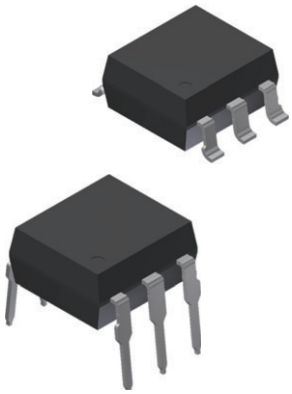
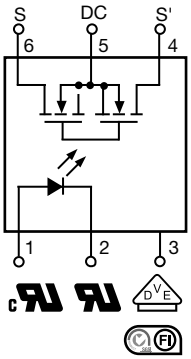
# 1 Form A Solid-State Relay






## FEATURES

- High speed SSR - $t_{on}/t_{off}$ < 800 µs
- Maximum $R_{ON}$ 0.25 Ω
- Isolation test voltage 5300 $V_{RMS}$
- Load voltage 60 V
- Load current 2 $A_{DC}$ configuration
- DIP-6 package
- Clean bounce free switching
- TTL / CMOS compatible input
- Available on tape and reel
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

## LINKS TO ADDITIONAL RESOURCES

Product Page | Design Tools | SPICE Models

## APPLICATIONS

- Instrumentation
- Industrial controls
- Security
- Automatic measurement equipment

## DESCRIPTION

The VO14642 is a high speed single channel normally open solid-state relay (SPST - 1 form A) in a DIP-6 package. The relay is constructed as a multi-chip hybrid device. A high efficient infrared LED enables low forward current on the input side. On the output side high performance MOSFET switches provide a low $R_{ON}$ and can be configured for AC/DC or DC only operation.

## AGENCY APPROVALS

- UL 1577
- cUL
- DIN EN 60747-5-5 (VDE 0884-5)
- FIMKO

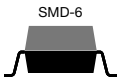
**Note**

- Agency approvals are valid only for ambient temperature range -40 °C to +85 °C

## ORDERING INFORMATION

| V | O | 1 | 4 | 6 | 4 | 2 | A | x | x | T | R |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER | | | | | | | ELECTR. VARIATION | PACKAGE CONFIG. | | TAPE AND REEL | |




| PACKAGE | |
|---|---|
| SMD-6, tape and reel | VO14642AABTR |
| DIP-6, Tubes | VO14642AT |



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| ABSOLUTE MAXIMUM RATINGS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| **INPUT** | | | | |
| LED continous forward current | | $I_F$ | 50 | mA |
| LED reverse voltage | | $V_R$ | 5 | V |
| LED power dissipation | At 25 °C | $P_{diss}$ | 80 | mW |
| **OUTPUT** | | | | |
| DC or peak AC load voltage | | $V_L$ | 60 | V |
| Load current (DC only) | | $I_L$ | 2000 | mA |
| Peak load current (AC/DC) | t = 10 ms | $I_{LPK}$ | 3.6 | A |
| Output power dissipation | At 25 °C | $P_{diss}$ | 250 | mW |
| **SSR** | | | | |
| Total power dissipation | | $P_{diss}$ | 330 | mW |
| Ambient temperature range | | $T_{amb}$ | -55 to +85 | °C |
| Storage temperature range | | $T_{stg}$ | -55 to +125 | °C |
| Soldering temperature (1) | t ≤ 10 s max. | $T_{sld}$ | 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 (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

