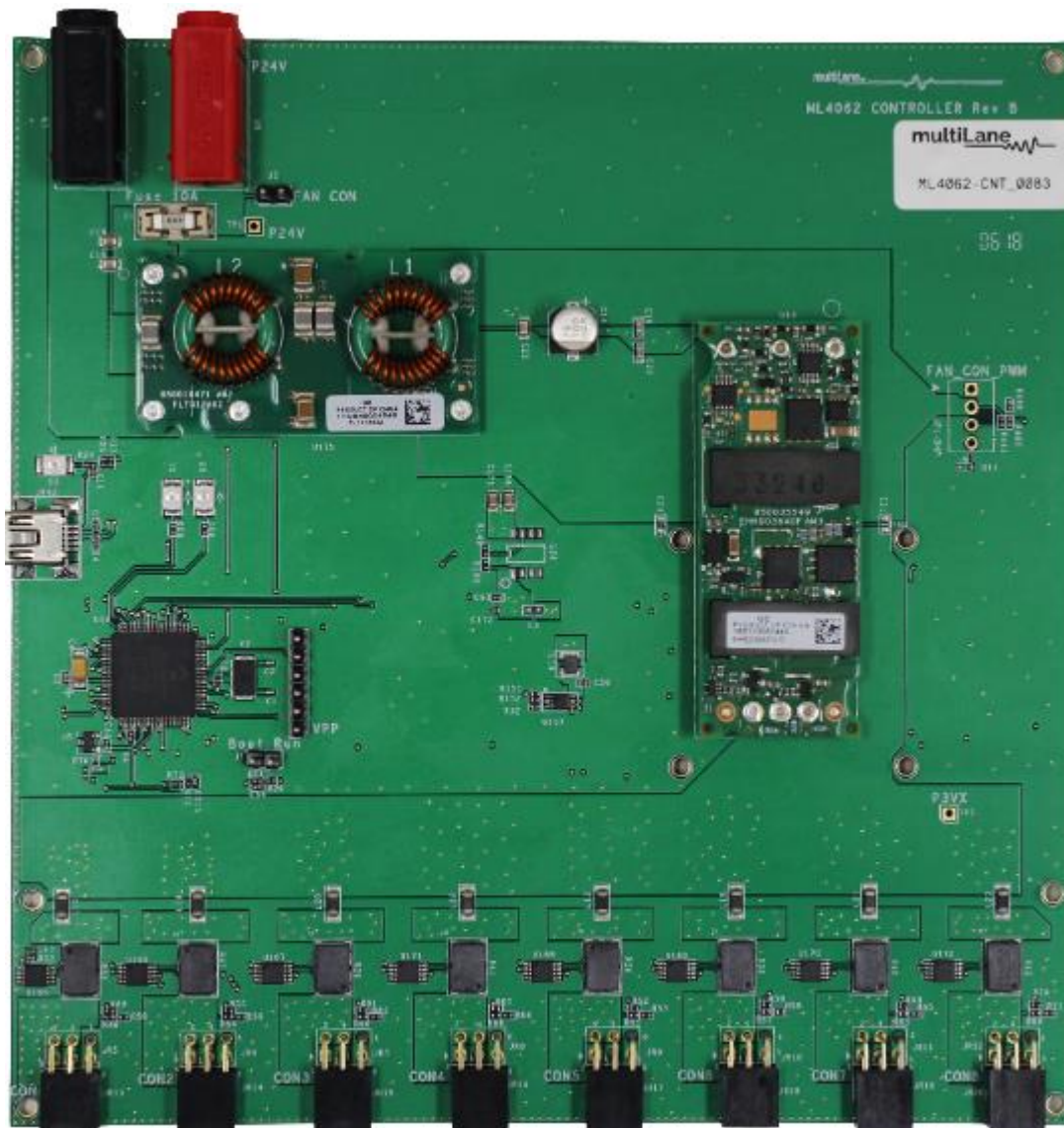


# ML4062-CNT-Gen2

## User Manual

Rev0.1



## Contents

1. Operating Conditions.....	3
2. Connection Tab .....	3
3. Configuration Tab.....	3
4. Monitoring Tab.....	4
5. I2C R/W Tab .....	5
6. EEPROM Tab .....	5
7. ML4062-TL2a-CON Features .....	6
7.1 General Description .....	6
7.2 Temperature Monitor .....	6
7.3 Voltage Sense .....	7
7.4 Current Sense .....	7
7.5 Programmable Power Dissipation and Thermal Emulation .....	7
7.6 Cut-OFF Temperature .....	8

