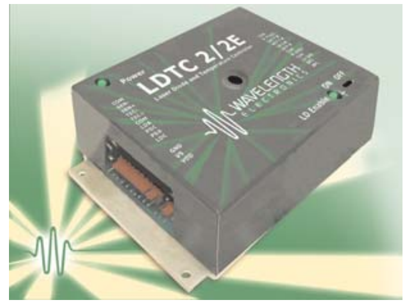
LDTC2/2

Combine the drive power of the WLD3343 with the temperature stability of the WTC3243



GENERAL DESCRIPTION:

The LDTC 2/2 combines a 2.2 Amp laser driver and 2.2 Amp temperature controller on one small board. Available as an open frame or in a chassis mount enclosure.

The WTC3243 will control temperature using thermistors, 100Ω Platinum RTDs, or linear temperature sensors such as the LM335 or the AD590. Adjust temperature using the onboard trim pot or a remote voltage input from a panel mount potentiometer, DAC, or other voltage source. A default temperature set point configuration provides fault tolerance and avoids accidental damage to system components. Adjustable trim pots configure heat and cool current limits.

The heart of the laser driver section is the WLD3343 2.0 Amp Laser Driver. It maintains precision laser diode current (Constant Current mode) or stable photodiode current (Constant Power mode) using electronics compatible with A/B Type lasers.

Ideal for higher power laser diodes for medical diagnostic equipment, remote sensing, and analytical instrumentation.

FEATURES:

- Small package size
- Single supply operation
- Cost Effective

FEATURES, Laser Diode Driver:

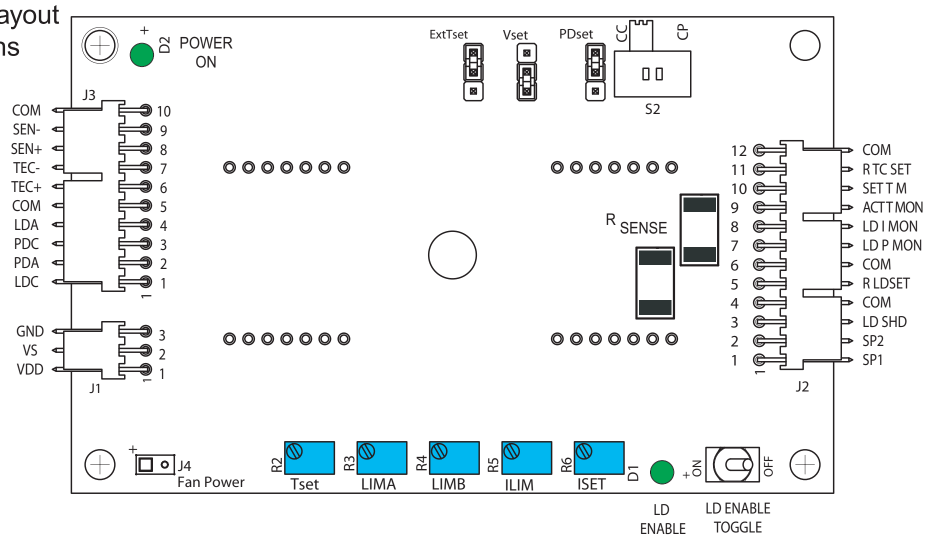
- Default current range is 2.2A. Custom ranges, from 3mA up, easily configured.
- Slow start laser diode protection
- Constant Current or Constant Power modes
- Compatible with A or B type laser diodes
- Adjustable laser diode current limit
- Remote TTL Shutdown / Interlock

FEATURES, Temperature Controller:

- Drive up to 2.2A of TEC current
- Set temp using D/A - includes default to near room temperature to avoid drive when D/A is turned off or signal lost
- Ultra-stable PI control loop
- Separate Heat & Cool current limits
- Single power supply operation

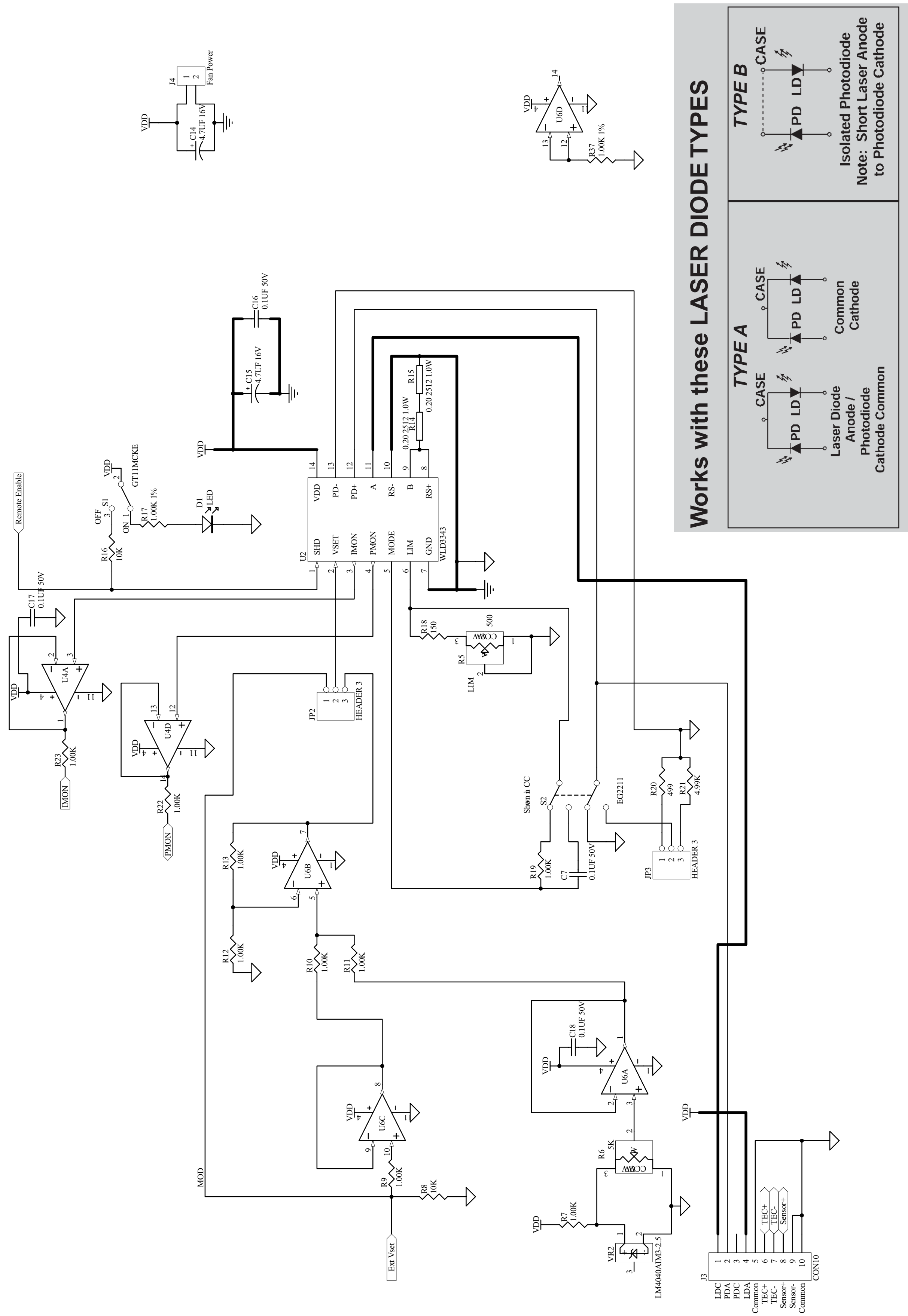
Figure 1
Top View Pin Layout and Descriptions

