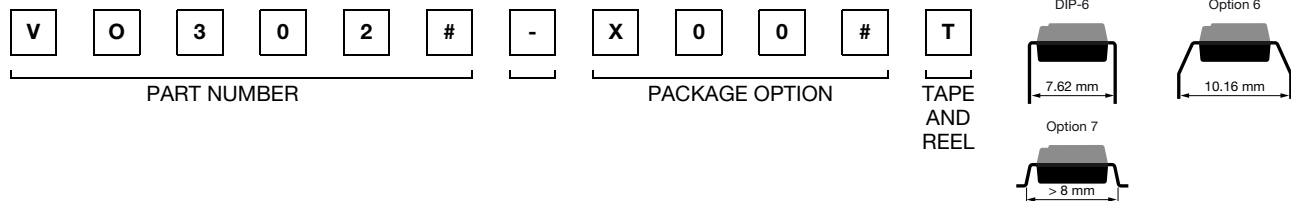


Schematics

DESCRIPTION

The VO302x series consists of a phototriac optically coupled to a gallium arsenide infrared-emitting diode in a 6-lead plastic dual inline package

ORDERING INFORMATION



| AGENCY CERTIFIED / PACKAGE | TRIGGER CURRENT, I _{FT} | | |
|---------------------------------|----------------------------------|-------------|-------------|
| | 5 mA | 10 mA | 15 mA |
| UL, cUL, CQC | | | |
| DIP-6 | VO3023 | - | - |
| DIP-6, 400 mil, option 6 | - | - | VO3021-X006 |
| VDE, UL, cUL, FIMKO, CQC | | | |
| DIP-6 | VO3023-X001 | VO3022-X001 | - |
| SMD-6, option 7 | VO3023-X017T | - | - |

Note

- Additional options may be possible, please contact sales office

| ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | |
|--|-----------------------------------|--------------|-------------|--------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| INPUT | | | | |
| Reverse voltage | | V_R | 6 | V |
| Forward current | | I_F | 50 | mA |
| Peak surge current | 100 μs , 200 pps | I_{FSM} | 0.5 | A |
| Power dissipation | | P_{diss} | 70 | mW |
| OUTPUT | | | | |
| Peak off-state voltage | | V_{DRM} | 400 | V |
| RMS on-state current | | $I_{T(RMS)}$ | 0.1 | A |
| Peak non-repetitive surge current | PW = 100 ms, 120 pps | I_{TSM} | 1 | A |
| Power dissipation | | P_{diss} | 300 | mW |
| COUPLER | | | | |
| Total power dissipation | | P_{diss} | 330 | mW |
| Storage temperature range | | T_{stg} | -55 to +150 | $^{\circ}\text{C}$ |
| Ambient temperature | | T_{amb} | -40 to +100 | $^{\circ}\text{C}$ |
| Lead soldering temperature | 2 mm from case, $t < 10\text{ s}$ | T_{sld} | 260 | $^{\circ}\text{C}$ |
| Junction temperature | | T_J | 125 | $^{\circ}\text{C}$ |

Note

- 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

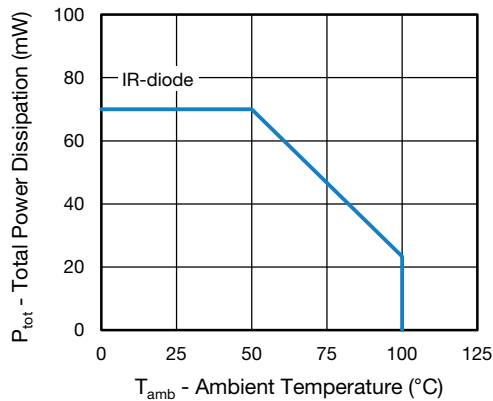


Fig. 1 - Total Power Dissipation vs. Ambient Temperature (IR diode)

