

1 Form A Solid-State Relay



DESCRIPTION

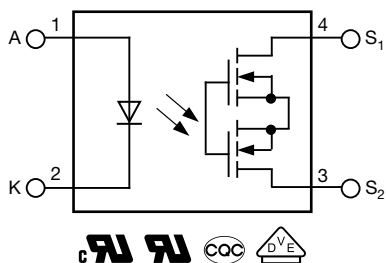
The VO1401AEF is an optically isolated 1 form A solid-state relay in a surface mount 4 pin SOP package.

FEATURES

- Maximum R_{ON} 2.5 Ω
- Load voltage 60 V
- Continuous load current 550 mA
- Isolation test voltage 3750 V_{RMS}
- Small 4 pin SOP 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



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)



APPLICATIONS

- Security systems
- Instrumentation
- Industrial controls

AGENCY APPROVALS

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

LINKS TO ADDITIONAL RESOURCES



ORDERING INFORMATION

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



PACKAGE	UL, cUL, CQC, VDE, FIMKO
SOP-4, tape and reel	VO1401AEFTR



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, 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
Continuous load current AC/DC peak		I_L	550	mA
Peak load current	$t = 10\text{ ms}$	I_{LPK}	1.2	A
SSR				
Total power dissipation		P_{diss}	800	mW
Ambient temperature range		T_{amb}	-40 to +85	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	-40 to +125	$^{\circ}\text{C}$
Soldering temperature	$t \leq 10\text{ s max.}$	T_{sld}	260	$^{\circ}\text{C}$

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.

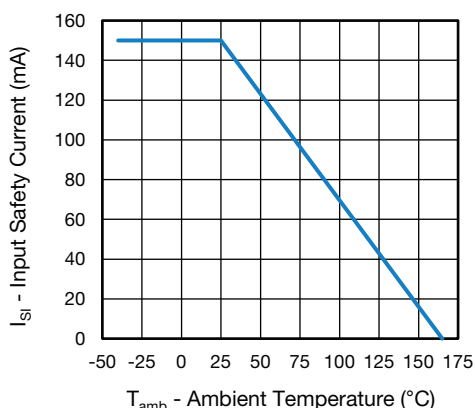
ABSOLUTE MAXIMUM RATING CURVE

Fig. 1 - Input Safety Current vs. Ambient Temperature

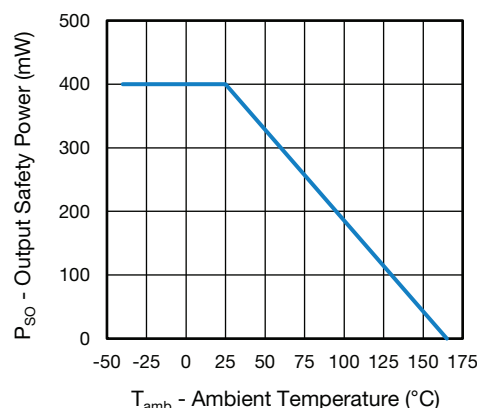


Fig. 2 - Output Safety Power vs. Ambient Temperature

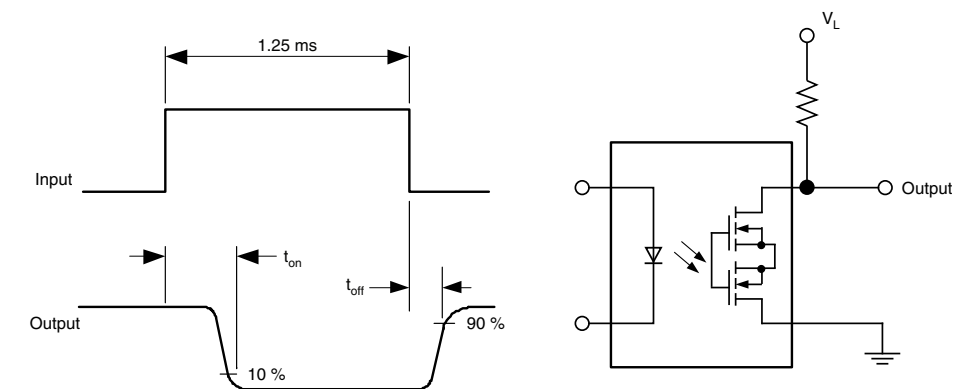
ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
LED forward current, switch turn-on	$I_L = 100\text{ mA}$, $V_L \leq 0.5\text{ V}$, $t = 10\text{ ms}$	I_{Fon}	-	2.5	5	mA
LED forward current, switch turn-off	$I_L = 1\text{ }\mu\text{A}$	I_{Foff}	0.4	2	-	mA
LED reverse current	$V_R = 5\text{ V}$	I_R	-	-	1	μA
LED forward voltage	$I_F = 5\text{ mA}$	V_F	0.8	1.2	1.5	V
OUTPUT						
On-resistance	$I_F = 10\text{ mA}$, $I_L = 500\text{ mA}$	R_{ON}	-	0.6	2.5	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.

