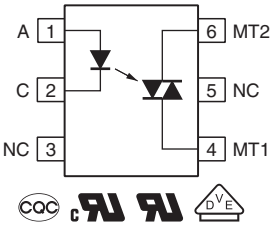
# Optocoupler, Phototriac Output, Non-Zero Crossing, High dV/dt, Low Input Current






23043

## FEATURES

- High isolation distance on output
- High static dV/dt 1000 V/µs
- High input sensitivity $I_{FT}$ = 10 mA
- 100 mA on-state current
- 800 V peak off-state blocking voltage
- Isolation rated voltage 5000 $V_{RMS}$
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

## APPLICATIONS

- Power TRIAC driver in solid-state relays
- 3-phase AC equipment
- Motor control
- Industrial control
- White goods / household equipment

## AGENCY APPROVALS

- UL 1577
- cUL
- DIN EN 60747-5-5 (VDE 0884-5), available with option "V"
- CQC

## DESIGN SUPPORT TOOLS

click logo to get started

3D Models Available | Design Tools Available | Related Documents

## DESCRIPTION

The VOT8123A consists of a GaAs IRLED optically coupled to a photosensitive TRIAC packaged in a DIP-6 package.

The VOT8123A isolates low-voltage logic from 120 $V_{AC}$, 240 $V_{AC}$, and 380 $V_{AC}$ lines to control resistive, inductive, or capacitive loads including motors, solenoids, high current thyristors or TRIAC and relays.

## ORDERING INFORMATION

| V | O | T | 8 | 1 | 2 | 3 | A | # | - | V | T | # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER | | | | | | | | PACKAGE OPTION | | VDE OPTION | TAPE AND REEL | |

| AGENCY CERTIFIED/PACKAGE | TRIGGER CURRENT, $I_{FT}$ (mA) |
|---|---|
| **UL, cUL, CQC** | **10** |
| DIP-6 | VOT8123AD |
| DIP-6, 400 mil | VOT8123AG |
| SMD-6 | VOT8123AB-T (1) |
| SMD-6, 180° orientation | VOT8123AB-T2 |
| **VDE, UL, cUL, CQC** | **10** |
| DIP-6 | VOT8123AD-V |
| DIP-6, 400 mil | VOT8123AG-V |
| SMD-6 | VOT8123AB-VT (1) |
| SMD-6, 180° orientation | VOT8123AB-VT2 |

**Note**

(1) Also available in tubes; do not add T to end



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| **ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| **INPUT** | | | | |
| Reverse voltage | | $V_R$ | 6 | V |
| Forward current | | $I_F$ | 50 | mA |
| Power dissipation | | $P_{diss}$ | 120 | mW |
| Junction temperature | | $T_j$ | 125 | °C |
| **OUTPUT** | | | | |
| Peak off-state voltage | | $V_{DRM}$ | 800 | V |
| On-state current | | $I_{T(RMS)}$ | 100 | mA |
| Peak repetitive surge current | PW = 1 ms, 120 pps | $I_{TSM}$ | 1 | A |
| Power dissipation | | $P_{diss}$ | 300 | mW |
| Junction temperature | | $T_j$ | 125 | °C |
| **COUPLER** | | | | |
| Storage temperature range | | $T_{stg}$ | -55 to +125 | °C |
| Ambient temperature range | | $T_{amb}$ | -40 to +110 | °C |
| Total power dissipation | | $P_{diss}$ | 330 | mW |
| Soldering temperature | For 10 s | $T_{sld}$ | 260 | °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.
  This phototriac should not be used to drive a load directly. It is intended to be a trigger device only

