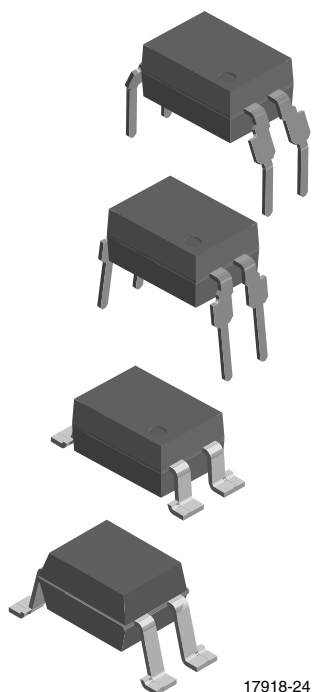
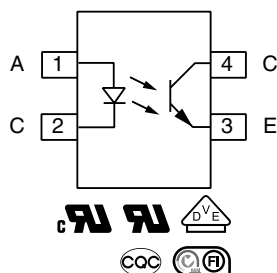


# Optocoupler, Phototransistor Output, High Reliability, 5300 V<sub>RMS</sub>



17918-24



## FEATURES

- Operating temperature from -55 °C to +110 °C
- Good CTR linearity depending on forward current
- Isolation voltage, 5300 V<sub>RMS</sub>
- High collector emitter voltage, V<sub>CEO</sub> = 80 V
- Low saturation voltage
- Fast switching times
- Low CTR degradation
- Low coupling capacitance
- End stackable, 0.100" (2.54 mm) spacing
- High common mode interference immunity
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

## DESCRIPTION

The 110 °C rated VO617A feature a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared emitting diode, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 package.

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

The couplers are end-stackable with 2.54 mm spacing.

Creepage and clearance distances of > 8.0 mm are achieved with option 6 and option 8. This version complies with IEC 60950 (DIN VDE 0805) for reinforced insulation up to an operation voltage of 400 V<sub>RMS</sub> or DC. Specifications subject to change.

## APPLICATIONS

- AC adapters
- SMPS
- PLC
- Factory automation

## AGENCY APPROVALS

Safety application model number covering all products in this data sheet is VO617A. This model number should be used when consulting safety agency documents.

- [UL / cUL 1577](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#), available with option 1
- [BSI](#)
- [CQC GB 4943.1-2022](#)
- [FIMKO](#)

## LINKS TO ADDITIONAL RESOURCES



Product Page



Design Tools



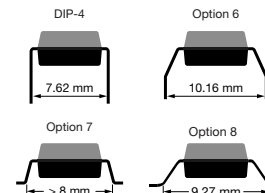
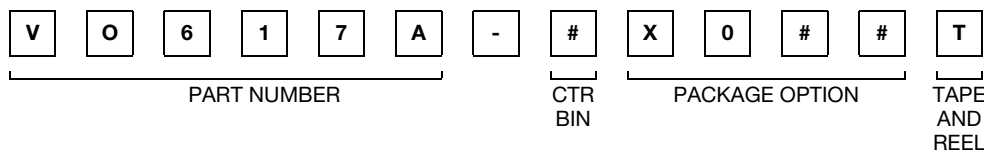
SPICE Models



Footprints



Related Documents

**ORDERING INFORMATION**


| AGENCY CERTIFIED / PACKAGE | CTR (%)      |               |               |               |               |               |               |               |
|----------------------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                            | 5 mA         |               |               |               |               |               |               |               |
| UL, cUL, BSI, FIMKO        | 50 to 600    | 40 to 80      | 63 to 125     | 100 to 200    | 160 to 320    | 80 to 160     | 130 to 260    | 200 to 400    |
| DIP-4                      | VO617A       | VO617A-1      | VO617A-2      | VO617A-3      | VO617A-4      | VO617A-7      | VO617A-8      | VO617A-9      |
| DIP-4, 400 mil, option 6   | -            | -             | -             | VO617A-3X006  | VO617A-4X006  | -             | -             | -             |
| SMD-4, option 7            | -            | -             | VO617A-2X007T | VO617A-3X007T | VO617A-4X007T | -             | -             | -             |
| VDE, UL, cUL, BSI, FIMKO   | 50 to 600    | 40 to 80      | 63 to 125     | 100 to 200    | 160 to 320    | 80 to 160     | 130 to 260    | 200 to 400    |
| DIP-4, 400 mil, option 6   | -            | -             | -             | VO617A-3X016  | VO617A-4X016  | VO617A-7X016  | VO617A-8X016  | VO617A-9X016  |
| SMD-4, option 7            | -            | VO617A-1X017T | VO617A-2X017T | VO617A-3X017T | VO617A-4X017T | VO617A-7X017T | VO617A-8X017T | VO617A-9X017T |
| SMD-4, 400 mil, option 8   | VO617A-X018T | -             | -             | VO617A-3X018T | VO617A-4X018T | -             | -             | -             |

