

ML4027-ACO

Technical Reference

CFP2 ACO MCB – MSA Compliant



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1. General Description

The **ML4027-ACO** is a CFP2-ACO Module Compliant Board. It is designed to provide an efficient and easy method of programming and testing CFP2-ACO modules.

The **ML4027-ACO** is designed to simulate an ideal environment for CFP2-ACO module testing, making the host board as electrically transparent as possible, and allowing a more accurate assessment of the module performance.

2. ML4027-ACO test board – key features

- ✓ High Performance signal integrity traces
- ✓ CFP2-ACO MSA Form Factor
- ✓ Supports 4x32G TX and RX Lanes
- ✓ High Speed Traces accessible through 40GHz K-Connectors
- ✓ Matched trace length for TX and RX channels
- ✓ MDIO interface
- ✓ Access to Control/Alarm signals provided through pin headers
- ✓ MSA low speed signals controlled from GUI or using Pin headers
- ✓ Access to ACI signals provided through pin headers
- ✓ DUT Current Sense

3. ML4027-ACO Hardware

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

3.1 Power-Up

The powering up method is described below.

To power up the ML4027-ACO host, steps are as follow:

- ✓ The host Top is where the cage is mounted
- ✓ Two options are available to power up the board:
 - Using the DC jack power connector (J2) that should be connected to 5V
 - Using the banana plug (U6) that should be connected to 3.3V
- ✓ Connect the host to your PC using a Type-B mini to Type-A USB cable.

3.2 Operating Conditions

Based on the used powering method, as described in the previous section, 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 U6 banana plug | +3.0 | +3.3 | +3.6 | |

Table 1: Operating Conditions

3.3 LEDs Indicators

The ML4027-ACO boards, include on-board LEDs, for quick debugging and monitoring purposes. LEDs are summarized below:

- LED D11 indicates whether a USB cable is plugged or not
- LEDs D12 and D13, are used for diagnostic purposes.
 - If the green LED, D13, is on: USB is locked and device is recognized by the USB driver.
 - If the red LED, D12, is on: USB not connected or USB driver not found.
 - If both LEDs are off: Board not powered correctly or firmware is corrupted.
- LED D7: Program Alarm 1 pin monitoring - PRGAL1
- LED D8: Program Alarm 2 pin monitoring - PRGAL2
- LED D10: Program Alarm 3 pin monitoring – PRGAL3
- LED D16: Global Alarm signal monitoring GLBALM
- LED D17: RX Loss pin monitoring RXLOS
- LED D18: Module Absent pin monitoring MOD_ABS

Note that the LED D16 reports the state of GLBALM signal, which is the reverse of GLB_ALRMn pin.

3.4 Hardware Signals

Hardware alarm pins, hardware control pins and MDIO pins can be accessed from the software via USB or through on-board pin headers. The dip switch U153 (HW_CNTRL) allows switching signaling pins control between software and hardware. And the dip switch U153 (STATE_MDIO) allows to operate the board via external MDIO.

The image below shows the default state of the switch, where in this case the signals are controlled through software. To access these signals via pin headers, the switches should be moved to the opposite side (switch to GND).

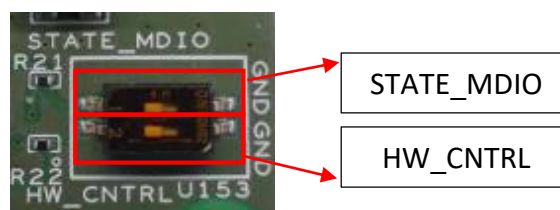


Figure 1: Dip Switch U153

3.4.1 MDIO Control

When the STATE_MDIO switch is moved to ground, the user could apply external MDIO through pin headers as shown below.

The user could access the MDIO bus for both MDIO 3.3V (U155 pin header) and MDIO 1.2V (TP4 and TP6 pins).



Figure 2: MDIO Pins

3.4.2 HW Control

When the HW_CTRL switch is moved to ground, the user could control the CFP2 control pins from an external source or through jumpers. Also Alarm pins could be accessed through pin headers shown below.

