# Specification of Thermoelectric Module

## TETC1-12703S

## Description

The 127 couples, 40 mm × 40 mm size single module is made of selected high performance ingot and fabricated by our unique “soft” processes to achieve superior cooling/heating performance. The module is able to run million thermal cycles in 70 °C temperature change range with less 3% degrading. It is good for the need of frequently cooling and heating applications. If higher operation or processing temperature is required, please specify, we can design and manufacture the custom made module according to your special requirements.

## Features

- High effective cooling and efficiency
- No moving parts, no noise, and solid-state
- Compact structure, small in size, light in weight
- Environmental friendly, RoHS compliant
- Precise temperature control
- Exceptionally reliable in quality, high performance
- Sustain million thermal cycles with 70 °C temperature change range

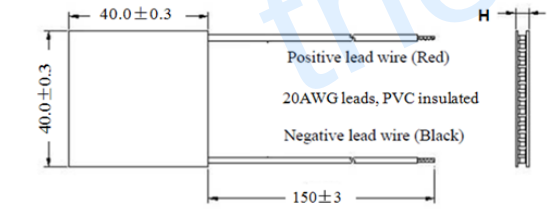
## Application

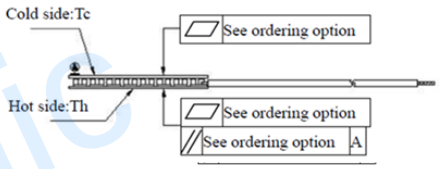
- Food and beverage service refrigerator
- Portable cooler box for cars
- Temperature stabilizer
- Liquid cooling
- CPU cooler and scientific instrument
- Photonic and medical systems

## Performance Specification Sheet

| | | | |
|---|---|---|---|
| Th (ºC) | 27 | 50 | Hot side temperature at environment: dry air, $N_2$ |
| $DT_{max}$ (ºC) | 74 | 83 | Temperature Difference between cold and hot side of the module when cooling capacity is zero at cold side |
| $U_{max}$ (Voltage) | 16.8 | 18.08 | Voltage applied to the module at $DT_{max}$ |
| $I_{max}$ (Amps) | 3.8 | 3.8 | DC current through the modules at $DT_{max}$ |
| $Q_{Cmax}$ (Watts) | 39.4 | 46.2 | Cooling capacity at cold side of the module under DT=0 ºC |
| AC resistance (Ohms) | 3.35 | 3.65 | The module resistance is tested under AC |
| Tolerance (%) | ± 10 | | For thermal and electricity parameters |

## Geometric Characteristics Dimensions in millimeters




## Manufacturing Options

**A. Solder:**

1. T100: BiSn (Tmelt=138ºC)
2. T200: CuAgSn (Tmelt = 217°C)
3. T240: SbSn (Tmelt = 240°C)

**B. Sealant:**

1. NS: No sealing (Standard)
2. SS: Silicone sealant
3. EPS: Epoxy sealant

**C. Ceramics:**

1. Alumina ($Al_2O_3$, white 96%)
2. Aluminum Nitride (AlN)

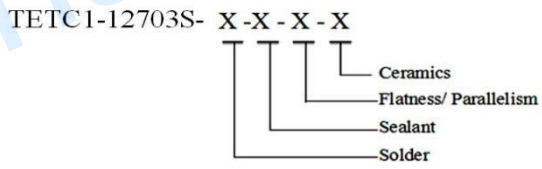
**D. Ceramics Surface Options:**

1. Blank ceramics (not metalized)
2. Metalized

## Ordering Option

| Suffix | Thickness H / (mm) | Flatness/ Parallelism (mm) | Lead wire length (mm) Standard/Optional length |
|---|---|---|---|
| TF | 0:4.8±0.1 | 0:0.08/0.08 | 150±3/Specify |
| TF | 1:4.8±0.03 | 1:0.03/0.03 | 150±3/Specify |
| Eg. TF01: Thickness 4.8±0.1(mm) and Flatness 0.03/0.03(mm) | | | |

## Naming for the Module




TETC1-12703S–T100 -NS –TF01 -AlO

T100: BiSn (Tmelt=138°C)

