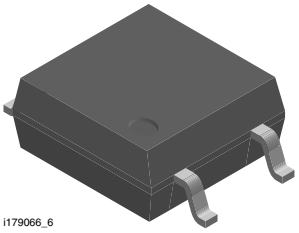
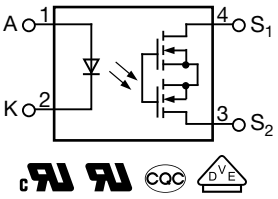
1 Form A Solid-State Relay





FEATURES

- Maximum R_{ON} 5 Ω
- Load voltage 60 V
- Load current 100 mA
- Isolation test voltage 3750 V_{RMS}
- Small 4 pin SOP package
- Clean bounce free switching
- TTL / CMOS compatible input
- High reliability hybrid receptor
- 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 | 3D Models | SPICE Models

DESCRIPTION

The VO1400AEF 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 1577
- cUL
- DIN EN 60747-5-5 (VDE 0884-5)
- CQC
- FIMKO

ORDERING INFORMATION

V	O	1	4	0	0	A	E	F	T	#
PART NUMBER						ELECTRICAL VARIATION	PACKAGE CONFIG.		TAPE AND REEL	

PACKAGE	UL, cUL, CQC, VDE, FIMKO
SOP-4, tape and reel	VO1400AEFTR
SOP-4, tape and reel (product rotated in tape)	VO1400AEFT1

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
LED continuous forward current		I_F	50	mA
LED reverse voltage		V_R	5	V
OUTPUT				
DC or peak AC load voltage		V_L	60	V
Load current AC peak		I_L	100	mA
Peak load current	t = 10 ms	I_{LPK}	350	mA
SSR				
Total power dissipation		P_{diss}	120	mW
Ambient temperature range		T_{amb}	-40 to +85	°C
Storage temperature range		T_{stg}	-40 to +125	°C
Soldering temperature	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.

ABSOLUTE MAXIMUM RATING CURVE

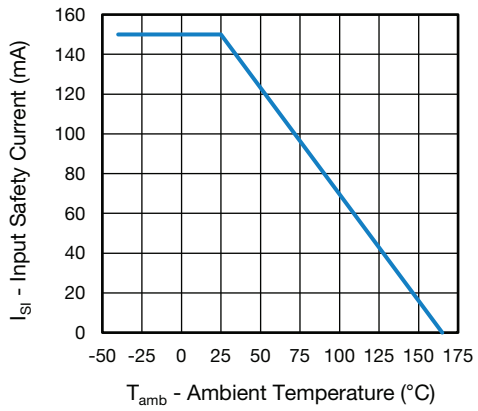


Fig. 1 - Input Safety Current vs. Ambient Temperature

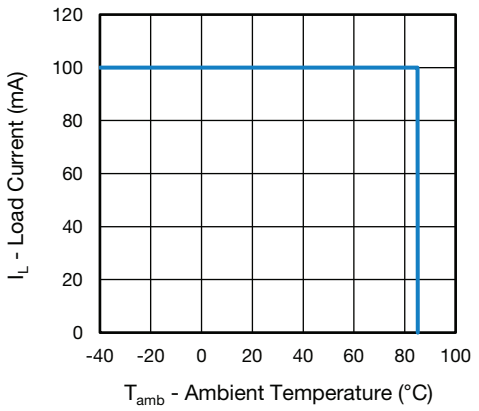


Fig. 3 - Load Current vs. Ambient Temperature

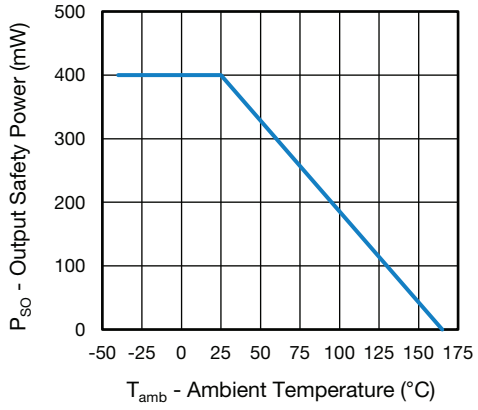


Fig. 2 - Output Safety Power vs. Ambient Temperature

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 = 100 mA, $V_L \leq$ 0.5 V, t = 10 ms	I_{Fon}	0.15	0.8	3.2	mA
LED forward current, switch turn-off	V_L = 60 V	I_{Foff}	100	400	-	µA
LED reverse current	V_R = 5 V	I_R	-	0.001	10	µA
LED forward voltage	I_F = 5 mA	V_F	0.8	1.4	1.6	V
LED reverse voltage	I_R = 10 µA	V_R	5	40		V
OUTPUT						
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

