



Thermoelectric Coolers for Projection Lasers

Introduction

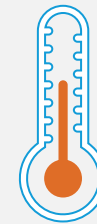


Laser Projectors used for large scale venues generate 4K-resolution images with a **robust color palette** and up to **75,000 lumens**



6kW

is required to generate bright, high-resolution images



Temperature control in high-power laser projectors is critical to ensure proper functionality, long life operation and crisp image projection.

Application Overview

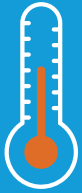
Laser Diode technology has become standard due to **reliability** and **long-life operation**
Laser light is generated when a laser diode travel through a laser crystal.



- Wider color range
- Sharper contrasts
- Projects at farther distances
- Start-up is virtually instant
- Longer life expectancy



Application Challenges



TEMPERATURE CONTROL

Achieving **desired temperature set point** and heat pumping capacity



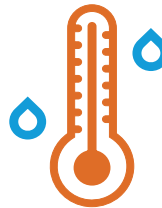
AIRFLOW

Lack of airflow negatively affect heat exchanger performance



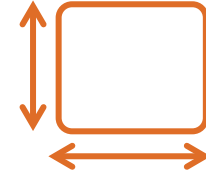
THERMAL NOISE

High-power laser systems generate more thermal noise



CONDENSATION

Moisture on cold surfaces may cause system failure



SWAP REQUIREMENTS

Smaller and lighter projectors for improved portability and simplified installation



OUTGASSING

Outgassing from standard thermal interface material can coat optics

Comparing Cooling Technologies

Compressor-Based Refrigeration Systems

- Higher Coefficient of Performance (COP)
- Lose thermal control as fluid comes closer to heat source



Ambient Liquid Loop Systems utilizing Thermoelectric Coolers

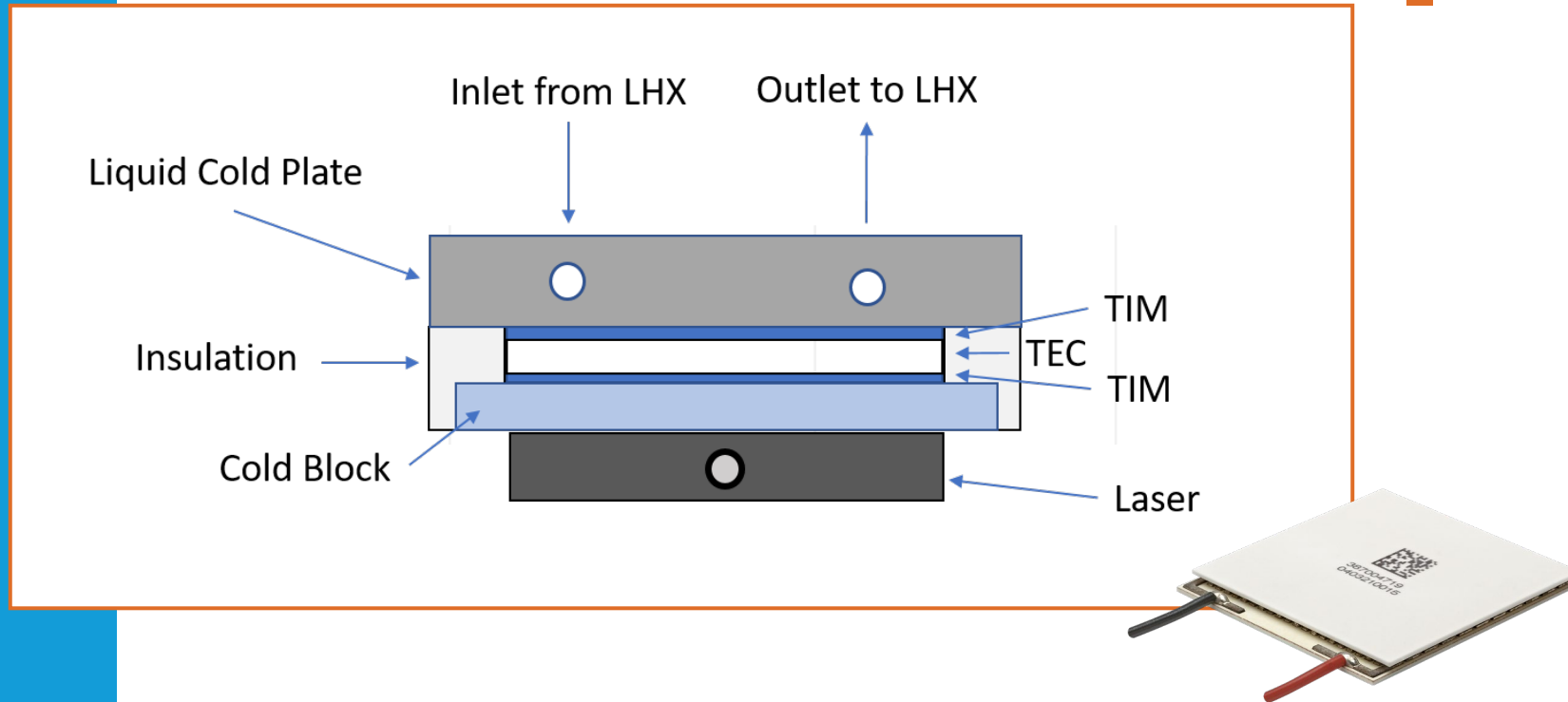
- Spot cooling of the laser for more precise temperature control
- Lower cost than alternate cooling technologies

