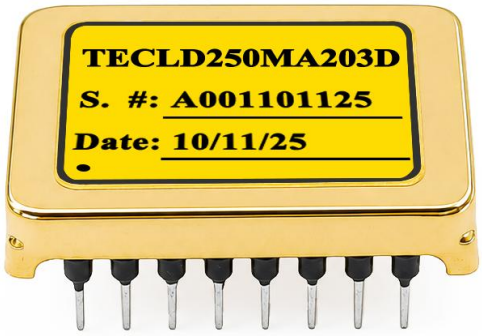

Figure 1.1. Top View of TECLD250MA203D

Figure 1.2. 3D View of TECLD250MA203D

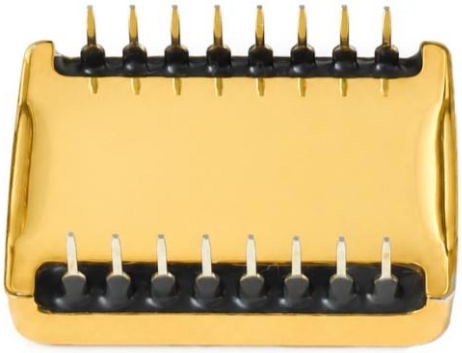

Figure 1.3. Bottom View of TECLD250MA203D

Figure 1.4. Side View of TECLD250MA203D

GENERAL FEATURES

- Combining TEC and Laser Controls in one Unit
- Configure and Read back All Analog Parameters through a Digital Port
- Configurable One Input Setting and One Output Monitoring Port for Analog Signals
- Controller Temperature Monitoring
- Compact Size and Simple Pin Out
- Complete Shielding
- 100 % lead (Pb)-free and RoHS compliant

TEC CONTROL FEATURES

- Auto PID Compensation Network
- High Efficiency: ≥90%
- Maximum Output Current Range: ±3.5A
- Maximum Voltage Range: $-V_{VPS}$ ~ V_{VPS} – 0.3V
- Temperature Stability: ±0.001°C
- Real Time Monitoring on TEC Current, Voltage & Target Object Temperature

LASER CONTROL FEATURES

- Low Noise: 1.6μA_{P-P} @ 0.1Hz ~ 10Hz
- Maximum Output Current w/o Heat Sink: 500mA
- Maximum Output Voltage: V_{VPS} – 1V
- High Absolute Accuracy: <0.1%
- High Stability: <±100ppm/°C
- Maximum Full Power Bandwidth: 1MHz
- Programmable Current Limit

DESCRIPTION

The TECLD500MA203D combines a high efficiency TEC controller and a low noise laser driver into one compact module without sacrificing the performance of each one. All the input analog parameters can be set, and the output analog signals can be read, by a digital port. Thus, the 2 pin digital port has saved numerous dedicated analog port pins as found in many conventional analog modules.

The TEC controller comes an auto PID compensation network, it saves the effort to tune the network for matching the thermal load, saves the cost and space for implementing the analog compensation network, and allows retuning the compensation network parameters for matching a different new thermal load. These analog parameters can be programmed through the digital port: Set-point temperature range, Set-point temperature,

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maximum cooling current, and maximum heating current. One of these parameters can be chosen and set by the analog input port, AI pin. These output parameters can be monitored by through the digital port: actual target object temperature, TEC current, TEC voltage, and TEC loop status. One of them can be chosen to be monitored directly through the analog output port, AO pin.

The laser controller features a linear mode low noise high speed laser driver. To protect the laser diode, it comes with a programmable current limit. Thus, in case the laser current setting pin exceeds the maximum current allowed by the laser diode, the current limit loop takes over the control and cap the current within the safe limit. These 2 analog input parameters can be set through the digital port. One of them can be chosen to be set directly through the analog port, AI pin. The actual laser's current and control loop status can be monitored by the digital port. The laser current be chosen to be monitored in real time through the analog output port, AO pin.

The controller has an control pin, it sets the controller to these modes: Shutdown, Standby, On, and PID Auto Tuning.

