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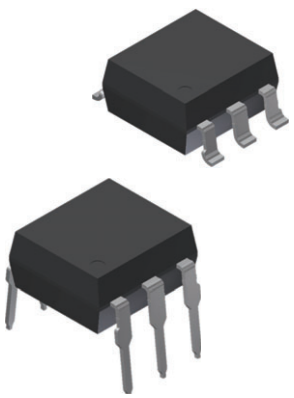
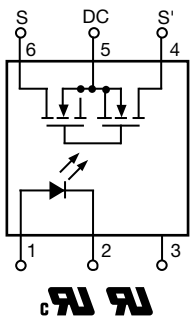
1 Form A Solid-State Relay





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

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.

APPLICATIONS

- Instrumentation
- Industrial controls
- Security
- Automatic measurement equipment

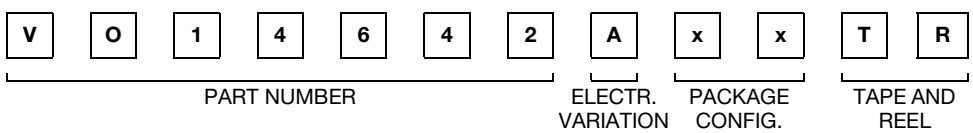
AGENCY APPROVALS

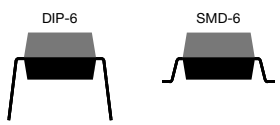
- UL1577
- cUL - UL1577
- DIN EN 60747-5-5 (VDE 0884-5) capable, consult sales representative for details

Note

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

ORDERING INFORMATION





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	2	A
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

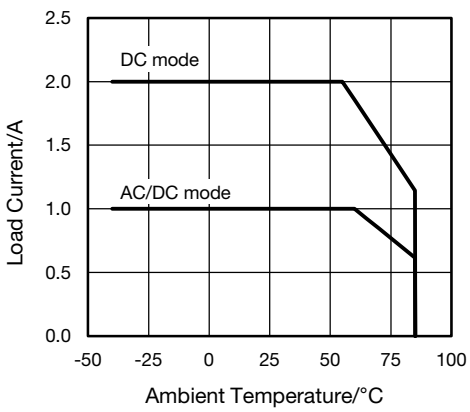

Fig. 1 - Load Current (AC/DC) vs. Temperature

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	θ_{EB}	176	°C/W
Thermal resistance, junction emitter to case	At 25 °C	θ_{EC}	208	°C/W
Thermal resistance, junction detector to board	At 25 °C	θ_{DB}	67	°C/W
Thermal resistance, junction detector to case	At 25 °C	θ_{DC}	134	°C/W
Thermal resistance, junction emitter to junction detector	At 25 °C	θ_{ED}	310	°C/W
Thermal resistance, case to ambient	At 25 °C	θ_{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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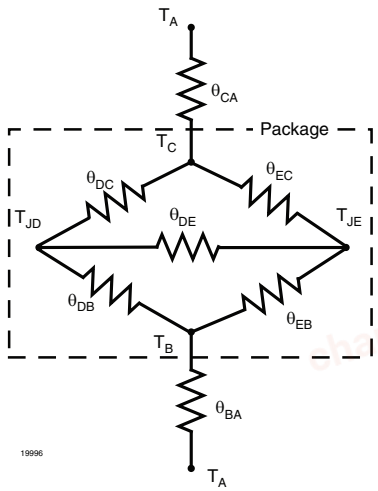
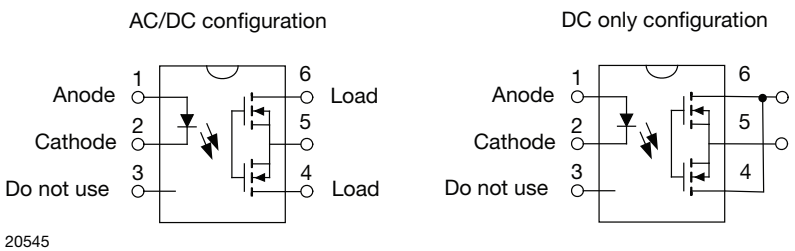


ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
LED forward current, switch turn-on	I_L = 1 A, $V_L \leq$ 0.5 V, t = 10 ms	I_{Fon}	-	0.5	2	mA
LED forward current, switch turn-off	V_L = 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	1.3	1.5	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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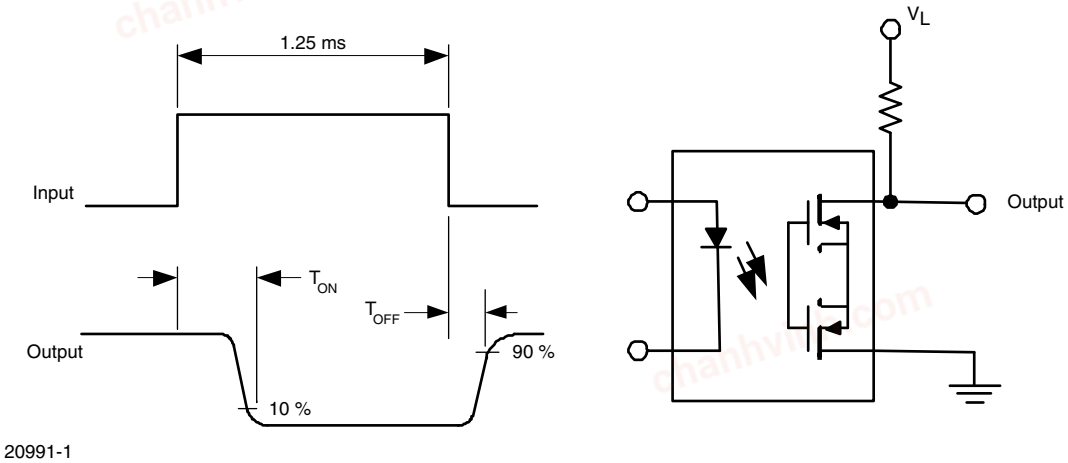

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SAFETY AND INSULATION RATINGS

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

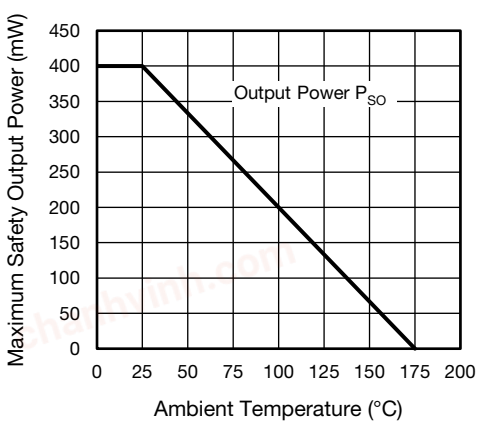

Fig. 2 - Safety Derating (input)

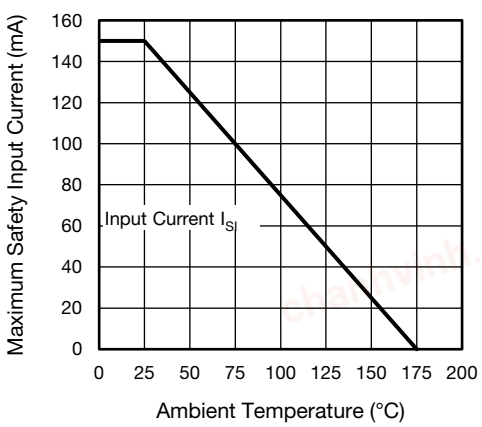

Fig. 3 - Safety Derating (output)

