ATE1-71 TEC Modules

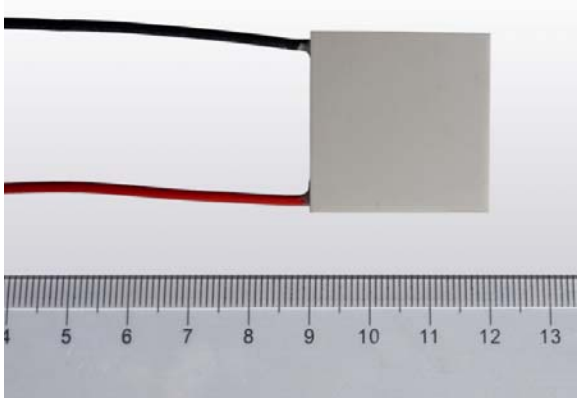

Figure 1.1 the Photo of Actual Sealed ATE1-71

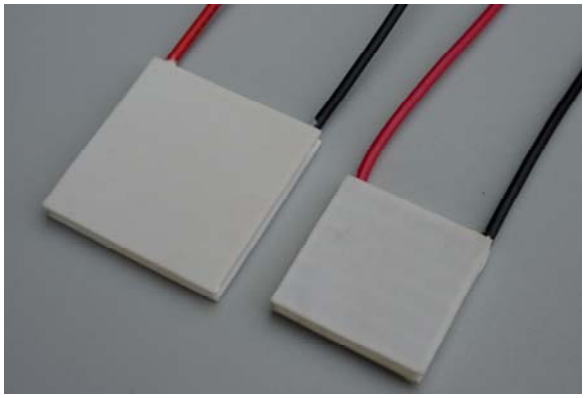
Figure 1.2 the Photo of Actual Sealed ATE1-71

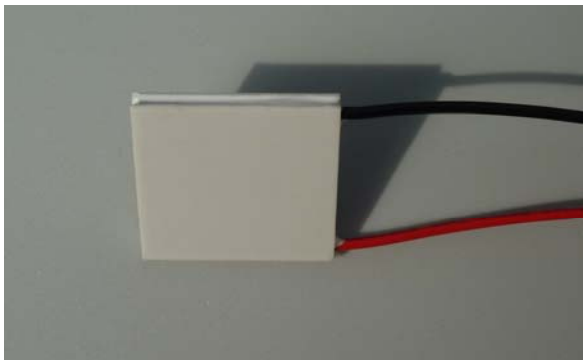
Figure 1.3 the Photo of Actual Sealed ATE1-71


Figure 1.4 the Photo of Actual Non-sealed ATE1-71

FEATURES

- Maximum Input Voltage: 8.5V
- Operating Temperature: 10°C ~ -65°C
- Low Cost
- Long Life Time

APPLICATIONS

Modulate the temperature of the object, and stabilize the temperature to a certain level. Widely used in the areas of icebox, laser, air condition, IC's, fiber-optic lasers, CPU's, CCD cameras, etc.

DESCRIPTIONS

This product, ATE1-71, is one of our TEC (Thermoelectric Cooler) series modules, designed for regulating the temperature of the objects by minimizing the effects of temperature coefficients on it, which results in the highly stable and efficient design. The ATE1-71 series can be used with our TEC controllers and thermistors, which will help modulate TECs' working status during application and protect the object from being overcooled or overheated.

The ATE1-71 series come in a ceramic side surface and two kinds of surface finish and an 8.5V maximum input voltage. This TEC module series consist of 8 versions, including ATE1-71-3A, ATE1-71-4A, ATE1-71-5A, ATE1-71-3B, ATE1-71-4B, ATE1-71-5B, ATE1-71-6AS and ATE1-71-7AS, and the last two letters, for example, 3A, indicate the maximum input current of the TEC module, and different versions have a ΔTdmax of 65℃ or 67℃. Moreover, the Qmax is different in all versions. Characteristics of the ATE1-71 are shown below in Table 1.

The ATE1-71 utilizes insulated leading wires . The positive input wire is red with the length of 13 inches (340mm), and the negative output wire is black, with the length of 13 inches (340mm). The mechanical dimensions are shown in figure 6 and figure 7.

The ATE1-71 comes in two packages: sealed and non-sealed, see Table 1. The former 6 versions come in non-sealed package and the latter 2 versions come in sealed package (with S as a postfix). The sealed package enables a longer life time than the non-sealed package, owing to its steady and waterproof features, but the non-sealed efficiency is higher, because of its high temperature difference between the two plates, which can help regulate object's temperature in shorter time than the sealed version. Photos in Figure 1.1~1.3 have shown the actual sealed and non-sealed one.