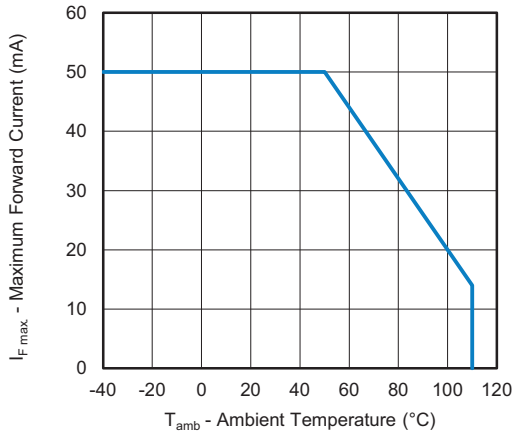



Fig. 1 - Maximum Forward Current vs. Ambient Temperature

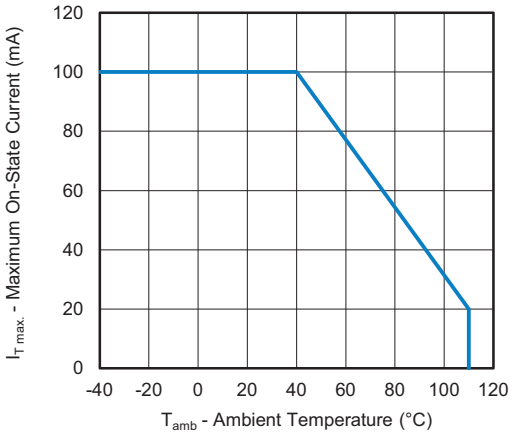



Fig. 2 - Maximum On-State Current vs. Ambient Temperature


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| **ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **INPUT** | | | | | | |
| Forward voltage | $I_F$ = 20 mA | $V_F$ | - | 1.2 | 1.4 | V |
| Reverse current | $V_R$ = 6 V | $I_R$ | - | 0.05 | 10 | µA |
| **OUTPUT** | | | | | | |
| Off-state current | $V_{DRM}$ = 800 V | $I_{DRM}$ | - | - | 0.1 | µA |
| On-state voltage | $I_T$ = 100 mA peak | $V_{TM}$ | - | - | 3 | V |
| Holding current | | $I_H$ | - | 400 | - | µA |
| Critical rate of rise of off-state voltage | $V_{IN}$ = 240 $V_{RMS}$ | dV/dt (1) | 1000 | - | - | V/µs |
| **COUPLER** | | | | | | |
| Trigger current | $V_{TM}$ = 3 V | $I_{FT}$ | - | - | 10 | mA |

**Notes**

- 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

(1) Static dV/dt

| **SAFETY AND INSULATION RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| Climatic classification | According to IEC 68 part 1 | | 55 / 115 / 21 | |
| Comparative tracking index | Insulation group IIIa | CTI | 175 | |
| Maximum rated withstanding isolation voltage | According to UL1577, t = 1 min | $V_{ISO}$ | 5000 | $V_{RMS}$ |
| Maximum transient isolation voltage | According to DIN EN 60747-5-5 | $V_{IOTM}$ | 8000 | $V_{peak}$ |
| Maximum repetitive peak isolation voltage | According to DIN EN 60747-5-5, DIP-6, SMD-6 | $V_{IORM}$ | 890 | $V_{peak}$ |
| | According to DIN EN 60747-5-5, DIP-6, 400 mil | $V_{IORM}$ | 1140 | $V_{peak}$ |
| Isolation resistance | $V_{IO}$ = 500 V, $T_{amb}$ = 25 °C | $R_{IO}$ | ≥ $10^{12}$ | Ω |
| | $V_{IO}$ = 500 V, $T_{amb}$ = 100 °C | $R_{IO}$ | ≥ $10^{11}$ | Ω |
| Output safety power | | $P_{SO}$ | 700 | mW |
| Input safety current | | $I_{SI}$ | 400 | mA |
| Input safety temperature | | $T_S$ | 175 | °C |
| Creepage distance | DIP-6, SMD-6 | | ≥ 7 | mm |
| Clearance distance | | | ≥ 7 | mm |
| Creepage distance | DIP-6, 400 mil | | ≥ 8 | mm |
| Clearance distance | | | ≥ 8 | mm |
| Insulation thickness | | DTI | ≥ 0.4 | mm |

**Note**

- As per IEC 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


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**TYPICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)

