

1 Form A Solid-State Relay

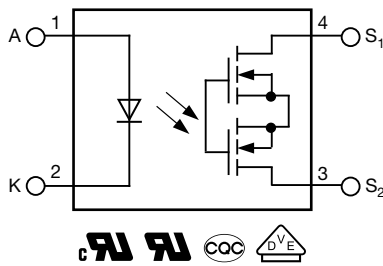


DESCRIPTION

The VOR1003M4 is an optically isolated 1 form A solid-state relay in a surface-mount 4 pin SOP package. This 1 form A opto-isolated relay comes in a low profile SOP-4 package, but still offers up to 5 A load current making it ideal for high current industrial applications.

FEATURES

- Load voltage 30 V
- Continuous load current = 5 A
- Isolation voltage 3750 V_{RMS}
- Low on resistance R_{ON} = 0.7 Ω (typ.)
- Fast switching:
t_{on} = 1.5 ms (typ.), t_{off} = 0.15 ms (typ.)
- Low leakage current I_{LEAK} < 1 μA (typ.)
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912



APPLICATIONS

- Security systems
- Instrumentation
- Industrial controls

AGENCY APPROVALS

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

ORDERING INFORMATION	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">V</div> <div style="border: 1px solid black; padding: 2px 5px;">O</div> <div style="border: 1px solid black; padding: 2px 5px;">R</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">3</div> <div style="border: 1px solid black; padding: 2px 5px;">M</div> <div style="border: 1px solid black; padding: 2px 5px;">4</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> </div> <p style="text-align: center; margin-top: 5px;">PART NUMBER</p>	<p>TAPE AND REEL</p>
PACKAGE	UL, cUL, CQC, VDE, FIMKO
SOP-4, tape and reel	VOR1003M4T

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	30	V
Continuous load current		I_L	5	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 +110	$^{\circ}\text{C}$
Soldering temperature	$t \leq 10\text{ s max.}$	T_{sld}	260	$^{\circ}\text{C}$

Note

- 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.

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	$I_L = 100\text{ mA}$	I_{Fon}	-	2	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	$I_F = 10\text{ mA}$	V_F	-	1.2	1.5	V
LED reverse voltage	$I_R = 10\text{ }\mu\text{A}$	V_R	-	5	-	V
OUTPUT						
On-resistance	$I_F = 10\text{ mA}$, $I_L = 2\text{ A}$	R_{ON}	-	0.6	2.6	Ω
Off-state leakage current	$I_F = 0\text{ mA}$, $V_L = 24\text{ V}$	I_{LEAK}	-	0.1	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	$I_F = 10\text{ mA}$, $R_L = 200\text{ }\Omega$, $V_L = 50\text{ mA}$	t_{on}	-	0.5	3	ms
Turn-off time	$I_F = 10\text{ mA}$, $R_L = 200\text{ }\Omega$, $V_L = 50\text{ mA}$	t_{off}	-	0.1	0.5	ms

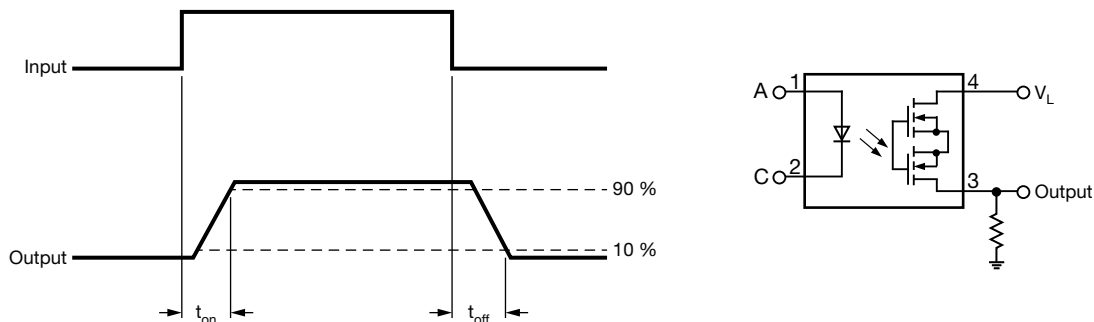


Fig. 1 - Timing Schematic



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}	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
Output safety power		P_{SO}	750	mW
Input safety current		I_{SI}	200	mA
Input safety temperature		T_S	150	$^{\circ}\text{C}$
Clearance distance			≥ 5.2	mm
Creepage distance			≥ 5.2	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.

