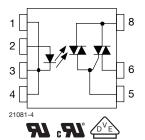


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## Vishay Semiconductors

# **Optocoupler, Power Phototriac**





### **DESCRIPTION**

The VO2223B is an optically coupled phototriac driving an integrated power TRIAC in a DIP-8 package. Featuring galvanic and electrical noise isolation, the VO2223B is able to directly drive medium AC loads with a low voltage input signal. The high blocking voltage of 600 V permits control of off-line voltages up to 230 V<sub>AC</sub> and is sufficient for as much as 380 V<sub>AC</sub>.

#### **FEATURES**

- Fully integrated power TRIAC
- Maximum trigger current (I<sub>FT</sub>): 10 mA
- Isolation test voltage 5300 V<sub>RMS</sub>
- Peak off-state voltage 600 V
- Load current 1 A<sub>RMS</sub>
- dV/dt of 600 V/μs
- DIP-8 package
- Pure tin leads
- · Material categorization: for definitions of compliance please see www.vishay.com/doc?99912





## **APPLICATIONS**

- Air conditioners
- Microwave ovens
- · Washing machines
- Refrigerators
- Fan heaters
- Inductive heating cooker
- Water heaters
- · Industrial equipments

### **AGENCY APPROVALS**

- UL
- cUL
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1

ORDERING INFORMATION				
V O 2 2 2 PART NUMBER	3 B - X 0 0 #  PACKAGE OPTION  Option 7  7.62 mm  > 0.7 mm			
AGENCY CERTIFIED/PACKAGE	TRIGGER, CURRENT I <sub>FT</sub> (mA)			
UL, cUL	10			
DIP-8	VO2223B			
SMD-8, option 7	VO2223B-X007T			
VDE, UL, cUL	10			
DIP-8	VO2223B-X001			
SMD-8, option 7	VO2223B-X017T			



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<b>ABSOLUTE MAXIMUM RATINGS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT			
INPUT							
Forward current		I <sub>F</sub>	50	mA			
Reverse voltage		$V_R$	5	V			
Input power dissipation		P <sub>diss</sub>	70	mW			
OUTPUT							
Repetitive peak off-state voltage	Sine wave, 50 Hz to 60 Hz, gate open	$V_{DRM}$	600	V			
RMS on-state current		I <sub>T(RMS)</sub>	1	Α			
Non repetitive surge peak on-state current	50 Hz, peak	I <sub>TSM</sub>	10	Α			
COUPLER							
Total power dissipation (1)		P <sub>diss</sub>	1.2	W			
Ambient temperature range		T <sub>amb</sub>	-40 to +85	°C			
Storage temperature range		T <sub>stg</sub>	-40 to +125	°C			
Soldering temperature	t ≤ 10 s max.	T <sub>sld</sub>	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
- (1) Total power dissipation value is based on 2S2P PCB

## **ABSOLUTE MAXIMUM RATING CURVES**

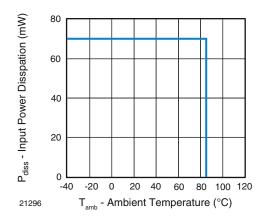


Fig. 1 - Input Power Dissipation vs. Ambient Temperature

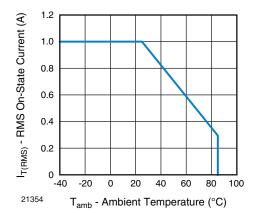


Fig. 2 - RMS On-State Current vs. Ambient Temperature

## Note

 The RMS on-state current was calculated out under a given operating conditions and only for reference: input power: Q<sub>E</sub> = 0.015 W, θ<sub>BA</sub> (4-layer) = 30 °C/W

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<b>ELECTRICAL CHARACTERISTICS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT	INPUT					
Trigger input current	V <sub>T</sub> = 6 V	I <sub>FT</sub>	2.5	-	10	mA
Input reverse current	V <sub>R</sub> = 5 V	I <sub>R</sub>	ı	1	10	μΑ
Forward voltage	$I_F = 10 \text{ mA}$	$V_{F}$	0.9	-	1.4	V
OUTPUT						
Peak on-state voltage	I <sub>TM</sub> = 1 A	$V_{TM}$	-	-	1.7	V
Peak off-state current	V <sub>DRM</sub> = 600 V	I <sub>DRM</sub>	-	-	100	μΑ
Holding current	$R_L = 100 \Omega$	I <sub>H</sub>	-	-	25	mA
Critical rate of rise of off-state voltage	V <sub>IN</sub> = 400 V <sub>RMS</sub> (Fig. 3)	dV/dt <sub>cr</sub>	-	600	-	V/µs
Critical rate of rise of commutating voltage	$V_{IN} = 240 V_{RMS}, I_T = 1 A_{RMS}$ (Fig. 3)	dV/dt <sub>crq</sub>	-	0.7	-	V/µs

