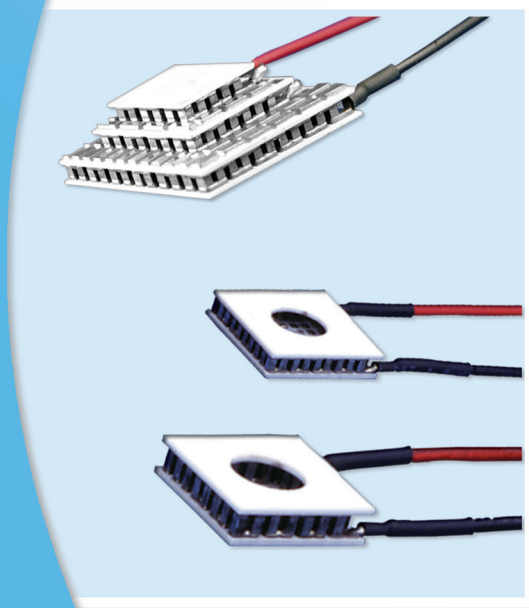
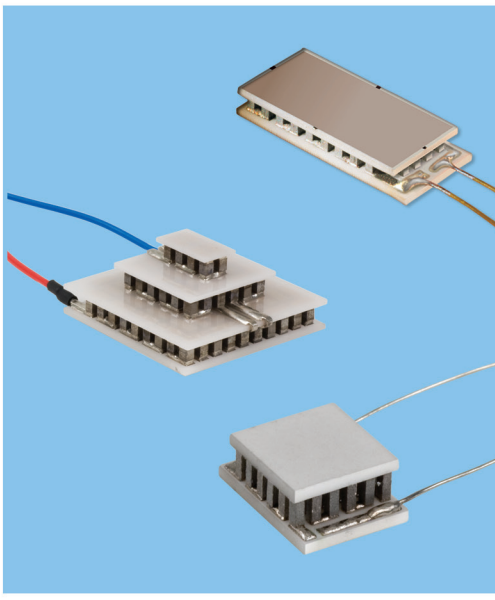
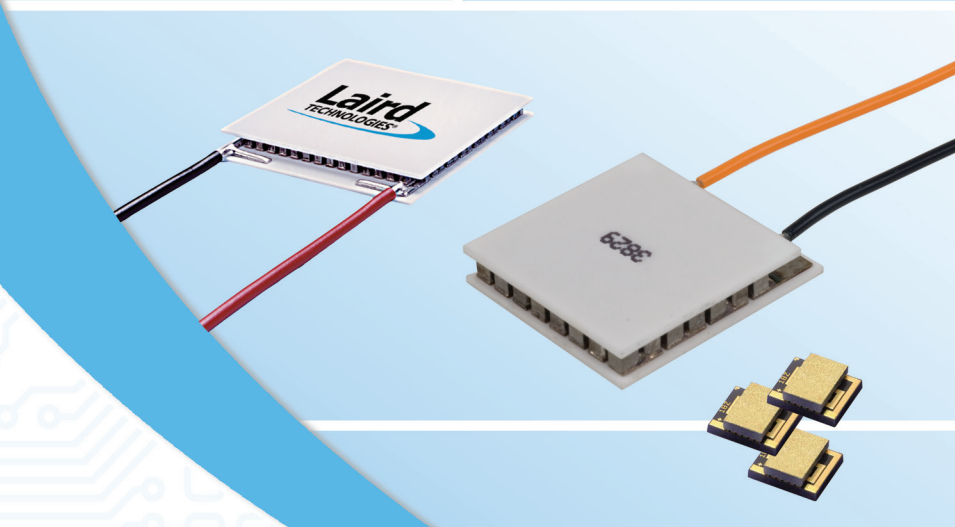
Thermoelectric Modules







Laird™

www.lairdtech.com

About Laird Technologies

Laird Technologies designs and manufactures customized, performance-critical products for wireless and other advanced electronics applications.

Laird Technologies is a global technology company focused on providing components and solutions that protect electronic devices from electromagnetic interference and heat, and that enable connectivity through wireless applications and antenna systems.

Custom products are supplied to all sectors of the electronics industry including the handset, telecommunications, data transfer and information technology, automotive, aerospace, defense, consumer, medical, mining, railroad and industrial markets.

Laird Technologies partners with its customers to design custom thermal solutions for applications in many industries including:

- Clinical Diagnostics
- Medical Imaging
- Electronic Enclosure Cooling
- Photonics Laser Systems
- Telecommunications
- Analytical Instrumentation
- Semiconductor Fabrication
- Aerospace Defense
- Food & Beverage
- Automotive

As an industry leader in high-performance and cost-effective Thermal Management Solutions, Laird Technologies provides the knowledge, innovation, and resources to ensure exceptional thermal performance and customer satisfaction for applications in the medical, analytical,telecom, industrial, and consumer markets.

A Brief Introduction to Thermoelectrics

Solid state heat pumps have been in existence since the discovery of the Peltier effect in 1834. The devices became commercially available several decades ago with the development of advanced semiconductor thermocouple materials in combination with ceramics substrates. Thermoelectric modules (TEMs) are solid-state heat pumps that require a heat exchanger to dissipate heat utilizing the Peltier Effect. During operation, DC current flows through the TEM to create heat transfer and a temperature differential across the ceramic substrates, causing one side of the TEM to be cold, while the other side is hot. A standard single-stage TEM can achieve temperature differentials of up to 70°C.