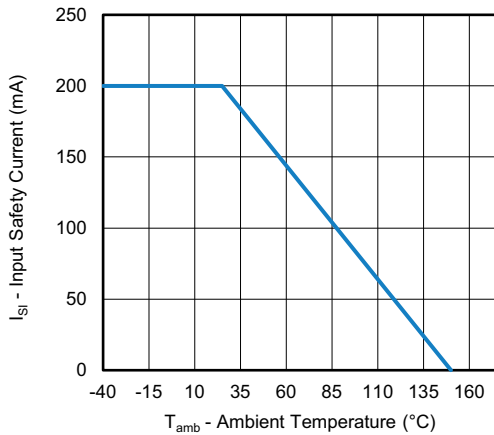


Fig. 2 - Safety Input Current vs. Ambient Temperature

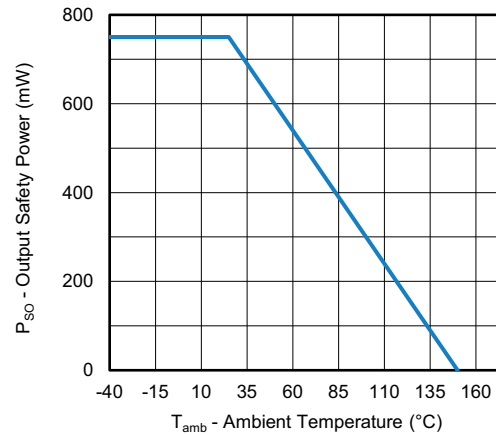


Fig. 3 - Safety Power Dissipation vs. Ambient Temperature

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

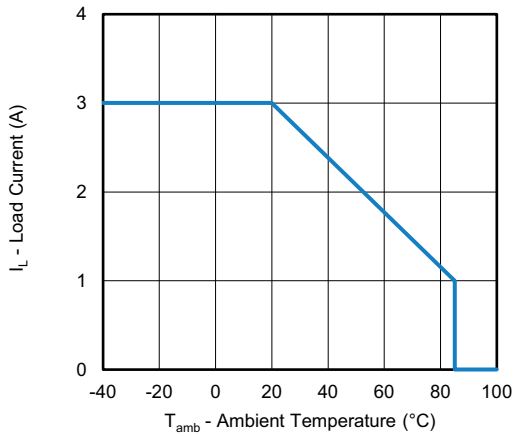


Fig. 4 - Load Current vs. Ambient Temperature

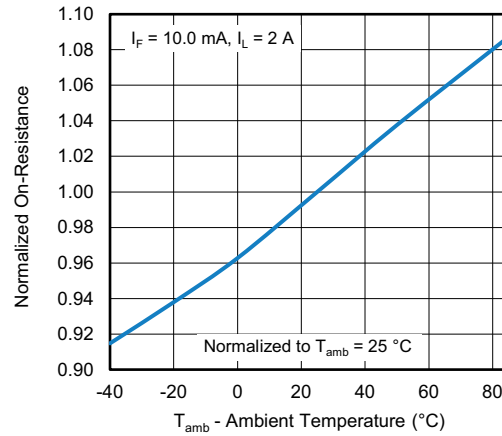


