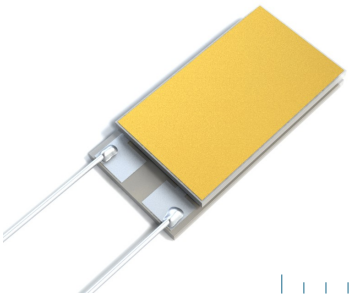
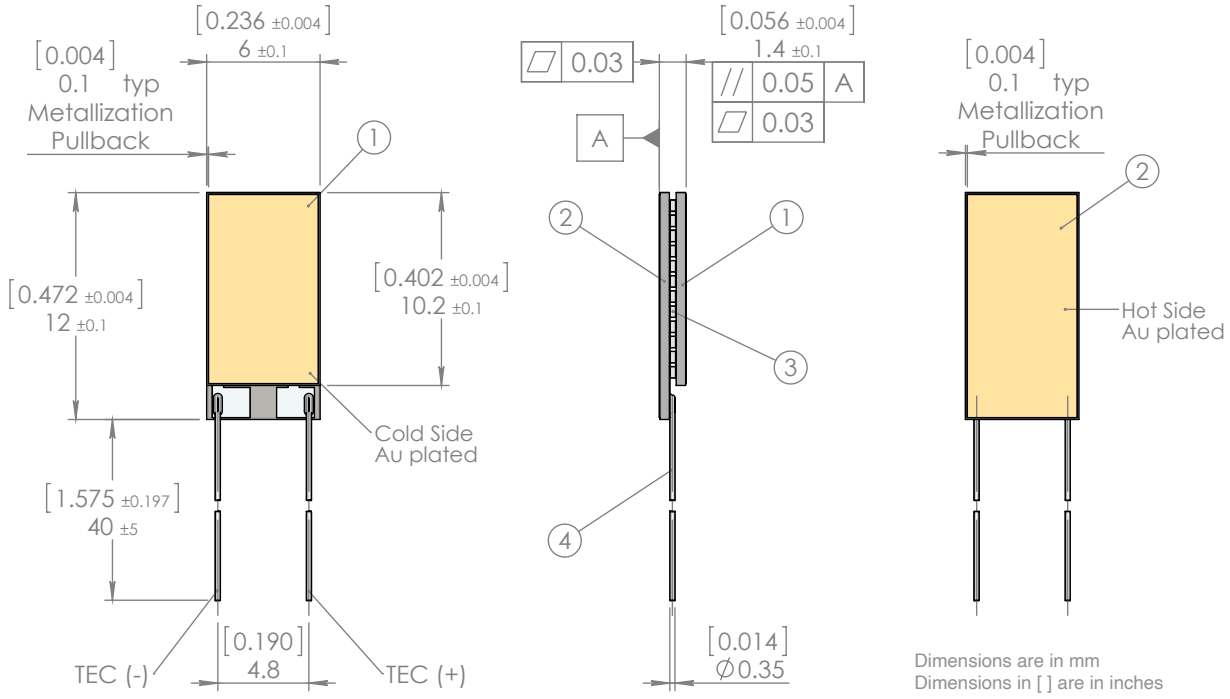
THERMOELECTRIC COOLER PERFORMANCE



ΔTmax K	Qmax W	Imax A	Umax V	ACR Ohm	Ambient Temperature	Ambient Conditions
64	13.9	4.8	5.0	0.8	+27°C / 300K	Vacuum
69	15.1	4.7	5.5	0.9	+50°C / 323K	Dry N2
75	16.2	4.6	6.0	1.0	+75°C / 348K	Dry N2
76	16.7	4.6	6.2	1.0	+85°C / 358K	Dry N2

Note: Thermoelectric Cooler performance values are specified for optimal conditions, assuming that TEC hot side (T_{hot}) is stabilized at ambient temperature (T_{amb})

TECHNICAL DRAWING 1MDL06-042-03



TEC DESCRIPTION

- Ceramics: Al_2O_3 (100%)
- Internal Assembly: Solder Sn-Sb (T_{melt}=230°C)
- Cold Side Surface: Au plated (0.2 - 0.3um)
- Hot Side Surface: Au plated (0.2 - 0.3um)
- Terminal Contacts: AWG-27 Wires, blank
- TEC Polarity: standard
- Bi-Te Material: high-grade, hot-extruded type
- Protective Coating: N/A (available by request)
- Integrated Thermistor: N/A (available by request)

