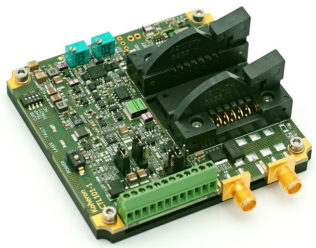
Low noise butterfly laser diode controller



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. 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.

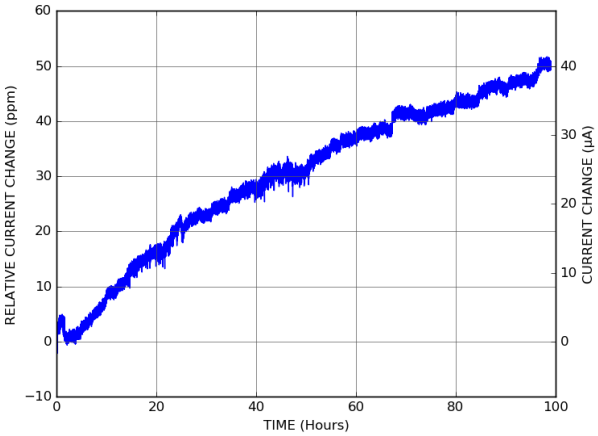
Specifications

	B-100	B-200	B-400	B-800
Current driver				
Laser current	0 - 110 mA	0 - 220 mA	0 - 440 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	120 nA_{rms}	200 nA_{rms}	390 nA_{rms}	810 nA_{rms}
RMS noise (10 Hz - 1 MHz) H gain	150 nA_{rms}	280 nA_{rms}	560 nA_{rms}	1160 nA_{rms}
Current noise density (1 kHz)	110 pA/√Hz	220 pA/√Hz	420 pA/√Hz	820 pA/√Hz
Current limit (H / L)	125 / 60 mA	250 / 150 mA	500 / 300 mA	1000 / 600 mA
Modulation gains	0.5 mA/V, 5 mA/V, 50 mA/V	1 mA/V, 10 mA/V, 100 mA/V	2 mA/V, 20 mA/V, 200 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	0.8 A	1.2 A	1.2 A	1.2 A
Temperature range (10 K thermistor)	10 °C to 35 °C	10 °C to 35 °C	10 °C to 35 °C	10 °C to 35 °C
Compliance voltage	±3 V	±3 V	±3 V	±3 V

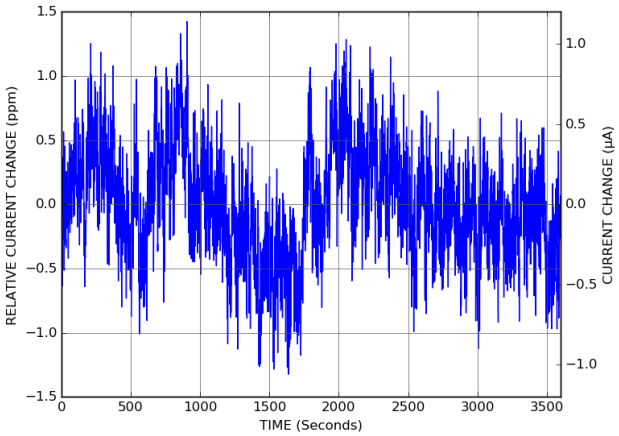
Temperature stability	0.0015 °C/°C	0.0015 °C/°C	0.0015 °C/°C	0.0015 °C/°C
Laser power monitor				
Photodiode current	0 - 1 mA	0 - 1 mA	0 - 1 mA	0 - 1 mA
Gain	3.9 V/mA	3.9 V/mA	3.9 V/mA	3.9 V/mA
Frequency range	DC - 20 MHz	DC - 20 MHz	DC - 20 MHz	DC - 20 MHz
Other				
Outside Dimensions	75 mm x 85 mm 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	4.9 V to 6.5 V	4.9 V to 6.5 V	4.9 V to 6.5 V
Operating temperature	0 °C - 60 °C	0 °C - 60 °C	0 °C - 60 °C	0 °C - 50 °C
Compatible lasers	Floating diodes	Floating diodes	Floating diodes	Floating diodes

Current driver

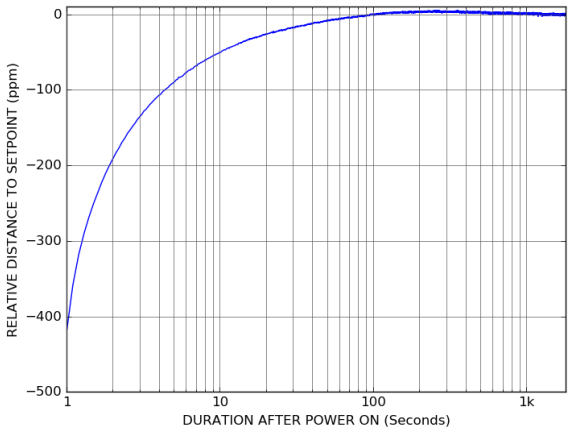
The figure below shows the relative current change of the CTL101 laser controller set at 800 mA current (CTL101-2-B-800) during its first 100 hours of operation:



