





| ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified) |                                                        |             |                   |             |       |
|---------------------------------------------------------------------------------|--------------------------------------------------------|-------------|-------------------|-------------|-------|
| PARAMETER                                                                       | TEST CONDITION                                         | PART        | SYMBOL            | VALUE       | UNIT  |
| <b>INPUT</b>                                                                    |                                                        |             |                   |             |       |
| Reverse voltage                                                                 |                                                        |             | V <sub>R</sub>    | 6           | V     |
| Forward current                                                                 |                                                        |             | I <sub>F</sub>    | 60          | mA    |
| Surge current                                                                   |                                                        |             | I <sub>FSM</sub>  | 2.5         | A     |
| Power dissipation                                                               |                                                        |             | P <sub>diss</sub> | 100         | mW    |
| Derate from 25 °C                                                               |                                                        |             |                   | 1.33        | mW/°C |
| <b>OUTPUT</b>                                                                   |                                                        |             |                   |             |       |
| Peak off-state voltage                                                          |                                                        | VO4154D/M   | V <sub>DRM</sub>  | 400         | V     |
|                                                                                 |                                                        | VO4156D/H/M | V <sub>DRM</sub>  | 600         | V     |
| RMS on-state current                                                            |                                                        |             | I <sub>TM</sub>   | 300         | mA    |
| Total power dissipation                                                         |                                                        |             | P <sub>diss</sub> | 500         | mW    |
| Derate from 25 °C                                                               |                                                        |             |                   | 6.6         | mW/°C |
| <b>COUPLER</b>                                                                  |                                                        |             |                   |             |       |
| Storage temperature range                                                       |                                                        |             | T <sub>stg</sub>  | -55 to +150 | °C    |
| Ambient temperature range                                                       |                                                        |             | T <sub>amb</sub>  | -55 to +100 | °C    |
| Soldering temperature                                                           | Max. ≤ 10 s dip soldering<br>≥ 0.5 mm from case bottom |             | T <sub>sld</sub>  | 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.

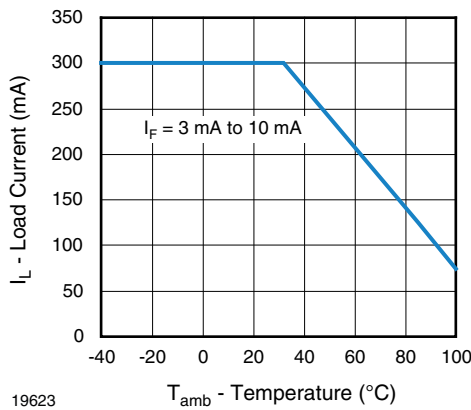


Fig. 1 - Recommended Operating Condition

| THERMAL CHARACTERISTICS                                   |                |       |      |
|-----------------------------------------------------------|----------------|-------|------|
| PARAMETER                                                 | SYMBOL         | VALUE | UNIT |
| LED power dissipation                                     | $P_{diss}$     | 100   | mW   |
| Output power dissipation                                  | $P_{diss}$     | 500   | mW   |
| Maximum LED junction temperature                          | $T_{jmax.}$    | 125   | °C   |
| Maximum output die junction temperature                   | $T_{jmax.}$    | 125   | °C   |
| Thermal resistance, junction emitter to board             | $\theta_{JEB}$ | 150   | °C/W |
| Thermal resistance, junction emitter to case              | $\theta_{JEC}$ | 139   | °C/W |
| Thermal resistance, junction detector to board            | $\theta_{JDB}$ | 78    | °C/W |
| Thermal resistance, junction detector to case             | $\theta_{JDC}$ | 103   | °C/W |
| Thermal resistance, junction emitter to junction detector | $\theta_{JED}$ | 496   | °C/W |
| Thermal resistance, case to ambient                       | $\theta_{CA}$  | 3563  | °C/W |

**Note**

- The thermal characteristics table above were measured at 25 °C and the thermal model is represented in the thermal network below. Each resistance value given in this model can be used to calculate the temperatures at each node for a given operating condition. The thermal resistance from board to ambient will be dependent on the type of PCB, layout and thickness of copper traces. For a detailed explanation of the thermal model, please reference Vishay's Thermal Characteristics of Optocouplers application note.

| ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                           |             |              |      |      |      |                  |
|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------|--------------|------|------|------|------------------|
| PARAMETER                                                                                         | TEST CONDITION                                            | PART        | SYMBOL       | MIN. | TYP. | MAX. | UNIT             |
| <b>INPUT</b>                                                                                      |                                                           |             |              |      |      |      |                  |
| Forward voltage                                                                                   | $I_F = 10\text{ mA}$                                      |             | $V_F$        | -    | 1.2  | 1.4  | V                |
| Reverse current                                                                                   | $V_R = 6\text{ V}$                                        |             | $I_R$        | -    | 0.1  | 10   | $\mu\text{A}$    |
| Input capacitance                                                                                 | $V_F = 0\text{ V}$ , $f = 1\text{ MHz}$                   |             | $C_I$        | -    | 25   | -    | pF               |
| <b>OUTPUT</b>                                                                                     |                                                           |             |              |      |      |      |                  |
| Repetitive peak off-state voltage                                                                 | $I_{DRM} = 100\text{ }\mu\text{A}$                        | VO4154D/M   | $V_{DRM}$    | 400  | -    | -    | V                |
|                                                                                                   |                                                           | VO4156D/H/M | $V_{DRM}$    | 600  | -    | -    | V                |
| Off-state current                                                                                 | $V_D = V_{DRM}$ , $I_F = 0\text{ A}$                      |             | $I_{DRM}$    | -    | -    | 100  | $\mu\text{A}$    |
| On-state voltage                                                                                  | $I_T = 300\text{ mA}$                                     |             | $V_{TM}$     | -    | -    | 3    | V                |
| On-state current                                                                                  | $PF = 1$ , $V_{T(RMS)} = 1.7\text{ V}$                    |             | $I_{TM}$     | -    | -    | 300  | mA               |
| Off-state current in inhibit state                                                                | $I_F = 2\text{ mA}$ , $V_{DRM}$                           |             | $I_{DINH}$   | -    | -    | 200  | $\mu\text{A}$    |
| Holding current                                                                                   |                                                           |             | $I_H$        | -    | -    | 500  | $\mu\text{A}$    |
| Zero cross inhibit voltage                                                                        | $I_F = \text{rated } I_{FT}$                              |             | $V_{IH}$     | -    | -    | 20   | V                |
| Critical rate of rise of off-state voltage                                                        | $V_D = 0.67 V_{DRM}$ , $T_J = 25\text{ }^{\circ}\text{C}$ |             | $dV/dt_{cr}$ | 5000 | -    | -    | V/ $\mu\text{s}$ |
| Critical rate of rise of on-state                                                                 |                                                           |             | $dV/dt_{cr}$ | 8    | -    | -    | A/ $\mu\text{s}$ |
| <b>COUPLER</b>                                                                                    |                                                           |             |              |      |      |      |                  |
| LED trigger current, current required to latch output                                             | $V_D = 3\text{ V}$                                        | VO4154D     | $I_{FT}$     | -    | -    | 1.6  | mA               |
|                                                                                                   |                                                           | VO4154M     | $I_{FT}$     | -    | -    | 3    | mA               |
|                                                                                                   |                                                           | VO4156D     | $I_{FT}$     | -    | -    | 1.6  | mA               |
|                                                                                                   |                                                           | VO4156H     | $I_{FT}$     | -    | -    | 2    | mA               |
|                                                                                                   |                                                           | VO4156M     | $I_{FT}$     | -    | -    | 3    | mA               |
| Common mode coupling capacitance                                                                  |                                                           |             | $C_{CM}$     | -    | 0.01 | -    | pF               |
| Capacitance (input to output)                                                                     | $f = 1\text{ MHz}$ , $V_{IO} = 0\text{ V}$                |             | $C_{IO}$     | -    | 0.8  | -    | pF               |