TOP VIEW



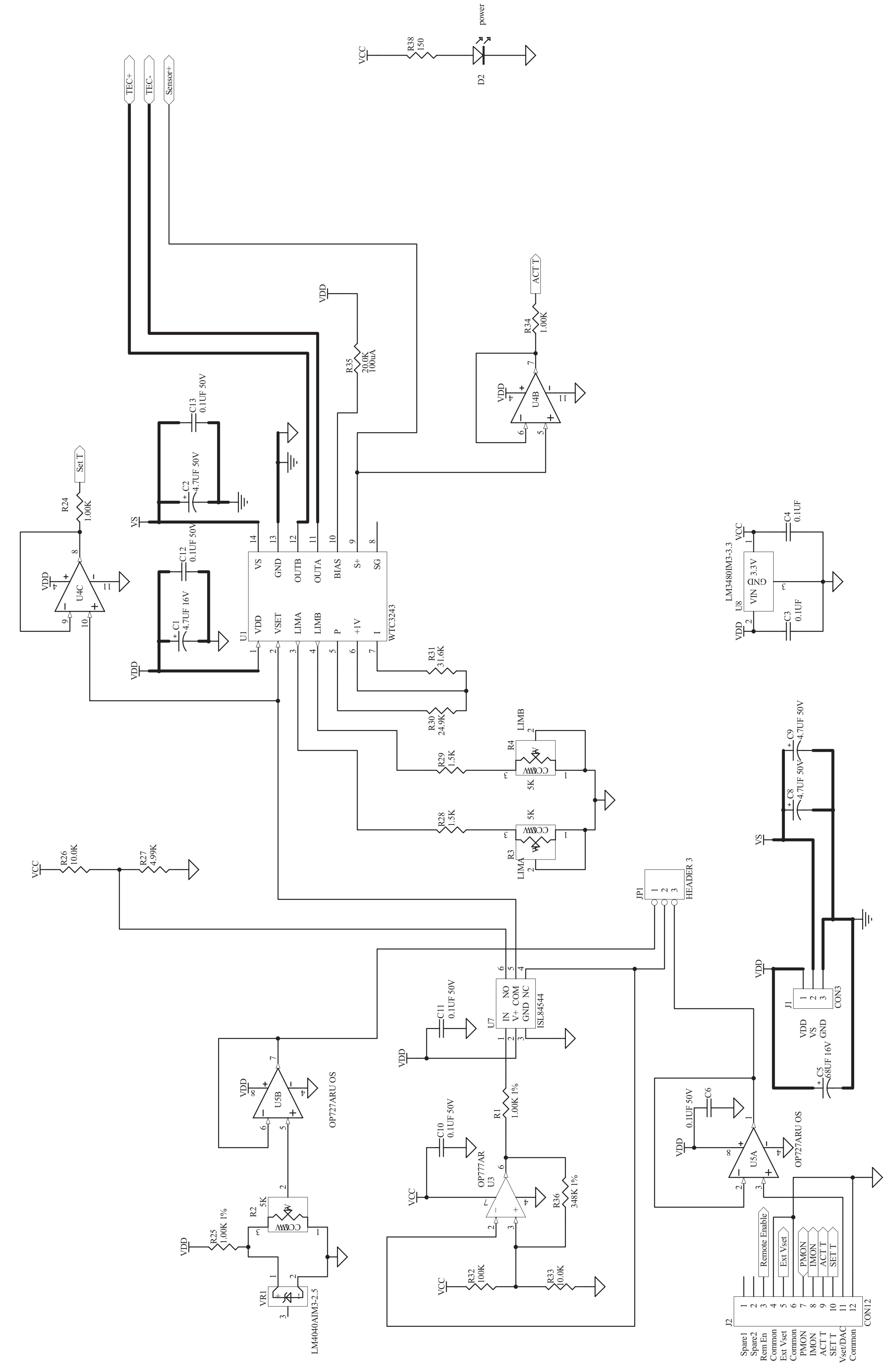
BLOCK DIAGRAM

Schematic for WLD3343 connections



BLOCK DIAGRAM

Schematic for WTC3243 connections



ELECTRICAL AND OPERATING SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS	SYMBOL	VALUE	UNIT
Operating Temperature, case [1]	T_{OPR}	- 40 to + 85	˚C
Storage Temperature	T_{STG}	- 65 to +150	˚C
Weight - with enclosure	LDTC2/2E		oz
Weight - open frame	LDTC2/2O		oz
WLD3343 Laser Diode Driver Rating	**SYMBOL**	**VALUE**	**UNIT**
Supply Voltage (Voltage on Pin 14)	V_{DD}	+4.5 to +12	Volts DC
Output Current (See SOA Chart)	I_{LD}	2.2	Amperes
Power Dissipation, $T_{AMBIENT}$ = +25˚C	P_{MAX}	9	Watts
WTC3243 Temperature Controller Rating	**SYMBOL**	**VALUE**	**UNIT**
Supply Voltage 1 (Voltage on Pin 1)	V_{DD}	+4.5 to +12	Volts DC
Supply Voltage 2 (Voltage on Pin 14)	V_S	+4.5 to +30	Volts DC
Output Current (See SOA Chart)	I_{OUT}	±2.5	Amperes
Power Dissipation, $T_{AMBIENT}$ = +25˚C (See SOA Chart) (with fan and heat sink)	P_{MAX}	9	Watts

Laser Diode Driver PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
CONSTANT CURRENT CONTROL					
Long Term Stability, 24 hours	$T_{AMBIENT}$ = 25˚C		50	75	ppm
CONSTANT POWER CONTROL					
Long Term Stability, 24 hours	$T_{AMBIENT}$ = 25˚C	0.02		0.05	%
OUTPUT					
Current, peak, see SOA chart	With Heat Sink and Fan	1.8	2.0	2.2	Amps
Compliance Voltage, Laser Diode Load	Full Temp. Range, I_{LD} = 2.0 Amps, 5V	3.0			Volts
Rise Time	I_{LD}= 2 Amps		160		nsec
Fall Time	I_{LD}= 2 Amps		320		nsec
Bandwidth	Constant Current, Sine Wave		1.6		MHz
Bandwidth	Constant Power (Depends on PD BW)				
Slow Start			0.25		Seconds
POWER SUPPLY					
Voltage, V_{DD}		5		12	Volts
Current, V_{DD} supply, quiescent		5	10	15	mA
INPUT					
Offset Voltage, initial, Imon	Pin 2, $T_{AMBIENT}$ = 25˚C, V_{CM} = 0V		1	5	mV
Bias Current (based on input Res of op amp)	Pin 2, $T_{AMBIENT}$ = 25˚C, V_{CM} = 0V		20	50	nA
Common Mode Range	Pin 2, Full Temp. Range	0		V_{DD}	V
Common Mode Rejection, Set point	Full Temperature Range	60	85		dB
Power Supply Rejection	Full Temperature Range	60	80		dB
THERMAL					
Heatspreader Temperature Rise	$T_{AMBIENT}$ = 25˚C	28	30	33	˚C/W
Heatspreader Temperature Rise	With WHS302 Heat sink, WTW002 Thermal Washer	18	21.5	25	˚C/W
Heatspreader Temperature Rise	With WHS302 Heat sink, WTW002 Thermal Washer and 3.5 CFM fan	3.1	3.4	3.9	˚C/W
Pin Solderability	Solder temp @260˚C		10		Sec

Note [1]. With Revision D of the WLD3343, an internal thermostat has been added to activate Shutdown (SHD) when the internal temperature exceeds 105˚C. The output will be re-enabled after a 250 to 300 msec slow-start once the internal temperature drops below 95˚C.