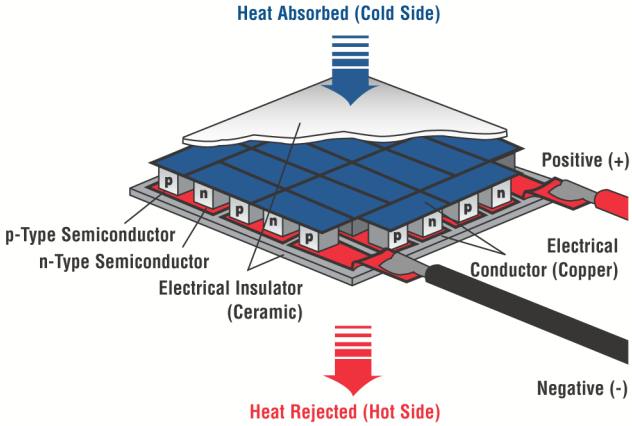
A typical TEM's geometric footprint can vary from 2 x 2 mm's to 62 x 62 mm's and are light in weight. This makes thermoelectrics ideal for applications with tight geometric space constraints and low weight requirements when compared to much larger cooling technologies, such as conventional compressor-based systems. TEMs can also be used as a power generator to convert waste heat into usable output DC power.

Thermoelectrics are ideal for applications that require active cooling to below ambient and have cooling capacity requirements of up to 600 Watts. A design engineer should consider TEMs when the system design criteria includes such factors as precise temperature control, high reliability, compact geometry constraints, low weight and environmental friendly requirements.

Benefits of Using Thermoelectrics

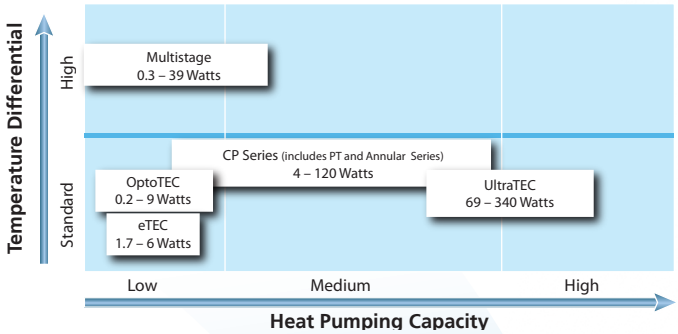
TEMs have several advantages over alternate cooling technologies:

- They have no moving parts, so the solid state construction results in high reliability and units can be mounted in any orientation.
- TEMs can cool devices down to well below ambient. Colder temperatures can be achieved, down to minus 100°C, by using a multistage thermoelectric module in a vacuum environment.
- Thermoelectrics are able to heat and cool by simply reversing the polarity, which changes the direction of heat transfer. This allows temperature control to be very precise, where up to ±0.01°C can be maintained under steady-state conditions.
- In heating mode, TEMs are much more efficient than conventional resistant heaters because they generate heat from input power supplied plus additional heat generated by the heat pumping action.
- Devices are environmentally friendly because they use no CFC's and electrical noise is minimal.
- TEMs can be used as energy harvesters, turning waste heat into usable output DC power.



Thermoelectric Product Line

Laird Technologies designs and manufactures thermoelectric modules (TEMs) which adhere to strict process control standards and pass/fail criteria, assuring our customers receive the best possible modules. Our extensive standard product portfolio covers a wide range of cooling capacities, temperature differentials, input power constraints and geometric footprints. Standard finishing options are available to accommodate alternate lead lengths, lapping thickness tolerances, and moisture protective sealants. Standard pre-tinning and solder constructions are available to accommodate solder-able mounting of the TEM to the heat exchanger, or processing of TEM through a reflow oven to solder the end assembly.



Laird offers several thermoelectric module product families that can be classified into cooling capacity and temperature differential spectrums. The low cooling capacity spectrum is defined as cooling capacities in milliwatts to approximately 10 Watts. The medium cooling capacity spectrum is defined as 10 Watts to approximately 100 Watts and the high cooling capacity spectrum is defined as 100 Watts to approximately 300 Watts. Laird offers a diverse product portfolio with product families that were designed for each cooling spectrum.

Telecommunications

Optical components require temperature stabilization while ambient conditions can fluctuate throughout the day. Electronics and batteries require cooling below ambient to ensure long life operation.

- Laser Diodes
- Pump Lasers
- Photodiodes
- Optical Transceivers
- Telecom Enclosures

Medical

Medical systems require temperature stabilization to maintain peak performance. Reagent chambers require cooling below ambient to extend life of reagents. DNA amplification is conducted by rapid thermal cycling.

- Medical Imaging
- Clinical Diagnostics
- Medical Lasers
- Analytical Instrumentation
- PCR

Industrial & Instrumentation

Operating electronic devices at low temperatures limits noise and expands the light spectrum captured by CCDs and IR detectors. Temperature stabilization is required for industrial lasers and high end printing systems to maintain peak performance.

