Piezoelectric Ring Chip, 150 V, 2.7 µm Travel

PA44RK

Description

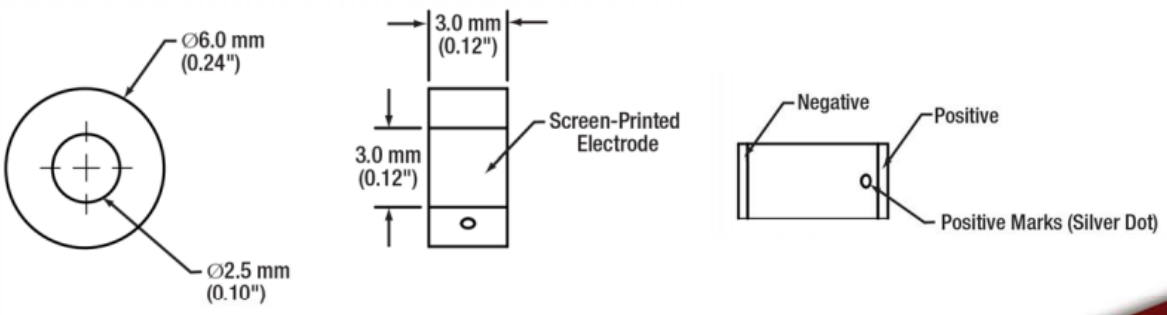
The PA44RK piezoelectric ring chip has a 6.0 mm outer diameter and a 2.5 mm inner diameter. It consists of a series of stacked piezoelectric ceramic layers, each possessing screen-printed electrodes. The printed layers are isostatically pressed to form the chip. The electrodes are electrically in parallel and the PA44RK provides a maximum displacement of 2.7 µm ± 15%. A silver dot is located next to the electrode that should receive positive bias; the other electrode should be grounded. The electrodes are bare.

Specifications

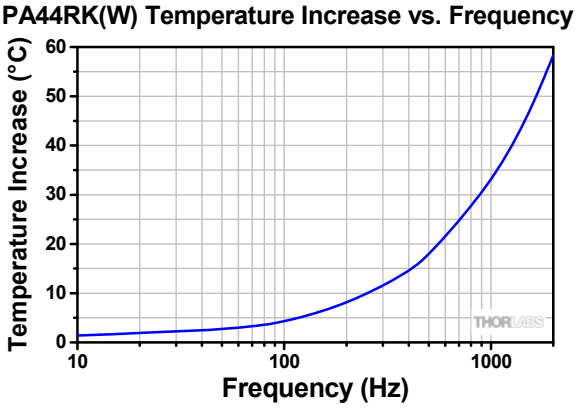
PA44RK[a]	
Drive Voltage Range	0 - 150 V
Displacement (Free Stroke) at 150 V[b]	2.7 µm ± 15%
Hysteresis	<15% (See Graph on Next Page)
Load for Maximum Displacement[c]	370 N (84 lbs)
Blocking Force at 150 V	930 N (209 lbs)
Resonant Frequency	475 kHz (No Load)
Impedance at Resonant Frequency	200 mΩ
Anti-Resonant Frequency	570 kHz
Dissipation Factor[d]	<2.0%
Capacitance[d]	195 nF ± 15%
Operating Temperature	-25 to 130 °C
Curie Temperature	230 °C
External Electrodes	Screen-Printed Silver
Dimensions	Outer Diameter: 6.0 mm ± 0.1 mm Inner Diameter: 2.5 mm ± 0.1 mm Length: 3.0 mm ± 5 µm

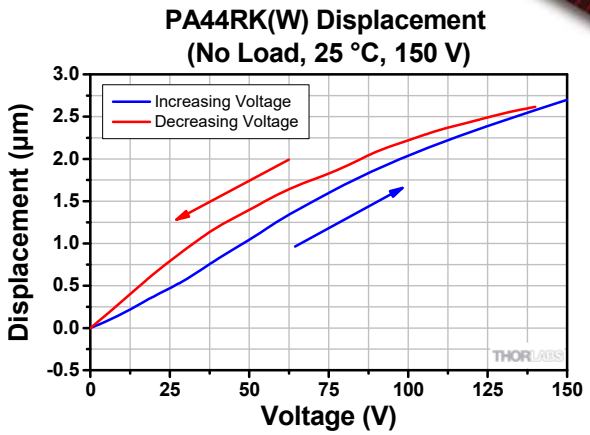
a. All specifications are quoted at 25 °C, unless otherwise stated.
b. The "free stroke" displacement corresponds to no load.
c. Displacement varies with loading. When used with this load, these chips achieve the maximum displacement, which is larger than the free stroke displacement.
d. Specified at 1 kHz, 1 V_{RMS}.

Drawing



Typical Performance Plots





The temperature increase of the chip was measured after applying a sine-wave drive voltage, with maximum and peak-to-peak amplitudes of 150 V, at the specified frequency for 10 minutes.

Operation

Electrical Considerations

- The electrode closest to the silver dot 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 (>10 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 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.