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

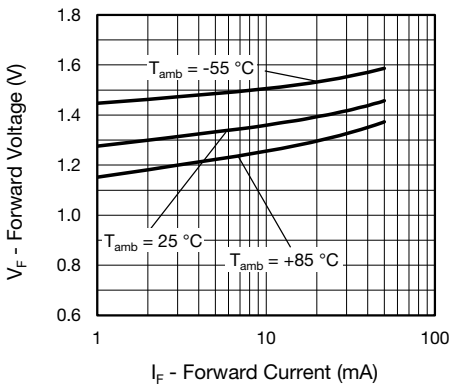

Fig. 4 - Forward Voltage vs. Forward Current

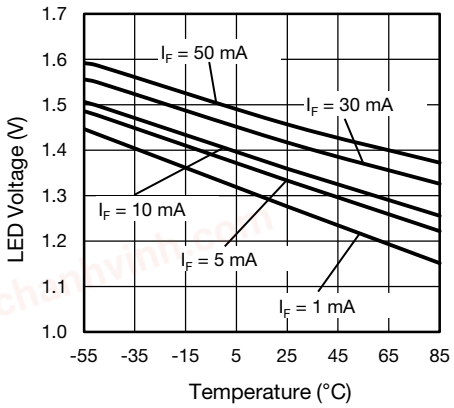

Fig. 7 - LED Voltage vs. Temperature

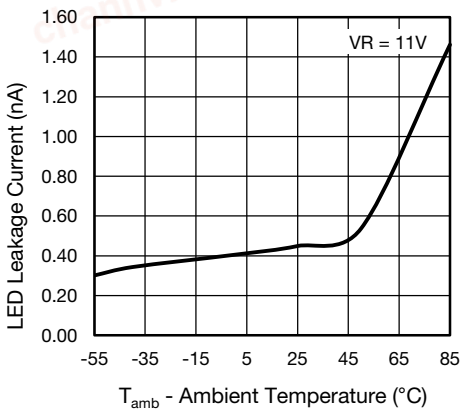

Fig. 5 - LED Leakage Current vs. Ambient Temperature

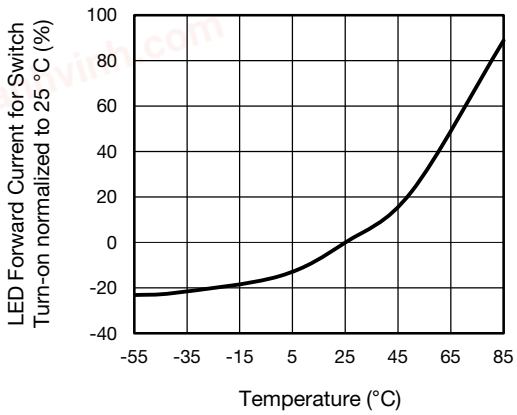

Fig. 8 - LED Forward Current for Switch Turn-On vs. Temperature

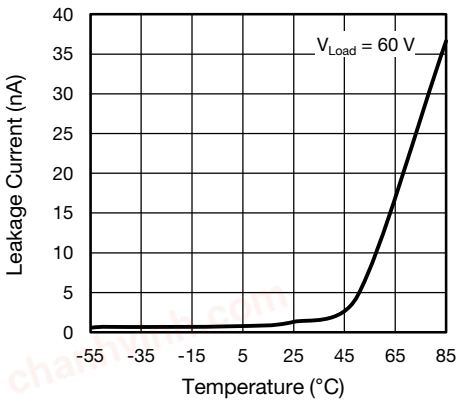

Fig. 6 - Leakage Current vs. Temperature

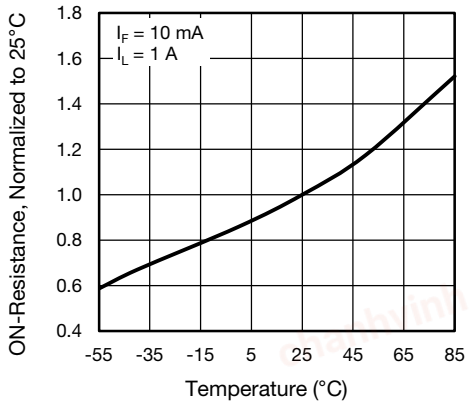

Fig. 9 - On-Resistance vs. Temperature

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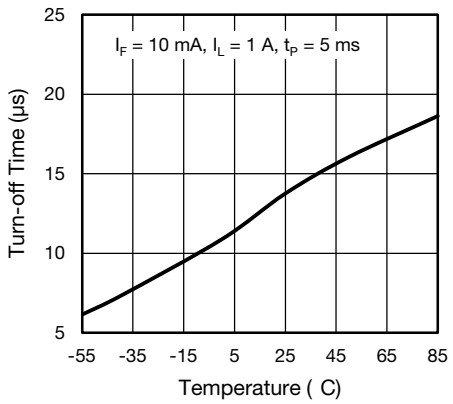

