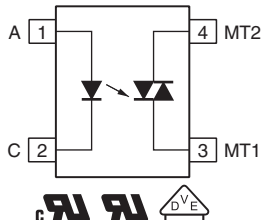


# Optocoupler, Phototriac Output, Non-Zero Crossing, High dV/dt, Low Input Current, SOP-4 Package



22995



## FEATURES

- Flat 2.0 mm SOP-4 package
- 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 3750 V<sub>RMS</sub>
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## DESIGN SUPPORT TOOLS

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Available

  
Design Tools  
Available

  
Related  
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## DESCRIPTION

The VOT8121AM consists of a GaAs IRLED optically coupled to a photosensitive TRIAC packaged in a board space saving tiny flat SOP-4 package.

The VOT8121AM isolates low-voltage logic from 120 V<sub>AC</sub>, 240 V<sub>AC</sub>, and 380 V<sub>AC</sub> lines to control resistive, inductive, or capacitive loads including motors, solenoids, high current thyristors or TRIAC and relays.

## 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"](#)

## ORDERING INFORMATION

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

AGENCY CERTIFIED/PACKAGE	TRIGGER CURRENT, $I_{FT}$ (mA)
<b>UL, cUL</b>	<b>10</b>
SOP-4	VOT8121AM-T
SOP-4, 180° orientation	VOT8121AM-T2
<b>VDE, UL, cUL</b>	<b>10</b>
SOP-4	VOT8121AM-VT
SOP-4, 180° orientation	VOT8121AM-VT2



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
Power dissipation		$P_{diss}$	70	mW
OUTPUT				
Peak off-state voltage		$V_{DRM}$	800	V
RMS on-state current		$I_{T(RMS)}$	100	mA
Power dissipation		$P_{diss}$	300	mW
Peak repetitive surge current	PW = 1 ms, 120 pps	$I_{TSM}$	1	A
COUPLER				
Storage temperature range		$T_{stg}$	-55 to +150	$^{\circ}\text{C}$
Ambient temperature range		$T_{amb}$	-55 to +110	$^{\circ}\text{C}$
Total power dissipation		$P_{diss}$	330	mW
Soldering temperature	For 10 s	$T_{sld}$	260	$^{\circ}\text{C}$

**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.  
This phototriac should not be used to drive a load directly. It is intended to be a trigger device only

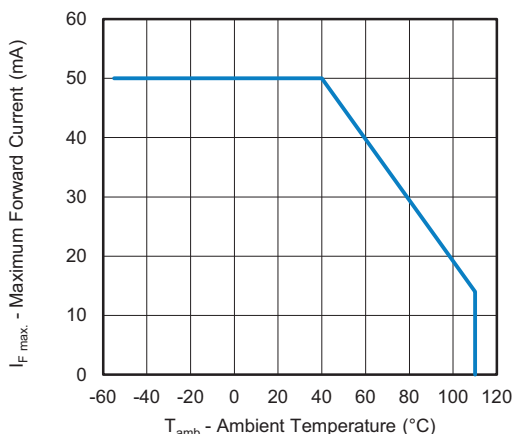


Fig. 1 - Maximum Forward Current vs. Ambient Temperature

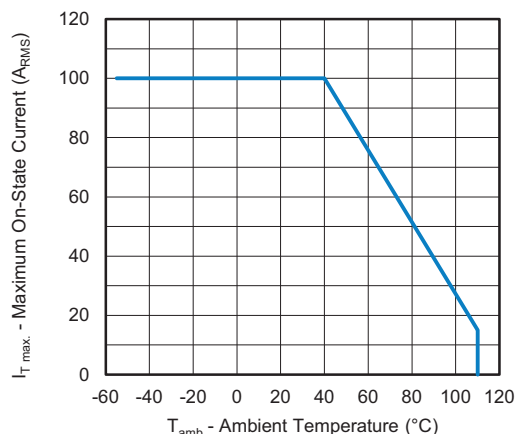


Fig. 2 - Maximum On-State Current vs. Ambient Temperature



<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 20\text{ mA}$	$V_F$	-	1.15	1.5	V
Reverse current	$V_R = 6\text{ V}$	$I_R$	-	-	10	$\mu\text{A}$
<b>OUTPUT</b>						
Off-state current	$V_{DRM} = 800\text{ V}$	$I_{DRM}$	-	-	0.1	$\mu\text{A}$
On-state voltage	$I_T = 100\text{ mA peak}$	$V_{TM}$	-	1.7	3	V
Holding current		$I_H$	-	250	-	$\mu\text{A}$
Critical rate of rise of off-state voltage		$dV/dt^{(1)}$	1000	-	-	V/ $\mu\text{s}$
<b>COUPLER</b>						
Trigger current	$V_{TM} = 3\text{ V}$	$I_{FT}$	-	-	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