- CCD Cameras
- Thermal Imaging
- Kiosks
- Metrology Instrumentation
- Digital Color Printing
- Industrial Laser Systems

TEM Rapid Prototyping Center

Since there are so many unique attributes that need to be ascertained for each application, often a customized TEM will yield a more optimal thermal solution. Laird Technologies offers strong engineering services with a global presence that supports onsite concept generation, thermal modeling, thermal design and rapid prototyping. We also offer validation test services to meet unique compliance standards for each industry, such as Telcordia, MIL-STDs or unique standards specific to a medical, automotive or industrial account. Minimum order quantity (MOQ) applies for all custom TEM designs and validation testing.

Custom Thermoelectric Modules

Patterning and Plating On Substrates

TE Semiconductor Processing

Tooling Fabrication

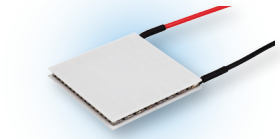
TEM Assembly

Lapping, Wiring and Sealing

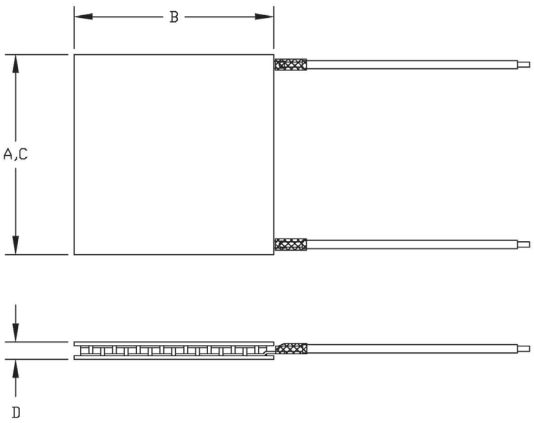
Test Validation

Thermoelectric MODULES

CP Series



- Designed for higher current, larger heat pumping applications
- Wide product breadth to cover many sizes, input power configurations and heat pumping capacities
- Ideal for clinical diagnostics, analytical instrumentation, photonics laser systems and enclosure cooling

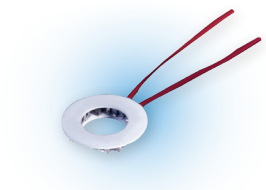


PART NO.	QMAX[1] (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	ΔTMAX (°C)	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)
CP14,7,10,L1,W4.5	1.8	3.9	0.8	68	9.5	9.5	9.5	4.7
CP08,31,06,L1,W4.5	4.4	2.1	3.8	67	12	12	12	3.4
CP14,17,10,L1,W4.5	4.5	3.9	1.9	68	15	15	15	5.7
CP10,31,08,L1,W4.5	5.3	2.5	3.8	67	15	15	15	4.0
CP10,31,05,L1,W4.5	8.2	3.9	3.8	67	15	15	15	3.2
CP14,31,10,L1,W4.5	8.2	3.9	3.75	68	20	20	20	4.7
CP08,63,06,L1,W4.5	9.0	2.1	7.6	67	12	25	12	3.4
CP10,63,06,L1,W4.5	12.7	3.0	7.6	67	15	30	15	3.6
CP10,71,06,L1,W4.5	14.4	3.0	8.6	67	23	23	23	3.6
CP10,63,05,L1,W4.5	16.6	3.9	7.6	67	15	30	15	3.2
CP08,127,06,L1,W4.5	18.1	2.1	15.4	67	25	25	25	3.4
CP14,71,10,L1,W4.5	18.7	3.9	8.6	68	30	30	30	4.7
CP2,31,10,L1,W4.5	18.8	9.0	3.8	68	30	30	30	5.6
CP10,71,05,L1,W4.5	19.0	3.9	7.9	67	23	23	23	3.2
CP14,35,045,L1,W4.5	19.0	8.5	4.2	65	15	30	15	3.3
CP085,127,06,L1,W4.5	20.2	2.7	15.3	66	30	30	30	3.6
CP14,51,06,L1,W4.5	20.6	6.0	5.8	67	9.5	62	9.5	3.8
CP10,127,08,L1,W4.5	21.4	2.5	15.4	67	30	30	30	4.0
CP08,127,05,L1,W4.5	22.6	2.6	14.4	67	25	25	25	3.1
CP10,127,06,L1,W4.5	25.7	3.0	15.4	67	30	30	30	3.6
CP14,71,06,L1,W4.5	28.7	6.0	8.6	67	30	30	30	3.8
CP2,31,06,L1,W4.5	29.3	14.0	3.5	67	30	30	30	4.6
CP14,51,045,L1,W4.5	29.7	8.5	5.8	65	9.5	62	9.5	3.3
CP10,127,05,L1,W4.5	33	3.9	15.4	67	30	30	30	3.2
CP14,127,10,L1,W4.5	33	3.9	15.4	68	40	40	40	4.7
CP14,71,045,L1,W4.5	39	8.5	8.6	65	30	30	30	3.3
CP2,71,10,L1,W4.5	44	9.0	7.9	67	44	44	44	5.6
CP10,254,06,L1,W4.5	51	3.0	30.8	67	60	30	60	3.6
CP14,127,06,L1,W4.5	51	6.0	15.4	67	40	40	40	3.8
CP12,161,06,L1,W4.5	52	4.8	18.3	67	40	40	40	3.6
CP2,71,06,L1,W4.5	67	14.0	8.6	68	44	44	44	4.6
CP14,127,045,L1,W4.5	72	8.5	15.4	65	40	40	40	3.3
CP12,161,04,L1,W4.5	79	7.3	18.4	67	40	40	40	3.3
CP2,127,10,L1,W4.5	80	9.3	14.5	68	62	62	62	5.6
CP14,199,06,L1,W4.5	81	6.0	22.7	67	40	40	40	3.8
CP14,199,045,L1,W4.5	116	8.5	22.4	65	40	40	40	3.3
CP2,127,06,L1,W4.5	120	14.0	15.4	67	62	62	62	4.6