SWITCHING CHARACTERISTICS

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$I_F = 10 \text{ mA}$, $V_L = 20 \text{ V}$, $I_L = 550 \text{ mA}$	t_{on}	-	1.3	3	ms
Turn-off time	$I_F = 10 \text{ mA}$, $V_L = 20 \text{ V}$, $I_L = 550 \text{ mA}$	t_{off}	-	1.45	0.5	ms



20991-2

Fig. 3 - 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, $t = 1 \text{ min}$	V_{ISO}	3750	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	4800	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	707	V_{peak}
Insulation resistance	$T_{amb} = 25 \text{ }^{\circ}\text{C}$, $V_{IO} = 500 \text{ V}$	R_{IO}	$\geq 10^{12}$	Ω
	$T_{amb} = 100 \text{ }^{\circ}\text{C}$, $V_{IO} = 500 \text{ V}$	R_{IO}	$\geq 10^{11}$	Ω
	$T_{amb} = T_S$, $V_{IO} = 500 \text{ V}$	R_{IO}	$\geq 10^9$	Ω
Output safety power		P_{SO}	400	mW
Input safety current		I_{SI}	200	mA
Input safety temperature		T_S	150	$^{\circ}\text{C}$
Clearance distance	Measured from input terminals to output terminals, shortest distance through air		≥ 5.2	mm
Creepage distance	Measured from input terminals to output terminals, shortest distance path along body		≥ 5.2	mm
Input to output test voltage, method B	$V_{IORM} \times 1.875 = V_{PR}$, 100 % production test with $t_M = 1 \text{ s}$, partial discharge $< 5 \text{ pC}$	V_{PR}	1326	V_{peak}
Input to output test voltage, method A	$V_{IORM} \times 1.6 = V_{PR}$, 100 % sample test with $t_M = 10 \text{ s}$, partial discharge $< 5 \text{ pC}$	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.

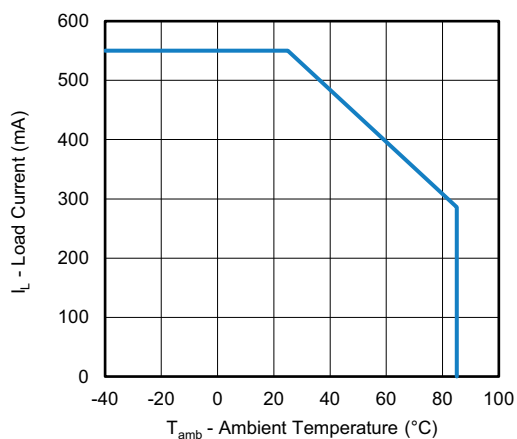
TYPICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)