**Note**

- Additional options may be possible, please contact sales office

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                 | CONDITIONS                            | SYMBOL     | VALUE       | UNIT               |
|---------------------------|---------------------------------------|------------|-------------|--------------------|
| <b>INPUT</b>              |                                       |            |             |                    |
| Reverse voltage           |                                       | $V_R$      | 6           | V                  |
| Forward current           |                                       | $I_F$      | 60          | mA                 |
| Forward surge current     | $t_p \leq 10 \mu\text{s}$             | $I_{FSM}$  | 1.5         | A                  |
| LED power dissipation     |                                       | $P_{diss}$ | 70          | mW                 |
| <b>OUTPUT</b>             |                                       |            |             |                    |
| Collector emitter voltage |                                       | $V_{CEO}$  | 80          | V                  |
| Emitter collector voltage |                                       | $V_{ECO}$  | 7           | V                  |
| Collector current         |                                       | $I_C$      | 50          | mA                 |
| Collector peak current    | $t_p/T = 0.5, t_p \leq 10 \text{ ms}$ | $I_{CM}$   | 100         | mA                 |
| Output power dissipation  |                                       | $P_{diss}$ | 150         | mW                 |
| <b>COUPLER</b>            |                                       |            |             |                    |
| Total power dissipation   |                                       | $P_{tot}$  | 200         | mW                 |
| Operation temperature     |                                       | $T_{amb}$  | -55 to +110 | $^{\circ}\text{C}$ |
| Storage temperature range |                                       | $T_{stg}$  | -55 to +150 | $^{\circ}\text{C}$ |
| Soldering temperature     | 2 mm from case, $\leq 10 \text{ s}$   | $T_{sld}$  | 260         | $^{\circ}\text{C}$ |

**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

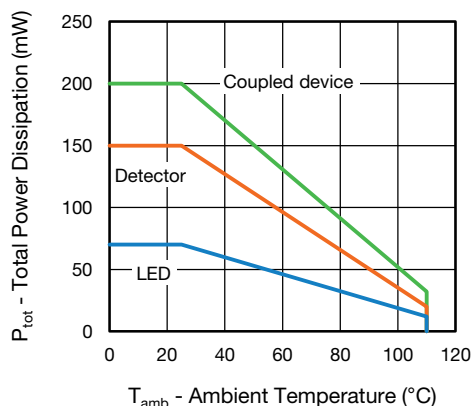


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

| <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                                                                                          | $I_F = 60\text{ mA}$                        | -        | $V_F$       | 1    | 1.35 | 1.65 | V             |
| Reverse current                                                                                          | $V_R = 6\text{ V}$                          | -        | $I_R$       | -    | 0.01 | 10   | $\mu\text{A}$ |
| Junction capacitance                                                                                     | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$     | -        | $C_j$       | -    | 13   | -    | pF            |
| <b>OUTPUT</b>                                                                                            |                                             |          |             |      |      |      |               |
| Collector emitter leakage current                                                                        | $V_{CE} = 10\text{ V}$                      | VO617A-1 | $I_{CEO}$   | -    | 2    | 50   | nA            |
|                                                                                                          |                                             | VO617A-2 |             | -    | 2    | 50   |               |
|                                                                                                          |                                             | VO617A-3 |             | -    | 5    | 100  |               |
|                                                                                                          |                                             | VO617A-4 |             | -    | 5    | 100  |               |
|                                                                                                          |                                             | VO617A-7 |             | -    | 5    | 100  |               |
|                                                                                                          |                                             | VO617A-8 |             | -    | 5    | 100  |               |
|                                                                                                          |                                             | VO617A-9 |             | -    | 5    | 100  |               |
| Collector emitter capacitance                                                                            | $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$  | -        | $C_{CE}$    | -    | 5.2  | -    | pF            |
| Collector emitter breakdown voltage                                                                      | $I_C = 1\text{ mA}$                         | -        | $BV_{CEO}$  | 80   | -    | -    | V             |
| Emitter collector breakdown voltage                                                                      | $I_E = 100\text{ }\mu\text{A}$              | -        | $BV_{ECO}$  | 7    | -    | -    | V             |
| <b>COUPLER</b>                                                                                           |                                             |          |             |      |      |      |               |
| Collector emitter saturation voltage                                                                     | $I_F = 5\text{ mA}$ , $I_C = 1.0\text{ mA}$ | -        | $V_{CEsat}$ | -    | 0.25 | 0.4  | V             |
| Coupling capacitance                                                                                     | $f = 1\text{ MHz}$                          | -        | $C_C$       | -    | 0.4  | -    | pF            |

