

## ATE1-71 TEC Modules

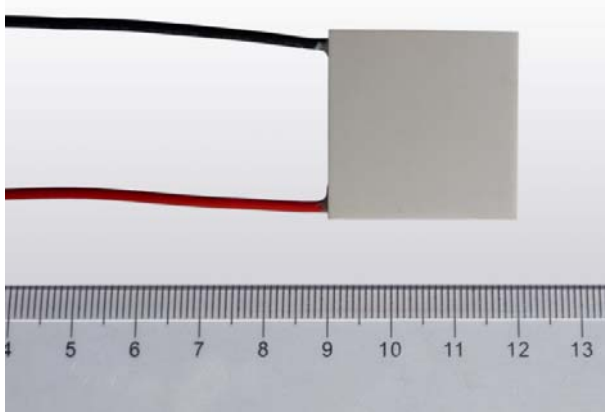


Figure 1.1 The Photo of Actual Sealed ATE1-71

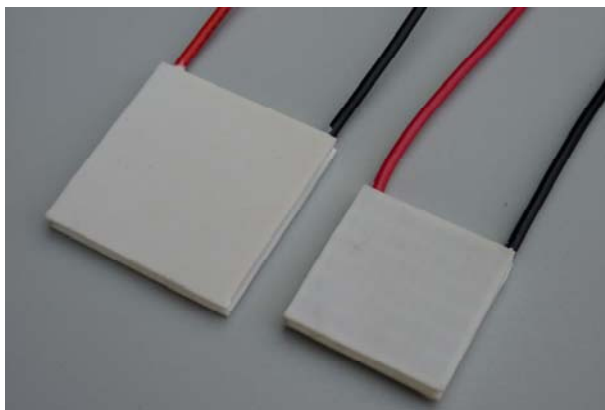


Figure 1.2 The Photo of Actual Sealed ATE1-71

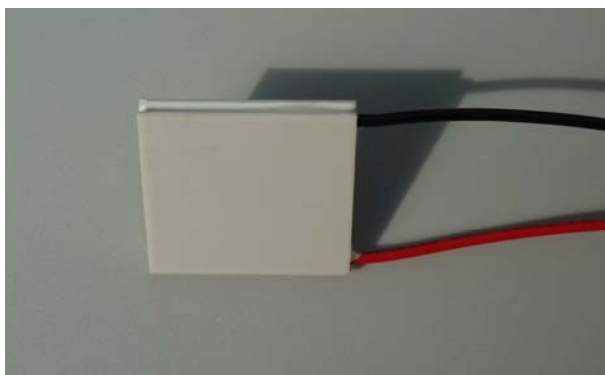


Figure 1.3 Side View of Actual Sealed ATE1-71



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

### FEATURES

- Maximum Input Voltage: 8.5V
- Low Cost
- Long Life Time
- 100 % lead (Pb)-free and RoHS compliant

### APPLICATIONS

Regulate the temperature of the target object with high changing speed and stabilize the temperature to a wide range with high precision. Widely used in solid state laser, icebox, air condition, IC's, optical components, CPU's, CCD cameras, etc.

### DESCRIPTIONS

This series of TEC (Thermoelectric Cooler) modules, ATE1-71, has 71 pairs of Peltier elements inside with a maximum voltage of 8.5 Volt, there are 8 options for maximum current, resulting in different power ratings, as shown in Table 1 below. They are designed for regulating the temperature of the target objects precisely and can be controlled by our TEC controllers to build highly stable and efficient temperature regulating systems. The ATE1-71 series TECs can be used with our thermistors as well to achieve precise and stable temperature sensing.

The ATE1-71 series TECs come in with highly flat bare ceramic surfaces on the both sides, they can be mounted onto flat metal surfaces by inserting thin layers of thermally conductive filler materials, the so-called thermal pads, or placing a thin layer of thermal 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.