Fig. 10 - Turn-Off Time vs. Temperature

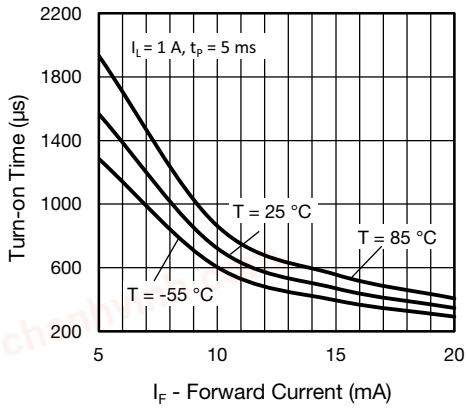

Fig. 13 - Turn-On Time vs. Forward Current

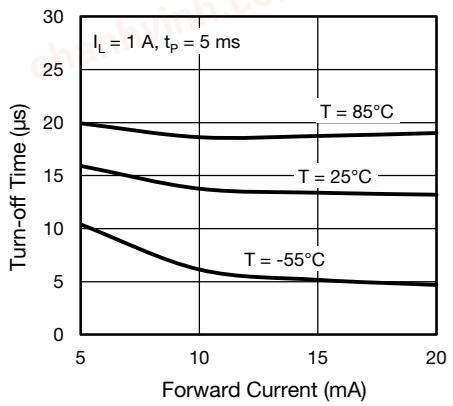

Fig. 11 - Turn-Off Time vs. Forward Current

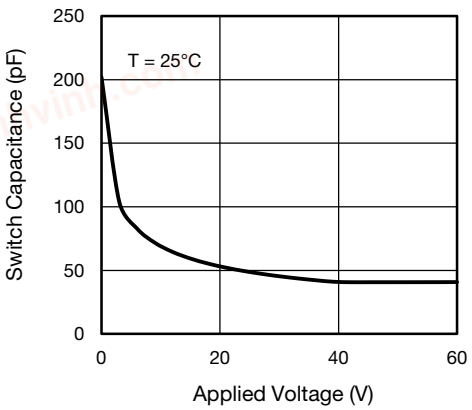