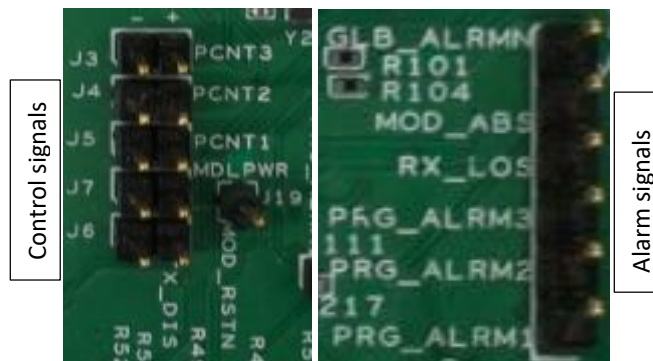


Figure 3: Low Speed Signals

All hardware control pins can be driven directly to ground using jumpers:

- J3: PRG_CTRL3
- J4: PRG_CTRL2
- J5: PRG_CTRL1
- J6: TX_DIS
- J7: MOD_LOPWR
- J19: MOD_RSTn. This is an independent pin. MOD_RSTn is connected to a switch for easy access from the user.

The low speed signals circuit shown below shows the connection of these signals to the microcontroller and CFP2- ACO connector.

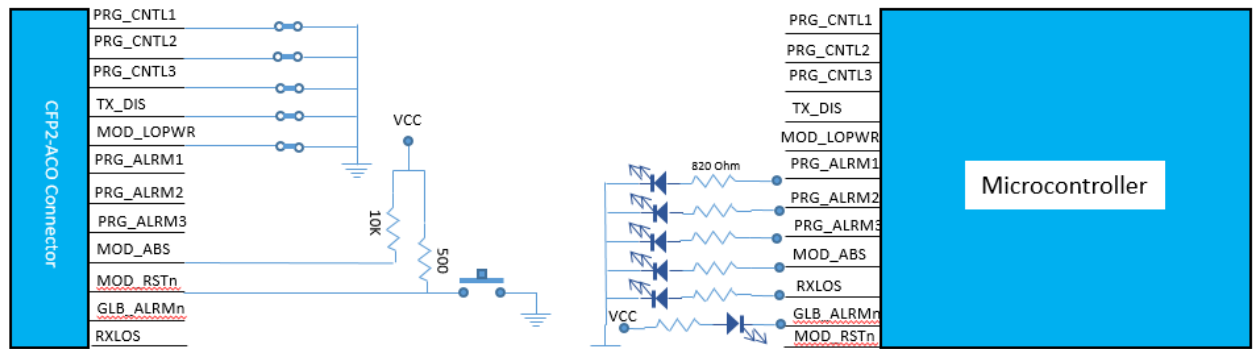


Figure 4: Low Speed Signals Schematics

Access to all ACI signals is provided by the pin headers shown in Figure 5. They are labeled with numbers that are described below the pin headers.



Figure 5: ACI pin headers

4. High Speed signals

4.1 Data Channels

All TX and RX channels on the board have the same trace length and geometry. A differential test trace of same length and geometry as the channels is available on the board to be used for de-embedding the MCB traces from the measurements.

4.2 Reference Clock

REFCLK N/P, TX_MCLK N/P and RX_MCLK N/P are accessible through SMP connectors and are AC coupled.

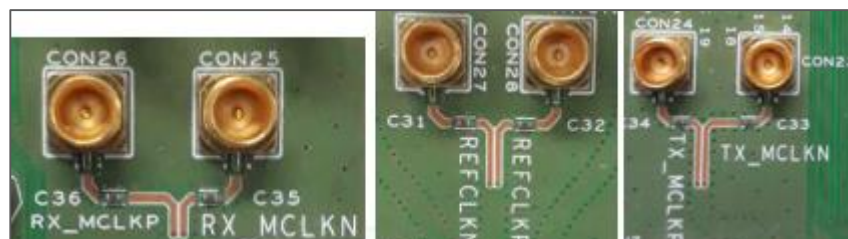


Figure 6: Reference Clock Connectors

5. ML4027-ACO Software

The ML4027-ACO 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 ML4027-ACO board and the software is established through USB connection.

5.1 USB Driver

In order to be able to communicate with the board, user need to install the USB driver of the ML4027-ACO. This is available on the website under the following link (USB Driver icon):

<https://multilaneinc.com/products/ml4027-ACO/>

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

5.2 GUI

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

<https://multilaneinc.com/products/ml4027-ACO/>

6. