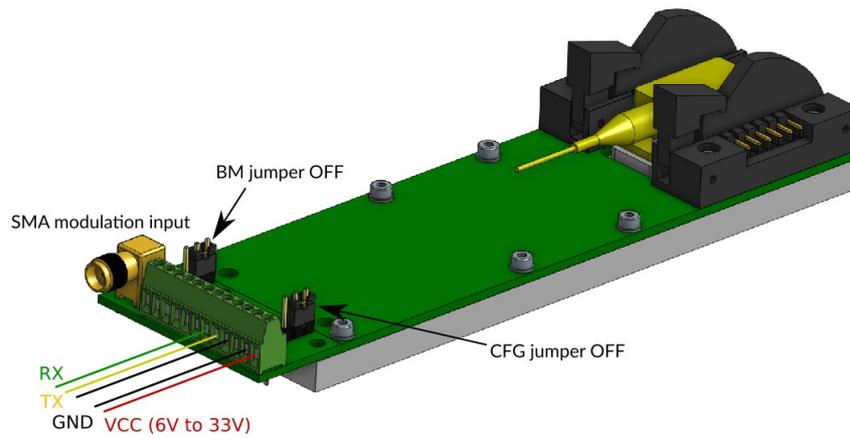
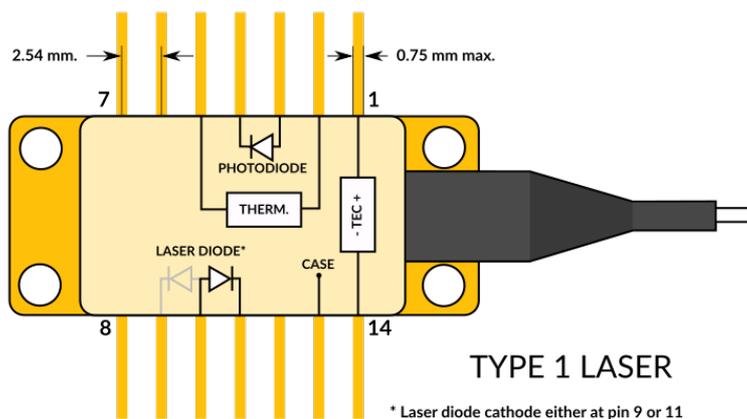


# CTL300E User Guide

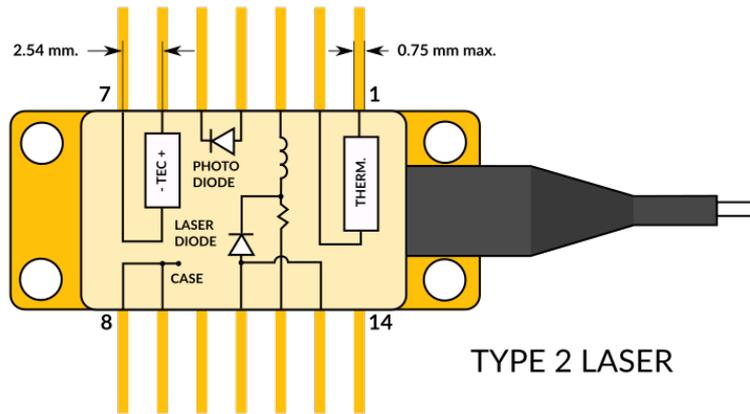


## Laser connections

The CTL300E-1 / CTL300E-2 is compatible with **Type 1 / Type 2** butterfly laser diodes. Note that it is compatible with [floating diodes](#).



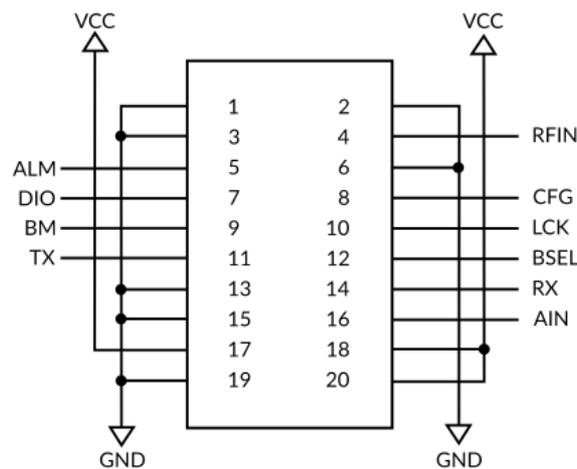
Butterfly laser type 1 pin configuration



Butterfly laser type 2 pin configuration

## Connector

The CTL300E mates with the [TB300 breakout board](#).



