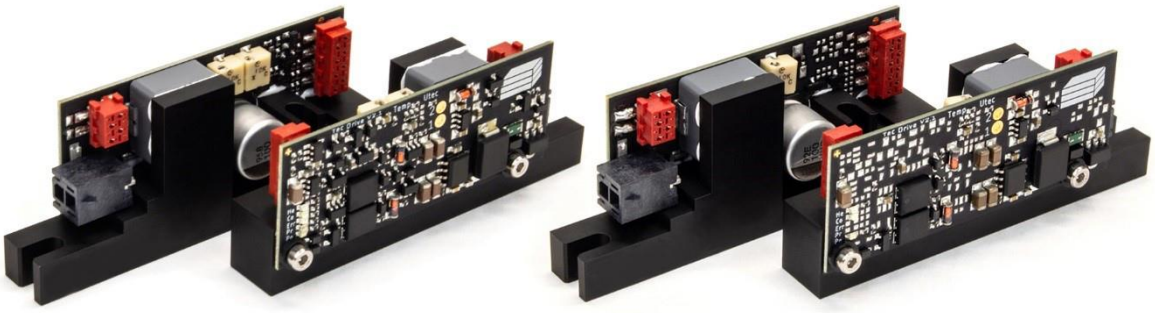
Laser Peak Lasers from the Alps.

TEC-driver LPTD124 - Madrisa
TEC-booster LPTB024 - Valluga

V2.1

TEC driver/booster with heating and cooling capability

Manual



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Features

- Easy to integrate
- Up to 50V operating voltage
- Standard NTC 10k compatible
- 5-50V @ 5A drive capability per driver
- Temp OK output at excessive and subnormal temperatures
- NTC short/open detection
- LP-BUS compatible
- Heating and cooling capability
- Booster compatible to driver (240W / 48V @ 5A per booster)
- High efficiency