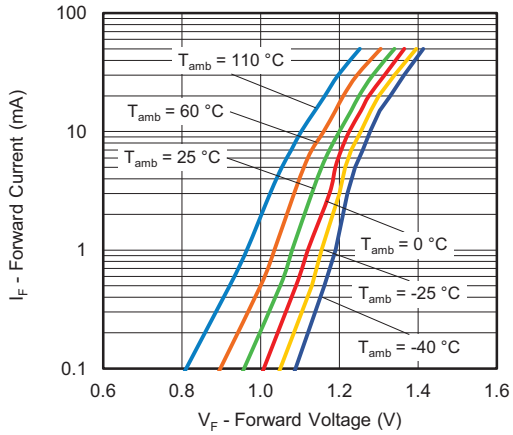



Fig. 3 - Forward Current vs. Forward Voltage

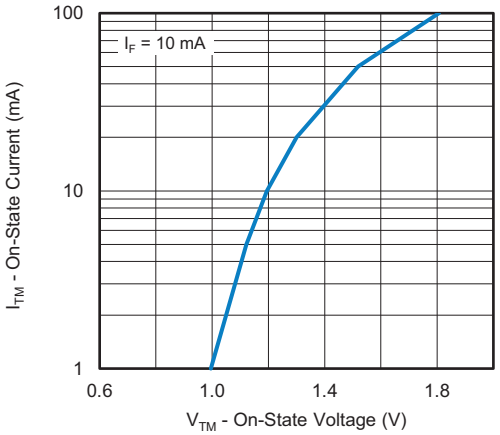



Fig. 6 - On State Current vs. On State Voltage

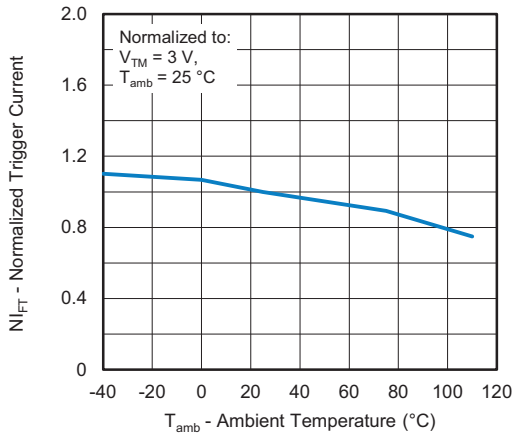



Fig. 4 - Normalized Trigger Current vs. Ambient Temperature

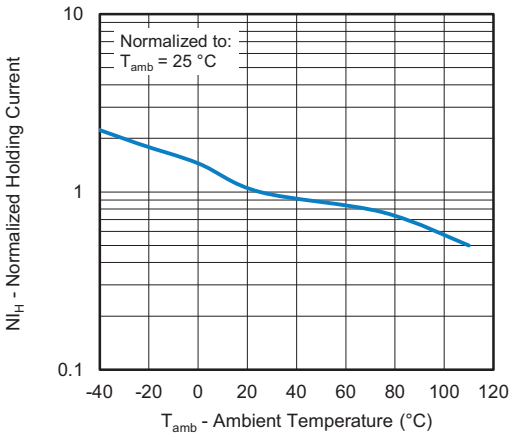



Fig. 7 - Normalized Holding Current vs. Ambient Temperature

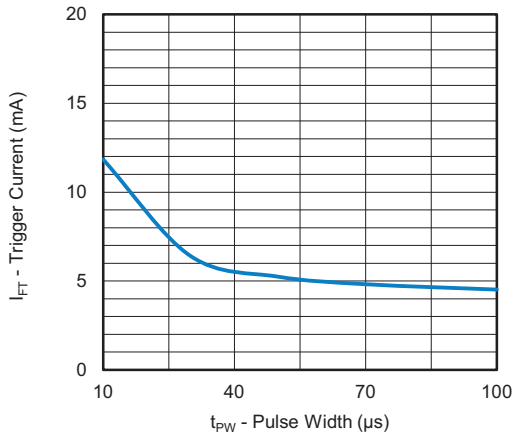



Fig. 5 - Trigger Current vs. Pulse Width

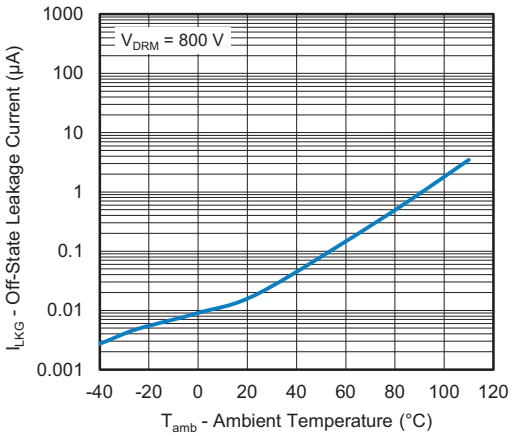



