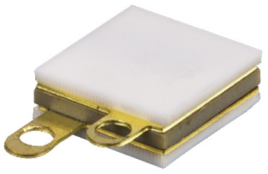
Single Piezo Actuator Stack, 200 V, 160 nm, 4.5 MHz, Two End Plates, Two Copper Leads

PA5FBP3



Description

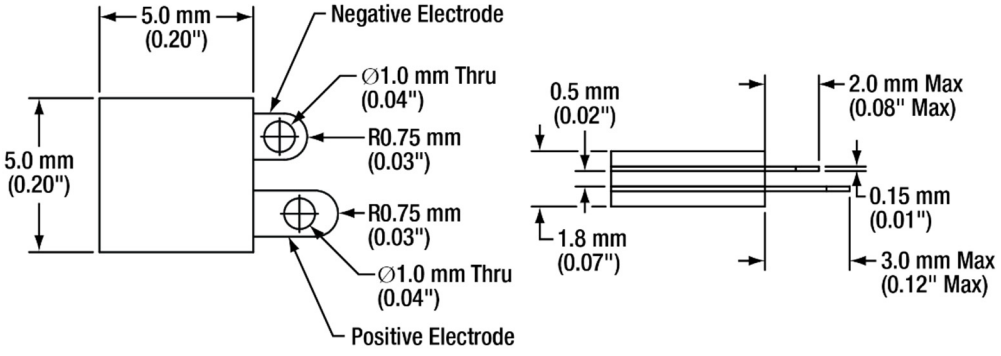
The PA5FBP3 Single Piezo Actuator Stack consists of a piezoelectric chip that is bonded via epoxy with copper foils and alumina end plates. Each copper foil is in electrical contact with an electrode of the piezo chip; the electrodes are located on the top and bottom surfaces of the chip. For easy access, the foils have copper leads extending beyond the footprint of the piezo chip. The copper foil with the longer lead should be connected to the positive electrode. The piezoelectric actuator offers a maximum displacement of 160 nm ± 20%.

Specifications

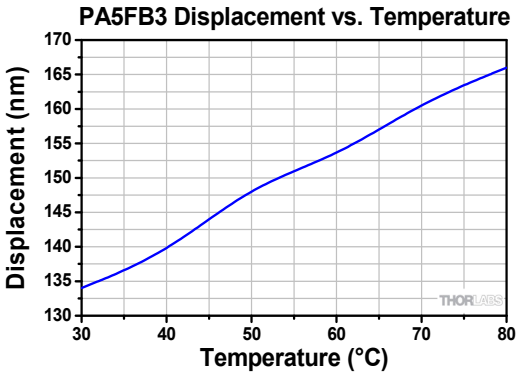
PA5FBP3[a]	
Drive Voltage Range	0 to 200 V
Displacement[b] (Free Stroke) at 200 V	160 nm ± 20%
Load for Maximum Displacement[c]	400 N (90 lbs)
Blocking Force at 200 V	1000 N (225 lbs)
Resonant Frequency	4.5 MHz (No Load)
Impedance at Resonant Frequency	10 Ω
Anti-Resonant Frequency	5.0 MHz
Dissipation Factor[d]	0.02 ± 15%
Capacitance[d]	1.60 nF ± 15%
Operating Temperature	-25 to 130 °C
Curie Temperature	230 °C
External Electrodes	Copper Foil Leads
Outer Dimensions	5.0 mm x 8.0 mm x 1.8 mm
Dimensional Tolerance	±0.1 mm

a. All specifications are quoted at 25 °C, unless otherwise stated.
b. The “free stroke” displacement corresponds to no load.
c. The displacement may vary slightly for different loads. The maximum displacement occurs when the load for maximum displacement is used.
d. Specified at 1 kHz, 1 V_{RMS}

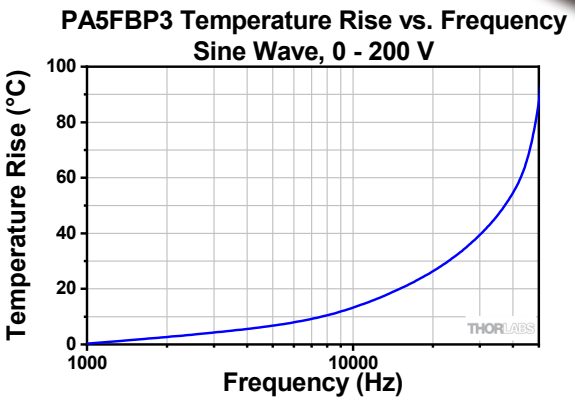
Drawing



Typical Performance Plots



The displacement of the stack was measured after heating to the set temperature for 10 minutes.



This test was conducted by applying a sine-wave driving voltage, 0 V to 200 V, at the specified frequency for 10 min, at room temperature without cooling. With lower maximum voltage and extra cooling measures, the working frequency can be higher, but the temperature of the device should be kept <130 ˚C.

Operation

Electrical Considerations

- Electrical connection to the external electrodes can be achieved by mechanical contacts, soldering, gluing with electrically conductive glues, or wire bonding. The copper foil with a longer lead should be connected to the positive electrode. The maximum drive voltage is 200 V. Exceeding 200 V will decrease the lifespan of the device and may cause mechanical failure. Reverse biasing the device may also cause mechanical failure.
- When soldering wires to the copper foil leads, use a temperature no greater than 370 ˚C (700 ˚F) for a maximum of 2 seconds per spot. Solder the lead to the middle of the electrode (where the through hole is) and keep the region over which heat is applied as small as possible.
- **Caution:** after driving, the piezo is fully charged. Directly connecting the long copper lead and the short copper lead has the risk of electrical discharge, spark, and even failure. We recommend using a resistor (> 1 kΩ) between the electrodes to release the charge.

Attaching Devices to the Piezo

- Any epoxy which cures at a temperature lower than 80 ˚C is safe to use. We recommend Thorlabs Item #'s 353NDPK or TS10. Loctite Hysol 9340 is also usable.
- Loads should only be attached to the central area of the largest face. Attaching a load to the smaller faces may lead to mechanical failure.

Storage Instructions

- Do not store the device in a humid environment. The relative humidity (RH) should be less than 40%.
- Do not store the device at a temperature above 80 ˚C.
- Do not immerse the device in organic solvents.
- Do not use the device around combustible gases or liquids.