

# Specification of Thermoelectric Module

## TETS1-03130

### Description

The 31 couples, 15mm x 15mm 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

- 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

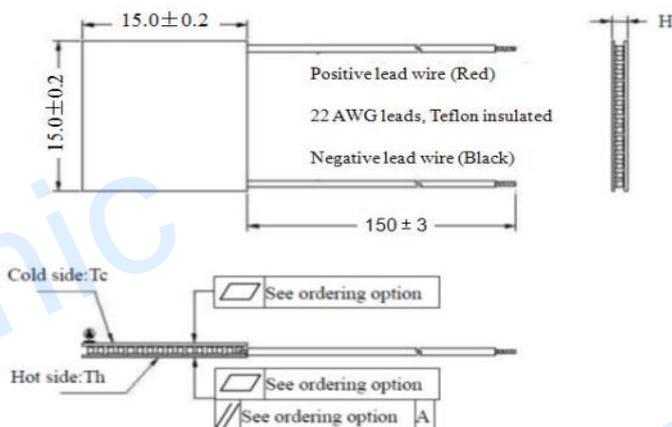
### Application

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

### Performance Specification Sheet

Th (°C)	27	50	Hot side temperature at environment: dry air, N <sub>2</sub>
DT <sub>max</sub> (°C)	70	79	Temperature Difference between cold and hot side of the module when cooling capacity is zero at cold side
U <sub>max</sub> (Voltage)	3.9	4.1	Voltage applied to the module at DT <sub>max</sub>
I <sub>max</sub> (Amps)	3.7	3.7	DC current through the modules at DT <sub>max</sub>
Q <sub>Cmax</sub> (Watts)	9.0	9.9	Cooling capacity at cold side of the module under DT=0 °C
AC resistance (Ohms)	0.9	0.97	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 (T<sub>melt</sub>=138°C)
2. T200: CuSn (T<sub>melt</sub> = 227 °C)

#### B. Sealant:

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

#### C. Ceramics:

1. Alumina (Al<sub>2</sub>O<sub>3</sub>, white 96%)
2. Aluminum Nitride (AlN)

#### D. Ceramics Surface Options:

1. Blank ceramics (not metallized)
2. Metallized

### Ordering Option

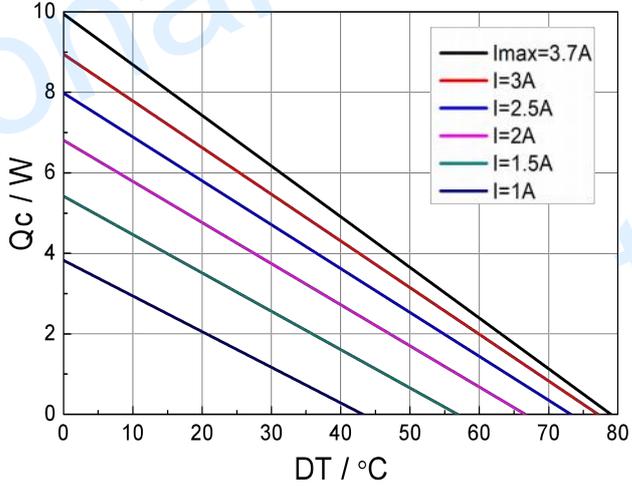
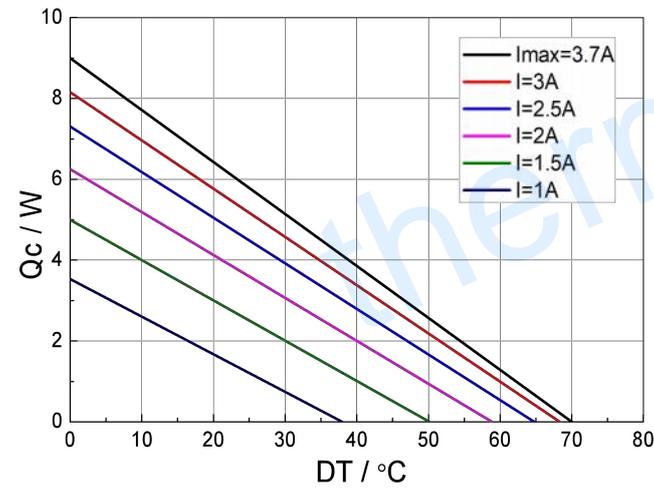
Suffix	Thickness H (mm)	Flatness/ Parallelism (mm)	Lead wire length(mm) Standard/Optional length
TF	0:3.6 ± 0.10	0: 0.05 / 0.05	150±3/Specify
TF	1:3.6 ± 0.05	1: 0.03 / 0.03	150±3/Specify