NS: No sealing

AlO: Alumina white 96%



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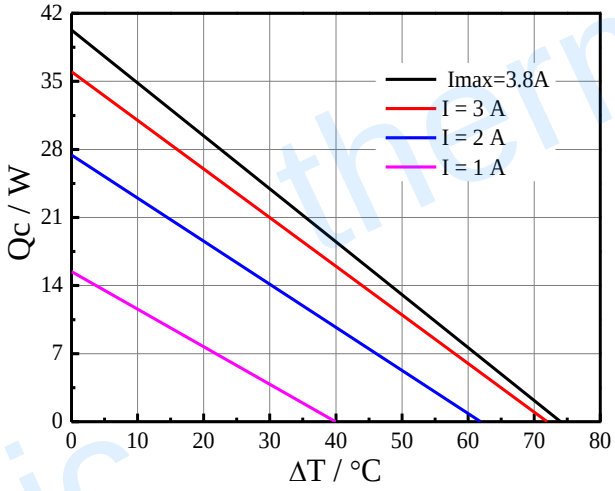
## Operation Cautions

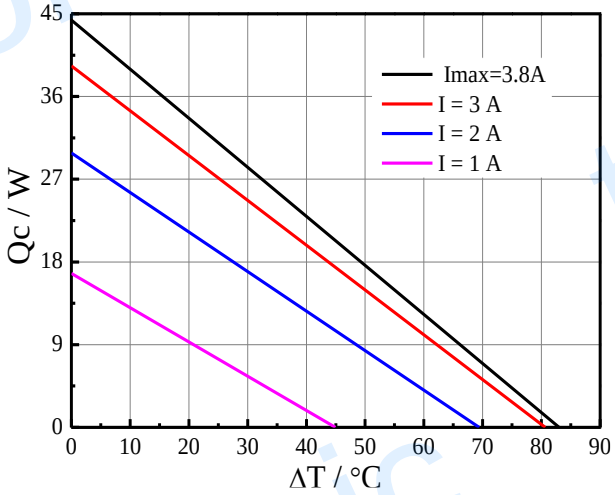
- Attach the cold side of module to the object to be cooled
- Attach the hot side of module to a heat radiator for heat dissipating
- Operation below $I_{max}$ or $V_{max}$
- Work under DC