## 1. Operating Conditions

The ML4062-CNT-Gen2 is powered up using 36V inputs minimum through banana plugs U6, U7.

Parameter	Min	Typical	Unit
V input	36	48	V

The ML4062-CNT-Gen2 has 8 ports, allowing to communicate with and configure 8 modules simultaneously. The ML4062-CNT-Gen2 allows to dissipate **19W/Port maximum**, for a total of 150W.

## 2. Connection Tab

The communication between the Controller board and the PC is established through a USB cable.

The **USB Instance** dropdown list is used to select the desired host if you have many controllers connected to your PC. Under **Module Type** select the module ML4062-TL2a. **Initialize** button is used to establish the connection.

The **Module Index** indicates the module that needs to be configured.

## 3. Configuration Tab

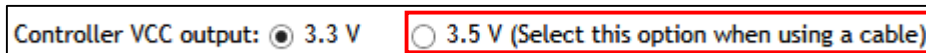
The **Configuration** tab is used to configure the power spots for each module independently, based on the selected module in the index drop down list.

The buttons are used to illustrate the power spots distribution, and enable the corresponding power spot.

The Top spots are static power spots and could be turned ON or OFF, while the Bottom spots are PWM controlled. When spot is enabled, the button turns Red. By clicking on a PWM controlled spot, a slider opens to select the power rate from 0 to 100%. The value takes effect after clicking enter.

The different shapes are used to show different power values for each spot, as shown in the legend at the left.

User can also control the module input voltage supply. Selecting 3.5V option when cable is used will compensate the voltage drop at the module input.

