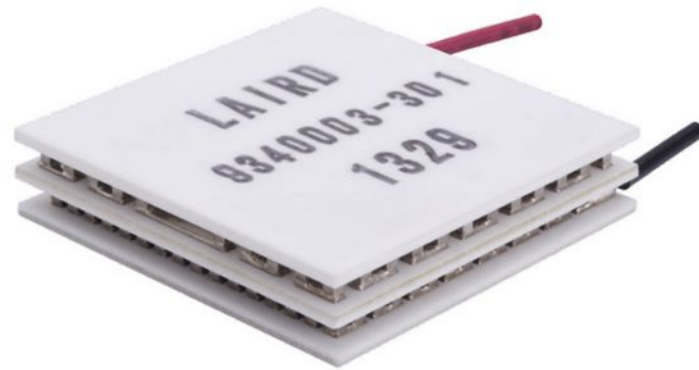


## Multistage MS Series Thermoelectric Cooler

The MS2-190-10-10-12-12-11-W8 multistage thermoelectric cooler is able to reach colder temperatures than single stage thermoelectric coolers. It has a maximum  $Q_c$  of 15.4 Watts when  $\Delta T = 0$  and a maximum  $\Delta T$  of 91 °C at  $Q_c = 0$ .

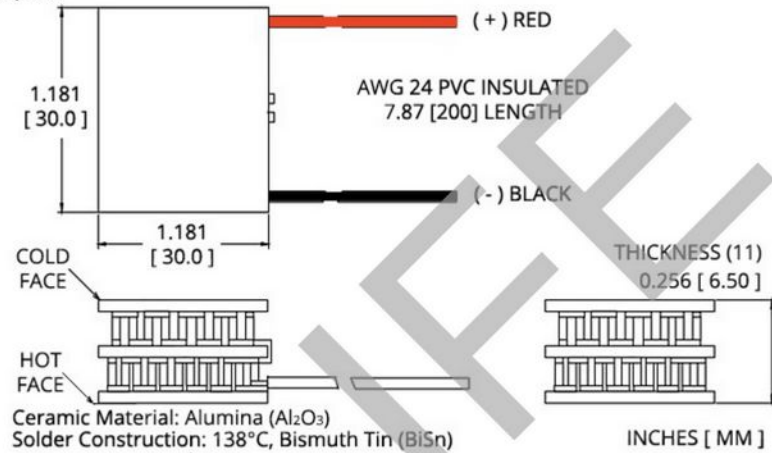


## Features

- High temperature differential
- Precise temperature control
- Reliable solid-state operation
- Environmentally-friendly
- DC operation
- RoHS-compliant

## Applications

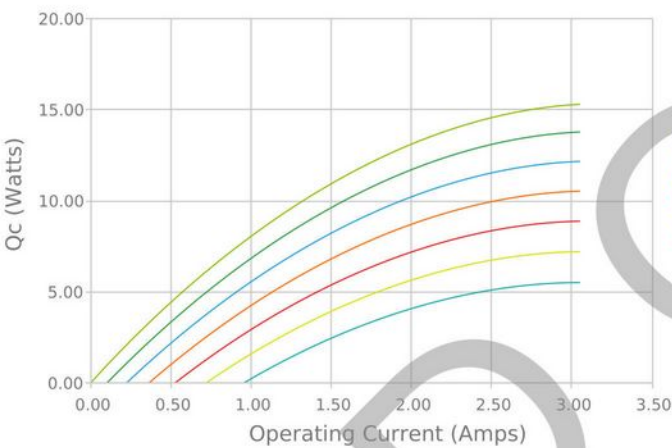
- Thermoelectric Cooling for CMOS Sensors