- 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}	-	20	500	µs
Turn-off time	I_F = 10 mA, V_L = 20 V, I_L = 100 mA	t_{off}	-	80	500	µs

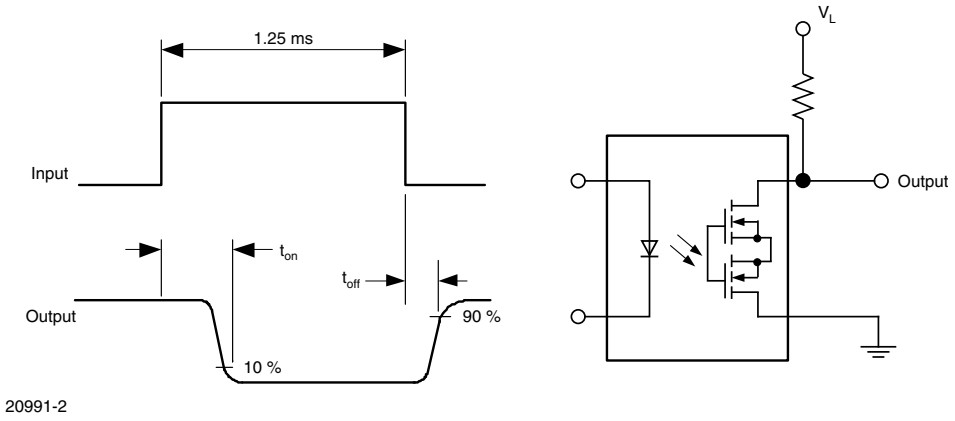


Fig. 4 - Timing Test Circuit and Waveforms

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		40 / 85 / 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}	3750	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	6000	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	707	V_{peak}
Insulation 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
Clearance distance	Measured from input terminals to output terminals, shortest distance through air		≥ 5	mm
Creepage distance	Measured from input terminals to output terminals, shortest distance path along body		≥ 5	mm
Input to output test voltage, method B	V_{IORM} x 1.875 = V_{PR}, 100 % production test with t_M = 1 s, partial discharge < 5 pC	V_{PR}	1326	V_{peak}
Input to output test voltage, method A	V_{IORM} x 1.6 = V_{PR}, 100 % sample test with t_M = 10 s, partial discharge < 5 pC	V_{PR}	1131	V_{peak}

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)