ELECTRICAL AND OPERATING SPECIFICATIONS, continued

Temperature Control PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
TEMPERATURE CONTROL					
Short Term Stability, 1 hour	TSET = 25˚C using 10 kΩ thermistor	0.001	0.005	0.010	˚C
Long Term Stability, 24 hour	TSET = 25˚C using 10 kΩ thermistor	0.003	0.008	0.010	˚C
Control Loop		P	PI		
P (Proportional Gain)		18	20	22	A/V
I (Integrator Time Constant)		2	3	4	Sec.
Setpoint vs. Actual T Accuracy	TSET = 25˚C using 10 kΩ thermistor		<0.2%(Rev B)		
OUTPUT					
Current, peak, see SOA Chart		±2.0	±2.2	± 2.5	Amps
Compliance Voltage, Pin 11 to Pin 12	Full Temp. Range, I_{OUT} = 100 mA	$\lvert V_S - 0.7 \rvert$	$\lvert V_S - 0.5 \rvert$		Volts
Compliance Voltage, Pin 11 to Pin 12	Full Temp. Range, I_{OUT} = 1 Amp	$\lvert V_S - 1.2 \rvert$	$\lvert V_S - 1.0 \rvert$		Volts
Compliance Voltage, Pin 11 to Pin 12	Full Temp. Range, I_{OUT} = 1.5 Amps	$\lvert V_S - 1.6 \rvert$	$\lvert V_S - 1.4 \rvert$		Volts
Compliance Voltage, Pin 11 to Pin 12	Full Temp. Range, I_{OUT} = 2.0 Amps	$\lvert V_S - 1.8 \rvert$	$\lvert V_S - 1.6 \rvert$		Volts
Compliance Voltage, Resistive Heater	Full Temp. Range, I_{OUT} = 2.0 Amps	$\lvert V_S - 1.7 \rvert$	$\lvert V_S - 1.6 \rvert$		
POWER SUPPLY					
Voltage, VDD		4.5		12	Volts
Current, VDD supply, quiescent			55	105	mA
Voltage, Vs		4.5		28	Volts
Current, Vs supply, quiescent		20	50	100	mA
INPUT					
Offset Voltage, initial	Pins 2 and 9		1	2	mV
Bias Current	Pins 2 and 9, $T_{AMBIENT}$ = 25˚C		20	50	nA
Offset Current	Pins 2 and 9, $T_{AMBIENT}$ = 25˚C		2	10	nA
Common Mode Range	Pins 2 and 9, Full Temp. Range	0		VDD-2[2]	V
Common Mode Rejection	Full Temperature Range	60	85		dB
Power Supply Rejection	Full Temperature Range	60	80		dB
Input Impedence			500		kΩ
Input voltage range		GND		VDD-2[2]	Volts

[2] The bias source has a compliance up to VDD - 2.0 V. In normal operation this limits the sensor voltage range tp 0.25V to VDD - 2.0V. While voltages up to +/- 5V outside this range on the Vset pin will not damage the unit, it will not provide proper control under these conditions.

NOTE: Operation higher than 5V on VDD (i.e. 12V) requires close evaluation of the SOA curves and current limit settings. Damage to the WLD or WTC will occur if they are operated outside their Safe Operating Area. Contact the factory if you plan to use higher than 5V.

PIN DESCRIPTIONS

Connector 1 (J1)

Pin	Pin #	Name	Function
VDD	1	Supply Voltage to Control Electronics and Laser Diode	Connect +5 to +12V between pins 2 & 3 to power the control electronics and the output drive to the Laser Diode. Use the ONLINE Safe Operating Area calculator to make sure maximum internal power dissipation in the WLD is not exceeded - especially when using greater than +5V.
VS	2	Supply Voltage to Output TEC Drive	Connect +5 to +28V between pins 1 & 3 to drive the TEC output stage - Use the ONLINE Safe Operating Area calculator to make sure maximum internal power dissipation in the WTC is not exceeded - especially when using greater than +5V.
GND	3	Power Supply Ground	

Connector 2 (J2)

SP1	1	Spare 1	Spare connection for your use - test point, etc.
SP2	2	Spare 2	Spare connection for your use - test point, etc.
LD SHD	3	LD Shutdown / Interlock	Float or GND = Enable Laser Diode Current Input >3V = Disable Laser Diode Current
COM	4	Common	Low current GND for monitors, DACs, External VSET, etc.
R LDSET	5	Remote Laser Diode Setpoint	Voltage Input range is 0 to 2V. Transfer function: $V_{R\ LDSET} = I_{LD} * (2\ R_{SENSE})$
COM	6	Common	Low current GND for monitors, DACs, External VSET, etc.
LD P M	7	Photodiode monitor	Monitor the laser diode power. The Photodiode Current Monitor produces a voltage proportional to the current produced by the laser diode monitor photodiode.
LD I M	8	LD Current monitor	Monitor the laser diode forward current. The Laser Diode Current Monitor produces a voltage proportional to the current flowing through the laser diode.
ACT T M	9	Actual Temp monitor	Monitor the actual voltage produced by the temperature sensor. The voltage produced and transfer function to temperature is determined by the sensor chosen.
SET T M	10	Setpoint monitor	Monitor the temperature setpoint voltage. The voltage produced and transfer function to temperature is determined by the sensor chosen.
R TCSET	11	Remote Temperature Setpoint	Connect a voltage source between Pin 11 (VSET) and Pin 12 (GND) to control the temperature setting remotely. A default value of 1V (about room temperature with 10kΩ thermistor) will be seen by the WTC if the voltage at this pin drops below 0.3V.
COM	12	Common	Low current GND for monitors, DACs, External VSET, etc.

Connector 3 (J3)

LDC	1	Laser Diode Cathode	
PDA	2	Photodiode Anode	
PDC	3	Photodiode Cathode	
LDA	4	Laser Diode Anode	
COM	5	Common	
TEC+	6	TEC + connection	Cooling current flows from this pin when using an NTC sensor.
TEC-	7	TEC - connection	Heating current flows from this pin when using an NTC sensor.
SEN+ SEN-	8 9	Temperature Sensor + Temperature Sensor -	Connect resistive and LM335 type temperature sensors across Pin 8 and Pin 9. Connect a 10 kΩ resistor across these pins when using AD590 type temperature sensors. The negative terminal of the AD590 sensor connects to Pin 8 and the positive terminal to Pin 1 (VDD) of Connector 1. AD590 operation requires that VDD be +8 Volts or greater for proper operation.
COM	10	Common	Low current GND for monitors, DACs, External VSET, etc.

Caution:

Do not exceed the Maximum Internal Power Dissipation of the WLD or WTC.
Safe Operating Area (SOA) tools are provided online to make your design easier.
Exceeding the Maximum Internal Power Dissipation voids the warranty.

To determine if the operating parameters fall within the SOA of the device, the maximum voltage drop across the driver and the maximum current must be plotted on the SOA curves.

These values are used for the example SOA determination for a WLD:

V_S = 12 volts
V_{Load} = 5 volts
I_{Load} = 1 amp

These values are determined from the specifications of the laser diode.