**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.

| SAFETY AND INSULATION RATINGS                |                                                                   |            |                |                    |
|----------------------------------------------|-------------------------------------------------------------------|------------|----------------|--------------------|
| PARAMETER                                    | TEST CONDITION                                                    | SYMBOL     | VALUE          | UNIT               |
| Climatic classification                      | According to IEC 68 part 1                                        |            | 55 / 100 / 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                                    | $V_{ISO}$  | 4420           | $V_{RMS}$          |
| 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                                     | $V_{IORM}$ | 890            | $V_{peak}$         |
| Isolation resistance                         | $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{IO} = 500\text{ V}$  | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$           |
|                                              | $T_{amb} = 100\text{ }^{\circ}\text{C}$ , $V_{IO} = 500\text{ V}$ | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$           |
| Output safety power                          |                                                                   | $P_{SO}$   | 500            | mW                 |
| Input safety current                         |                                                                   | $I_{SI}$   | 250            | mA                 |
| Input safety temperature                     |                                                                   | $T_S$      | 175            | $^{\circ}\text{C}$ |
| Creepage distance                            | DIP-6                                                             |            | $\geq 7$       | mm                 |
| Clearance distance                           |                                                                   |            | $\geq 7$       | mm                 |
| Creepage distance                            | DIP-6, 400 mil, option 6                                          |            | $\geq 8$       | mm                 |
| Clearance distance                           |                                                                   |            | $\geq 8$       | mm                 |
| Creepage distance                            | SMD-6, option 7                                                   |            | $\geq 7$       | mm                 |
| Clearance distance                           |                                                                   |            | $\geq 7$       | mm                 |
| Insulation thickness                         |                                                                   | DTI        | $\geq 0.4$     | 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.

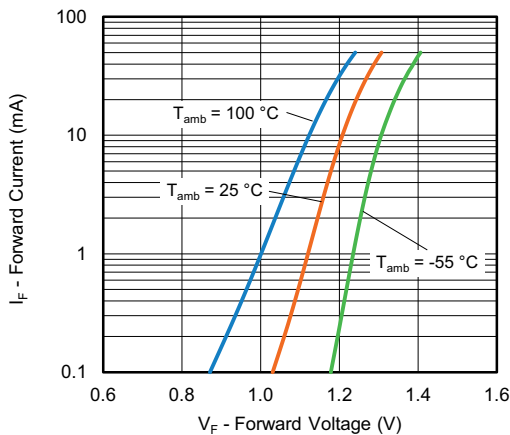
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 2 - Diode Forward Voltage vs. Forward Current