#### 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

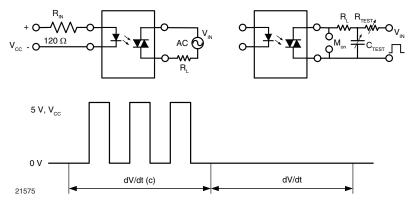


Fig. 3 - dV/dt Test Circuit

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 <sub>ISO</sub>	4470	V <sub>RMS</sub>		
Tested withstanding isolation voltage	According to UL1577, t = 1 s	$V_{ISO}$	5300	$V_{RMS}$		
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V <sub>IOTM</sub>	8000	V <sub>peak</sub>		
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V <sub>IORM</sub>	890	V <sub>peak</sub>		
Isolation resistance	$T_{amb} = 25  ^{\circ}C,  V_{IO} = 500  V$	R <sub>IO</sub>	≥ 10 <sup>12</sup>	Ω		
	$T_{amb} = 100  ^{\circ}\text{C},  V_{IO} = 500  \text{V}$	R <sub>IO</sub>	≥ 10 <sup>11</sup>	Ω		
Output safety power		P <sub>SO</sub>	2000	mW		
Input safety current		I <sub>SI</sub>	150	mA		
Input safety temperature		T <sub>SI</sub>	165	°C		
Creepage distance	DIP-8		≥ 7	mm		
Clearance distance	DIF-0		≥ 7	mm		
Creepage distance	CMD 9 antion 7		≥ 8	mm		
Clearance distance	SMD-8, option 7		≥ 8	mm		
Insulation thickness		DTI	≥ 0.4	mm		

#### Note

This phototriac coupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with safety ratings shall be
ensured by means of protective circuits