Fig. 8 - Off-State Leakage Current vs. Ambient Temperature


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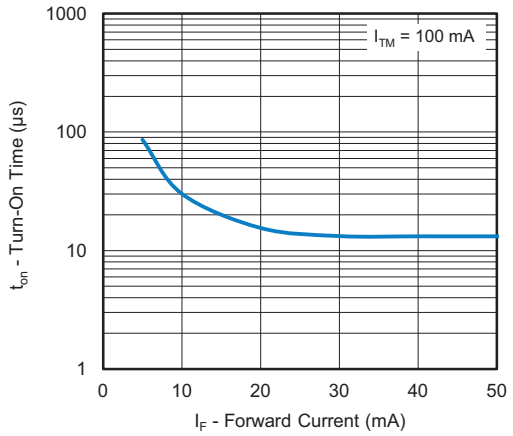



Fig. 9 - Turn-On Time vs. Forward Current

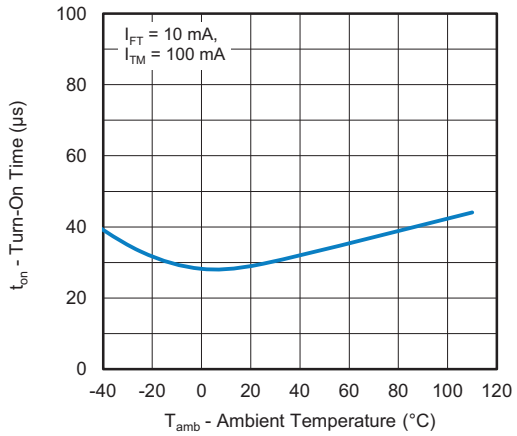



Fig. 10 - Turn-On Time vs. Ambient Temperature

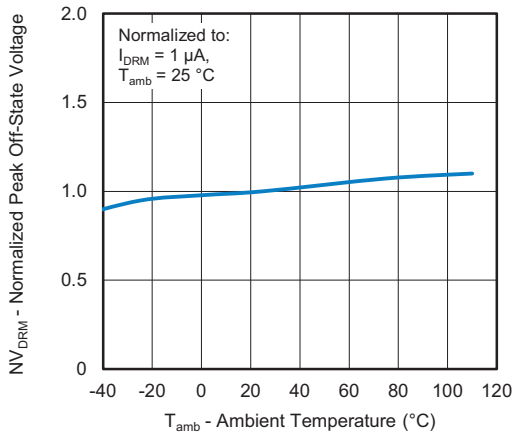



Fig. 11 - Normalized Peak Off-State Voltage vs. Ambient Temperature


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## PACKAGE DIMENSIONS (in millimeters)