Our TEC module surfaces are made by ceramic, which is high thermal conductive and good at protecting the internal components.

SPECIFICATIONS

Table 1. Characteristics

Versions	ΔTmax (℃)	Qmax (W)	Imax (A)	Umax (V)
ATE1-71-3A	65	15.8	3	8.5
ATE1-71-4A	65	21.1	4	8.5
ATE1-71-5A	65	26.8	5	8.5
ATE1-71-3B	67	16.6	3	8.5
ATE1-71-4B	67	21.1	4	8.5
ATE1-71-5B	67	29.1	5	8.5
ATE1-71-6AS	67	34.1	6	8.5
ATE1-71-7AS	65	40.3	7	8.5

APPLICATION INFORMATION

When applying the TEC modules, a question may come up, how does it work? And the theory is very simple. A TEC module consists of P and N type pairs connected electrically in series and sandwiched between two ceramic plates. When connected to a suitable DC power source, the electrons will start off from "**-**", and pass by the P type semiconductor first, absorbing heat, and then to the N type semiconductor and at last release the heat. Every time after this process, there will be some heat transported from one side to the other, creating the hot and cold side, resulting in a temperature difference. Then we can utilize this feature by exposing the cold side of the TEC to the object or substance to be cooled and the hot side to the heat sink which can help dissipate the heat to the environment.

When the current flows from "+" to "**-**", the module generates cooling power, on the contrary, when the current flows from "**-**" to "**+**", the module generates heating power. "+" and "**-**" indicates the anode and the cathode of the TEC module respectively. When the current is reversed, the previous hot face will become the cold face.

From Table 1, you can see that the ΔTmax is about 65℃ to 70℃ for all versions, when in need of a higher ΔTmax, we can use two or more TECs side by side to increase the amount of heat pumped, or stack one TEC on top of another to increase the temperature difference across the TEC. When the temperature difference needs to be greater than 60℃, it is advisable to use more than one TEC to achieve a higher efficiency.

When using the TEC modules with electronics, for example a CPU, the electrified plate on it can create a heat pump which works when it is tightly slid between the CPU and the heat sink to keep the CPU side cool while the heat sink side stays warm.

When being used with a laser, the module can keep the laser working at a constant temperature, thus, the laser will have higher stability, resulting in a constant output wavelength, constant power without or with less mode hopping.

Our TEC modules can be used in almost all the devices working by changing the temperature in which the elements are almost the same, just by changing the direction of the flowing current.

When no load is connected to the TEC, the TEC is just like an electric battery, which can generate electricity. At this moment, we can call it TEG (thermoelectric generator).

When ordering, you should choose the TEC modules according to your particular requirement, which is the general suggestion for choosing the TEC modules and designing the TEC based thermal systems:

1. For achieving the maximum efficiency, it is best to minimize the thermal resistance between the TEC module plates and the thermal heat-sink on the hot side and the thermal load on the cold side.
2. The best way to mount the TEC modules' plates to the heat-sink or the thermal load is to metallize the TEC modules' plate surface and then solder the metallized surface directly onto the heat-sink surface and/or the thermal load surface.
3. It is best to design the system with lower maximum temperature difference between the 2 plates (the hot side and the cold side) of the TEC modules, so that the thermal efficiency of the system will be high. It's best to keep the maximum temperature difference to be ≤ 30℃.
4. When the required maximum temperature difference is low, such as < 30℃, using large TEC modules to drive small thermal load will result in high thermal efficiency.

It is not really hard to design in a TEC, but does require some understanding of heat transfer and a good grasp of your application.

The thermal efficiency of the TEC modules is usually measured by COP: Coefficient of Performance, which can be calculated as: thermal output power / electrical input power.