This series of TEC modules are consisted of 36 versions, ATE1-71-1AS, ATE1-71-1ASH, ATE1-71-2AS, ATE1-71-2ASH, ATE1-71-2BS, ATE1-71-2BSH, ATE1-71-3A, ATE1-71-3AH, ATE1-71-3AS, ATE1-71-3ASH, ATE1-71-3B, ATE1-71-3BH, ATE1-71-3BS, ATE1-71-3BSH, ATE1-71-4A, ATE1-71-4AH, ATE1-71-4AS, ATE1-71-4ASH, ATE1-71-4B, ATE1-71-4BH, ATE1-71-4BS, ATE1-71-4BSH, ATE1-71-5A, ATE1-71-5AH, ATE1-71-5AS, ATE1-71-5ASH, ATE1-71-5B, ATE1-71-5BH, ATE1-71-5BS, ATE1-71-5BSH, ATE1-71-6AS, ATE1-71-6ASH, ATE1-71-7AS, ATE1-71-7ASH, ATE1-71-8AS and ATE1-71-8ASH.

In the part number, for example, ATE1-71-1ASH, “1A” indicate the maximum current allowed for entering the TEC module. “S” represents sealed version and “H” stands for high operating temperature, up to 200°C. All of them can achieve a maximum temperature difference,  $\Delta T_{max}$ , of 63°C.

There are two different operating temperature ranges to choose. One is  $-60^{\circ}\text{C} \sim 85^{\circ}\text{C}$  for the TECs, whose part number is without a “H” and the other is  $-60^{\circ}\text{C} \sim 200^{\circ}\text{C}$  for the TECs, whose part number is ended with a “H”.

The ATE1-71 TECs come with 2 insulated lead wires. The positive wire is in red color, and the negative wire is of black. The mechanical dimensions are shown in Figure 6, Figure 7 and Table 2.

The TECs, which have the edge area be sealed, can prevent moisture from getting into the Peltier elements and to extend the life time of the TECs.

The advantage of the non-sealed TECs is that the efficiency is higher and can achieve higher maximum temperature difference between the two TEC plates. Figure 1.1 ~ 1.4 show the actual sealed and non-sealed TECs.

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	$\Delta T_{max}$ (°C)	$Q_{max}$ (W)	$I_{max}$ (A)	$U_{max}$ (V)
ATE1-71-1AS	63	5.6	1	8.5
ATE1-71-1ASH	63	5.6	1	8.5
ATE1-71-2AS	63	11.2	2	8.5
ATE1-71-2ASH	63	11.2	2	8.5
ATE1-71-2BS	63	11.2	2	8.5
ATE1-71-2BSH	63	11.2	2	8.5
ATE1-71-3A	63	15.8	3	8.5
ATE1-71-3AH	63	15.8	3	8.5
ATE1-71-3AS	63	15.8	3	8.5
ATE1-71-3ASH	63	15.8	3	8.5
ATE1-71-3B	63	16.6	3	8.5
ATE1-71-3BH	63	16.6	3	8.5
ATE1-71-3BS	63	16.8	3	8.5
ATE1-71-3BSH	63	16.8	3	8.5
ATE1-71-4A	63	21.1	4	8.5
ATE1-71-4AH	63	21.1	4	8.5
ATE1-71-4AS	63	21.1	4	8.5
ATE1-71-4ASH	63	21.1	4	8.5
ATE1-71-4B	63	21.1	4	8.5
ATE1-71-4BH	63	21.1	4	8.5
ATE1-71-4BS	63	22.4	4	8.5
ATE1-71-4BSH	63	22.4	4	8.5
ATE1-71-5A	63	26.3	5	8.5
ATE1-71-5AH	63	26.3	5	8.5
ATE1-71-5AS	63	26.3	5	8.5
ATE1-71-5ASH	63	26.3	5	8.5
ATE1-71-5B	63	29.1	5	8.5



ATE1-71-5BH	63	29.1	5	8.5
ATE1-71-5BS	63	28	5	8.5
ATE1-71-5BSH	63	28	5	8.5
ATE1-71-6AS	63	34.1	6	8.5
ATE1-71-6ASH	63	34.1	6	8.5
ATE1-71-7AS	63	40.3	7	8.5
ATE1-71-7ASH	63	40.3	7	8.5
ATE1-71-8AS	63	44.8	8	8.5
ATE1-71-8ASH	63	44.8	8	8.5

#### APPLICATION INFORMATION

As shown in Table 1, the  $\Delta T_{max}$ , the maximum temperature difference between the 2 TEC plates, is between 65°C to 67°C. This is the normal value for a single stage TEC module. When needing a higher  $\Delta T_{max}$ , 2 or 3 stage TECs must be utilized. Contact us for details.