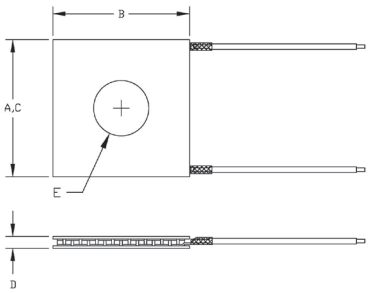
Annular Series

- Features center hole for transmission of light, wires, probes or other hardware through the thermoelectric component
- Round or square configurations available
- Rapid prototyping available to accommodate unique shape requirements

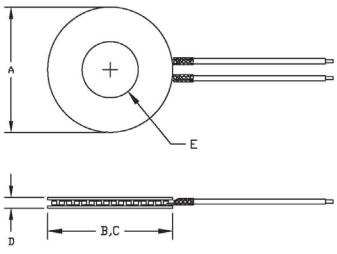
PART NO.	QMAX[1] (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	ΔTMAX (°C)	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)	DIM E (mm)
SH10,23,06,L1,W4.5	4.7	3.0	2.8	67	15	15	15	3.6	7.2
SH08,28,05,L1,W4.5	4.9	2.6	3.9	67	15	15	15	3.1	4.4
SH14,15,06,L1,W4.5	6.0	6.0	1.7	67	14	14	14	3.8	5.1
SH10,125,05,L1,W4.5	33	3.9	15.2	67	30	30	30	3.2	3.6
SH14,125,10,L1,W4.5	33	3.9	14.3	67	40	40	40	4.7	4.7
SH10,95,06,L1,W4.5	33	3.9	14.3	67	40	40	40	3.6	4.7
SH14,125,06,L1,W4.5	51	6.0	15.2	67	40	40	40	3.6	4.7
SH14,125,045,L1,W4.5	68	8.5	15.2	67	40	40	40	3.3	4.7
RH14,14,10,L1,W4.5	3.7	3.9	1.7	67	26	26	26	4.7	14
RH14,14,06,L1,W4.5	5.7	6.0	1.7	67	26	26	26	3.8	14
RH14,32,06,L1,W4.5	12.9	6.0	3.9	67	44	44	44	3.8	27



SH Series



RH Series



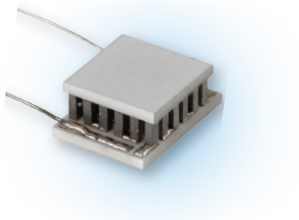
Notes: 1) QMax rated value at ΔT = 0°C, Imax and Vmax, Th = 25°C; 2) Thickness for non-metallized versions only. All modules are lead-free. For wiring options contact Laird Technologies.

RoHS

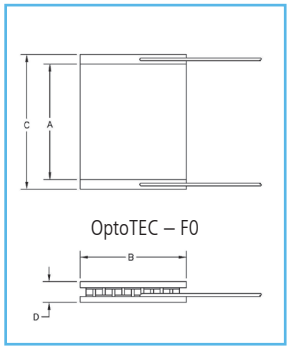
Thermoelectric MODULES

OptoTEC™

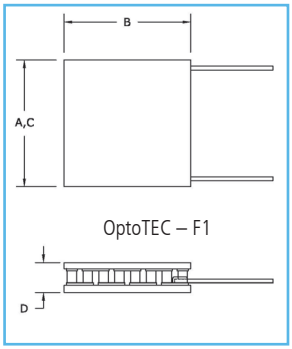
- Miniature Form Factor
- Pb-free solder construction with three solder melt temperatures
- Alumina or Aluminum Nitride Substrates Available
- Designed for laser diodes, infrared detectors, pump lasers and optical transceivers



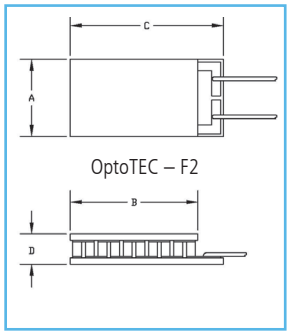
Internal Solder Melt Temperature	
OT	138°C
ET	232°C
HOT	271°C



OptoTEC – F0



OptoTEC – F1



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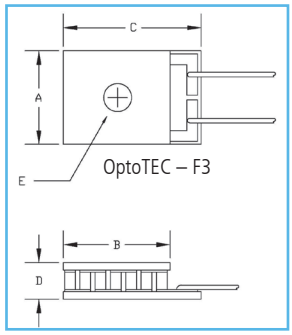