**Operation Cautions**

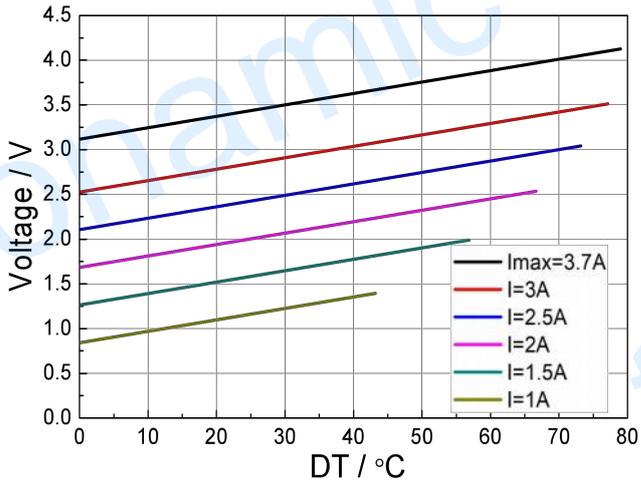
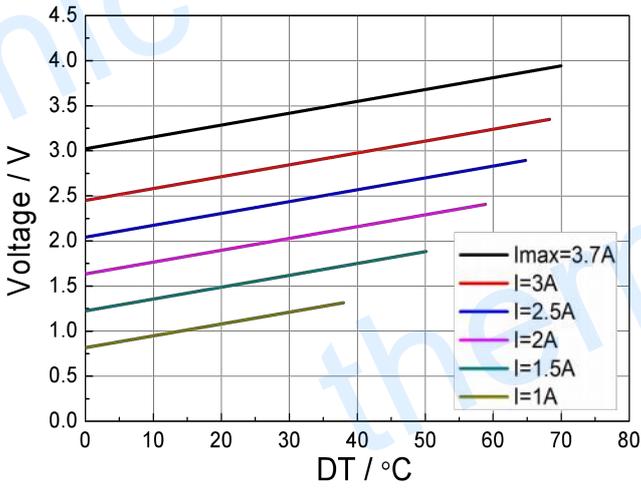
- Cold side of the module sticked on the object being cooled
- Hot side of the module mounted on a heat radiator
- Work under DC
- Operation below  $I_{max}$  or  $V_{max}$
- Operation or storage module below  $100\text{ }^{\circ}\text{C}$