<sup>(1)</sup> Static  $dV/dt$

<b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$V_D = 6\text{ V to } 4\text{ V}$ , $R_L = 100\text{ }\Omega$ , $I_F = \text{rated } I_{FT} \times 1.5$	$t_{on}$	-	30	100	$\mu\text{s}$

**Note**

- 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

<b>SAFETY AND INSULATION RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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, $t = 1\text{ min}$	$V_{ISO}$	3750	$V_{RMS}$
Maximum transient isolation voltage	According to DIN EN 60747-5-5	$V_{IOTM}$	6000	$V_{peak}$
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	$V_{IORM}$	565	$V_{peak}$
Isolation resistance	$V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$	$R_{IO}$	$10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$10^{11}$	$\Omega$
Output safety power		$P_{SO}$	300	mW
Input safety current		$I_{SI}$	50	mA
Input safety temperature		$T_S$	150	$^{\circ}\text{C}$
Creepage distance			> 5	mm
Clearance distance			> 5	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

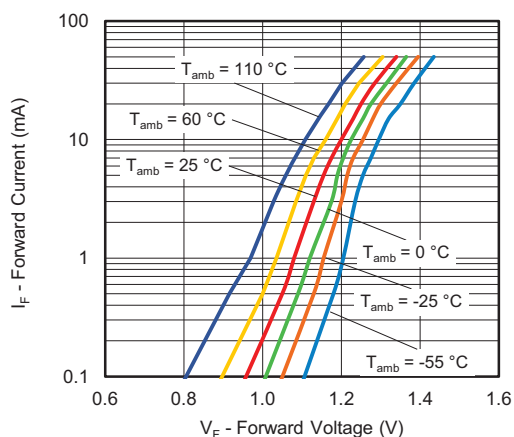
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 3 - Forward Current vs. Forward Voltage

