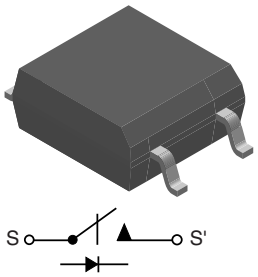
1 Form A Solid State Relay

20050



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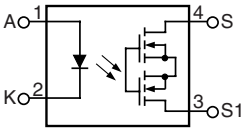


FEATURES

- Maximum R_{ON} 5 Ω
- Load voltage 60 V
- Load current 100 mA
- Isolation test voltage 1500 V_{RMS}
- Small 4 pin SOP package
- Clean bounce free switching
- TTL/CMOS compatible input
- High reliability hybrid receptor
- Available on tape and reel
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION

The VO1400AEFTR is an optically isolated 1 form A solid-state relay in a surface mount 4 pin SOP package.

APPLICATIONS

- Security systems
- Instrumentation
- Industrial controls

AGENCY APPROVALS

UL:	file no. E300068 system code K
CUL :	file no. E300068
DIN EN:	60747-5-5 (VDE 0884)

ORDER INFORMATION

PART	REMARKS	PACKAGE
VO1400AEFTR	Tape and reel	SOP-4
VO1400AEFT2	Tape and reel (product rotated in tape)	SOP-4

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
OUTPUT				
DC or peak AC load voltage		V_L	60	V
SSR				
Total power dissipation		P_{diss}	400	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	t = 1.0 s	V_{ISO}	1500	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.

ABSOLUTE MAXIMUM RATING CURVE

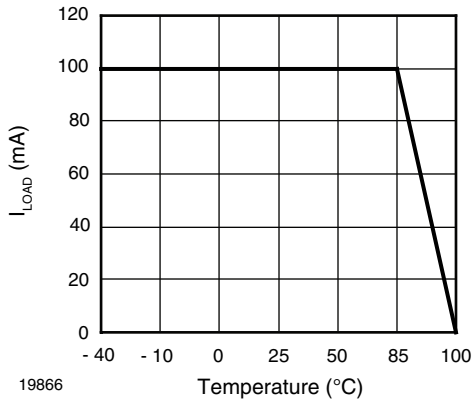
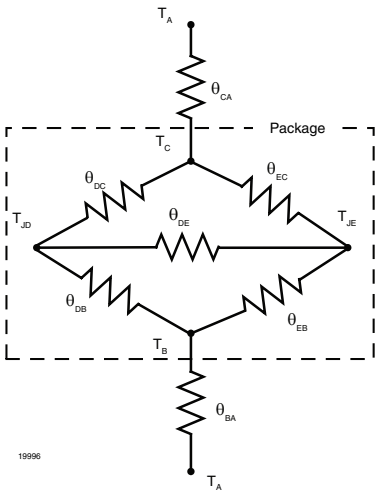


Fig. 1 - I_{LOAD} vs. Temperature

THERMAL CHARACTERISTICS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
LED power dissipation	at 25 °C	P_{diss}	60	mW
Output power dissipation	at 25 °C	P_{diss}	50	mW
Total power dissipation	at 25 °C	P_{tot}	110	mW
Maximum LED junction temperature		$T_{jmax.}$	125	°C
Maximum output die junction temperature		$T_{jmax.}$	125	°C
Thermal resistance, junction emitter to board		θ_{JEB}	114	°C/W
Thermal resistance, junction emitter to case		θ_{JEC}	99	°C/W
Thermal resistance, junction detector to board		θ_{JDB}	60	°C/W
Thermal resistance, junction detector to case		θ_{JDC}	80	°C/W
Thermal resistance, junction emitter to junction detector		θ_{JED}	115	°C/W
Thermal resistance, case to ambient		θ_{CA}	2396	°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.

