

Thermoelectric Cooler (TEC) controller

Features

- Low noise
- Compact
- Designed for 14 and 10 pin Butterfly laser modules

Applications

- Laser cooling
- Temperature control of optical components

There are different types of TEC controllers. PWM drivers that offer high efficiency at the cost of switching noise. Then in the other extreme there are low noise analog drivers, e.g. based on power OPAMPS.

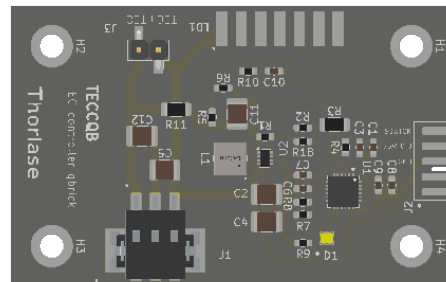
The design of the TEC-controller_qbrick is in-between in terms of switching noise. It sets one terminal of the TEC (TEC+) at a constant supply (+3.3V) and uses a buck-boost converter to regulate the voltage at the TEC- terminal between +1.8 V and +5 V to give the cooling or heating requested by the PID loop on a microcontroller. The

Description

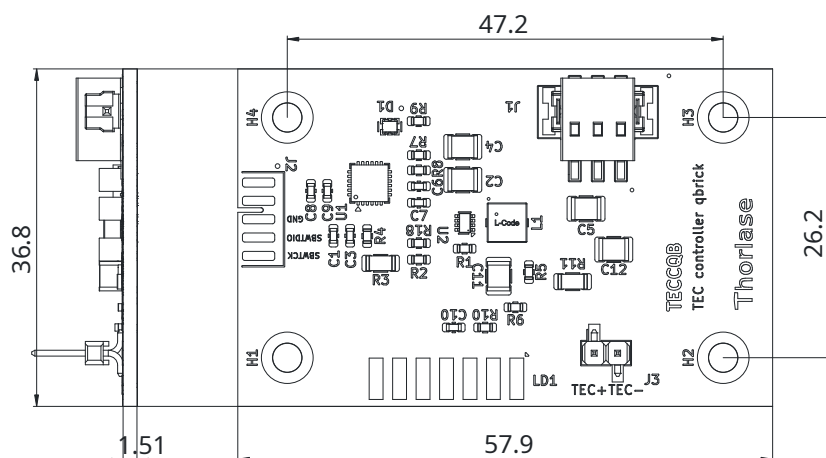
The TEC-controller_qbrick is a board level controller for Thermoelectric Coolers (TEC) also known as Peltier elements. The board is designed to accompany laser diode drivers to serve the case where the laser diode module has a built-in TEC and a 10k ohm NTC temperature sensor.

The design is an adaptation of the Texas Instruments TEC Driver Reference Design: Design Guide: TIDA-050017.

temperature set point is factory set to 25°C and can be changed via serial interface.



Drawing (mm)



Absolute Maximum Ratings

+3.3V supply input voltage.....	3.6V
+3.3V supply input current.....	2A
Maximum Operating Temperature.....	+50°C
Storage Temperature.....	-5°C to +50°C

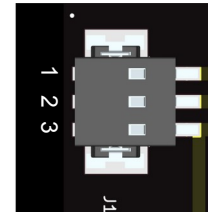
Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
+3.3V supply input voltage	+3.3V	2.7	3.3	3.6	V	
+3.3V supply input current			0.3	2	A	Inrush current reach max
TEC current	I_{TEC}			1.5	A	
Control temperature range	T_{set}	-10	25	100	°C	Calibration range. Actual depends on dissipation.
Temperature stability		-0.1		+0.1	°C	

Connector pinout

J1 Wire (20-24 AWG) to Board Terminal Block NQ0300000000G

pin	Name	Description	Normal Operation
1	VOUT_ext	TEC - , for monitoring or alternative TEC - connection	+1.8 V to +5 V
2	GND	Common system GND	0V
3	VIN (+3.3V)	+3.3V	+3.3V



J2 2mm Board edge connector pad

pin	Name	Description	Normal Operation
1	RXD	UCA1RXD UART receive data	+3.3V LVTTTL
2	TXD	UCA1TXD UART transmit data	+3.3V LVTTTL
3	GND	Common system GND	
4	SBWTDIO	Spy-Bi-Wire data input/output	
5	SBWTCK	Spy-Bi-Wire input clock	
6	GND	connected to GND on board	
7	NC	unconnected on board	
8	NC	unconnected on board	
9	NC	unconnected on board	
10	+3.3V	connected to +3.3V on board	+3.3V

J3 Connector Header Surface Mount 2 position 0.100" (2.54mm)

pin	Name	Description	Normal Operation
1	TEC +	TEC + connection	+3.3V
2	TEC -	TEC - connection	+1.8 V to +5 V

LD1 14 pin Butterfly laser diode module solder pads

pin	Name	Description	Normal Operation
1	TEC +	TEC + connection	+3.3V
2	NTC+	connected to ADC_NTC on board	1.5V-10K-VADC_NTC - NTC - GND. 0.75V at 25°C
3	PD_A	unconnected on board	
4	PD_C	unconnected on board	
5	NTC-	connected to GND on board	GND
6	NC	unconnected on board	
7	NC	unconnected on board	
14	TEC -	wire TEC - to Butterfly pin 14	+1.8 V to +5 V

Application Information

Electrical wiring

The TECCQB is designed to accompany laser diode drivers used for Butterfly laser modules with internal TEC and NTC. The signals are low speed and moderate current so they can be wired over several meters of cable length. This allows the use of the TECCQB in a variety of setups with TEC's.

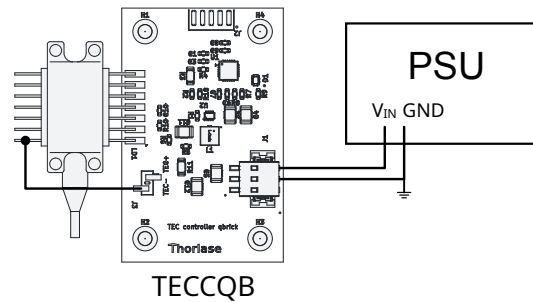


Figure. Electrical wiring.

Power is supplied on J1 Wire to Board Terminal Block with +3.3V and GND connections.

List of accessories

This is a list of accessories that are not included in the kit but are often used together with the kit.

Description	Supplier	Mfr. Part No.
RS232 and Spy-Bi-Wire (SBW) adapter	Thorlase	RS232SBW
Baseplate bar 60mmx6mm	Thorlase	BLDDTEC
HOOK-UP STRND 22AWG RED	CNC Tech	3132-22-1-0500-004-1-TS
HOOK-UP STRAND 22AWG BLACK	CNC Tech	1569-22-1-0500-001-1-TS
CONN RCPT HSG 1POS CRIMP	Harwin Inc.	M20-1060100
CONN SOCKET 22-30AWG CRIMP GOLD	Harwin Inc.	M20-1180042

Document control

Version	Apply to	Data
Datasheet_TEC-controller_qbrick	TEC-controller-qbrick_V1r2	20261028