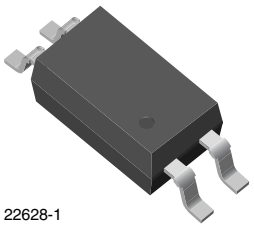
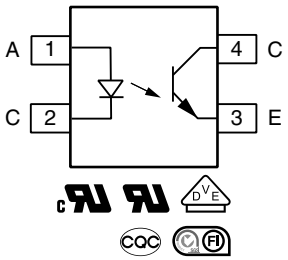
# Optocoupler, Phototransistor Output, SSOP-4, Half Pitch, Mini-Flat Package



22628-1




## FEATURES

- High CTR with low input current
- Low profile package (half pitch)
- High collector emitter voltage, $V_{CEO}$ = 80 V
- Isolation test voltage = 3750 $V_{RMS}$
- Low coupling capacitance
- High common mode transient immunity
- Material categorization:
  For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

## DESCRIPTION

The VOS617A series has a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a 4-pin 50 mil lead pitch mini-flat package.

It features a high current transfer ratio at low input current, low coupling capacitance, and high isolation voltage.

The coupling devices are designed for signal transmission between two electrically separated circuits.

## APPLICATIONS

- Telecom
- Industrial controls
- Battery powered equipment
- Office machines
- Programmable controllers

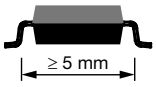
## AGENCY APPROVALS

Safety application model number covering all products in this datasheet is VOS617A. This model number should be used when consulting safety agency documents.

- UL1577, file no. E52744
- cUL
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- FIMKO EN 60065, EN 60950-1
- CQC GB4943.1-2011 and GB8898-2011 (suitable for installation altitude below 2000 m)

## ORDERING INFORMATION

| V | O | S | 6 | 1 | 7 | A | - | # | X | 0 | 0 | 1 | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER | | | | | | | | CTR BIN | PACKAGE OPTION | | | | TAPE AND REEL |




| AGENCY CERTIFIED/ PACKAGE | CTR (%) 5 mA | | | | | | |
|---|---|---|---|---|---|---|---|
| **UL, cUL, FIMKO, CQC** | **50 to 600** | **63 to 125** | **100 to 200** | **160 to 320** | **80 to 160** | **130 to 260** | **200 to 400** |
| SSOP-4, 50 mil pitch | VOS617AT | VOS617A-2T | VOS617A-3T | VOS617A-4T | VOS617A-7T | VOS617A-8T | VOS617A-9T |
| **UL, CUL, FIMKO, CQC, VDE (option 1)** | **50 to 600** | **63 to 125** | **100 to 200** | **160 to 320** | **80 to 160** | **130 to 260** | **200 to 400** |
| SSOP-4, 50 mil pitch | VOS617A-X001T | VOS617A-2X001T | VOS617A-3X001T | VOS617A-4X001T | VOS617A-7X001T | VOS617A-8X001T | VOS617A-9X001T |

**Note**

- Additional options may be possible, please contact sales office.

| **ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| **INPUT** | | | | |
| Reverse voltage | | $V_R$ | 6 | V |
| Power dissipation | | $P_{diss}$ | 70 | mW |
| Surge forward current | $t_p \leq 10$ µs | $I_{FSM}$ | 1.5 | A |
| Forward current | | $I_F$ | 50 | mA |
| **OUTPUT** | | | | |
| Collector emitter voltage | | $V_{CEO}$ | 80 | V |
| Emitter collector voltage | | $V_{ECO}$ | 7 | V |
| Collector current | | $I_C$ | 50 | mA |
| Power dissipation | | $P_{diss}$ | 150 | mW |
| **COUPLER** | | | | |
| Isolation test voltage between emitter and detector | t = 1 min | $V_{ISO}$ | 3750 | $V_{RMS}$ |
| Total power dissipation | | $P_{tot}$ | 170 | mW |
| Storage temperature range | | $T_{stg}$ | -55 to +150 | °C |
| Ambient temperature range | | $T_{amb}$ | -55 to +110 | °C |
| Junction temperature | | $T_j$ | 125 | °C |
| Soldering temperature (1) | t = 10 s | $T_{sld}$ | 260 | °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.

(1) Refer to reflow profile for soldering conditions for surface mounted devices.