## ABSOLUTE MAXIMUM RATING CURVE

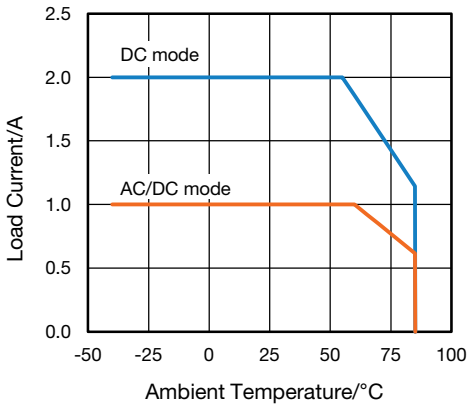


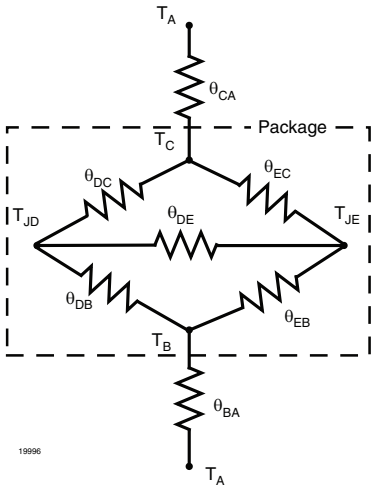

Fig. 1 - Load Current (AC/DC) vs. Temperature

| THERMAL CHARACTERISTICS | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| Maximum LED junction temperature | At 25 °C | $T_{jmax.}$ | 125 | °C |
| Maximum output die junction temperature | At 25 °C | $T_{jmax.}$ | 125 | °C |
| Thermal resistance, junction emitter to board | At 25 °C | $\theta_{EB}$ | 176 | °C/W |
| Thermal resistance, junction emitter to case | At 25 °C | $\theta_{EC}$ | 208 | °C/W |
| Thermal resistance, junction detector to board | At 25 °C | $\theta_{DB}$ | 67 | °C/W |
| Thermal resistance, junction detector to case | At 25 °C | $\theta_{DC}$ | 134 | °C/W |
| Thermal resistance, junction emitter to junction detector | At 25 °C | $\theta_{ED}$ | 310 | °C/W |
| Thermal resistance, case to ambient | At 25 °C | $\theta_{CA}$ | 2180 | °C/W |

**Note**

- 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.


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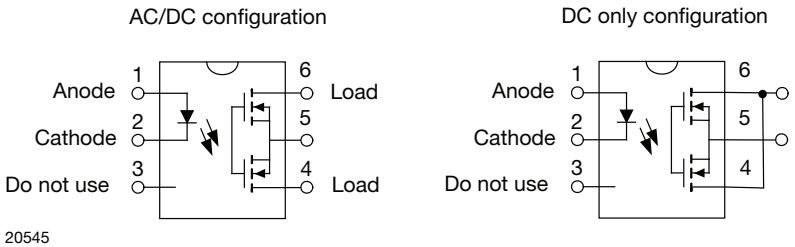



| **ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **INPUT** | | | | | | |
| LED forward current, switch turn-on | $I_L$ = 1 A, $V_L \leq$ 0.5 V, t = 10 ms | $I_{Fon}$ | - | 0.5 | 2 | mA |
| LED forward current, switch turn-off | $V_L$ = 60 V, $I_L$ < 1 µA | $I_{Foff}$ | 50 | - | - | µA |
| LED reverse current | $V_R$ = 5 V | $I_R$ | - | - | 10 | µA |
| LED forward voltage | $I_F$ = 10 mA | $V_F$ | 1.0 | 1.4 | 1.6 | V |
| **OUTPUT** | | | | | | |
| On-resistance (AC/DC) | $I_F$ = 10 mA, $I_L$ = 1 A | $R_{ON}$ | - | 0.18 | 0.25 | Ω |
| On-resistance (DC only) | $I_F$ = 10 mA, $I_L$ = 2 A | $R_{ON}$ | - | 0.05 | 0.07 | Ω |
| Off-state leakage current | $I_F$ = 0 mA, $V_L$ = 60 V | $I_{LEAK}$ | - | - | 1 | µA |