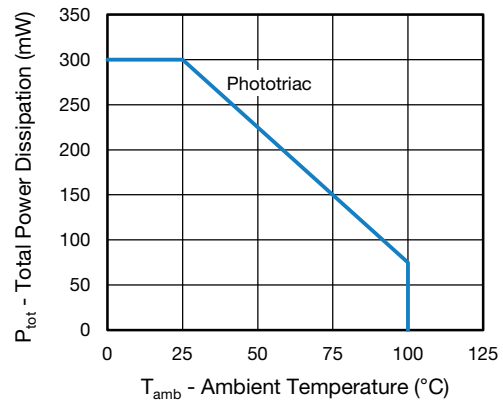


Fig. 2 - Total Power Dissipation vs. Ambient Temperature (Phototriac)



| ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | | | | |
|--|--|--------|--------------|------|------|------|------------------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| INPUT | | | | | | | |
| 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 | μA |
| Junction capacitance | $V_R = 0\text{ V}$, $f = 1\text{ MHz}$ | | C_j | - | 50 | - | pF |
| OUTPUT | | | | | | | |
| 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/ μs |
| COUPLER ⁽²⁾ | | | | | | | |
| Emitting diode trigger current | $V_T = 3\text{ V}$, $R_L = 150\text{ }\Omega$ | VO3021 | I_{FT} | - | 8 | 15 | mA |
| | | VO3022 | I_{FT} | - | 5 | 10 | mA |
| | | VO3023 | I_{FT} | - | 3 | 5 | mA |
| Holding current | $I_F = 10\text{ mA}$, $V_T \geq 3\text{ V}$ | | I_H | - | 200 | - | μA |

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

| SAFETY AND INSULATION RATINGS | | | |
|--|---|------------|---------------------|
| PARAMETER | | SYMBOL | UNIT |
| MAXIMUM SAFETY RATINGS | | | |
| Output safety power | | P_{SO} | mW |
| Input safety current | | I_{si} | mA |
| Safety temperature | | T_S | $^{\circ}\text{C}$ |
| Comparative tracking index | | CTI | 175 |
| INSULATION RATED PARAMETERS | | | |
| Maximum withstanding isolation voltage | | V_{ISO} | V_{RMS} |
| Maximum transient isolation voltage | | V_{IOTM} | V_{peak} |
| Maximum repetitive peak isolation voltage | | V_{IORM} | V_{peak} |
| | | V_{IORM} | 1140 ⁽¹⁾ |
| Insulation resistance | $T_{amb} = 25\text{ }^{\circ}\text{C}$, $V_{DC} = 500\text{ V}$ | R_{IO} | Ω |
| Isolation resistance | $T_{amb} = 100\text{ }^{\circ}\text{C}$, $V_{DC} = 500\text{ V}$ | R_{IO} | Ω |
| 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) | | | ≥ 7 mm |
| Creepage distance (400 mil DIP-6) | | | ≥ 8 mm |
| Clearance distance (standard DIP-6) | | | ≥ 7 mm |
| Clearance distance (400 mil DIP-6) | | | ≥ 8 mm |
| Insulation thickness | | DTI | ≥ 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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