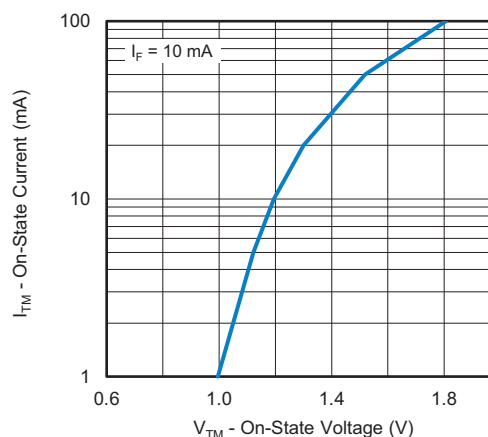


Fig. 6 - On State Current vs. On State Voltage

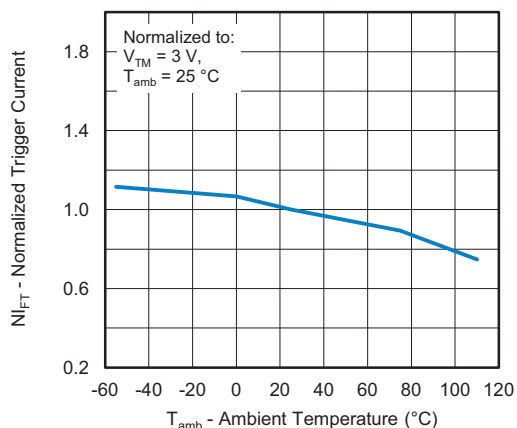


Fig. 4 - Normalized Trigger Current vs. Ambient Temperature

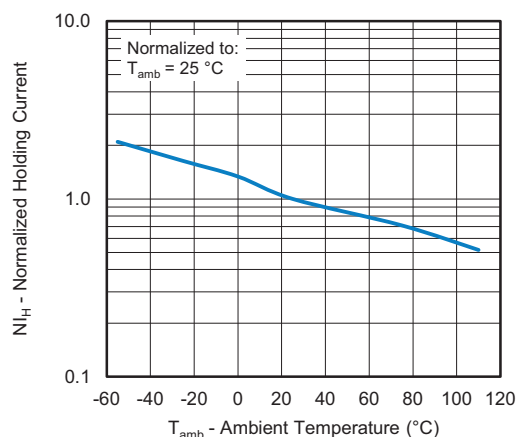


Fig. 7 - Normalized Holding Current vs. Ambient Temperature

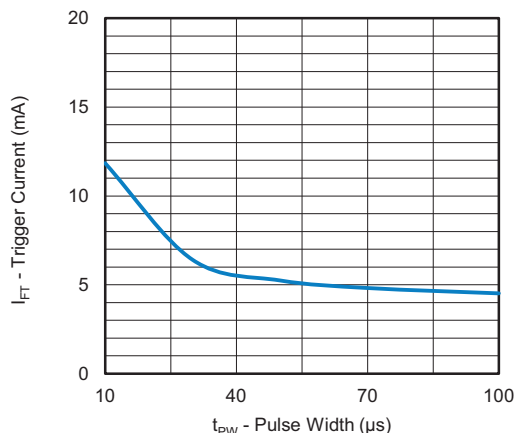


Fig. 5 - Trigger Current vs. Pulse Width

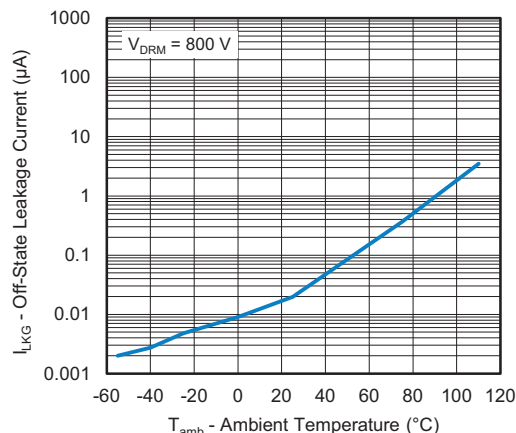


Fig. 8 - Off-State Leakage Current vs. Ambient Temperature

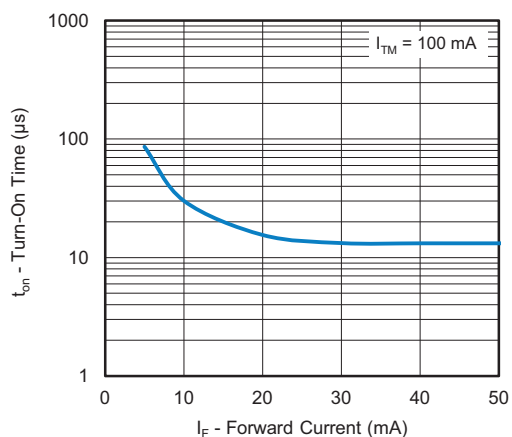


Fig. 9 - Turn-On Time vs. Forward Current

