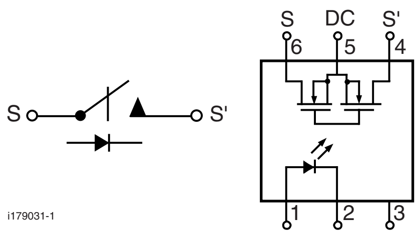
1 Form A Solid State Relay



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
- Pure tin leads
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

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.

APPLICATIONS

- Instrumentation
- Industrial controls
- Security

AGENCY APPROVALS

UL1577:	file no. E52744 system code H or J, double protection
CUL - UL1577:	file no. E52744 system code H or J, double protection
DIN EN:	60747-5-5

ORDER INFORMATION

PART	REMARKS	PACKAGE
VO14642AABTR	Tape and reel	SMD-6
VO14642AT	Tubes	DIP-6

ABSOLUTE MAXIMUM RATINGS (1)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
LED continous forward current		I_F	50	mA
LED reverse voltage		V_R	5.0	V
LED power dissipation	at 25 °C	P_{diss}	80	mW
OUTPUT				
DC or peak AC load voltage		V_L	60	V
Output power dissipation	at 25 °C	P_{diss}	250	mW

ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
COUPLER				
Total power dissipation		P_{diss}	330	mW
Ambient temperature range		T_{amb}	- 40 to + 85	°C
Storage temperature range		T_{stg}	- 40 to + 125	°C
Soldering temperature (2)	t ≤ 10 s max.	T_{sld}	260	°C
Isolation test voltage	for 1.0 s	V_{ISO}	3750	V_{RMS}

Notes

(1) T_{amb} = 25 °C, unless otherwise specified.
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

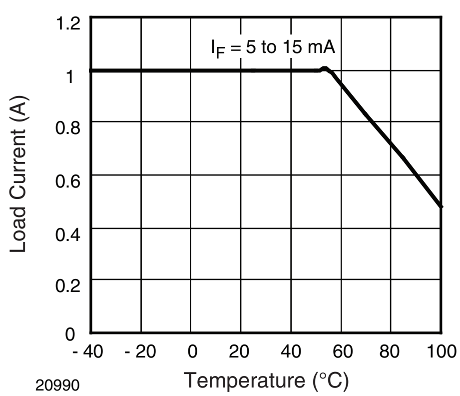
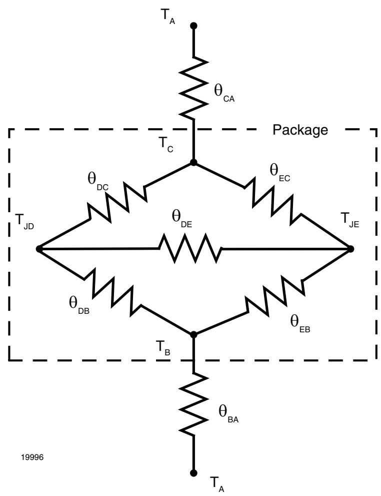


Fig. 1 - I_{LOAD} vs. Temperature

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.

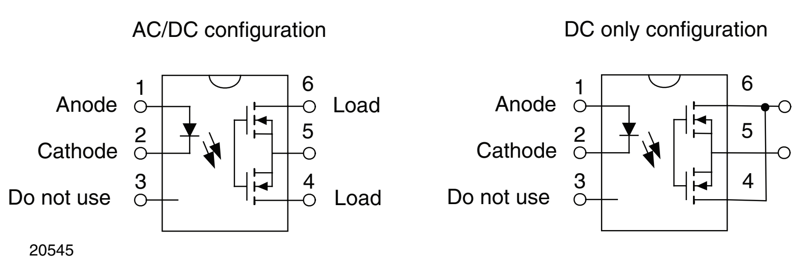


ELECTRICAL CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
LED forward current, switch turn-on	I_L = 1 A, $V_L \leq$ 0.5 V, t = 10 ms	I_{Fon}		0.5	2.0	mA
LED forward current, switch to remain off	V_L = 60 V, I_L < 1 µA	I_{Foff}	50			µA
Input reverse current	V_R = 5 V	I_R			10	µA
LED forward voltage	I_F = 10 mA	V_F	1.0	1.3	1.5	V
OUTPUT						
Peak load voltage		V_L			60	V
Load current DC	I_F = 10 mA	I_L			2	A
Peak load current (AC/DC)	10 ms	I_{LPK}			3.6	A
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