Applications

- Efficient laser diode cooling

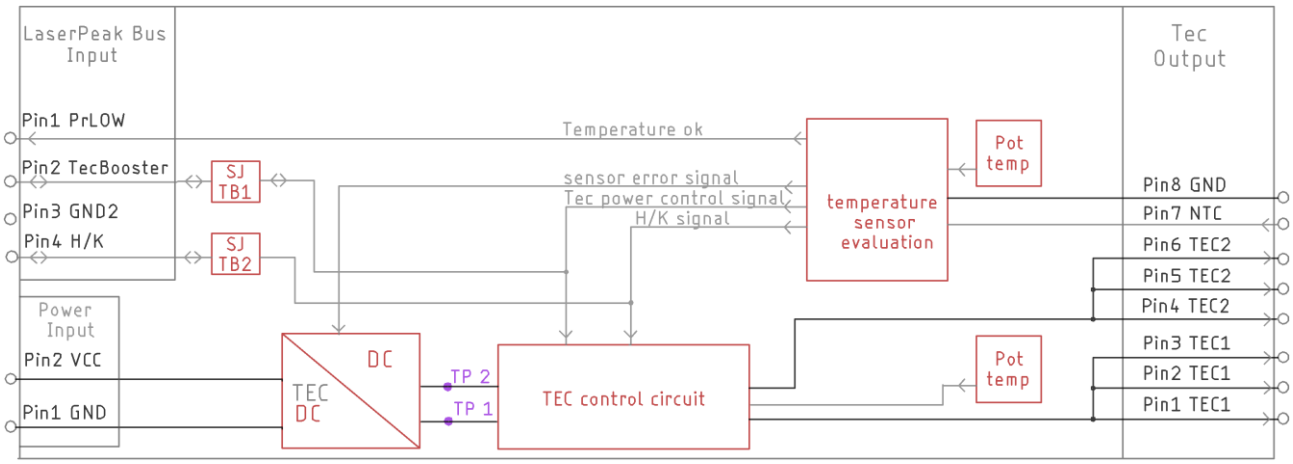
Description

The TEC-driver *LPTD124 - Madrisa* is designed to be efficient and versatile.
The driver offers a high operation voltage, and a stable regulation in a small and easy to integrate form factor.
The 240W maximum output power of the TEC-driver can be extended to up to 1200W with the use of the TEC-boosters *LPTB024 - Valluga*.
These TEC-boosters enable driving up to 48V @ 25A TECs with minimal cost and maximum efficiency.
A temperature-good output (power reduction) enables easy integration of the driver in any system. It offers the possibility to check if the TEC driver has reached the desired temperature, i.e. if everything is working as it should. The driver also features an NTC sensor error detection.
Both drivers are fully compatible with the LP-BUS system.
The LP-BUS allows connecting everything in a tidy way and furthermore uses the power reduction (PR) output (temp ok) to command a reduced drive current from the LP diode drivers in order to protect the laser diodes in case a TEC should fail.

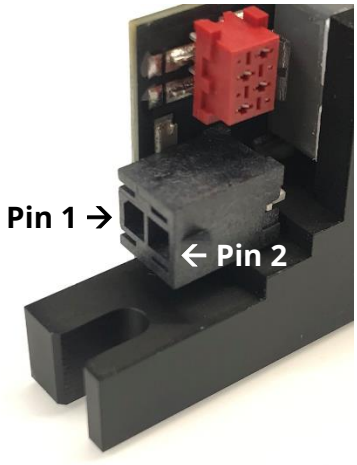
Information

Every driver is designed and manufactured in Austria to meet our high standards at Laser Peak.
Drivers are shipped ready to use.
The TEC-drivers and boosters come with all needed connectors.
For more information, please contact Laser Peak.