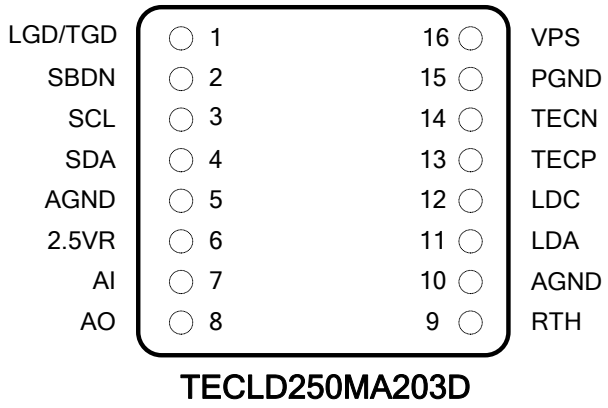

Figure 2. Pin Names and Locations

Warning: The through hole type of modules can only be soldered manually on the board by a solder iron of < 310ºC (590ºF), not go through a reflow oven process.

SPECIFICATIONS

Table 1. Pin Function Descriptions

Pin #	Name	Type	Description
1	**LGD/TGD**	Digital output	Temperature good indication or Loop Good indication.
2	**SBDN**	Digital input	Shut down control. Negative logic, at the internal chip control input: >1.4V = enable, <0.95V = shut down, normal threshold voltage = 1.2V.
3	**SCL**	Serial clock input	Serial Clock Input. Data is shifted into the SDA pin on the rising edges of SCL and output through the SDA pin on the falling edges of SCL.
4	**SDA**	Serial data input	Serial data input and output.
5	**AGND**	Ground	Signal ground pin. Connect ADC and DAC grounds to here.
6	**2.5VR**	Analog output	Reference voltage. It can source 3mA max, with 1.2μVp-p noise @ 0.1 to 10Hz and 20ppm/°C stability max.
7	**AI**	Analog input	An external control voltage, instead of the internal DAC, can be used to set the desired LD output current, TEC current limit, TEC voltage limit, TEC temperature . The set point can be monitored in real time.
8	**AO**	Analog output	Analog signals can be buffered out this pin by sending commands through the digital serial interface. Output values(LD voltage, LD current, TEC temperature, TEC voltage, TEC current) can be monitored in real time.

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9	**RTH**	Analog input	Connect to the thermistor for sensing the desired object temp. Thermistor's other end connects to the signal ground, pin 4 or pin 10. RRTH = 10kΩ @ 25°C. Other thermistors or temperature sensors can also be used, consult with us.
10	**GND**	Ground	Signal ground, internally connected to Pin 5 GND. Can be used for connecting the thermistor.
11	**LDA**	Analog output	Laser diode anode. Connect it to the anode of the laser diode.
12	**LDC**	Analog output	Laser diode cathode. Connect it to the cathode of the laser diode.
13	**TECP**	Analog power output	Connects to TEC positive terminal.
14	**TECN**	Analog power output	Connects to TEC negative terminal.
15	**PGND**	Power ground	Power ground for connecting to the power supply.
16	**VPS**	Power input	Positive power supply rail. The value is 5V.

Table 1. Electrical characteristics.

Symbol	Parameter	Min	Max	Units
f_{SCL}	Clock Frequency, SCL		400	kHz
t_{LOW}	Clock Pulse Width Low	1.2		µs
t_{HIGH}	Clock Pulse Width High	0.6		µs
t_{AA}	Clock Low to Data Out Valid	0.1	0.9	µs
t_{BUF}	Time the bus must be free before a new transmission can start(2)	1.2		µs
$t_{HD.STA}$	Start Hold Time	0.6		µs
$t_{SU.STA}$	Start Set-up Time	0.6		µs
$t_{HD.DAT}$	Data In Hold Time	0		µs
$t_{SU.DAT}$	Data In Set-up Time	100		ns
t_R	Inputs Rise Time		300	ns
t_F	Inputs Fall Time		300	ns
$t_{SU.STO}$	Stop Set-up Time	0.6		µs
t_{DH}	Data Out Hold Time	50		ns