Fig. 14 - Switch Capacitance vs. Applied Voltage

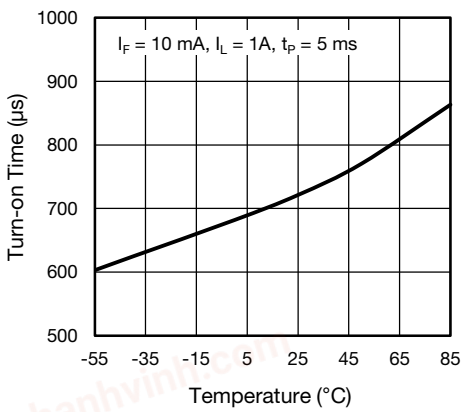

Fig. 12 - Turn-On Time vs. Temperature

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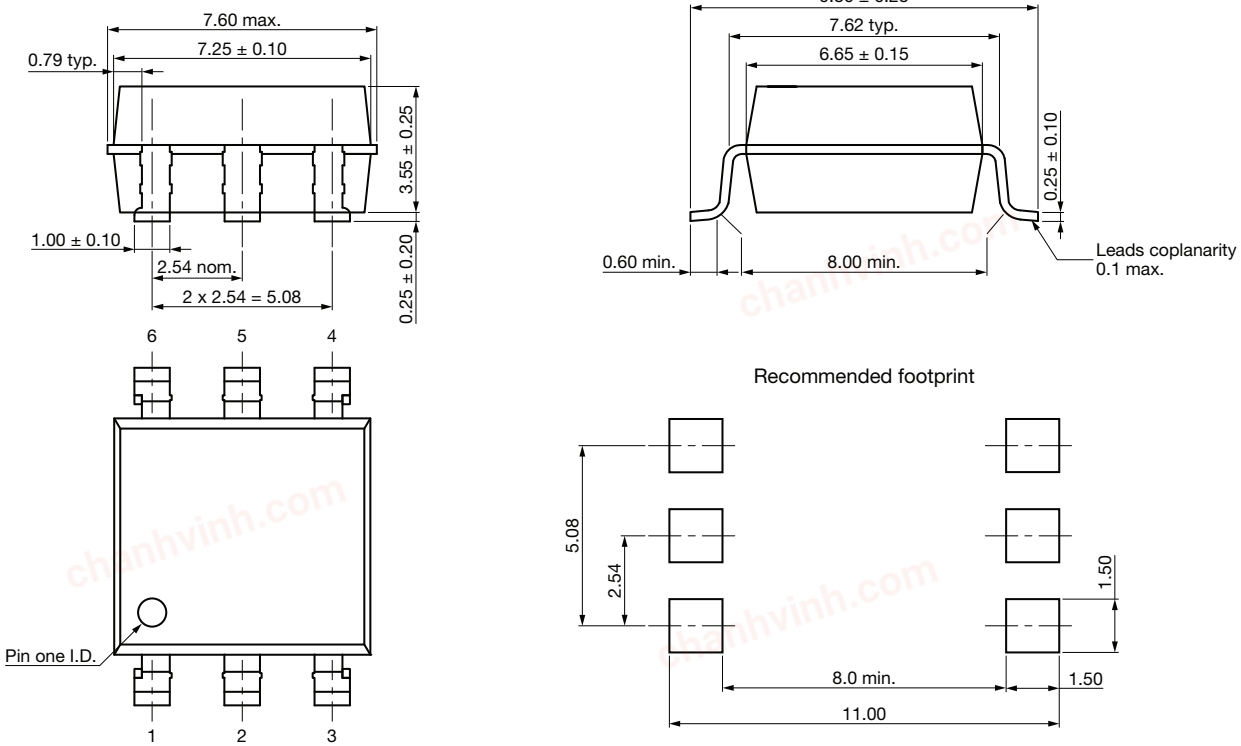
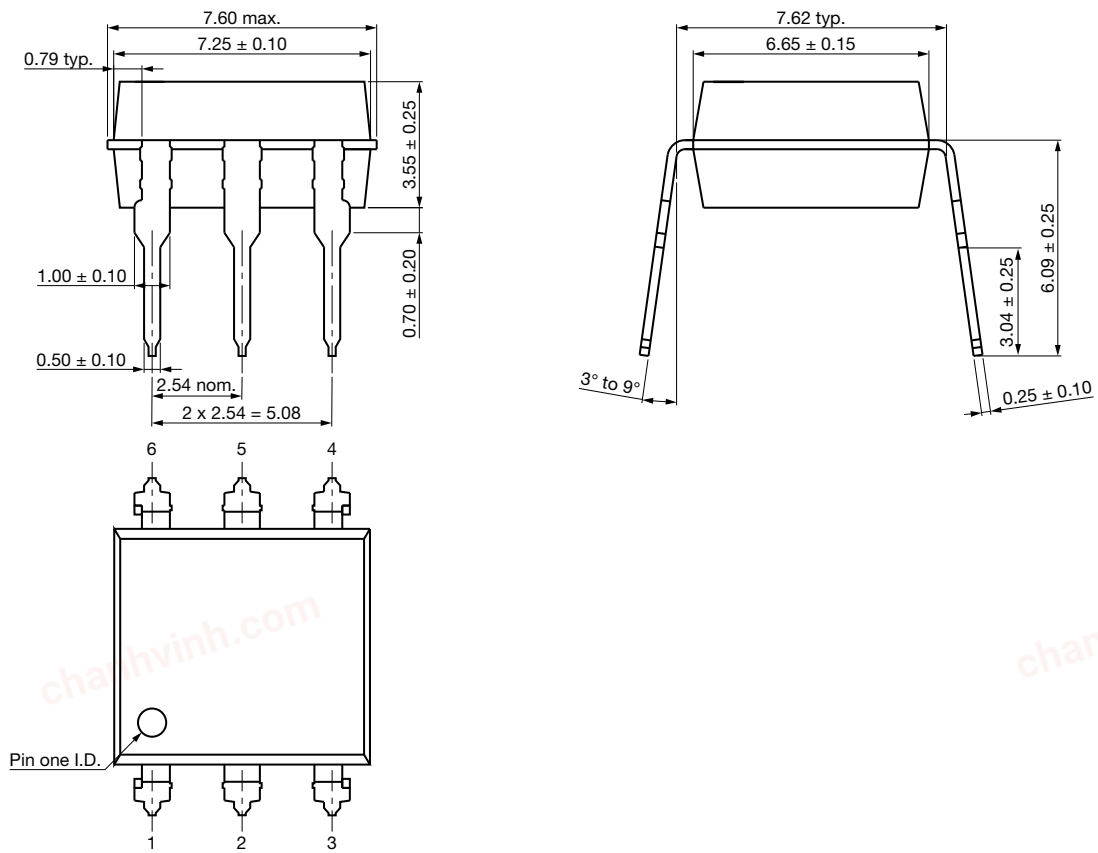
PACKAGE DIMENSIONS (in millimeters)