Functional block diagram



Power input connector

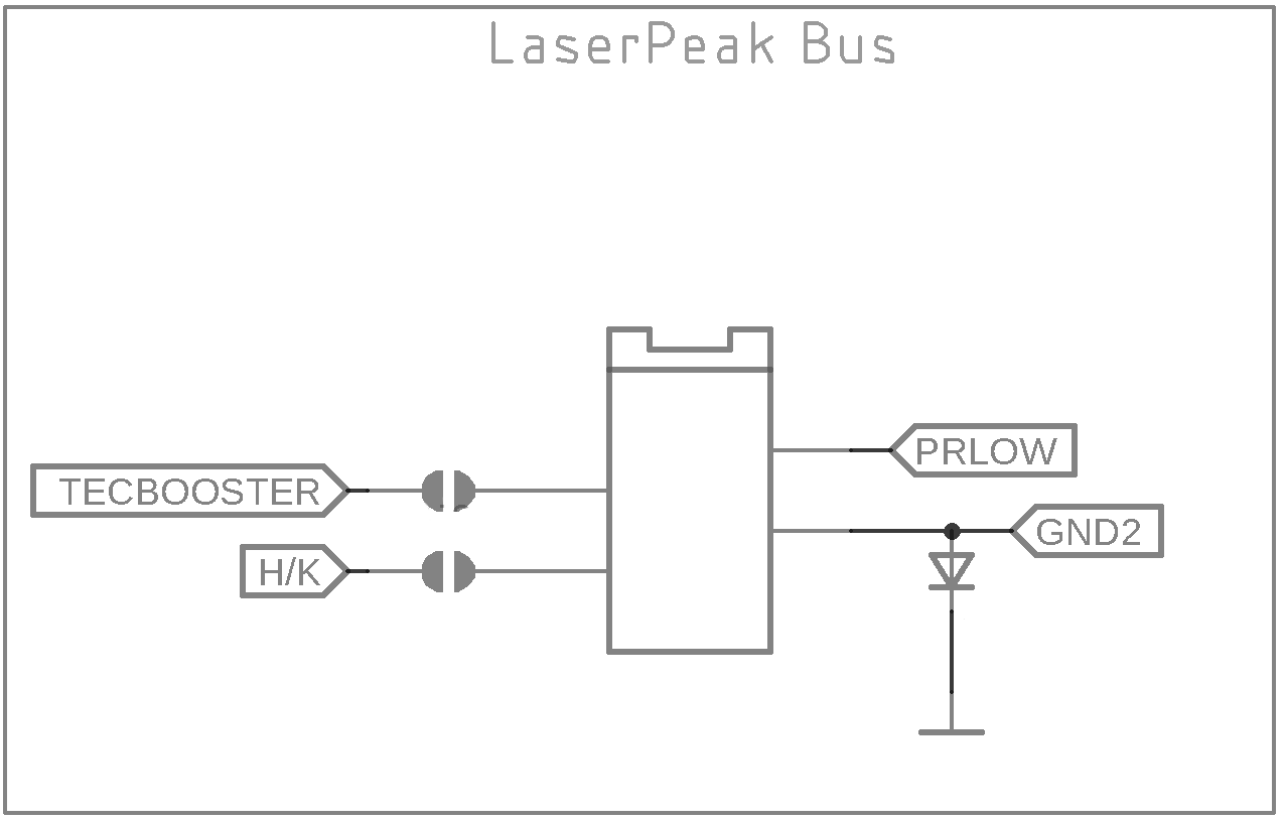


Pin		I/O	Description
No.	Name		
1	GND	I	Negative supply voltage
2	VCC	I	Positive supply voltage

Power input considerations

The power supply input connector uses WR-MPC connectors. The TEC-driver ships with all needed connector housings and crimp contacts. Make sure to use the right tool to crimp the contacts. We also offer pre-crimped cabling. Contact us for more information. You need to use low impedance connections, e.g., use short wires that can withstand the current that your application requires. The driver has limited reverse polarity and surge protection. The voltage surge protection is useful against transients only, so please make sure to use power supplies of good quality from reputable brands only. You can also contact Laser Peak for advice on choosing the right power supply for your application.