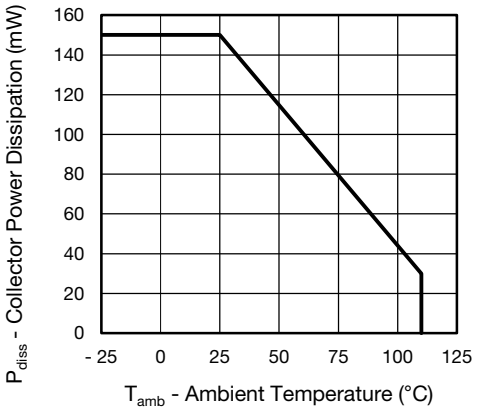



Fig. 1 - Power Dissipation vs. Ambient Temperature

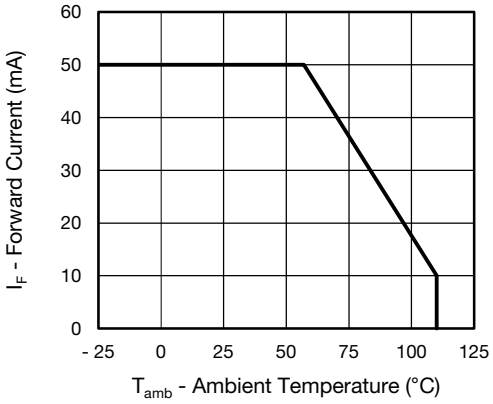



Fig. 2 - Forward Current vs. Ambient Temperature

| ELECTRICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **INPUT** | | | | | | |
| Forward voltage | $I_F$ = 50 mA | $V_F$ | | 1.18 | 1.5 | V |
| Reverse current | $V_R$ = 6 V | $I_R$ | | 0.01 | 10 | µA |
| Capacitance | $V_R$ = 0 V, f = 1 MHz | $C_I$ | | 7.3 | | pF |
| **OUTPUT** | | | | | | |
| Collector emitter leakage current | $V_{CE}$ = 10 V | $I_{CEO}$ | | 0.3 | 100 | nA |
| Collector emitter breakdown voltage | $I_C$ = 100 µA | $BV_{CEO}$ | 80 | | | V |
| Emitter collector breakdown voltage | $I_E$ = 10 µA | $BV_{ECO}$ | 7 | | | V |
| Collector emitter capacitance | $V_{CE}$ = 5 V, f = 1 MHz | $C_{CE}$ | | 5 | | pF |
| **COUPLER** | | | | | | |
| Collector emitter saturation voltage | $I_F$ = 5 mA, $I_C$ = 2.5 mA | $V_{CEsat}$ | | 0.25 | 0.4 | V |
| Cut-off frequency | $I_F$ = 10 mA, $V_{CC}$ = 5 V, $R_L$ = 100 Ω | $f_{ctr}$ | | 155 | | kHz |

**Note**

- 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.

| CURRENT TRANSFER RATIO ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| $I_C/I_F$ | $I_F$ = 5 mA, $V_{CE}$ = 5 V | VOS617A | CTR | 50 | | 600 | % |
| | | VOS617A-2 | CTR | 63 | | 125 | % |
| | | VOS617A-3 | CTR | 100 | | 200 | % |
| | | VOS617A-4 | CTR | 160 | | 320 | % |
| | | VOS617A-7 | CTR | 80 | | 160 | % |
| | | VOS617A-8 | CTR | 130 | | 260 | % |
| | | VOS617A-9 | CTR | 200 | | 400 | % |

| SWITCHING CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **NON-SATURATED** | | | | | | |
| Rise and fall time | $I_C$ = 2 mA, $V_{CC}$ = 5 V, $R_L$ = 100 Ω | $t_r$ | | 3 | | µs |
| Fall time | | $t_f$ | | 3 | | µs |
| Turn-on time | | $t_{on}$ | | 6 | | µs |
| Turn-off time | | $t_{off}$ | | 4 | | µs |
| **SATURATED** | | | | | | |
| Rise and fall time | $I_F$ = 1.6 mA, $V_{CC}$ = 5 V, $R_L$ = 1.9 kΩ | $t_r$ | | 3 | | µs |
| Fall time | | $t_f$ | | 12 | | µs |
| Turn-on time | | $t_{on}$ | | 4 | | µs |
| Turn-off time | | $t_{off}$ | | 18 | | µs |