**Note**

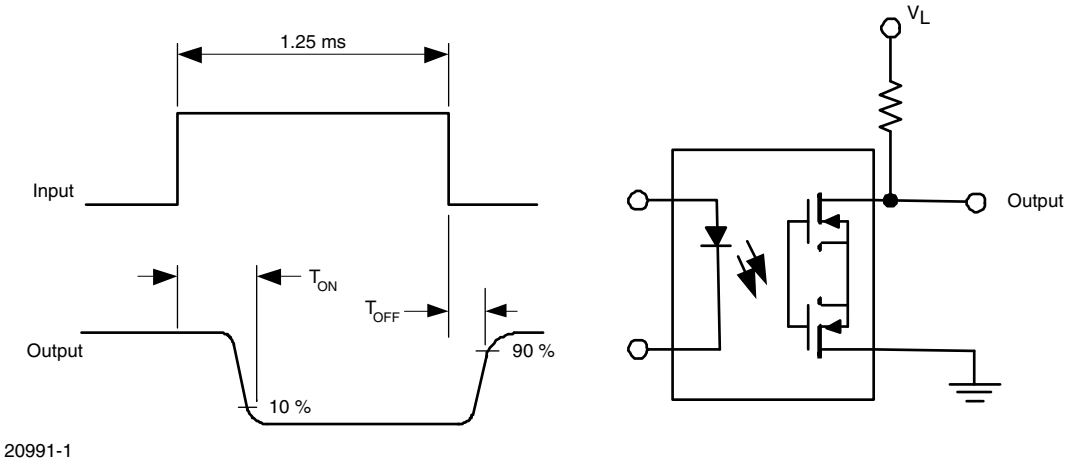
- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information only and are not part of the testing requirements.

## PIN CONFIGURATION




| **SWITCHING CHARACTERISTICS (AC/DC CONNECTION)** | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| Turn-on time | $I_F$ = 10 mA, $V_L$ = 30 V, $I_L$ = 200 mA | $t_{on}$ | - | 370 | 800 | µs |
| Turn-off time | $I_F$ = 10 mA, $V_L$ = 30 V, $I_L$ = 200 mA | $t_{off}$ | - | 50 | 800 | µs |
| Turn-on time | $I_F$ = 10 mA, $V_L$ = 5 V, $I_L$ = 1 A | $t_{on}$ | - | 550 | - | µs |
| Turn-off time | $I_F$ = 10 mA, $V_L$ = 5 V, $I_L$ = 1 A | $t_{off}$ | - | 18 | - | µs |


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## SAFETY AND INSULATION RATINGS

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| Climatic classification | According to IEC 68 part 1 | | 40 / 085 / 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 | $V_{ISO}$ | 5300 | $V_{RMS}$ |
| 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 °C, $V_{IO}$ = 500 V | $R_{IO}$ | ≥ $10^{12}$ | Ω |
| | $T_{amb}$ = 100 °C, $V_{IO}$ = 500 V | $R_{IO}$ | ≥ $10^{11}$ | Ω |
| | $T_{amb}$ = $T_S$, $V_{IO}$ = 500 V | $R_{IO}$ | ≥ $10^{9}$ | Ω |
| Output safety power | | $P_{SO}$ | 400 | mW |
| Input safety current | | $I_{SI}$ | 150 | mA |
| Input safety temperature | | $T_S$ | 165 | °C |
| Creepage distance | | | ≥ 7 | mm |
| Clearance distance | | | ≥ 7 | mm |
| Insulation thickness | | DTI | ≥ 0.4 | mm |

**Note**

- This SSR is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

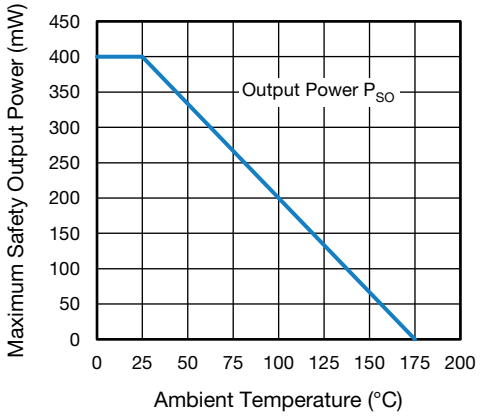



Fig. 2 - Safety Derating (output)

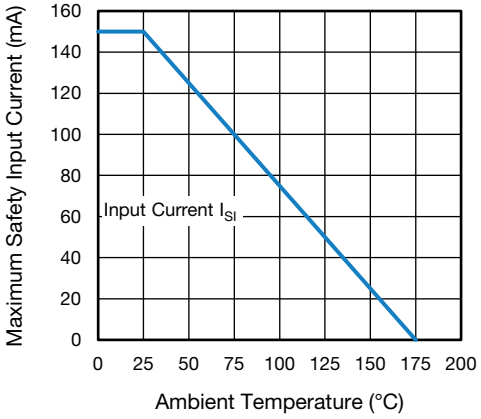



Fig. 3 - Safety Derating (input)