Input Configuration and Functions

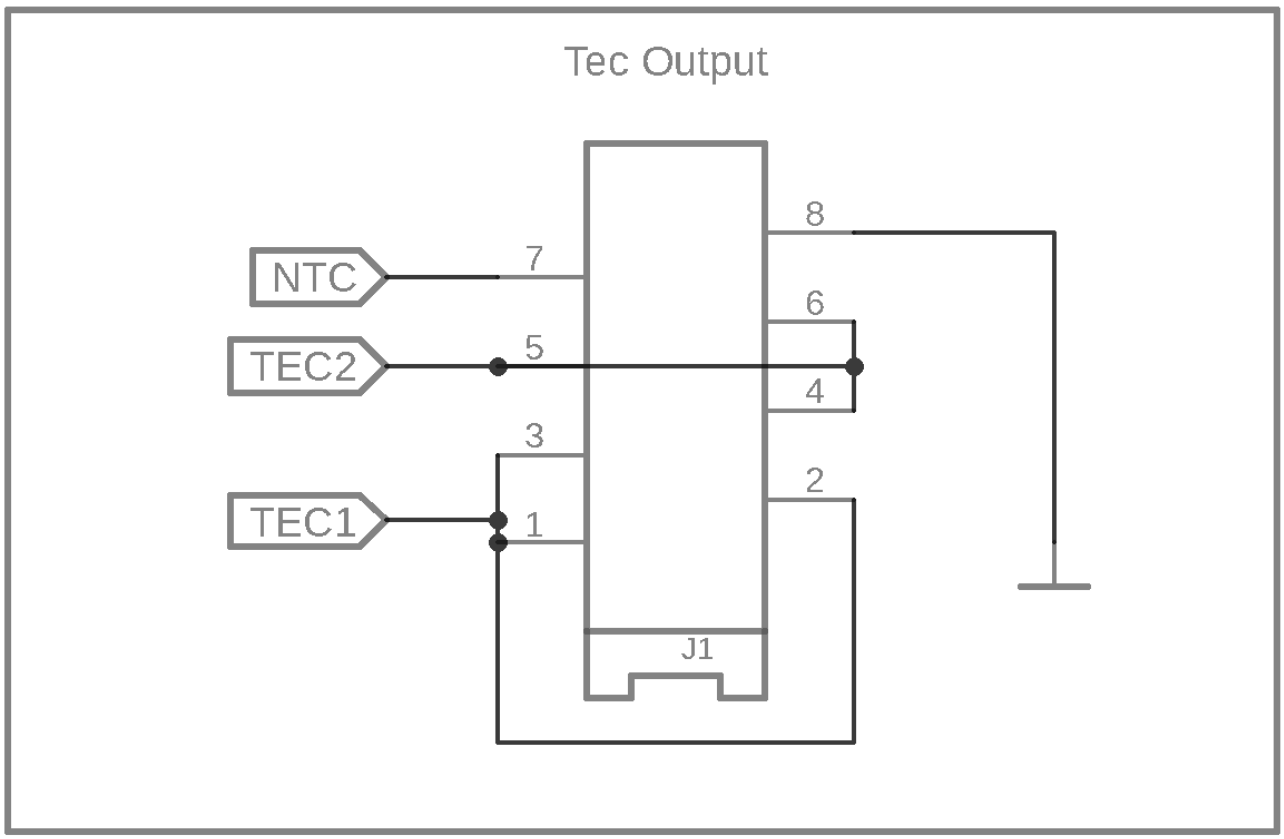


Pin Configuration and Function

Pin		I/O	Description
No.	Name		
1	PRLOW	I/O	Power reduction pin. If the driver detects a temperature problem with the module this pin gets internally connected to RETURN.
2	TECBOOSTER	O	Output pin for TEC-boosters, control power needed to reach set temperature, -5V if 100% power needed, 5V if 0% power is needed
3	GND2	-	Return pin for all control signals
4	H/K	O	Output pin for TEC-boosters; high if driver is in cooling mode; low if driver is in heating mode.

Jumpers: Please consider that the jumpers are preconfigured to match the application, e.g. a TEC-booster will always ship with jumpers preconfigured.
No need for any change, but of course possible if desired.

