

CTL101 - Low noise butterfly laser diode controller



Koheron CTL101 is a low noise current driver with modulation combined with a temperature controller. It is designed to drive narrow-linewidth laser diodes in butterfly package. It is compatible with **floating diodes**, which means that neither the anode nor the cathode should be connected to the case. The CTL101 fits in a 75 mm x 75 mm square, uses a single 5 V supply, and can operate between 0 and 50°C. The CTL101 is conduction-cooled. It comes with an aluminum base plate and a zero insertion force socket for easy mounting.

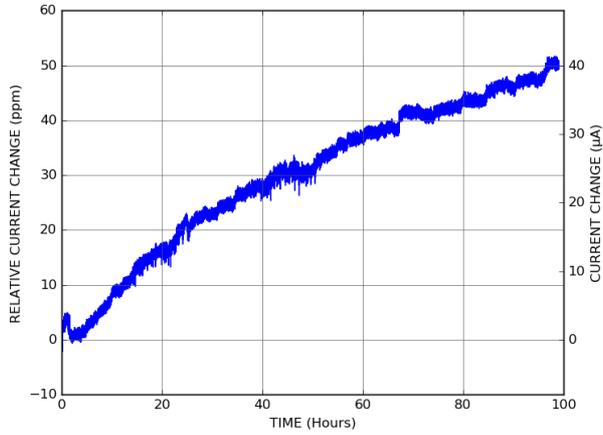
Specifications

CTL101 laser controller is available for type 1 lasers (CTL101-1-) and type 2 lasers (CTL101-2-).

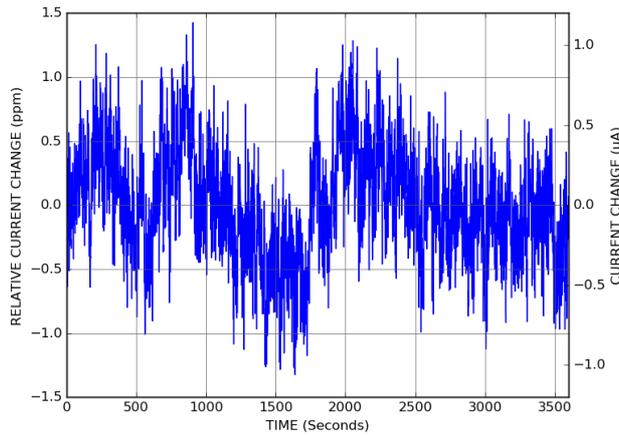
	B-200 (200 mA)	B-400 (400 mA)	B-600 (600 mA)	B-800 (800 mA)
Current driver				
Laser current	0 - 220 mA	0 - 440 mA	0 - 660 mA	0 - 880 mA
Compliance voltage (5V supply) 2.2 V		2.2 V	2.2 V	2.2 V
Compliance voltage (6V supply) 3.2 V		3.2 V	3.2 V	3.2 V
RMS noise (10 Hz - 1 MHz) L/M gain	200 nA _{rms}	390 nA _{rms}	600 nA _{rms}	810 nA _{rms}
RMS noise (10 Hz - 1 MHz) H gain	280 nA _{rms}	560 nA _{rms}	860 nA _{rms}	1160 nA _{rms}
Current noise density (1 kHz)	220 pA/√Hz	420 pA/√Hz	620 pA/√Hz	820 pA/√Hz
Current limit (H / L)	250 / 150 mA	500 / 300 mA	750 / 450 mA	1000 / 600 mA
Modulation gains	1 mA/V, 10 mA/V, 100 mA/V	2 mA/V, 20 mA/V, 200 mA/V	3 mA/V, 30 mA/V, 300 mA/V	4 mA/V, 40 mA/V, 400 mA/V
3 dB modulation bandwidth	12 MHz	12 MHz	12 MHz	12 MHz
Temperature coefficient	15 ppm/°C	15 ppm/°C	15 ppm/°C	15 ppm/°C
Slow start (90 % setpoint)	250 ms	250 ms	250 ms	250 ms
AC modulation cutoff frequency	1.5 MHz	1.5 MHz	1.5 MHz	1.5 MHz
TEC controller				
Maximum current	1.2 A	1.2 A	1.2 A	1.2 A
Temperature range (10 K thermistor)	10 °C to 35 °C			
Compliance voltage	±3 V	±3 V	±3 V	±3 V
Temperature stability	0.0015 °C/°C	0.0015 °C/°C	0.0015 °C/°C	0.0015 °C/°C
Laser power monitor				
Photodiode current	0 - 1 mA			
Gain	3.9 V/mA	3.9 V/mA	3.9 V/mA	3.9 V/mA
Frequency range	DC - 20 MHz			
Other				
Outside Dimensions	75 mm x 85 mm x 27 mm	75 mm x 85 mm x 27 mm	75 mm x 85 mm x 27 mm	75 mm x 85 mm x 27 mm
Weight	103 g	103 g	103 g	103 g
Supply voltage	4.9 V to 6.5 V			
Operating temperature	0 °C - 60 °C	0 °C - 60 °C	0 °C - 55 °C	0 °C - 50 °C