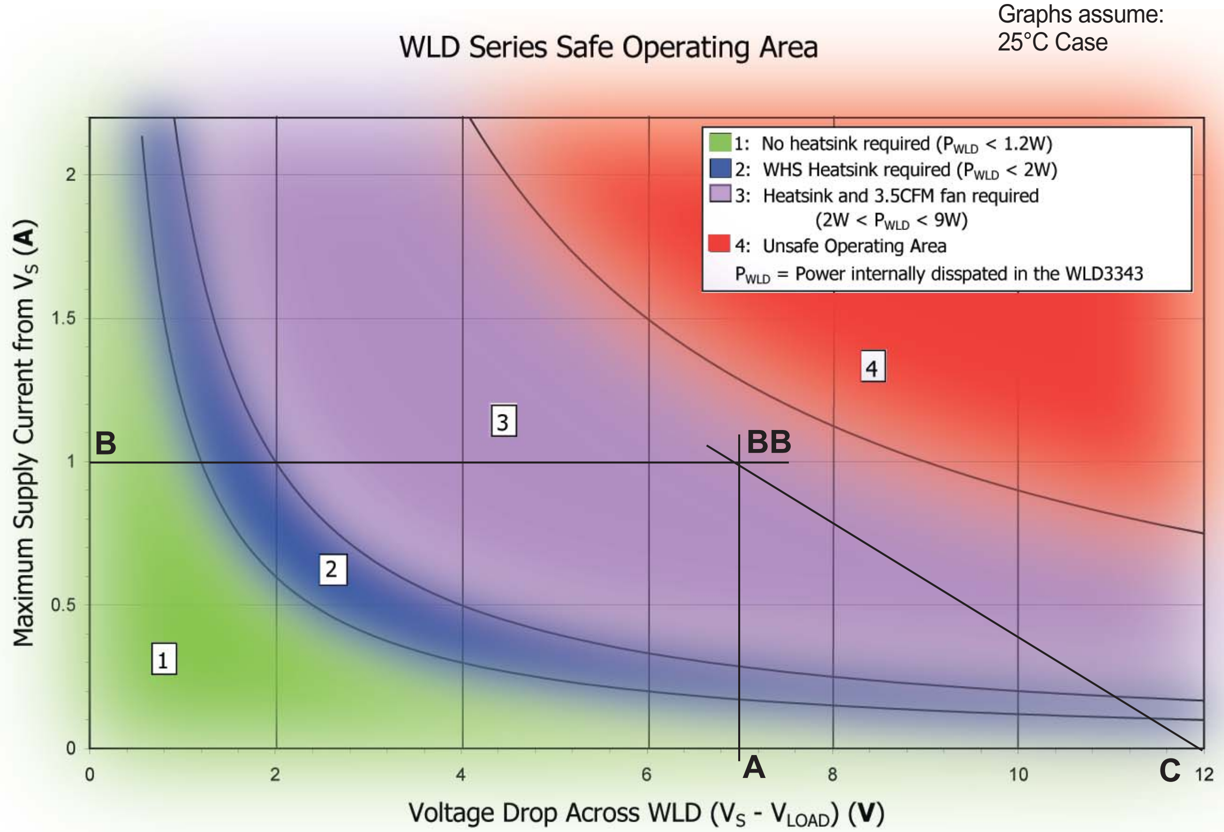
Follow these steps:

1. Determine the maximum voltage drop across the driver, V_S-V_{Load}, and mark on the X axis.
   Example: 12 volts - 5 volts = 7 volts, Point A)
2. Determine the maximum current, I_{Load}, through the driver and mark on the Y axis:
   (1 amp, Point B)
3. Draw a horizontal line through Point B across the chart. (Line BB)
4. Draw a vertical line from Point A to the maximum current line indicated by Line BB.
5. Mark V_S on the X axis. (Point C)
6. Draw the Load Line from where the vertical line from point A intersects Line BB down to Point C.

Refer to the chart shown below and note that the Load Line is in the Unsafe Operating Areas for use with no heatsink (1) or the heatsink alone (2), but is outside of the Unsafe Operating Area for use with heatsink and Fan (3).

An online tool for calculating your load line is at http://www.teamwavelength.com/tools/calculator/soa/defaultld.htm

Graphs assume:
25°C Case



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Safe Operating Area (SOA) tools are provided online to make your design easier. Exceeding the Maximum Internal Power Dissipation voids the warranty.

To determine if the operating parameters fall within the SOA of the device, the maximum voltage drop across the controller and the maximum current must be plotted on the SOA curves.

These values are used for the example SOA determination for a WTC:

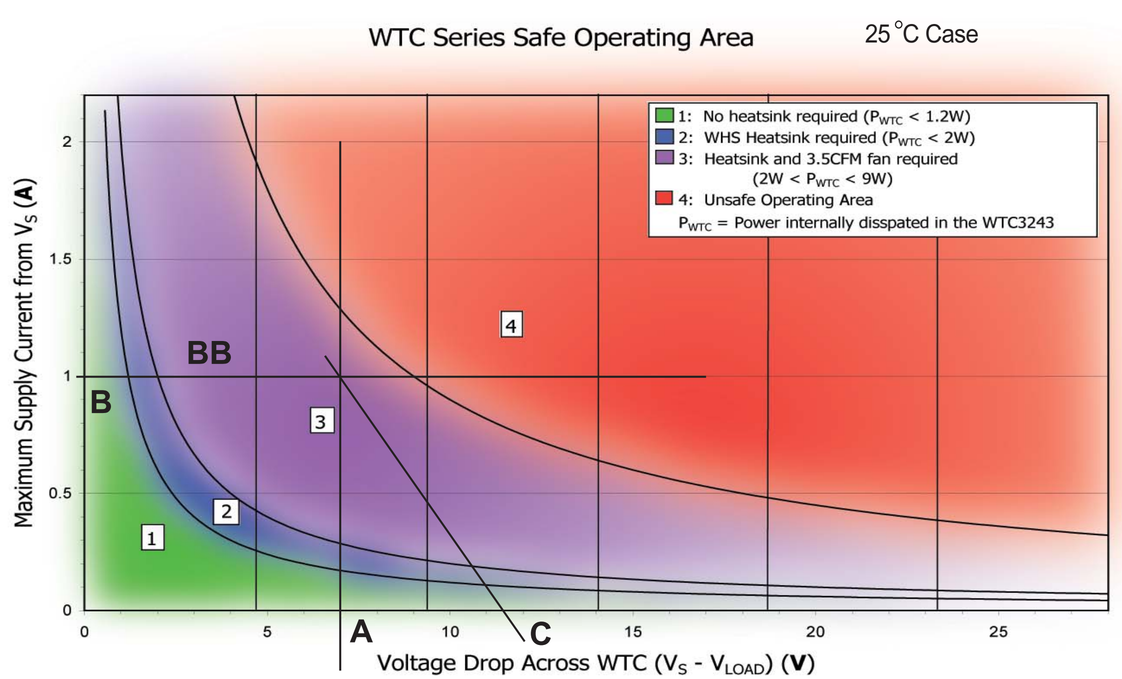
Vs= 12 volts
Vload = 5 volts
ILoad = 1 amp

Follow these steps:

1. Determine the maximum voltage drop across the controller ,Vs-Vload, and mark on the X axis.
   (12volts - 5 volts = 7 volts, Point A)
2. Determine the maximum current, ILoad, through the controller and mark on the Y axis:
   (1 amp, Point B)
3. Draw a horizontal line through Point B across the chart. (Line BB)
4. Draw a vertical line from Point A to the maximum current line indicated by Line BB.
5. Mark Vs on the X axis. (Point C)
6. Draw the Load Line from where the vertical line from point A intersects Line BB down to Point C.

Refer to the chart shown below and note that the Load Line is in the Unsafe Operating Areas for use with no heatsink (1) or the heatsink alone (2), but is outside of the Unsafe Operating Area for use with heatsink and Fan (3).

An online tool for calculating your load line is at http://www.teamwavelength.com/tools/calculator/soa/defaulttc.htm.



Proper Heat dissipation from the WLD & WTC is critical to longevity of the LDTC 2/2. The heat spreaders of the WTC3243 and WLD3343 are positioned to use your chassis for heat dissipation. Be sure to add thermally conductive paste to all relevant surfaces that need to dissipate heat.

WTC OPERATION

Recommended order of setup:
WTC temperature control section WITHOUT the laser diode installed THEN the WLD laser diode driver. Use a simulated laser diode load until you are comfortable with the WLD operation.

CAUTION:
Operate the LDTC2/2 with loads attached - if you short either the LD or TC output connections during setup, current will flow and possibly overheat / damage the WLD or WTC.

1. CONFIGURING HEATING AND COOLING CURRENT LIMITS

The LDTC2/2 has two trimpots that independently set the heating and cooling current limits: LIM A & LIM B. These are 12-turn 5kΩ trimpots. Full current (2.2 A) is at full CCW position. Table 1 shows the meaning of the trimpots with various sensors and actuators. Note that PTC sensors include 100Ω platinum RTDs, the LM335, and the AD590.

