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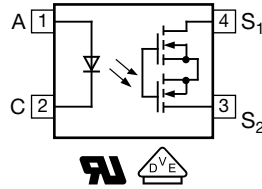
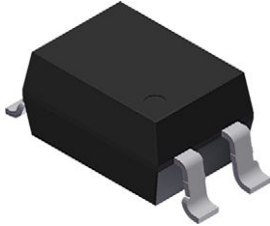
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1 Form A Solid-State Relay



FEATURES

- Isolation test voltage 5300 V_{RMS}
- Typical R_{ON} 22 Ω
- Load voltage 400 V
- Load current 140 mA
- Clean bounce free switching
- Current limit protection
- Low power consumption
- Wide temperature range
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



DESCRIPTION

The VOR1142 is a 400 V single channel normally open optically isolated solid-state relay (SPST - 1 form A). Based on hybrid architecture which allows fast switching times with a wide operating ambient temperature range. A high efficient GaAlAs IRED enables low forward current on the input side. On the output side high performance MOSFET switches provide a low R_{ON} and can switch both DC and AC signals.

APPLICATIONS

- General telecom switching
- Metering
- Security equipment
- Instrumentation
- Industrial controls
- Battery management systems
- Automatic test equipment

AGENCY APPROVALS

- UL1577, file no. E52744
- DIN EN 60747-5-5 (VDE 0884-5)

ORDERING INFORMATION	
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PACKAGE	UL, VDE
SMD-4, tape and reel	VOR1142B4T
SMD-4, tube	VOR1142B4



ABSOLUTE MAXIMUM RATINGS (T _{amb} = 25 °C, unless otherwise specified)				
PARAMETER	CONDITION	SYMBOL	VALUE	UNIT
INPUT				
IRED continuous forward current		I _F	50	mA
IRED reverse voltage		V _R	5	V
Input power dissipation		P _{diss}	80	mW
OUTPUT				
DC or peak AC load voltage		V _L	400	V
Continuous DC load current at 25 °C, bidirectional		I _L	140	mA
SSR output power dissipation		P _{diss}	550	mW
SSR				
Ambient temperature range		T _{amb}	-40 to +100	°C
Storage temperature range		T _{stg}	-40 to +150	°C
Soldering temperature	t = 10 s max.	T _{slid}	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						
IRED forward current, switch turn-on	I _L = 100 mA, t = 10 ms	I _{Fon}	-	0.25	2	mA
IRED forward current, switch turn-off	V _L = ± 350 V, I _L < 1 μA	I _{Foff}	0.05	0.15	-	mA
IRED forward voltage	I _F = 10 mA	V _F	-	1.36	1.5	V
IRED reverse current	V _R = 5 V	I _R	-	-	10	μA
OUTPUT						
On-resistance, AC/DC: pin 3 (±) to 4 (±)	I _F = 5 mA, I _L = 50 mA	R _{ON}	-	22	27	Ω
Off-resistance	I _F = 0 mA, V _L = ± 100 V	R _{OFF}	1	5000	-	GΩ
Off-state leakage current	I _F = 0 mA, V _L = ± 100 V	I _O	-	< 1	100	nA
	I _F = 0 mA, V _L = ± 400 V	I _O	-	6	500	nA
Output capacitance pin 3 to 4	I _F = 0 mA, V _L = 1 V, 1 MHz	C _O	-	39	-	pF
	I _F = 0 mA, V _L = 50 V, 1 MHz	C _O	-	6	-	pF
Current limit AC/DC	I _F = 5 mA, t = 5 ms, V _L = ± 6 V	I _{limit}	170	300	450	mA
TRANSFER						
Capacitance (input to output)	V _{IO} = 1 V	C _{IO}	-	1	-	pF

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, I _L = 50 mA	t _{on}	-	0.13	0.5	ms
Turn-off time	I _F = 5 mA, I _L = 50 mA	t _{off}	-	0.05	0.2	ms