KEY FEATURES

- High-Density (HD) pellets placement technology
- RoHS EU Compliant
- REACH EU Compliant
- TELCORDIA GR-468 (MIL-883) qualified
- Front porch for Terminal Wires (default)
- WB configuration is available by request
- Up to 225°C short time processing (for mounting)
- Wide range of additional manufacturing options (see Pages 3,4)

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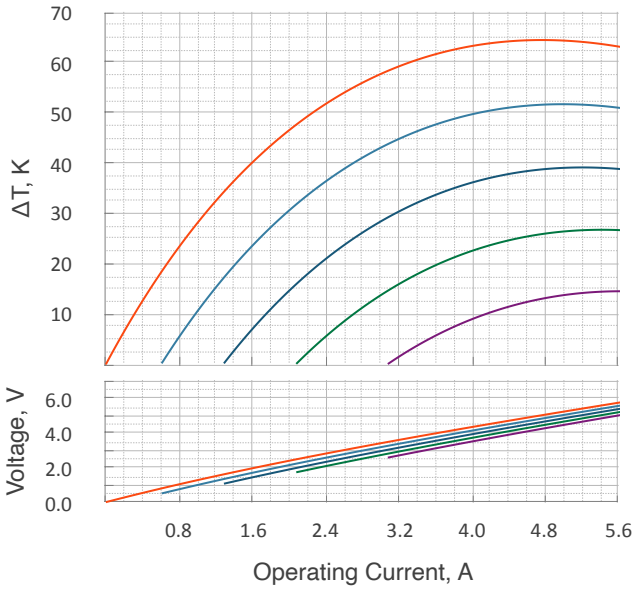
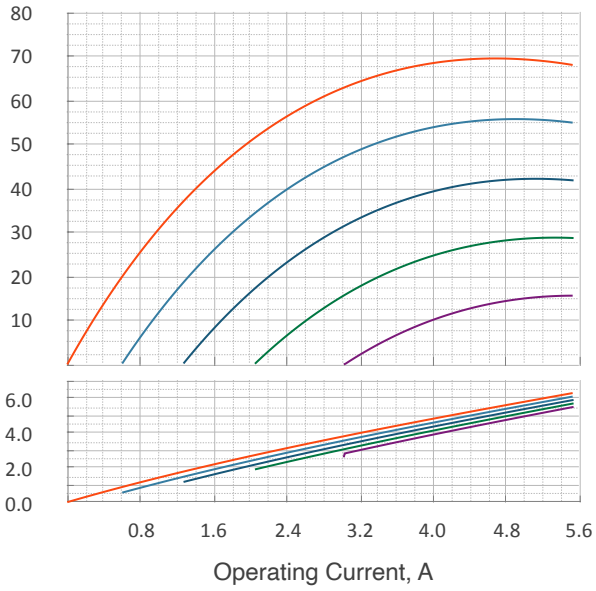
PERFORMANCE PLOTS

@27°C, Vacuum	ΔTmax K	Qmax W	Imax A	Umax V
1MDL06-042-03	64	13.9	4.8	5.0



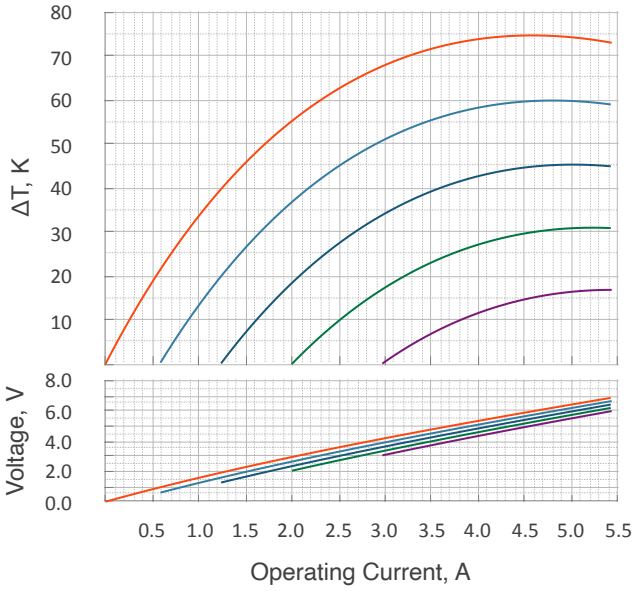
Heatload, W	0.0	2.8	5.6	8.4	11.2
% from Qmax	0%	20%	40%	60%	80%

