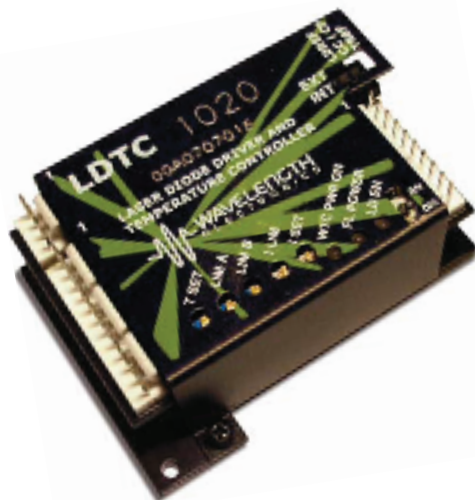


# DATASHEET AND OPERATING GUIDE

# LDTC0520/LDTC1020

## Laser Diode & Temperature Controllers



### FEATURES AND BENEFITS

- Small package size
- Single supply operation possible
- LD current range 500 mA or 1 A
- Compatible with Type A and B lasers
- Slow start laser diode protection
- Constant Current or Constant Power modes
- Adjustable laser diode current limit
- Brownout protection
- Drive up to  $\pm 2.2$  A of TEC current
- Internal or External setpoint control
- Failsafe setpoint default
- Ultra-stable PI control loop
- Separate Heat & Cool current limits

### PROVEN RELIABILITY SAVES YOU TIME AND MONEY

The LDTC Laser Diode and Temperature Controller combines the proprietary FL500 and ultra-stable WTC3243 in one compact and easy-to-use module. All the controls and indicators are onboard for simple plug-and-play operation.

### APPLICATIONS

LDTC modules are in use around the world providing trouble-free reliability in range finders, telecom laser modules, military-aerospace research and development, airborne metrology, academic research, laser diode LIV testers, and more.

### POWER YOUR APPLICATION WITH THE RIGHT FEATURES

The popular FL500 is known for trouble-free operation. The current limit circuit cleanly clamps laser diode current without ringing or overshoot, and recovers without inducing a phase shift in a modulated laser signal.

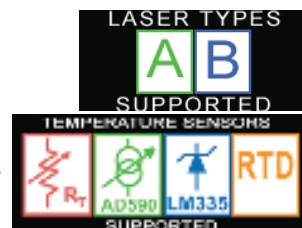
The WTC3243 ultra-stable temperature control module is known for precision and reliability. Independent cooling- and heating-current limits allow the LDTC to be used with thermoelectric coolers or resistive heaters, and either negative or positive temperature coefficient sensors.

### CONTENTS

	PAGE
QUICK CONNECT GUIDE	2
PIN DESCRIPTIONS	5
ELECTRICAL SPECIFICATIONS	7
SAFETY & THERMAL DESIGN CONSIDERATIONS	9
OPERATING INSTRUCTIONS -- TEMP CONTROLLER	10
OPERATING INSTRUCTIONS -- LASER DRIVER	15
ADDITIONAL TECHNICAL INFORMATION	17
TROUBLESHOOTING -- TEMP CONTROLLER	22
TROUBLESHOOTING -- LASER DRIVER	23
MECHANICAL SPECIFICATIONS	25
CERTIFICATION AND WARRANTY	26

### ORDERING INFORMATION

PART NO	DESCRIPTION
LDTC0520	500 mA LD / $\pm 2.2$ A TEC Controller
LDTC1020	1.0 A LD / $\pm 2.2$ A TEC Controller



## ELECTRICAL SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS	SYMBOL	LDTC0520	LDTC1020	UNIT	NOTE
LD Supply Voltage	$V_{DD\_FL}$	3 to 12		VDC	
TC Electronics Supply Voltage	$V_{DD\_WTC}$	4.5 to 12		VDC	
TC Load Supply Voltage	$V_S$	4.5 to 30		VDC	
Max LD Output Current	$I_{LD}$	505	1010	mA	
Max TC Output Current	$I_{TEC}$	$\pm 2.2$		A	
Laser Driver Internal Power Dissipation <sup>1</sup>	$P_{LD\_MAX}$	2	4	W	$T_{AMBIENT} = 25^{\circ}\text{C}$ <sup>1</sup>
Temp Controller Internal Power Dissipation	$P_{TC\_MAX}$	9		W	
Case Operating Temperature	$T_{OPR}$	-40 to 85		$^{\circ}\text{C}$	
Case Storage Temperature	$T_{STG}$	-55 to 125		$^{\circ}\text{C}$	
Weight		3.04	3.13	oz	86.2 g (LDTC0520) 88.7 g (LDTC1020)
Size		2.9 x 2.35 x 1.08		inches	73.6 x 59.7 x 27.3 mm

