compact
silent
powerful
efficient
light weight
reliable

PIEZO VIBRATORY FANS

..truly revolutionary

Innovation in Motion
TECHNOLOGY OVERVIEW

Traditional muffin fans have been used for many years as an effective means of cooling different types of electronic equipment. However, they are not suitable for the increasingly shrinking devices that require compact cooling, low power, and quiet operation.

PIEZO COOLING FANS

In response to the cooling needs of small electronics, piezoelectric fans have become good alternatives to traditional fans because of their small size, low power, and quiet operation. However, the performance of the piezoelectric material used degrades with exposure to high mechanical and electrical stresses for extended periods. This drawback has limited “piezo fans” from being widely and economically used.

THE RLP™ BREAKTHROUGH

A new breakthrough in cooling technology combines compact and rugged design with quiet, low power operation and effective cooling - Ruggedized Laminated Piezo (RLP™).

RLP™ Piezo Vibratory Fans work on a simple principle. The RLP™ fan has a flexible blade, typically made of stainless steel, that is set into motion by a piezoceramic bending element. This bending element functions due to an ultra low power oscillating current of electricity. The electric field causes the piezoceramic to elongate, which bends the blade back and forth. The rapid flapping action produced is much like that of a hummingbird’s wing, and creates an enormous amount of cooling capacity.
**ENHANCED PERFORMANCE**

RLP™ fans are extremely rugged and can withstand greatly increased drive voltages and the stresses. This in turn enables the piezo to reliably perform much higher levels of work.

**RELIABILITY**

RLP™ fans exhibit superior performance, high reliability, and have been tested for over 100,000 hours B5 life using QALT (150,000 hrs to MTBF).

**INDUSTRY BENEFITS**

The need for RLP™ fans has become increasingly important as a major alternative cooling solution due to the ever-shrinking size of electronics. Traditional muffin and other rotary cooling fans are also too large for many applications and require more power that can be provided. RLP™ fans have no motors, bearings, or wearing parts and are very quiet. They require low power and take up a small space, and can therefore be easily incorporated into small electronic devices.

**MARKETS SERVED**

RLP™ fans can be used in a wide variety of applications and can be customized to meet industry specific requirements. A few markets include:

- Computers • PDAs • Mobile Phones • Portable Electronics
- Video Games • Wireless Devices • Automotive Applications

**FAN PERFORMANCE SPECIFICATIONS**

<table>
<thead>
<tr>
<th></th>
<th>3” Fan</th>
<th>2” Fan</th>
<th>1” Fan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>3” L x 0.5”W x 0.18”D</td>
<td>2” L x 0.5”W x 0.18”D</td>
<td>1” L x 0.375”W x 0.15”D</td>
</tr>
<tr>
<td>Tip Displacement</td>
<td>1” at 35°C</td>
<td>10mm (0.394”)</td>
<td>0.375” at 35°C</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-40°C to + 80°C up to + 100°C for 1 hour</td>
<td>-40°C to + 80°C</td>
<td>-40°C to + 80°C up to + 100°C for 1 hour</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>20mW</td>
<td>TBD</td>
<td>&lt;20mW</td>
</tr>
<tr>
<td>Reliability</td>
<td>5σ @ 50,000 hrs 3σ @100,000 hrs</td>
<td>10 yrs minimum 15 yrs desired</td>
<td>5σ @ 50,000 hrs 3σ @100,000 hrs</td>
</tr>
<tr>
<td>Humidity</td>
<td>5 to 100% RH, non-condensing</td>
<td>TBD</td>
<td>5 to 100% RH, non-condensing</td>
</tr>
<tr>
<td>Altitude</td>
<td>10,000 ft</td>
<td>TBD</td>
<td>10,000 ft</td>
</tr>
<tr>
<td>Operating Frequency</td>
<td>57-70 Hz</td>
<td>57-70 Hz Designed for 125 Hz</td>
<td>57-80 Hz</td>
</tr>
<tr>
<td>Input Power</td>
<td>60 Hz, 120VAC</td>
<td>12-15 VDC</td>
<td>60 Hz, 120VAC</td>
</tr>
</tbody>
</table>
RLP™ fans are compact in size enabling operation in many small electronic devices.

SILENT
RLP™ fans vibrate air movement and are practically noiseless.

POWERFUL
RLP™ fans provide very effective cooling relative to their small form factor.

EFFICIENT
RLP™ fans require very little power to operate.

LIGHT WEIGHT
RLP™ fans are made of a rugged light weight material.

RELIABLE
RLP™ fans have a much longer operating life than conventional cooling fans because there are no bearings or wearing parts.

..truly revolutionary