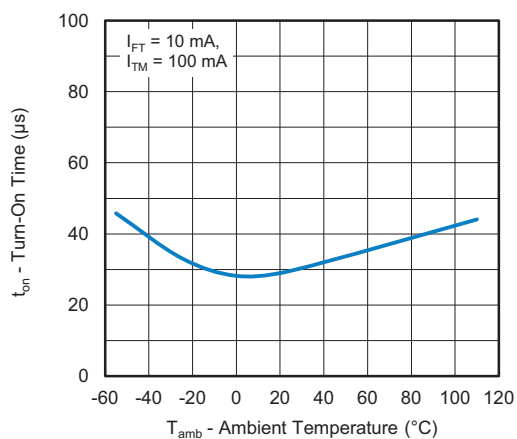


Fig. 10 - Turn-On Time vs. Ambient Temperature

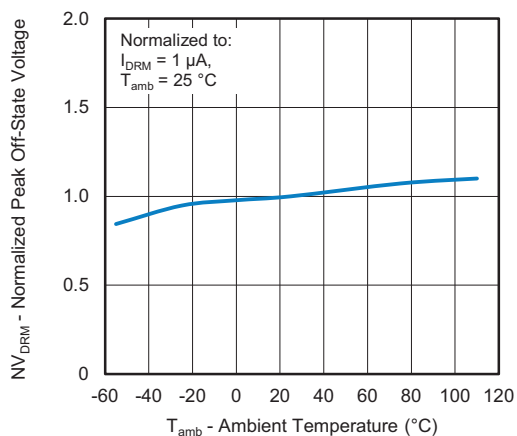


Fig. 11 - Normalized Peak Off-State Voltage vs. Ambient Temperature

**PACKAGE DIMENSIONS** (in millimeters)

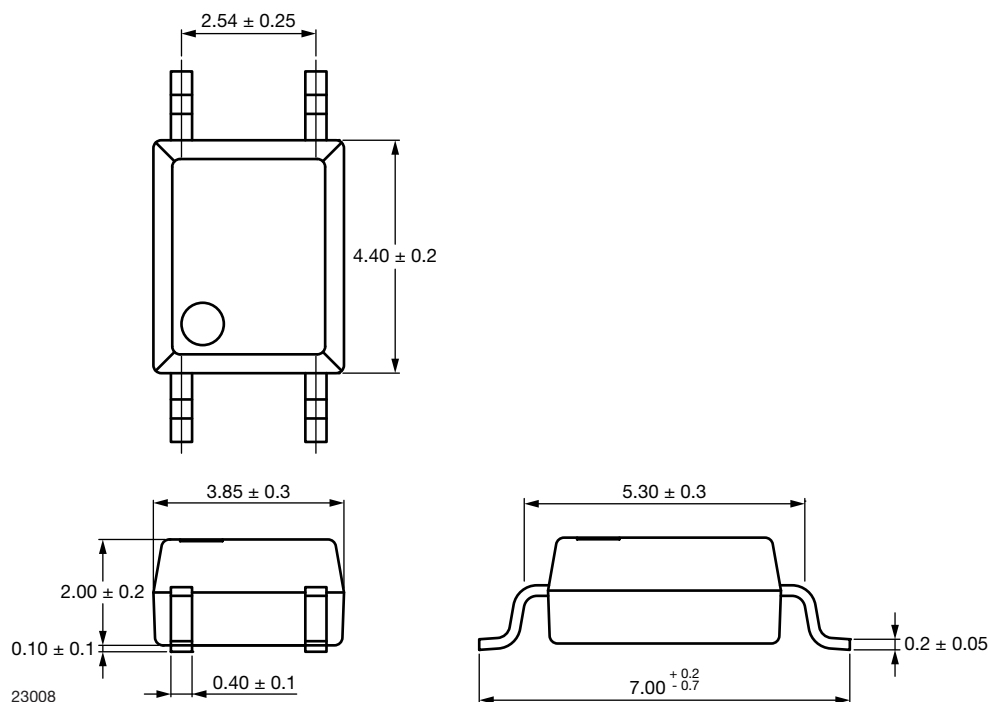
**SOP-4**


Fig. 1

**PACKAGE MARKING**


Fig. 12 - Example of VOT8121AM-VT

**Notes**

- “YWW” is the date code marking (Y = year code, WW = week code)
- “X” is only marked on VDE option parts
- Tape and reel suffix (T) is not part of the package marking