@50°C, Dry N2	ΔTmax K	Qmax W	Imax A	Umax V
1MDL06-042-03	69	15.1	4.7	5.5



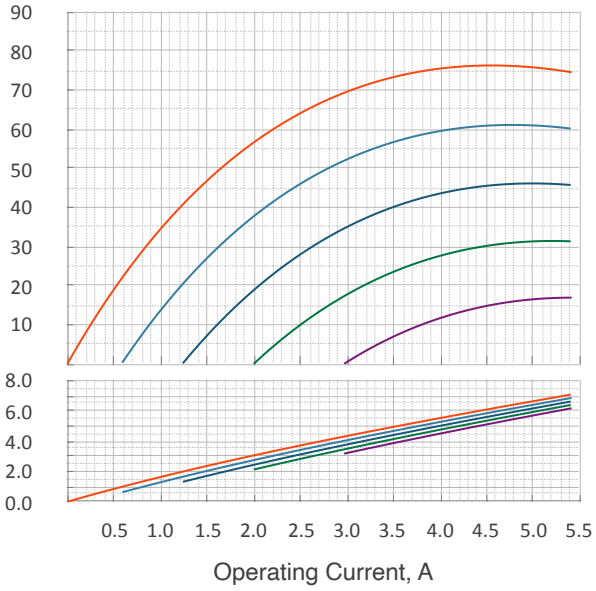
Heatload, W	0.0	3.0	6.1	9.1	12.1
% from Qmax	0%	20%	40%	60%	80%

@75°C, Dry N2	ΔTmax K	Qmax W	Imax A	Umax V
1MDL06-042-03	75	16.2	4.6	6.0



Heatload, W	0.0	3.2	6.5	9.7	13.0
% from Qmax	0%	20%	40%	60%	80%

@85°C, Dry N2	ΔTmax K	Qmax W	Imax A	Umax V
1MDL06-042-03	76	16.7	4.6	6.2



Heatload, W	0.0	3.3	6.7	10.0	13.3
% from Qmax	0%	20%	40%	60%	80%

Note: Thermoelectric cooler performance values and plots are specified at optimal conditions, assuming TEC hot side is stabilized at ambient temperature (T_{hot}=T_{amb}). The performance data is specified for four most common ambient condition modes. Please, contact TEC Microsystems GmbH directly for estimations under different conditions, if required.

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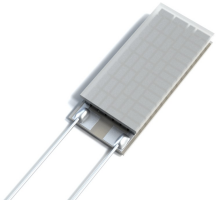
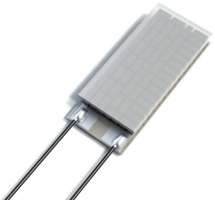
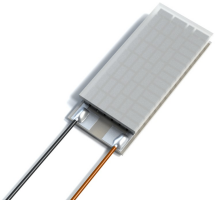
TEC TERMINAL CONNECTION OPTIONS



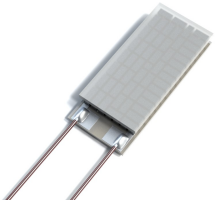
● Blank Wires



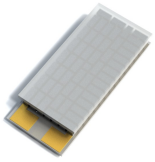
☐ Insulated Wires



☐ Insulated Color-coded Wires



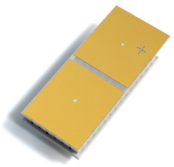
☐ Varnished Wires



☐ WB Pads

☐ WB Posts

☐ Terminal Rods

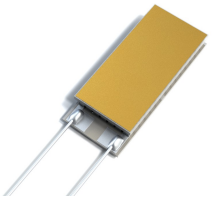


☐ SMD / Flip-chip (contacts on hot side)

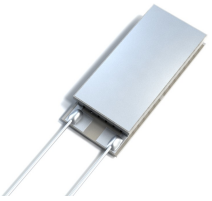
● - By default thermoelectric cooler is provided with blank tinned single-core Copper wires. Various TEC terminal connection options are available by request. In case of terminal wires wire type, material, length and diameter can be specified by customer.

TEC SURFACE OPTIONS

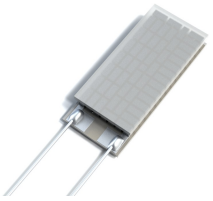
Standard ceramics surface options, available without price change.
The pre-tinning is possible for one side or both TEC sides.