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:

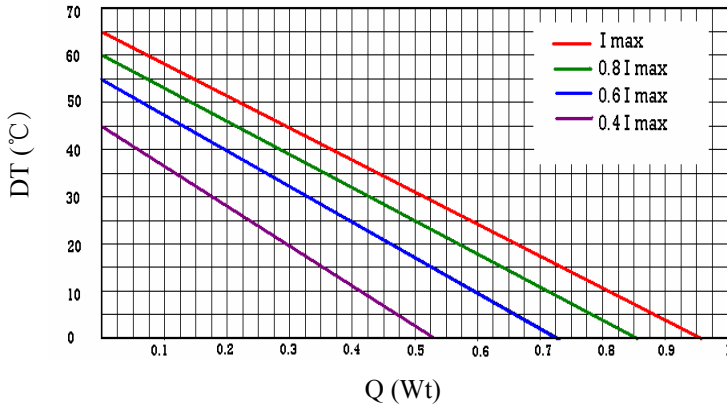
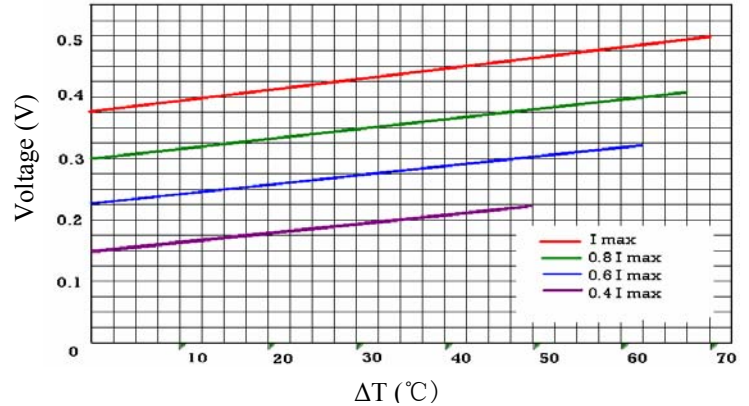
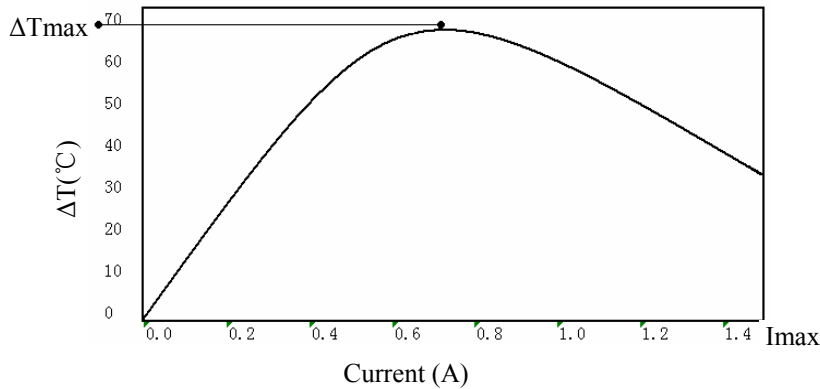
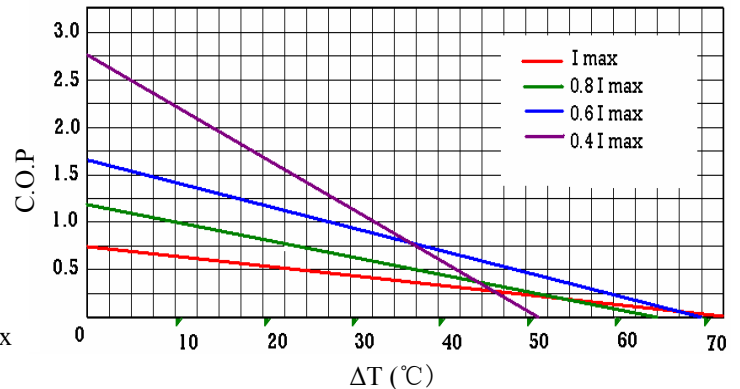
1. To achieve the maximum efficiency, it is essential to minimize the thermal resistance between the TEC plate surface and heat sink surface and between the TEC plate and the target object surface. The best way to minimize the thermal resistance is to mount the TEC modules' plates to the heat-sink and 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. Therefore, thermal paste is recommended to be applied between the TEC plates and the heat-sink. One of such products is Type 44 Heat Sink Compound 1/2 FL.OZ. made by Allied. More detail technical data about this material can be found here: <http://www.alliedelec.com>. 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:

