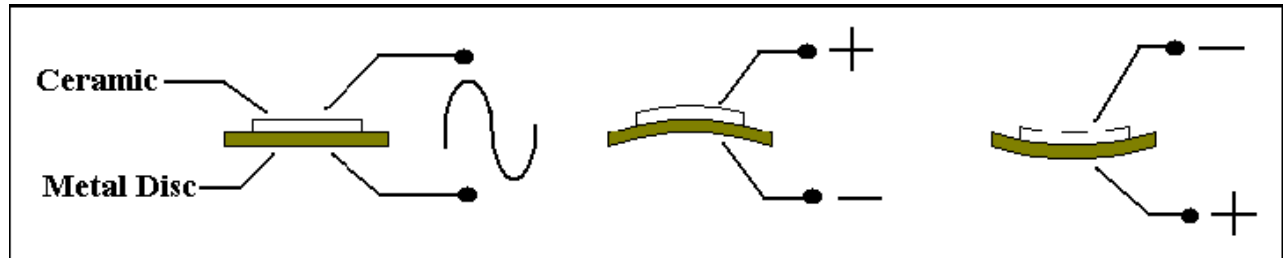


Technical APPLICATION Guide

Operation of Piezoelectric Audible Alarms

Piezoelectric electronic audible alarms work by converting the user input voltage to an appropriate oscillating signal that is applied to a sounder element that is mounted in a housing. The piezoelectric sounder element consists of a metal disc that has a special ceramic material bonded to it that physically bends when voltage is applied to it.



The above picture shows a bare piezoelectric sounder element. By applying a sinusoidal wave-form at an appropriate frequency, the transducer will physically deflect in one direction and then in the opposite direction following the shape of the input wave-form. If this oscillation occurs in the audible frequency range (1 Hz to 20 kHz), then air pressure waves are produced that the human ear interprets as an audible sound.

The larger the voltage of the applied wave-form, the larger the amplitude of the air pressure waves resulting in a louder sound level. However, the ceramic portion of the transducer can only bend so far before there is a risk of a catastrophic failure. This maximum voltage is somewhere around 40 to 50 volts. However, it is rare to apply this much voltage to a transducer as you reach a point of diminishing returns for voltages much greater than 32 volts.

By itself, the sound level produced by a transducer element is insignificant. To increase the size of the air pressure waves (and thus the sound level), the transducer element must be mounted inside an acoustic chamber that is optimized for the transducer size and resonant frequency. Every transducer has one frequency where it flexes more efficiently producing the louder sound levels. This frequency where the transducer performs the best is called the resonant frequency.

Self-Drive type devices provide a 3rd terminal that connects to an isolated portion of the piezoelectric transducer. This third terminal provides a feed-back signal that is 180 degrees out of phase with the drive signal. This signal can be fed back into the circuit to allow the sounder element to self-tune itself to the transducer's resonant frequency.