## TYPICAL CHARACTERISTICS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

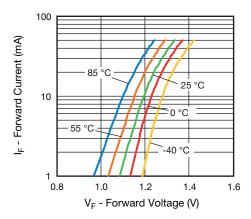


Fig. 4 - Forward Current vs. Forward Voltage

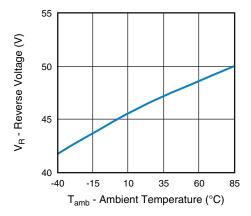


Fig. 5 - Reverse Voltage vs. Ambient Temperature

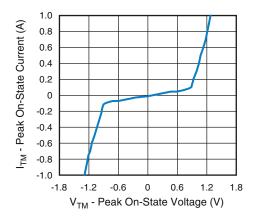


Fig. 6 - On-State Current vs. On-State Voltage

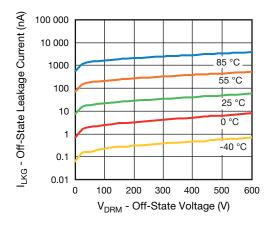


Fig. 7 - Off-State Leakage Current vs. Off-State Voltage

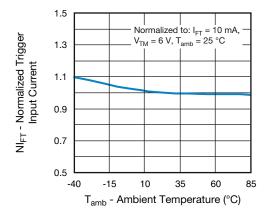


Fig. 8 - Normalized Trigger Input Current vs. Ambient Temperature

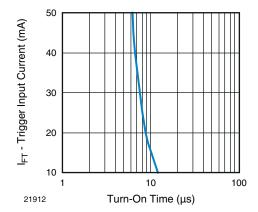


Fig. 9 - Trigger Input Current vs. Turn-On Time



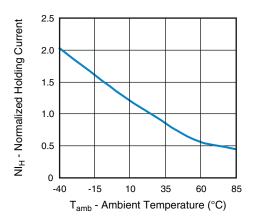


Fig. 10 - Normalized Holding Current vs. Ambient Temperature

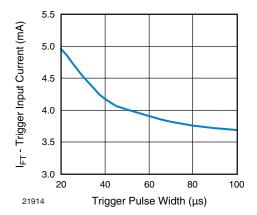


Fig. 11 - Trigger Input Current vs. Trigger Pulse Width

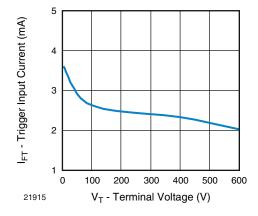
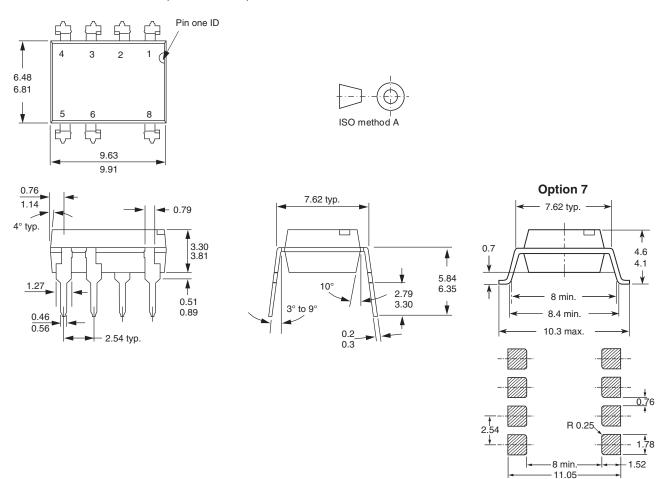


Fig. 12 - Trigger Input Current vs. Terminal Voltage



## **PACKAGE DIMENSIONS** (in millimeters)



## PACKAGE MARKING (example of VO2223B-X001)



## Notes

- The VDE logo is only marked on option 1 parts. Option information is not marked on the part
- Tape and reel suffix (T) is not part of the package marking

## **PACKING INFORMATION**

DEVICE PER TUBE				
TYPE	UNITS/TUBE	TUBES/BOX	UNITS/BOX	
DIP-8	50	40	2000	

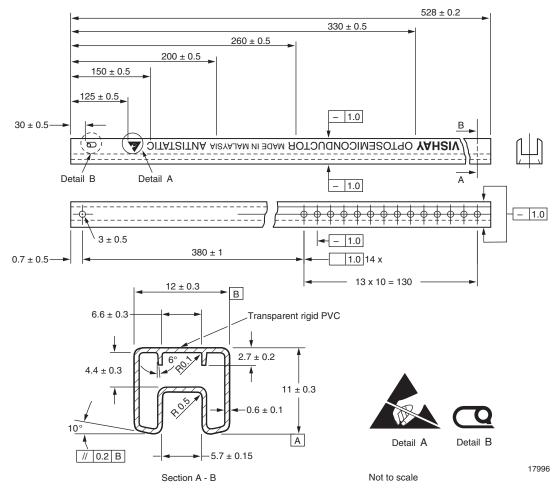


Fig. 13 - Shipping Tube Specifications for DIP Packages

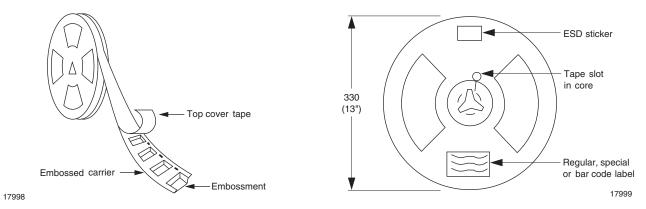


Fig. 14 - Tape and Reel Shipping Medium

Fig. 15 - Tape and Reel Shipping Medium



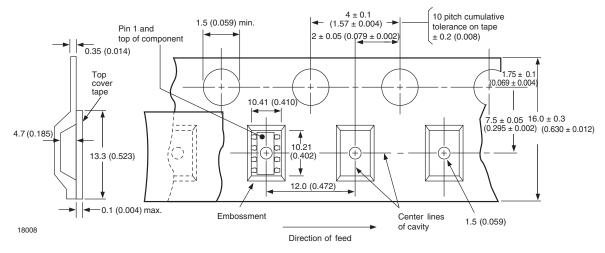


Fig. 16 - Tape and Packing (1000 pieces on reel)

#### **SOLDER PROFILES**

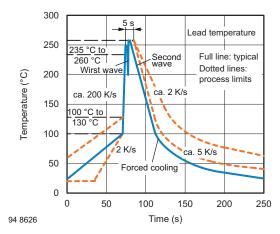


Fig. 17 - Recommended Wave Soldering Double Wave Profile for DIP Devices

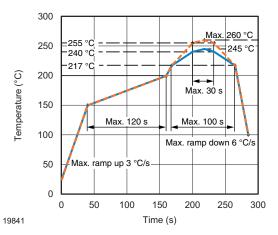


Fig. 18 - Recommended Lead (Pb)-free Reflow Solder Profile for SMD Devices

#### 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



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