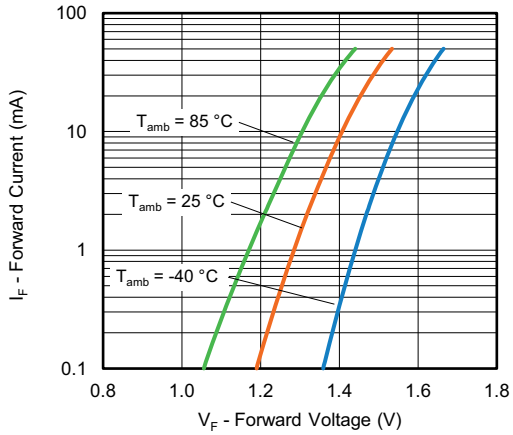


Fig. 5 - Forward Current vs. Forward Voltage

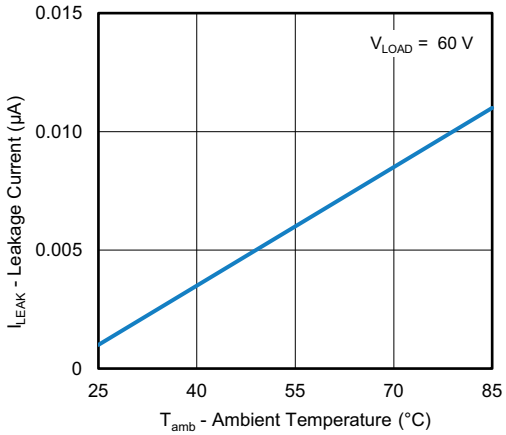


Fig. 8 - Leakage Current vs. Ambient Temperature

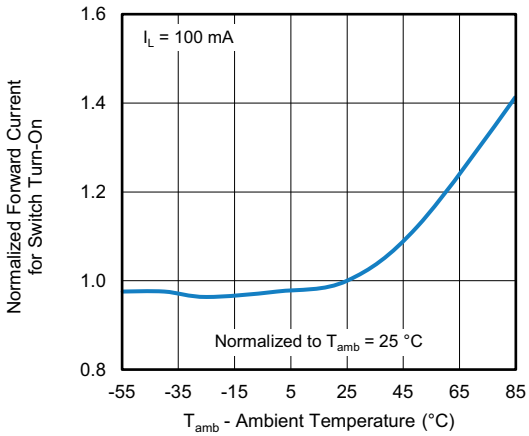


Fig. 6 - Forward Current for Switch Turn-On vs. Ambient Temperature

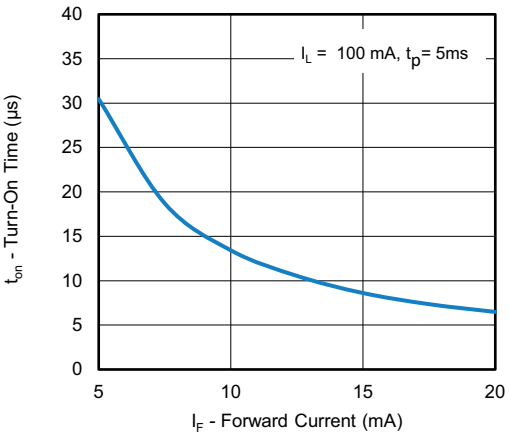


Fig. 9 - Turn-On Time vs. Forward Current

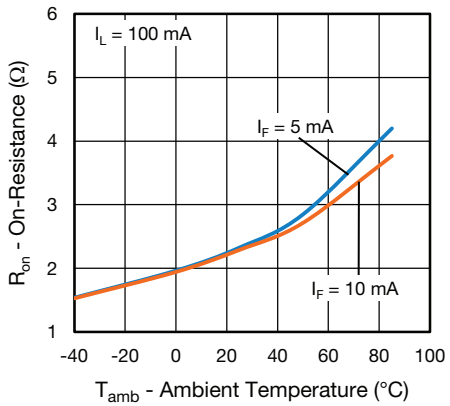


Fig. 7 - On-Resistance vs. Ambient Temperature

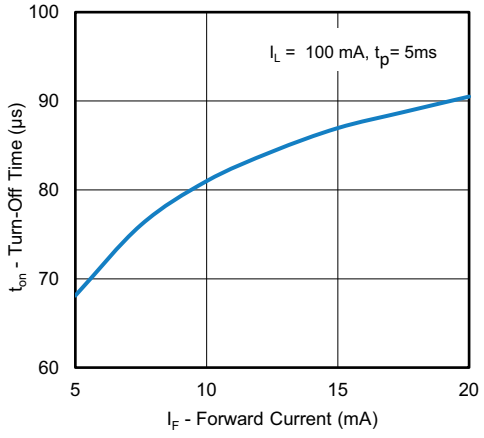


Fig. 10 - Turn-Off Time vs. Forward Current

PACKAGE DIMENSIONS (in millimeters)