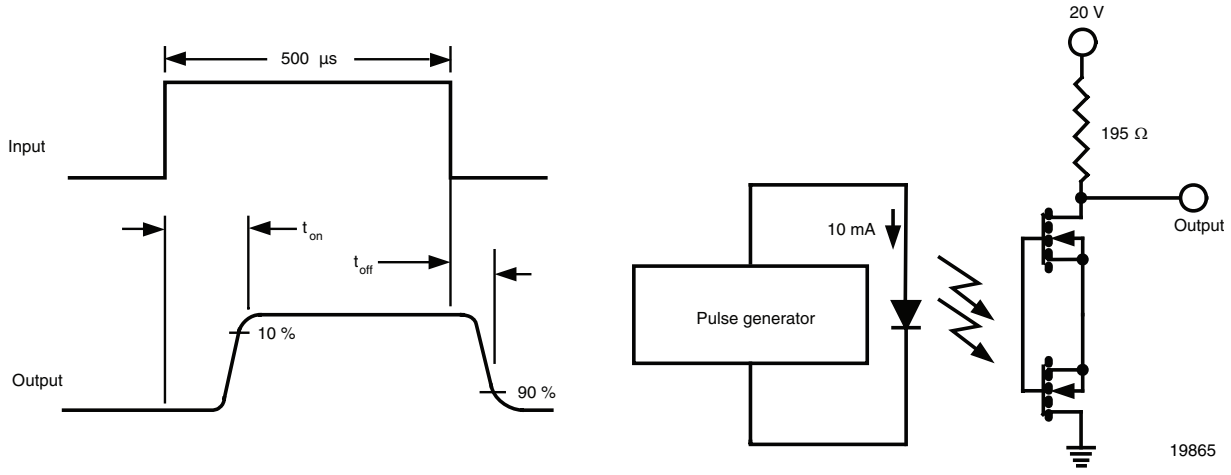


ELECTRICAL CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
LED forward current, switch turn-on	I_L = 100 mA, $V_L \leq$ 0.5 V, t = 10 ms	I_{Fon}	0.3	1.0	3.2	mA
LED forward current, switch to remain off	V_L = 60 V	I_{Foff}	100	150		µA
Input reverse current	V_R = 5.0 V	I_R		0.001	10	µA
LED forward voltage	I_F = 5.0 mA	V_F	0.8	1.1	1.4	V
LED reverse voltage	I_R = 10 µA	V_R	5	40		V
OUTPUT						
Peak load voltage		V_L			60	V
Load current AC peak	I_F = 2.0 mA	I_L			100	mA
Peak load current	10 ms	I_{LPK}			350	mA
On-resistance	I_F = 10 mA, I_L = 100 mA	R_{ON}		2.3	5	Ω
Off-state leakage current	I_F = 0 mA, V_L = 60 V	I_{LEAK}		0.002	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.

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	I_F = 10 mA, V_L = 20 V, I_L = 100 mA	t_{on}		52	500	µs
Turn-off time	I_F = 10 mA, V_L = 20 V, I_L = 100 mA	t_{off}		36	500	µs



SAFETY AND INSULATION RATINGS					
PARAMETER		**TEST CONDITION**	**SYMBOL**	**VALUE**	**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}	6000	V_{peak}
Maximum working insulation voltage		Recurring peak voltage	V_{IORM}	707	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 a, $V_{pd} = V_{IORM}$ x 1.875	V_{pd}	1325	V_{peak}
Isolation test voltage, 1 s			V_{RMS}	1800	V_{RMS}
Safety limiting values - maximum values allowed in the event of a failure	Output power		P_{SO}	400	mW
	Input current		I_{SI}	150	mA
	Case temperature		T_{SI}	165	°C
Minimum external air gap (clearance distance)		Measured from input terminals to output terminals, shortest distance through air		≥ 5.0	mm
Minimum external tracking (creepage distance)		Measured from input terminals to output terminals, shortest distance path along body		≥ 5.0	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