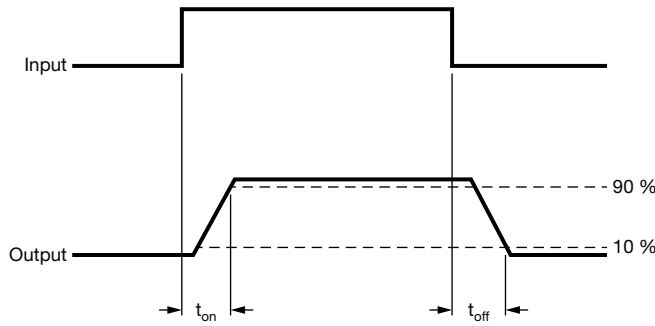
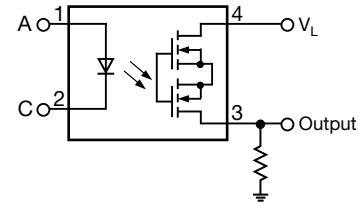


Fig. 1 - Timing Schematic



SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		40 / 100 / 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}	5300	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	8000	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	890	V_{peak}
Isolation resistance	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^{\circ}\text{C}$	R_{IO}	$\geq 10^{12}$	Ω
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$	R_{IO}	$\geq 10^{11}$	Ω
Output safety power		P_{SO}	720	mW
Input safety current		I_{SI}	240	mA
Safety temperature		T_S	175	$^{\circ}\text{C}$
Creepage distance			≥ 8	mm
Clearance distance			≥ 8	mm
Insulation thickness		DTI	≥ 0.4	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}	1669	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}	1424	V_{peak}