Both these cooling solutions can cool well below ambient temperatures



Thermoelectrics in Laser Projectors

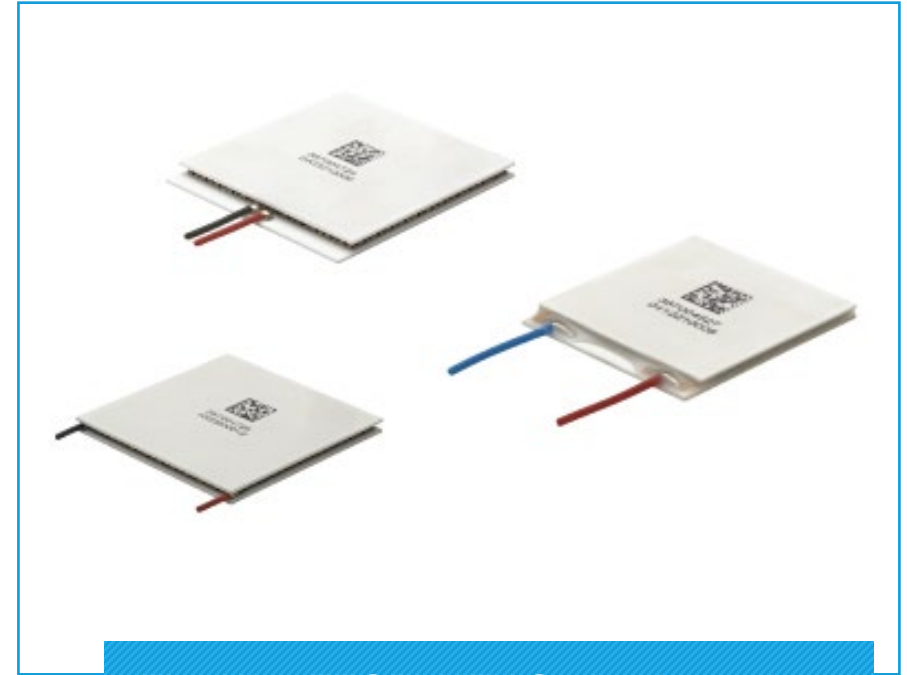
Thermoelectric coolers offer high reliability and a more cost-effective solution



UltraTEC™ UTX Series

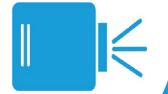
A new generation thermoelectric coolers

- **10% Cooling Capacity Boost**
Advanced thermoelectric materials for higher heat pumping capacity
- **(ΔT) up to 72°C**
Improved temperature differential with higher thermal insulating barrier
- **Precise Temperature Control**
Spot cooling allow for precise temperature control
- **Quiet operation**
No operational noise
- **Reliable Solid-State**
No moving parts, solid-state Peltier coolers significantly reduce maintenance and total ownership costs.



The UltraTEC™ UTX Series has a heat pumping capacity of up to 296 Watts.

Form factors range from 25 x 25 mm's
up to 55 x 55 mm's



High-power laser projectors require thermal management solutions for maximum performance



TEMPERATURE STABILIZATION IS CRITICAL FOR LASER PROJECTORS

Heat generated by the laser must be quickly dissipated to ensure **long-life operation** and **crisp image projection**.

THERMAL MANAGEMENT DESIGN CHALLENGES

Size constraints, condensation, lack of airflow and **outgassing** need to be taken into consideration when designing laser projector systems

THERMOELECTRICS PROVIDE SUPERIOR SPOT COOLING

Ambient liquid loops with thermoelectric coolers are considered more **reliable** and **cost-effective** than conventional cooling solutions.

ULTRATEC UTX SERIES BOOSTS COOLING CAPACITY BY 10%

Offering a heat pumping capacity up to 296 Watts, Laird Thermal Systems UltraTEC UTX Series is **ideal for high heat pumping applications** such as laser projectors.

For More Information

Thermoelectric coolers for
laser projector applications



More information on the **UltraTEC™ UTX Series** can be found by visiting

<https://www.lairdthermal.com/products/thermoelectric-cooler-modules/peltier-utx-series>

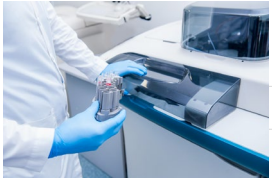
Read more about Thermoelectric Cooling for Projection Lasers in our **application note**

<https://www.lairdthermal.com/thermal-technical-library/application-notes/thermoelectric-cooling-laser-projectors>

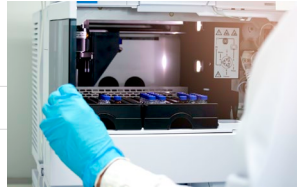


About Laird Thermal Systems

Laird Thermal Systems develops thermal management solutions for demanding applications



Medical



Analytical



Industrial



Transportation



Telecom

- **DIVERSE PRODUCT PORTFOLIO**
Thermoelectric Coolers, Thermoelectric Cooler Assemblies, Temperature controllers and Liquid Cooling Systems
- **SOLVING COMPLEX ISSUES**
Our engineers use advanced thermal modeling and management techniques to solve complex heat and temperature control problems
- **ACCELERATING TIME-TO-MARKET**
We partner closely with our customers across the entire product development lifecycle.
- **MAXIMIZING PERFORMANCE**
Our global manufacturing and support resources help customers maximize productivity, uptime, performance and product quality

Laird Thermal Systems is the optimum choice for standard or custom thermal solutions

Learn more by visiting
www.lairdthermal.com





Have a question or need more information about
Laird Thermal Systems? Please contact us via the website at www.lairdthermal.com



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