SMD-6



DIP-6



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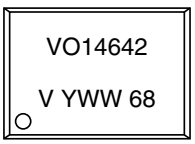
PACKAGE MARKING



Note

- Tape and reel suffix “TR” is not part of the package marking

PACKING INFORMATION (in millimeters)

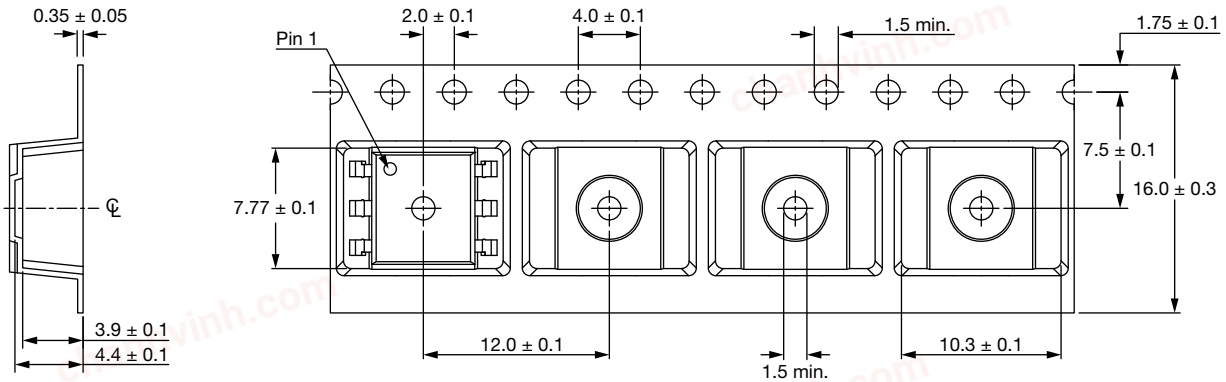


Fig. 15 - Tape and Reel Packing

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

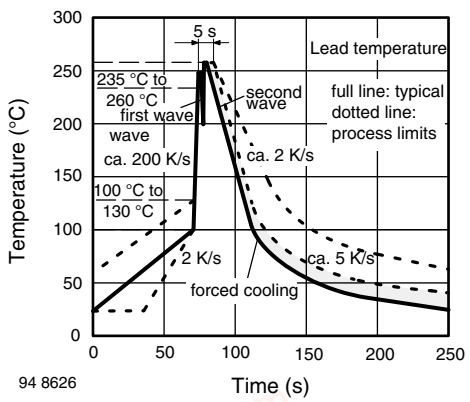


Fig. 16 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices

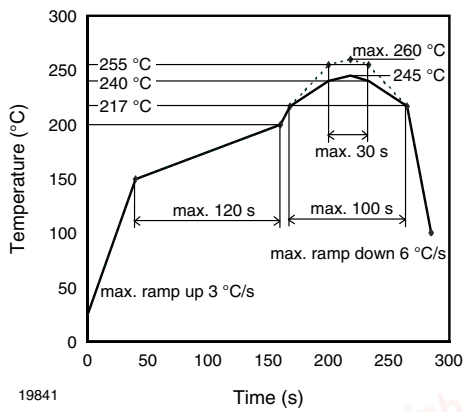


Fig. 17 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

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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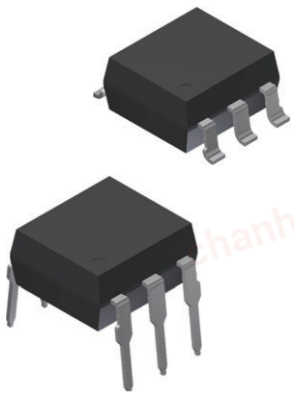

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