ATEC1−49 Circular TEC Modules

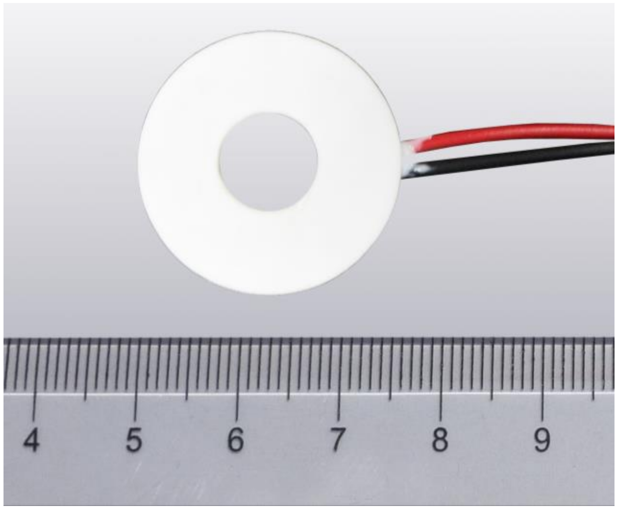

Figure 1.1. The Photo of Actual Sealed ATEC1−49

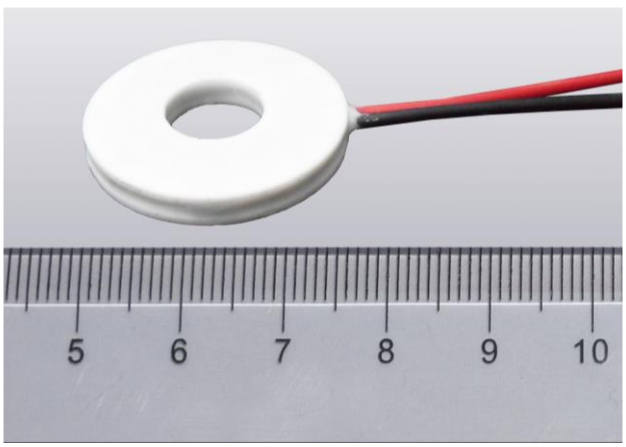

Figure 1.2. The Photo of Actual Sealed ATEC1−49

FEATURES

- Circular shape with a center hole
- High Maxim Voltage/Current Ratio: 5.5 V / 3A
- Long Life Time

APPLICATIONS

Stabilize the temperature for laser diodes, CCD image sensors, etc., where the connection wires come out from the center area of the bottom surface.

DESCRIPTIONS

This circular TEC (Thermoelectric Cooler) module, ATEC1−49, contains 49 pairs of Peltier elements with a maximum voltage of 5.5 Volt. Its circular shape is designed for mounting the type of target objects which has electrical connection leads located on the center of the bottom surface, such as laser diodes, photo detectors, CCD camera sensors, etc. This TEC module can be controlled by our TEC controller, TECA1−5V−5V−D, to achieve high temperature stability, < ±0.01 ℃, and with high efficiency, > 90%. The ATEC1−49 TEC module can be used with our thermistors as well to achieve precise and stable temperature sensing. Figure 1.1 and 1.2 show the actual sealed version of the ATEC1−49 TEC.

The ATEC1−49 TECs come in with highly flat bare ceramic surfaces on the both sides, and they can be mounted onto flat metal surfaces by inserting a thin layer of thermal conductive paste. When mounting, make sure that proper pressure is applied constantly to keep good thermal contacting between the metal and the TEC plates, minimizing thermal resistance between them.

The TECs can withstand strong orthogonal forces applied to the surface, but very vulnerable to tangent forces, especially shocking tangent forces. A small shocking tangent force can cause the Peltier elements crack inside. The crack may not cause operation problem initially, but it will grow with time, causing the TEC resistance to increase slowly, by the end, the TEC will stop operating.

In the part number, e.g. ATEC1−49−3AS, “C” stands for its circular shape; “3A” indicates the maximum current allowed for entering the TEC module; “S” represents sealed version. It can achieve a maximum temperature difference, ΔTmax, of 63 ℃, and a Qmax of 12.6W.

The ATEC1−49 TEC comes with 2 insulated lead wires. The positive wire is in red color with the length of 5.5 inches, 140mm, and the negative wire is of black, with the same length. The mechanical dimensions are shown in Figure 6 and Table 2.