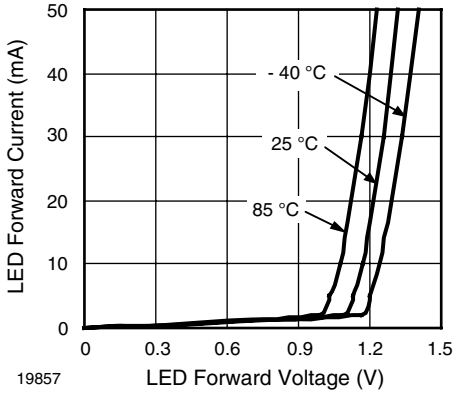


Fig. 2 - Typical LED Forward Voltage vs. Current

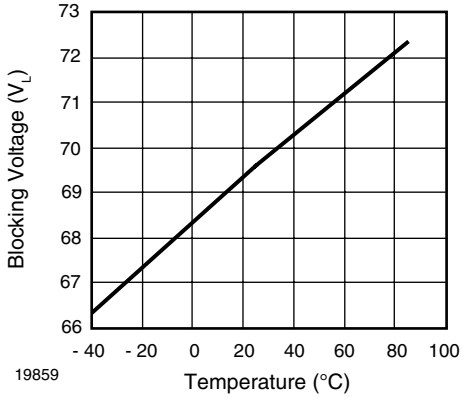


Fig. 3 - Typical Blocking Voltage vs. Temperature

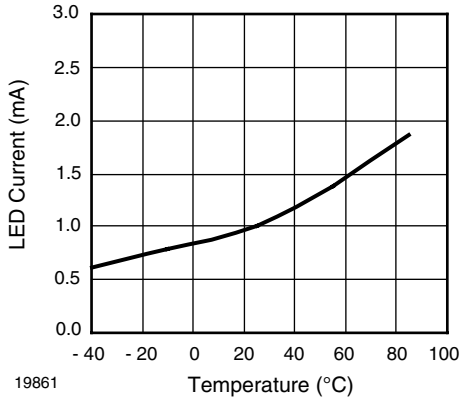


Fig. 4 - Typical I_F for Switch Operation vs. Temperature (Load Current = 100 mA)

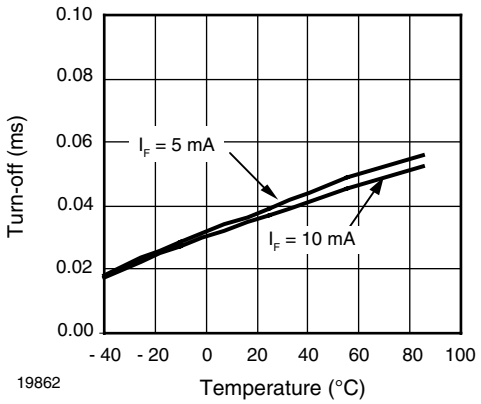


Fig. 7 - Typical Turn-off vs. Temperature (Load Current = 100 mA)

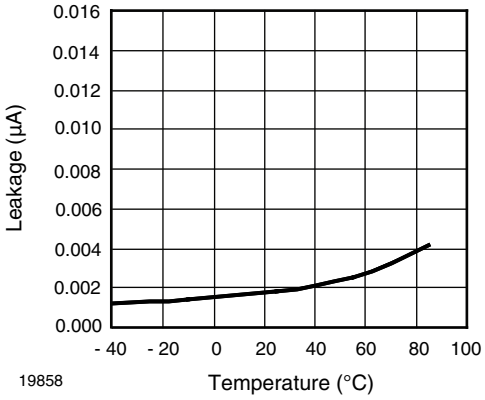


Fig. 5 - Typical Leakage vs. Temperature (V_L = 60 V)

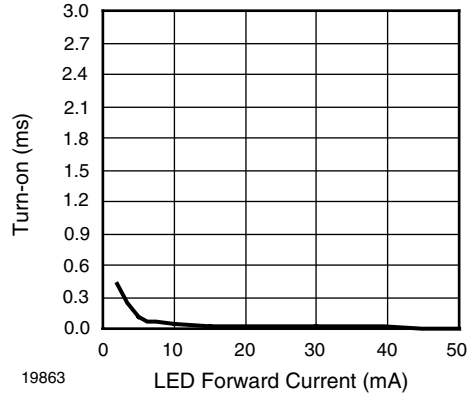


Fig. 8 - Typical Turn-on vs. LED Forward Current (Load Current = 100 mA)

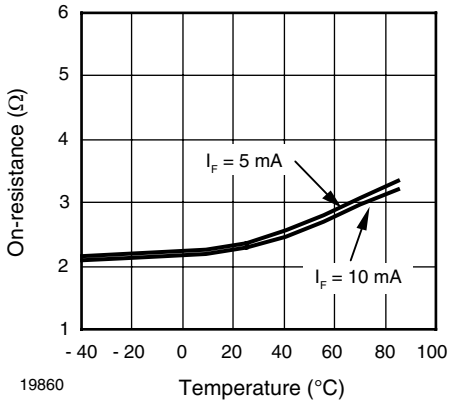


Fig. 6 - Typical On-resistance vs. Temperature (Load Current = 100 mA)

