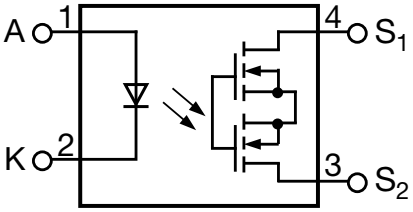
1 Form A Solid-State Relay





DESCRIPTION

The VORA1010M4 is an optically isolated 1 form A solid-state relay in a surface mount 4 pin SOP package.

FEATURES

- AEC-Q102 qualified
- Load voltage 100 V
- Load current 100 mA
- Isolation voltage 3750 V_{RMS}
- SOP-4 low profile package
- Clean bounce free switching
- Available on tape and reel
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

APPLICATIONS

- Hybrid / electric vehicle applications
- Battery management
- 48 V board net
- Security systems
- Instrumentation
- Industrial controls

LINKS TO ADDITIONAL RESOURCES

Infographics

AGENCY APPROVALS

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

ORDERING INFORMATION

V	O	R	A	1	0	1	0	M	4	#
PART NUMBER										TAPE AND REEL

SOP

PACKAGE	UL, cUL, CQC, VDE, FIMKO
SOP-4, tape and reel	VORA1010M4T

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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
Input power dissipation		P_{diss}	80	mW
OUTPUT				
DC or peak AC load voltage		V_L	100	V
Load current AC peak		I_L	100	mA
Output power dissipation		P_{diss}	150	mW
SSR				
Total power dissipation		P_{diss}	200	mW
Ambient temperature range		T_{amb}	-40 to +125	°C
Storage temperature range		T_{stg}	-40 to +150	°C
Soldering temperature	t ≤ 10 s max.	T_{sld}	260	°C

Note

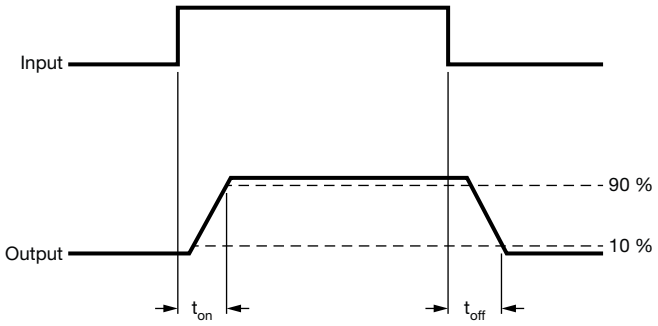
- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
LED forward current, switch turn-on	I_L = 100 mA, t_{delay} = 10 ms	I_{Fon}	-	0.2	2	mA
LED forward current, switch turn-off	V_L = 100 V	I_{Foff}	50	-	-	µA
LED reverse current	V_R = 5 V	I_R	-	0.001	10	µA
LED forward voltage	I_F = 5 mA	V_F	-	1.37	1.6	V
LED reverse voltage	I_R = 10 µA	V_R	5	23	-	V
OUTPUT						
On-resistance	I_F = 10 mA, I_L = 100 mA	R_{ON}	-	2	6	Ω
Off-state leakage current	I_F = 0 mA, V_L = 100 V	I_{LEAK}	-	0.001	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 (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	I_F = 5 mA, V_L = 6 V, I_L = 50 mA	t_{on}	-	100	250	µs
Turn-off time	I_F = 5 mA, V_L = 6 V, I_L = 50 mA	t_{off}	-	100	150	µs



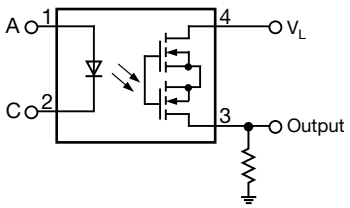


Fig. 1 - Timing Schematic

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SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		40 / 125 / 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} = 125 °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			≥ 5	mm
Creepage distance			≥ 5	mm
Insulation thickness		DTI	≥ 0.3	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}, 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.