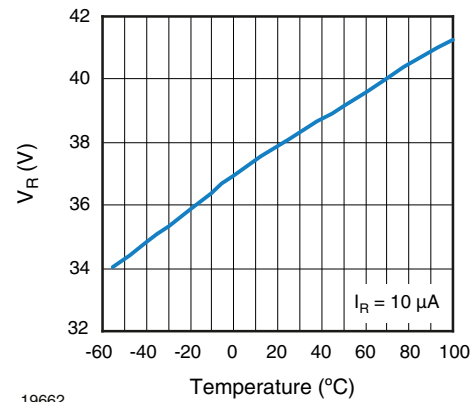


Fig. 3 - Diode Reverse Voltage vs. Temperature

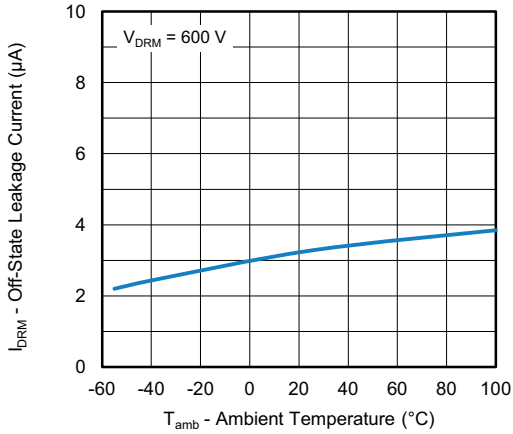


Fig. 4 - Leakage Current vs. Ambient Temperature

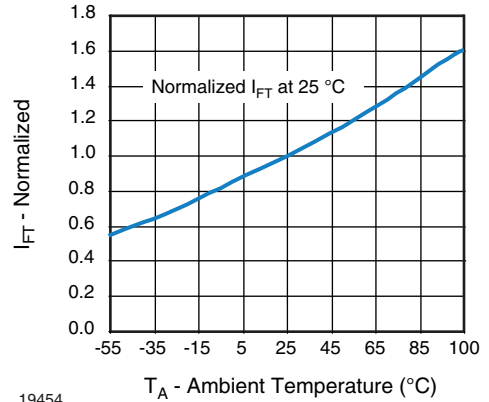


Fig. 7 - Normalized Trigger Input Current vs. Temperature

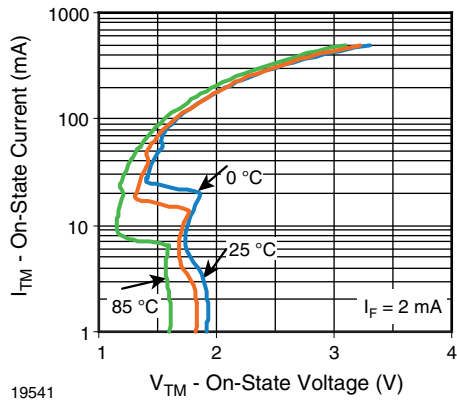


Fig. 5 - On-State Current vs. On-State Voltage

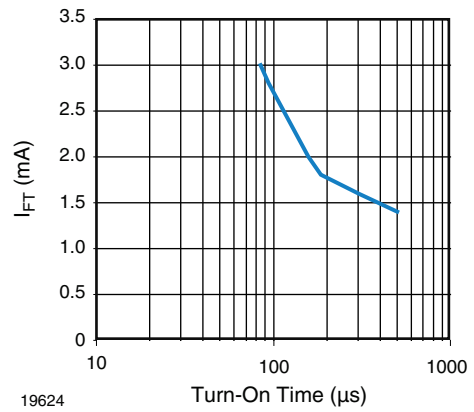


Fig. 8 -  $I_{FT}$  (mA) vs. Turn-On Time ( $\mu$ s)