Fig. 4 - Load Current vs. Ambient Temperature

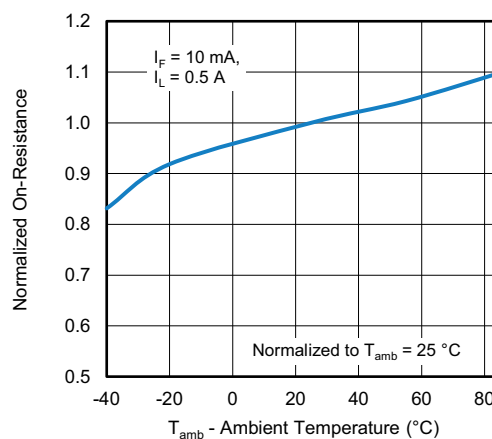


Fig. 7 - Normalized On-Resistance vs. Ambient Temperature

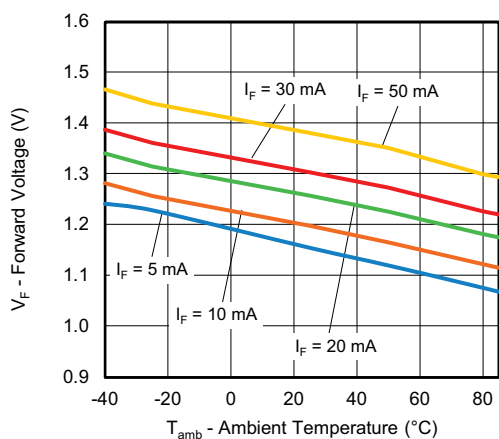


Fig. 5 - Forward Voltage vs. Ambient Temperature

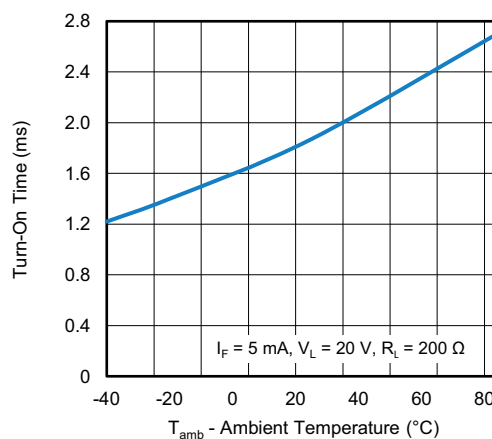


Fig. 8 - Turn-On Time vs. Ambient Temperature

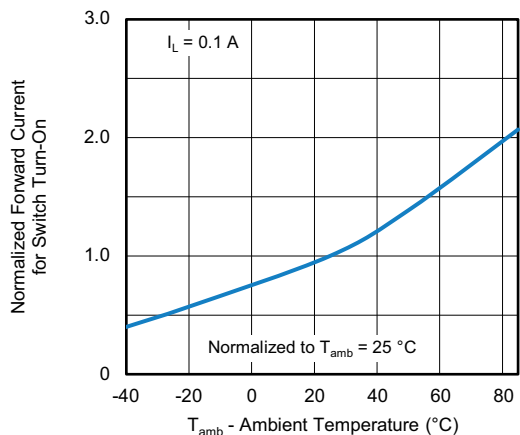