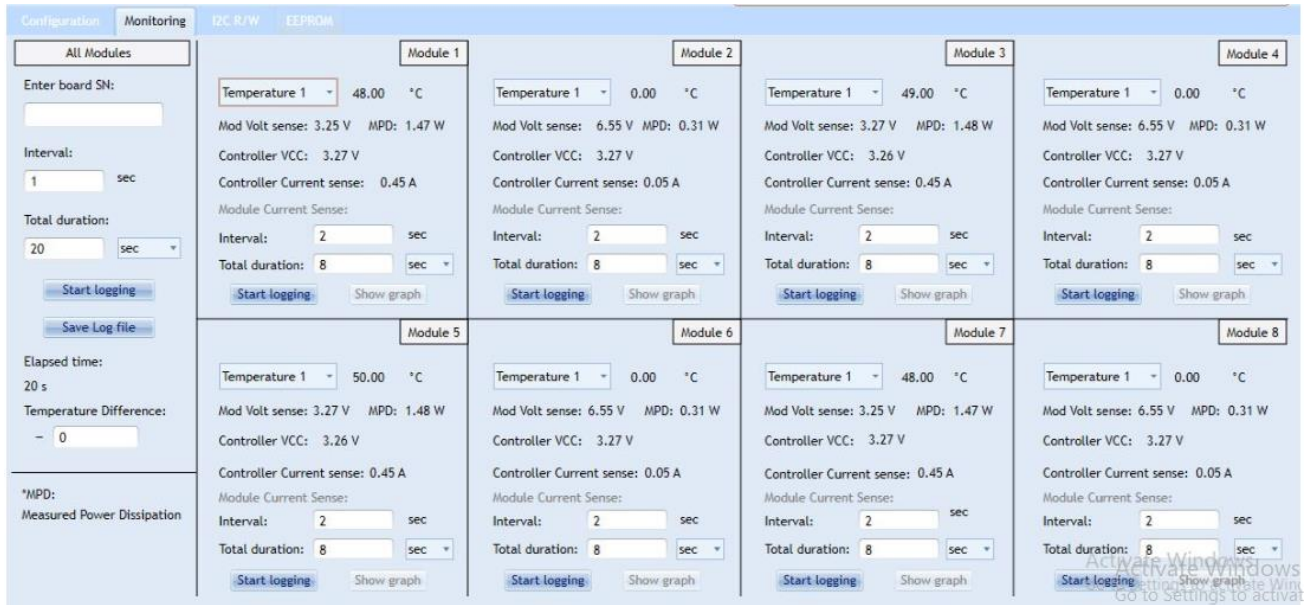


## 4. Monitoring Tab

This tab displays the temperature values, the module voltage sense, the controller VCC, the module current sense, the controller current sense, and the module power dissipation.

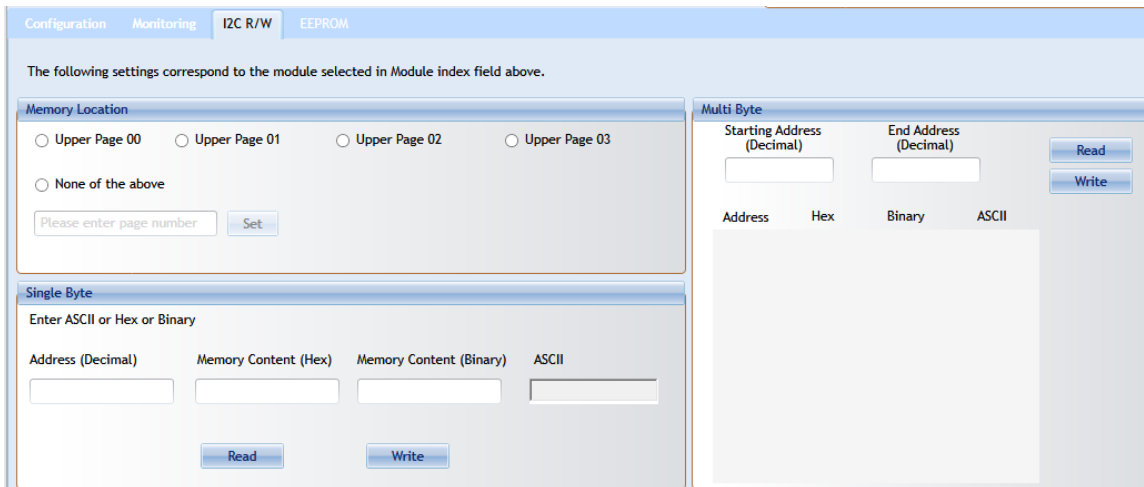
Below is a brief description of these monitoring parameters:

- **Mod Volt Sense:** Voltage measured by the internal voltage sense of the module.
- **Controller VCC:** Measured voltage on the controller.
- **Controller Current Sense:** Module current consumption measured by the controller current sense.
- **Module Current Sense:** Module current consumption measured by the internal module current sense.
- **MPD:** Measured power dissipation (**Mod Volt sense \* Module current sense**).
- **Temperature:** The temperature values are read from the internal temperature sensors of the module. User can select from the drop down list one of the four temperature sensors present in the module.



## 5. I2C R/W Tab

From this tab, user can read and write specific registers from the selected page in the memory map, which provides full access to all registers present in the memory.



## 6. EEPROM Tab

This tab allows the user to Load or Save custom MSA configuration.

- **Refresh Page:** Read MSA Registers, and refresh values.
- **Save MSA to file:** Save the current MSA memory to a file using Comma separated values (CSV) format.
- **Write MSA to HW:** Write the loaded MSA configuration to the module.
- **Load MSA from file:** Load MSA from file and map it to MSA memory.