Note

- As per IEC 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

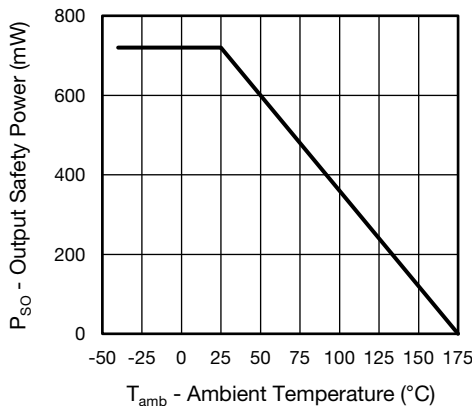


Fig. 2 - Safety Power Dissipation vs. Ambient Temperature

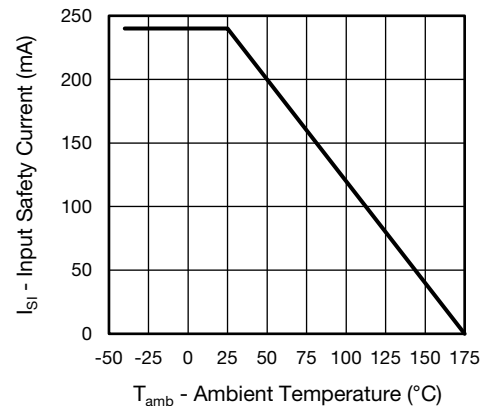


Fig. 3 - Safety Input Current vs. Ambient Temperature

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

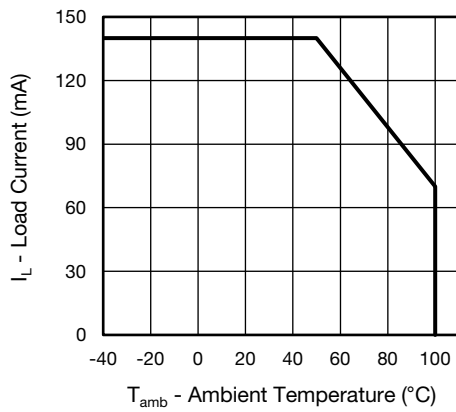


Fig. 4 - Maximum Load Current vs. Ambient Temperature

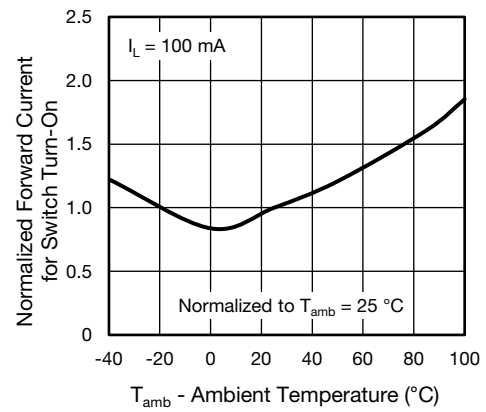


Fig. 7 - Normalized Forward Current for Switch Turn-On vs. Ambient Temperature

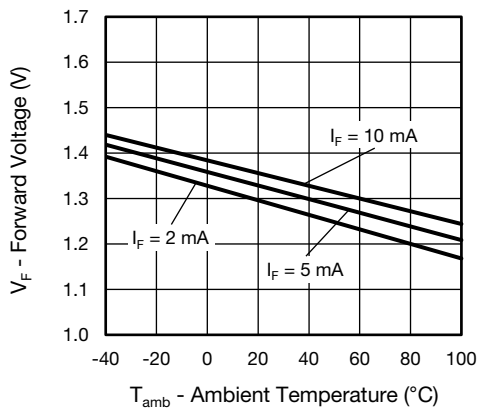


Fig. 5 - Forward Voltage vs. Ambient Temperature

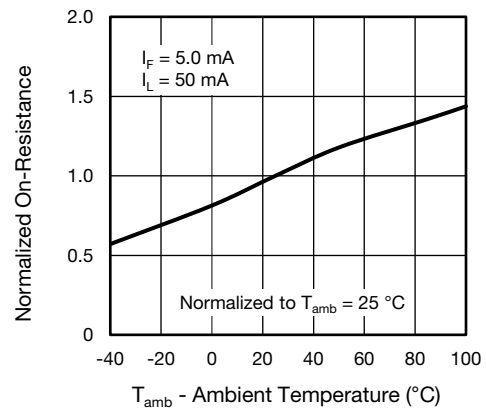