A well designed system can achieve a COP > 2

TYPICAL CHARACTERISTICS

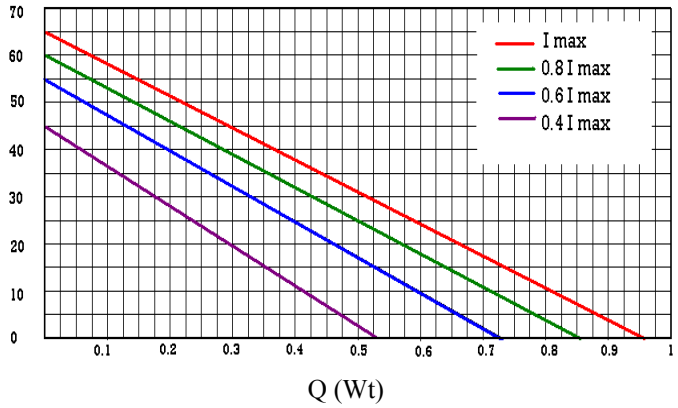

Figure 2. Thermal Load vs. DT (NP=P/P_{max})

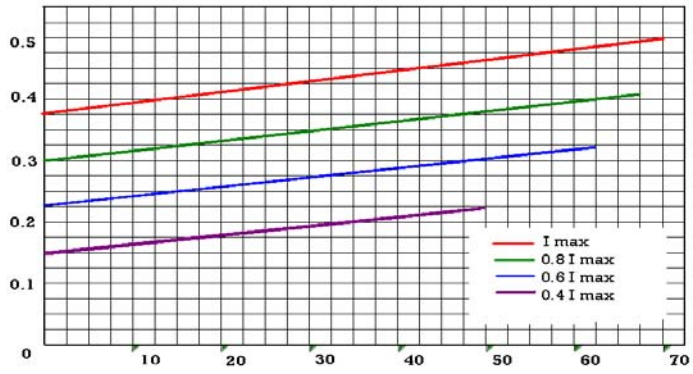

Figure 3. ΔT vs. Voltage

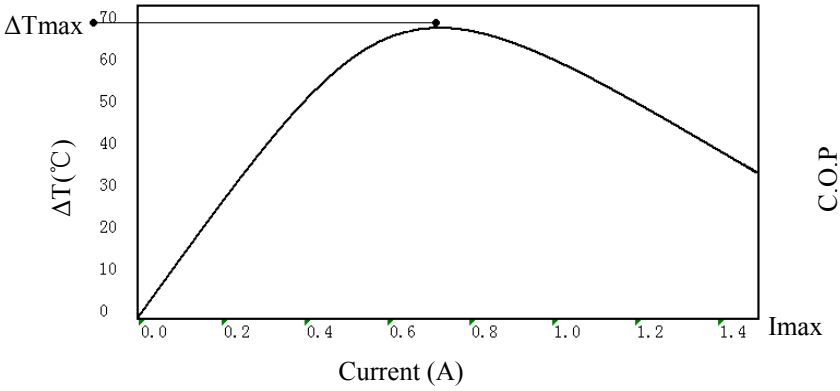

Figure 4. Current vs. ΔT

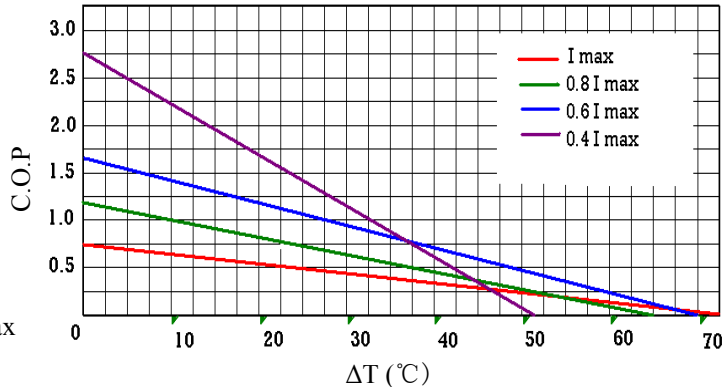

Figure 5. Current vs. ΔT

MECHANICAL DIMENSIONS

The mechanical dimensions of the ATE1-71 are shown below.