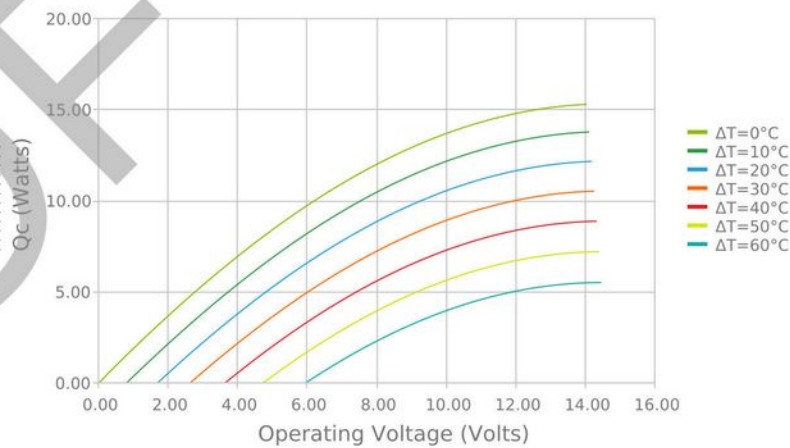
## Electrical and Thermal Performance

For maximum performance, be sure to orient the CONTROL side of the TEC against the application to be managed and the AMBIENT side against the heat sink or other heat rejection method. The CONTROL side is always opposite the side with lead attachments. Lead attachment is a passive heat loss and less impactful if located on the side that attaches to the heat exchanger.

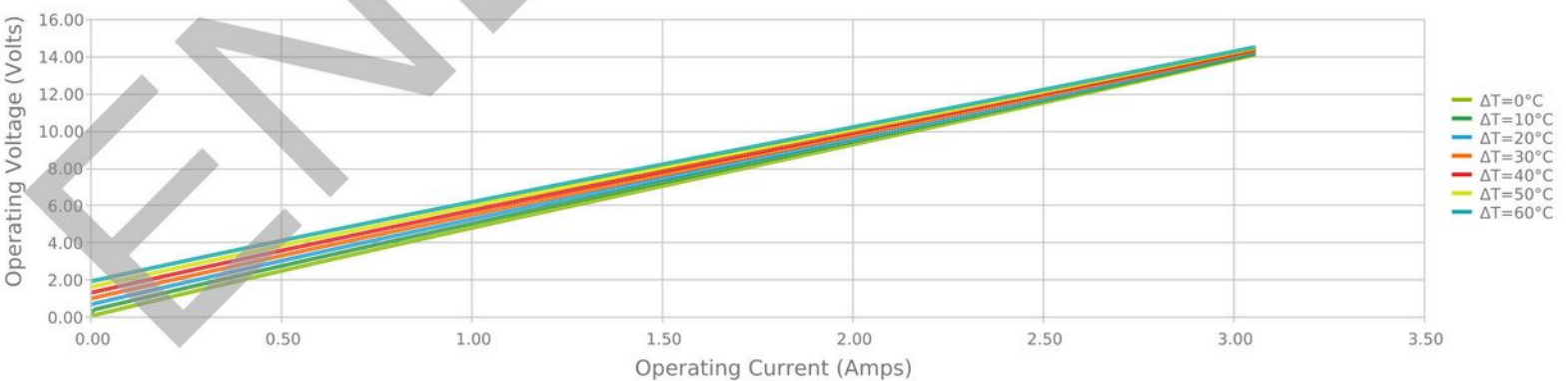
Heat Pumped at Cold Side  
 $T_{hot} = 27\text{ °C}$



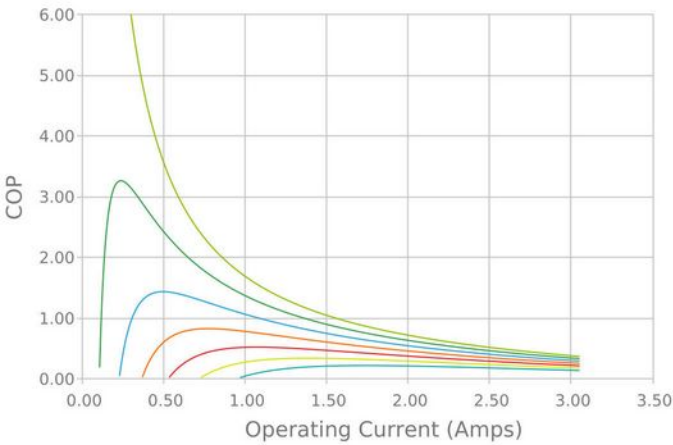
Heat Pumped at Cold Side  
 $T_{hot} = 27\text{ °C}$