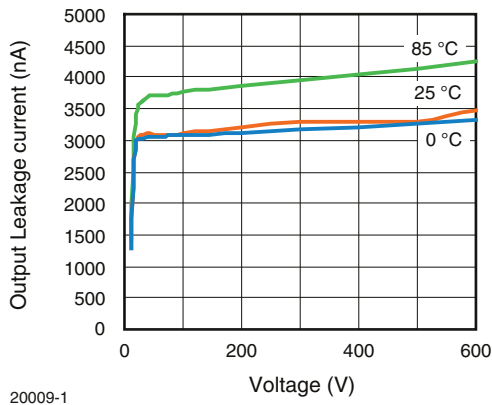


Fig. 6 - Output Off Current (Leakage) vs. Voltage

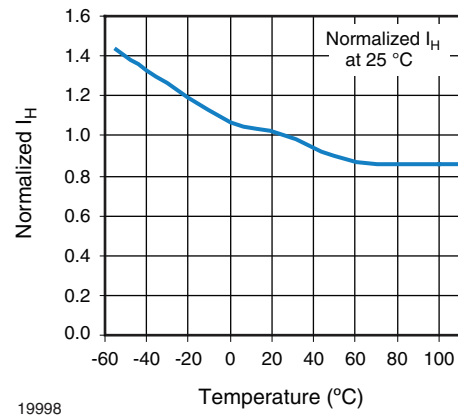


Fig. 9 - Normalized Holding Current vs. Temperature

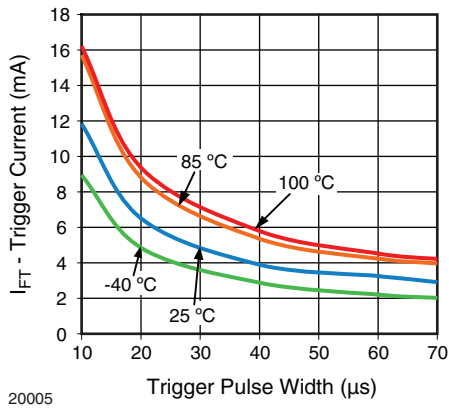
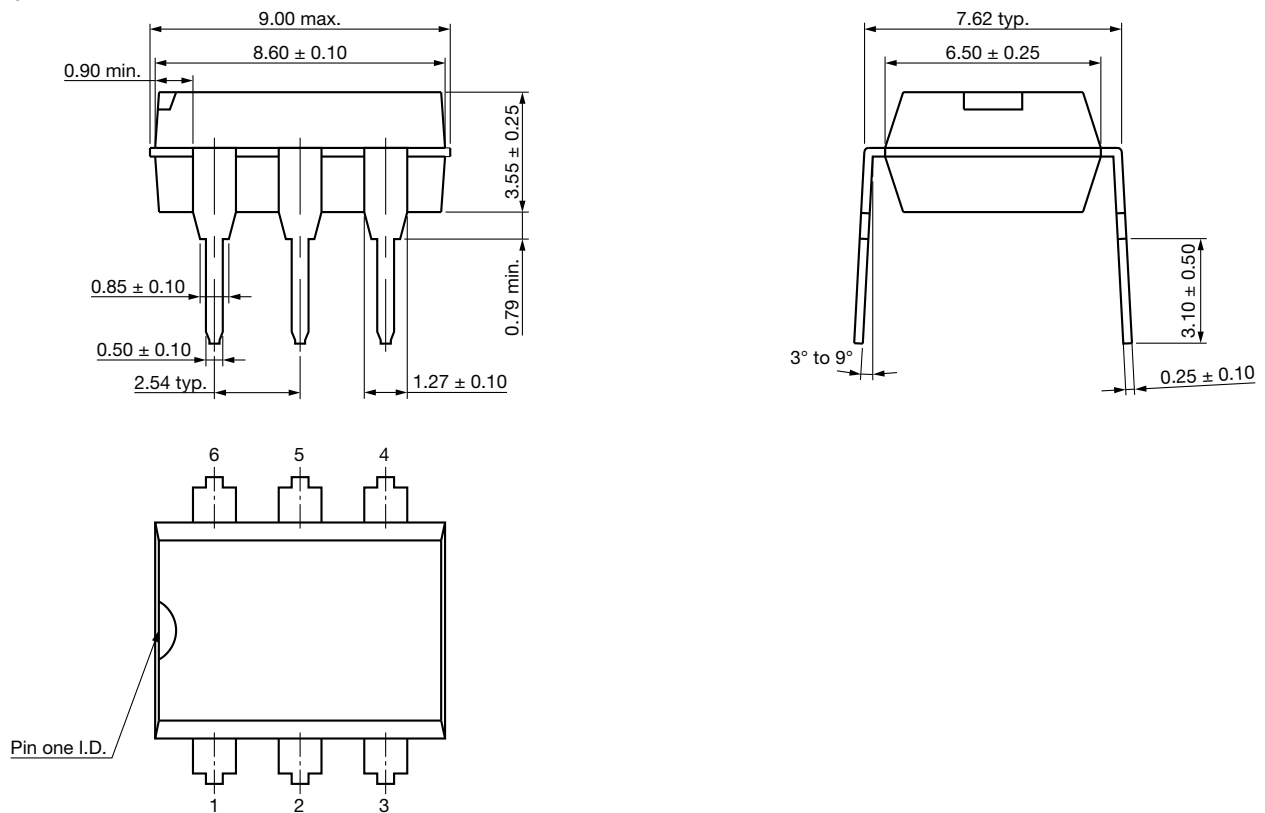


Fig. 10 -  $I_{FT}$  vs. LED Pulse Width

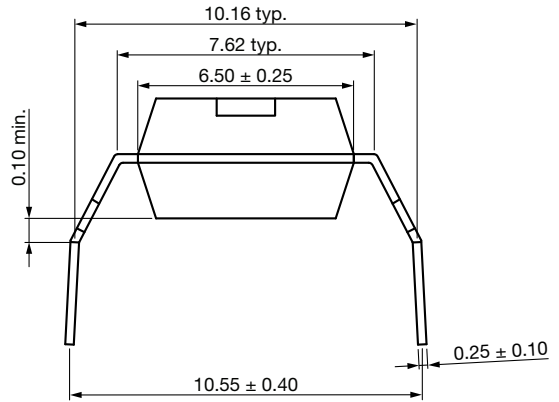
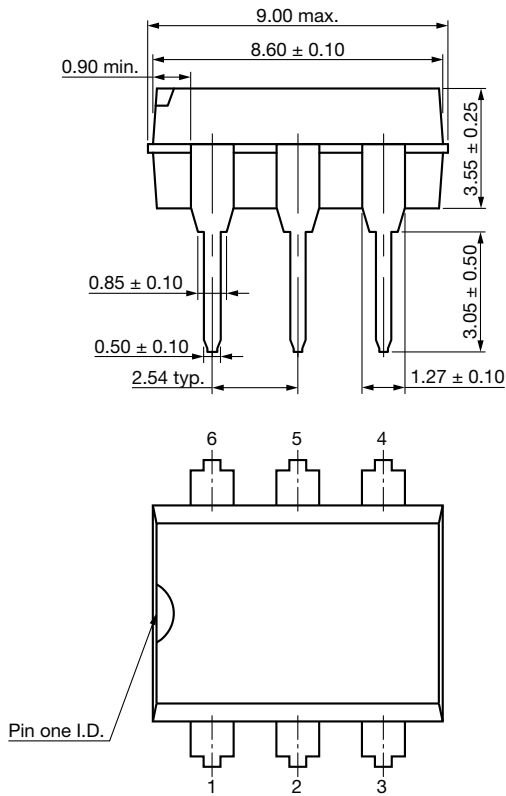
**PACKAGE DIMENSIONS**