### DIP-6

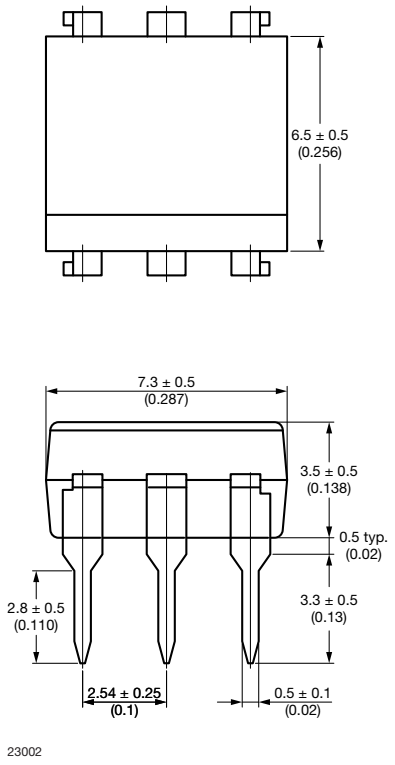



Fig. 1

### DIP-6, Gullwing

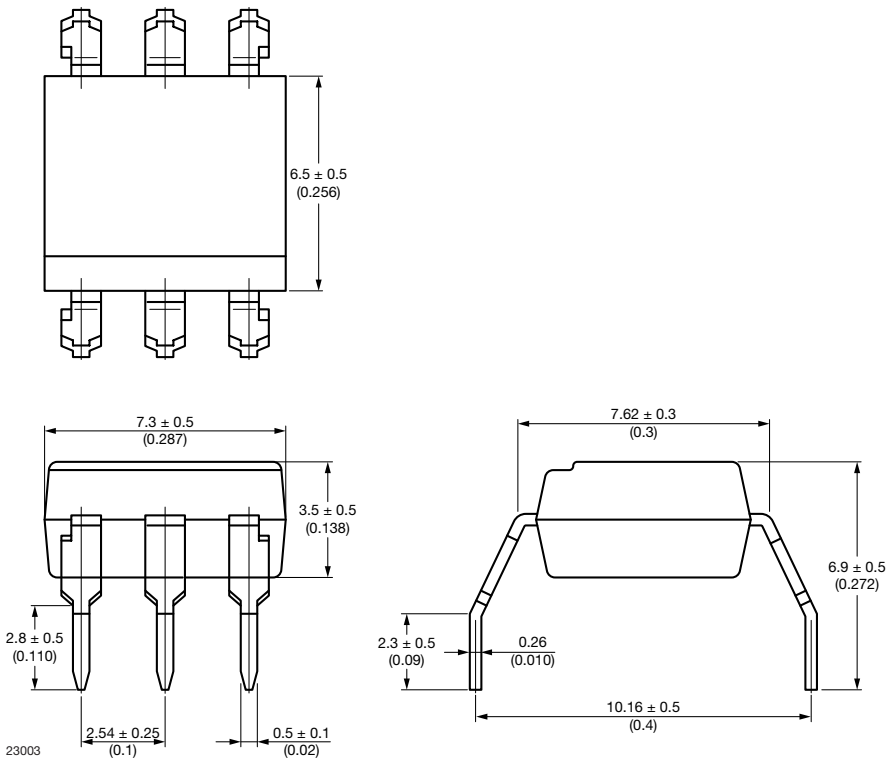



Fig. 2


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**SMD-6**

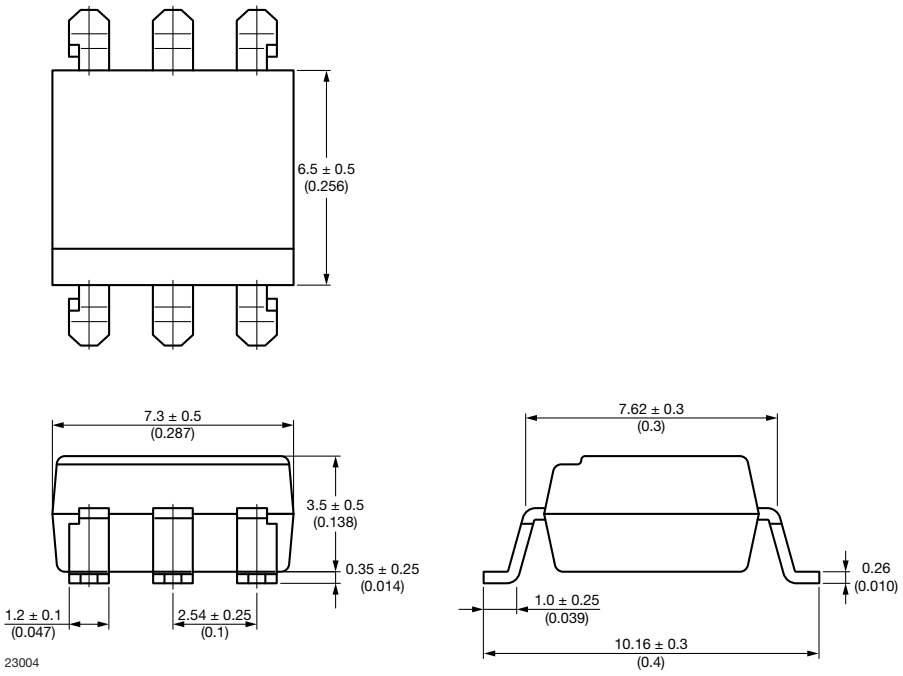



Fig. 3

## PACKAGE MARKING

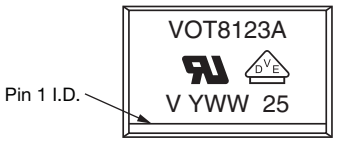



Fig. 12 - Example of VOT8123AD-VT

**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


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## PACKAGING INFORMATION (in millimeters)

| DEVICES PER TUBE | | | |
|---|---|---|---|
| **TYPE** | **UNITS/TUBE** | **TUBES/BOX** | **UNITS/BOX** |
| DIP-6 | 50 | 40 | 2000 |
| DIP-6, 400 mil | 50 | 40 | 2000 |
| SMD-6 | 50 | 40 | 2000 |