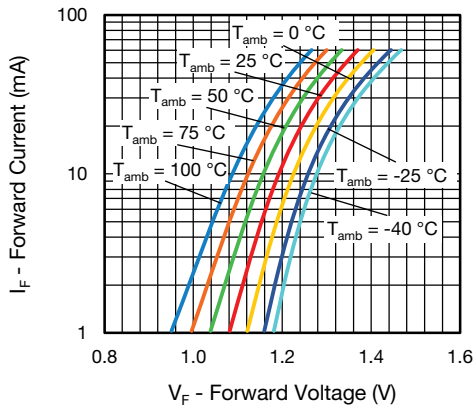


Fig. 3 - Forward Current vs. Forward Voltage

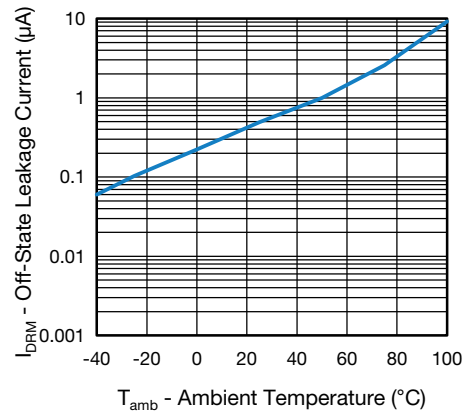


Fig. 6 - Off-State Leakage Current vs. Ambient Temperature

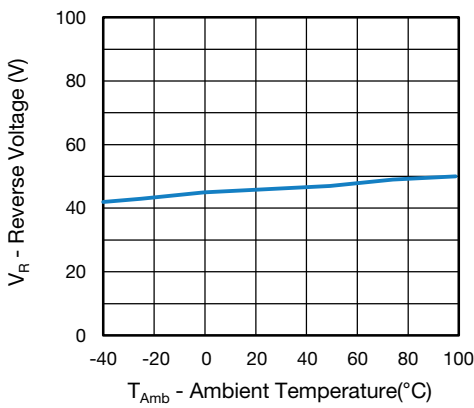


Fig. 4 - Reverse Voltage vs. Ambient Temperature

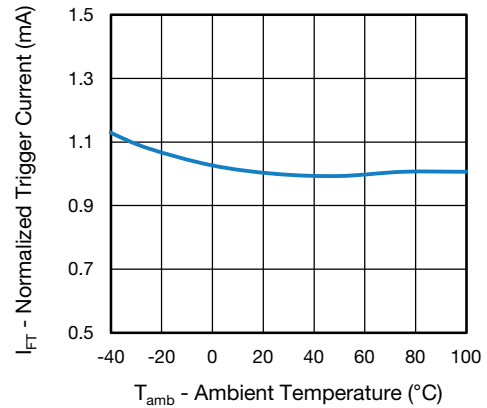


Fig. 7 - Normalized Trigger Current vs. Ambient Temperature

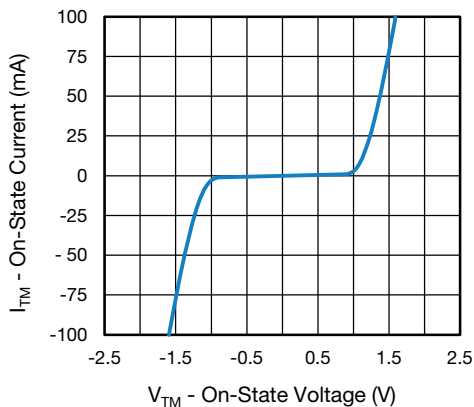


Fig. 5 - On-State Current vs. On-State Voltage

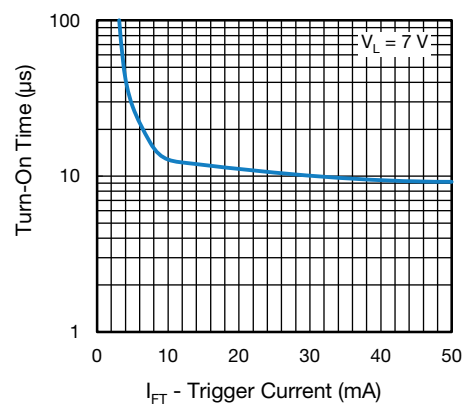


Fig. 8 - Turn-On Time vs. Trigger Current

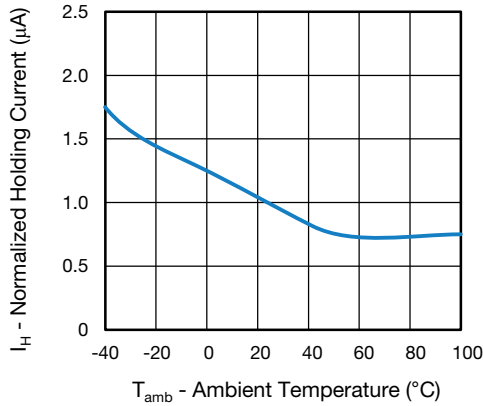