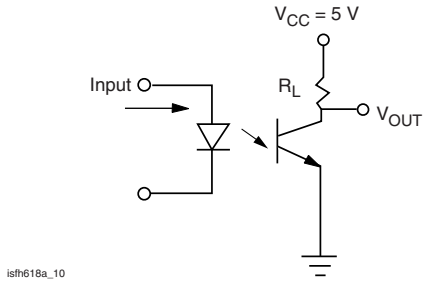



Fig. 3 - Test Circuit

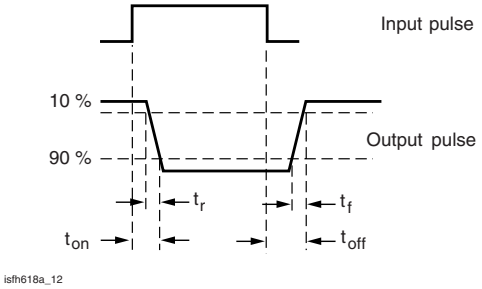



Fig. 4 - Test Circuit and Waveforms

| SAFETY AND INSULATION RATINGS | | | | |
|---|---|---|---|---|
| **PARAMETER** | | **SYMBOL** | **VALUE** | **UNIT** |
| **MAXIMUM SAFETY RATINGS** | | | | |
| Output safety power | | $P_{SO}$ | 300 | mW |
| Input safety current | | $I_{si}$ | 200 | mA |
| Safety temperature | | $T_S$ | 150 | °C |
| Comparative tracking index | | CTI | 175 | |
| **INSULATION RATED PARAMETERS** | | | | |
| Maximum withstanding isolation voltage | 40 % to 60 % RH, AC test of 1 min | $V_{ISO}$ | 3750 | $V_{RMS}$ |
| Maximum transient isolation voltage | | $V_{IOTM}$ | 6000 | $V_{peak}$ |
| Maximum repetitive peak isolation voltage | | $V_{IORM}$ | 565 | $V_{peak}$ |
| Insulation resistance | $T_{amb}$ = 25 °C, $V_{DC}$ = 500 V | $R_{IO}$ | $\geq 10^{12}$ | Ω |
| Isolation resistance | $T_{amb}$ = 100 °C, $V_{DC}$ = 500 V | $R_{IO}$ | $\geq 10^{11}$ | Ω |
| Climatic classification (according to IEC 68 part 1) | | | 55/110/21 | |
| Environment (pollution degree in accordance to DIN VDE 0109) | | | 2 | |
| 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 °C, unless otherwise specified)