**Note**

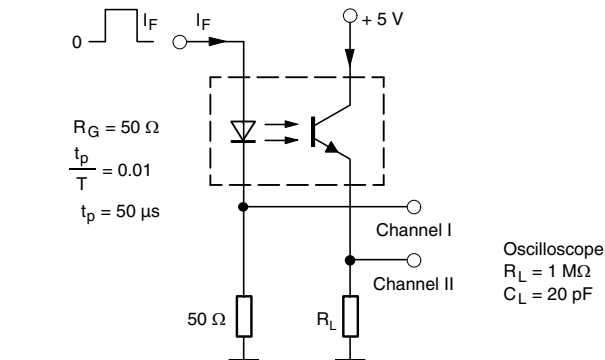
- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements

**CURRENT TRANSFER RATIO** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER | TEST CONDITION                              | PART     | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-----------|---------------------------------------------|----------|--------|------|------|------|------|
| $I_C/I_F$ | $I_F = 5\text{ mA}$ , $V_{CE} = 5\text{ V}$ | VO617A   | CTR    | 50   | -    | 600  | %    |
|           |                                             | VO617A-1 | CTR    | 40   | -    | 80   | %    |
|           |                                             | VO617A-2 | CTR    | 63   | -    | 125  | %    |
|           |                                             | VO617A-3 | CTR    | 100  | -    | 200  | %    |
|           |                                             | VO617A-4 | CTR    | 160  | -    | 320  | %    |
|           |                                             | VO617A-7 | CTR    | 80   | -    | 160  | %    |
|           |                                             | VO617A-8 | CTR    | 130  | -    | 260  | %    |
|           |                                             | VO617A-9 | CTR    | 200  | -    | 400  | %    |

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

| PARAMETER            | TEST CONDITION                                                         | CTR BIN | SYMBOL        | MIN. | TYP. | MAX. | UNIT          |
|----------------------|------------------------------------------------------------------------|---------|---------------|------|------|------|---------------|
| <b>NON-SATURATED</b> |                                                                        |         |               |      |      |      |               |
| Rise and fall time   | $I_F = 5\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$ | -       | $t_r$ , $t_f$ | -    | 2    | -    | $\mu\text{s}$ |
| Turn-on time         | $I_F = 5\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$ | -       | $t_{on}$      | -    | 3    | -    | $\mu\text{s}$ |
| Turn-off time        |                                                                        | -       | $t_{off}$     | -    | 2.3  | -    | $\mu\text{s}$ |
| Cut-off frequency    | $I_F = 5\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$ | -       | $f_{ctr}$     | -    | 190  | -    | kHz           |
| <b>SATURATED</b>     |                                                                        |         |               |      |      |      |               |
| Turn-on time         | $I_F = 5\text{ mA}$                                                    | -       | $t_{on}$      | -    | 6    | -    | $\mu\text{s}$ |
| Turn-off time        | $I_F = 5\text{ mA}$                                                    | -       | $t_{off}$     | -    | 25   | -    | $\mu\text{s}$ |
| Rise time            | $I_F = 5\text{ mA}$                                                    | -       | $t_r$         | -    | 4.6  | -    | $\mu\text{s}$ |
| Fall time            | $I_F = 5\text{ mA}$                                                    | -       | $t_f$         | -    | 15   | -    | $\mu\text{s}$ |



95 10804-3

Fig. 2 - Test Circuit, Non-Saturated Operation

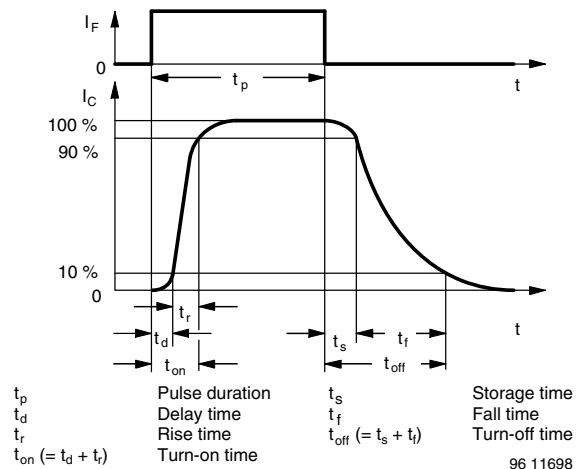
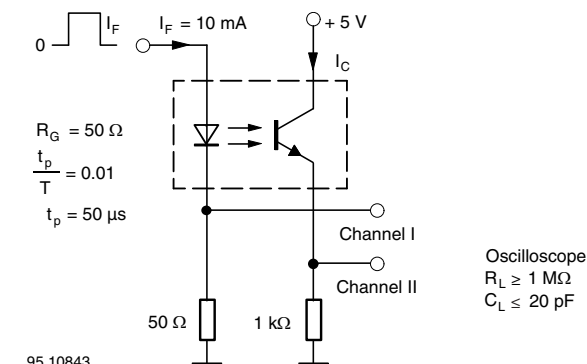