- **VCC:** (pins 17, 18 and 20) Input power supply between 6 V and 33 V.
- **RFIN:** (pin 4) Modulation input with  $\pm 1$  V range and 50  $\Omega$  impedance.
- **ALM:** (pin 5) Alarm output (3V3 logic).
- **DIO:** (pin 7) Digital Input/Output (3V3 logic).
- **CFG:** (pin 8) Configuration input (3V3 logic, internally pulled-up to 3V3 with 100 k $\Omega$ ). If CFG is HIGH at start-up, the board will start with the user-defined configuration. Otherwise, the default configuration is loaded.
- **BM:** (pin 9) Digital Input (3V3 logic, internally pulled-up to 3V3 with 100 k $\Omega$ ). This pin is used for [firmware update](#). Tie this pin to GND for normal operation.
- **LCK** (pin 10) Interlock pin (see *Interlock* section).
- **TX** (pin 11) UART TX pin.
- **BSEL** (pin 12) Bias selection pin (see *Bias switching* section). This pin is internally pulled-low with a 100 k $\Omega$  resistor.
- **RX** (pin 14) UART RX pin.
- **AIN** (pin 16) Analog input with a voltage range between 0 and 2.5 V. The voltage at the pin AIN can be retrieved with the `ain` command.

Connector mates with Samtec references FSH-110-04-L-RA-SL and FSH-110-04-L-DH-SL.

## Serial interface

The serial interface can be accessed via TX and RX pins on the 20-pin connector (3V3 logic level / 5V tolerant). The serial interface is the only way to configure the CTL300E operating parameters. Once the configuration is done, it can be saved to the internal memory with the `save` command. If the CFG input is HIGH at start-up, the CTL300E will load the user-defined configuration and the serial interface is no longer needed.

The CTL300E can be controlled directly from a serial port terminal (e.g. [Teraterm](#) on Windows) with the following configuration:

- Baud rate: 115200
- Parity: None
- Bits: 8
- Stopbits: 1
- Flow control: None

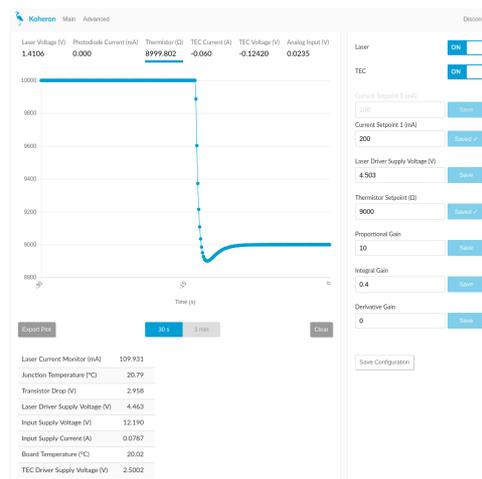
### Example use of the serial port terminal

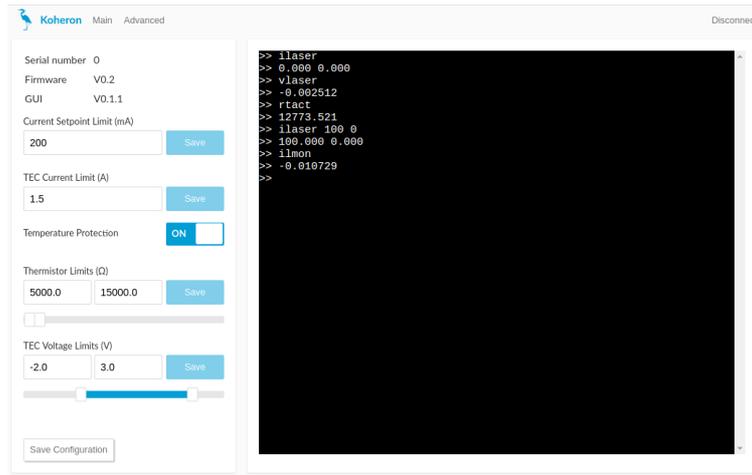
```
>>
>>version
V0.2
>>rtset
10000.000000
>>rtact
10000.023438
>>rtset 12000
12000.000000
>>rtact
11999.853516
```

**Note:** Each command must be followed by `\r\n`.

### Graphical User Interface

A Graphical User Interface is available for Windows. The installer can be downloaded at this [link](#). The GUI provides an effective mean of tuning the PID gains of the temperature controller.