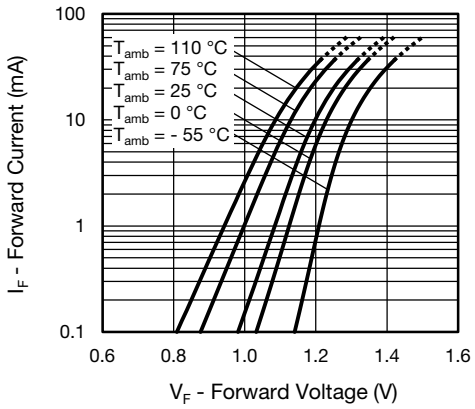



Fig. 5 - Forward Voltage vs. Forward Current

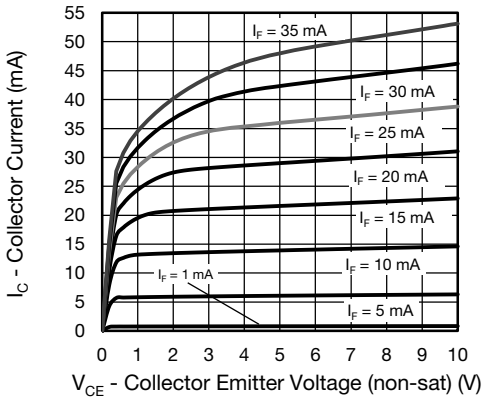



Fig. 6 - Collector Current vs. Collector Emitter Voltage

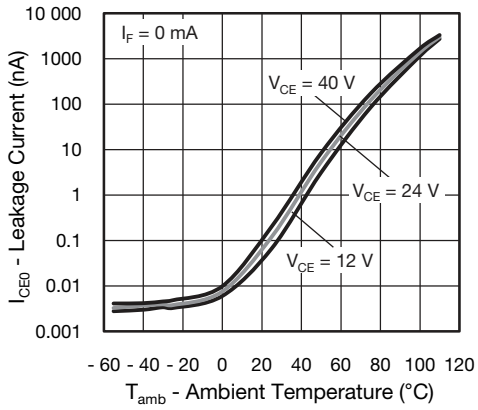



Fig. 7 - Leakage Current vs. Ambient Temperature

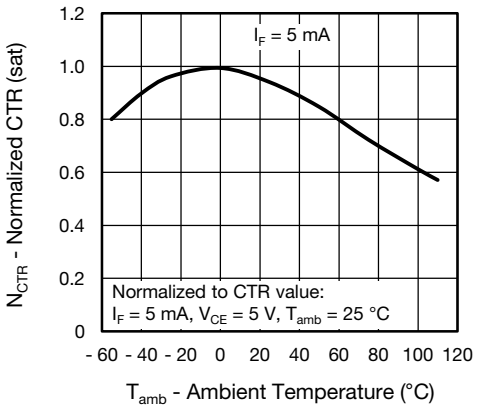



Fig. 10 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

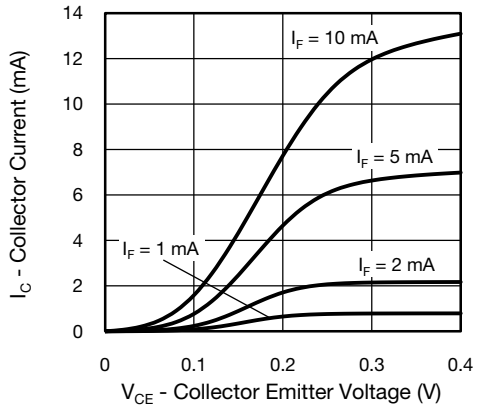



Fig. 8 - Collector Current vs. Collector Emitter Voltage

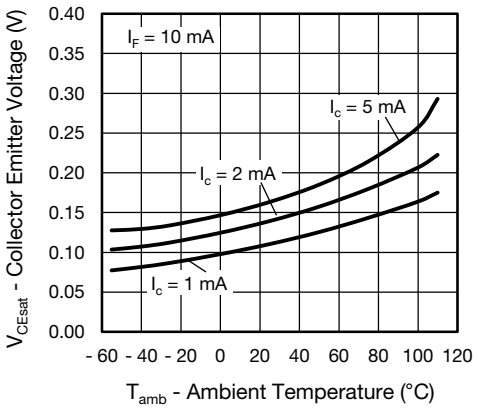



Fig. 11 - Collector Emitter Voltage vs. Ambient Temperature

