

# Specification of Thermoelectric Module

## TETC1-16104

### Description

The 161 couples, 40 mm × 40mm size single stage 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 down and heating up to 100 °C 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

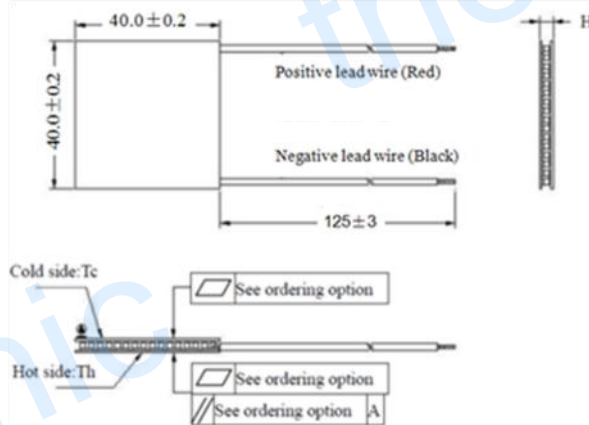
### Application

- 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)	74	83	Temperature Difference between cold and hot side of the module when cooling capacity is zero at cold side
U <sub>max</sub> (Voltage)	20.9	22.5	Voltage applied to the module at DT <sub>max</sub>
I <sub>max</sub> (Amps)	4.5	4.5	DC current through the modules at DT <sub>max</sub>
Q <sub>Cmax</sub> (Watts)	60.4	65.0	Cooling capacity at cold side of the module under DT=0 °C
AC resistance (Ohms)	3.48	3.75	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: CuAgSn (T<sub>melt</sub> = 217°C)
3. T240: SbSn (T<sub>melt</sub> = 240°C)

#### B. Sealant:

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

#### 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 metalized)
2. Metalized

### Ordering Option

Suffix	Thickness (mm)	Flatness/ Parallelism (mm)	Lead wire length(mm) Standard/Optional length
TF	0:3.6±0.1	0:0.08/0.08	125±3/Specify
TF	1:3.6±0.03	1:0.03/0.03	125±3/Specify

Eg. TF01: Thickness 3.6 ± 0.1 (mm) and Flatness 0.03 / 0.03 (mm)

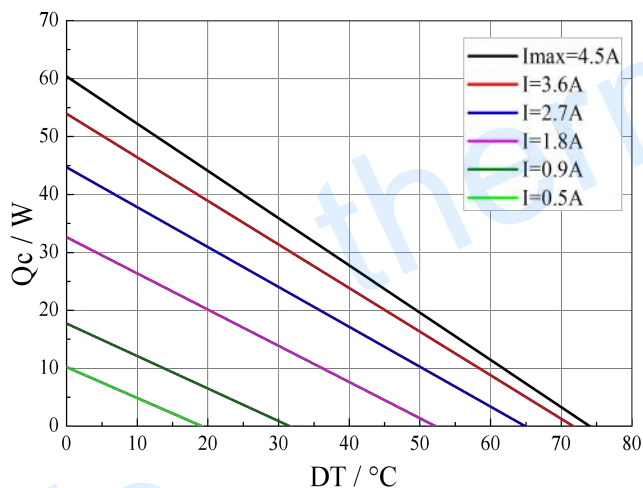
**Operation Cautions**

- 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

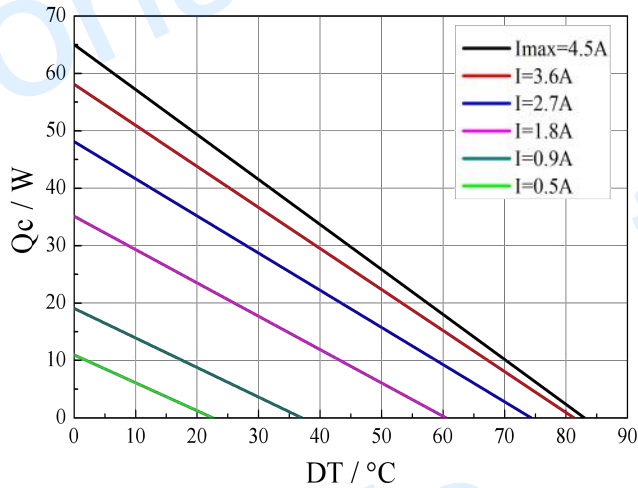
- Operation below  $I_{max}$  or  $V_{max}$
- Work under DC