**DIP-6**

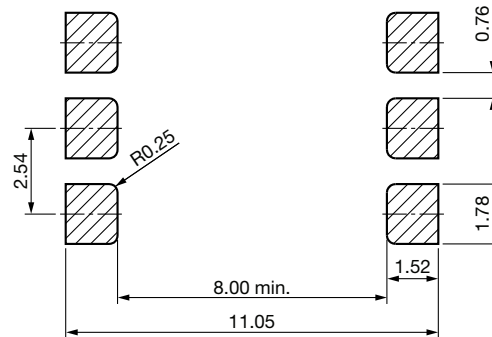
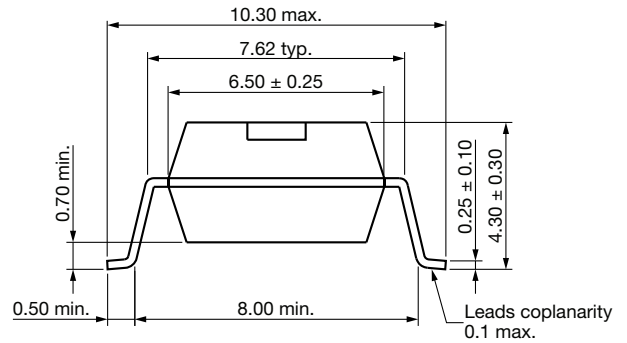
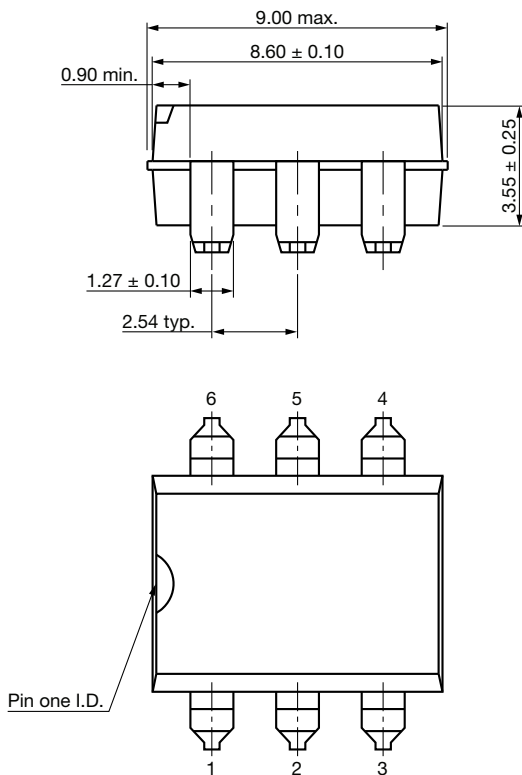




DIP-6, Option 6



SMD-6, Option 7



**PACKAGE MARKING**

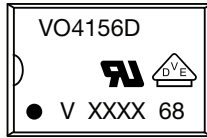


Fig. 11 - Example of VO4156D-X017T

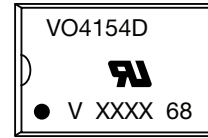


Fig. 12 - Example of VO4154D-X006

**Notes**

- XXXX = LMC (lot marking code)
- The VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking

**PACKING INFORMATION** (in millimeters)

**Tube**

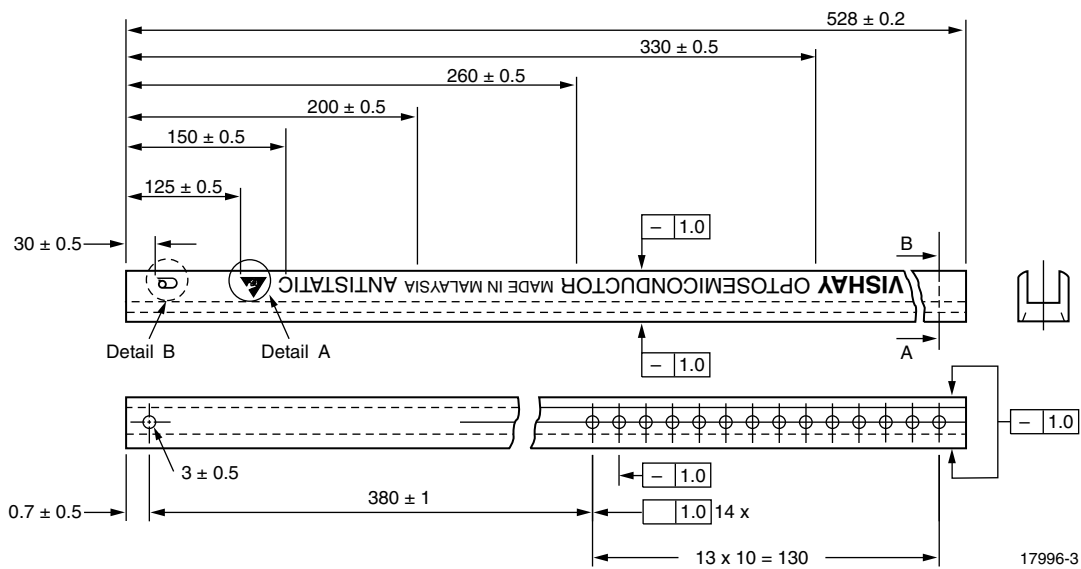


Fig. 13 - Shipping Tube Specifications for DIP-6 Packages

| DEVICES PER TUBS |            |           |           |
|------------------|------------|-----------|-----------|
| TYPE             | UNITS/TUBE | TUBES/BOX | UNITS/BOX |
| DIP-6            | 50         | 40        | 2000      |
| DIP-6, option 6  | 50         | 40        | 2000      |