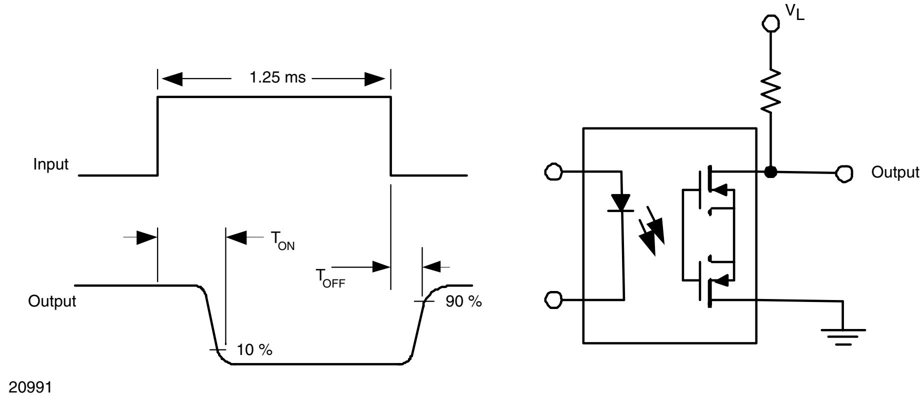
Note

T_{amb} = 25 °C, unless otherwise specified.
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_{on1}		370	800	µs
Turn-off time	I_F = 10 mA, V_L = 30 V, I_L = 200 mA	t_{off1}		50	800	µs
Turn-on time	I_F = 10 mA, V_L = 5 V, I_L = 1 A	t_{on2}		550		µs
Turn-off time	I_F = 10 mA, V_L = 5 V, I_L = 1 A	t_{off2}		18		µs



SAFETY AND INSULATION 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 tracking index)		Insulation group IIIa	CTI	175			
Highest allowable overvoltage		Transient overvoltage	V_{IOTM}	8000			V_{peak}
Maximum working insulation voltage		Recurring peak voltage	V_{IORM}	890			V_{peak}
Insulation resistance at 25 °C		V_{IO} = 500 V	R_{IS}			$\geq 10^{12}$	Ω
Insulation resistance at T_S		V_{IO} = 500 V	R_{IS}			$\geq 10^{9}$	Ω
Insulation resistance at 100 °C		V_{IO} = 500 V	R_{IS}			$\geq 10^{11}$	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 - maximum values allowed in the event of a failure	Case temperature		T_{SI}		165		°C
	Input current		I_{SI}		150		mA
	Output power		P_{SO}		400		mW
Minimum external air gap (clearance distance)		Measured from input terminals to output terminals, shortest distance through air			≥ 7.0		mm
Minimum external tracking (creepage distance)		Measured from input terminals to output terminals, shortest distance path along body			≥ 7.0		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