Fig. 8 - Normalized On-Resistance vs. Ambient Temperature

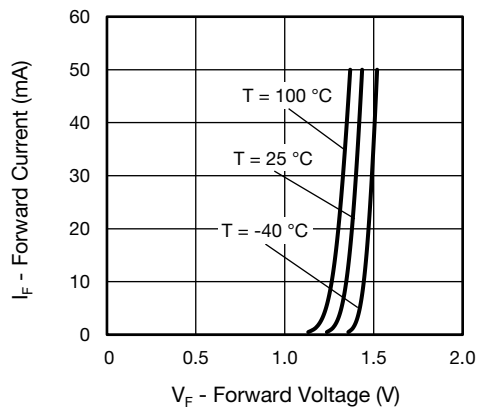


Fig. 6 - Forward Current vs. Forward Voltage

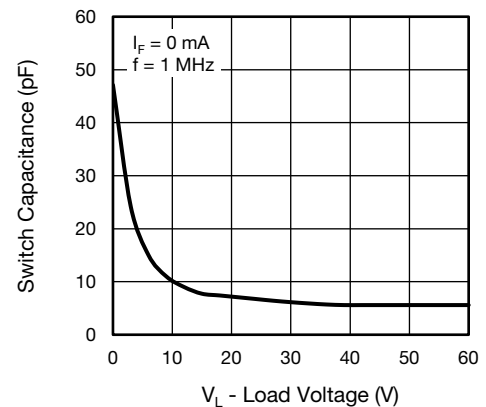


Fig. 9 - Output Capacitance vs. Load Voltage

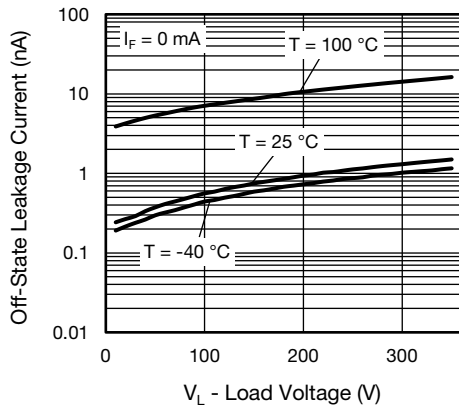


Fig. 10 - Off-State Leakage Current vs. Load Voltage

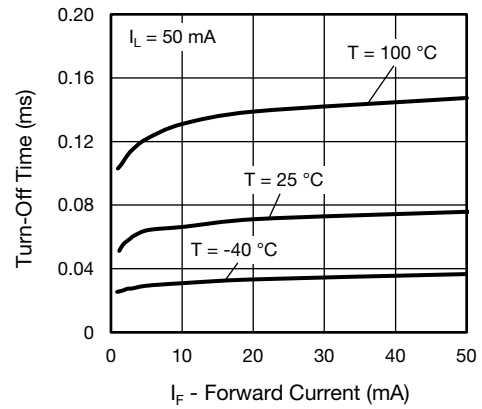


Fig. 13 - Turn-Off Time vs. Forward Current

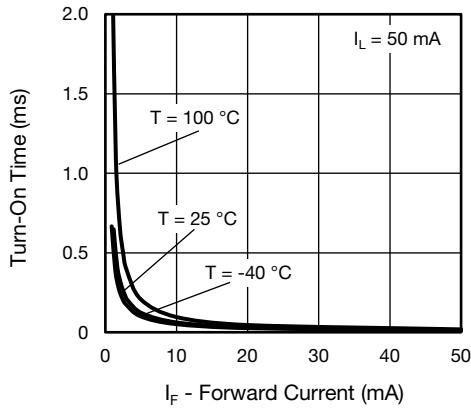


Fig. 11 - Turn-On Time vs. Forward Current

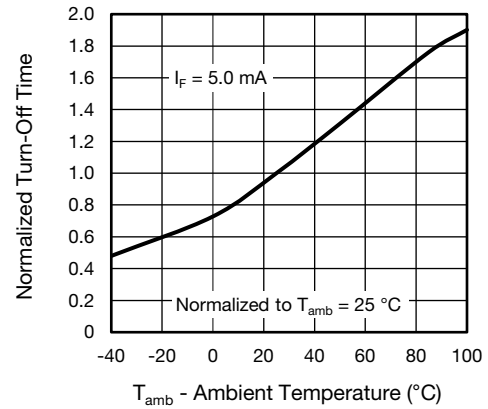


Fig. 14 - Normalized Turn-Off Time vs. Ambient Temperature

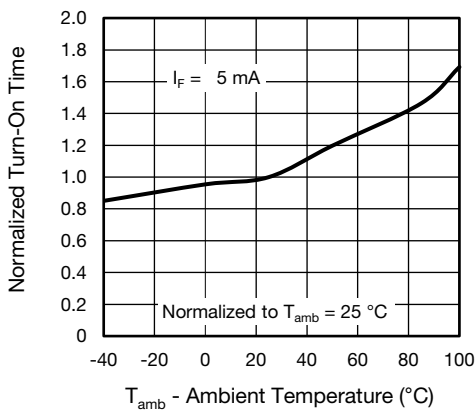
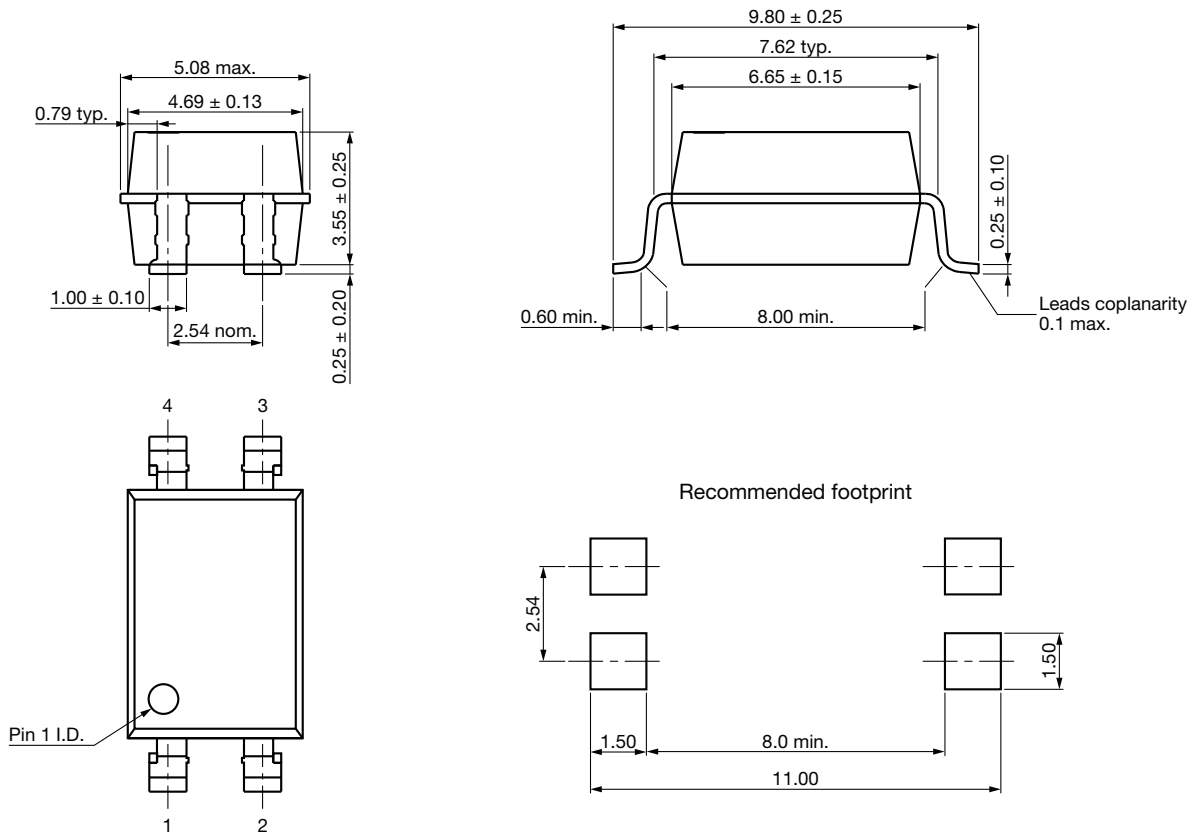


