ML4024
Technical Reference

MSA Compliant SFP MCB
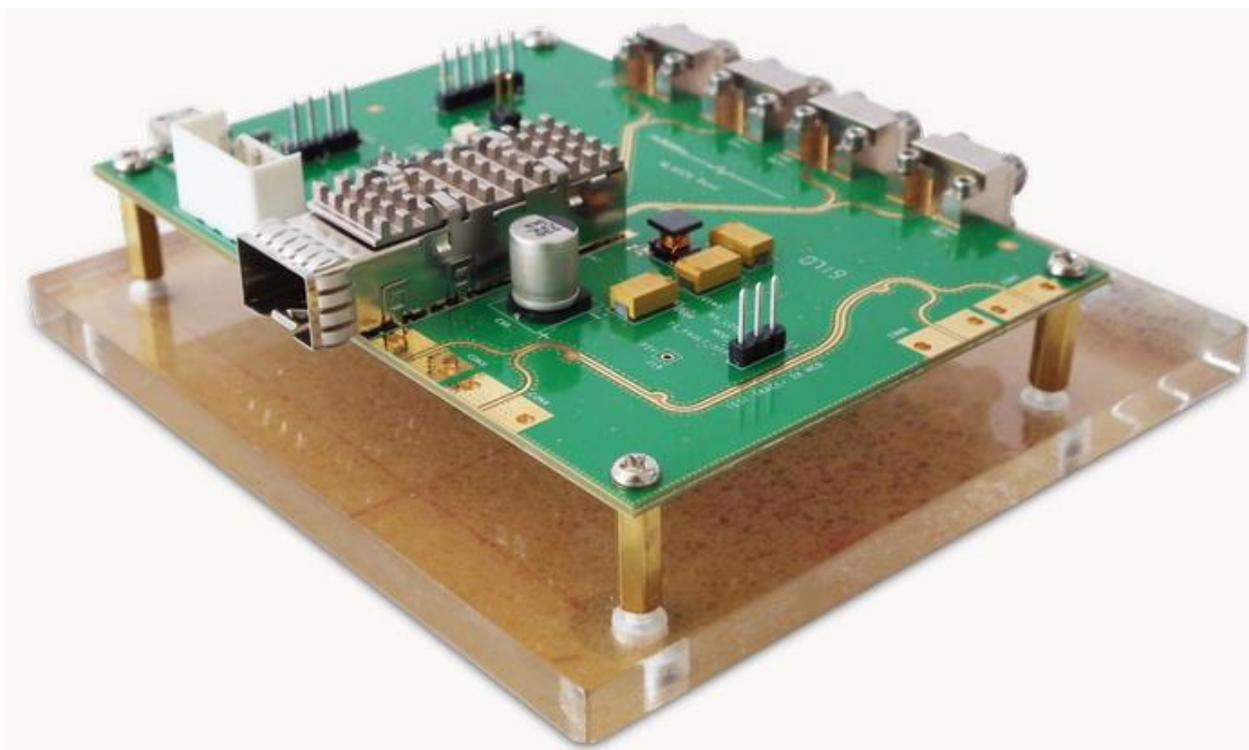
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Innovation for the next generation

1.   Introduction

The ML4024 is designed to provide an efficient and easy method of programming and testing 28G SFP transceivers and active optical cables. It includes a complete user-friendly GUI supporting all features defined by SFP MSA and simplifying configuration processes to enable intuitive memory map programming and testing. It is designed to simulate an ideal environment for SFP transceivers module testing, characterization and manufacturing.

2.   Key Features

- ✓ Supports 1x28G interface
- ✓ High performance signal integrity traces
- ✓ 2.92mm 40GHz edge launch connectors
- ✓ Matched differential trace length
- ✓ I2C master driven from both on board microcontroller or external pin headers
- ✓ Current Sense
- ✓ On-board pin headers for MSA input control signals
- ✓ User friendly GUI for I2C R/W commands and loading custom MSA memory maps
- ✓ Four corner testing capability
- ✓ USB interface

3.   ML4024 Hardware

The subsequent sections cover the essential parts in the hardware, for board operation and testing.

3.1 Power-Up

To power up the ML4024 host, steps are as follow:

- The host TOP is where the cage is mounted
- Two options are available to power up the board, through power connector J43:
  - ➢ Using dual supply, 5V AND 3.3V taking into account pins distribution, where SMD jumper R5 must be populated
  - ➢ Using single supply that should be connected to 3.3V Pin, where SMD jumper R3 must be populated
- Connect the host to your PC using a Type-B mini to Type-A USB cable.