Fig. 9 - Normalized Holding Current vs. Ambient Temperature

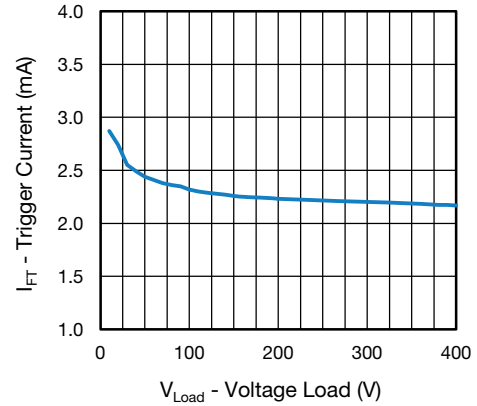


Fig. 12 - Trigger Current vs. Voltage Load

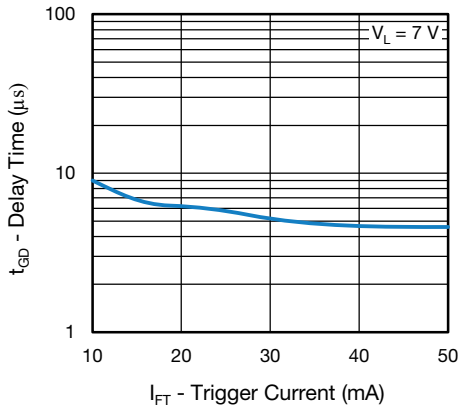


Fig. 10 - Delay Time vs. Trigger Current

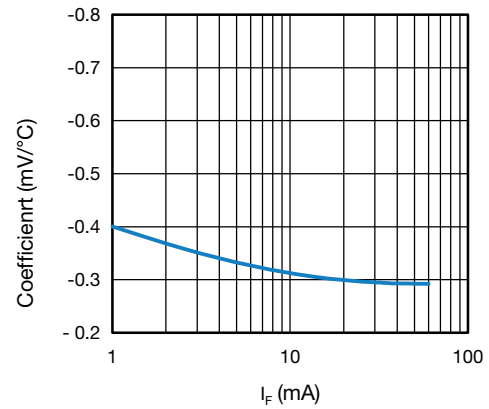


Fig. 13 - Coefficient vs. Forward Current

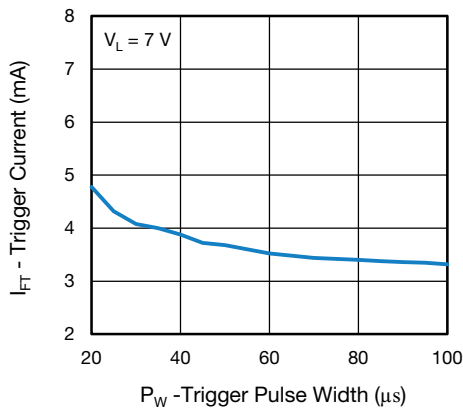


Fig. 11 - Trigger Current vs. Trigger Pulse Width

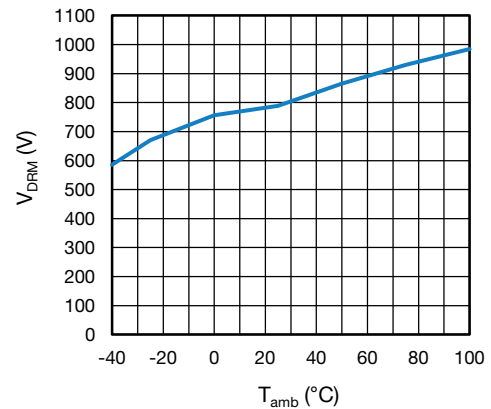


Fig. 14 - Peak Off-State Voltage vs. Ambient Temperature

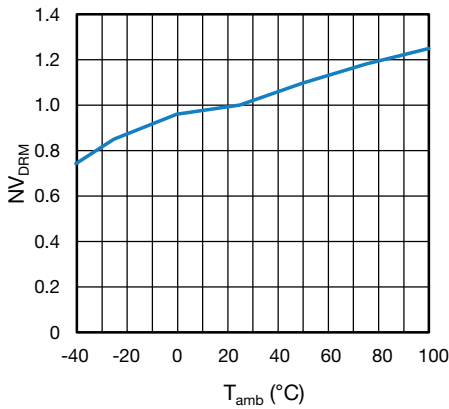


Fig. 15 - Normalized Off-State Voltage M2/M1 vs. Ambient Temperature

PACKAGE DIMENSIONS (in millimeters)