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

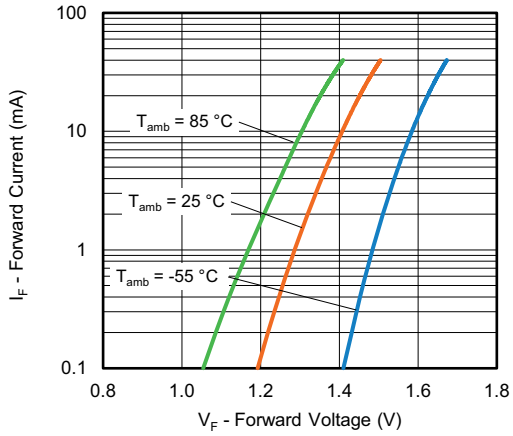



Fig. 4 - Forward Voltage vs. Forward Current

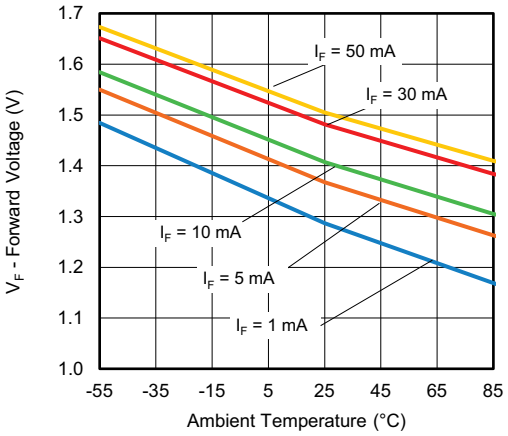



Fig. 7 - LED Voltage vs. Temperature

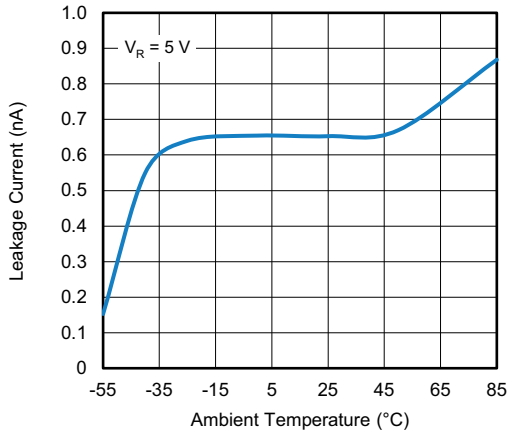



Fig. 5 - LED Leakage Current vs. Ambient Temperature

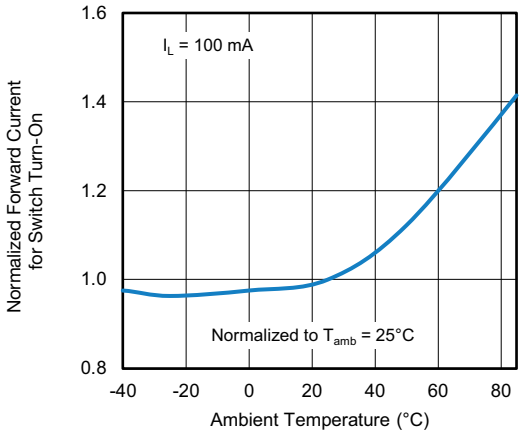



Fig. 8 - LED Forward Current for Switch Turn-On vs. Ambient Temperature

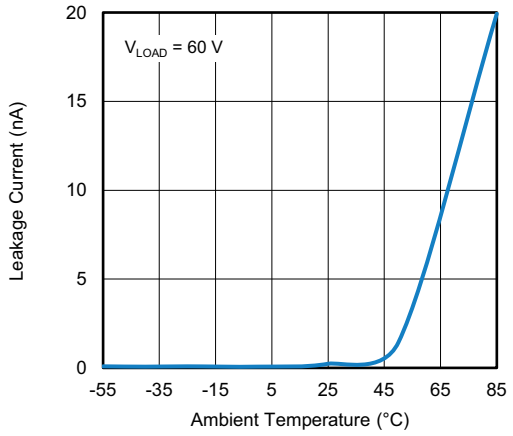



Fig. 6 - Leakage Current vs. Temperature

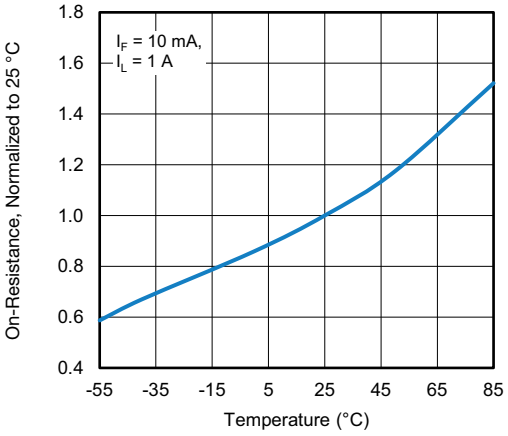



Fig. 9 - On-Resistance vs. Temperature


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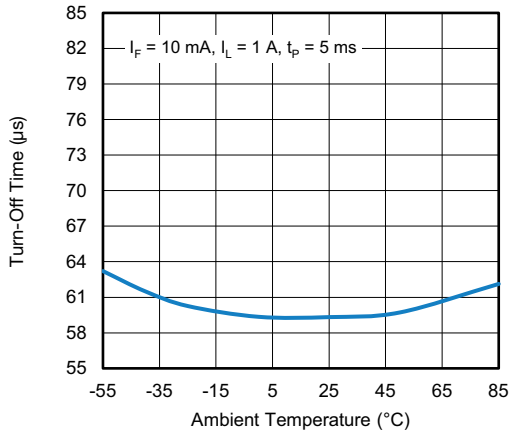



