

Vishay Semiconductors

1 Form A Solid State Relay



DESCRIPTION

The VO14642AT are high speed SPST normally open (1 form A) solid-state relay in a DIP-6 package. The relays are constructed as a multi-chip hybrid device. Actuation control is via an infrared LED. The output switch is a combination of a photodiode array with MOSFET switches. The relays can be configured for AC/DC or DC only operation.

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
- · Pure tin leads
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

APPLICATIONS

- Instrumentation
- Industrial controls
- Security

AGENCY APPROVALS

- UL1577: file no. E52744 system code H, double protection
- cUL-UL1577: file no. E52744 system code H, double protection

Notes

- IEC 60747-5-2 (VDE 0884) capable, consult sales representative for details
- Agency approvals are valid only for ambient temperature range - 40 °C to 85 °C



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RoHS COMPLIANT

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ABSOLUTE MAXIMUM RATINGS ⁽¹⁾ ($T_{amb} = 25 \degree C$, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT			
INPUT							
LED continous forward current		IF	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		VL	60	V			
Load current (DC only)		١L	2	А			
Peak load current (AC/DC)	t = 10 ms	I _{LPK}	3.6	А			
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 ⁽²⁾	$t \le 10$ s max.	T _{sld}	260	°C			
Isolation test voltage	for 1 s	V _{ISO}	5300	V _{RMS}			

Notes

(1) 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.

⁽²⁾ 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



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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.



ELECTRICAL CHARACTERISTICS ($T_{amb} = 25 \text{ °C}$, 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	$V_L = 60 \text{ V}, \text{ I}_L < 1 \ \mu\text{A}$	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	$I_F = 0 \text{ mA}, V_L = 60 \text{ V}$	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.

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PIN CONFIGURATION



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



20991-1

Document Number: 81646 Rev. 1.5, 26-Apr-11



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SAFETY AND INSULATION	N RATINGS						
PARAMETER		TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic classification		IEC 68 part 1			40/85/21		
Pollution degree		DIN VDE 0109			2		
Tracking resistance (comparative t	racking index)	Insulation group IIIa	CTI	175			
Highest allowable overvoltage		Transient overvoltage	VIOTM	8000			V _{peak}
Maximum working insulation voltage	ge	Recurring peak voltage	VIORM	890			V _{peak}
Insulation resistance at 25 °C		V _{IO} = 500 V	R _{IS}			≥ 10 ¹²	Ω
Insulation resistance at T_S		V _{IO} = 500 V	R _{IS}			≥ 10 ⁹	Ω
Insulation resistance at 100 °C		V _{IO} = 500 V	R _{IS}			≥ 10 ¹¹	Ω
Partial discharge test voltage		Method b, V _{pd} = V _{IORM} x 1.875	V _{pd}			1669	V _{peak}
Isolation test voltage		1 s	V _{ISO}			5300	V _{RMS}
Safety limiting values -	Case temperature		T _{SI}		165		°C
maximum values allowed in the	Input current		I _{SI}		150		mA
event of a failure	Output power		P _{SO}		400		mW
Minimum external air gap (clearance distance)		Measured from input terminals to output terminals, shortest distance through air			≥ 7		mm
Minimum external tracking (creepage distance)		Measured from input terminals to output terminals, shortest distance path along body			≥ 7		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.

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





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Fig. 4 - Output Leakage Current vs. Temperature



Fig. 5 - LED Voltage vs. Temperature



Fig. 6 - Diode Breakdown Voltage vs. Temperatur



Fig. 7 - LED Current for Switch Turn-on vs. Temperature





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Fig. 10 - Turn-off Time vs. LED



Fig. 11 - Turn-on Time vs. Temperature



Fig. 12 - Turn-on Time vs. LED



Fig. 13 - Load Current vs. Load Voltage



Fig. 14 - Switch Capacitance vs. Applied Voltage

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0.76

2.54



1.78

1.52

PACKAGE DIMENSIONS in millimeters





ISO method A



R 0.

8 min.

11.05

i178014_2

PACKAGE MARKING

0.46

0.51



Note

• Tape and reel suffix (TR) is not part of the package marking.

0.84 typ.

2.54 typ.



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