Fig. 6 - Normalized Forward Current for Switch Turn-On vs. Ambient Temperature

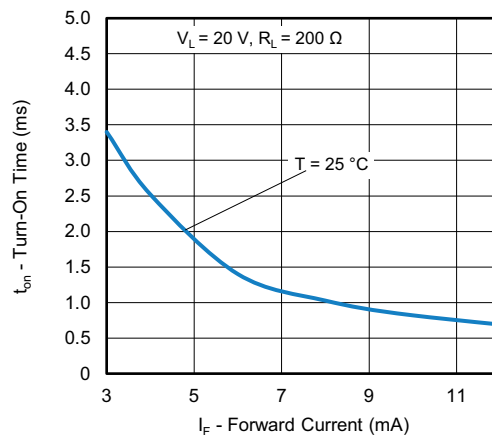


Fig. 9 - Turn-On Time vs. Forward Current

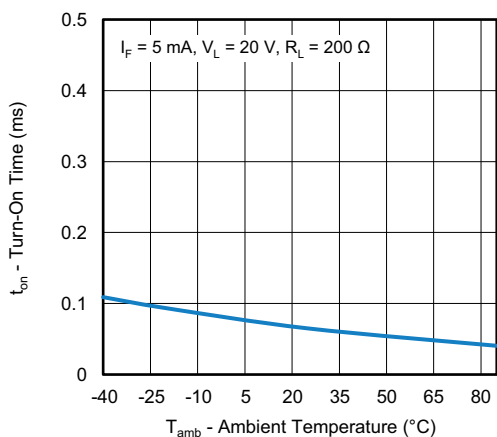


Fig. 10 - Turn-On Time vs. Ambient Temperature

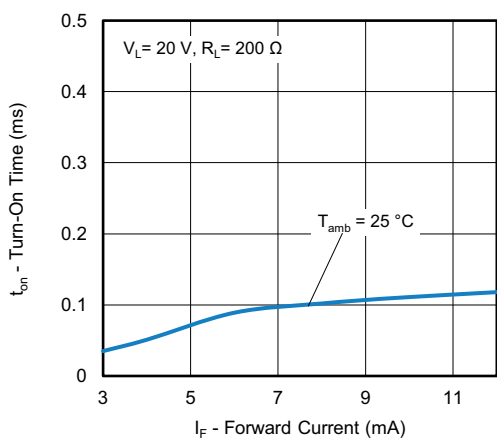


Fig. 11 - Turn-On Time vs. Forward Current

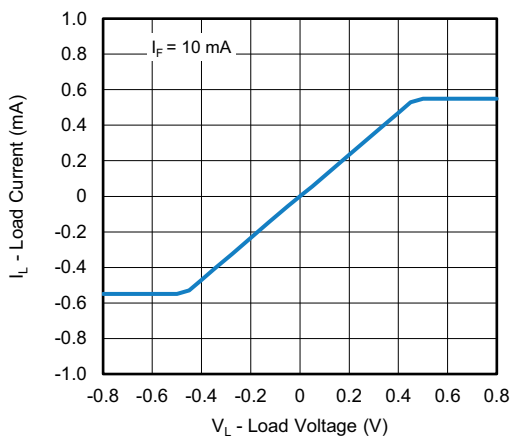
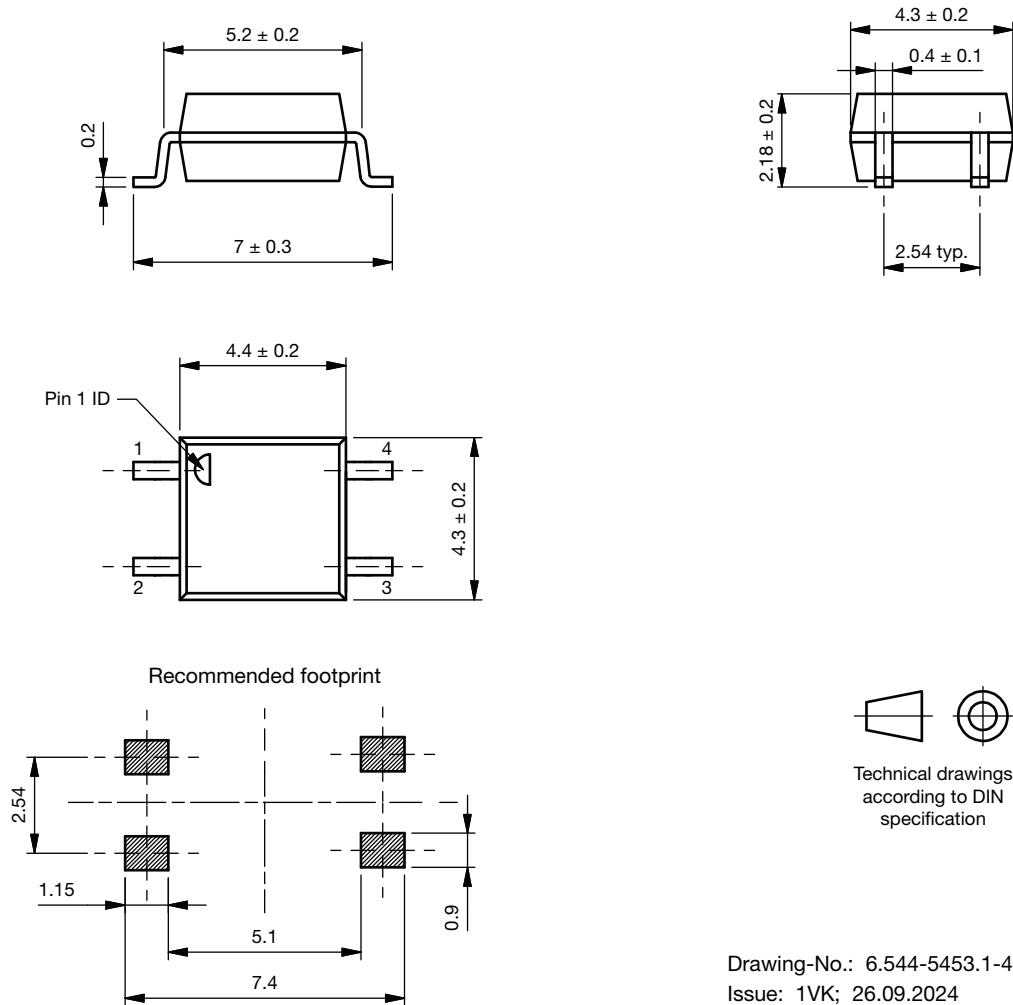