### SMD-6 Tape

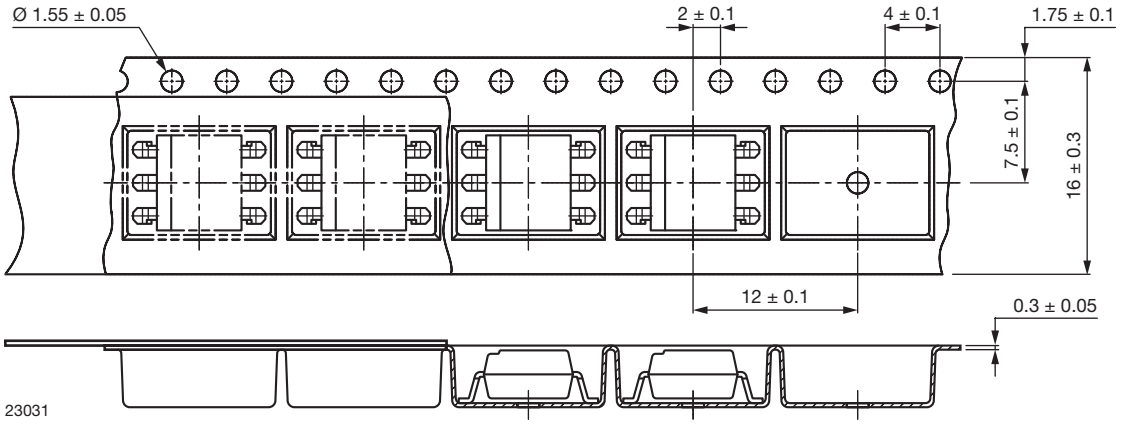



Fig. 13 - Tape and Reel Packaging (1000 pieces on reel)

### SMD-6 Tape, 180° Orientation

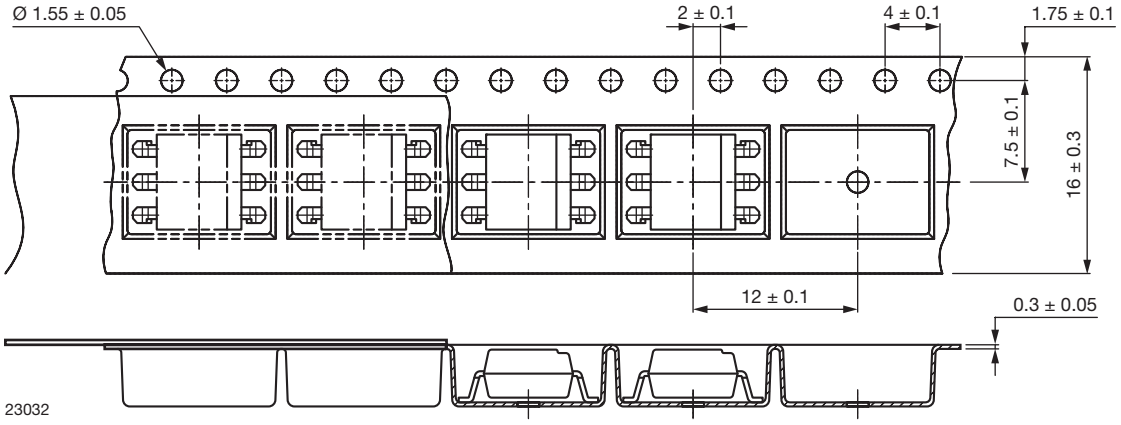



Fig. 14 - Tape and Reel Packaging (1000 pieces on reel)