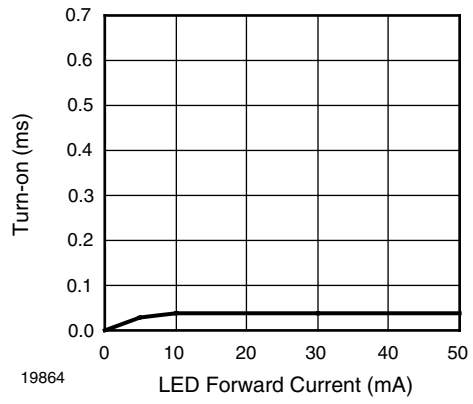
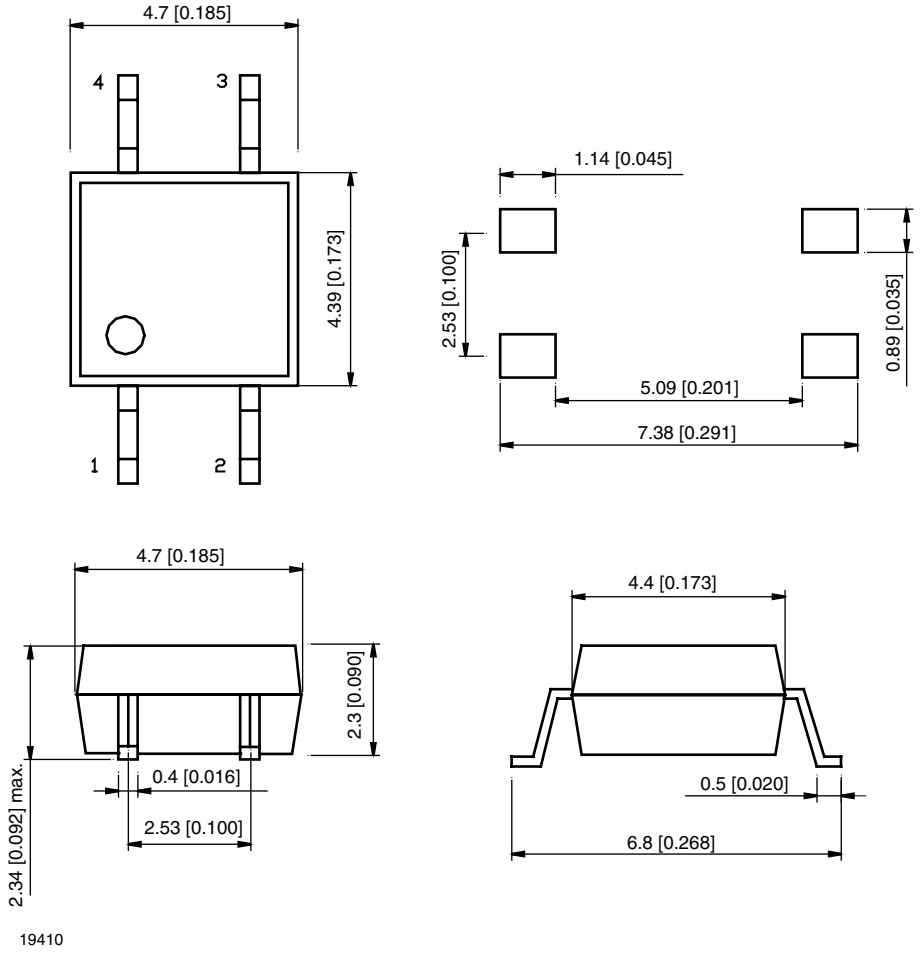


Fig. 9 - Typical Turn-off vs. LED Forward Current (Load Current = 100 mA)

PACKAGE DIMENSIONS in inches (millimeters)



ESD CAUTION

This is an ESD (elektro static discharge) sensitive device. Electrostatic charges accumulate on the human body and test equipment and can discharge without detection, Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality. ESD withstand voltage of this device is up to 1500 V acc. to JESD22-A114-B.

20055_1

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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