DIP-6

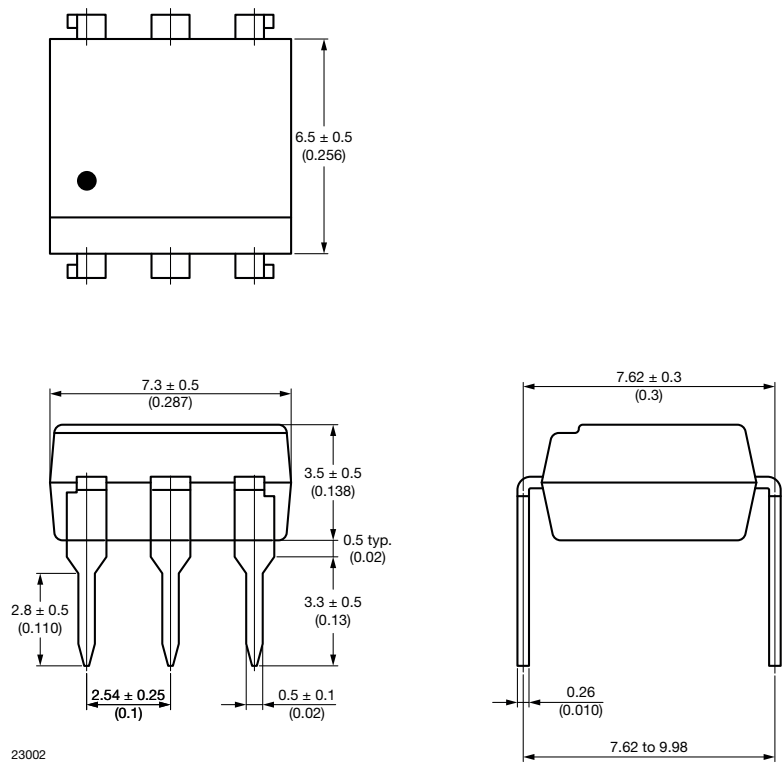


Fig. 1



DIP-6, 400 mil

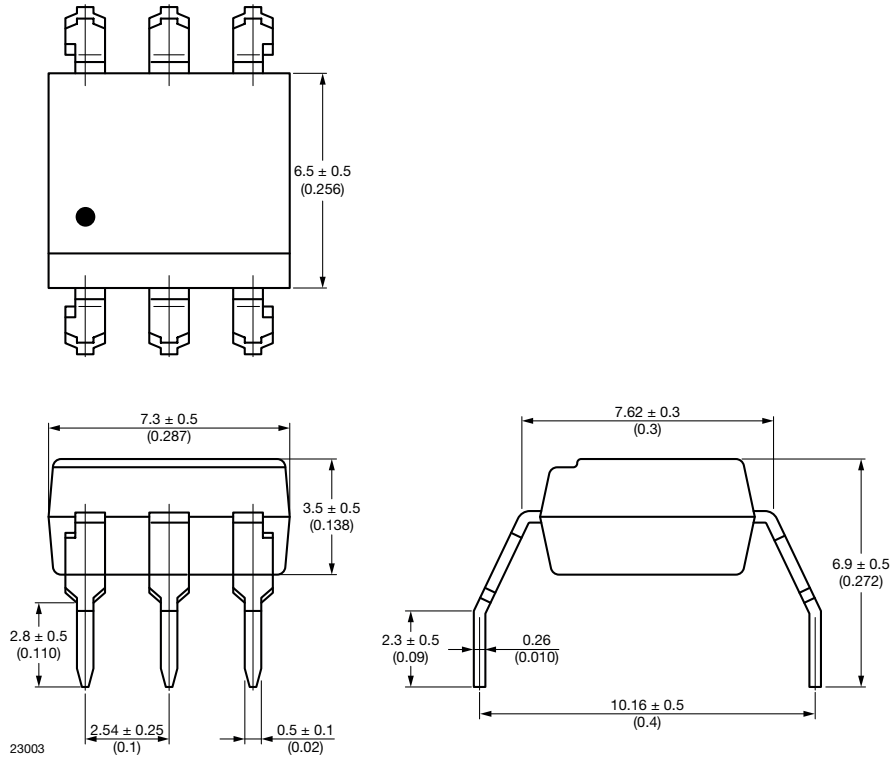


Fig. 2

SMD-6

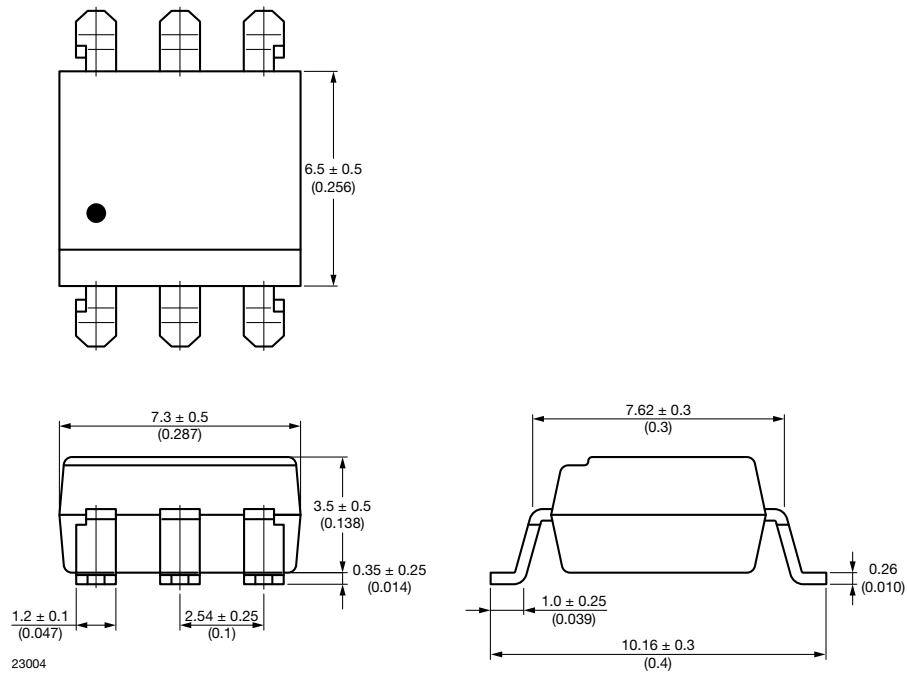


Fig. 3

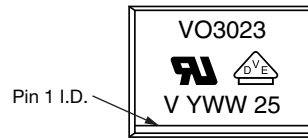
PACKAGE MARKING


Fig. 16 - Example of VO3023-X017T

Notes

- “YWW” is the date code marking (Y = year code, WW = week code)
- VDE logo is only marked on VDE option parts
- 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 |
| DIP-6, 400 mil | 50 | 40 | 2000 |

