Piezoelectric Ring Chip with Wires, 150 V, 3.9 µm Travel

PA44M3KW

Description

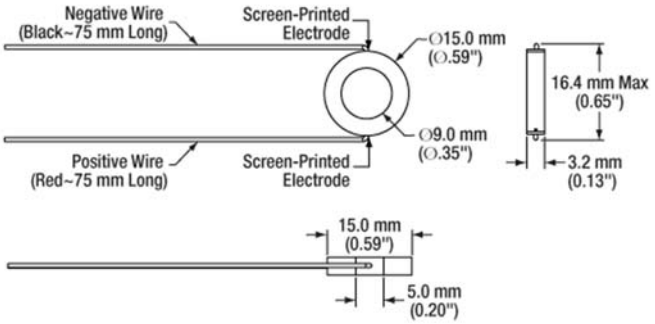
The PA44M3KW piezoelectric ring chip has a 15.0 mm outer diameter and a 9.0 mm inner diameter. It consists of a series of stacked piezoelectric ceramic layers, each possessing screen-printed electrodes. The printed layers are isostatically pressed to form the chip. The electrodes are electrically in parallel, and the PA44M3KW provides a maximum displacement of 3.9 µm ± 15%. A red wire is soldered to the electrode that should receive positive bias; a silver dot is also located next to this electrode. The other electrode should be grounded.

Specifications

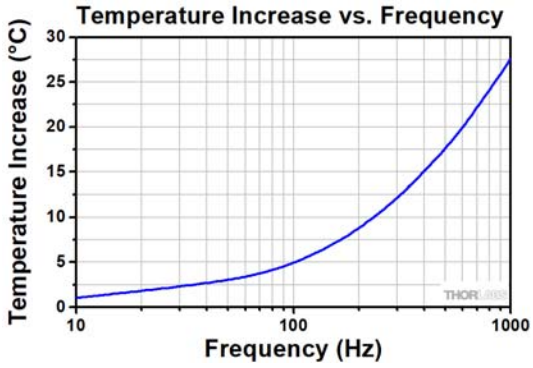
PA44M3KW[a]	
Drive Voltage Range	0 - 150 V
Displacement (Free Stroke) at 150 V[b]	3.9 µm ± 15%
Hysteresis	<15% (See Graph on Next Page)
Load for Maximum Displacement[c]	1810 N (406 lbs)
Blocking Force at 150V	4520 N (1015 lbs)
Resonant Frequency	260 kHz (No Load)
Impedance at Resonant Frequency	100 mΩ
Anti-Resonant Frequency	485 kHz
Dissipation Factor[d]	<2.0%
Capacitance[d]	2.2 µF ± 15%
Operating Temperature	-25 to 130 °C
Curie Temperature	230 °C
External Electrodes	Screen-Printed Silver
Dimensions[e]	Outer Diameter: 15.0 mm ± 0.1 mm Inner Diameter: 9.0 mm ± 0.1 mm Length: 3.2 mm ± 5 µm Max Width: 16.4 mm

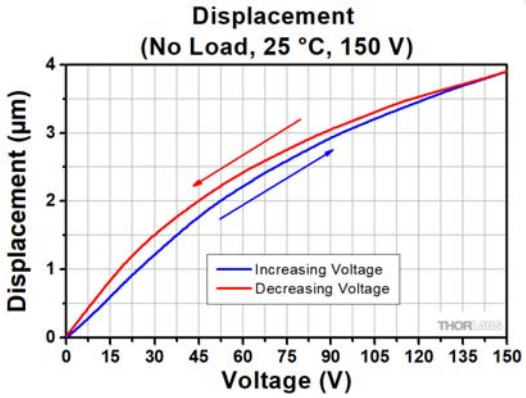
a. All specifications are quoted at 25 °C, unless otherwise stated.
b. The "free stroke" displacement corresponds to no load.
c. Displacement varies with loading. When used with this load, these chips achieve the maximum displacement, which is larger than the free stroke displacement.
d. Specified at 1 kHz, 1 V_{RMS}.
e. Max width includes the electrodes, wire connections, and chip diameter, but not the wire length.

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 attached to the red wire should be connected to the output port or positive pole of a driver or controller or amplifier, and the electrode attached to the black wire should be grounded. The maximum 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.
- If it becomes necessary to reattach the wires to the electrodes, use a soldering iron at 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 red and black wires has the risk of electricity discharging, spark, and even failure. We recommend using a resistor (>10 kΩ) between the wires to release the charge.

Attaching Devices to the Piezo

- Any epoxy that 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.