● Au plated

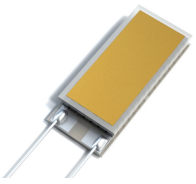


☐ Pre-tinned with solder

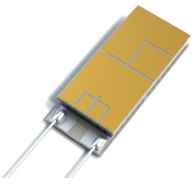


☐ Blank ceramics (w/o metallization)

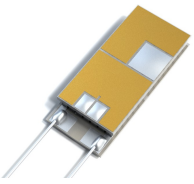
Advanced ceramics surface options, available by request



☐ Custom gap



☐ Customized Au pattern



☐ Selective pre-tinning over pattern

● - By default thermoelectric cooler is provided with Au plated ceramics surfaces (both sides). This is the universal solution, suitable for soldering and gluing. Surface solution can be specified for each TEC side (top and bottom ceramics surfaces) individually.

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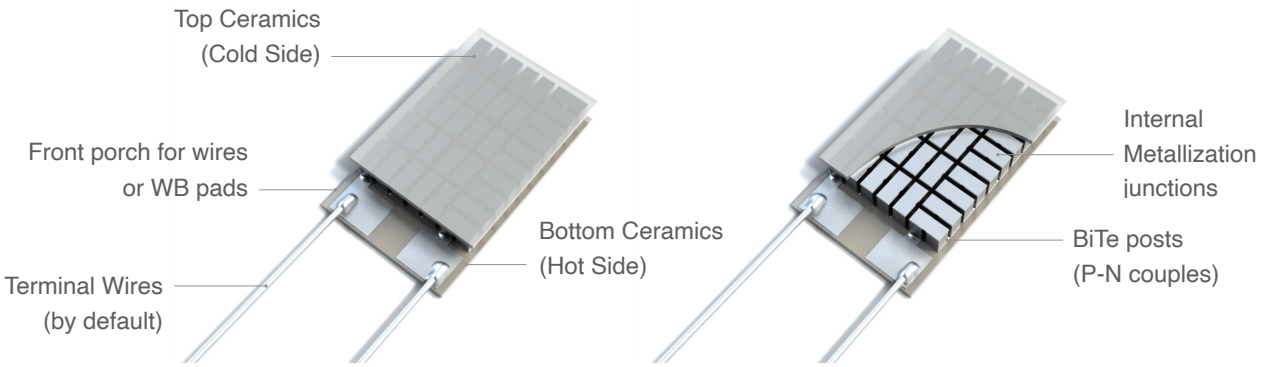
1MDL06 SERIES THERMOELECTRIC COOLERS OVERVIEW



- 1MDL06 Thermoelectric Coolers have a front porch on bottom ceramics for optimal wires or WB pads/posts integrating. The default TEC configuration is provided with terminal wires (blank tinned Copper).
- TEC WB pads/posts solutions are available by request.
- TEC internal Assembly Solder by default: Sn-Sb, Tmelt=230ºC

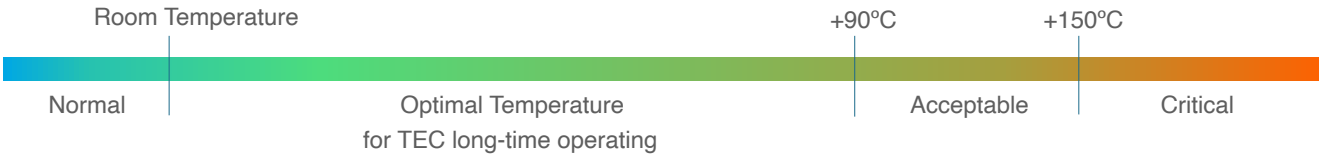
RoHS Compliant

APPLICATION TIPS

- Maximum **short time process** temperature is 220˚C (TEC assembly solder has Tmelt=230˚C).
- Maximum **long time operating** temperature is 150˚C.
- Use thermoelectric cooler only with an appropriate heat sink attached to the hot side.
- Connect thermoelectric cooler to DC power supply in according to TEC polarity.
- Do not exceed DC current and voltage higher than Imax and Umax values.
- Use temperature ramping and avoid thermal shocks during soldering and/or baking processes.
- Check FAQ on TEC Microsystems web for more details about TECs operating and handling.

220

150



TEC Lifetime depends on Ambient Temperature (T_{amb}) and can be estimated by Arrhenius equation

Term “Lifetime” for TEC is taken from Telcordia GR-468 Standard. The criteria of failure is TEC AC Resistance (ACR) change for more than 5%. It doesn’t mean TEC stops operating, but certain performance degradation appears.