OptoTEC – F3

PART NO.	QMAX[1] (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	ΔTMAX (°C)	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)
ET12,65,F2A,1312,11,W2.25	5.3	1.2	7.4	67	13.2	12.1	13.2	2.2
ET19,23,F1N,0608,11,W2.25	3.0	1.9	2.7	65	6.0	8.2	6.0	1.65
ET19,35,F1N,0612,11,W2.25	4.5	1.9	4.0	67	6.0	12.1	6.0	1.65
ET20,24,F2A,0709,11,W2.25	3.3	2.0	2.7	67	6.6	8.8	10.8	2.0
ET20,30,F2A,0610,11,W2.25	4.1	2.0	3.4	67	6.2	10.3	12.3	1.8
ET20,31,F1A,0909,11,W2.25	4.2	2.0	3.5	67	8.8	8.8	8.1	2.2
ET20,68,F1A,1313,11,W2.25	9.3	2.0	7.8	67	13.2	13.2	13.2	2.2
HOT12,18,F2A,0606,11,W2.25	1.5	1.2	2.1	67	6.0	6.2	7.2	2.7
HOT12,65,F2A,1312,11,W2.25	5.3	1.2	7.4	67	13.2	12.1	13.2	2.7
HOT20,31,F2A,0909,11,W2.25	4.2	2.0	3.5	67	8.8	8.8	11	2.2
HOT20,65,F2A,1312,11,W2.25	8.9	2.0	7.4	67	13.2	12.1	13.2	2.2
OT08,04,F0,0203,11,W2.25	0.2	0.8	0.5	67	1.8	3.4	3.4	2.4
OT08,08,F0,0305,11,W2.25	0.4	0.8	1.0	67	3.4	3.4	5.0	2.4
OT08,11,F1,0305,11,W2.25	0.6	0.8	1.3	67	3.3	4.9	4.9	2.4
OT08,18,F0,0505,11,W2.25	1.0	0.8	2.1	67	4.9	4.9	6.5	2.4
OT08,18,F2,0505,11,W2.25	1.0	0.8	2.1	67	5.0	5.0	6.7	2.4
OT08,32,F2,0707,11,W2.25	1.7	0.8	3.7	67	6.6	6.6	8.1	2.4
OT08,66,F0,1009,11,W2.25	3.6	0.8	7.6	67	9.8	8.9	11.4	2.4
OT12,12,F0,0406,11,W2.25	1.0	1.2	1.4	67	4.2	4.2	6.2	3.0
OT12,18,F0,0606,11,W2.25	1.5	1.2	2.1	67	6.2	6.2	8.3	3.0
OT12,18,F2A,0606,11,W2.25	1.5	1.2	2.1	67	6.0	6.2	7.2	3.1
OT12,62,F3,1211,11,W2.25	5.0	1.2	7.1	67	6.0	6.0	7.6	3.1
OT12,66,F0,1211,11,W2.25	5.4	1.2	7.5	67	12.3	11.3	14.4	3.1
OT15,30,F2A,0610,11,W2.25	3.0	1.5	3.4	67	6.2	10.3	12.3	2.2
OT15,66,F0,1211,11,W2.25	6.8	1.5	7.5	67	12.3	11.3	14.4	2.8
OT16,18,F2,0606,11,W2.25	2.0	1.6	2.0	67	6.0	6.0	7.6	2.4
OT20,12,F0,0406,11,W2.25	1.6	2.0	1.4	67	4.1	6.1	6.1	2.5
OT20,30,F2A,0610,11,W2.25	4.1	2.0	3.4	67	6.2	10.3	12.3	2.1
OT20,31,F1,0808,11,W2.25	4.2	2.0	3.5	67	8.1	8.1	8.1	2.5
OT20,32,F0,0808,11,W2.25	4.4	2.0	3.7	67	8.1	8.1	10.2	2.5
OT20,66,F0,1211,11,W2.25	9.0	2.0	7.5	67	12.2	11.2	14.2	2.5
OT24,31,F1,1010,11,W2.25	5.3	2.4	3.9	72	10.0	10.0	10	2.6

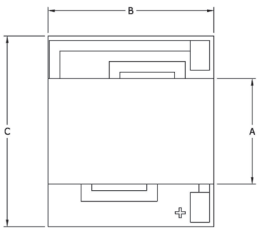
Notes: 1) QMax rated value at ΔT = 0°C, Imax and Vmax, Th = 25°C; 2) Thickness for non-metallized versions only.
All modules are lead-free. For wiring options contact Laird Technologies.

eTEC™

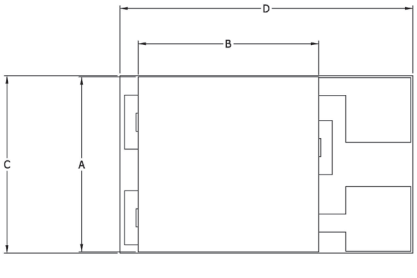
- Uses thin film semiconductor technology
- Micro form factor
- Very high heat flux density
- Ideal for laser diodes, infrared detectors, focal plane arrays, pump lasers and optical transceivers


Typical eTEC™ Module

PART NO.	QMAX (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	ΔTMAX (°C)	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)	DIM E (mm)
HV14,18,F0,0102,GG	1.7	0.9	2.7	60	1.0	1.6	1.8	0.6	0.6
HV37,48,F2,0202,GG	4.5	0.9	7.7	60	2.0	2.1	2.1	3.4	0.6
HV56,72,F2,0203,GG	6	0.9	10.8	60	3.1	2.1	3.1	3.6	0.6



