Thermoelectric Coolers

A very compact way to manage localized cooling of on-board components is to install a thermoelectric cooler (TEC). These lightweight devices use a direct current (DC) to drive heat transfer from a heat source toward a cooler surface or heat sink. This effect, known as the Peltier effect, can not only force heat dissipation in the direction that provides cooling, but it can also be reversed by inverting the polarity. In that case, the device transfers heat in the opposite direction, allowing it to provide heating to a component when in contact with a heat source.

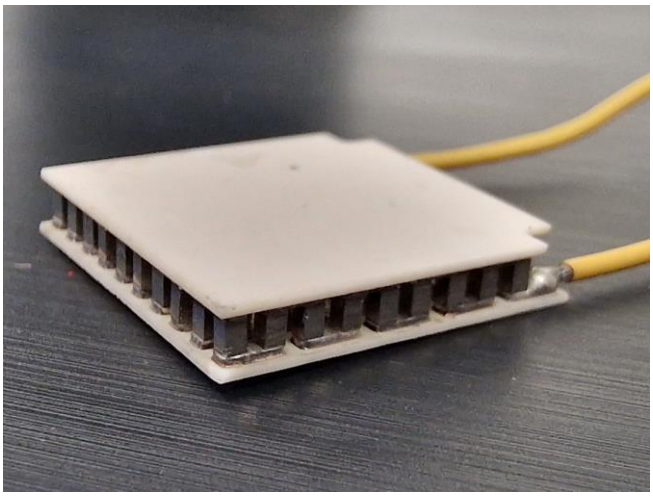


Figure 1. Thermoelectric Cooler (TEC)

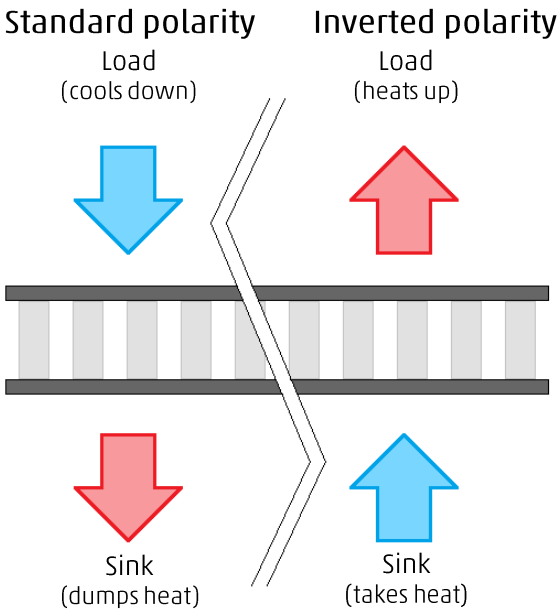


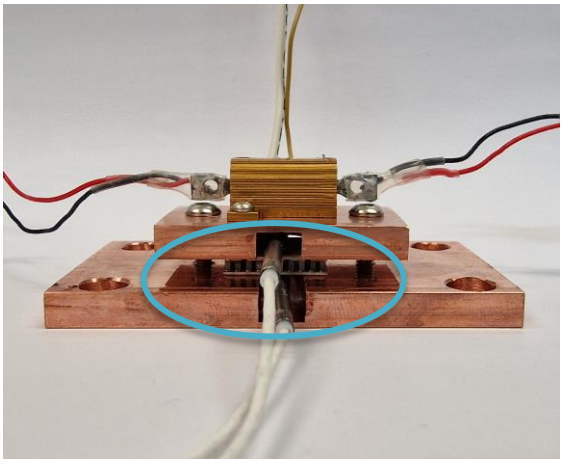
Figure 2. Possible thermal flow applications according to supplied polarity

Specifications and performance

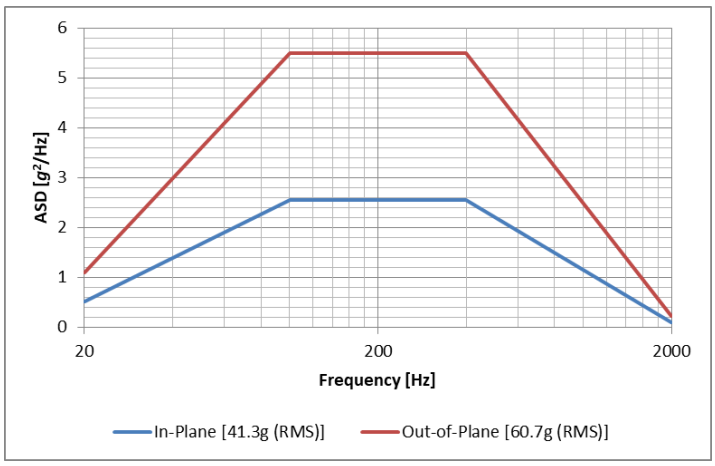
Parameter	Value		
Dimensions [mm]	15 (length)	15 (width)	2.1 (thick.)
Mass [g]	2.5		
Max. current (DC) [A]	2.8		
Max. voltage [V]	6.7		
ΔT max. [K]	85 (@ max. power)		
Q max. [W]	9.9 (@ max. power)		

Testing and evaluation

Thermal Vacuum Tests	p ≤10^{-5} mbar, -40°C ≤ T ≤ +80°C
Life cycling (up to 500 cycles)	p = 1 bar (GN2), T = 80°C
Random Vibration	42g (RMS) in-plane & 61g (RMS) out-of-plane (@ 20 to 2000 Hz)
Mechanical Shock	500g, 0.5 ms half-sine (all directions)



TEC + thermal load setup



Random vibration levels

Company Background

Azimut Space GmbH is a Space Thermal specialist with 18+ years of experience in thermo-mechanical engineering, offering a full spectrum of thermal services and products for small and large satellites and launchers.

CUSTOMERS AND PARTNERS

ESA, DLR, Thales Alenia Space, AIRBUS D&S, OHB, TNO, Sonaca

ENGINEERING SOFTWARE

ESATAN-TMS, Thermal Desktop, StarCCM+, Thermica, Hyperworks, LabView, Solidworks, Solid Edge

THERMAL TESTING FACILITIES

Thermal Vacuum Chamber (0.54x0.54x0.54m^3)
Thermal life-cycling chamber (0.30x0.39x0.25m^3)
Clean Assembly

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