Fig. 10 - Turn-Off Time vs. Temperature

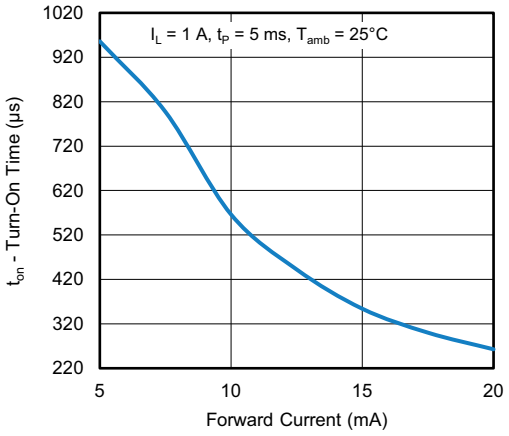



Fig. 13 - Turn-On Time vs. Forward Current

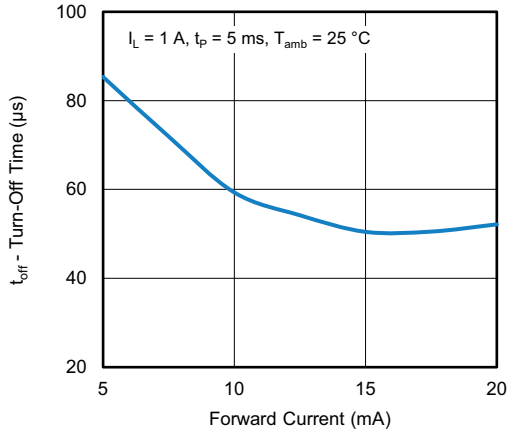



Fig. 11 - Turn-Off Time vs. Forward Current