Table 1
Trimpot function vs. Sensor & Load Type

Sensor Type	Load Type	LIM A Limits:	LIM B Limits:
Thermistor	Thermoelectric	Cool Current	Heat Current
PTC	Thermoelectric	Heat Current	Cool Current
Thermistor	Resistive Htr	Turn off - Fully CW	Heat Current
PTC	Resistive Htr	Heat Current	Turn off - Fully CW

2. WIRE OUTPUT CONNECTION

Use Table 2 to determine the connection from the LDTC2/2 to your thermoelectric or resistive heater.

Table 2
Wiring vs. Sensor & Load Type

Sensor Type	Load Type	TEC+ Connector 3, Pin 6	TEC - Connector 3, Pin 7
Thermistor	Thermoelectric	Thermoelectric positive wire	Thermoelectric negative wire
PTC	Thermoelectric	Thermoelectric negative wire	Thermoelectric positive wire
Thermistor	Resistive Htr	**Quick Connect:** Connect the Resistive Heater to TEC+ & TEC - (polarity doesn't matter). Adjust the Cooling Current Limit A trimpot to zero - fully CW. **Max V Connect:** Connect one side of the resistive heater to TEC- and the other side to the voltage source V_S. LIM A trimpot setting is then irrelevant.	
PTC	Resistive Htr	**Quick Connect:** Connect the Resistive Heater to TEC+ & TEC - (polarity doesn't matter). Adjust the Cooling Current Limit B trimpot to zero - fully CW. **Max V Connect:** Connect one side of the resistive heater to TEC- and the other side to the voltage source V_S. LIM B trimpot setting is then irrelevant.	

3. CONNECT TEMPERATURE SENSOR

The LDTC2/2 is configured to operate a 10kΩ thermistor with a 100µA bias current. If your application requires a different sensor, please contact Wavelength for details. Wire the thermistor between pins 8 & 9 (SENS+ & SENS-) on Connector J3. Operating without a temperature sensor will drive maximum current through the WTC, potentially damaging it.

WTC OPERATION, continued

4. PROPORTIONAL GAIN AND INTEGRATOR TIME CONSTANT - PI TERMS

The LDTC2/2 is configured to the mid-range positions appropriate for most laser diode loads. To adjust these parameters to optimize the temperature control system time to temperature or stability, contact Wavelength.

5. POWER SUPPLY SELECTION

The VDD voltage supply input is common to both the WLD3343 and the WTC3243. This supply furnishes the voltage to the control electronics of the devices as well as the compliance voltage for the WLD3343 Laser Driver.

The supply should be capable of providing at least 3.0 Amps of current in applications that use a separate VS supply in the temperature control implementation. Temperature control applications that tie VDD and VS together require a VDD current capacity that equals the sum of the maximum TEC or Resistive Heater current, plus the maximum laser diode current, plus approximately 200 mA for the control electronics of the WTC3243 Temperature Controller and the WLD3343 Laser Driver, plus current to an optional fan. Using the maximum potential of the WLD and WTC will not require more than 6.0 Amps.

VS is the voltage that is applied to the TEC or resistive heater. This voltage should be high enough to supply the voltage required by the TEC or resistive heater plus the compliance required by the WTC. The voltage available to the TEC will be from between 0.5 to 1.8V lower than VS. To minimize power dissipation in the WTC, keep VS as low as possible.

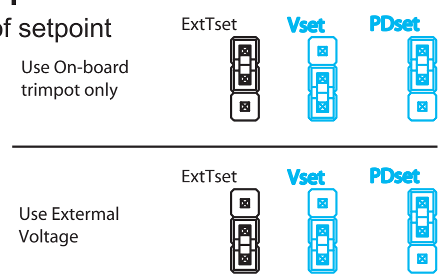
Online Safe Operating Area (SOA) calculators are available for the WTC3243. Calculate the maximum power dissipation of your design at http://www.teamwavelength.com/tools/calculator/soa/defaulttc.htm **before applying power to the LDTC2/2.**

6. TEMPERATURE SETPOINT

Wavelength introduces a special setpoint circuit with the LDTC2/2. An on-board trimpot (TSET) will adjust the voltage from 0.3V to 2.5V. Additionally, Pin 11 (R TC SET) & 12 (COM) of Connector 2 will accept a DAC voltage (from 0.3 to 2.5V). The new feature - the “Failsafe Setpoint” will default the setpoint to 1V (~25°C for a 10kΩ thermistor) if the chosen signal (from pot or DAC) falls below 0.3V.

A jumper set lets you choose to use only the on-board potentiometer or the external voltage.

Figure 1
Source of setpoint



JP1 configures the Remote Temperature Setpoint choice. There is about 100mV of hysteresis built into the default voltage. The input impedance of the R TC SET is greater than 20kΩ and is fully buffered.

If you use a different sensor or would prefer a different default voltage, contact Wavelength.

7. MONITOR ACTUAL TEMP AND SETPOINT

Pins 9 & 10 of Connector 2 are ACT T Monitor and SET T Monitor respectively. Measure the actual sensor voltage across Pin 9 and Pin 12 (COM). For a 10kΩ thermistor with 100µA bias current, the resistance (in kΩ) is given by:

$$R = V_{PIN\ 9} / 0.1$$

To monitor the Setpoint Voltage used by the WTC, use pins 10 and 12.

For other sensor calculations, contact Wavelength.

8. ENABLE CURRENT TO TEC

Output current is supplied to the load as soon as power is applied to the controller. The Power LED indicator will light GREEN when power is applied.

WLD OPERATION

Recommended order of setup:
WTC temperature control section WITHOUT the laser diode installed THEN the WLD laser diode driver. Use a simulated laser diode load until you are comfortable with the WLD operation. Steps 1 through 4 should be done BEFORE power is supplied to VDD and the laser diode connected.

1. SELECTING THE LASER DIODE OUTPUT CURRENT RANGE

The output current range of the WLD3343 depends on the selection of resistor R_{SENSE}. Two 2512 resistors combine in series to produce this resistance (R14 & R15).

THE LDTC2/2 defaults the maximum range to 2.2Amps. To change the range, and the sensitivity of the setpoint voltage, use Table 3 or Equation 1.

Table 3
Laser Diode Current Sense Resistor R_{SENSE} vs Maximum Laser Diode Current I_{LDMAX}

Maximum Output Current I_{LDMAX}	Constant Power Current Sense Resistor, R_{SENSE}	Constant Current Current Sense Resistor, R_{SENSE}
50 mA	25.00 Ω	20.00 Ω
125 mA	10.00 Ω	8.00 Ω
250 mA	5.00 Ω	4.00 Ω
500 mA	2.50 Ω	2.00 Ω
1.25 Amps	1.00 Ω	0.80 Ω
2.2 Amps	0.57 Ω	0.45 Ω

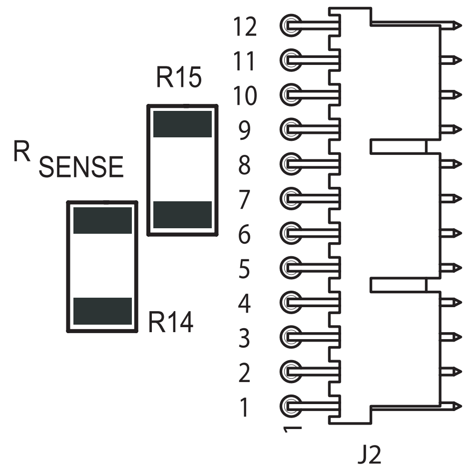
2. HELPFUL HINTS FOR CHOOSING R_{SENSE}

•Never use a carbon film resistor for R_{SENSE}.
•Avoid resistors with high parasitic inductance.
•Select a resistor with a low temperature coefficient (1%, <100ppm/˚C).
•Use Equation 2 for determining the power rating of R_{SENSE}.

Note: Wavelength Electronics recommends a conservative power rating of 2 times normal maximum for R_{SENSE}. Equation 2 incorporates this recommendation.

CAUTION:
Operate the LDTC2/2 with loads attached - if you short either the LD or TC output connections during setup, current will flow and possibly overheat / damage the WLD or WTC.