HV14



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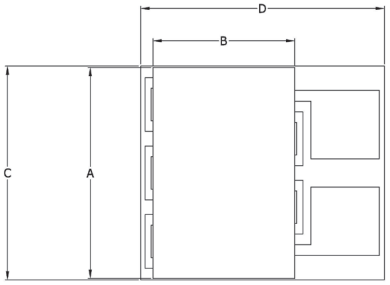
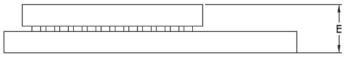
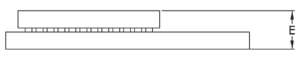


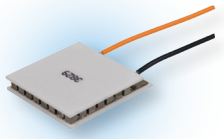
HV56



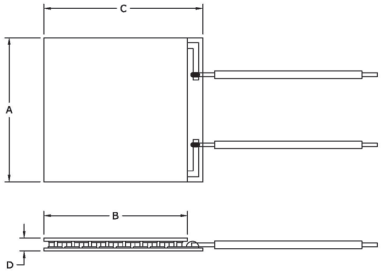


Thermoelectric MODULES

ThermaTEC™



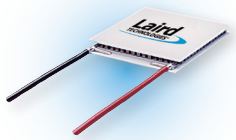
- High Operating Temperature, up to 175°C
- Superior Thermal Cycling Capability
- Able to use on Power Generating applications to turn waste heat into usable output DC power



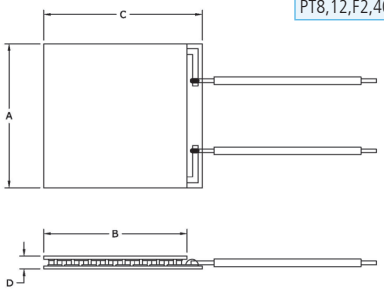
PART NO.	QMAX(1) (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	ΔTMAX (°C)	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)
HT4,6,F2,2143,TA,W6	16	3.7	7.2	64	21	38	43	4.1
HT4,7,F2,3030,TA,W6	18	3.7	8.1	67	30	30	34	4.1
HT2,12,F2,3030,TA,W6	20	2.3	14.4	63	30	30	34	3.6
HT9,3,F2,2525,TA,W6	20	9.6	3.6	66	25	25	29	4.9
HT3,12,F2,3030,TA,W6	24	2.8	14.4	63	30	30	34	3.2
HT6,7,F2,3030,TA,W6	29	6	8	63	30	30	34	3.8
HT4,12,F2,4040,TA,W6	32	3.7	14.4	64	40	40	44	4.1
HT4,12,F2,3030,TA,W6	33	3.9	14.4	63	30	30	34	3.2
HT8,7,F2,3030,TA,W6	39	8.5	8.1	63	30	30	34	3.3
HT6,12,F2,4040,TA,W6	51	6	14.4	63	40	40	44	3.6
HT8,12,F2,4040,TA,W6	72	8.5	14.4	63	40	40	44	3.3

Notes: 1) QMax rated value at ΔT = 0°C, Imax and Vmax, Th = 25°C; 2) Thickness for non-metallized versions only. All modules are lead-free. For wiring options contact Laird Technologies.

PolarTEC™

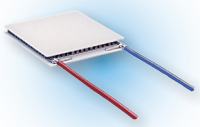


- Porch style ceramic for improved lead attachment
- Standard 4,6 and 8 Amp configurations available
- Designed for high volume production runs in consumer, food and beverage markets

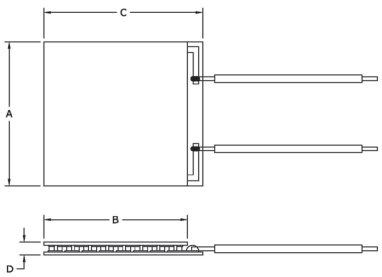


PART NO.	QMAX(1) (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	ΔTMAX (°C)	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)
PT4,7,F2,3030,TA,W6	18	3.8	8.1	67	30	30	34	4.1
PT6,7,F2,3030,TA,W6	29	6	8.1	65	30	30	34	3.8
PT4,12,F2,4040,TA,W6	32	3.7	14.4	67	40	40	44	4.1
PT4,12,F2,3030,TA,W6	33	3.9	14.4	65	30	30	34	3.2
PT6,12,F2,4040,TA,W6	52	6	14.4	65	40	40	44	3.8
PT8,12,F2,4040,TA,W6	72	8.5	14.4	64	40	40	44	3.3

UltraTEC™



- High heat flux density
- High COP in low power input applications
- Ideal for industrial and medical laser systems and high powered projectors