**Performance Curve**

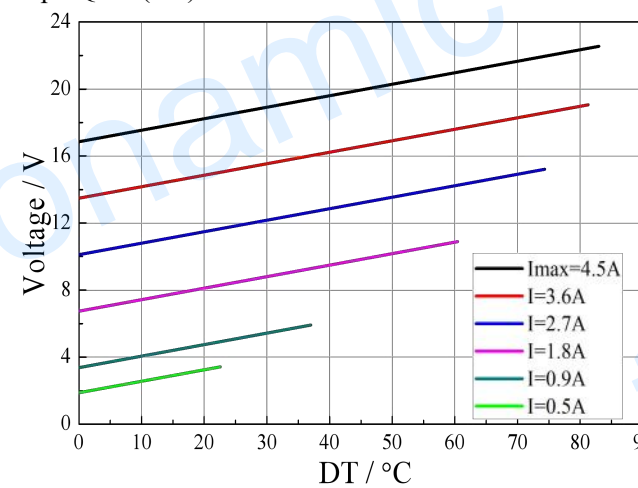
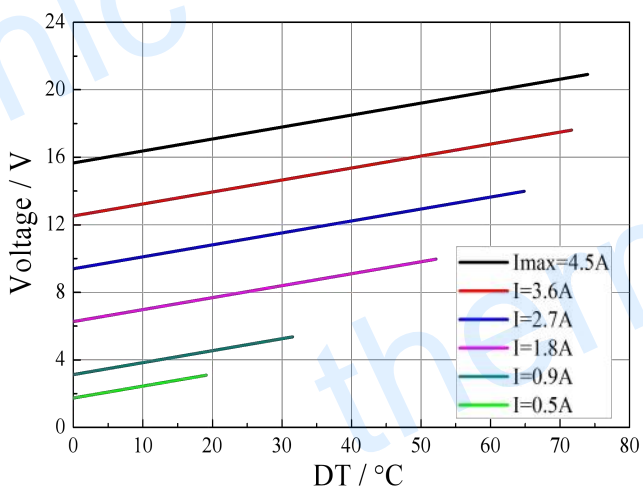
**Performance Curves at  $T_h=27^\circ C$**



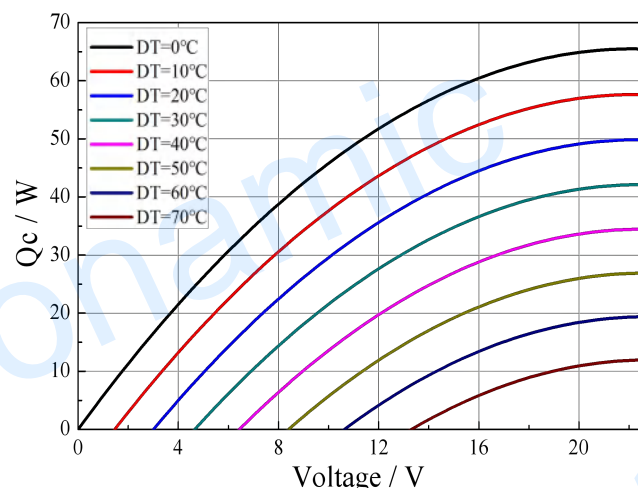
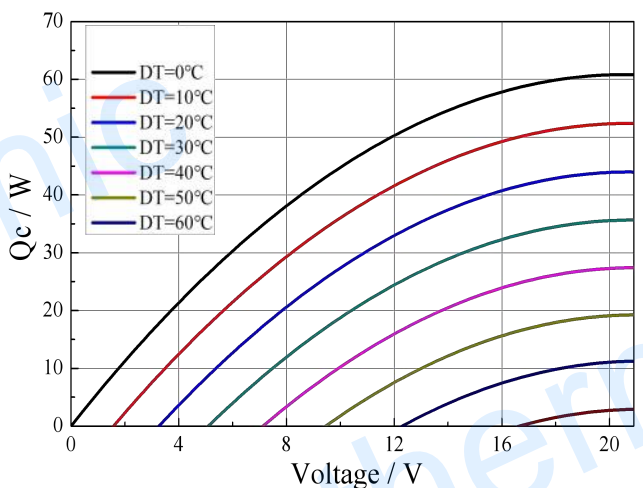
**Performance Curves at  $T_h=50^\circ C$**