3.2 Operating Conditions

According to the powering method described in section 3.1, the input voltage supply must follow the table below.

Parameter	Symbol	Condition	Min	Typical	Max	Unit
+5	P5V	Supply from J2 (P5V pin)	-	5	-	V
+3.3	P3V3	Supply from J2 (P3V3 Pin) OR banana plug U8	3.0	3.3	3.6	

Table 1: Voltage Operating Conditions

3.3 LED Indicators

The ML4024 includes on-board LEDs, for quick debugging and monitoring purposes. LEDs are summarized below:

- LED D1 indicates whether a USB cable is plugged or not.
- LEDs D2 and D4, colored green and red, respectively, are used for diagnostic purposes:
  - ✓ If D2 is on: USB is locked and device is recognized by the USB driver
  - ✓ If D4 is on: USB is not connected or USB driver is not found
  - ✓ If both are off: board is not powered correctly or firmware is corrupted
  - ✓ If both are blinking: the board is in Bootloader mode
- Led D8: RX_LOS_SFP+ signal monitoring
- Led D10: Mod_Abs signal monitoring
- LED D11: Tx_Fault_SFP+ signal monitoring

3.4 Low Speed Signals

3.4.1 External I2C

The I2C bus can be accessed externally using U152 pins. In this case a jumper should be placed on pin header j2 (HW_I2C) shown in the image below.
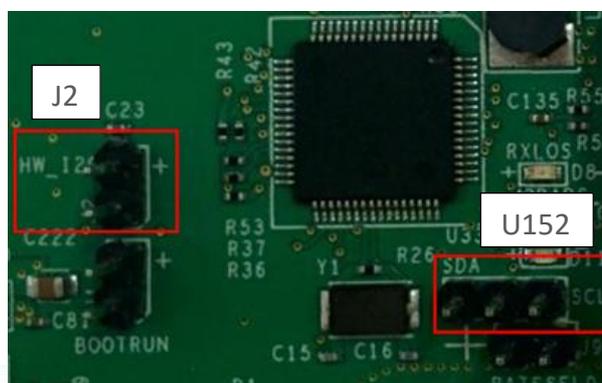

Figure 1: On-board LEDs

3.4.2 External HW Control

It is recommended to have FW V1.3 and later to use this feature.

Also Low Speed Signals are controllable using an external source, this can be done through control signals pin headers J7, J8 and J9. In this case a jumper should be placed on pin header P19 (HW_CTRL) shown in the image below.
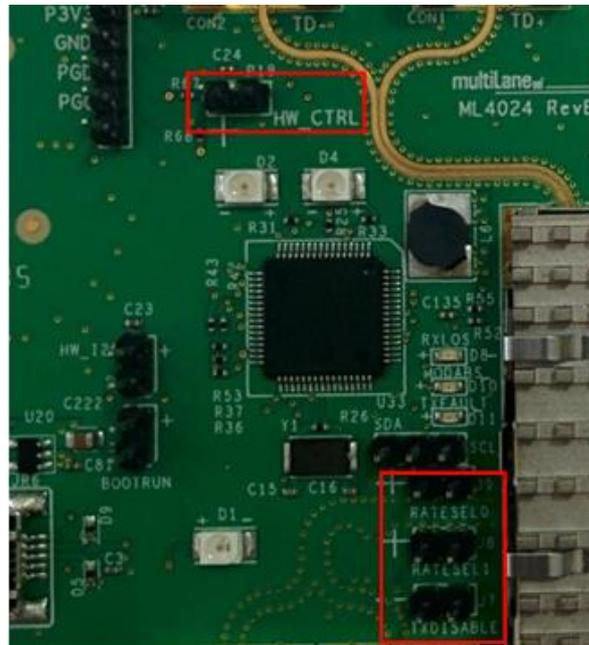