Configuration Monitoring I2C R/W EEPROM					
Refresh Page Save MSA to file Write MSA to HW Load MSA from file					
	Address	Data(Hex)	Data(Dec.)	Data(Ascii)	MSA Description
▶	LowMem 0(00h)	0	0	0	Identifier
	LowMem 1(01h)	0	0	0	Revision Compliance
	LowMem 2(02h)	0	0	0	CLEI code present
	LowMem 3(03h)	0	0	0	Module State
	LowMem 4(04h)	0	0	0	Bank 0 flag summary
	LowMem 5(05h)	0	0	0	Bank 1 flag summary
	LowMem 6(06h)	0	0	0	Bank 2 flag summary
	LowMem 7(07h)	0	0	0	Bank 3 flag summary
	LowMem 8(08h)	0	0	0	Data Path/Module firmware fault and Module State changed flag
	LowMem 9(09h)	0	0	0	Latched VCC3.3/Temp Alarm and Warning
	LowMem 10(0Ah)	0	0	0	Latched AUX1/2 Alarm and Warning
	LowMem 11(0Bh)	0	0	0	Latched Vendor Defined/AUX3 Alarm and Warning
	LowMem 12(0Ch)	0	0	0	Reserved
	LowMem 13(0Dh)	0	0	0	Custom
	LowMem 14(0Eh)	0	0	0	Internally measured Temperature 1 MSB

## 7. ML4062-TL2a-CON Features

In the subsequent paragraphs, a description of main ML4062-TL2a-CON features is present.

### 7.1 General Description

The ML4062-TL2a-CON module is connected to the controller board using the **ML4062-CNT-CBL-G2**. This cable provides the connectors mating between the module and the controller, power for the module and allows I2C communication with the controller board.

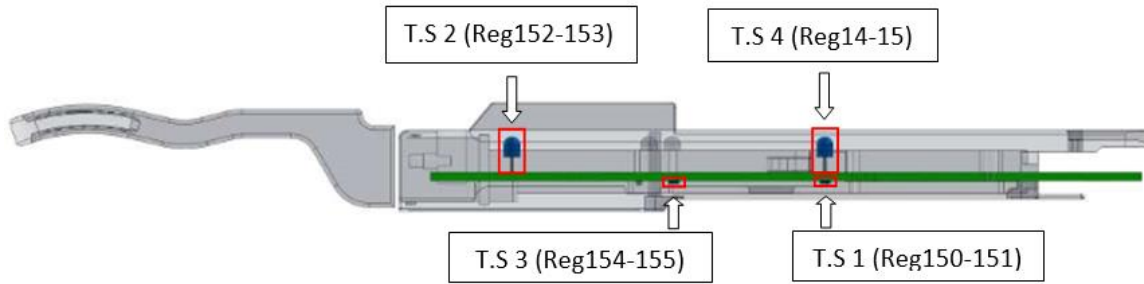
The module is always running in ModuleReady state on power up. User can force the module to run in ModuleLowPwr state, through register 26 bit 4 (ForceLowPwr) only. When this bit is set, the module is in low power mode, and all power spots are disabled. In order to re-activate power spots this bit should be cleared.

### 7.2 Temperature Monitor

The ML4062-TL2a-CON has 4 internal temperature sensors, two on the PCBA and two on the shell in order to continuously monitor the module temperature. Internally measured Module temperature are represented as a 16-bit signed two's complement value in increments of 1/256 degrees Celsius, yielding a total range of -127C to +128C that is considered valid between -40 and +125C.

Address	Bit	Name	Description	Type
<b>14 Lower page</b>	All	Temperature MSB	Internally measured TempSense4 (shell T.S.)	RO
<b>15 Lower page</b>	All	Temperature LSB	Internally measured TempSense4 (shell T.S.)	
<b>150 Page 03</b>	All	Temperature MSB	Internally measured TempSense1 (PCB Bottom)	
<b>151 Page 03</b>	All	Temperature LSB	Internally measured TempSense1 (PCB Bottom)	
<b>152 Page 03</b>	All	Temperature MSB	Internally measured TempSense2 (shell T.S.)	
<b>153 Page 03</b>	All	Temperature LSB	Internally measured TempSense2 (shell T.S.)	
<b>154 Page 03</b>	All	Temperature MSB	Internally measured TempSense3 (PCB Bottom)	
<b>155 Page 03</b>	All	Temperature LSB	Internally measured TempSense3 (PCB Bottom)	

The distribution of internal temperature sensors is shown in the figure below.