LASER DRIVER SPECIFICATIONS	SYMBOL	LDTC0520	LDTC1020	UNIT	NOTE
CONSTANT CURRENT CONTROL					
Short Term Stability, 1 hour		35 to 40		ppm	T <sub>AMBIENT</sub> = 25°C
Long Term Stability, 24 hours		50 to 75		ppm	T <sub>AMBIENT</sub> = 25°C
CONSTANT POWER CONTROL					
Short Term Stability, 1 hour		0.019		%	T <sub>AMBIENT</sub> = 25°C
Long Term Stability, 24 hours		0.011		%	T <sub>AMBIENT</sub> = 25°C
OUTPUT					
Peak Current	I <sub>MAX</sub>	495 to 505	990 to 1010	mA	
Compliance Voltage		V <sub>DD_FL</sub> - (0.5 * V <sub>EXT LD SET</sub> )		V	I <sub>MAX</sub> = 500 mA
Rise Time		300		nsec	I <sub>LD</sub> = 500 mA
Fall Time		300		nsec	I <sub>LD</sub> = 500 mA
Bandwidth, Constant Current <sup>2</sup>		500		kHz	Sinewave input signal
Delayed Start		100		msec	
Slow Start Ramp		15		mA / msec	
Depth of Modulation		99		%	100 kHz sinewave
POWER SUPPLY					
Power Supply Voltage	V <sub>DD_FL</sub>	3 to 12		V	
Quiescent Current, V <sub>DD_FL</sub>		2.2 to 4.6	4.4 to 9.2	mA	
EXT LD SET INPUT					
Input Impedance		5		kΩ	
Input Voltage Range	V <sub>EXT LD SET</sub>	0 to 2		V	
Damage Threshold		-0.3 > V <sub>EXT LD SET</sub> > V <sub>DD_FL</sub> + 0.3		V	
NOISE					
Noise and Ripple (RMS)		7.5	22	μA RMS	I <sub>LD</sub> = 100 mA; 100 kHz bandwidth
Leakage Current		1		mA	V <sub>EXT LD SET</sub> = 0 V, Output = ON
		0.2			V <sub>EXT LD SET</sub> = 0 V, Output = OFF
		0.3			V <sub>EXT LD SET</sub> = 2 V, Output = OFF

1. Derate laser driver internal power dissipation by 34 mW /  $^{\circ}\text{C}$  when operating above  $25^{\circ}\text{C}$ . For the LDTC1020 with dual FL500 chips, derating should be applied to both chips for a total of 68 mW /  $^{\circ}\text{C}$ .
2. Modulation bandwidth in Constant Power mode is dependent on photodiode bandwidth, and is typically lower than the bandwidth in Constant Current mode because of the frequency response of the photodiode.

## ELECTRICAL SPECIFICATIONS [CONTINUED]

TEMPERATURE CONTROLLER SPECIFICATIONS	MIN	TYP	MAX	UNIT	NOTE
OUTPUT CURRENT					
Max Output Current	±2.0		±2.2	A	
Compliance Voltage, TEC	V <sub>s</sub> - 0.7	V <sub>s</sub> - 0.5		V	Full Temp Range, I <sub>TEC</sub> = 100 mA
Compliance Voltage, TEC	V <sub>s</sub> - 1.2	V <sub>s</sub> - 1.0		V	Full Temp Range, I <sub>TEC</sub> = 1 A
Compliance Voltage, TEC	V <sub>s</sub> - 1.6	V <sub>s</sub> - 1.4		V	Full Temp Range, I <sub>TEC</sub> = 1.5 A
Compliance Voltage, TEC	V <sub>s</sub> - 1.8	V <sub>s</sub> - 1.6		V	Full Temp Range, I <sub>TEC</sub> = 2 A
Compliance Voltage, Resistive Heater	V <sub>s</sub> - 1.7	V <sub>s</sub> - 1.6		V	Full Temp Range, I <sub>TEC</sub> = 2 A
Short Term Stability, 1 hour <sup>1</sup>	0.001	0.002	0.010	°C	OFF ambient, 10 kΩ thermistor @ 25°C
Short Term Stability, 1 hour <sup>1</sup>		0.005		°C	ON ambient, 10 kΩ thermistor @ 25°C
Long Term Stability, 24 hours <sup>1</sup>	0.003	0.008	0.010	°C	OFF ambient, 10 kΩ thermistor @ 25°C
Quiescent Current, V <sub>s</sub>	20	50	100	mA	
POWER SUPPLY					
Power Supply Voltage, V <sub>DD_WTC</sub>	4.5		12	VDC	
Quiescent Current, V <sub>DD_WTC</sub>		55	105	mA	
Power Supply Voltage, V <sub>s</sub>	4.5		30	VDC	
TEMPERATURE SENSORS					
Sensor Compatibility	Thermistor, RTD, IC Sensors				
Sensor Input Voltage Range <sup>2</sup>	0.25 to (V <sub>DD_WTC</sub> – 2.0)			V	
Sensor Input Damage Threshold	3.6			V	
Sensor Bias Current Selection	Adjustable, 2 μA to 1 mA				
EXTERNAL SETPOINT AND MONITORS					
EXT T SET Input Impedance		1		MΩ	
EXT T SET Input Voltage Range	0 to 3.3			V	
EXT T SET Input Damage Threshold	0 to 3.6			V	
Setpoint vs. Actual Temperature Accuracy	0.1	2	4	mV	T <sub>SET</sub> = 25°C, 10 kΩ thermistor
FEEDBACK LOOP					
P (Proportional Gain)	18	20	22	A / V	
I (Integrator Time Constant)	2	3	4.5	sec	

<sup>1</sup>. When using resistive heaters, stability can only be consistently achieved when specified temperatures are 10°C or more above ambient.

<sup>2</sup>. The sensor bias source has a compliance up to ( $V_{DD\_WTC} - 2.0$  V). In normal operation this limits the sensor voltage range to (0.25 V to  $V_{DD\_WTC} - 2.0$  V). While voltages up to ±0.5 V outside this range on the EXT T SET pin will not damage the unit, the controller will not provide proper control under these conditions.

NOTE: Operation at  $V_S > 5$  V or  $V_{DD\_FL} > 5$  V requires evaluation of the SOA curves and current limit settings. Damage to the LDTC will occur if it is operated outside the Safe Operating Area (SOA). See our online SOA calculator for:

WTC3243 at <http://www.teamwavelength.com/support/calculator/soa/soatc.php>

FL500 at <http://www.teamwavelength.com/support/calculator/soa/soald.php>.