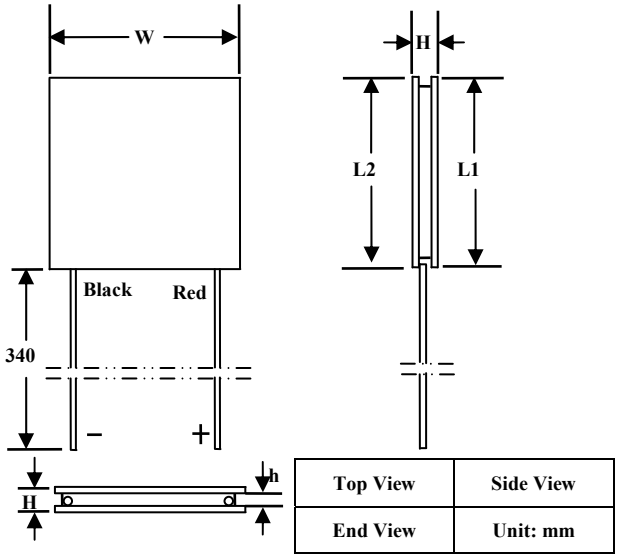

Figure 6. Mechanical Dimensions of Sealed TEC-71

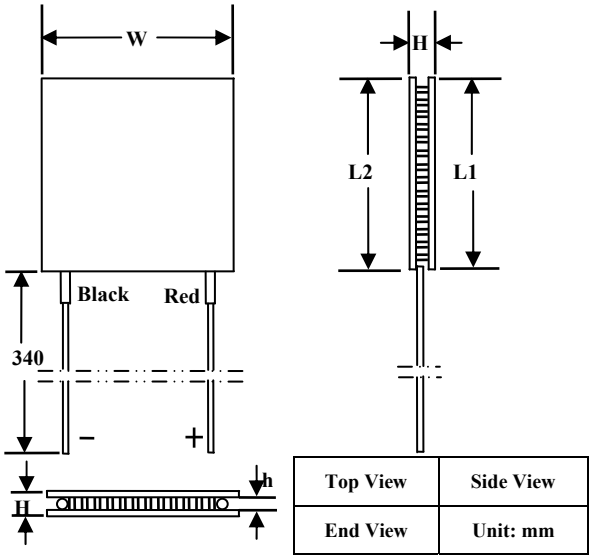

Figure 7. Mechanical Dimensions of Non-sealed TEC-71

The TEC1-71 series comes in square, small size, light weight and no moving parts, the L1, L2, W and H of the ATEC1-71 is different by versions, you can use the table below as a reference.

Table 2. Dimensions Table

Versions	L1 (mm)	L2 (mm)	W (mm)	H (mm)
ATE1-71-3A	23	23	23	3.6
ATE1-71-4A	23	23	23	3.2
ATE1-71-5A	23	23	23	3.1
ATE1-71-3B	30	30	30	5.5
ATE1-71-4B	30	30	30	4.7
ATE1-71-5B	30	30	30	4.2
ATE1-71-6A-S	30	30	30	4.0
ATE1-71-7A-S	30	30	30	3.8

We offer you 3 installations for placing the TEC modules between the heat sink and the object to be cooled when operating:

1. Mechanical mounting: When operating large modules, place the TEC between two heat sinks, this can be done by screws.
2. Soldering: You can use this method when operating TEC modules with metallized surface; it requires patients and careful procedures.
3. Gluing: This method is an up-to-date one, which is now used by many customers, because of the high availability of glues. A glue is usually based on some epoxy compound filled with some thermal conductive material, such as graphite, diamond, silver, SIN or others.

CAUTIONS

1. Never apply our TEC modules without being attached heat sink at the bottom side.
2. According to the polarity when connecting TEC modules to DC power supply.
3. Always keep the DC current less than Imax

ORDERING INFORMATIONS

Table 3. Part Number

Part #	Description
ATE1-71	High efficiency 71 series TEC modules, the maximum input voltage is 8.5V. Both sealed package and non-sealed package is available.

Table 4. Unit Price

Quantity	1 - 4	5 - 24	25 - 99	≥100
ATE1-71	$10.0	$9.5	$9.0	$8.5

NOTICE

1. ATI warrants performance of its products for one year to the specifications applicable at the time of sale, except for those being damaged by excessive abuse. Products found not meeting the specifications within one year from the date of sale can be exchanged free of charge.
2. ATI reserves the right to make changes to its products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete.
3. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgment, including those pertaining to warranty, patent infringement, and limitation of liability. Testing and other quality control techniques are utilized to the extent ATI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.
4. Customers are responsible for their applications using ATI components. In order to minimize risks associated with the customers' applications, adequate design and operating safeguards must be provided by the customers to minimize inherent or procedural hazards. ATI assumes no liability for applications assistance or customer product design.
5. ATI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of ATI covering or relating to any combination, machine, or process in which such products or services might be or are used. ATI's publication of information regarding any third party's products or services does not constitute ATI's approval, warranty or endorsement thereof.
6. IP (Intellectual Property) Ownership: ATI retains the ownership of full rights for special technologies and/or techniques embedded in its products, the designs for mechanics, optics, plus all modifications, improvements, and inventions made by ATI for its products and/or projects.