**PACKAGING INFORMATION** (in millimeters)

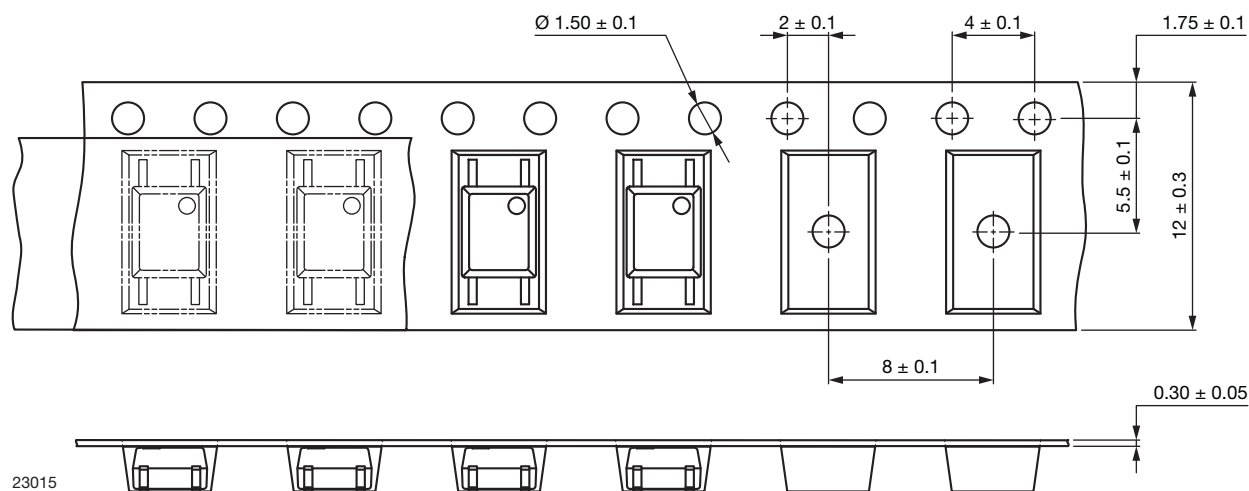
**Tape SOP-4**


Fig. 13 - Tape and Reel Packaging (3000 pieces on reel)

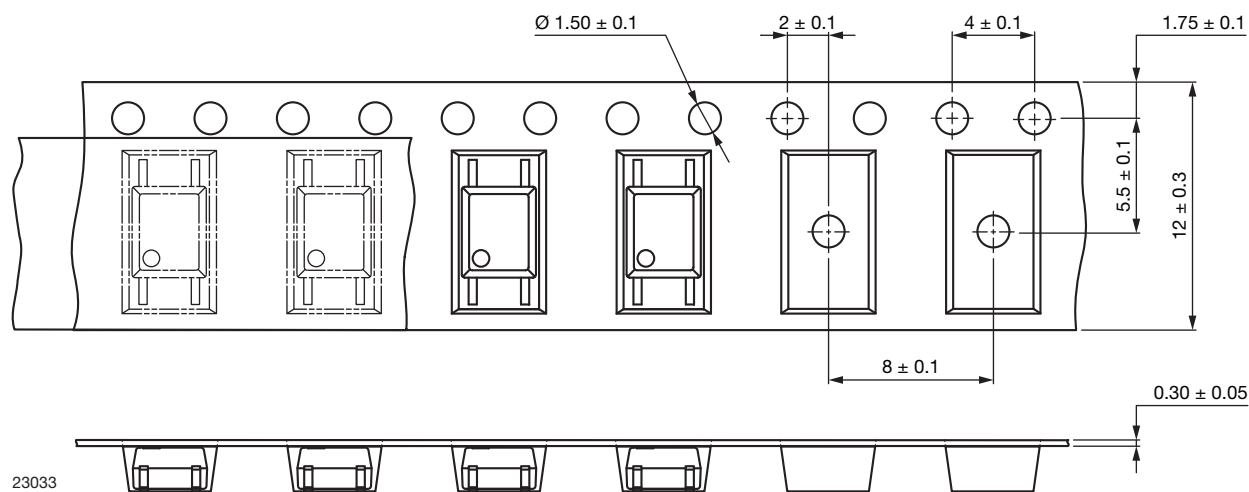
**Tape SOP-4, 180° Orientation**


Fig. 14 - Tape and Reel Packaging (3000 pieces on reel)