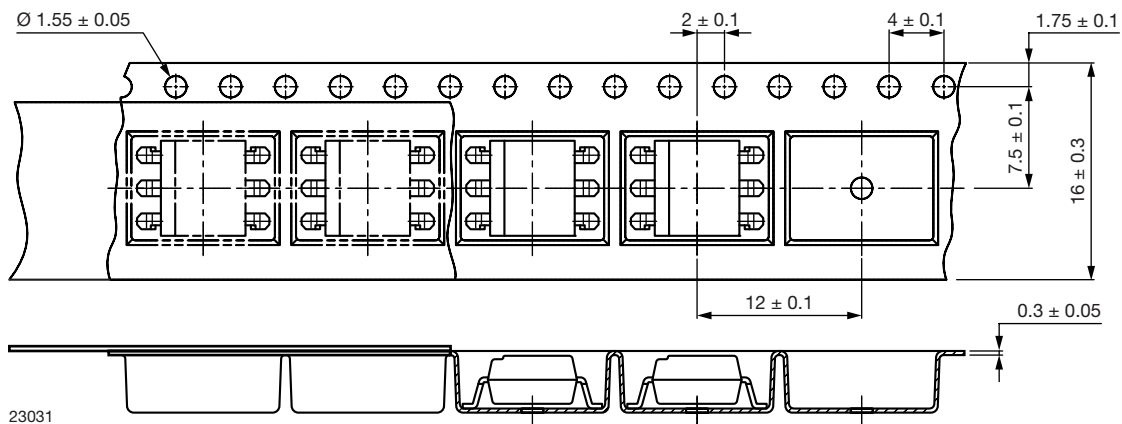
SMD-6 Tape


Fig. 17 - Tape and Reel Packaging (1000 pieces on reel)