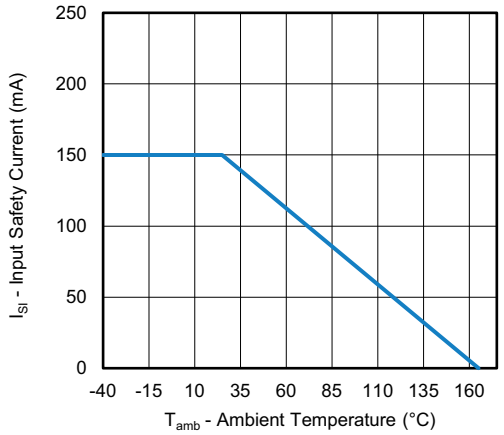


Fig. 2 - Safety Input Current vs. Ambient Temperature

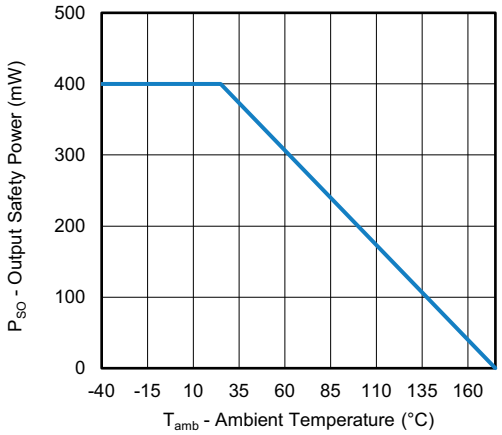


Fig. 3 - Safety Power Dissipation vs. Ambient Temperature

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TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