Fig. 4 - Switching Times



95 10843

Fig. 3 - Test Circuit, Saturated Operation



| SAFETY AND INSULATION RATINGS                |                                                    |                   |                    |                   |
|----------------------------------------------|----------------------------------------------------|-------------------|--------------------|-------------------|
| PARAMETER                                    | CONDITION                                          | SYMBOL            | VALUE              | UNIT              |
| Climatic classification                      | According to IEC 68 part 1                         |                   | 55 / 115 / 21      |                   |
| Pollution degree                             | According to DIN VDE 0109                          |                   | 2                  |                   |
| Comparative tracking index                   | Insulation group IIIa                              | CTI               | 175                |                   |
| Maximum rated withstanding isolation voltage | According to UL1577, t = 1 min                     | V <sub>ISO</sub>  | 5300               | V <sub>RMS</sub>  |
| Maximum transient isolation voltage          | According to DIN EN 60747-5-5                      | V <sub>IOTM</sub> | 8000               | V <sub>peak</sub> |
| Maximum repetitive peak isolation voltage    | According to DIN EN 60747-5-5                      | V <sub>IORM</sub> | 890                | V <sub>peak</sub> |
| Isolation resistance                         | T <sub>amb</sub> = 115 °C, V <sub>IO</sub> = 500 V | R <sub>IO</sub>   | ≥ 10 <sup>11</sup> | Ω                 |
|                                              | T <sub>amb</sub> = 175 °C, V <sub>IO</sub> = 500 V | R <sub>IO</sub>   | ≥ 10 <sup>9</sup>  | Ω                 |
| Output safety power                          |                                                    | P <sub>SO</sub>   | 700                | mW                |
| Input safety current                         |                                                    | I <sub>SI</sub>   | 400                | mA                |
| Input safety temperature                     |                                                    | T <sub>S</sub>    | 175                | °C                |
| Creepage distance                            | DIP-4                                              |                   | ≥ 7                | mm                |
| Clearance distance                           | DIP-4                                              |                   | ≥ 7                | mm                |
| Creepage distance                            | DIP-4, 400 mil, option 6                           |                   | ≥ 8                | mm                |
| Clearance distance                           | DIP-4, 400 mil, option 6                           |                   | ≥ 8                | mm                |
| Creepage distance                            | SMD-4, option 7                                    |                   | ≥ 7                | mm                |
| Clearance distance                           | SMD-4, option 7                                    |                   | ≥ 7                | mm                |
| Creepage distance                            | SMD-4, 400 mil, option 8                           |                   | ≥ 8                | mm                |
| Clearance distance                           | SMD-4, 400 mil, option 8                           |                   | ≥ 8                | mm                |
| Insulation thickness                         |                                                    | DTI               | ≥ 0.4              | mm                |

**Note**

- 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

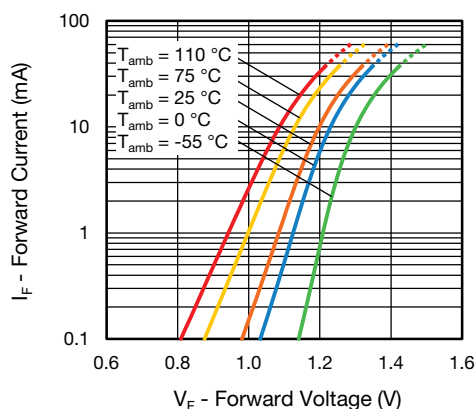
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 5 - Forward Voltage vs. Forward Current