$$COP = \text{thermal power} / \text{electric power},$$

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),  $\Delta T$ . When the operating  $\Delta T$  can be kept to be  $\leq 30^\circ\text{C}$ , the COP can be as high as 2, a very good result.

3. When the required maximum temperature difference is low, such as  $< 30^\circ\text{C}$ , a large TEC module can be used to drive small thermal load, resulting in a low  $\Delta T$ , 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.
5. Use the charts provided in Figure 2 to Figure 5, to decide which TEC to use, what is the heat needed to be dumped through the heat sink, what is the heat sink temperature, etc.
6. ATE1-71-1AS, ATE1-71-1ASH, ATE1-71-2AS, ATE1-71-2ASH, ATE1-71-2BS, ATE1-71-2BSH, ATE1-71-3A, ATE1-71-3AH, ATE1-71-3AS, ATE1-71-3ASH, ATE1-71-3B, ATE1-71-3BH, ATE1-71-3BS, ATE1-71-3BSH, ATE1-71-4A, ATE1-71-4AH, ATE1-71-4AS, ATE1-71-4ASH, ATE1-71-4B, ATE1-71-4BH, ATE1-71-4BS, ATE1-71-4BSH, ATE1-71-5A, ATE1-71-5AH, ATE1-71-5AS, ATE1-71-5ASH, ATE1-71-5B, ATE1-71-5BH, ATE1-71-5BS and ATE1-71-5BSH can be driven by our quality TEC controller, TECA1-5V-5V-D, see datasheet: <http://www.analogtechnologies.com/document/TECA1-XV-XV-D.pdf>; ATE1-71-6AS, ATE1-71-6ASH, ATE1-71-7AS, ATE1-71-7ASH, ATE1-71-8AS and ATE1-71-8ASH can be driven by TEC-5V4A-D, see datasheet: <http://www.analogtechnologies.com/document/TEC5V4-A-D.pdf>.