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**Reel**

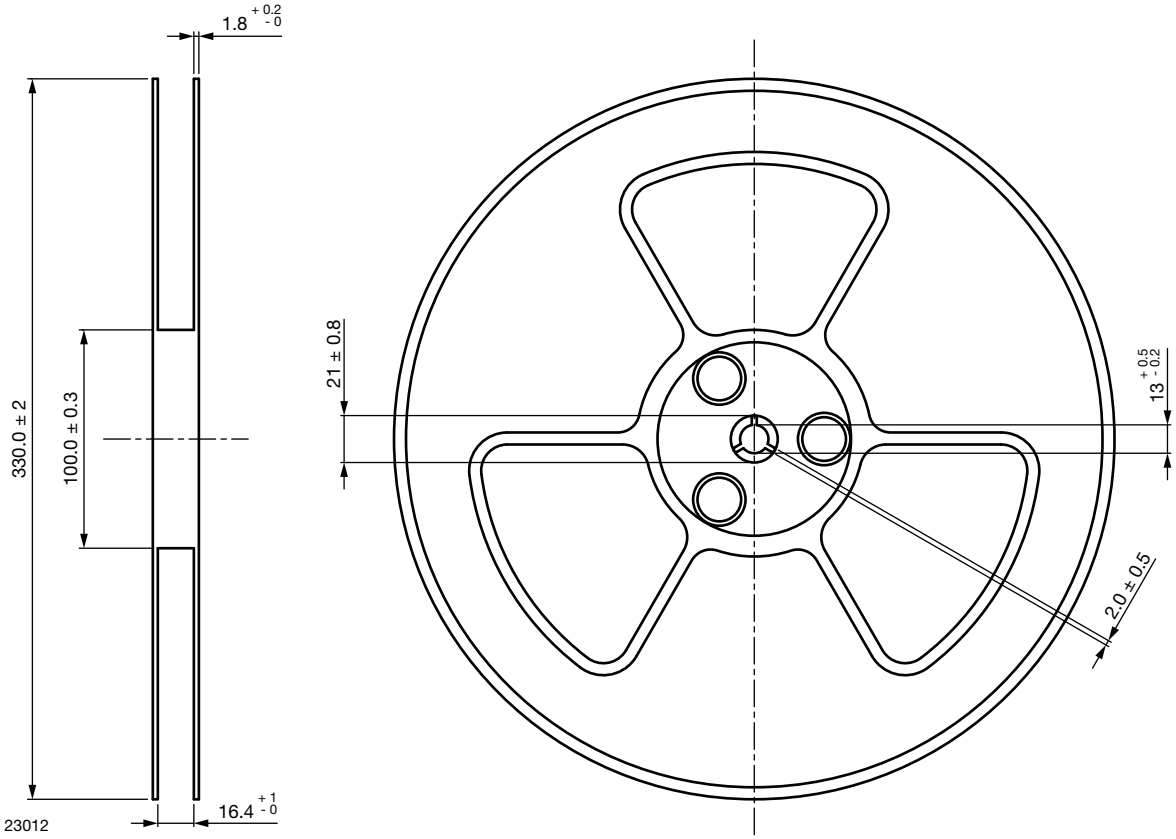



Fig. 15 - Tape and Reel Shipping Medium


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## 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 ($T_{S\ min.}$) | 150 °C |
| - Temperature maximum ($T_{S\ max.}$) | 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 |

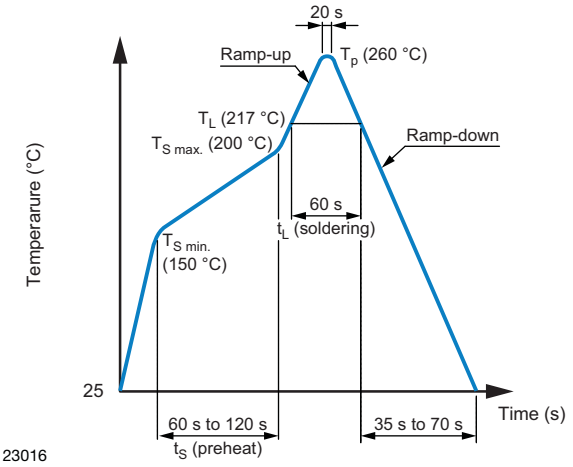



Fig. 4

### 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

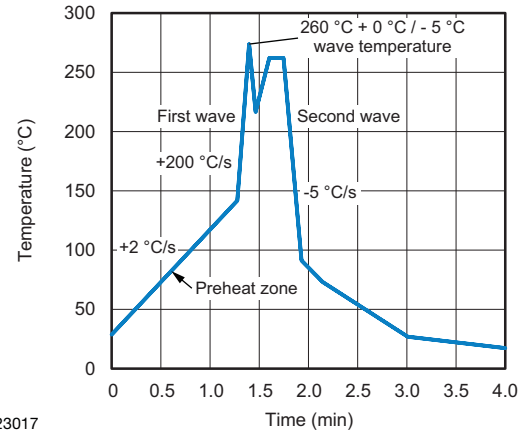



Fig. 5

### 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: $T_{amb}$ < 30 °C, RH < 85 %

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


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