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IMPORTANT NOTES

1. Thermoelectric Cooler (TEC) performance in this datasheet is specified in typical ambient condition modes (Vacuum, +27ºC; Dry N2, +50ºC; Dry N2, +75ºC and Dry N2, +85ºC. TEC performance may differ under other conditions. Please, contact TEC Microsystems for for detailed analysis and additional TEC performance info.

2. TEC ACR and Umax values are sensitive to ambient temperature. These values can be different from those specified in the datasheet at other ambient conditions. ACR and Umax rise with ambient temperature increasing.

3. TEC dTmax is specified at zero heatload, while Qmax is specified at zero dT (check Fig.1 for example). TEC dTmax and Qmax values rise with ambient temperature (check Fig. 2 for example).

4. Thermoelectric coolers have the best performance in the temperature range from near room up to +80..90ºC. TEC cooling performance is getting lower at ambient temperatures below 0ºC. TECs are not suitable to operate at cryogenic temperatures.

Fig. 1 - Understanding dT_{max} and Q_{max}

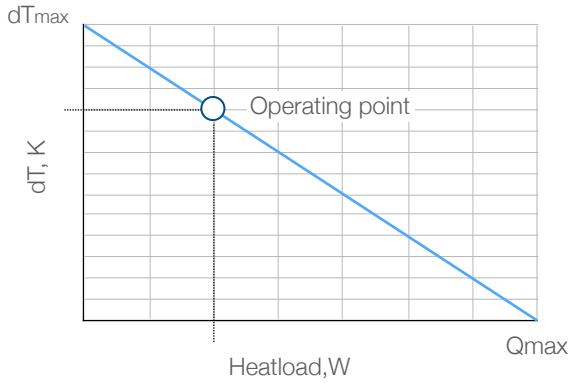
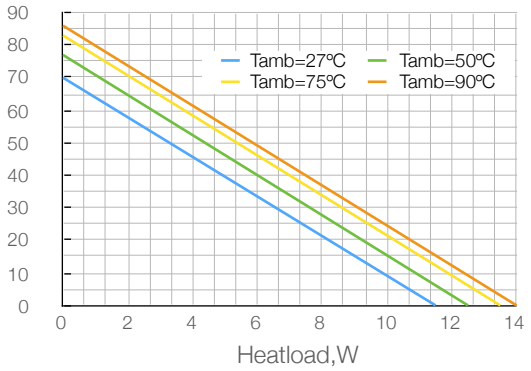


Fig. 2 - Same TEC dTmax and Qmax parameters at different ambient temperatures



5. Driving TEC at Imax or Umax level doesn't mean the max cooling performance mode. The real optimal mode may depend on operating conditions, required dT level and application heatload. In fact a better performance can be reached at operating current and voltage lower than Imax and Umax values specified in datasheet.

6. It is strongly recommended to avoid a direct mounting of thermoelectric cooler to pure Copper, Aluminium or Nickel materials as well as a mounting of objects from these materials on TEC cold side. Any material with high CTE (Coefficient of Thermal Expansion) may affect on TEC lifetime and/or even damage TEC in case of improper mounting, thermal shock or temperature cycling. In case of above mentioned materials necessity, it is recommended to use some elastic "soft" solders or glues with large modulus of elasticity (Indium-based solders or silicon-based thermoconductive glues).

7. TEC Microsystems GmbH confirms that all thermoelectric coolers are qualified and meet the requirements of Telcordia GR-468 Standard (based on MIL-883). The up-to-date Reliability Report is available by request.
TEC Microsystems GmbH warranties thermoelectric coolers lifetime no less than 250K-300K operating hours under normal application conditions.

8. Additional information about thermoelectric coolers operating and handling, all the most important questions and answers, are available on TEC Microsystems web in FAQ section (link).

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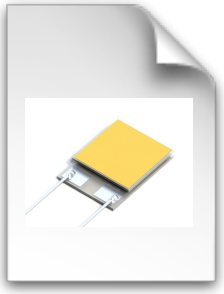

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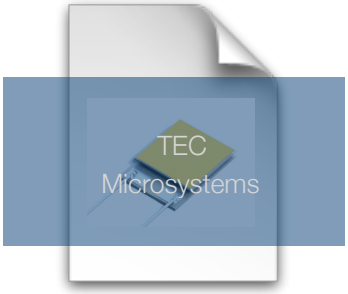

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