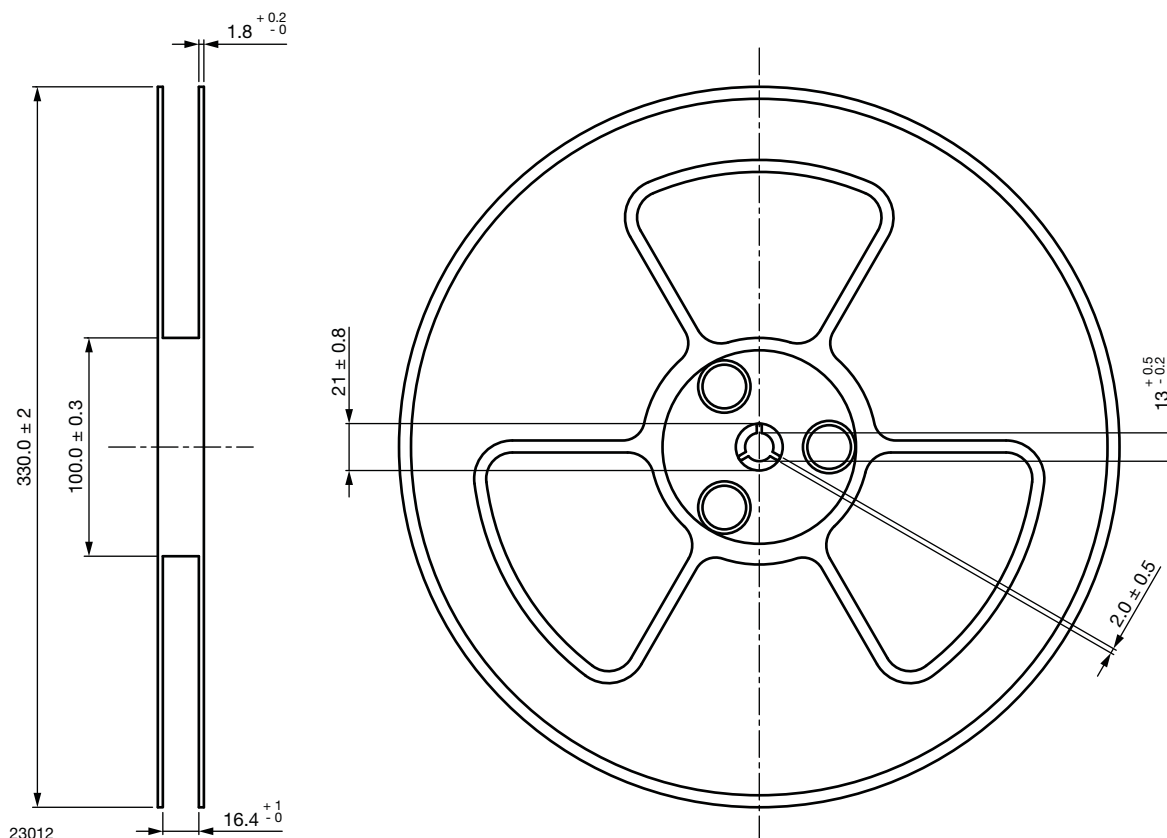
**Reel**


Fig. 15 - Tape and Reel Shipping Medium



## 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 $\pm$ 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

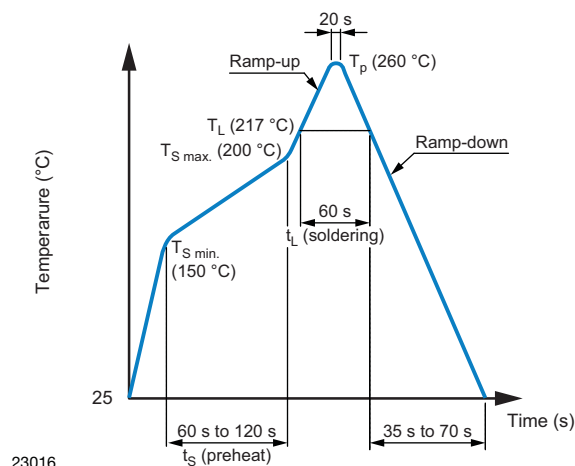


Fig. 2

### 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

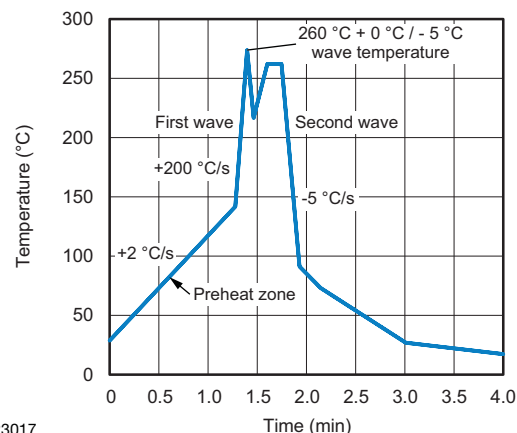


Fig. 3

### 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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