**Performance Curves at  $T_h=27\text{ }^{\circ}\text{C}$**

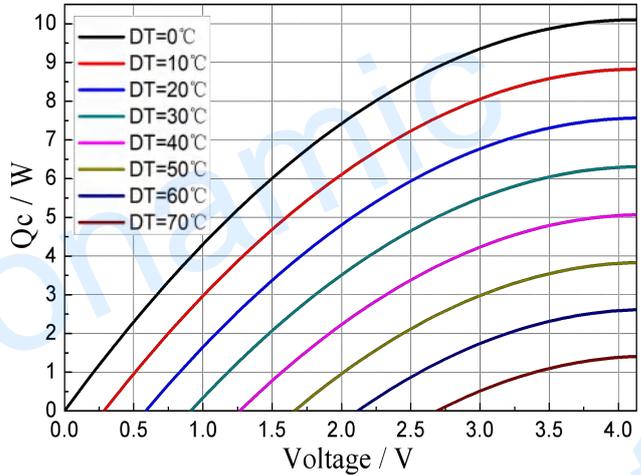
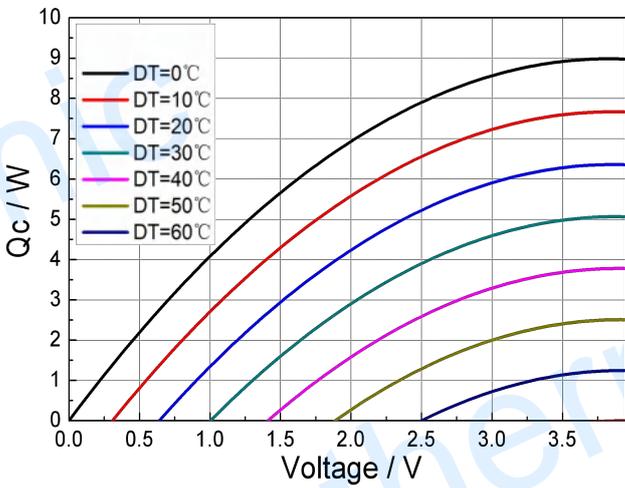
**Performance Curves at  $T_h=50\text{ }^{\circ}\text{C}$**