### 7.3 Voltage Sense

A voltage sense circuit is available in the ML4062-TL2a-CON that allows to measure the internal module supplied voltage  $V_{cc}$ , with LSB unit is 0.1 mV.

Address	Bit	Name	Description	Type
16	All	Supply voltage MSB	Internally measured supply voltage	RO
17	All	Supply voltage LSB	Internally measured supply voltage	

### 7.4 Current Sense

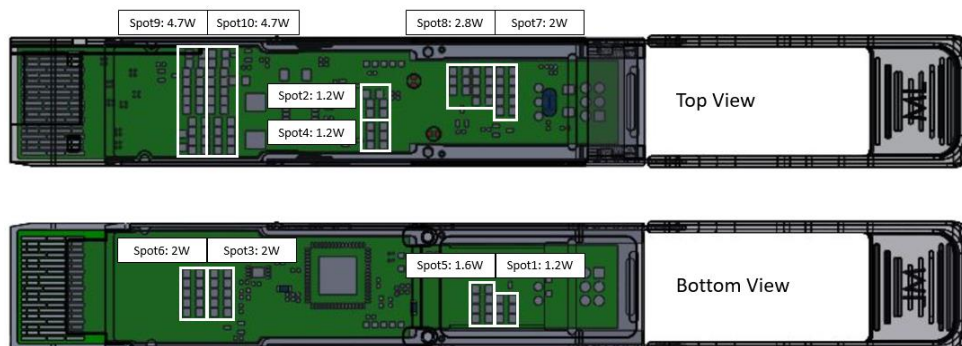
A current sense circuit is available in the ML4062-TL2a-CON that allows monitoring the current consumption of the heaters that are distributed over ten power spots. The current sense is able to measure up to 6.665 Amps. Current is stored in low memory registers 24 and 25.

Note that the Max current consumption of the module is 7.1Amps, but the current sense can read only up to 6.665Amps.

Address	Bit	Name	Description	Type
24	All	Current Consumption MSB	Current consumption in mA	RO
25	All	Current Consumption LSB		

### 7.5 Programmable Power Dissipation and Thermal Emulation

The ML4062-TL2a-CON module contains ten thermal spots positioned as shown in the figure below, to allow the user to emulate the thermal behavior of an optical module.



Where some of these spots are PWM controlled, others are ON/OFF controlled. The table below shows control type for each of these thermal spots.

Power Spot number	Control Type
1-3-5-6	PWM
2-4-7-8-9-10	ON/OFF

Registers 135, 136, 137, 138 and 140, page 03h are used to control thermal spots over I2C. They are 8 bits data wide registers.

The consumed power changes accordingly when the values of these registers are changed (only in high power mode). In Low power mode the module automatically turns off all power spots. The values written in these registers are permanently stored.

The control registers of the thermal spots are shown in the table below:

Power Spot	Register	Bit	Power consumption	Control Type	Memory Type
1	135	7:0	1.2 W	PWM	RW (NVR)
2	140	0	1.2 W	ON/OFF	
3	136	7:0	2 W	PWM	
4	140	1	1.2 W	ON/OFF	
5	137	7:0	1.6 W	PWM	
6	138	7:0	2 W	PWM	
7	140	2	2 W	ON/OFF	
8	140	3	2.8 W	ON/OFF	
9	140	4	4.7 W	ON/OFF	
10	140	5	4.7 W	ON/OFF	

## 7.6 Cut-Off Temperature

To avoid overheating the module, a Cut-Off Temperature is pre-defined.

The module is continuously monitoring the temperature and checking its value against the Cut-Off temperature. Once the module temperature reaches the cut-off temperature, all power spots will automatically turn off in order to prevent overheating. Once the temperature is 5 degrees below cut-off value, the PWM goes back to its previous value.

The maximum Cut-Off temperature for the ML4062-TL2a is 100°C and it can be programmed to any value from register 134 of memory page 3. Its default value is 100°C.



### Revision History

Revision number	Date	Description
0.1	3/3/2020	▪ Preliminary