The TECs have the edge area be sealed, to prevent moisture from getting into the Peltier elements and to extend the life time of the TECs. The ATEC1−49 TECs come in sealed version only. For applications in moisture environments, sealed version is recommended, in order to achieve long life time and high reliability for the system.

For high end applications where good and reliable thermal contacts are needed between the TEC and the target object surfaces, the TEC ceramic surface can be metalized so that the TEC and the target object surfaces can be soldered together.

SPECIFICATIONS

Table 1. Characteristics

Part Number	ΔTmax (℃)	Qmax (W)	Imax (A)	Umax (V)
ATEC1−49−3AS	63	12.6	3	5.5

APPLICATION INFORMATION

As shown in Table 1, the ΔTmax, the maximum temperature difference between the 2 TEC plates, is 63℃.

TEC modules can be used for stabilizing laser chip temperature, to stabilize the wavelength and the working lasing mode, resulting in less or no mode hopping and stable output power.

Inversely, when applying a temperature difference between the TEC 2 plates, electricity can be generated. Thus, the TECs can be called TEGs (thermoelectric Generators).

When designing a thermal system by using TECs, one should choose the TEC module in the following way:

1. To achieve the maximum efficiency, it is essential to minimize the thermal resistance between the TEC plate surface and heat sink surface and between the TEC plate and the target object surface. The best way to minimize the thermal resistance is to mount the TEC modules' plates to the heat-sink and to the thermal load by soldering them together. This requires metalizing the TEC plate surfaces first. The 2nd best way is to apply a thin layer of thermal paste between the TEC plates and the heat-sink and the target object surfaces. Constant pressure is needed between the TEC plates and heat-sink and the target object surfaces. Thermal pad material, or so called thermal filler pads, can be used to replace the thermal paste. But this may increase the thermal resistance between the TEC plates and the heat-sink and the target object surfaces. The 3rd best way is to use thermally conductive epoxy, to glue the TEC surface and the heat-sink and the target object surfaces together. This approach is the least reliable because the epoxy may lose its adhere power as time goes.
2. To achieve high COP, Coefficient of Performance, which is defined as:

   COP = thermal power / electric power,

   the ratio between the TEC's output thermal power and the input electric power. Apparently, a high COP leads to low power system consumption, thus, high efficiency. The key to achieve high COP is to design the system with a low maximum temperature difference between the 2 TEC plates (the hot side and the cold side), ΔT. When the operating ΔT can be kept to be ≤ 30℃, the COP can be as high as 2, a very good result.
3. When the required maximum temperature difference is low, such as < 30℃, a large TEC module can be used to drive small thermal load, resulting in a low ΔT, thus high COP and efficiency.
4. It is not hard to design in a TEC system, but does require some understanding of heat transfer and a good grasp of your applications.