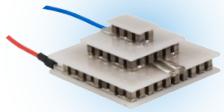


PART NO.	QMAX(1) (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	ΔTMAX (°C)	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)
UT8,12,F2,2525,TA,W6	69	7.9	14.4	69	25	25	29	1.9
UT8,12,F2,3030,TA,W6	69	7.9	14.4	69	30	30	34	2.6
UT6,19,F1,4040,TA,W6	93	6	24.6	74	40	40	40	3.9
UT11,12,F2,3030,TA,W6	95	11	14.4	69	30	30	34	2.4
UT6,24,F1,5555,TA,W6	113	6	29.8	74	55	55	55	3.9
UT15,12,F2,4040,TA,W6	126	14.6	14.4	69	40	40	44	2.8
UT8,200,F2,4040,TA,W6	128	8.5	24.9	71	40	40	44	3.8
UT8,24,F1,5555,TA,W6	153	8.5	29.8	72	55	55	55	3.8
UT8,288,F2,5252,TA,W6	182	8.5	35.9	71	52	52	56	3.8
UT9,28,F2,4040,TA,W6	206	9.2	36.7	68	40	40	44	2.8
UT15,200,F2,4040,TA,W6	236	15.4	25	68	40	40	44	3.3
UT15,24,F2,5252,TA,W6	288	15.1	30.8	70	52	52	56	3.3
UT15,288,F2,5252,TA,W6	341	15.4	36	68	52	52	56	3.3

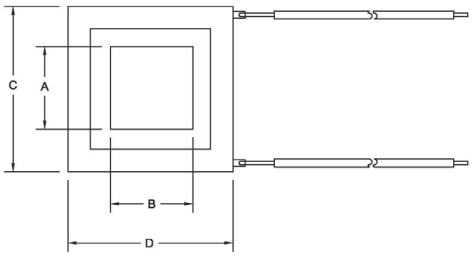
Thermoelectric MODULES

Multi-stage

- Designed for large temperature differential applications
- Custom designs available to meet unique attribute requirements
- Ideal for CCD cameras, IR Detectors and Industrial Sensing Instrumentation



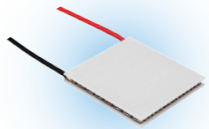
Typical Multistage Module

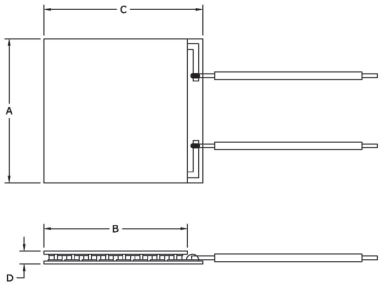


PART NO.	QMAX(1) (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	ΔTMAX (°C)	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)	DIM E (mm)
MS2,010,06,06,11,11,11,W2	0.35	1.1	0.9	92	3.2	3.2	3.9	3.9	4.4
MS2,024,06,06,11,11,11,W2	0.81	1.1	2.2	92	4.1	4.1	6.1	6.1	4.8
MS2,049,10,10,15,15,11,W8	3.4	2.1	3.8	87	11.5	11.5	15	15	6.8
MS2,049,14,14,15,15,11,W8	6.6	4	3.8	87	15	15	20	20	7.4
MS2,051,22,22,25,25,11,W8	10.5	5.7	3.5	76	26	26	30	30	10.9
MS2,065,04,04,11,11,11,W8	1.1	0.5	5.5	82	12.0	4.0	14.0	6.0	4.7
MS2,068,14,14,15,15,11,W8	8.4	5	6.2	92	14.7	14.7	24	24	7.9
MS2,083,05,05,13,13,11,W8	1.1	0.6	6.9	90	4.9	4.9	10	10	4.6
MS2,094,10,10,13,13,11,W8	7.6	2.9	7.5	85	7.2	30	15	30	6.1
MS2,102,14,14,17,17,11,W8	12.1	4.3	8.2	87	20	20	30	30	7.5
MS2,102,22,22,17,17,11,W8	29	10.3	7.87	87	30	30	44	44	9.1
MS2,107,10,10,12,12,11,W8	9.2	3	9.2	89	23	23	23	23	6.4
MS2,190,10,10,12,12,11,W8	16.4	2.8	15.7	87	30	30	30	30	6.7
MS2,190,10,13,08,20,11,W8	16.4	2.8	15.6	87	30	30	30	30	6.6
MS2,192,14,20,11,18,11,W8	40	6.7	15.6	87	40	40	40	40	8.1
MS2,192,14,20,15,25,11,W8	27	4.4	16	88	40	40	40	40	8.3
MS3,052,10,17,11,W8	1.4	1.8	3.3	99	7.2	7.2	15	15	9.8
MS3,070,20,25,11,W8	3.0	6.5	6.5	118	8	14	36	36	16.2
MS3,119,14,15,11,W8	7.5	3.9	8	100	15	15	30	30	10.4
MS3,119,20,15,11,W8	14.9	8	8.2	100	22	22	44	44	13.1
MS3,231,10,15,11,W8	6.9	1.9	15.5	104	15	15	30	30	9.5
MS4,108,10,20,11,W8	1.1	1.5	7.87	110	7.1	7.1	18	24	14.6
MS4,115,14,15,11,W8	2.6	3.5	7.6	122	4.5	14.5	24	33	14
MS4,129,10,15,11,W8	1.9	1.8	8.2	115	8.0	8.0	23	23	12.7
MS5,257,10,15,11,W8	2.0	1.5	14.5	123	8.0	8.0	30	30	15.6

ZT Series

- Assembled with premium Bismuth Telluride semiconductor material
- Achieves a higher temperature differential than standard single stage TEMs
- Ideal for applications that require to reach colder temperatures