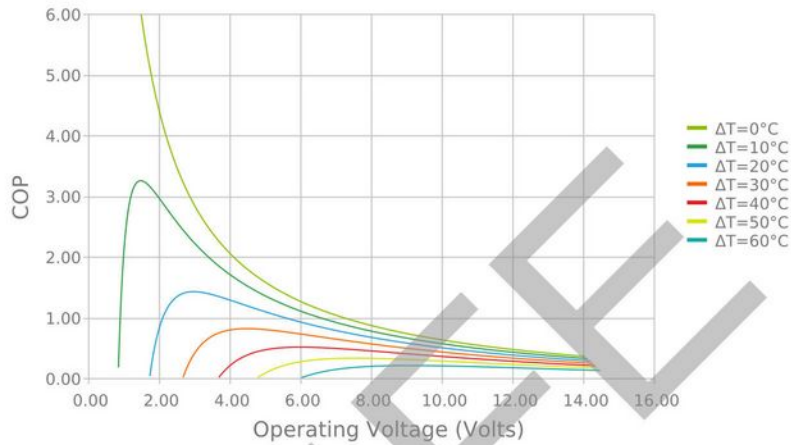
Current vs Voltage (I vs V)  
 $T_{hot} = 27\text{ °C}$



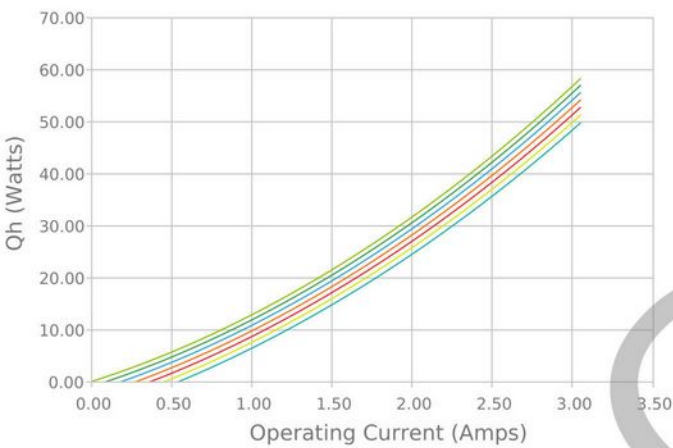
Coefficient of Performance ( $COP = Q_c/P_{in}$ )  
 $T_{hot} = 27^\circ C$



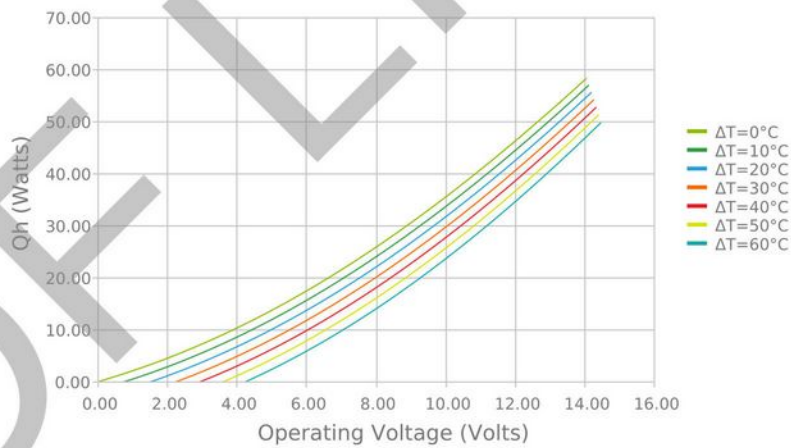
Coefficient of Performance ( $COP = Q_c/P_{in}$ )  
 $T_{hot} = 27^\circ C$