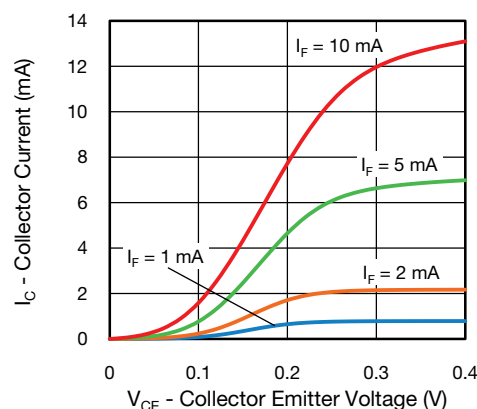


Fig. 8 - Collector Current vs. Collector Emitter Voltage

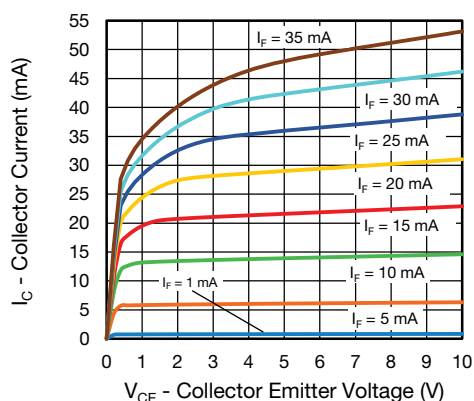


Fig. 6 - Collector Current vs. Collector Emitter Voltage

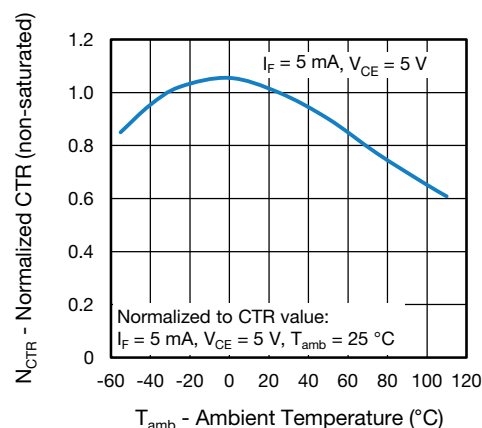


Fig. 9 - Normalized Current Transfer Ratio (non-sat.) vs. Ambient Temperature

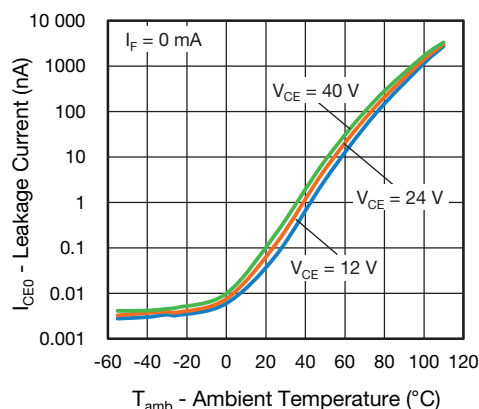


Fig. 7 - Leakage Current vs. Ambient Temperature

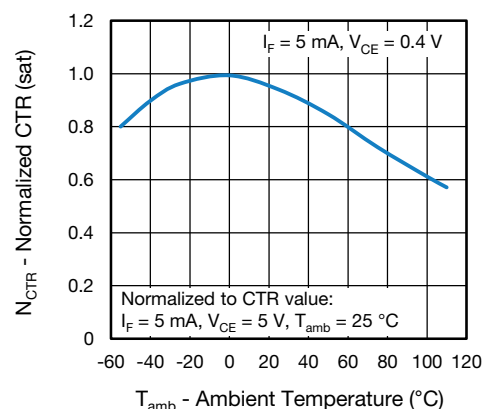


Fig. 10 - Normalized Current Transfer Ratio (sat.) vs. Ambient Temperature

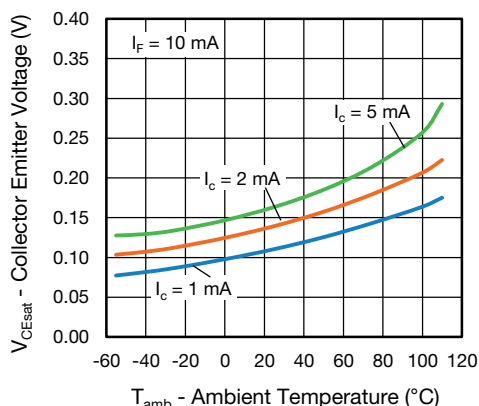