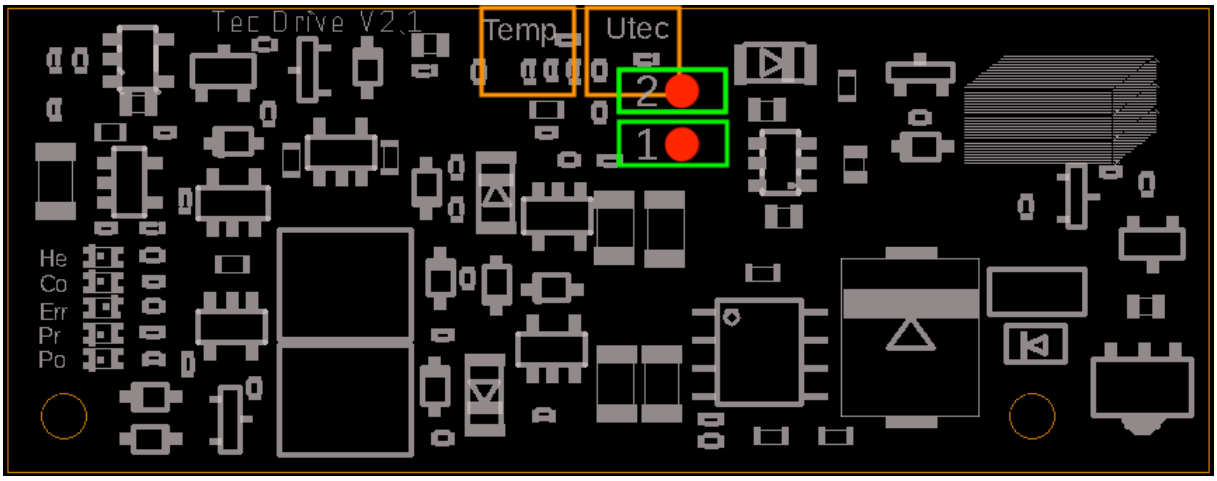
Pin Configuration and Function



Connectors: WR-MM 8Pin Art.Nr.: 690157000872

	Pin		I/O	Description
No. MM	No.	Name		
1		TEC1	O	Output pin for TEC, if driver is in cooling mode this becomes positive
2		TEC1	O	Output pin for TEC, if driver is in cooling mode this becomes positive
3		TEC1	O	Output pin for TEC, if driver is in cooling mode this becomes positive
4		TEC2	O	Output pin for TEC, if driver is in cooling mode this becomes negative
5		TEC2	O	Output pin for TEC, if driver is in cooling mode this becomes negative
6		TEC2	O	Output pin for TEC, if driver is in cooling mode this becomes negative
7		NTC	I	Temperature sense pin Connect one lead from NTC to this pin, do not connect anything else
8		GND	O	GND pin, connect one lead from the NTC to this pin, do not connect anything else

Potentiometer/Measurement Points Configuration and Function



Potentiometer considerations

Each potentiometer increases the value counterclockwise (CCW) and decreases the value clockwise (CW).
Please be careful with your adjustment tool. The potentiometers can easily break away from the PCB when excessive force is being used!

Potentiometer		Min	Max	Unit
UTEC	Voltage for TEC	5	50	V
TEMP	Set temperature	-15	+30	°C

Probe Points

The probe points are labeled on the PCB. Use a volt-meter for all measurements. Make sure the meter has a high input impedance. Otherwise, the measurements will be inaccurate. Every probe point is protected against short circuits.

Measurement Point		Min	Max	Unit
0	GND	0	0	V
1	TEC voltage	0	50	V

Difference between TEC-drivers and TEC-boosters

The TEC-driver *LPTD124 – Madrisa* and the TEC-booster *LPTB024 - Valluga* feature the same PCB but use different components and are designed for different applications.

TEC-drivers

Laser Peak's TEC-drivers are stand-alone continuous regulation drivers and thus control the power going into the Peltier element not only by switching it on and off but also by reducing the drive power to a level that is needed to keep the set temperature. To do this, the TEC-driver reads a 10k NTC, determines the difference between set temperature and actual temperature and adjusts the output accordingly. It also acts as a master for TEC-boosters. In this case the solder jumpers need to be set accordingly.
The TEC-drivers are DVT compatible, so they can be connected to an LP-BUS even if it uses a different power supply or the negative supply rail. All LP-BUS-connected laser drivers receive the temperature-good signal and adjust their output current accordingly.