Figure 2: External Control Signals

The low speed signals circuit shown below shows the connection of these signals to the microcontroller and SFP connector.
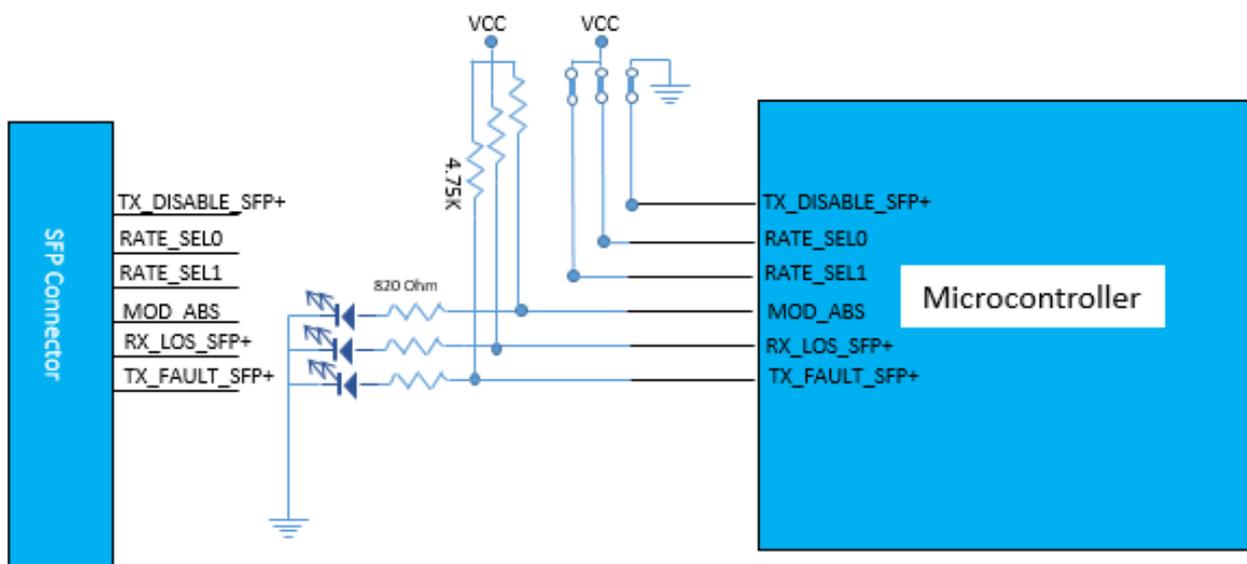

Figure 3: Low Speed Signals Schematics

4.   ML4024 Software

The ML4024 is accessible and controlled through application software. This software is MSA compliant and provides a user-friendly interface to operate the board and access all its features. The communication between the ML4024 board and the software is established through USB connection.

4.1 USB Driver

In order to be able to communicate with the board, user need to install the USB driver of the ML4024. This is available on the website under the following link (USB Driver icon):

https://multilaneinc.com/products/ml4024/

Below is a brief guide on how to install the USB Driver:

- Power up the board
- Connect the board to the PC through USB cable
- Download the USB driver file
- Go to "Device Manager"
- Find the target device that need to install the driver
- Right-click on the device and select Update Driver Software
- Select Browse my computer for driver software
- Browse you PC and select the driver file
- Click Next and wait until the driver is installed

4.2 GUI

For GUI installation and operation, refer to the link below. GUI user manual is available for detailed description.

https://multilaneinc.com/products/ml4024

5.   Hardware Revision

- **ML4024-RevA:** Initial Version
- **ML4024-RevB:** Fix the silkscreen of D13
- **ML4024-RevC:** improve high speed traces performance

6.   Firmware Revision

- **ML4024-revA_V1_2**: latest FW revision, compatible with the ML4024-RevC hardware.

7. Bootloader

Accessing in bootloader mode allows the user to reprogram the microcontroller, this is done as described below:

1. Connect a jumper on (J1) situated close to the microcontroller.
2. Connect a USB cable between the PC and Board.
3. Power up the board with a +3.3V supply.
4. LEDs (D2, D4) start blinking.
5. Remove jumper.
6. Open the software "Microchip USB HID Bootloader v2.3".
7. Click on "Open Hex File".
8. Choose the new FW to download.
9. Click on "Program/Verify".
10. Once the software finishes programming press on "Reset Device".
11. After reset the Firmware is successfully updated.

Date	Revision	Description
8/19/2020	0.1	▪ Initial Version
10/30/2020	0.2	▪ Update section 3.3: signals monitoring LEDs ▪ Update section 3.4.2: schematics diagram
10/5/2023	0.3	▪ Update section 3.4.2: add FW rev compatibility

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