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

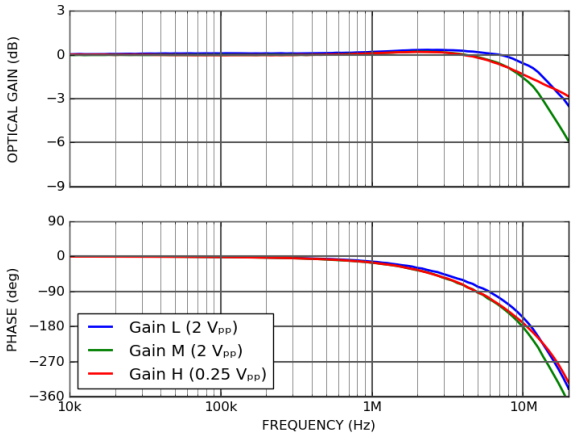


After a subsequent power-on, the CTL101 controller takes only one minute to settle the laser current within 10 ppm of the setpoint value:

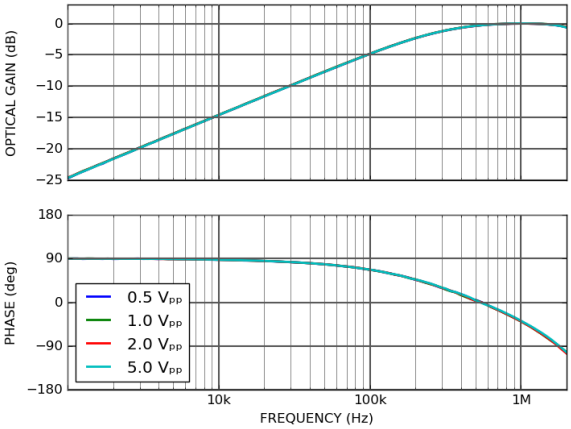


Current modulation

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).

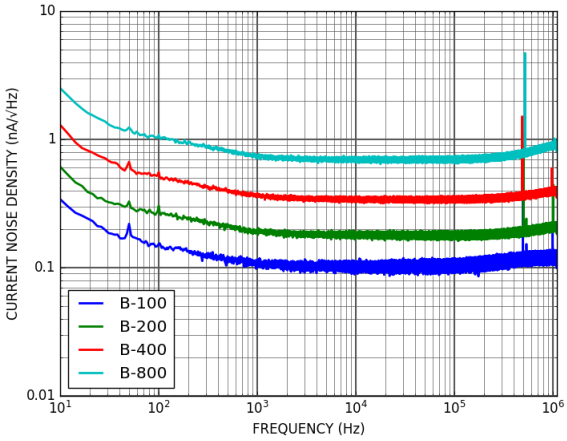


The AC modulation input can be used to modulate the laser above 1 MHz with a modulation gain of 20 mA/V:



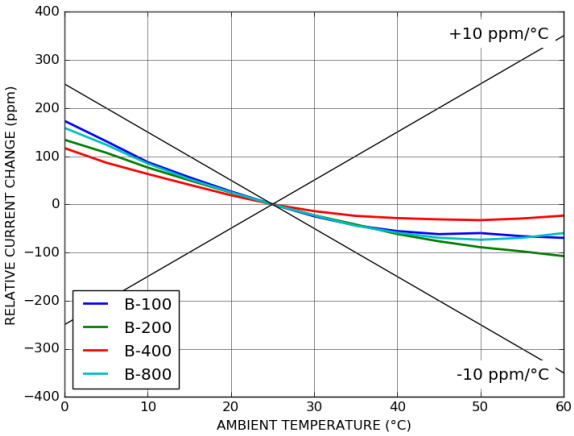
Current noise

The figure below shows the current noise of the CTL101 controller operating at rated current with the modulation gain set to medium:



Temperature stability

The figure below shows the variation of the output current against the ambient temperature for controllers operating at rated current:



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.

Ordering codes

- **CTL101-1-B-100:** Laser type 1 / Laser current 100 mA
- **CTL101-1-B-200:** Laser type 1 / Laser current 200 mA
- **CTL101-1-B-400:** Laser type 1 / Laser current 400 mA
- **CTL101-1-B-800:** Laser type 1 / Laser current 800 mA
- **CTL101-2-B-100:** Laser type 2 / Laser current 100 mA
- **CTL101-2-B-200:** Laser type 2 / Laser current 200 mA
- **CTL101-2-B-400:** Laser type 2 / Laser current 400 mA
- **CTL101-2-B-800:** Laser type 2 / Laser current 800 mA