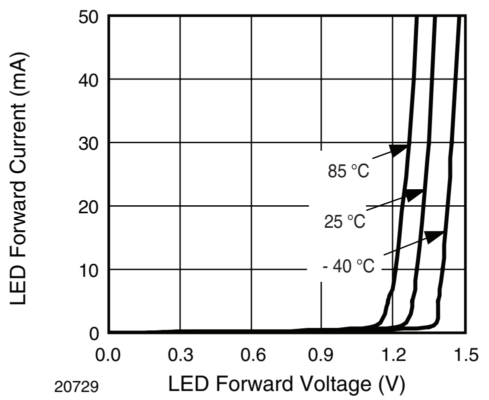


Fig. 2 - Typical LED Forward Voltage vs. Current

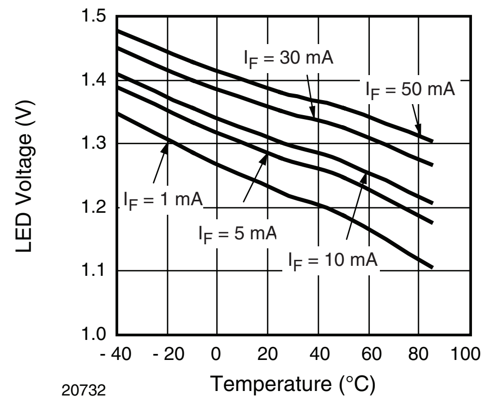


Fig. 5 - Typical LED Forward Voltage vs. Temperature

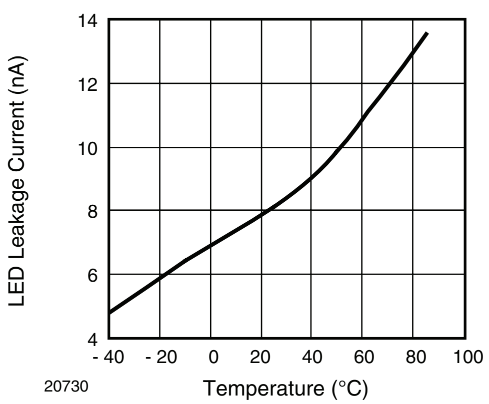


Fig. 3 - Typical LED Leakage vs. Temperature (V_R = 5 V)

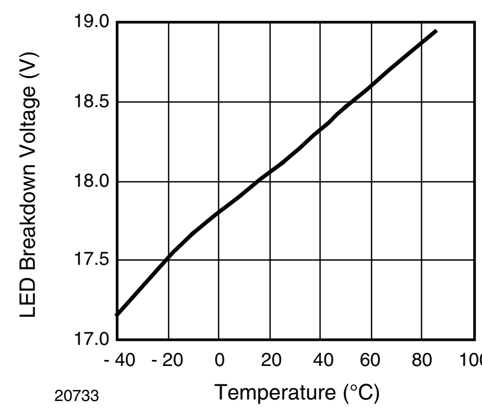


Fig. 6 - Typical Breakdown Voltage vs. Temperatur (I_L = 5 µA)

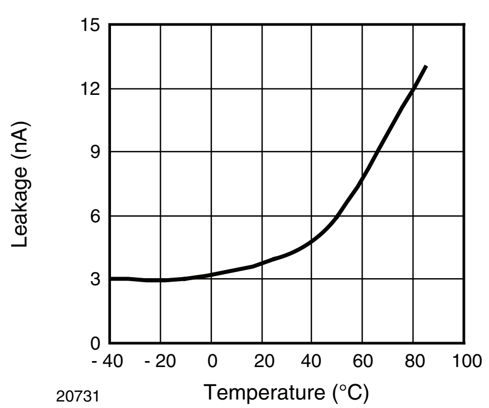


Fig. 4 - Typical Leakage vs. Temperature (V_{Load} = 60 V)

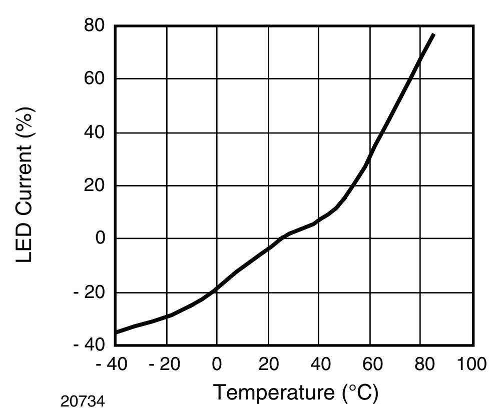


Fig. 7 - I_F For Switch Operation vs. Temperature
(Normalized to 25 °C, Load Current = 1 A)