Fig. 12 - Load Current vs. Load Voltage

PACKAGE DIMENSIONS (in millimeters)


Drawing-No.: 6.544-5453.1-4
Issue: 1VK; 26.09.2024

Fig. 13 - Package Drawings

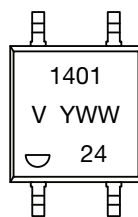
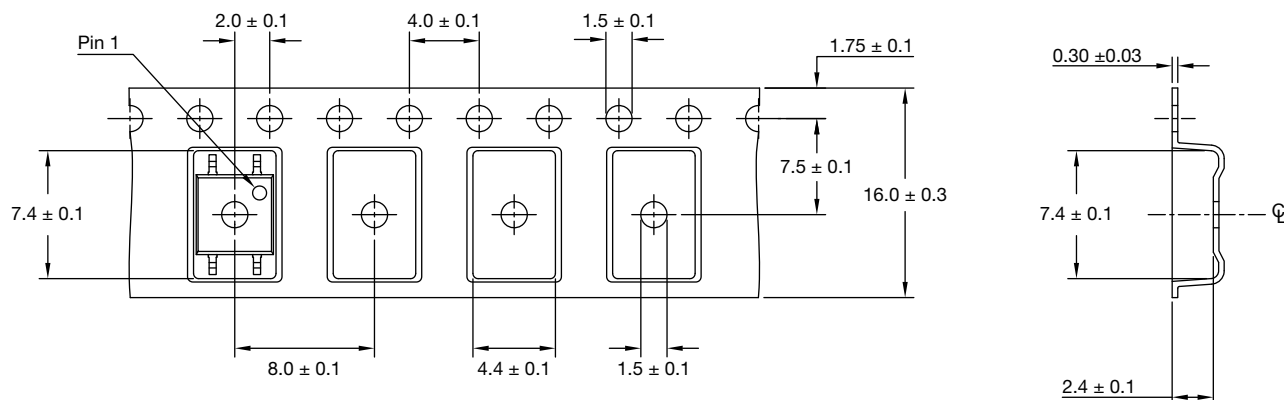
PACKAGE MARKING


Fig. 14 - VO1401AEF

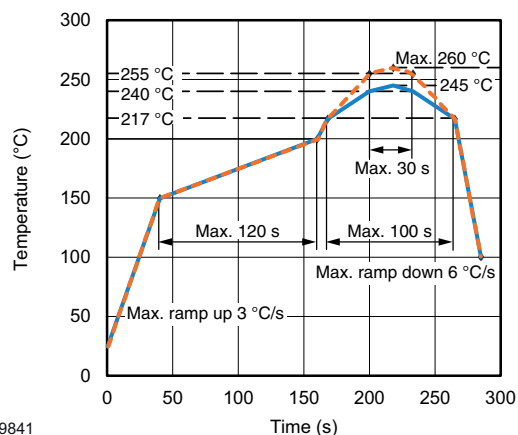
Notes

- YWW = date code
- Tape and reel suffix (TR) is not part of the package marking

TAPE AND REEL INFORMATION (in millimeters)

Note:

- Cumulative tolerance of 10 spocket holes is 0.20

Fig. 15 - VO1401AEFTR (3000 pieces on reel)

SOLDER PROFILES


19841

Fig. 16 - 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: $T_{amb} < 30\text{ °C}$, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



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