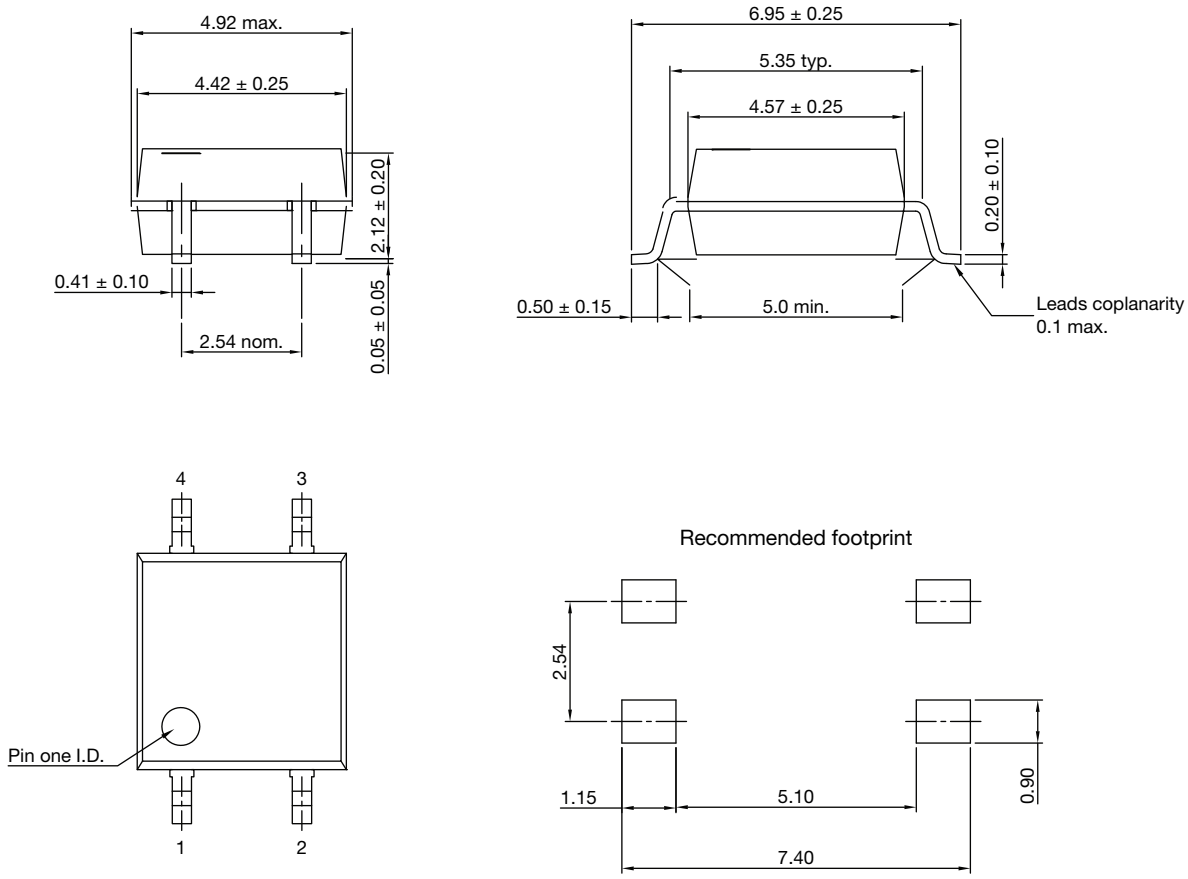


Fig. 11 - Package Drawings

PACKAGE MARKING

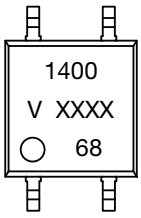
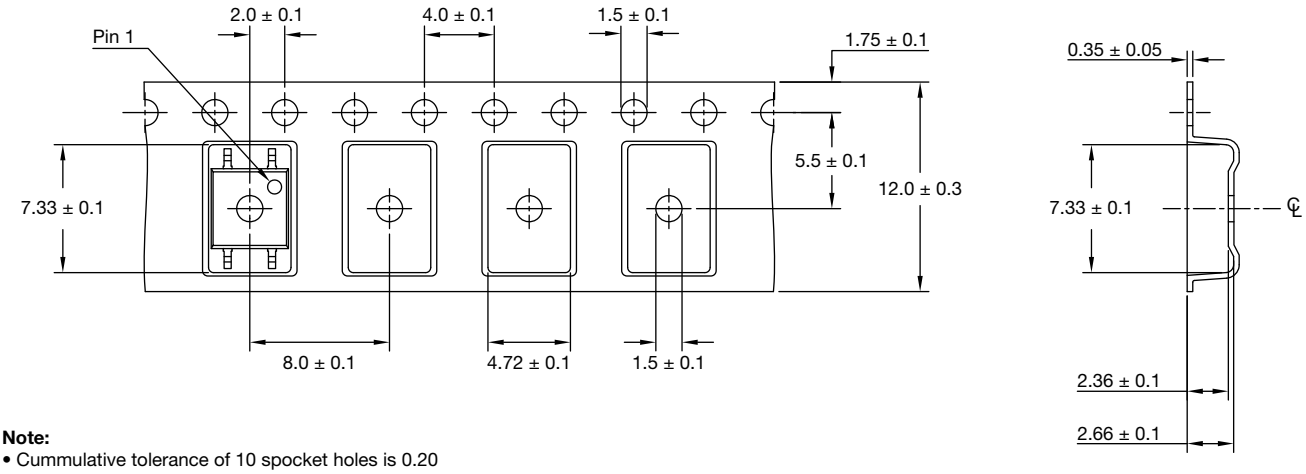