Fig. 11 - Collector Emitter Voltage vs. Ambient Temperature

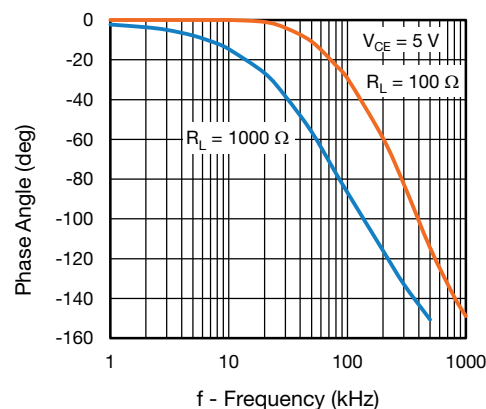


Fig. 14 - Phase Angle vs. Frequency

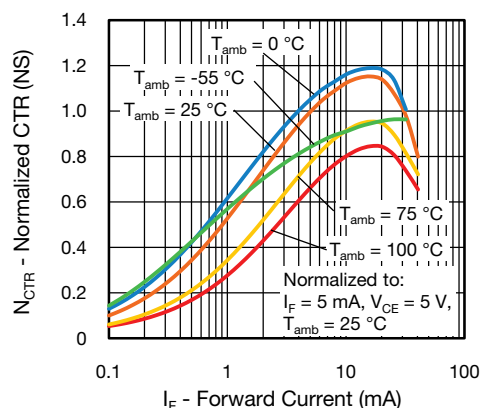


Fig. 12 - Normalized CTR (non-sat.) vs. Forward Current

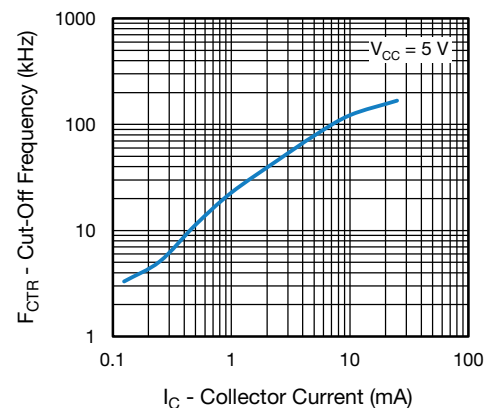


Fig. 15 - Cut-Off Frequency vs. Collector Current

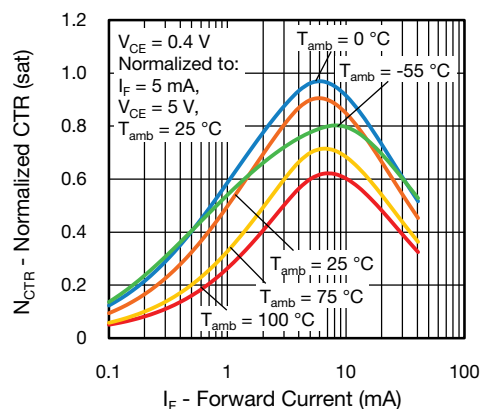


Fig. 13 - Normalized CTR (sat.) vs. Forward Current

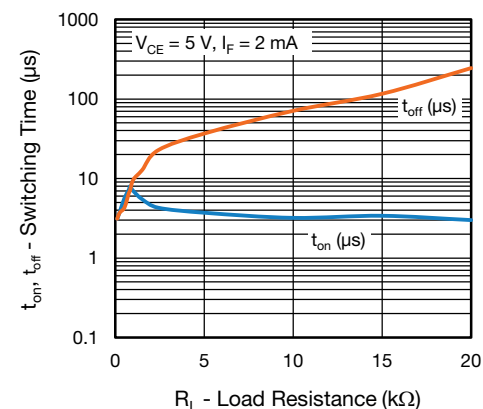


Fig. 16 - Switching Time vs. Load Resistance

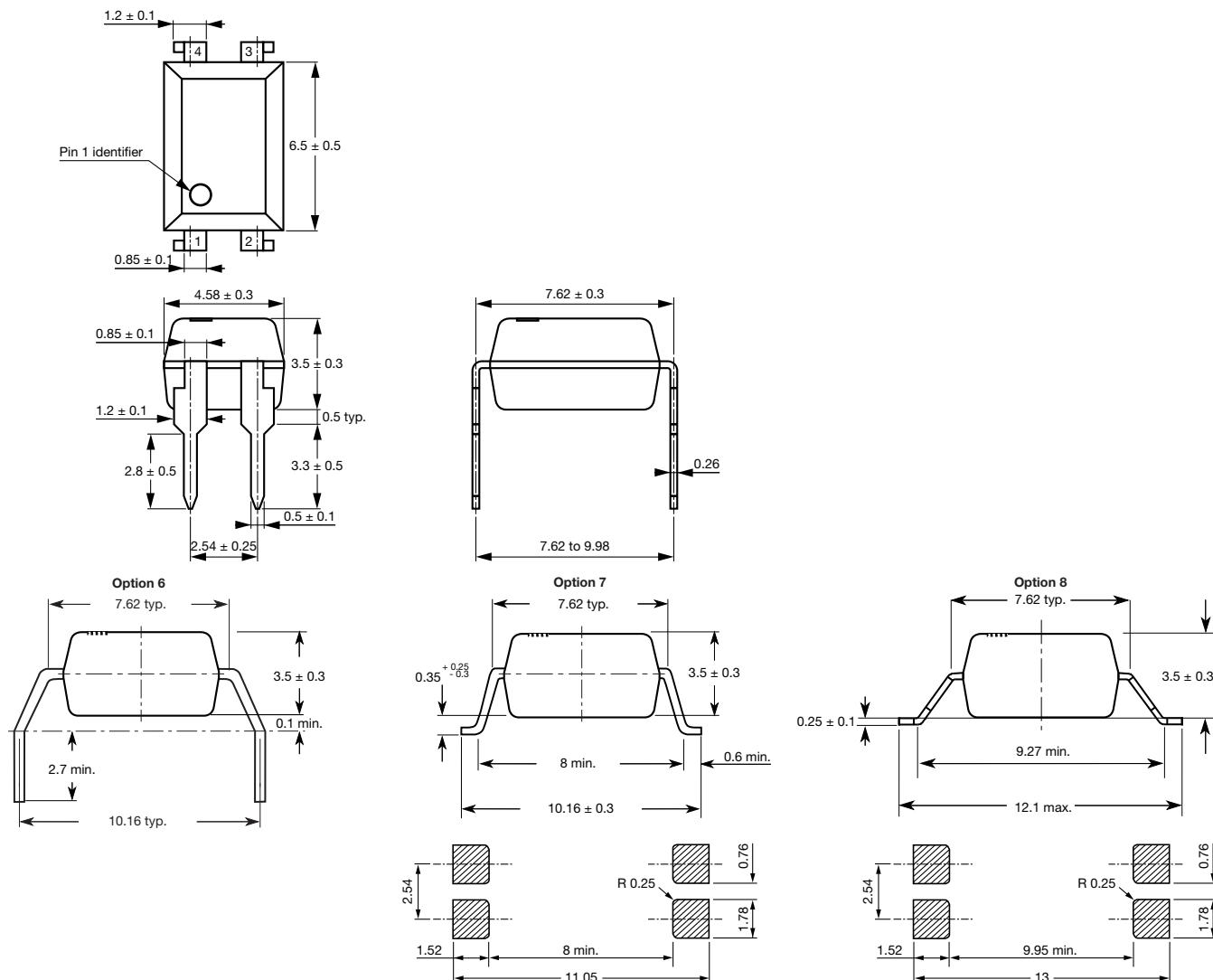
**PACKAGE DIMENSIONS** (in millimeters)


Fig. 17 - Package Drawings

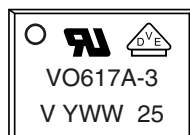
**PACKAGE MARKING**


Fig. 18 - Example of VO617A-3X017T

**Notes**

- The 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**

| DEVICE PER TUBE |            |           |           |
|-----------------|------------|-----------|-----------|
| TYPE            | UNITS/TUBE | TUBES/BOX | UNITS/BOX |
| DIP-4           | 100        | 40        | 4000      |

| DEVICE PER TAPE AND REEL |            |
|--------------------------|------------|
| TYPE                     | UNITS/REEL |
| SMD-4, option 7          | 1000       |
| SMD-4, 400 mil, option 8 | 2000       |