## Performance Curve

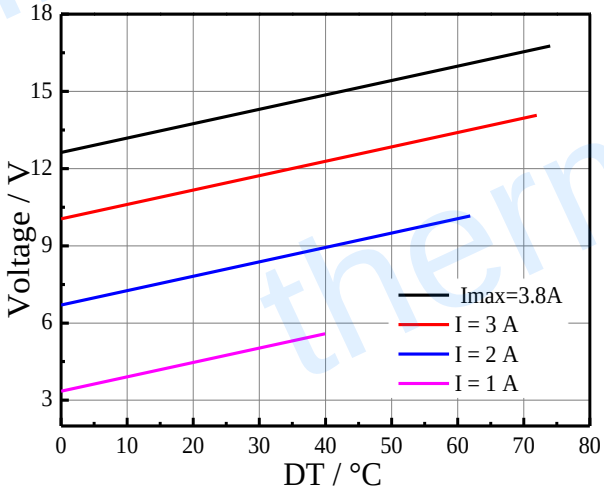
### Performance Curves at Th=27 ºC

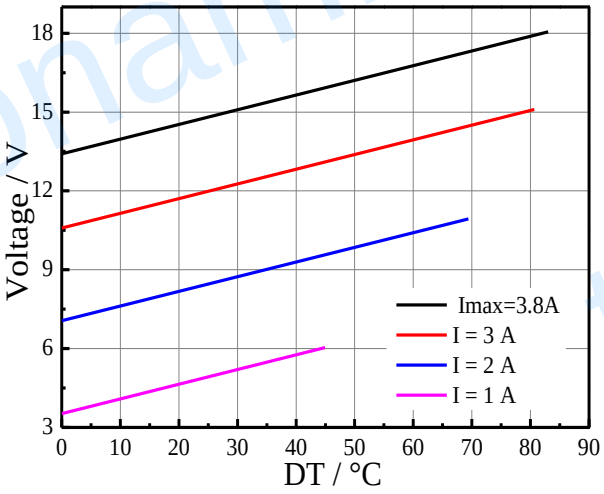



### Performance Curves at Th=50 ºC

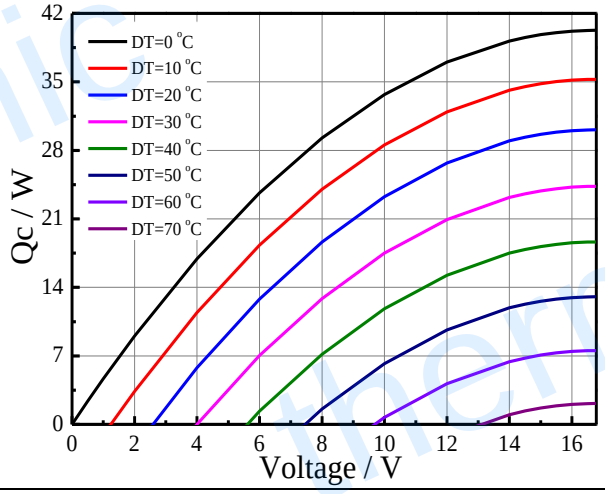


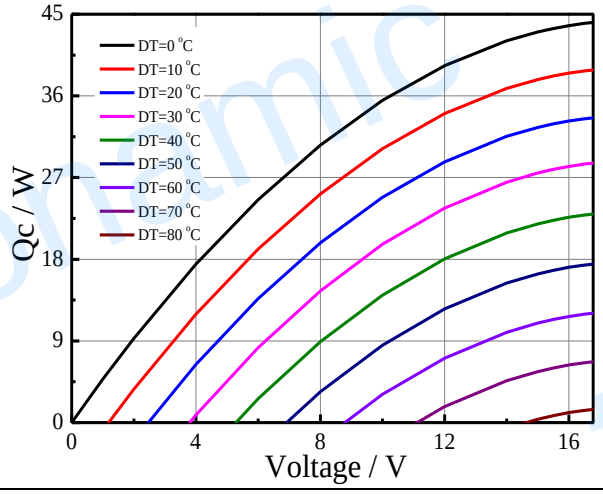

Standard Performance Graph Qc= f(DT)



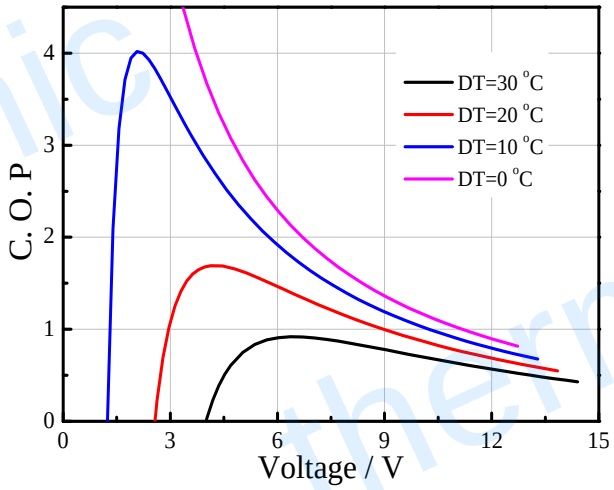

Standard Performance Graph V= f(DT)



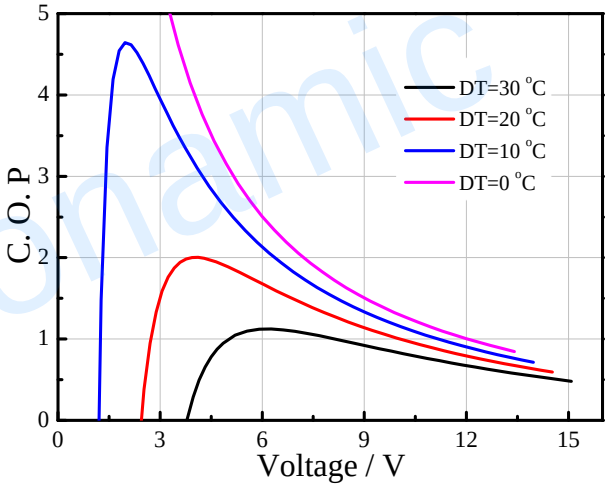



Standard Performance Graph Qc= f(V)