**TYPICAL CHARACTERISTICS**

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

 Figure 3.  $\Delta T$  vs. Voltage

 Figure 4. Current vs.  $\Delta T$ 

 Figure 5. Current vs.  $\Delta T$ 
**MECHANICAL DIMENSIONS**

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

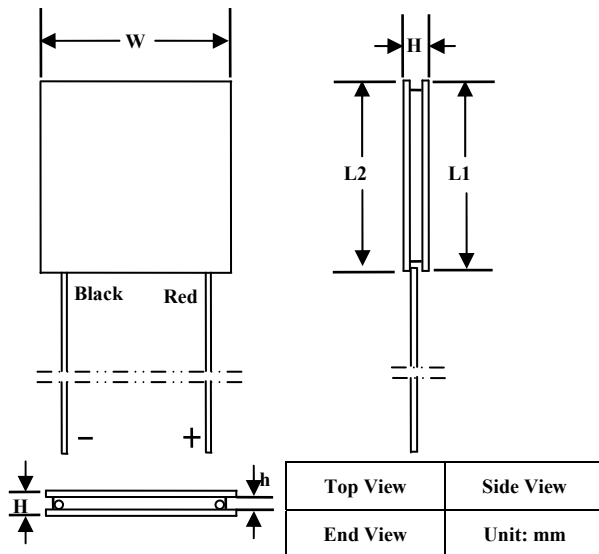


Figure 6. Mechanical Dimensions of Sealed ATE1-71

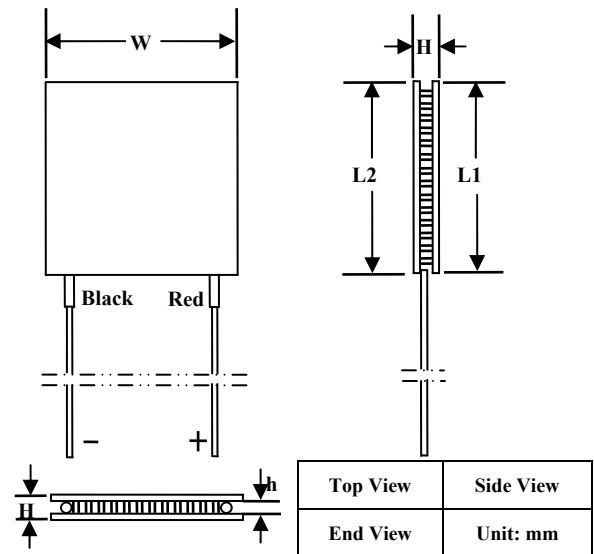


Figure 7. Mechanical Dimensions of Non-sealed ATE1-7



The ATE1-71 series TECs come in square shape, small size, and light weight. The L1, L2, W dimensions are the same for the ATE1-71TECs, only the H dimension varies with different currents, thus different powers, as shown in Table 2 below.

Table 2. Dimensions Table

Versions	L1 (mm)	L2 (mm)	W (mm)	H (mm)
ATE1-71-1AS	23	23	23	5.07
ATE1-71-1ASH	23	23	23	5.07
ATE1-71-2AS	23	23	23	3.69
ATE1-71-2ASH	23	23	23	3.69
ATE1-71-2BS	30	30	30	4.20
ATE1-71-2BSH	30	30	30	4.20
ATE1-71-3A	23	23	23	3.34
ATE1-71-3AH	23	23	23	3.34
ATE1-71-3AS	23	23	23	3.34
ATE1-71-3ASH	23	23	23	3.34
ATE1-71-3B	30	30	30	4.8
ATE1-71-3BH	30	30	30	4.8
ATE1-71-3BS	30	30	30	4.8
ATE1-71-3BSH	30	30	30	4.8
ATE1-71-4A	23	23	23	3.2
ATE1-71-4AH	23	23	23	3.2
ATE1-71-4AS	23	23	23	3.2
ATE1-71-4ASH	23	23	23	3.2
ATE1-71-4B	30	30	30	4.4
ATE1-71-4BH	30	30	30	4.4
ATE1-71-4BS	30	30	30	4.4
ATE1-71-4BSH	30	30	30	4.4
ATE1-71-5A	23	23	23	3.18
ATE1-71-5AH	23	23	23	3.18
ATE1-71-5AS	23	23	23	3.18
ATE1-71-5ASH	23	23	23	3.18
ATE1-71-5B	30	30	30	4.11
ATE1-71-5BH	30	30	30	4.11
ATE1-71-5BS	30	30	30	4.11
ATE1-71-5BSH	30	30	30	4.11
ATE1-71-6AS	30	30	30	4.08
ATE1-71-6ASH	30	30	30	4.08



ATE1-71-7AS	30	30	30	3.68
ATE1-71-7ASH	30	30	30	3.68
ATE1-71-8AS	30	30	30	3.60
ATE1-71-8ASH	30	30	30	3.60

**CAUTIONS**

1. Never apply electricity to TEC modules without having heat sinks attached properly.
2. Always keep the current less than I<sub>max</sub>, to avoid thermal run-away disaster.

**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 are available.

Table 4. Unit Price

Quantity	1 - 4	5 - 24	25 - 99	≥100
ATE1-71-XA	\$11.0	\$10.5	\$9.9	\$9.4
ATE1-71-XAS	\$11.0	\$10.5	\$9.9	\$9.4
ATE1-71-XAH	\$13.0	\$12.4	\$11.7	\$11.1
ATE1-71-XASH	\$13.0	\$12.4	\$11.7	\$11.1

**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.
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