TEC-boosters

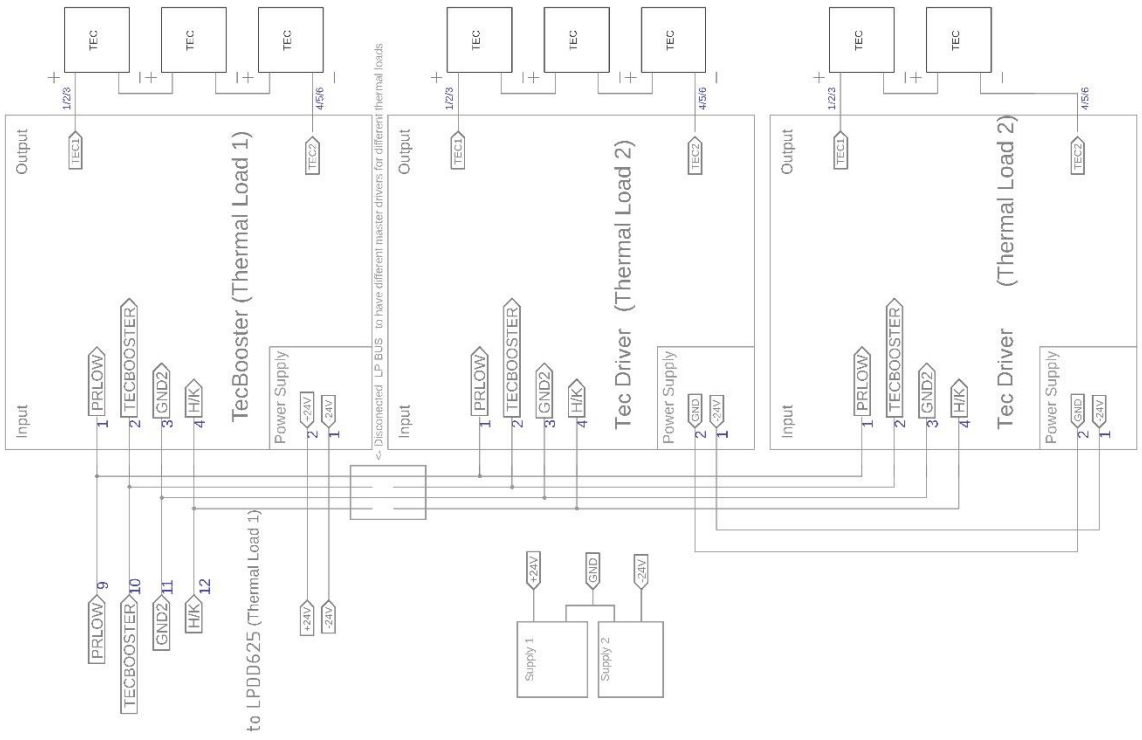
A TEC-booster must act as a slave to either a stand-alone LP TEC-driver or to an LP diode driver with integrated TEC-driver. A TEC-booster extends the output power of a master driver. TEC-boosters cannot be used as stand-alone devices, but they must receive control information from another TEC-driver or diode driver. The communication is possible through the LP-BUS. In order to use a TEC-booster, the master driver needs to have the solder jumpers set accordingly. The TEC-boosters are not DVT compatible, so they must share the same ground as their master driver in order to function correctly. It is possible to use up to 4 TEC-boosters for extending the output power of a single master.
The TEC outputs of master and slave have to be isolated. Do not connect them in parallel to drive TECs with more than 5A current demand. Instead use more TECs to drive the same thermal load. The outputs of slave drivers do not need to be the same or have the same number of TECs connected, the output power of each slave/master can be adjusted individually.
If you need more than one master driver on an LP-BUS, you can break the H/K and TEC-booster lines between master drivers to separate the different thermal loads.
See examples for more information.

LP-BUS connection example

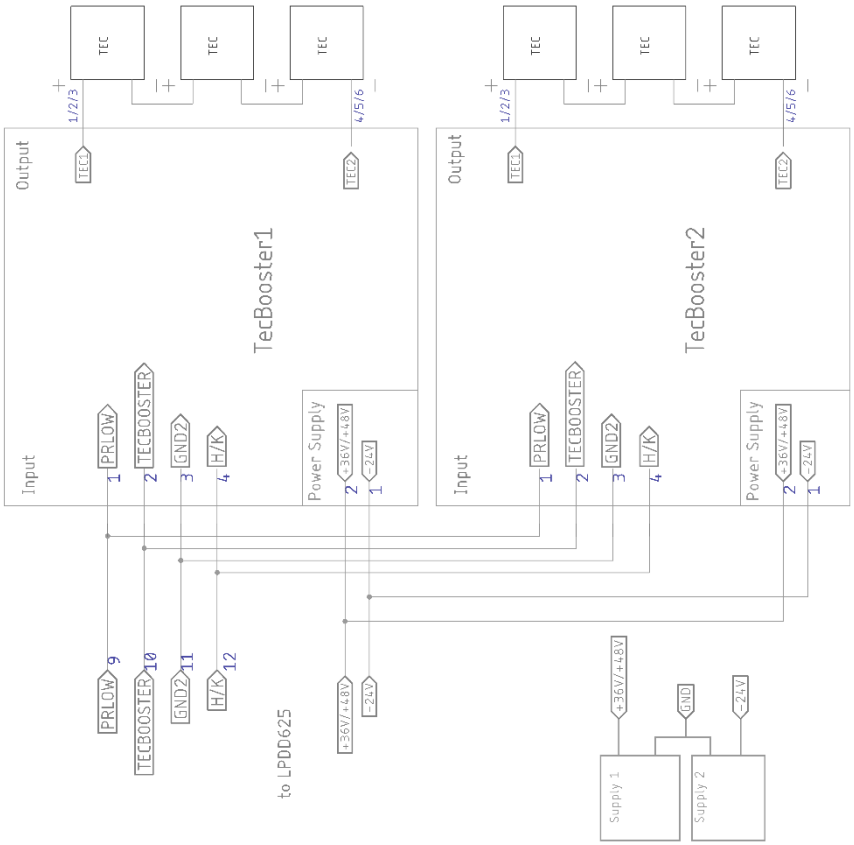
First example:
One diode driver with integrated TEC-driver and one TEC-booster are driving thermal load 1.
One TEC-driver and one TEC-booster are driving thermal load 2.
In this case the diode driver will react to over/under temperature of both thermal loads and reduce the drive current. Two different set temperatures for the different thermal loads can be set. Drivers for the second thermal load do not need to be powered by the same supply rail as the drivers for the first load. For example, the drivers of thermal load 1 may be powered from +/-24V, while the drivers of thermal load 2 are powered by -24v only.