Reel

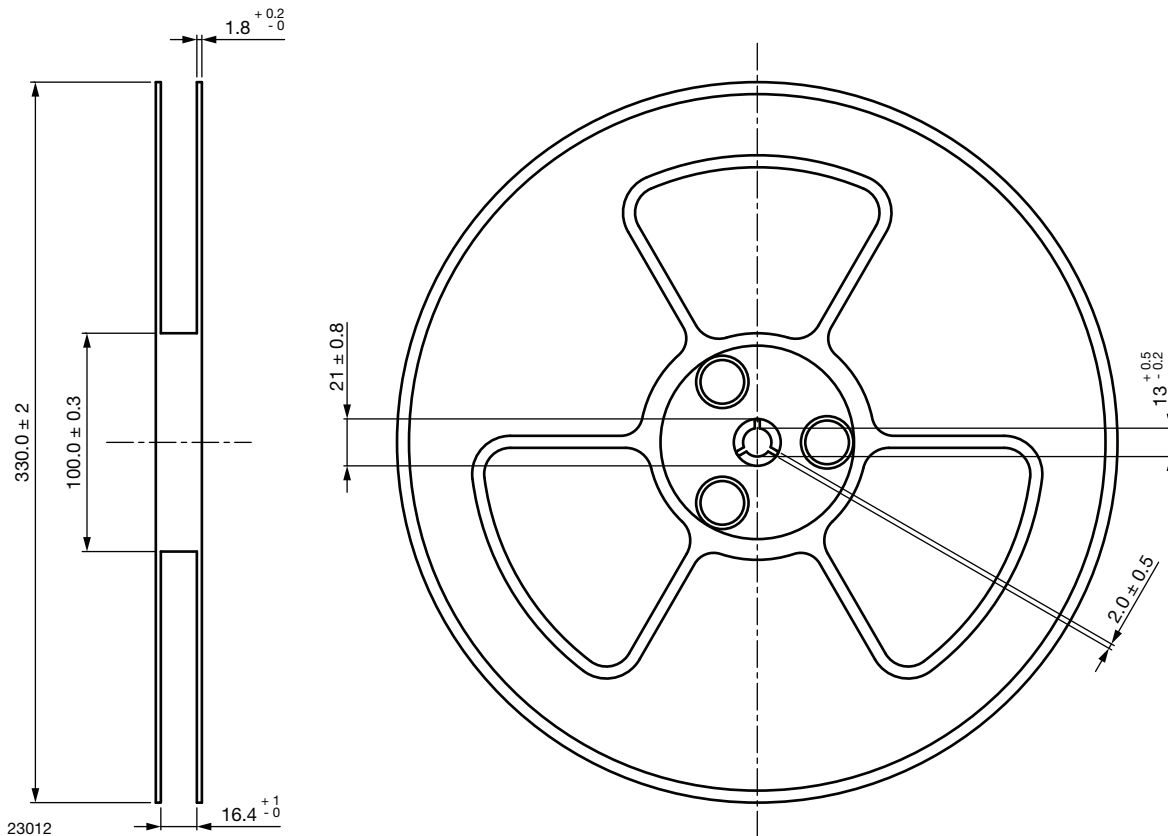


Fig. 18 - Tape and Reel Shipping Medium

REEL DIMENSIONS in millimeters

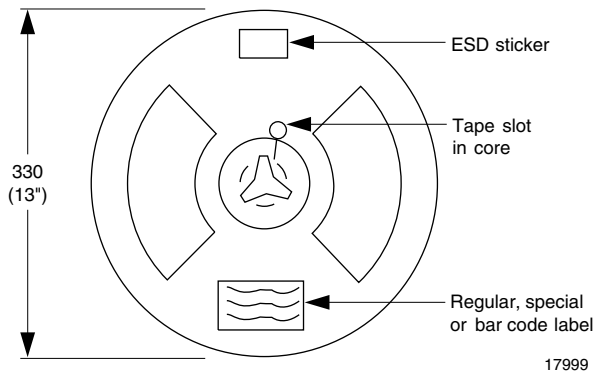


Fig. 19 - Reel Dimensions

SOLDER PROFILES
IR Reflow Soldering (JEDEC® J-STD-020C compliant)

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

| PROFILE ITEM | CONDITIONS |
|--|------------------|
| Preheat | |
| - Temperature minimum ($T_{S \text{ min.}}$) | 150 °C |
| - Temperature maximum ($T_{S \text{ max.}}$) | 200 °C |
| - Time (min. to max.) (t_S) | 90 s ± 30 s |
| Soldering zone | |
| - Temperature (T_L) | 217 °C |
| - Time (t_L) | 60 s |
| Peak temperature (T_p) | 260 °C |
| Ramp-up rate | 3 °C/s max. |
| Ramp-down rate | 3 °C/s to 6 °C/s |