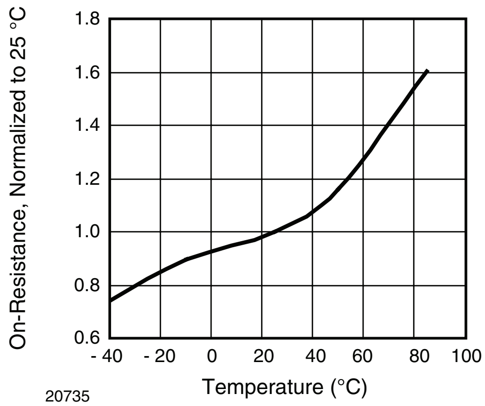


Fig. 8 - Typical On-Resistance vs. Temperature (Load Current = 1 A)

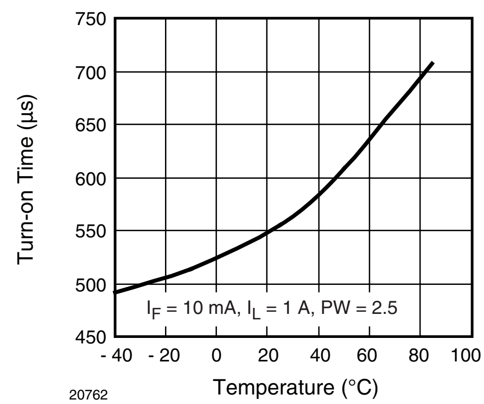


Fig. 11 - Typical Turn-On vs. Temperature (Load Current = 1 A)

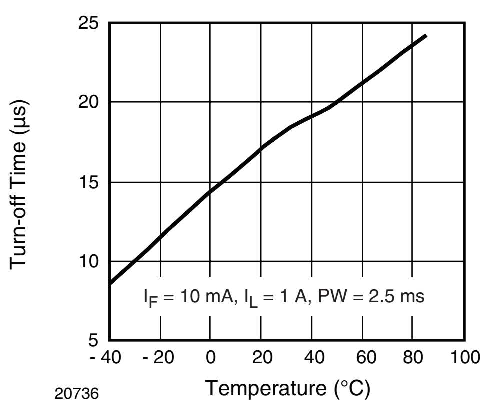


Fig. 9 - Typical Turn-Off vs. Temperature (Load Current = 1 A)

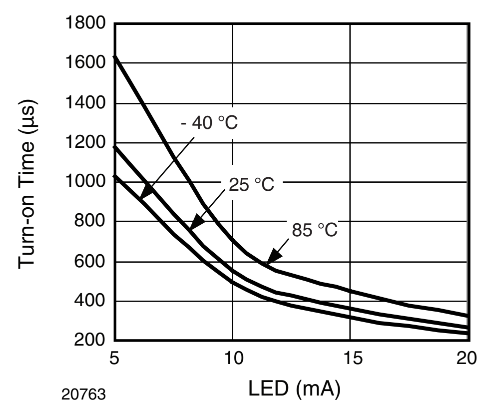


Fig. 12 - Typical Turn-On vs.
LED Forward Current (Load Current = 1 A)

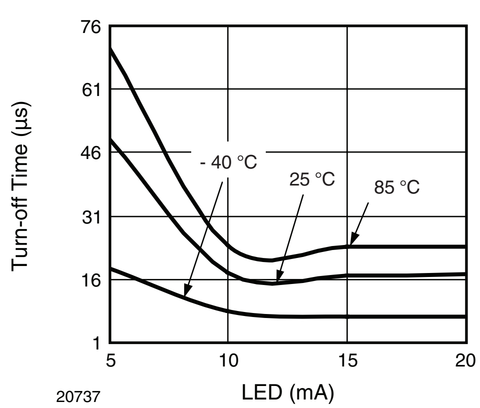


Fig. 10 - Typical Turn-Off vs.
LED Forward Current (Load Current = 1 A)