PART NO.	QMAX(1) (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	ΔTMAX (°C)	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)
ZT4,7,F1,2020,TA,W8	18	3.9	8.8	74	20	20	20	3.6
ZT6,7,F1,3030,TA,W8	31	6.0	8.6	74	30	30	30	3.9
ZT4,12,F1,3030,TA,W8	35	3.9	16.4	74	30	30	30	3.6
ZT4,12,F1,4040,TA,W8	37	3.9	15.4	74	40	40	40	4.8
ZT6,12,F1,4040,TA,W8	55	6.0	15.4	74	40	40	40	3.9
ZT5,16,F1,4040,TA,W8	62	5.0	20	74	40	40	40	3.7
ZT8,12,F1,4040,TA,W8	77	8.5	15.4	72	40	40	40	3.8
ZT7,16,F1,4040,TA,W8	84	6.7	20	72	40	40	40	3.3

Notes: 1) QMax rated value at ΔT = 0°C, Imax and Vmax, Th = 25°C; 2) Thickness for non-metallized versions only. All modules are lead-free. For wiring options contact Laird Technologies.

Finishing Options

Surface Finish Options	CP Series	OptoTEC	ThermaTEC	PolarTEC	UltraTEC	Multistage	Center Hole SH/RH
Metallized Hot/Cold Surface	MM	00	-	-	00	MM	MM
Non-Metallized Hot and/or Cold face	L	11	11	11	11	L	L
Pre-tinning Hot and/or Cold face with 118˚C InSn Solder	TT	22	-	-	22	TT	TT
Pre-tinning Hot and/or Cold face with 138˚C BiSn Solder	-	33	-	-	-	-	-
Au plating (Hot/Cold Surface)	-	GG	-	-	GG	-	-
Example: CP10,127,05TL = Pre-tinned Hot Face (118˚C InSn), Non-Metallized Cold Face. Note: Metallization and pretinning are not recommended for module sizes larger than 12 x 12 mm's. Consult datasheet for module thicknesses for each surface finishing option. Contact Laird Technologies for finishing options for Multistage Modules.							

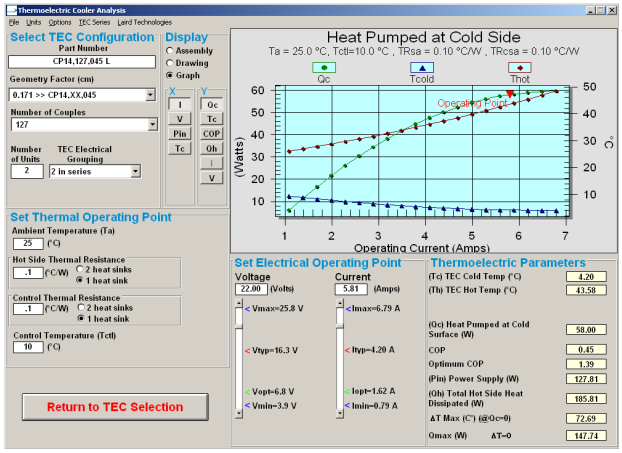
Thickness Tolerance Options	CP Series	OptoTEC	ThermaTEC	PolarTEC	UltraTEC	Multistage	Center Hole SH/RH
+/- 0.001" (0.025 mm)	L1	TA	TA	TA	TA	-	TA
+/- 0.0005" (0.013 mm)	L2	TB	TB	TB	TB	-	TB
Example: CP10,127,05,L2 = thickness is 3.2 mm +/- 0.013 mm. Contact Laird Technologies for thickness options for Multistage Modules.							

Moisture Protection Options	CP Series	OptoTEC	ThermaTEC	PolarTEC	UltraTEC	Multistage	Center Hole SH/RH
RTV perimeter seal, Color: Translucent or White	RT	RT	RT	RT	RT	RT	RT
Epoxy perimeter seal, Color: Black	EP	EP	EP	EP	EP	EP	EP
Example: CP10,127,05,L2,RT = RTV silicone perimeter seal Silicone (RTV) is an all purpose sealant that exhibits good sealing characteristics and retains its elastomeric properties over a wide temperature range, -60 to 200°C. The sealant is non-corrosive to many chemicals and exhibits good electrical properties with low thermal conductivity. Epoxy (EP) is an effective barrier to moisture that exhibits a useable temperature range of -40 to 130°C. When cured the material is completely uni-cellular and therefore the moisture absorption is negligible. The material exhibits a low dielectric constant, low coefficient of thermal expansion and low shrinkage.							

Wire Options	CP Series	OptoTEC	ThermaTEC	PolarTEC	UltraTEC	Multistage	Center Hole SH/RH
Custom lead length # in inches, (S denotes special requirement)	W#	W#	W#	W#	W#	W#	W#
Example: CP10,127,05,L2,W8 = Wire length is 8" (203 mm). Reference datasheet for standard lead length, wire type and insulation sleeving. Consult with Laird Technologies for wire bondable posts or thru hole mount.							

Aztec Software

AZTEC™ is a software tool that allows engineers to specify a given set of input variables based on application attributes and model the performance of the TEM prior to trial. The program also contains an analysis worksheet, which simulates how the TEM(s) will function under a specific set of operating conditions. Available only online, the AZTEC™ tool is accessible from the Laird Technologies Website.



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