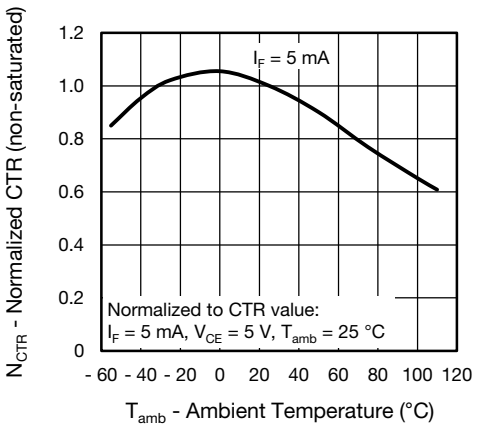



Fig. 9 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

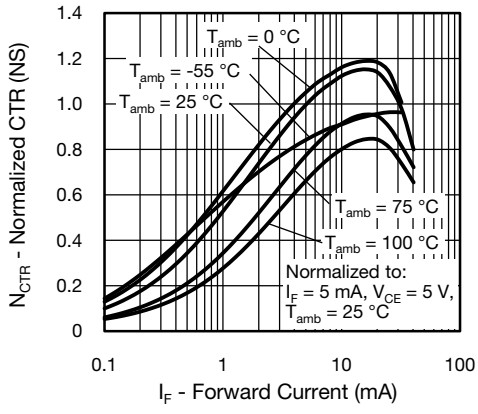



Fig. 12 - Normalized CTR (non-saturated) vs. Forward Current

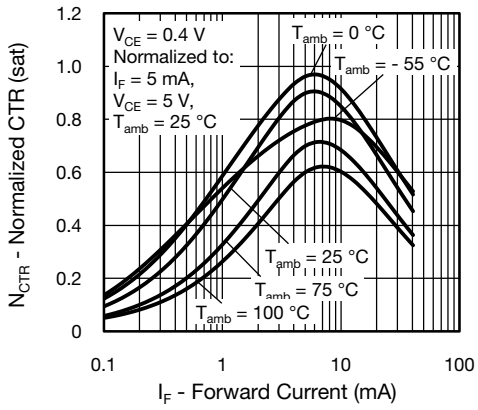



Fig. 13 - Normalized CTR (saturated) vs. Forward Current

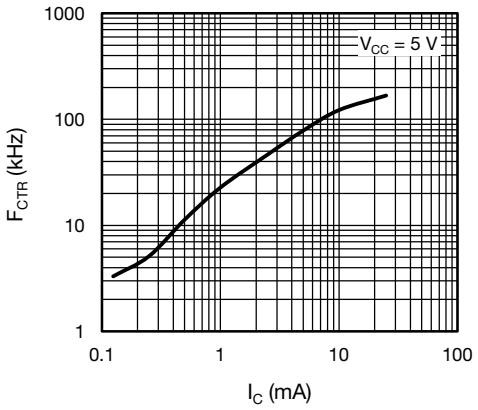



Fig. 15 - $F_{CTR}$ vs. Collector Current

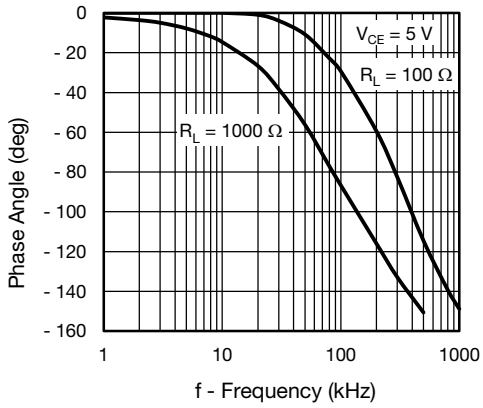



Fig. 14 - $F_{CTR}$ vs. Phase Angle

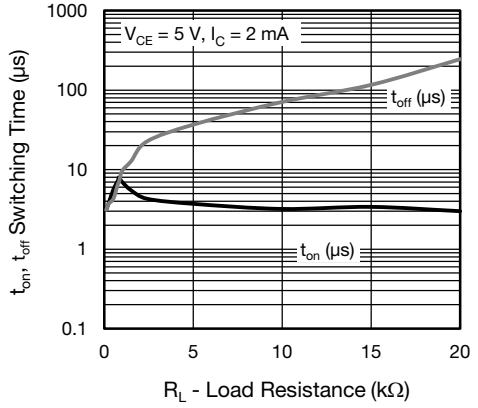
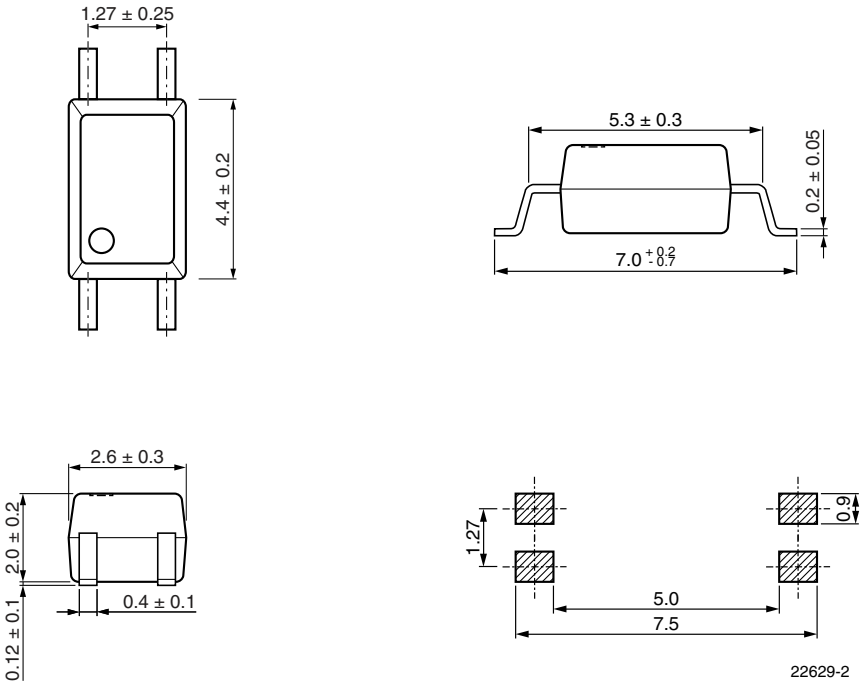
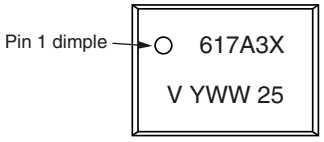



