

PB4VB2W

Description

The PB4VB2W piezoelectric bimorph is co-fired with multiple piezoelectric ceramic layers. The PB4VB2W offers a maximum displacement of $\pm 135 \mu\text{m} \pm 15\%$. It has three electrodes on the top surface and a silver plus sign is located next to one electrode attached to a red wire, which should receive positive bias.

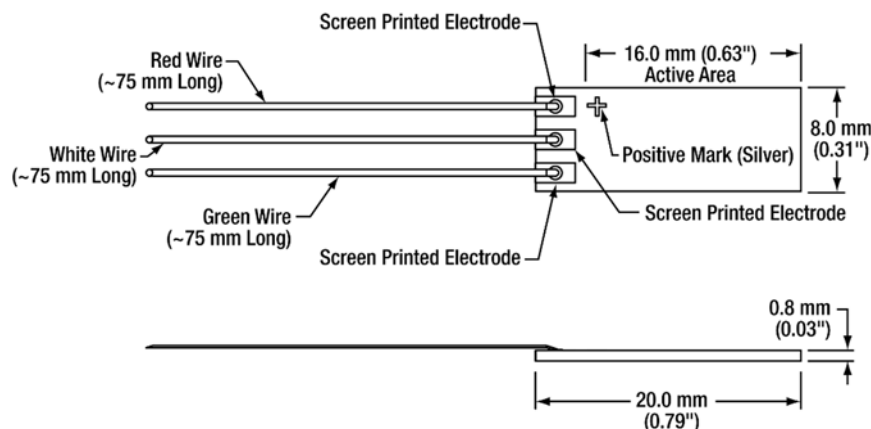
Specifications

PB4VB2W ^a	
Drive Voltage Range	0 - 150 V
Displacement at 150 V (16 mm free length)	$\pm 135 \mu\text{m} \pm 15\%$
Hysteresis	<15% (See Graph on Next Page)
Free Length	16 mm
Blocking Force at 150V	1.4 N (0.31 lbs)
Resonant Frequency ^b	930 Hz (No Load)
Dissipation Factor ^c	<2.0%
Capacitance ^c	145 nF $\pm 15\%$ for Each Side of the Bimorph
Operating Temperature	-25 to 130 °C
Curie Temperature	230 °C
External Electrodes	Screen-Printed Silver
Dimensions	Length: 20.0 mm ± 0.5 mm Width : 8.0 mm ± 0.1 mm Thickness: 0.8 mm ± 0.1 mm

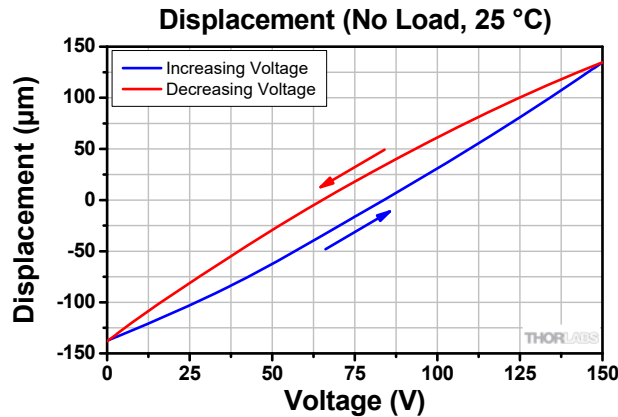


- All specifications are quoted at 25 °C, unless otherwise stated.
- Clamp on one side with 16 mm free length, without load.
- Specified at 1 kHz, 1 V_{RMS}.

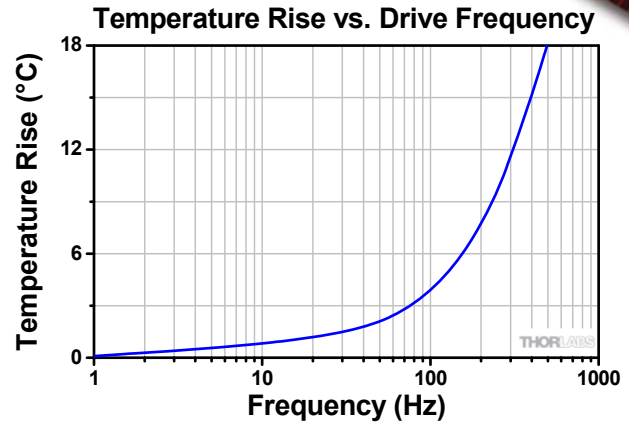
Drawing



Typical Performance Plots



Differential Voltage Control was used for this displacement test: Red Wire at 150 V, White Wire varied from 0 to 150 V, Green Wire at 0 V.