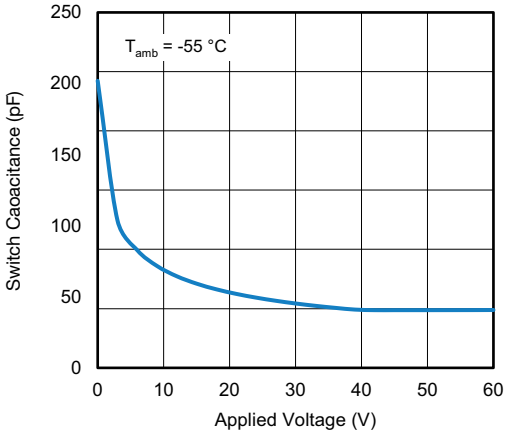



Fig. 14 - Switch Capacitance vs. Applied Voltage

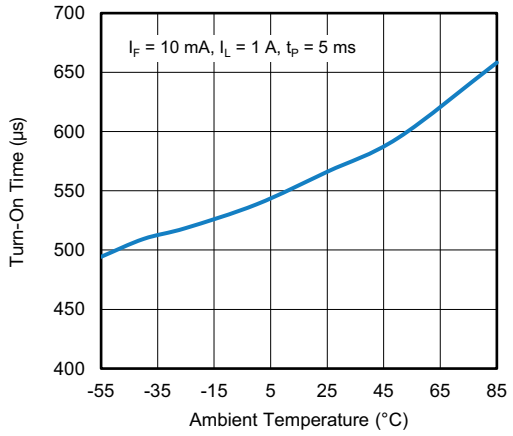
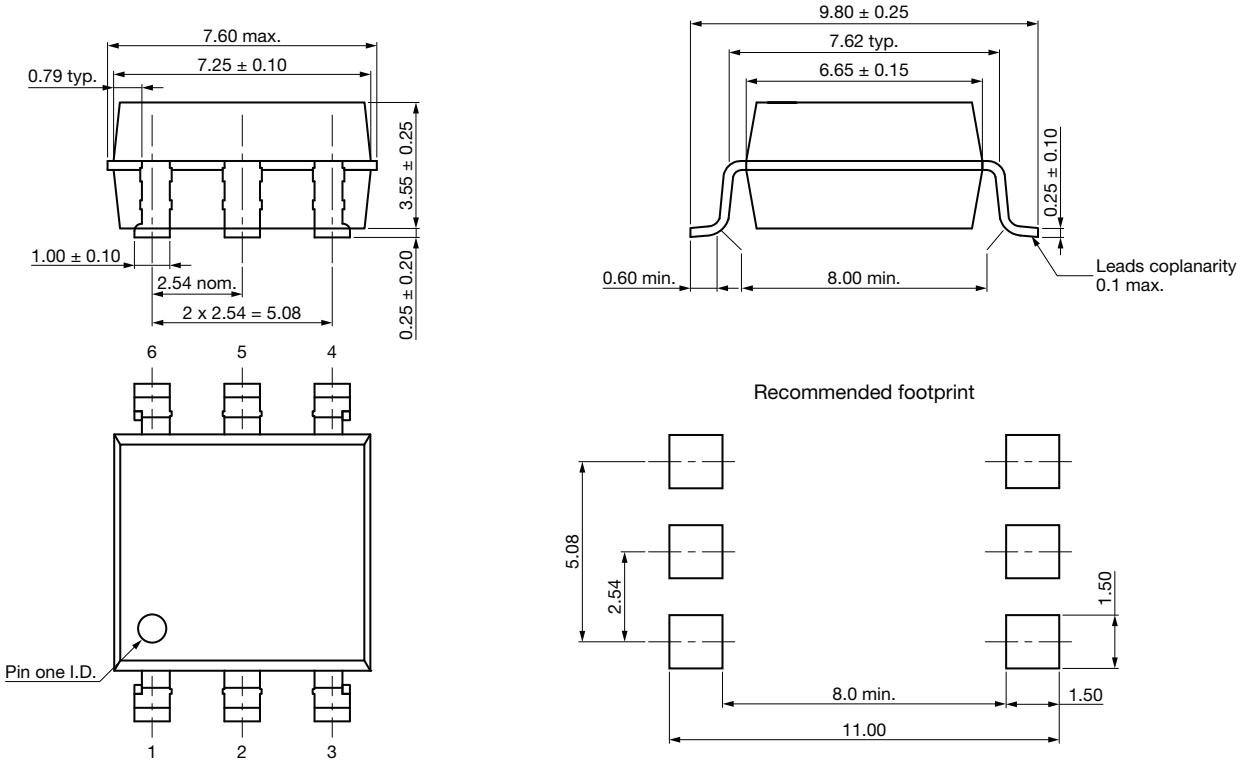



