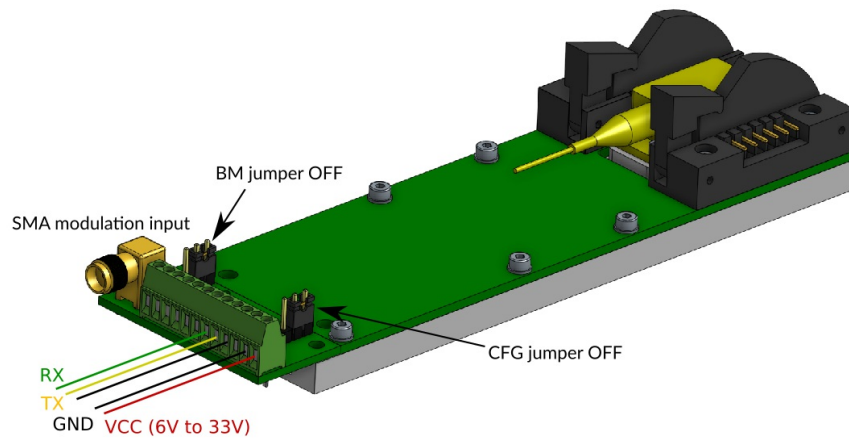


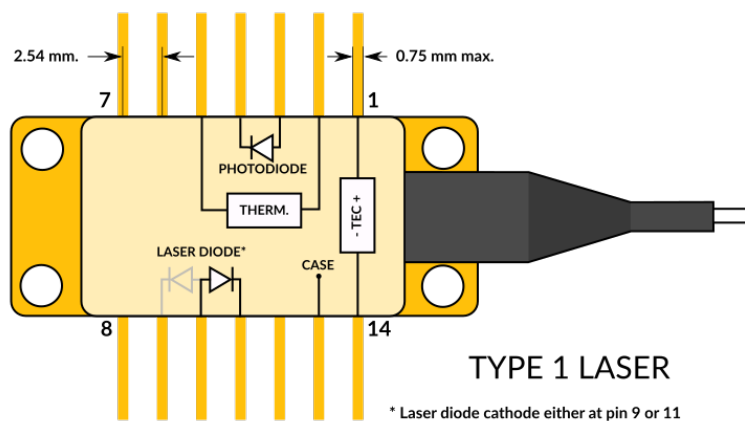
CTL300P User Guide



CTL300P connections

Laser connections

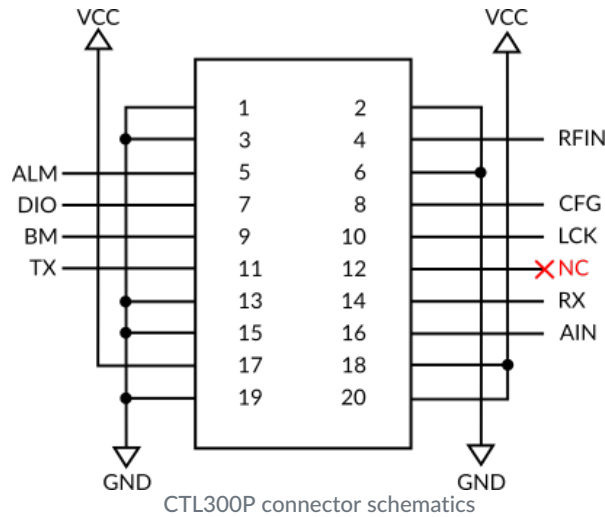
The CTL300P-1 is compatible with **Type 1** butterfly laser diodes. Note that it is **only compatible with [floating diodes](#)**.



CTL300P butterfly laser type1

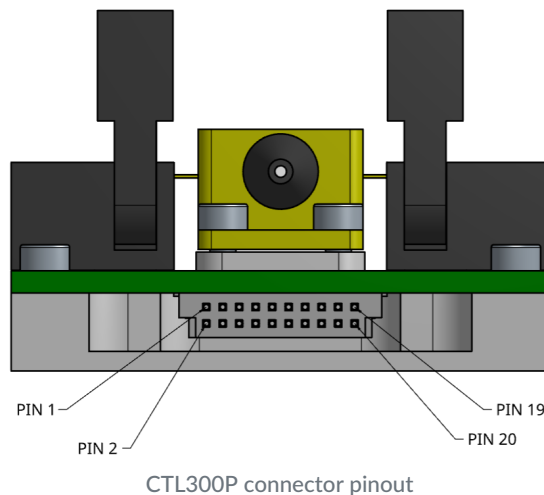
Connector

The CTL300P mates with the [TB300 breakout board](#).