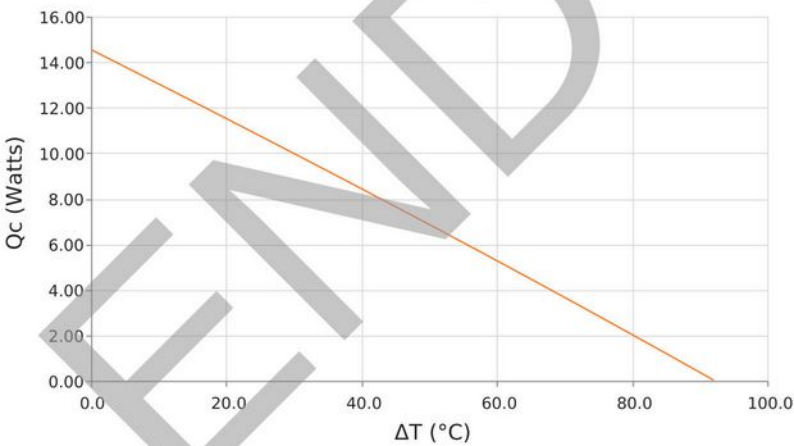
Total Heat Dissipated at Hot Side ( $Q_h = Q_c + P_{in}$ )  
 $T_{hot} = 27^\circ C$



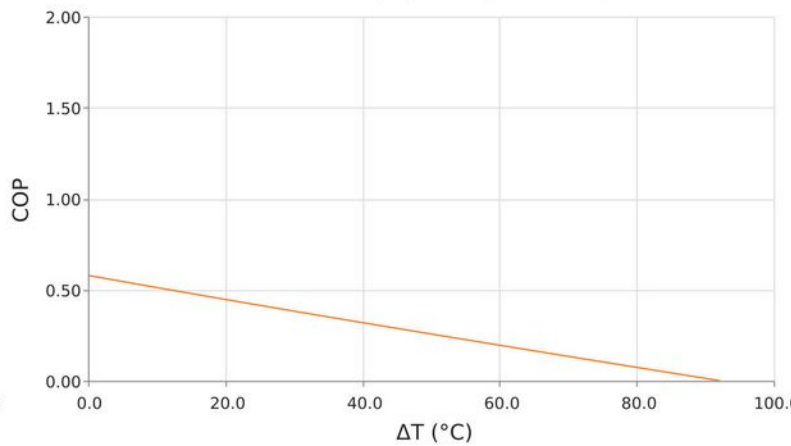
Total Heat Dissipated at Hot Side ( $Q_h = Q_c + P_{in}$ )  
 $T_{hot} = 27^\circ C$



Heat Pumped at Cold Side ( $Q_c$ )  
 $T_{hot} = 35^\circ C$  |  $I_{operating} = 2.3$  Amps



Coefficient of Performance ( $COP = Q_c/P_{in}$ )  
 $T_{hot} = 35^\circ C$  |  $I_{operating} = 2.3$  Amps



### Specifications

|                                          |              |
|------------------------------------------|--------------|
| Hot Side Temperature                     | 27.0 °C      |
| Qcmax ( $\Delta T = 0$ )                 | 15.4 Watts   |
| $\Delta T_{max}$ ( $Q_c = 0$ )           | 91.0 °C      |
| I <sub>max</sub> (I @ $\Delta T_{max}$ ) | 3.0 Amps     |
| V <sub>max</sub> (V @ $\Delta T_{max}$ ) | 14.3 Volts   |
| Module Resistance                        | 4.85 Ohms    |
| Max Operating Temperature                | 80 °C        |
| Weight                                   | 18.0 gram(s) |

### Finishing Options

| Suffix | Thickness                           | Flatness / Parallelism                     | Hot Face | Cold Face | Lead Length         |
|--------|-------------------------------------|--------------------------------------------|----------|-----------|---------------------|
| 11     | 6.500 ±0.203 mm<br>0.256 ± 0.008 in | 0.025 mm / 0.203 mm<br>0.001 in / 0.008 in | Lapped   | Lapped    | 199.9 mm<br>7.87 in |

### Sealing Options

| Suffix | Sealant | Color | Temp Range | Description          |
|--------|---------|-------|------------|----------------------|
|        | None    |       |            | No sealing specified |

### Notes

Max operating temperature: 80°C  
 Do not exceed I<sub>max</sub> or V<sub>max</sub> when operating module  
 Reference assembly guidelines for recommended installation  
 Solder tinning also available on metallized ceramics

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