Fig. 12 - Turn-On Time vs. Temperature

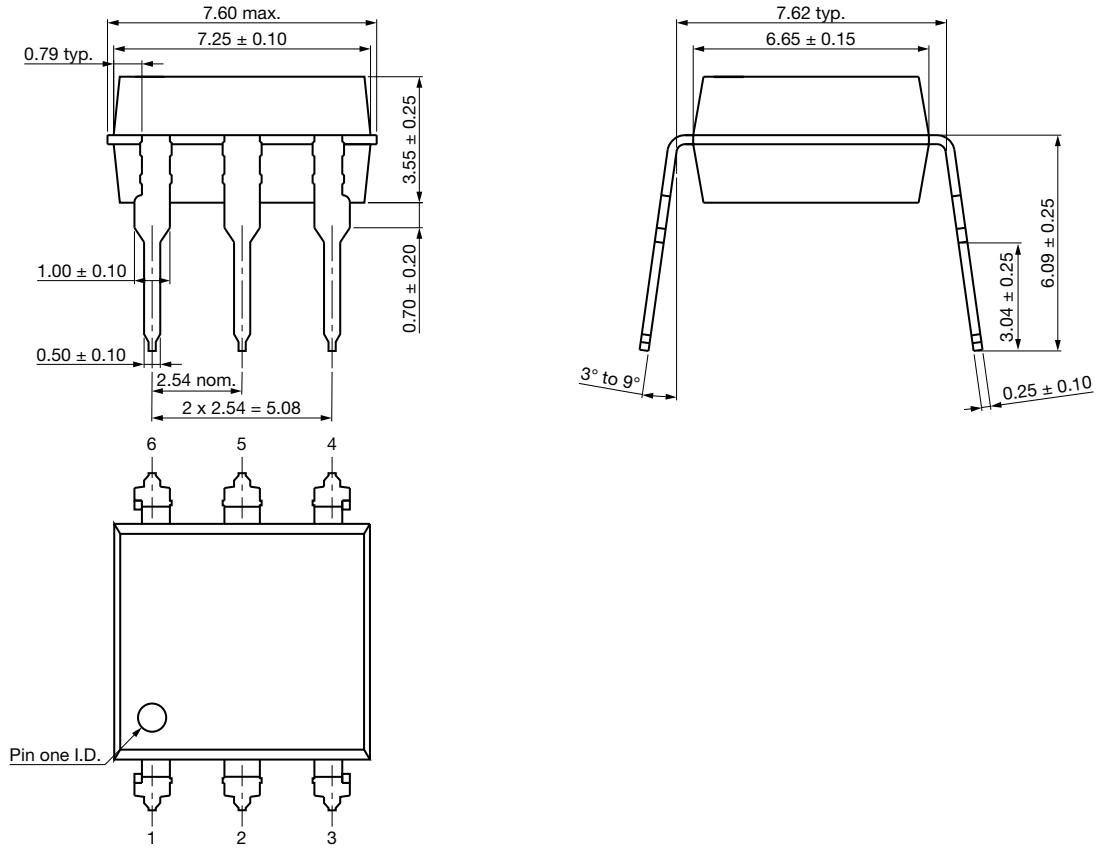

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## PACKAGE DIMENSIONS (in millimeters)

### SMD-6



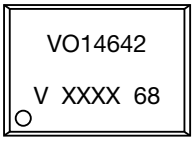

### DIP-6





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## PACKAGE MARKING




**Notes**

- XXXX = LMC (lot marking code)
- Tape and reel suffix “TR” is not part of the package marking