Current driver

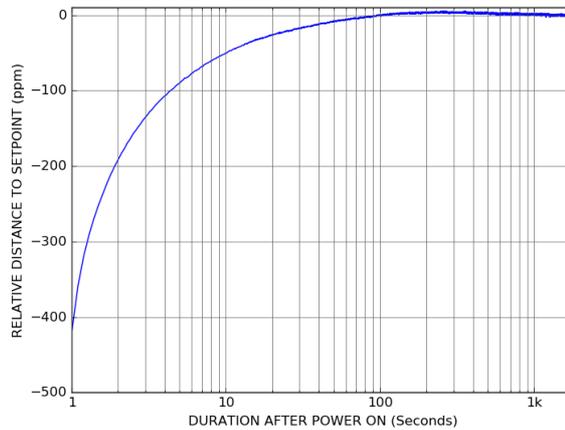
The figure below shows the relative current change of the CTL101 laser controller set at 800 mA current (CTL101-2-B-800) during its first 100 hours of operation:



The current stability of the controller after 100 hours is shown below:

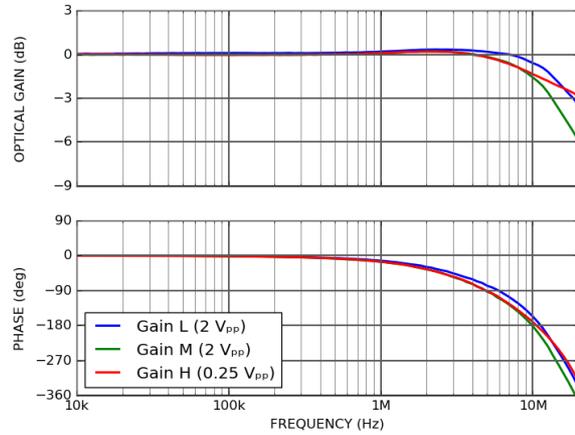


After a subsequent power-on, the CTL101 controller takes only one minute to settle the laser current within 10 ppm of the setpoint value:

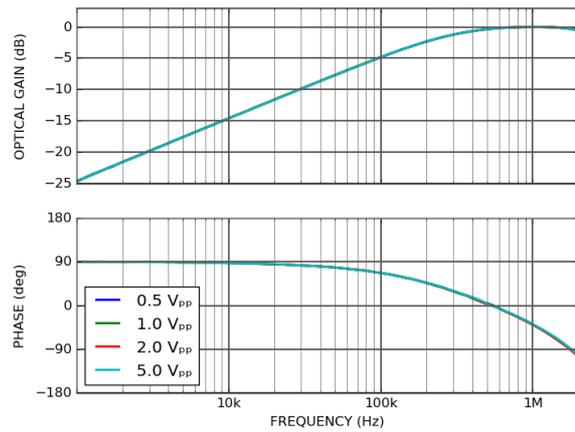


Current modulation

The CTL101 controller has two current modulation inputs available on SMA connectors. The DC modulation input allows to modulate the current setpoint between DC and 10 MHz. A jumper allows to choose between 3 modulation gains (2 mA/V, 20 mA/V and 200 mA/V for the 400 mA version).

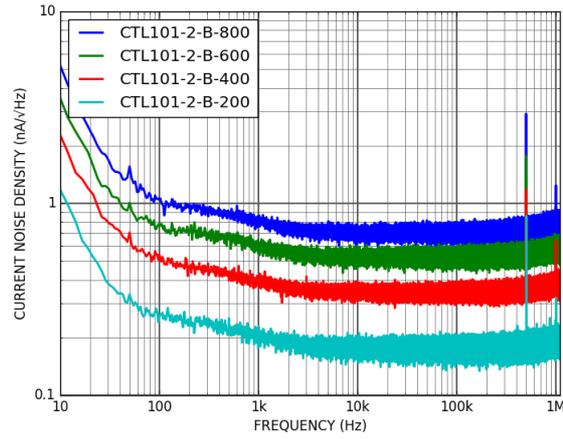


The AC modulation input can be used to modulate the laser above 1 MHz with a modulation gain of 20 mA/V:



Current noise

The figure below shows the current noise of the CTL101 controller at operating currents of 200, 400, 600 and 800 mA:



Temperature controller

The temperature controller consists of a precision Wheatstone bridge, an analog PID controller and a linear current driving stage. PID gains are fixed and have been adjusted for a typical butterfly laser diode. Temperature setpoint is adjusted with a precision trimming potentiometer.