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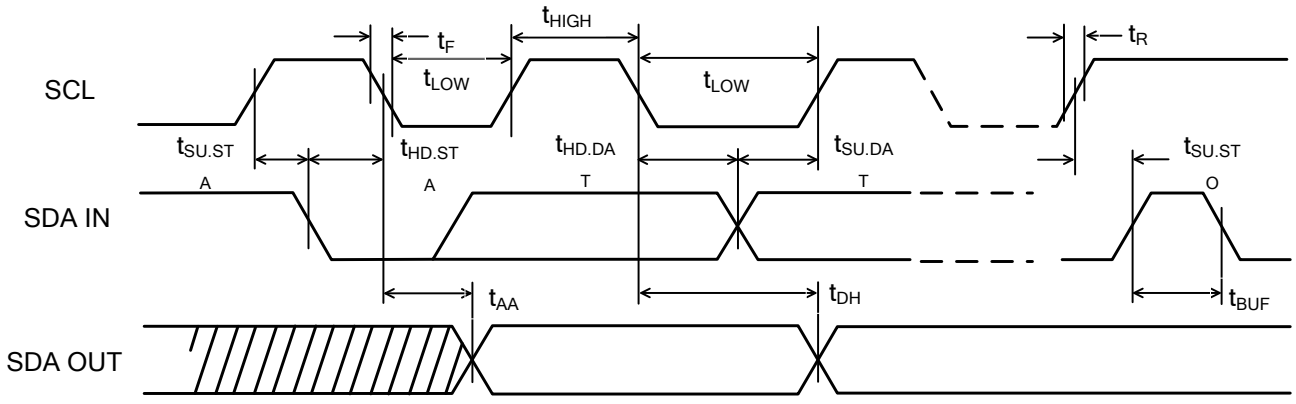

Figure 3. SCL: Serial Clock, SDA: Serial Data I/O

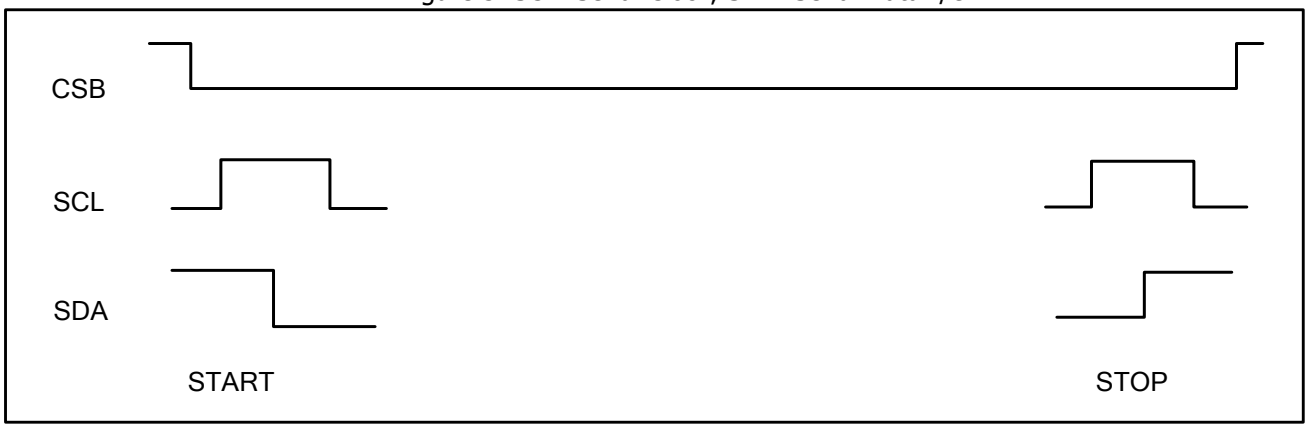

Figure. 4

Table. 3

START	DECICE ADDRESS	R/W	ACK	REDA DATA WRITE DATA	STOP
	0000000 or 1000000			00000000	

Table 4. REGISTER MAP command

REGISTER	DESCRIPTION	R/W	SIZE	ADDR	DEFAULT VALUE
AI	Device control	R/W	7	0x00	0x0
AO	Device operation summary	R/W	7	0x80	0x80

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Table 5. AI REGISTER

BITS	SYMBOL	DESCRIPTION
B[0]	LIS	Laser current set. 0V to 2.5V sets the laser current from 0 to 250mA linearly.
B[1]	TMS	Object set-point temperature input port. It is internally tied by a 500k resistor to the half value of the reference voltage, 1.25V. The open circuit voltage of this pin is thus 1.25V, corresponding to a set-point temperature of 25°C by using the default temperature network (with the set-point temperature range being from 15°C to 35°C).
B[2]	ILMC	TEC cooling limits
B[3]	ILMH	TEC heating limits
B[4]	VLM	TEC voltage limits
B[5]	NC	
B[6]	NC	
B[7]	NC	