- **VCC:** (pins 17, 18 and 20) Input power supply from 6 V to 33 V.
- **RFIN:** (pin 4) Modulation input between -0.5 V and 4 V and 1 k Ω 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 Ω). 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 Ω). This pin is used for [firmware update](#). Leave this pin unconnected or drive this pin high for normal operation.
- **LCK:** (pin 10) Interlock pin (see [Interlock](#)).
- **TX:** (pin 11) UART TX pin.
- **RX:** (pin 14) UART RX pin.
- **AIN:** (pin16) 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.
- **NC:** (pin12) Not connected.

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 CTL300P 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

CTL300P will load the user-defined configuration and the serial interface is no longer needed.

The CTL300P 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 installer can be downloaded at this [link](#).

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		0.0	3000.0
vldrop	Laser driver transistor drop	R/W	V	0.2	0.0	2.0
vldauto	Disable enable automatic adjustment of vslaser	R/W		0	0	1
tecon	Disable enable TEC current	R/W		0	0	1
tprot	Disable enable temperature protection	R/W		0	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	A	2.0	0.25	4.0
rtmin	Minimum thermistor resistance. If temperature protection is enabled, the laser current is automatically disabled below this value.	R/W	Ω	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	Ω	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				
serial	Return the serial number	R				
userdata write	Write the user data (e.g. <i>userdata write ABC</i>)	W				31 chars
userdata	Read the user data	R				
brate	UART baud rate	R/W	baud	115200	9600	460800
err	Return the error code in hexadecimal format (no argument)	R				
errclr	Clear the error code (no argument)	W				

Error codes

The command **err** returns a 32-bit number in hexadecimal representation which concatenates the detected errors (B0 is the Least Significant Bit):

- B0: UART_BUFFER_OVERFLOW (err = 1)
- B1: UART_CMD_BEFORE_PROMPT (err = 2)
- B2: RESERVED (err = 4)
- B3: RESERVED (err = 8)
- B4: BUS_UNDERVOLTAGE (err = 10)
- B5: BUS_OVERVOLTAGE (err = 20)
- B6: BOARD_OVERTEMPERATURE (err = 40)
- B7: LASER_UNDERTEMPERATURE (err = 80)
- B8: LASER_OVERTEMPERATURE (err = 100)
- B9: LASER_OVERVOLTAGE (err = 200)
- B10: CMD_UNKNOWN (err = 400)
- B11: CMD_INVALID_ARG (err = 800)
- B12: LASER_ON_WHILE_INTERLOCK (err = 1000)
- B13: INTERLOCK_TRIGGERED (err = 2000)
- B14: LASER_ON_WHILE_TURNING_OFF (err = 4000)
- B15: LASER_DAC_OVERFLOW (err = 8000)
- B16: LASER_OVERCURRENT (err = 10000)
- B17: BOARD_MODEL_UNKNOWN (err = 20000)
- B18: FET_OVERPOWER (err = 30000)

Adjusting the laser driver supply voltage *vslaser*

The CTL300P allows to adjust the laser driver supply voltage **vslaser** in order to optimize the voltage drop **vldrop** in the transistor that regulates the laser current. **vldrop** must stay above 300 mV for proper current regulation and below 1 V to prevent excessive heating of the transistor. In most situations, a voltage drop of 400-600 mV is a good trade-off between current regulation performance and power consumption.

An automatic adjustment mode can be enabled with the command **vldauto 1**. In this mode, the laser driver supply voltage **vslaser** is adjusted continuously so that the transistor voltage drop stays close to the value defined with the command **vldrop**.

Modulation input

DC coupled modulation input for modulation between DC and 100 kHz. Modulation input voltage range is -0.5 V to 4 V (1 k Ω input impedance).

Thermal management

The TEC voltage limits (**vtmin** and **vtmax**) and the thermistor resistance limits (**rtmin** and **rtmax**) 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 1** 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. The behavior of the interlock pin can be inverted with the command **lckon 3**.