Standard Performance Graph  $Q_c = f(DT)$



Standard Performance Graph  $V = f(\Delta T)$

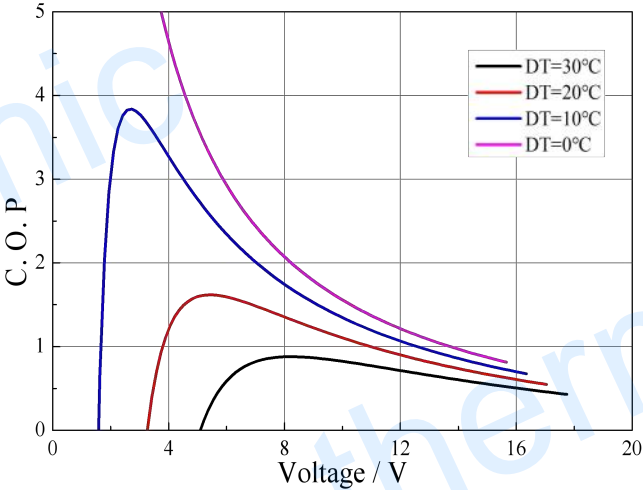


Standard Performance Graph  $Q_c = f(V)$

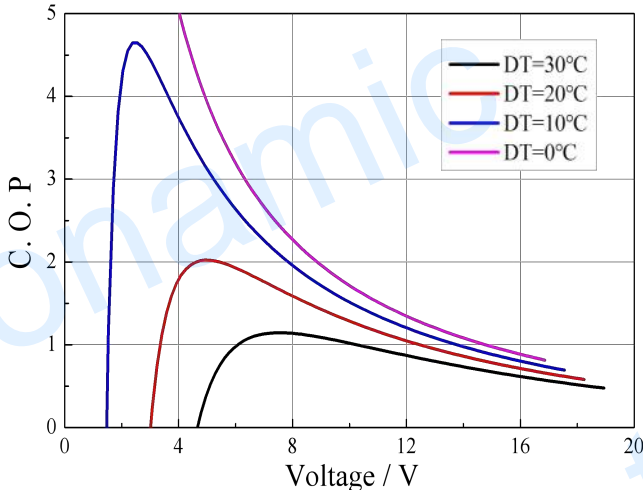
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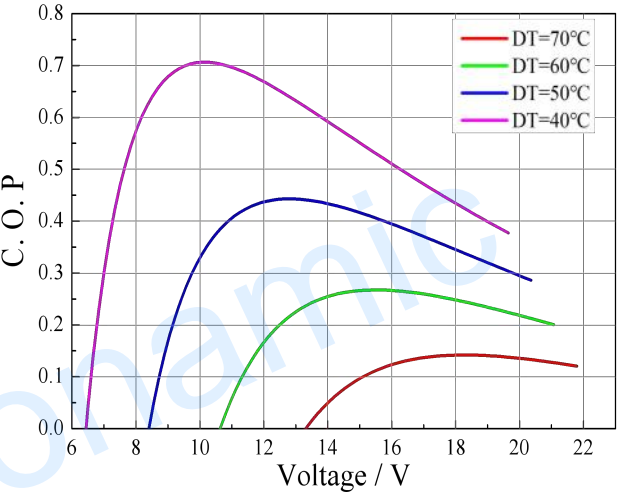
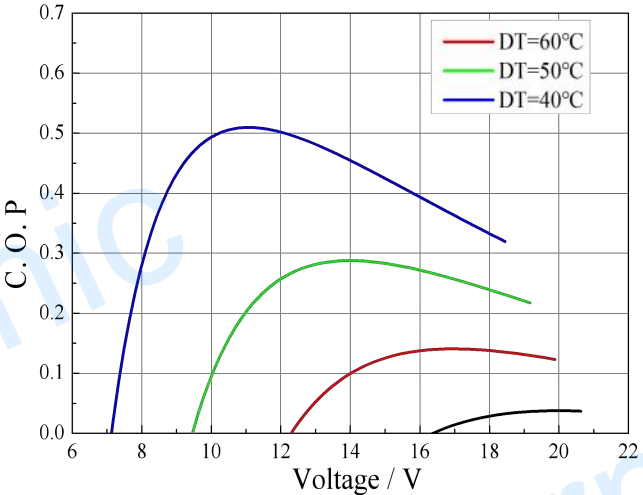
**Performance Curves at Th=27 °C**



**Performance Curves at Th=50 °C**



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

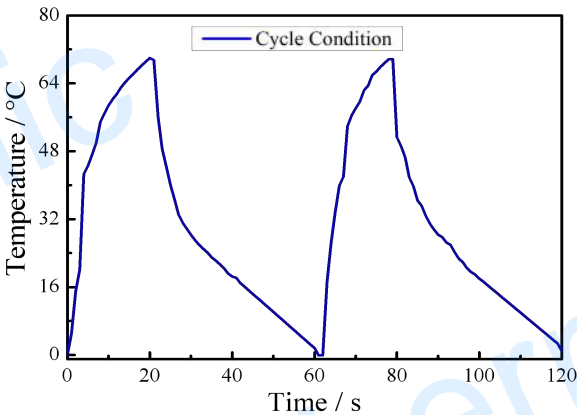


Standard Performance Graph COP = f(V) of ΔT ranged from 40 to 70 °C

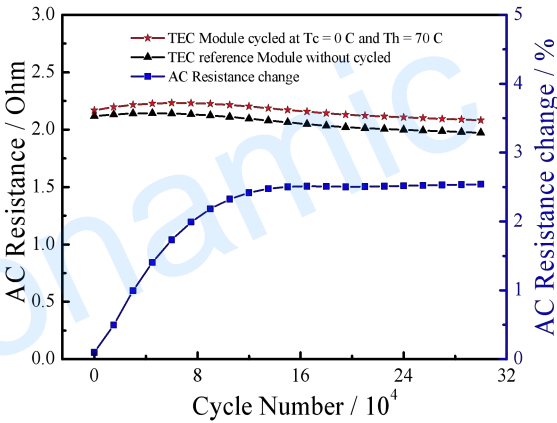
Remark: The coefficient of performance (COP) is the cooling power Qc/Input power (V × I).

A typical 127 couples module is fabricated by the unique “soft” process and has demonstrated that it only has 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