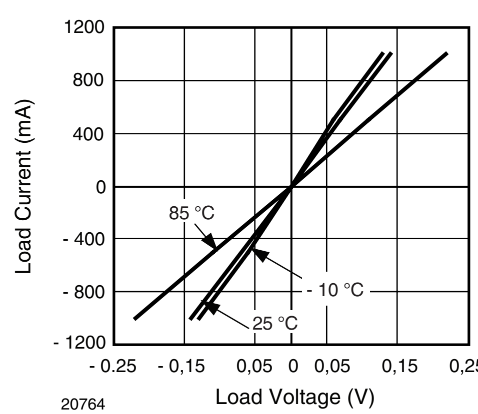


Fig. 13 - Typical Load Current vs.
Load Voltage (LED Current = 10 mA)

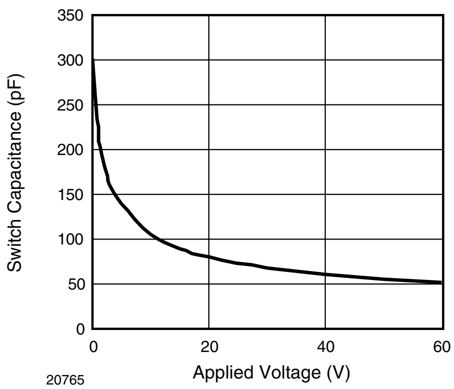
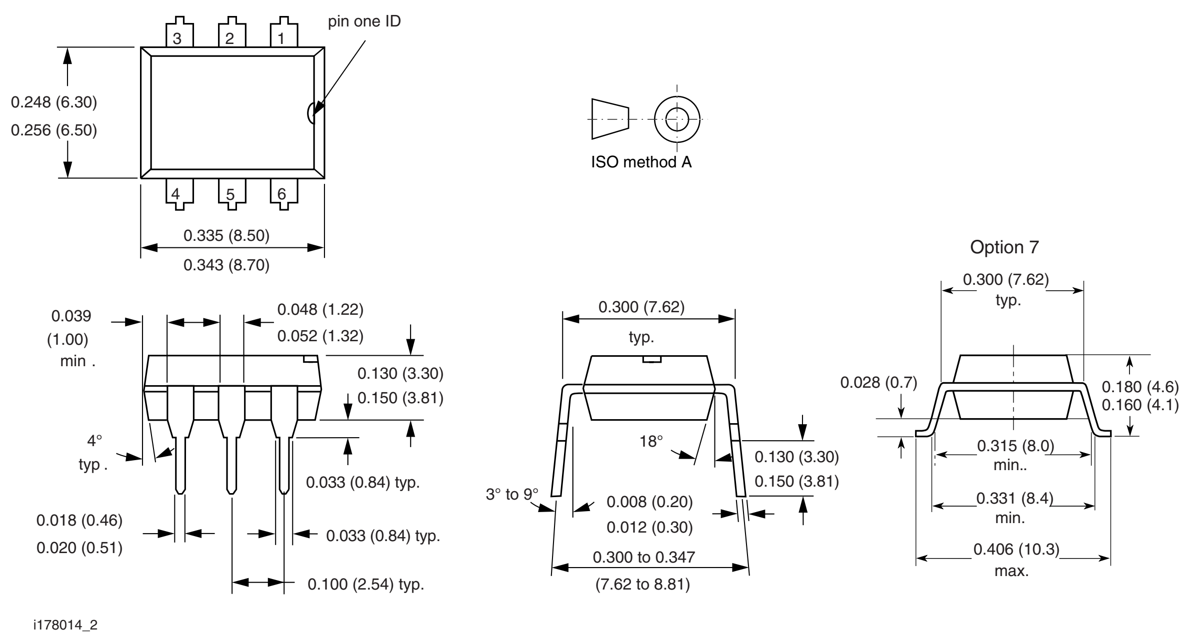


Fig. 14 - Switch Capacitance vs. Applied Voltage

PACKAGE DIMENSIONS in inches (millimeters)



OZONE DEPLETING SUBSTANCES POLICY STATEMENT

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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