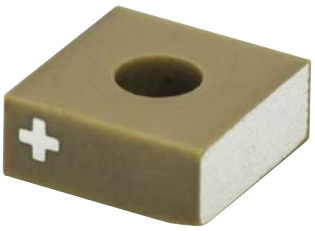
# Piezoelectric Chip, 150 V, 1.8 µm Travel

**PA4FEH3**



## Description

The PA4FEH3 piezoelectric chip with insulated Ø2 mm inner hole consists of stacked piezoelectric ceramic layers (which are mechanically in series) that are sandwiched between interdigitated electrodes (which are electrically in parallel). It offers a maximum displacement of 1.8 µm ± 15%. A silver + mark is located next to the electrode that should receive positive bias; the other electrode should be grounded. The electrodes are bare.

## Specifications

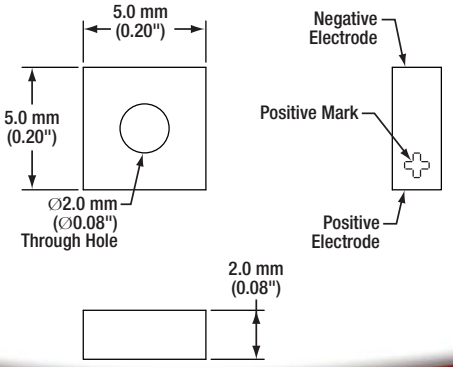
| PA4FEH3[a] | |
|---|---|
| **Drive Voltage Range** | 0 - 150 V |
| **Displacement (Free Stroke[b]) at 150 V** | 1.8 µm ± 15% |
| **Hysteresis** | <15% (See Graph on Next Page) |
| **Load (Recommended)** | 300 N (68 lbs) |
| **Blocking Force at 150 V** | 800 N (180 lbs) |
| **Resonant Frequency[c]** | 610 kHz (No Load) |
| **Impedance at Resonant Frequency[c]** | 200 mΩ |
| **Anti-Resonant Frequency[c]** | 820 kHz |
| **Dissipation Factor** | <2.0% |
| **Capacitance** | 160 nF ± 15% |
| **Operating Temperature** | -25 to 130 °C |
| **Curie Temperature** | 230 °C |
| **External Electrodes** | Screen-Printed Silver |
| **Dimensions** | Hole diameter: 2.0 mm ± 0.1 mm<br>Width 1: 5.0 mm ± 0.1 mm<br>Width 2: 5.0 mm ± 0.1 mm<br>Length: 2.0 mm ± 5 µm |

a. All specifications are quoted at 25 °C, unless otherwise stated.

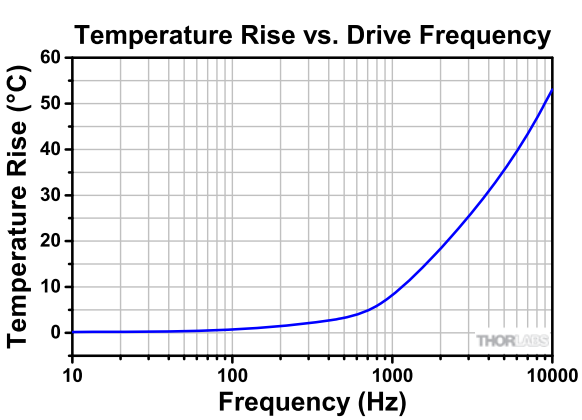
b. This chip is designed to produce maximum displacement when used with the recommended load. The displacement may vary slightly for different loads.

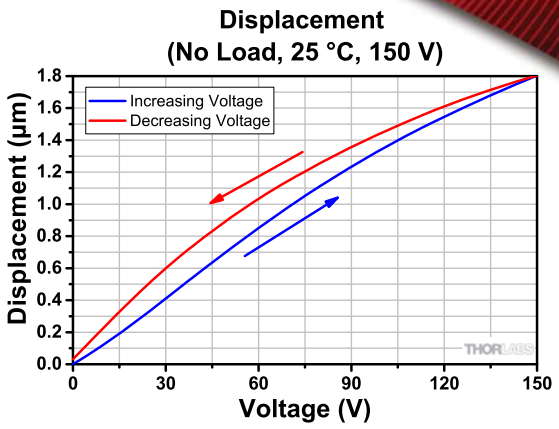
c. These specifications are for the unwired chip.

## Drawing



# Typical Performance Plots




These temperature rises were measured after applying a sine-wave drive voltage ranging from 0 to 150 V at the specified frequency for 10 minutes.

# Operation

Electrical Considerations

- The electrode closest to the silver + mark should be positively biased, and the opposite electrode should be grounded. The maximum drive voltage is 150 V. Exceeding 150 V will decrease the device's lifespan and may cause mechanical failure. Reverse biasing the device may cause mechanical failure.
- When soldering wires to the electrodes, use a temperature no greater than 370 °C (700 °F) for a maximum of 2 seconds per spot. Solder to the middle of the electrode, keeping the spot as small as possible.
- **Caution:** after driving, the piezo is fully charged. Directly connecting the positive and negative electrodes has the risk of electricity discharging, 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 Numbers 353NDPK or TS10. Loctite Hysol 9340 is also usable.
- Loads should only be attached to the central area of the largest face since the edges do not translate. Attaching a load to the smaller faces may lead to mechanical failure.

Storage Instructions

- Do not store the device at temperatures above 80 °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.