Second example:
A diode driver with integrated TEC-driver as master with 2 TEC-boosters as slaves, driving 6 TECs with the TEC-boosters and driving 3 TECs with the diode driver. The 9 TECs together handle a single thermal load.

Example 1:



Example 2:



Specifications

Absolute Maximum Ratings (1)		**Min**	**Max**	**Unit**
Input Voltage	Power input connector	-0.3	50	V
Output Voltage	LP-BUS connector 1-3	-5	5	V
	NTC	-	1.25	
	TEC	3	50	V
	Output ripple @ 48Vin 15Vout 5Aout BW20Mhz		45	mV
Source current	NTC	120	130	µA
Sink current	PRLOW	5	5	mA
Storage temperature		-40	+80	ºC
Driver temperature	Measured at heatsink	-50	+75	ºC

(1) Values beyond the listed ratings may cause permanent damage to the driver.

Adjusting for your application

If you want to tune a TEC-driver to your connected Peltier element, first turn the UTEC pot fully CW to reduce the TEC voltage to a minimum. After that you can connect your Peltier element and NTC.
Supply power to your driver and turn the temp pot CW until the temperature LED lights up.
The driver should now supply maximum current to the connected Peltier element to reach the set temperature. You can measure the voltage using the measurement points and turn the UTEC pot CCW to increase it to the desired drive voltage.
Next you need to set the temperature via the temp pot to a level that suits your application.

If you want to tune a TEC-booster, almost the same procedure applies.
First turn the UTEC pot on the TEC-booster fully CW to reduce the TEC voltage to the minimum.
Now connect your Peltier element and NTC.
Supply power to slave and master driver and turn the temp pot at the master CW until the temperature LED lights up.
The driver should now supply maximum current to the connected Peltier element to reach the set temperature. You can measure the voltage using the measurement points at the slave driver and turn the UTEC pot at the Booster CCW to increase it to your desired drive voltage.
Next you need to set the temperature via the temp pot to a level that suits your application.

Status LEDs

The drivers have built-in status LEDs to let the user know their status.
The driver has 5 LEDs that are labeled accordingly. The table below shows the associated function.

LED label	Color	Status if lit	Status if off	Solution
pwg (power good)	green	Driver is enabled and working correctly	Driver faulty	Contact Laser Peak
			Input voltage too low	Use correct voltage specified on measurement report.
Pr (power reduction)	yellow	Module temperature not correct	Module temperature regulated correctly	Make sure the heatsink temperature is held within the absolute maximums and wait until module has reached operating temperature.
Err (Error)	red	NTC/cabling defective	NTC working properly	Please check 10k NTC and check cabling for short / open.
Co (cooling)	blue	Driver is cooling the module	The LED shows the required power to keep the module at its operating temperature	-
He (heating)	red	Driver is heating the module		
Both He and Co	-	Pulsating: driver too hot or output current too high. Also: Output voltage higher than input Voltage.	Pulsating: driver too hot or output current too high. Also: Output voltage higher than input voltage.	Mount the driver to a bigger heatsink. Adjust UTEC to a lower level to reduce the drive current and voltage.

Technical drawings