These temperature rises were measured after applying a sine-wave drive voltage ranging from 0 to 150 V applied to the white wire at the specified frequency for 10 minutes. The red wire was held at 150 V and the green wire at 0 V.

Operations

Mounting

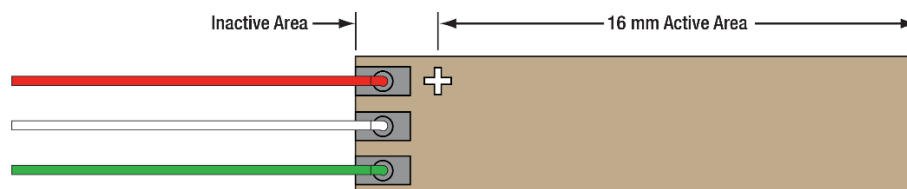
The PB4VB2W bimorph has three electrodes on the top surface and can be mounted either by mechanical clamping or gluing. It is recommended to attach the bimorph to a rigid carrier (ceramic, PEEK, etc.) in order to avoid additional drift and elastic compliance. The contact surfaces of the carrier have to be sufficiently flat to allow for proper attachment of the bimorph. If the carrier is made of metal, the contact area should be insulating to prevent a short circuit caused by the three external electrodes and the carrier.

If mounted with glue, it should be emphasized that gluing the contact surface is restricted to cover only the inactive part of the bender in order to not reduce the stroke. Adhesive with a low Young's modulus is recommended for mechanical assembling, and the curing temperature should be as low as possible to reduce the thermo-mechanical stress in the support.

If mounted with clamping, the clamping pressure should be as low as possible for the mechanical stability of the assembly, approximately 5 times the specified blocking force.

Electrical Connection

PB4VB2W has three electrodes: the positive electrode is attached to a red wire, and the other two electrodes are soldered to white and green wires, as shown below.



Caution: After driving, the piezo is fully charged. Directly connecting the green and white wires or red and white wires has the risk of electricity discharging, spark, and even failure. We recommend using a resistor ($>1\text{ k}\Omega$) between the wires to release the charge.

Driving Modes

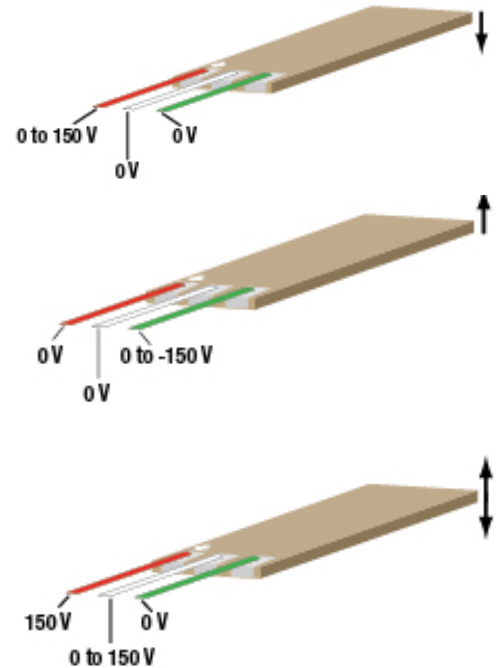
The bimorph bender can be operated following one of two basic driving principles:

Single-Side Voltage Control

If a positive voltage ($\leq 150\text{ V}$) is applied between the red and white lead wires, PB4VB2W will bend down when the silver plus is facing up, as shown in the diagrams below.

If a negative voltage ($\geq -150\text{ V}$) is applied between the white and green lead wires, PB4VB2W will bend up when the silver plus is facing up, as shown in the diagrams below.

When operating in Single-Side Voltage Control mode, never apply the voltage to both the green and red leads at the same time, as a voltage difference $>150\text{ V}$ between the two leads could damage the actuator.



Differential Voltage Control

In this mode, the bending can be controlled both upwards and downwards. This type of the driving requires a dual power supply to provide differential voltage to the two electrodes which are attached to the red and green wires, respectively. Then the voltage applied to the white wire can be varied to obtain up and down, as shown in the tale below.

Soldering Contact	Red	White	Green
Option 1	150 V	0 V to 150 V	GND
Option 2	75 V	-75 V to 75 V	-75 V

Long Term Operation

PB4VB2W actuators remained function after a long-term durability test of 1×10^8 cycles at a frequency of 100 Hz under conditions of $25\text{ }^\circ\text{C}$ room temperature and 45% ambient humidity.

Storage Instructions

- Do not store the device at temperatures above $80\text{ }^\circ\text{C}$.
- Do not store the device in humid environments. The relative humidity (RH) should be less than 40%.
- Do not immerse the device in organic solvents.
- Do not use the device around combustible gases or liquids.