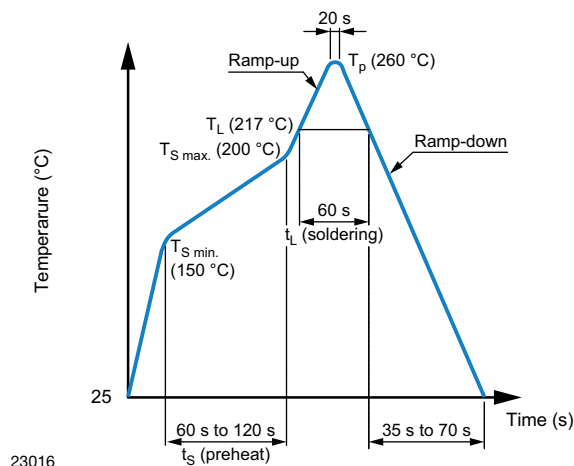


Fig. 4

Wave Soldering (JEDEC JESD22-A111 compliant)

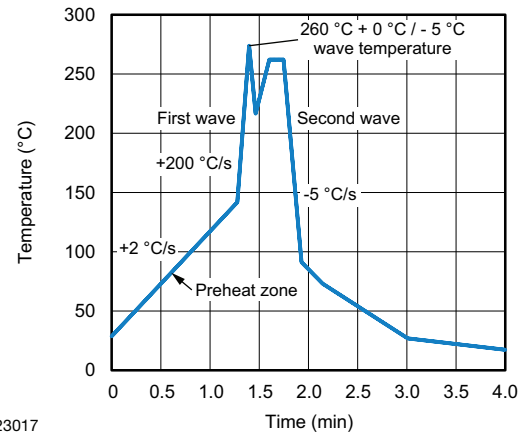
One time soldering is recommended within the condition of temperature.

Temperature: 260 °C + 0 °C / - 5 °C

Time: 10 s

Preheat temperature: 25 °C to 140 °C

Preheat time: 30 s to 80 s



23017

Fig. 5

Hand Soldering by Soldering Iron

Allow single lead soldering in every single process. One time soldering is recommended.

Temperature: 380 °C + 0 °C / - 5 °C

Time: 3 s max.

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: $T_{\text{amb}} < 30 \text{ °C}$, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



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