Fig. 12 - VO1400AEF

Notes

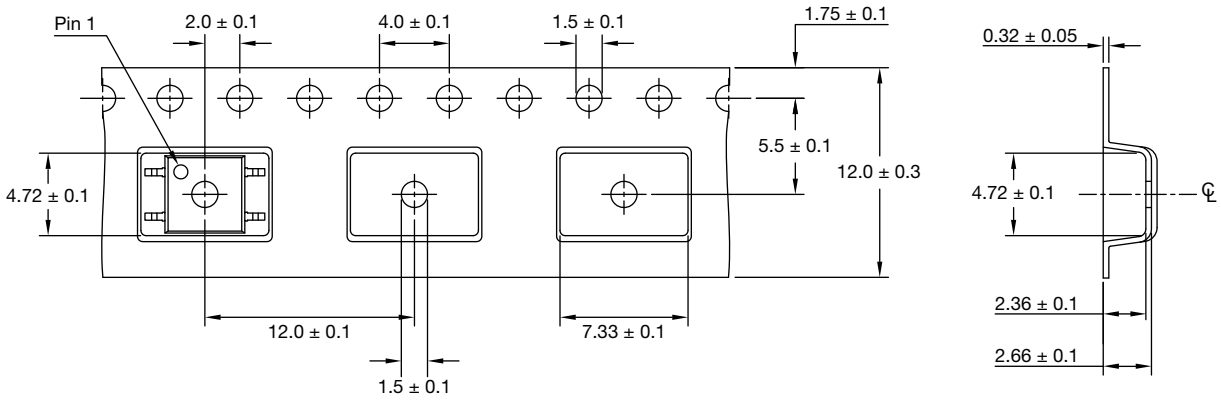
- XXXX = LMC (lot marking code)
- Tape and reel suffix (TR) is not part of the package marking

TAPE AND REEL INFORMATION (in millimeters)



Note:
• Cummulative tolerance of 10 spocket holes is 0.20

Fig. 13 - VO1400AEFT (2000 pieces on reel)



Note:
• Cummulative tolerance of 10 spocket holes is 0.20

Fig. 14 - VO1400AEFT1 (1000 pieces on reel)

SOLDER PROFILES

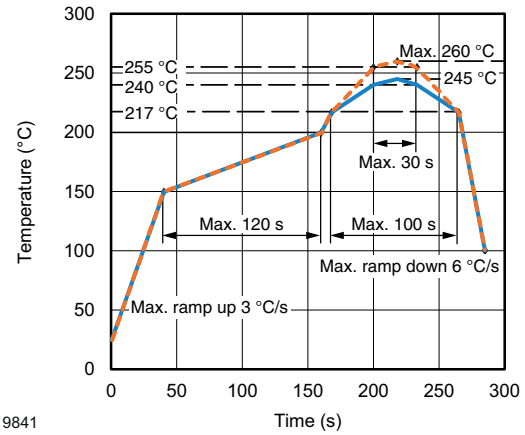


Fig. 15 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

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

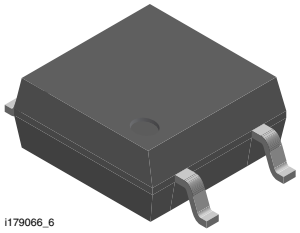
Footprint and Schematic Information for VO1400AEF

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
VO1400AEFT1	www.snapeda.com/parts/VO1400AEFT1/Vishay/view-part
VO1400AEFT2	www.snapeda.com/parts/VO1400AEFT2/Vishay/view-part
VO1400AEFTR	www.snapeda.com/parts/VO1400AEFTR/Vishay/view-part

For technical issues and product support, please contact optocoupleranswers@vishay.com.



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