Figure 2
Location of R_{SENSE}



Equation 1
Calculating R_{SENSE}

Constant Power Mode

$$R_{SENSE} = \frac{1.25}{I_{LDMAX}}$$

Constant Current Mode

$$R_{SENSE} = \frac{1.00}{I_{LDMAX}}$$

Equation 2
Calculating The Power Rating For R_{SENSE}

$$\text{RATING} = 2 * I^2_{LDMAX} * R_{SENSE}$$

WLD OPERATION, continued

3. CHOOSE OPERATING MODE - CONSTANT CURRENT OR CONSTANT POWER

A sliding switch selects operating mode. Do not move this switch while power is applied or you risk damaging your laser diode.

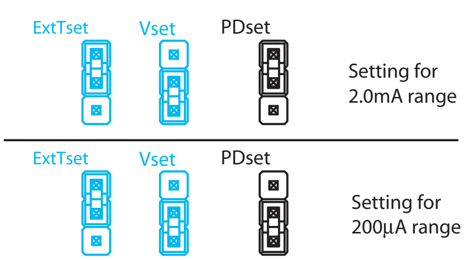
In Constant Current mode, LD VSet correlates directly to the laser diode current, regardless of laser diode power intensity. In Constant Power mode, the LDTC controls the laser diode using the photodiode to achieve a laser light intensity that is directly proportional to LD VSet.

Select the mode of operation for the LDTC with the power off by setting the sliding switch S2 in the CC position for Constant Current mode or the CP position for Constant Power mode.

4. SELECT THE MONITOR PHOTODIODE CURRENT RANGE- for Constant Power Operation

Select between two ranges on the LDTC2/2 board: 200µA or 2.0mA. A jumper (JP3) selects the range. Move this jumper only when power is not applied to VDD.

Figure 3
Select Photodiode Range



The transfer function of the Setpoint Voltage depends on this setting for Constant Power Operation. If you choose the wrong setting, you could overdrive your laser diode.

If you would prefer a different range, contact Wavelength.

5. POWER SUPPLY SELECTION

The VDD voltage supply input is common to both the WLD3343 and the WTC3243. This supply furnishes the voltage to the control electronics of the devices as well as the compliance voltage for the WLD3343 Laser Driver.

The supply should be capable of providing at least 3.0 Amps of current in applications that use a separate VS supply in the temperature control implementation. Temperature control applications that tie VDD and VS together require a VDD current capacity that equals the sum of the maximum TEC or Resistive Heater current, plus the maximum laser diode current, plus approximately 200 mA for the control electronics of the WTC3243 Temperature Controller and the WLD3343 Laser Driver. Using the maximum potential of the WLD and WTC will not require more than 6.0 Amps.

Performance of the laser driver is very dependent upon the performance of the power supply. The LDTC 2/2 does not provide any power supply filtering or noise suppression so a power supply that can provide the appropriate level of noise and ripple for the application at hand should be utilized.

Wavelength Electronics offers a selection of switching or linear power supplies in a range of output voltage and current capacities.

Online Safe Operating Area (SOA) calculators are available for the WLD3343. Calculate the maximum power dissipation of your design at http://www.teamwavelength.com/tools/calculator/soa/defaultld.htm **before applying power to the LDTC2/2.**

WLD OPERATION, continued

6.DISABLING THE OUTPUT CURRENT

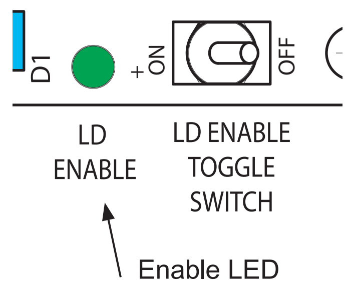
The output current can be enabled and disabled as shown in Figure 4 using the on-board toggle switch.

A remote voltage signal can be use to control the output status of the laser driver. Float or connect a zero volt signal to the “LD SHD” (pin 3 on Connector J2) to ENABLE output current to the laser diode. A voltage level greater than 3 V, but less than 5V, will DISABLE output current to the laser diode. This input was design for TTL inputs.

The LD SHD voltage overrides the setting of the on-board toggle switch.

NOTE:
Do not insert or remove the laser diode from the WLD3343 circuit with power applied to the unit.

Figure 4
Disabling Output Current



7. MONITOR LASER DIODE OR PHOTODIODE CURRENT

Equation 3 provides a transfer function for converting the voltage output of LD I M (Laser Diode Current Monitor - Pin 8 of Connector 2) to the amount of forward current flowing through the laser diode. Default R_{SENSE} is 0.4Ω, so

default $I_{LD} = V_{LD\,I\,M} / 0.8$

Equation 4 provides a transfer function for converting the voltage output of LD P M (Laser Diode Power Monitor - Pin 7 of Connector 2) to the amount of forward current flowing through the photodiode. R_{PD} varies with the Photodiode Current range:

R_{PD} = 499Ω for 2.0 mA range or
4.99kΩ for 200μA range

default $I_{PD} = V_{LD\,P\,M} / 499$ for 2.0mA range

or

default $I_{PD} = V_{LD\,P\,M} / 4990$ for 200μA range

Photodiode current can be monitored in Constant Current mode.

Equation 3
Laser Diode Forward Current Measurement

$$I_{LD} = \frac{V_{LD\,I\,M}}{2^*R_{SENSE}} \text{ [AMPS]}$$

Equation 4
Monitor Photodiode Current Measurement in Constant Current Mode

$$I_{PD} = \frac{V_{LD\,P\,M}}{R_{PD}} \text{ [AMPS]}$$

WLD OPERATION, continued

8. CONFIGURE THE LASER DIODE CURRENT LIMIT

The default configuration of the LDTC2/2 uses a trimpot to adjust the Current Limit from 0 to the maximum range set in Step 1- WLD Operation. This trimpot is labeled ILIM (vs. LIM A or LIM B for the temperature control limit current trimpots). Fully CCW sets the limit current to the max. It is recommended that a simulated laser diode load is used while limit current is set. Follow Step 7 to monitor Laser Diode Current. Adjust the trimpot until the appropriate voltage is measured.

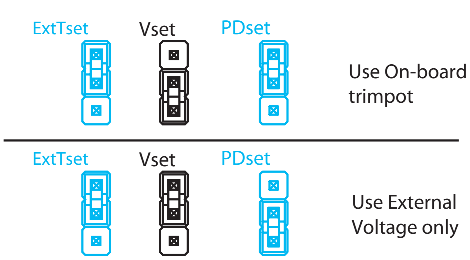
9. LASER DIODE SETPOINT AND MODULATION

The laser diode set point voltage determines the amount of current that is delivered to the laser. In Constant Current mode the set point is directly proportional to the laser diode current. In Constant Power mode the set point is directly proportional to the photodiode current, allowing for control of the optical power of the light emitted by the laser diode.

The set point voltage can be adjusted either by using the onboard ISET trim pot, by applying an external set point voltage, or by summing an external set point voltage with the set point voltage created by adjustment of the ISET trim pot. The sum of the external set point voltage and the voltage created with the onboard ISET trim pot can be from zero to 2.5 volts.

To use only the onboard ISET trim pot, place the VSET SOURCE jumper in the lower position (pins 2 and 3 on JP2), and do not connect an external voltage source to the R LD SET input. The ISET trim pot provides a Set Point adjustment of between zero to 2.5 V.

Figure 5
Laser Diode Setpoint Configuration



To use an external voltage source summed with the voltage supplied by the SET trim pot, place the VSET SOURCE jumper in the lower position (pins 2 and 3 on JP2). Connect the external voltage, or DAC output, to the R LD SET input (pin 5 on Connector 2). The final set point voltage will be the sum of the external voltage being supplied plus any Set Point voltage created with the onboard SET trim pot.