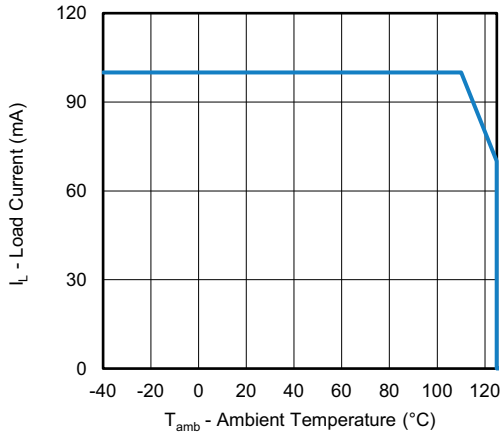


Fig. 4 - Maximum Load Current vs. Ambient Temperature

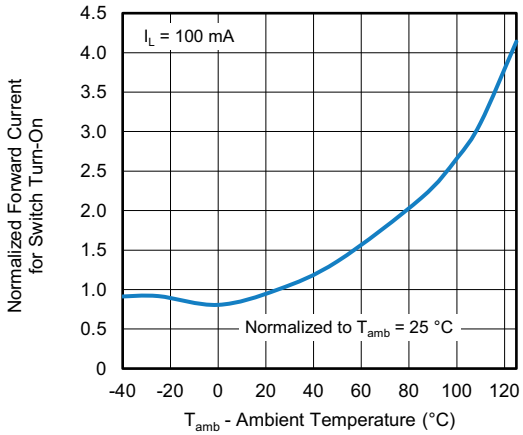


Fig. 7 - Normalized Forward Current for Switch Turn-On vs. Ambient Temperature

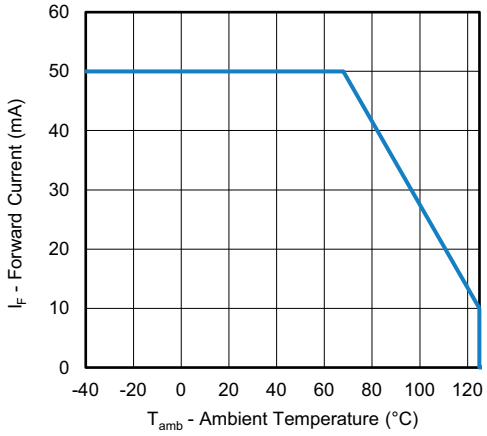


Fig. 5 - Forward Current vs. Ambient Temperature

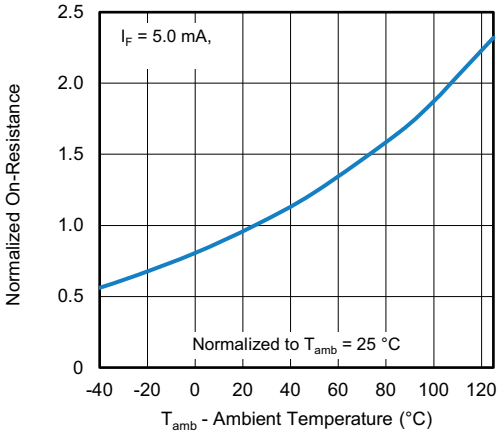


Fig. 8 - Normalized On-Resistance vs. Ambient Temperature

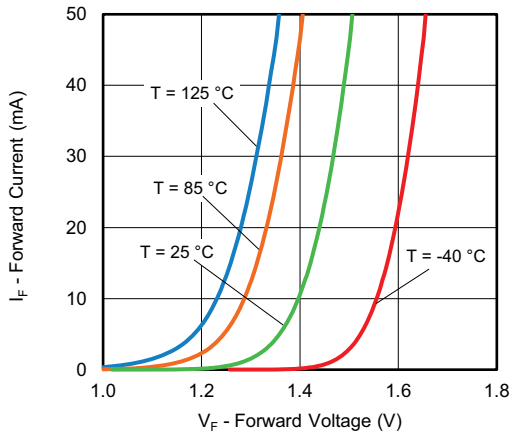


Fig. 6 - Forward Current vs. Forward Voltage

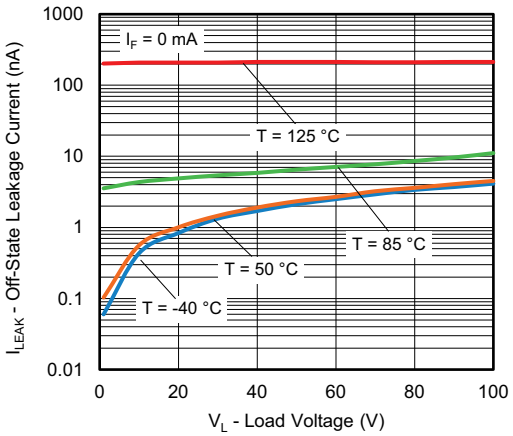


Fig. 9 - Off-State Leakage Current vs. Load Voltage

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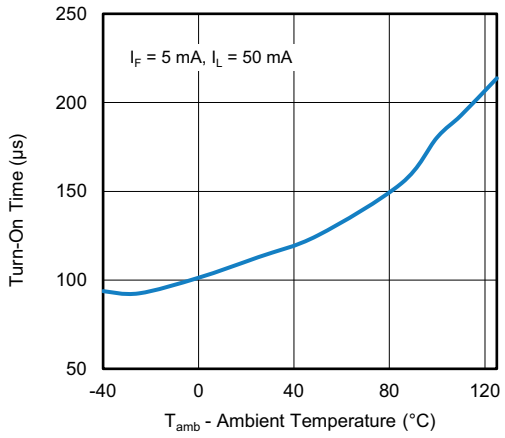


Fig. 10 - Turn-On Time vs. Ambient Temperature

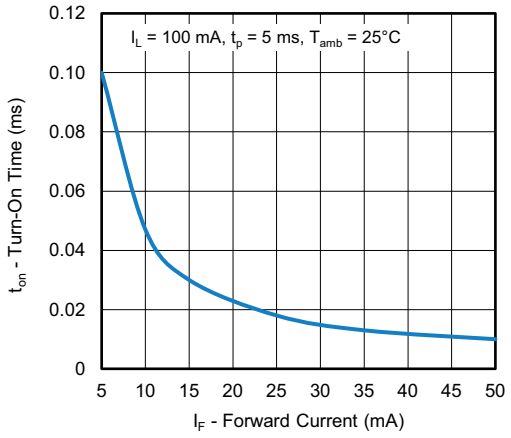


Fig. 11 - Turn-Off Time vs. Ambient Temperature

PACKAGE DIMENSIONS (in millimeters)