## Control commands

Command	Description	Type	Unit	Default	Min	Max
lason	Disable   enable laser current.	R/W		0	0	1
ilaser	Laser current.	R/W	mA	0.0	0.0	ilmax
vlaser	Laser voltage.	R	V			
lckon	Disable   enable interlock functionality.	R/W		0	0	1
ilmon	Monitored laser current.	R	mA			
vslaser	Laser driver supply voltage.	R/W	V	4.5	1.14	5.1733
vslmon	Monitored laser supply voltage.	R	V			
ldelay	Time between when the controller lights up and when the laser lights up.	R/W	ms	1000.0	10.0	100000.0
ilmax	Software current limit.	R/W	mA	1200.0	0.0	2000.0
vldrop	Laser driver transistor drop.	R/W	V	0.2	0.0	2.0
bsel	Status of the laser bias selection pin.	R			0	1
tecon	Disable   enable TEC current.	R/W		0	0	1
tprot	Disable   enable temperature protection.	R/W		1	0	1
rtset	Thermistor resistance setpoint.	R/W	Ω	10000.0	rtmin	rtmax
rtact	Actual value of thermistor resistance.	R	Ω			
itec	TEC current.	R	A			
vtec	TEC voltage.	R	V			
pgain	Proportional gain of the temperature controller.	R/W		10.0	0.0	100.0
igain	Integral gain of the temperature controller.	R/W		0.4	0.0	4.0
dgain	Differential gain of the temperature controller.	R/W		0.0	0.0	100.0

vstec	TEC driver supply voltage.	R	V			
tilim	TEC current limit.	R/W		1.5	0.25	2.5
rtmin	Minimum thermistor resistance. If temperature protection is enabled, the laser current is automatically disabled below this value.	R/W	$\Omega$	5000.0	2000.0	50000.0
rtmax	Maximum thermistor resistance. If temperature protection is enabled, the laser current is automatically disabled above this value.	R/W	$\Omega$	15000.0	2000.0	50000.0
vtmin	Minimum TEC voltage.	R/W	V	-2.0	-4.5	0.0
vtmax	Maximum TEC voltage.	R/W	V	3.0	0.0	4.5
tjunc	TEC driver junction temperature.	R	$^{\circ}\text{C}$			
iphd	Photodiode current.	R	mA		0.0	5.0
ain	AIN pin voltage.	R	V		0.0	2.5
tboard	Board temperature.	R	$^{\circ}\text{C}$			
vbus	Input supply voltage.	R	V			
ibus	Input supply current.	R	A			
version	Firmware version.	R		v0.2		
status	Return <i>lason</i> , <i>vlaser</i> , <i>ilmon</i> , <i>itec</i> , <i>vtec</i> , <i>rtact</i> , <i>iphd</i> , <i>ain</i> .	R				
save	Save configuration in internal memory (no argument).	W				

## Bias switching

The CTL300E allows to switch between two independent current setpoints in about 400 ns. The two setpoints are defined with the `ilaser` command. For instance with:

```
>> ilaser 100.0 600.0
100.000 600.00
```

The laser current will be 100 mA when BSEL is low and 600 mA when BSEL is high.

The pin BSEL is internally pulled low with a 100 k $\Omega$  resistor. If the bias switching functionality is not needed, you can leave the pin BSEL floating and define only the first setpoint:

```
>> ilaser 200.0
200.000 600.00
```

## Modulation input

DC coupled modulation input for modulation between DC and 5 MHz. Modulation range is  $\pm 1$  V (50  $\Omega$  input impedance).

## Thermal management

The TEC voltage limits ( $v_{tmin}$  and  $v_{tmax}$ ) and the thermistor resistance limits ( $r_{tmin}$  and  $r_{tmax}$ ) provide an effective way of protecting the laser against thermal runaway. For reliable operation, the aluminium cooling base plate must be properly heatsunk.

## Interlock

An optional interlock functionality can be activated with the `lckon` command. Laser current is then disabled when the LCK pin is pulled low. Once laser current has been disabled, the serial command `lason 1` must be sent to re-enable the laser current.