TYPICAL CHARACTERISTICS

DTmax=63 ℃

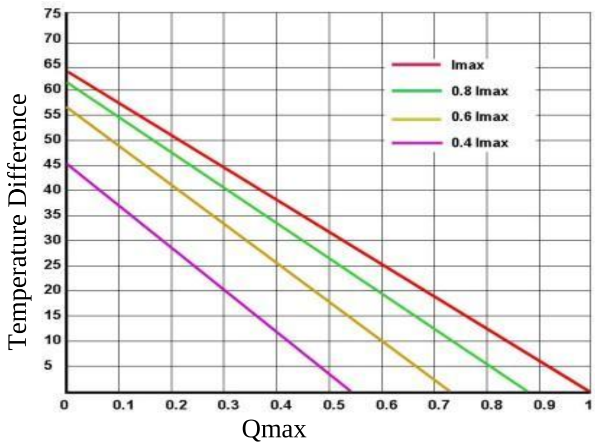

Figure 2. Temperature Difference vs. Qmax

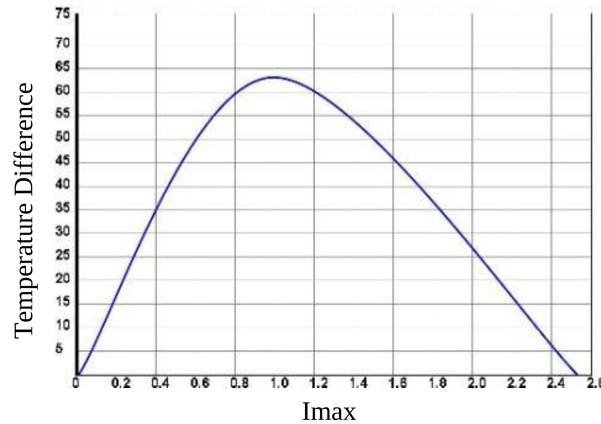

Figure 3. Temperature Difference vs. Imax

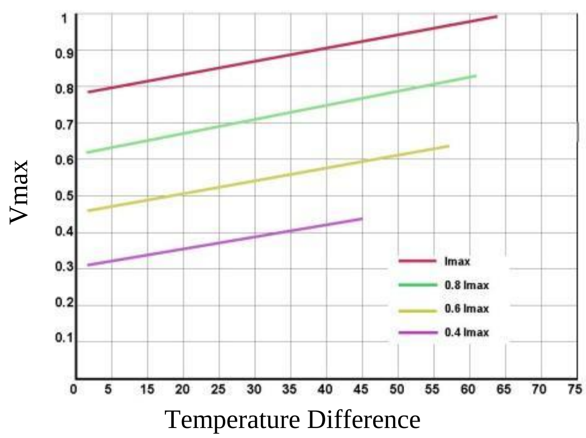

Figure 4. Vmax vs. Temperature Difference

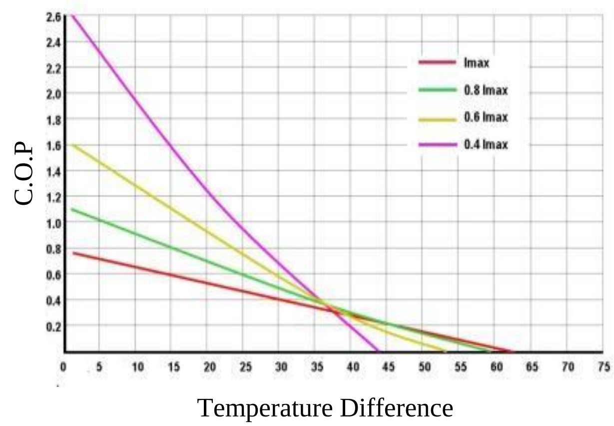

Figure 5. C.O.P vs. Temperature Difference

MECHANICAL DIMENSIONS

The mechanical dimensions of the ATEC1−49 are shown below.

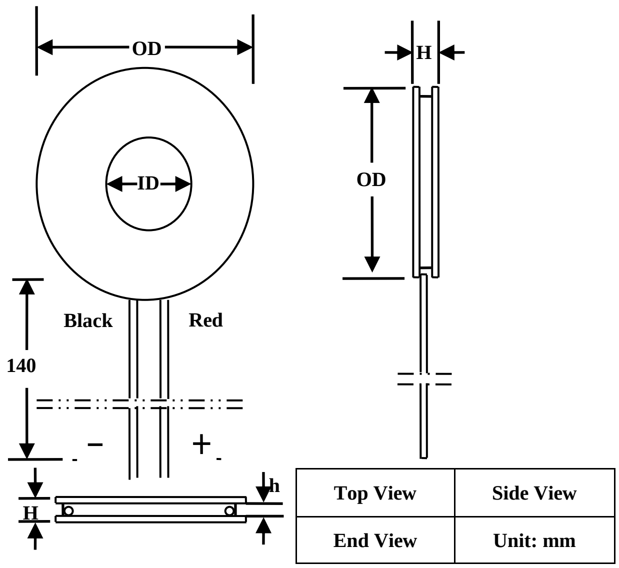

Figure 6. Mechanical Dimensions of Sealed ATEC1−49

The ATEC1−49 TECs come in circular shape, small size, and light weight. The outer diameter, the inner diameter and the height dimensions are shown in Table 2 below.

Table 2. Dimensions Table

Part #	OD	ID	H
ATEC1−49−3AS	26 mm	10 mm	3.6mm

CAUTIONS

1. Never apply electricity to TEC modules without having hest sinks attached properly.
2. Always keep the current less than Imax, to avoid thermal run-away disaster.

ORDERING INFORMATIONS

Table 3. Part Number

Part #	Description
ATEC1−49−3AS	Only sealed package is available.

Table 4. Unit Price

Quantity	1 – 4	5 – 24	25 – 99	≥100
ATEC1−49−3AS	$29.0	$28.4	$27.8	$27.2

Note: For ATEC1−49−3AS, the volume for the first order should not be less than 100 PCs.

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