Standard Performance Graph  $Q_c = f(DT)$

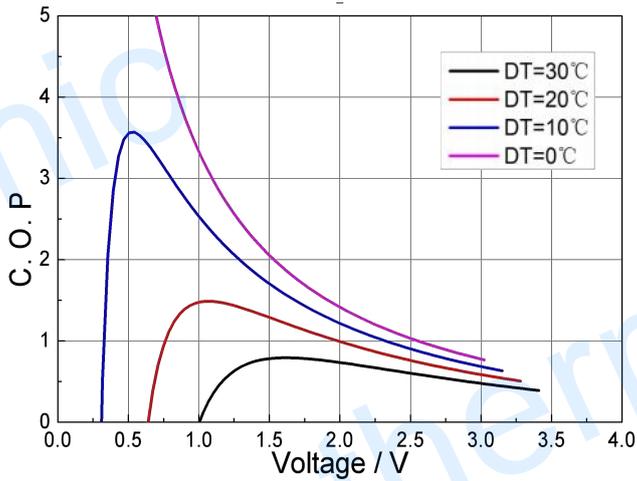


Standard Performance Graph  $V = f(DT)$

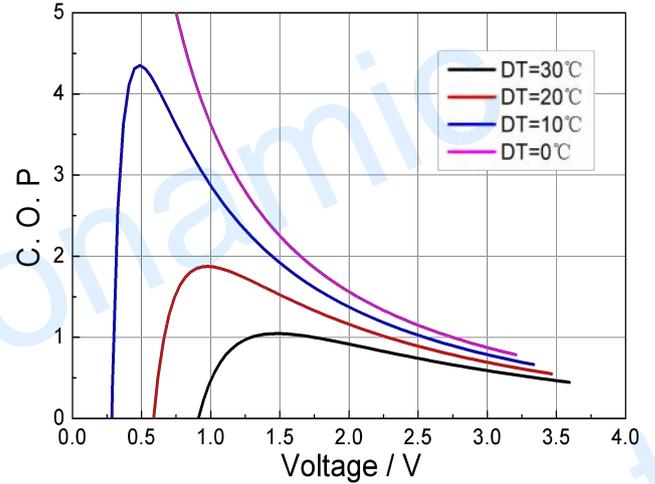


Standard Performance Graph  $Q_c = f(V)$

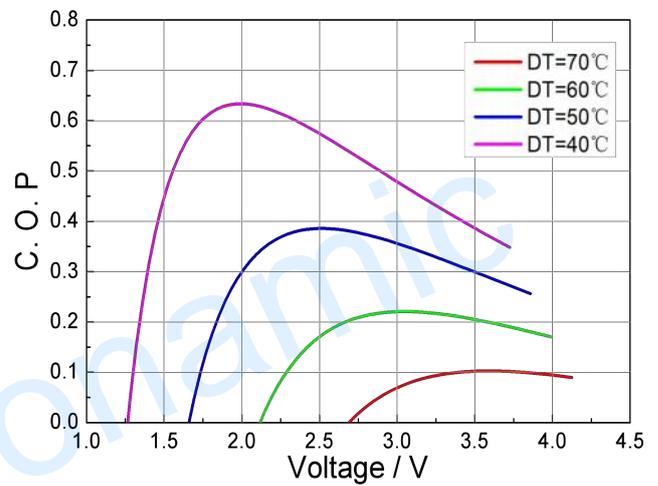
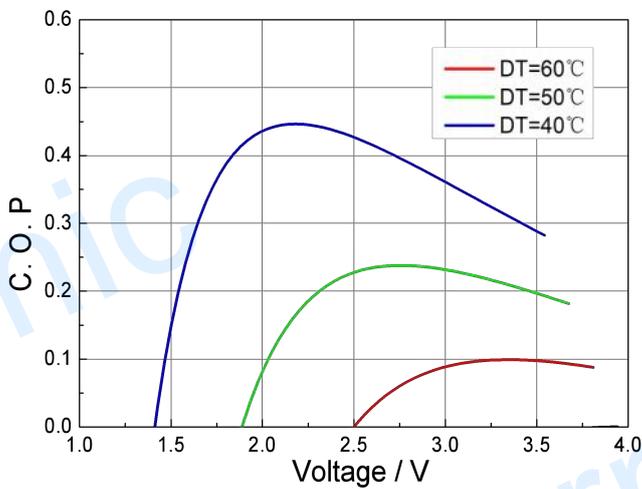
**Performance Curves at Th=27 °C**



**Performance Curves at Th=50 °C**



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

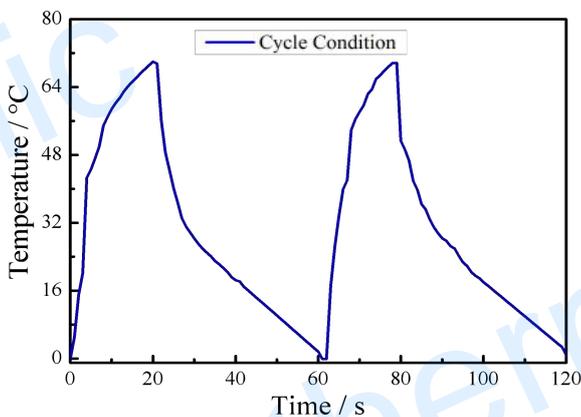


Standard Performance Graph COP = f(V) of DT ranged from 40 to 60/70 °C

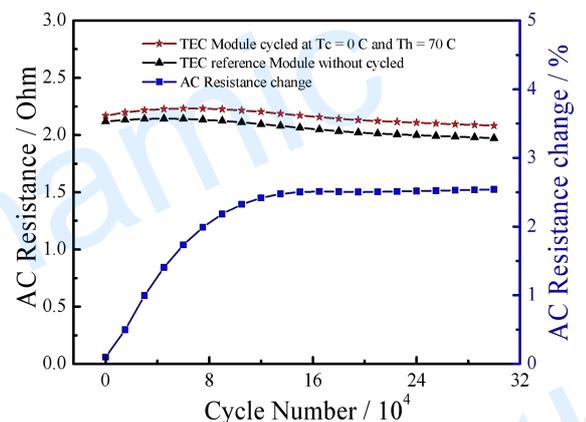
Remark: The coefficient of performance (COP) is the cooling power  $Q_c$ /Input power ( $V \times I$ ).

A typical 127 couples module is fabricated by the unique “soft” process and has demonstrated that it only has 2.5% degrading after 300,000 thermal cycling. The below graphic shows that in beginning 120,000 cycles, it degrade about 2.5%, and then go on stable with very tiny degrading in further 180,000 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