Fig. 16 - Switching Time vs. Load Resistance

## PACKAGE DIMENSIONS in millimeters




## PACKAGE MARKING (example of VOS617A-3X001T)




**Notes**

- Option 1 is reflected with letter “X”.
- Tape and reel suffix (T) is not part of the package marking.

## TAPE AND REEL DIMENSIONS in millimeters

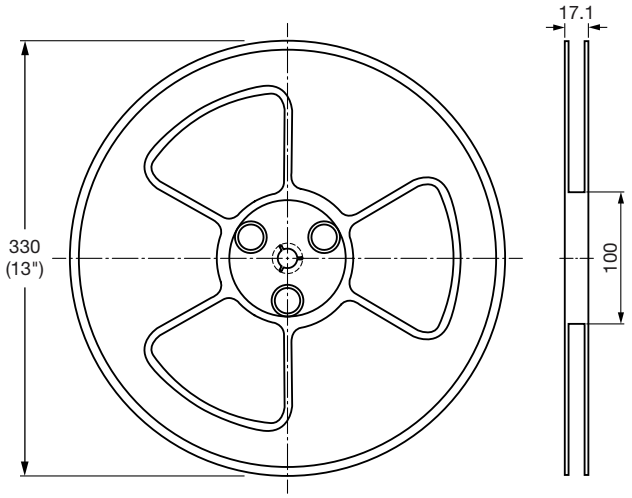



Fig. 17 - Reel Dimensions (3000 units per reel)

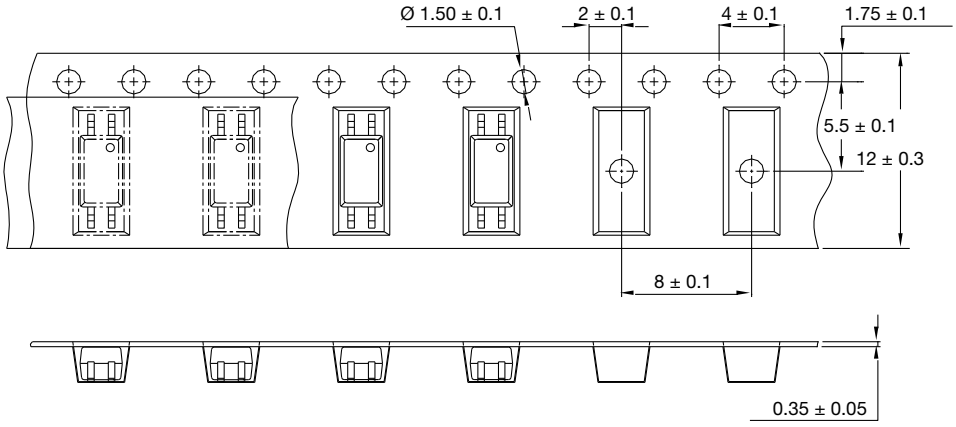



Fig. 18 - Tape Dimensions

# Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Vishay:
VOS617A-X001T VOS617A-3X001T VOS617A-2T VOS617A-2X001T VOS617A-4T VOS617A-4X001T VOS617A-7T VOS617A-7X001T VOS617AT VOS617A-3T VOS617A-8T VOS617A-9T VOS617A-8X001T VOS617A-9X001T