To use only an external voltage source for the Set Point voltage place the VSET SOURCE jumper in the upper position (pins 1 and 2 on JP2) and connect the external set point voltage via the R LD SET input. In this configuration, any voltage created by the onboard ISET trim pot will not be included in the final Set Point voltage which is applied to the laser driver.

Equation 5 illustrates the relationship between Set Point Voltage ($V_{R\ LD\ SET}$) and the current that will be applied to the laser diode according to the current range that has been configured for the driver using standard R_{SENSE} resistances.

$$I_{LD} = \frac{V_{R\ LD\ SET}}{2 * R_{SENSE}} \text{ [AMPS]}$$

R_{SENSE} default is 0.4Ω.

Equation 6 illustrates the relationship between Set Point voltage ($V_{R\ LD\ SET}$) and the resulting photodiode current while operating in Constant Power mode for the two standard photodiode ranges that can be configured on the LDTC 2/2.

$$I_{PD} = \frac{V_{R\ LDSET}}{2 * R_{PD}} \text{ [AMPS]}$$

R_{PD} = 499Ω for 2.0 mA range or
4.99kΩ for 200μA range

$I_{PD} = V_{R\ LDSET}$ / 1000 for 2.0mA range default

or

$I_{PD} = V_{R\ LDSET}$ / 10000 for 200μA range default

OPERATION NOTES:

Modulation caution - if operating with VDD at 12V, if you exceed 12V on R LD SET with the modulation signal for any duration, the WLD will be destroyed.

WARNING:
The LDTC 2/2 does not support laser diode packages that incorporate a built in sensor that is connected to or common with the laser case ground.

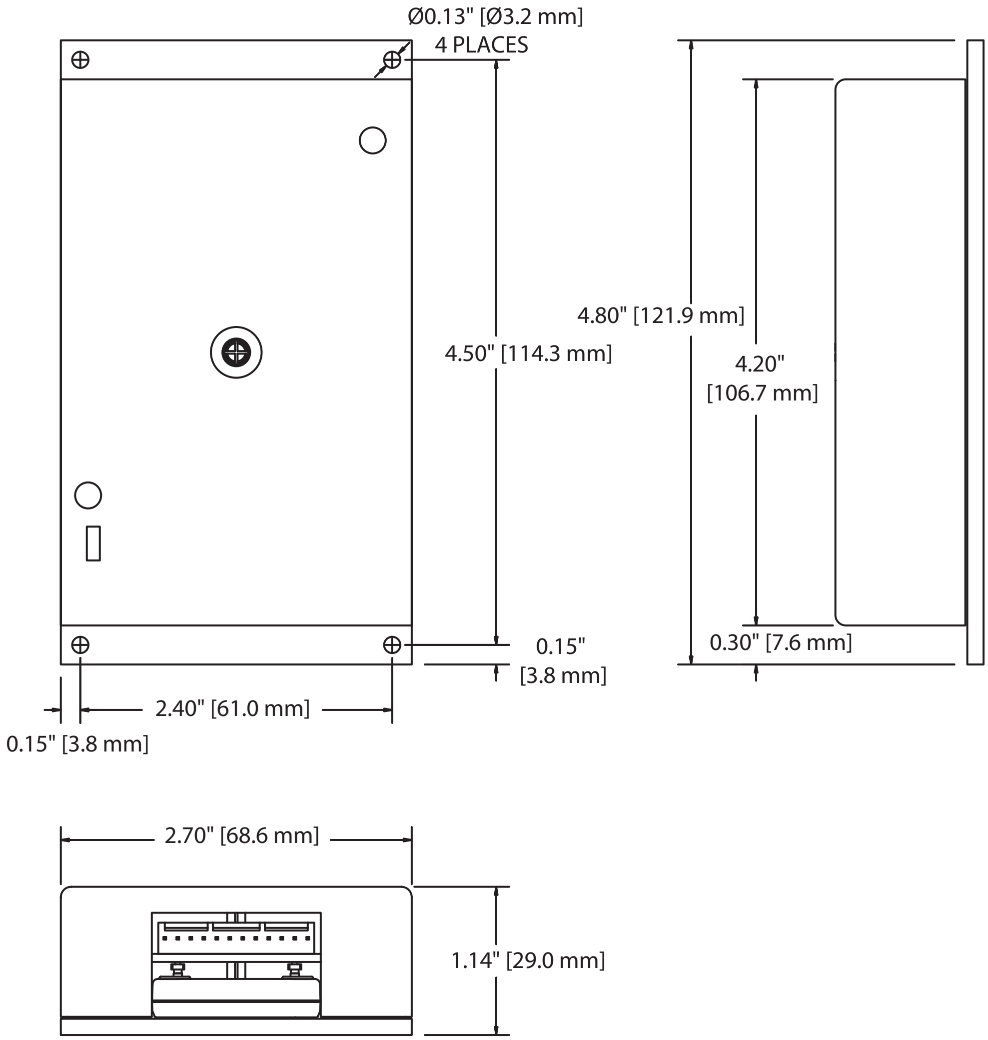
ORDERING INFORMATION:

LDTC2/2E	Comes with board, WLD, WTC, base plate, lid, cables
LDTC2/2O	Comes with board, WLD, WTC, standoffs & hardware, cables

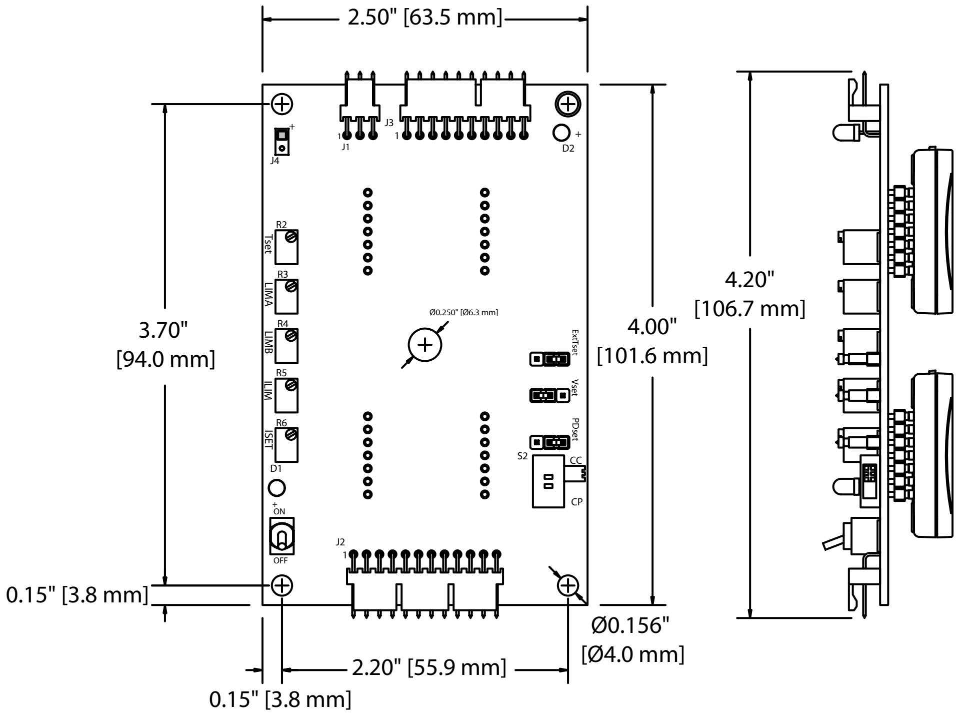
For easy heasinking of Open Frame Model:

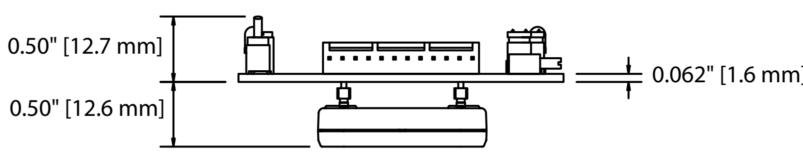
WEV-300	Standard WLD or WTC thermal washer and heatsink
WEV-301	Standard WLD or WTC thermal washer, heatsink, and 5V fan
WEV-302	Standard WLD or WTC thermal washer, heatsink, and 12V fan