Fig. 7 - Normalized On-Resistance vs. Ambient Temperature

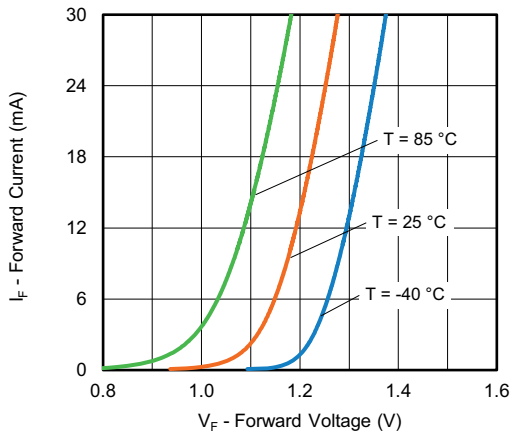


Fig. 5 - Forward Current vs. Forward Voltage

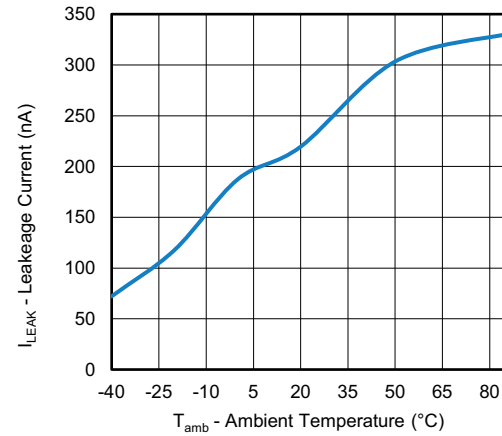


Fig. 8 - Off-State Leakage Current vs. Ambient Temperature

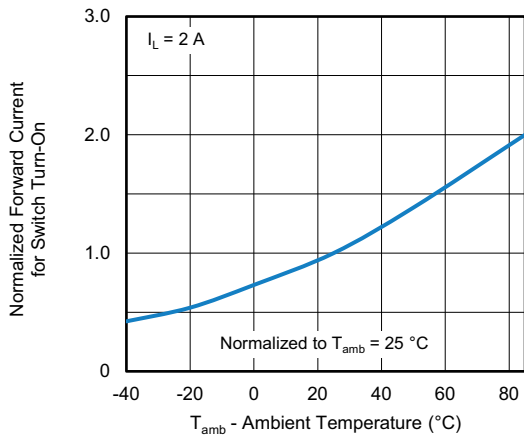


Fig. 6 - Normalized Forward Current for Switch Turn-On vs. Ambient Temperature

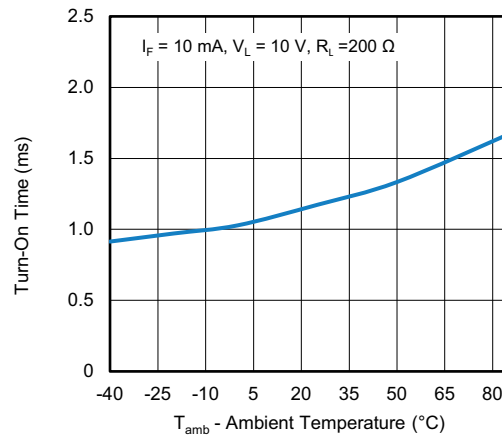