Fig. 12 - Normalized Turn-On Time vs. Ambient Temperature

PACKAGE DIMENSIONS in millimeters

SMD-4



PACKAGE MARKING (example)

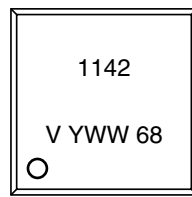


Fig. 15 - VOR1142B4

Note

- Package configuration (T, A, B) are not part of the package marking.

PACKING INFORMATION (in millimeters)

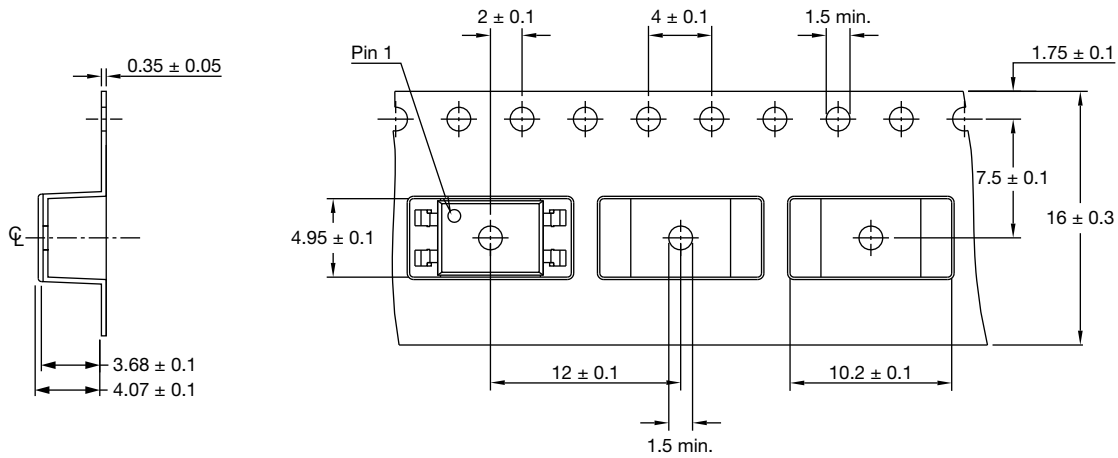


Fig. 16 - Tape and Reel Packing

TAPE AND REEL PACKING	
TYPE	UNITS/REEL
SMD-4	1000

TUBE PACKING			
TYPE	UNITS/TUBE	TUBES/BOX	UNITS/BOX
SMD-4	100	20	2000

SOLDER PROFILES

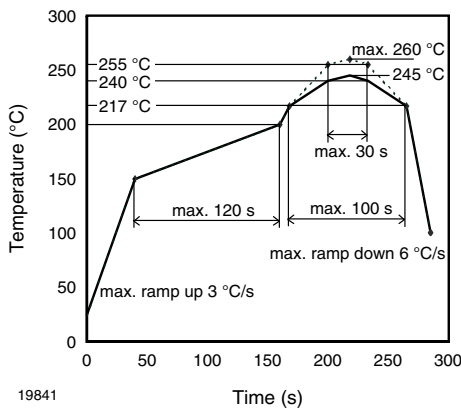


Fig. 17 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2
 Floor life: unlimited
 Conditions: $T_{amb} < 30\text{ °C}$, $RH < 85\%$
 Moisture sensitivity level 1, according to J-STD-020



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