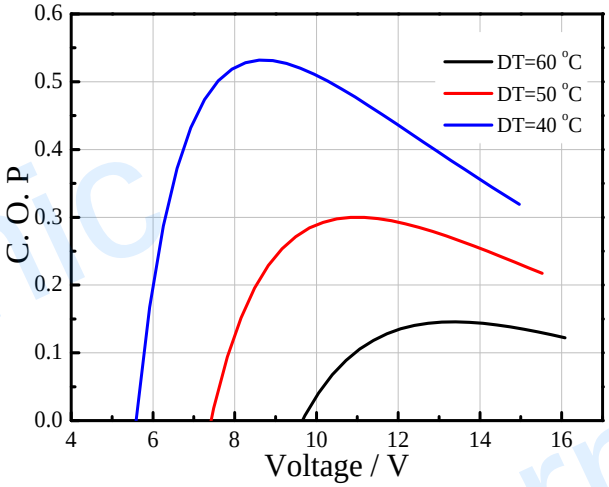
## Performance Curves at Th=27 ºC

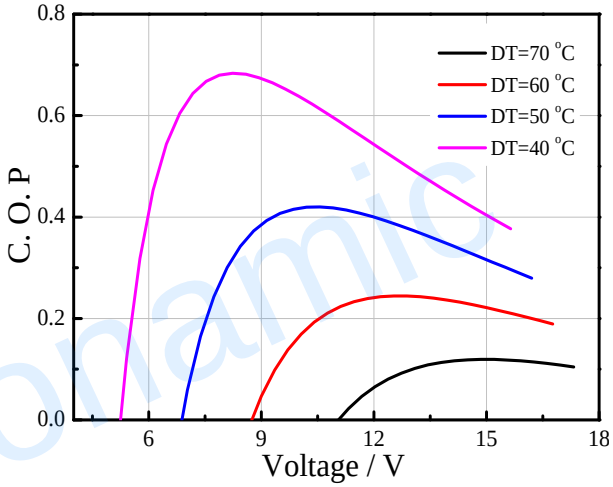



## Performance Curves at Th=50 ºC




Standard Performance Graph COP = f(V) of DT ranged from 0 to 30 ˚C



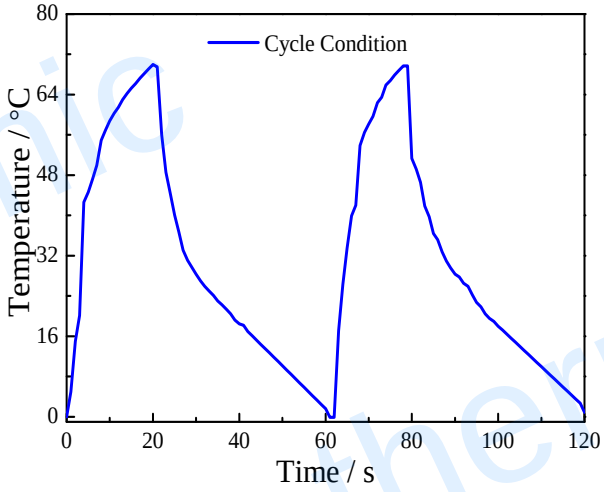




Standard Performance Graph COP = f(V) of DT ranged from 40 to 60/70 ˚C

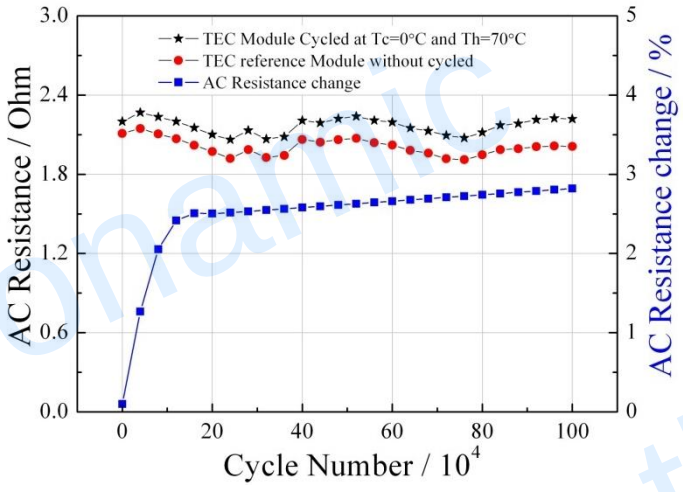
Remark: The coefficient of performance (COP) is the cooling power Qc/Input power (V × I).

A typical 127 couples module is fabricated by the unique “soft” process and has demonstrated that it only has less than 3% degrading after 1000,000 thermal cycling. The below graphic shows that in beginning 500,000 cycles, it degrade about 2.5%, and then go on stable with very tiny degrading in further 500,000 thermal cycles. It is derived out that the modules can go over million thermal cycles.

## TEC Thermal Cycle Lifetime Test On TETC1-12706




Typical cooling-heating cycle




The Chart for AC Resistance and AC Resistance Changes

*vs*. Cycle Number