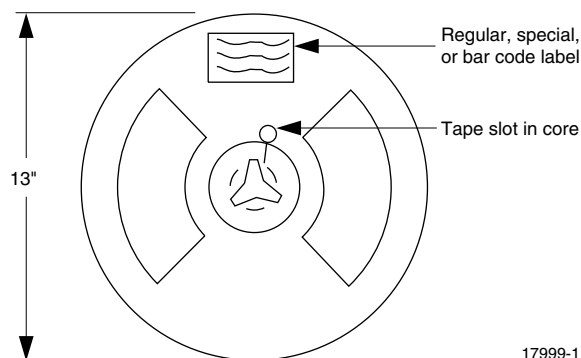


Fig. 19 - Tape and Reel Shipping Medium

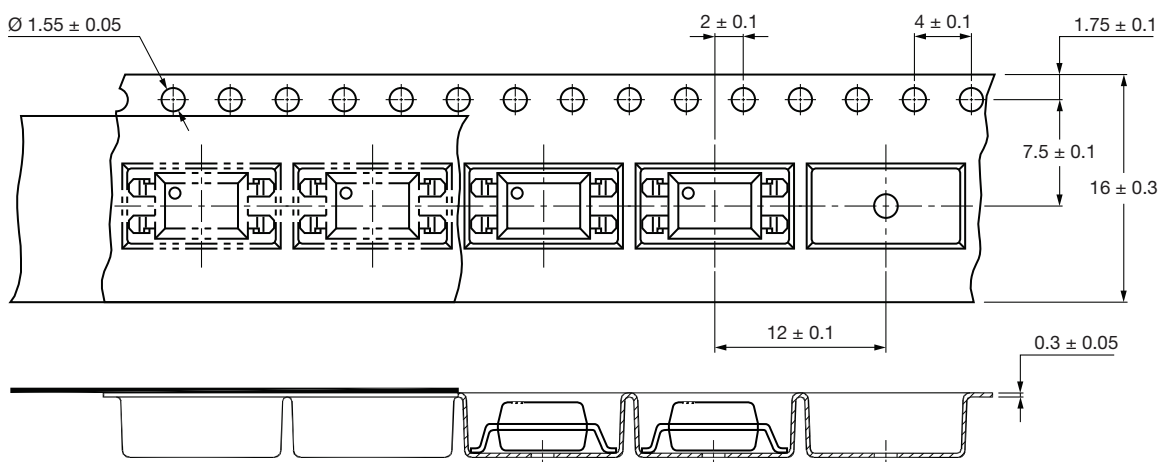


Fig. 20 - Tape and Packing for Option 7 (1000 units per reel)

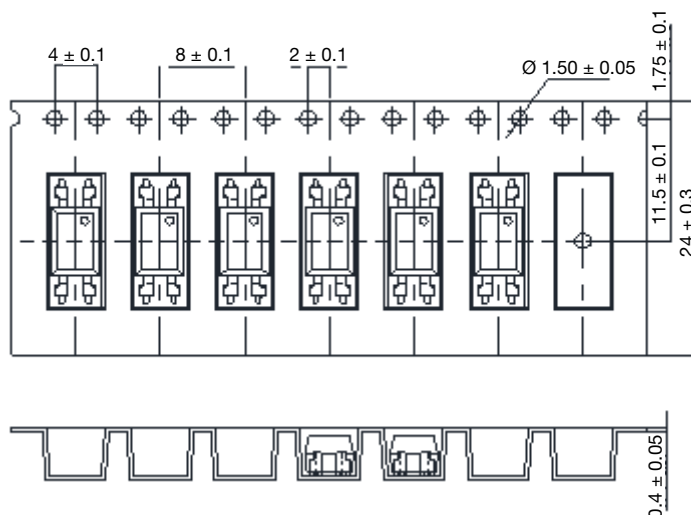


Fig. 21 - Tape and Reel Packaging for Option 8 (2000 units per reel)

## SOLDER PROFILES

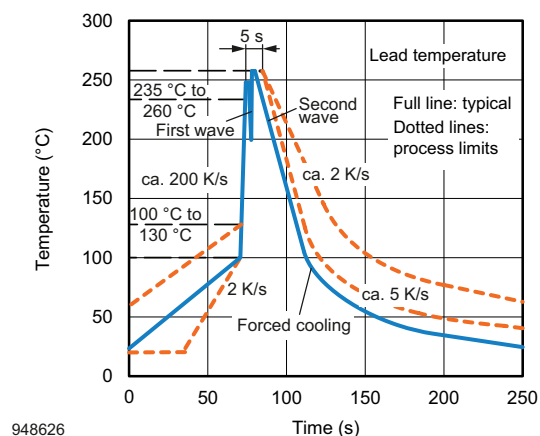


Fig. 22 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices

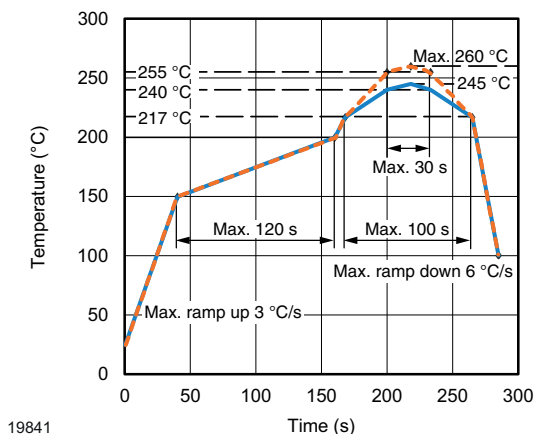


Fig. 23 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

## HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

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

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



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