MECHANICAL SPECIFICATIONS
- LDTC2/2 E - with enclosure

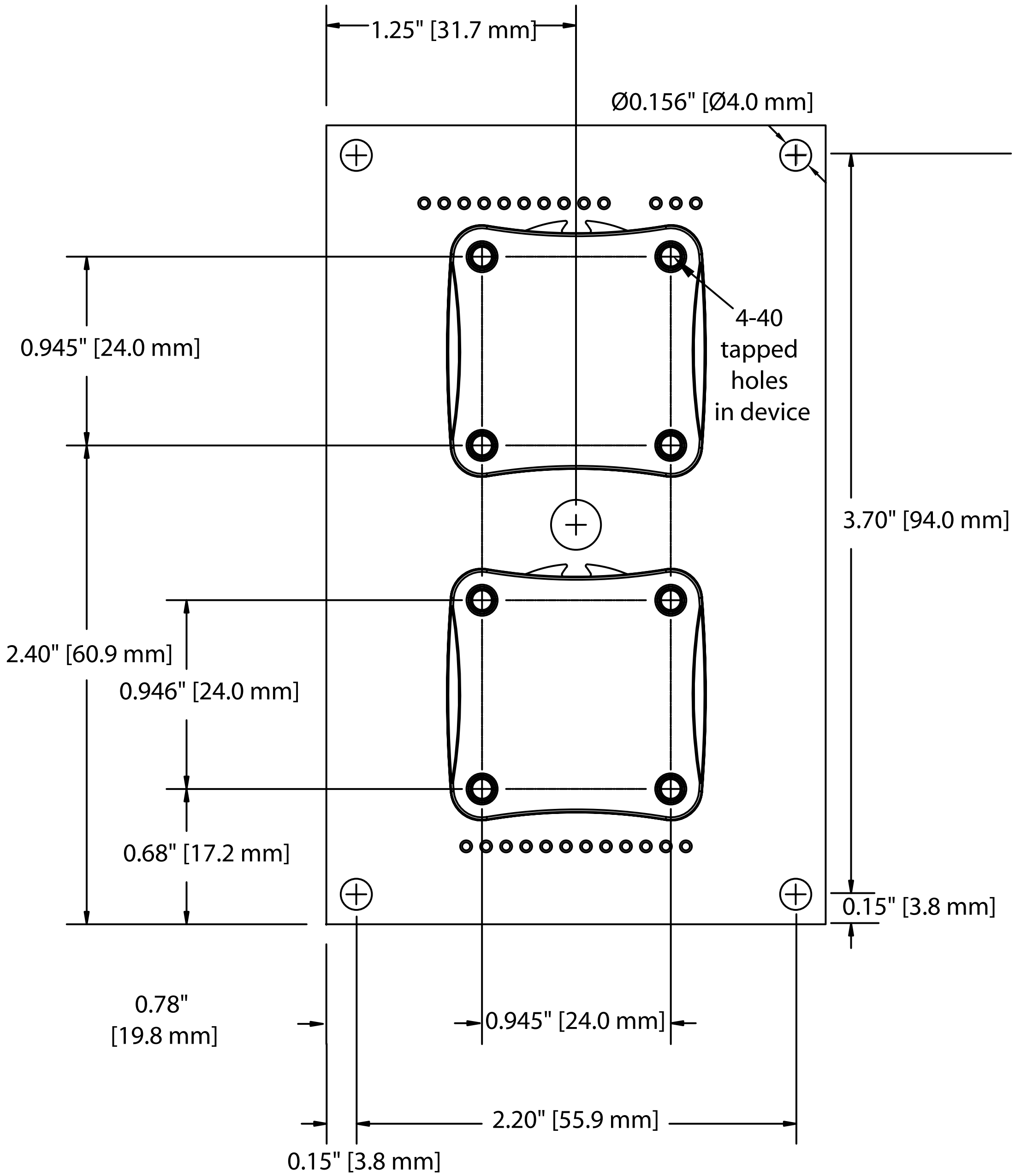


MECHANICAL SPECIFICATIONS
- LDTC2/2 O - Open Frame



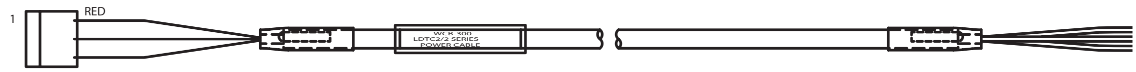


HEATSINK FOOTPRINT



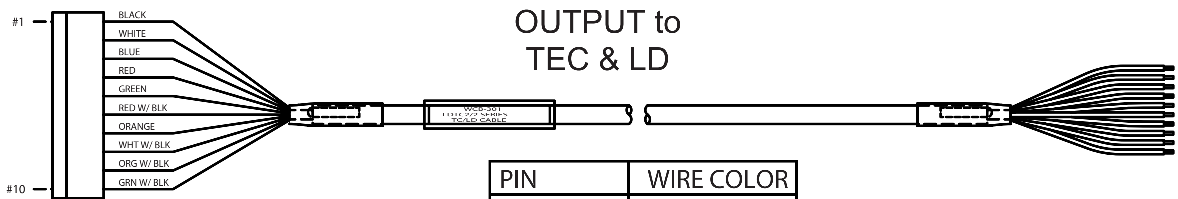
CABLE DIAGRAMS

Power



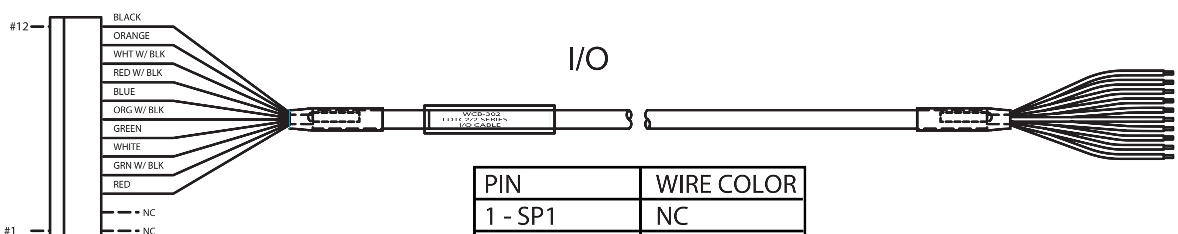
PIN	WIRE COLOR
1- VDD	RED
2 - VS	WHITE
3 - GND	BLACK

OUTPUT to TEC & LD



PIN	WIRE COLOR
1 - LDC	BLACK
2 - PDA	WHITE
3 - PDC	BLUE
4 - LDA	RED
5 - COM	GREEN
6 - TEC+	RED W/ BLK
7 - TEC-	ORANGE
8 - SEN+	WHT W/ BLK
9 - SEN-	ORG W/ BLK
10 - COM	GRN W/ BLK

I/O



PIN	WIRE COLOR
1 - SP1	NC
2 - SP2	NC
3 - LD SHD	RED
4 - COM	GRN W/ BLK
5 - R LDSET	WHITE
6 - COM	GREEN
7 - LD P M	ORG W/ BLK
8 - LD I M	BLUE
9 - ACT T M	RED W/ BLK
10 - SET T M	WHT W/ BLK
11 - R TCSET	ORANGE
12 - COM	BLACK

CERTIFICATION AND WARRANTY

CERTIFICATION:
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This Wavelength product is warranted against defects in materials and workmanship for a period of 90 days from date of shipment. During the warranty period, Wavelength will, at its option either repair or replace products which prove to be defective.

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WAVELENGTH ELECTRONICS, INC.
51 Evergreen Drive
Bozeman, Montana, 59715

phone: (406) 587-4910 Sales and Technical Support
(406) 587-4183 Accounting
fax: (406) 587-4911
e-mail: sales@teamwavelength.com
web: www.teamwavelength.com