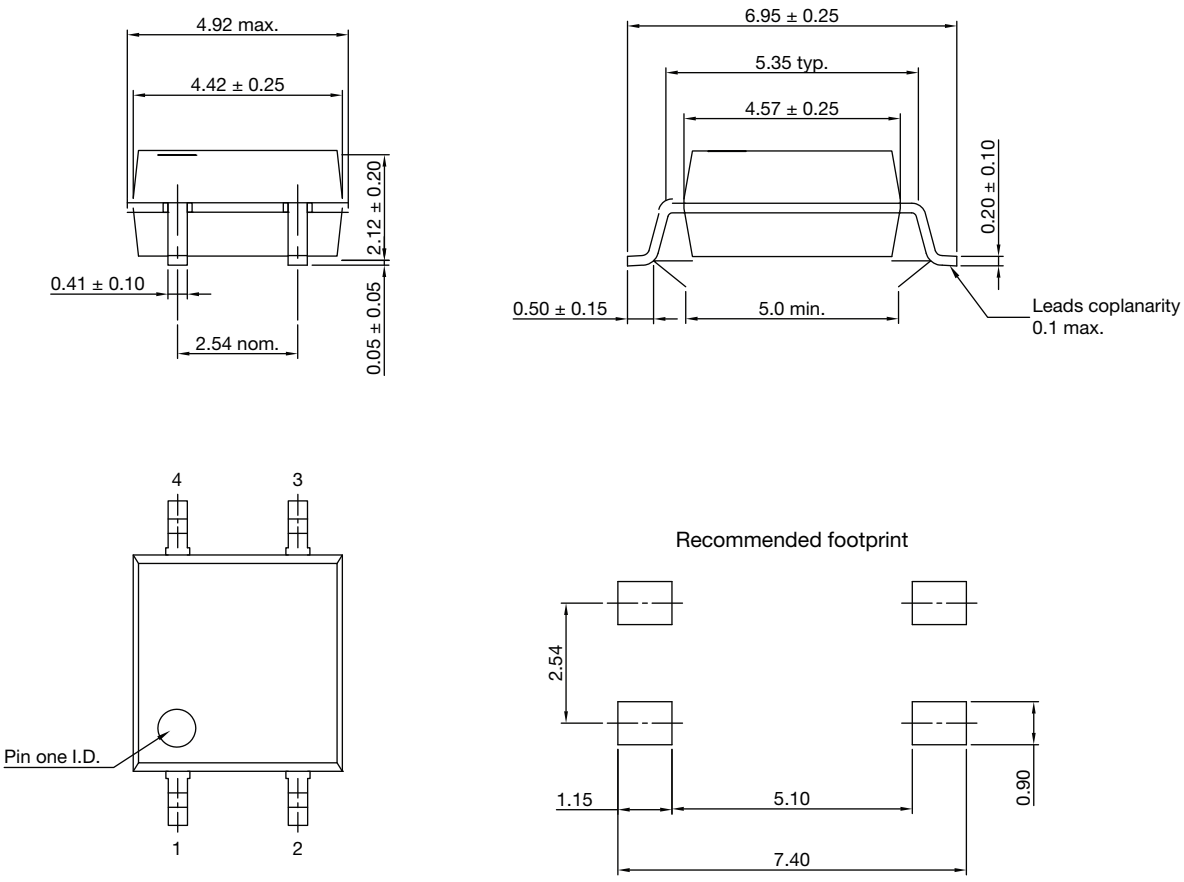


Fig. 12 - Package Drawings

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PACKAGE MARKING

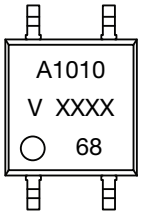
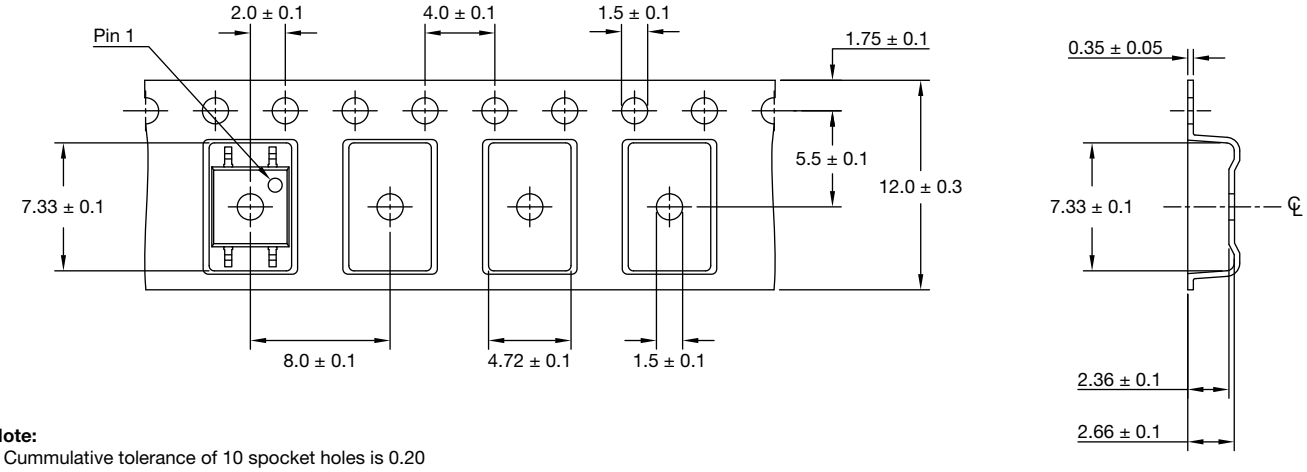


Fig. 13 - VORA1010M4

Notes

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

TAPE AND REEL INFORMATION (in millimeters)



Note:

- Cummulative tolerance of 10 spocket holes is 0.20

Fig. 14 - VORA1010M4T (2000 pieces on reel)

SOLDER PROFILES

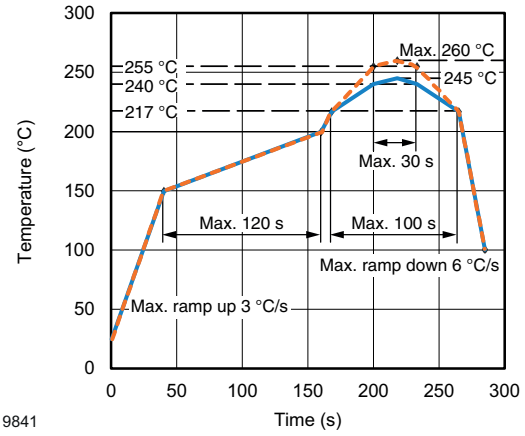


Fig. 15 - Lead (Pb)-free Reflow Solder Profile
According to J-STD-020 for SMD Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: 168 h

Conditions: T_{amb} < 30 °C, RH < 60 %

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

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