Table 6. AO REGISTER

BITS	SYMBOL	DESCRIPTION
B[0]	LIO	Laser current output indication. 0V to 2.5V indicates the laser current from 0A to 250mA linearly.
B[1]	LDA	Laser diode anode. Connect it to the anode of the laser diode. This pin is used to drive a laser of which the cathode is connected to the case and the case is connected to the ground.
B[2]	TMO	Actual object temperature. 0.1V to 2.5V indicates the default temperature network from 15°C to 35°C.
B[3]	VTEC	TEC Voltage Output.
B[4]	ITEC	TEC Current Output.
B[5]	CTMO	The driver internal temperature indication output.
B[5]	NC	
B[6]	NC	
B[7]	NC	

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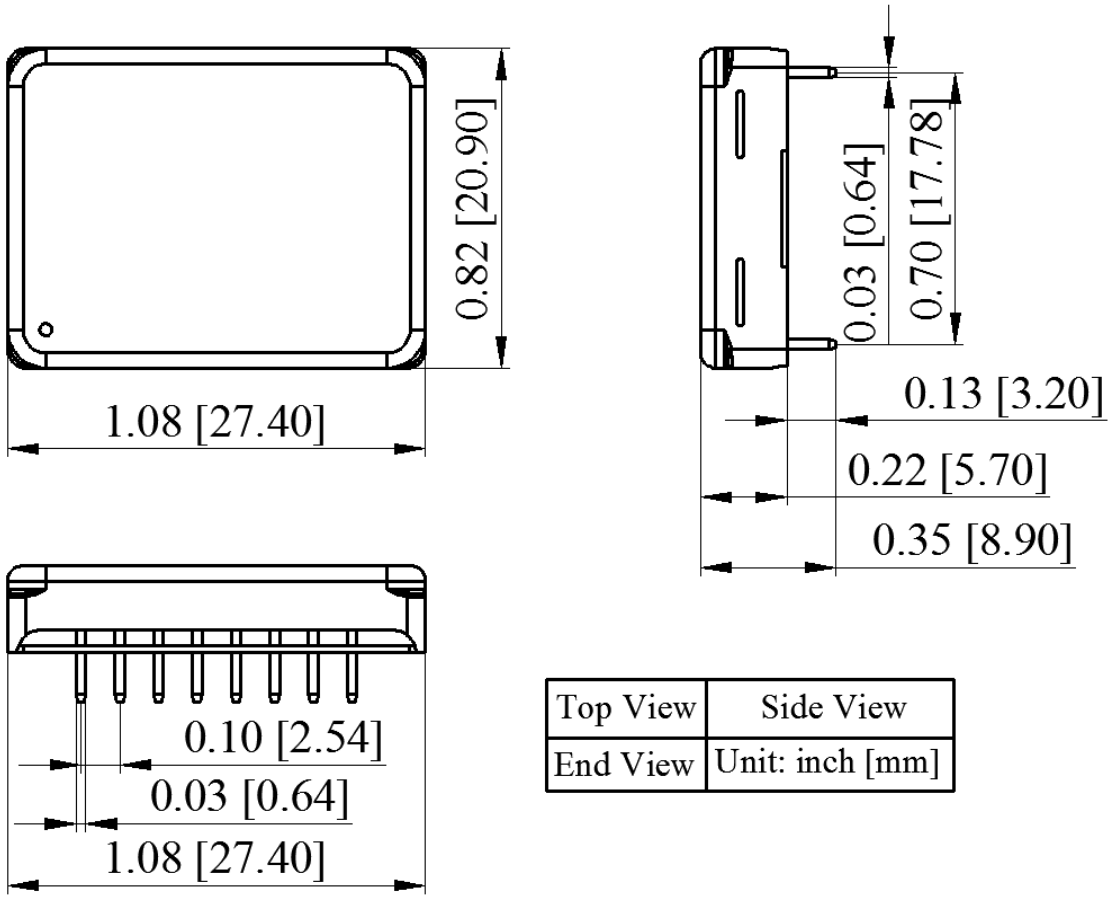
MECHANICAL DIMENSIONS



Top View	Side View
End View	Unit: inch [mm]

Figure. 5 Dimensions

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