## PACKING INFORMATION (in millimeters)

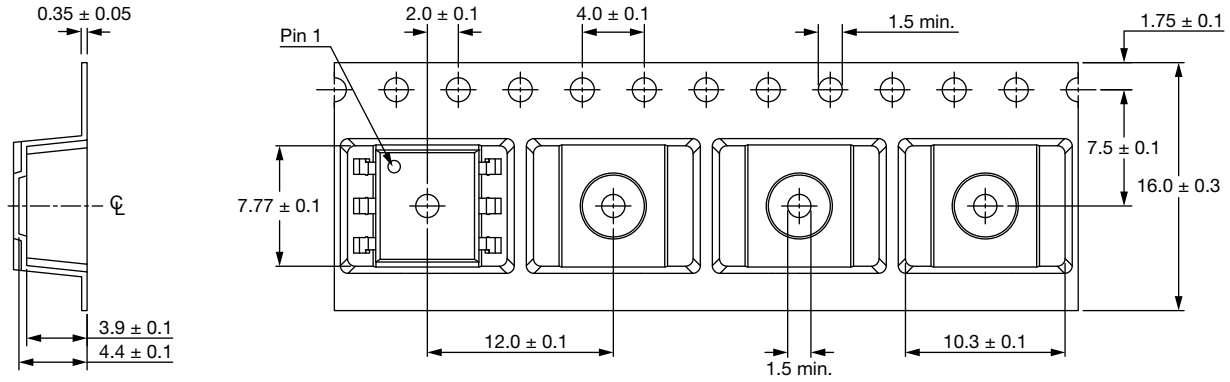



Fig. 15 - Tape and Reel Packing

| TAPE AND REEL PACKING | |
|---|---|
| **TYPE** | **UNITS/REEL** |
| SMD-6 | 1000 |

| TUBE PACKING | | | |
|---|---|---|---|
| **TYPE** | **UNITS/TUBE** | **TUBES/BOX** | **UNITS/BOX** |
| DIP-6 | 50 | 40 | 2000 |

## SOLDER PROFILES

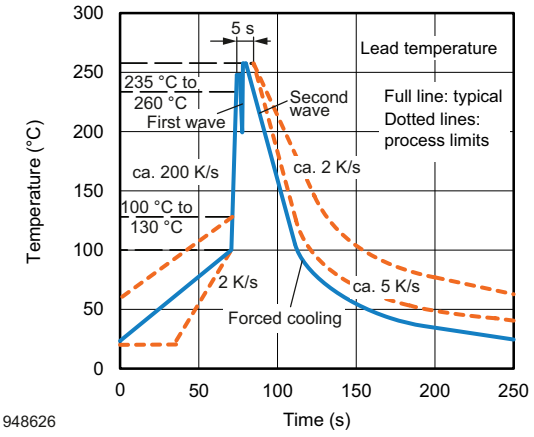



Fig. 16 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices

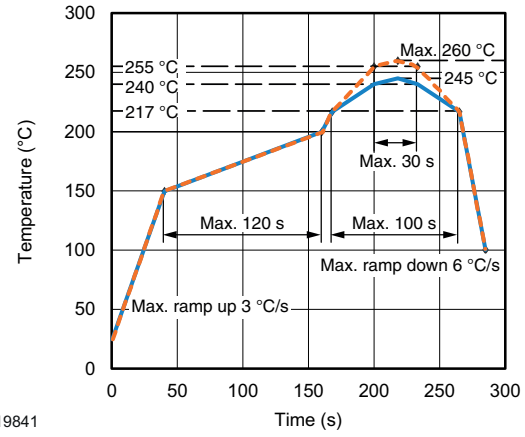



Fig. 17 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices


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## 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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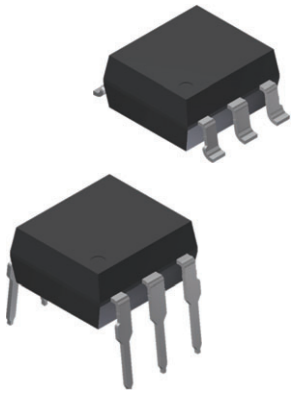
# Footprint and Schematic Information for VO14642AAB, VO14642AT

The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

Note that the 3D models for these parts can be found on the Vishay product page.

| PART NUMBER | FOOTPRINT / SCHEMATIC |
|---|---|
| VO14642AAB | www.snapeda.com/parts/VO14642AAB/Vishay/view-part |
| VO14642AT | www.snapeda.com/parts/VO14642AT/Vishay/view-part |

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