Fig. 9 - Turn-On Time vs. Ambient Temperature

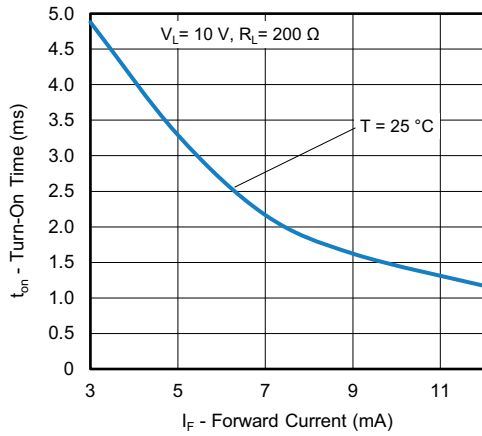


Fig. 10 - Turn-On Time vs. Forward Current

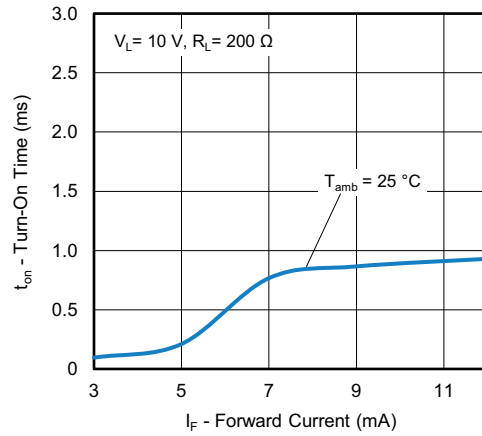


Fig. 12 - Turn-Off Time vs. Forward Current

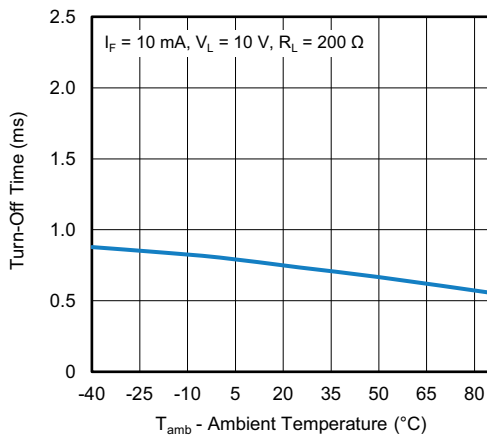


Fig. 11 - Turn-Off Time vs. Ambient Temperature

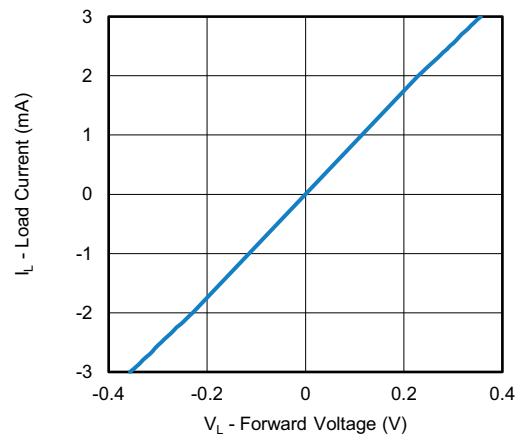


Fig. 13 - Load Current vs. Load Voltage

PACKAGE DIMENSIONS (in millimeters)