**DIP-6**

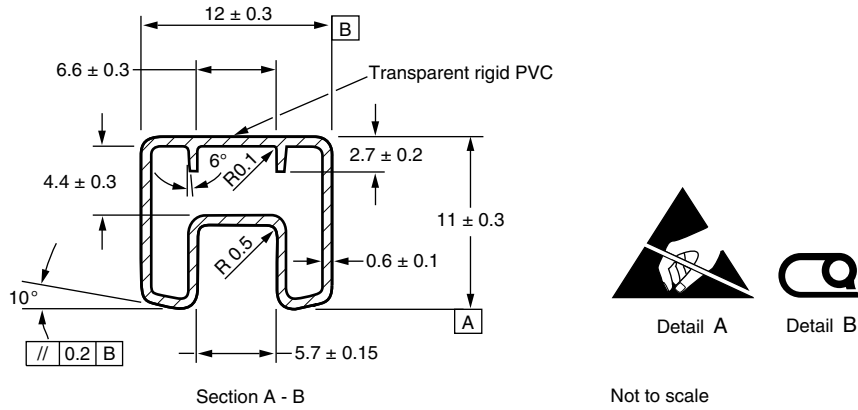


Fig. 14 - Tube Shipping Medium

**DIP-6, Option 6**

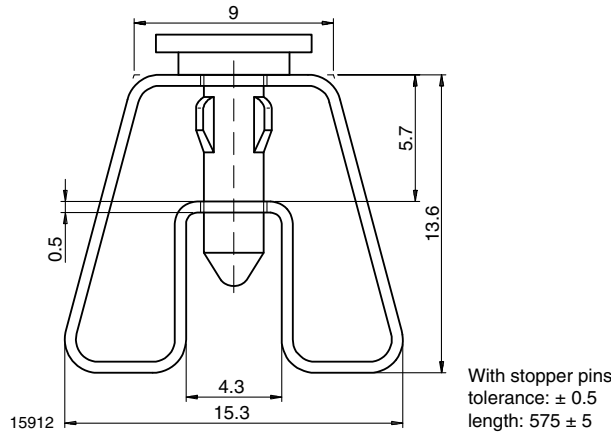


Fig. 15 - Tube Shipping Medium

**Tape and Reel**

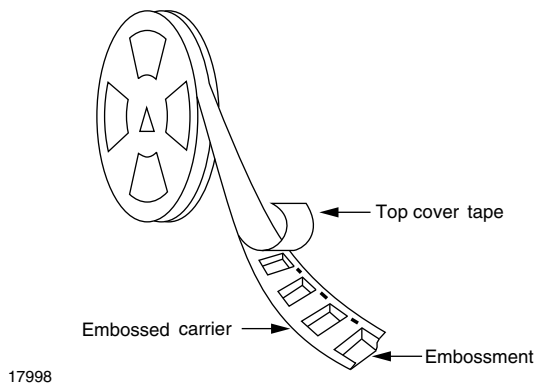


Fig. 16 - Tape and Reel Shipping Medium

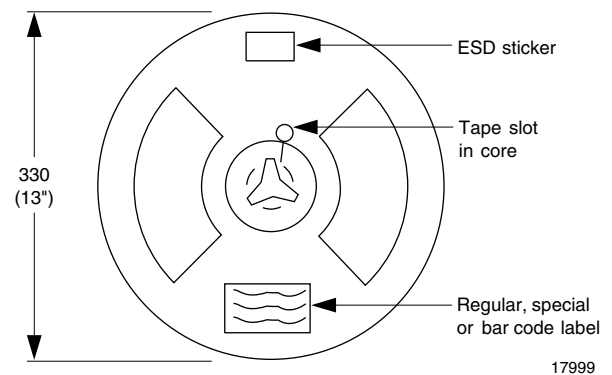


Fig. 17 - Tape and Reel Shipping Medium

**SMD-6, Option 7**

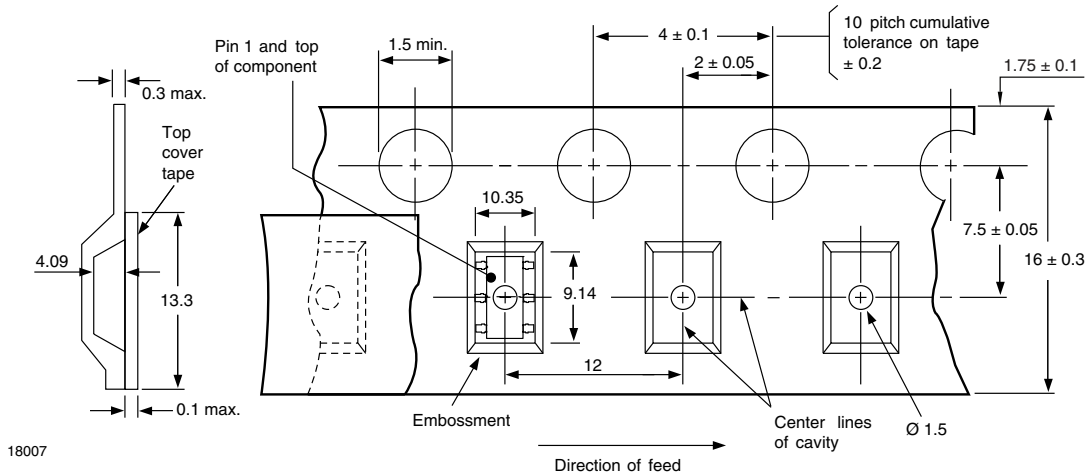
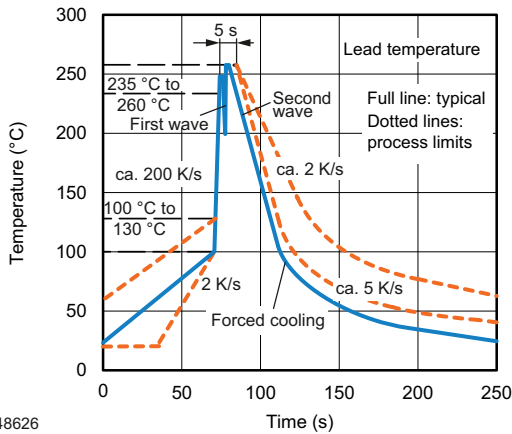


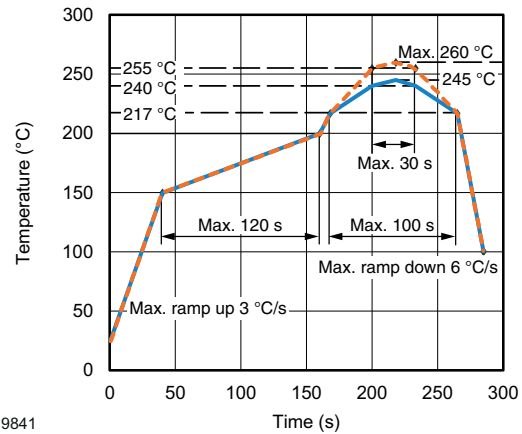
Fig. 18 - Tape and Reel Packing (1000 pieces on reel)

**SOLDER PROFILES**



948626

Fig. 19 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices



19841

Fig. 20 - 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:  $T_{amb} < 30\text{ }^{\circ}\text{C}$ , RH < 85 %

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



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