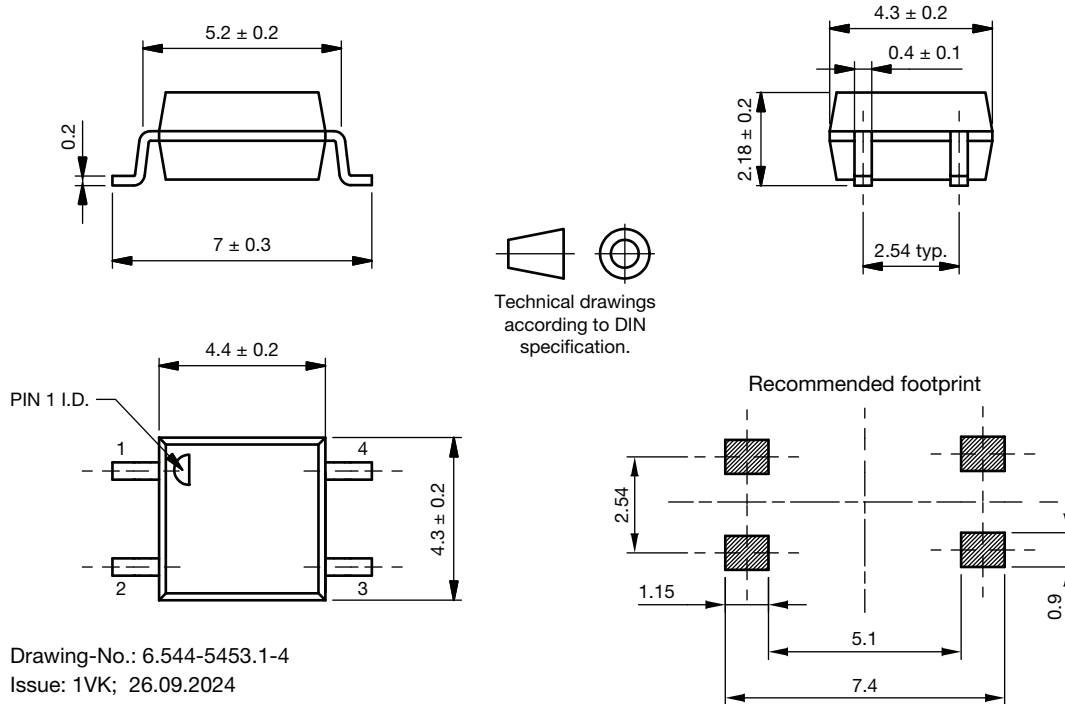


Fig. 14 - Package Drawings

PACKAGE MARKING

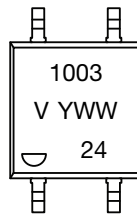
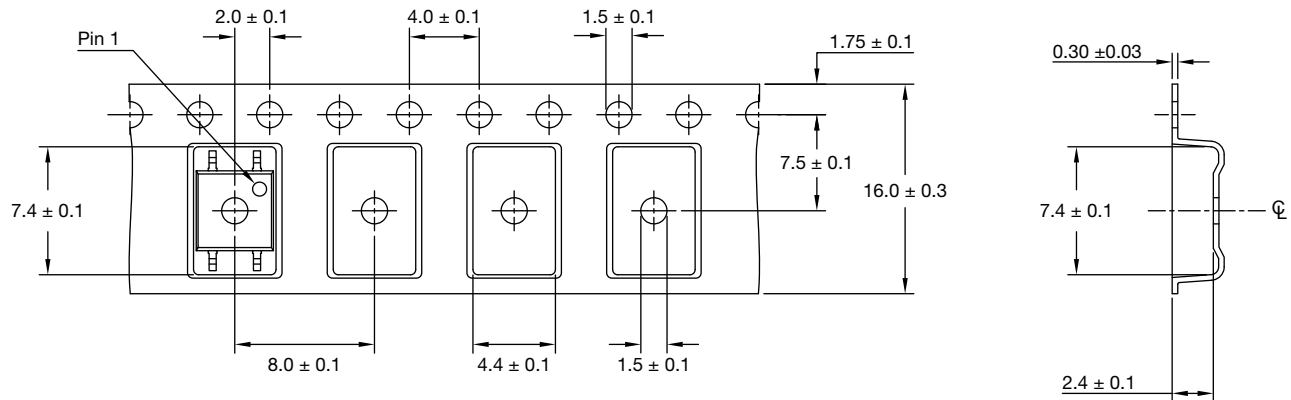


Fig. 15 - VOR1003M4

Notes

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

TAPE AND REEL INFORMATION (in millimeters)

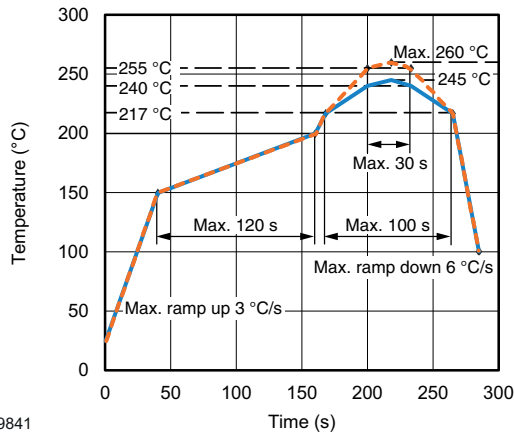


Note:

- Cumulative tolerance of 10 sprocket holes is 0.20

Fig. 16 - VOR1003M4T (3000 pieces on reel)

SOLDER PROFILES



19841

Fig. 17 - 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: 168 h

Conditions: $T_{amb} < 30\text{ }^{\circ}\text{C}$, RH < 60 %

Moisture sensitivity level 3, according to J-STD-020



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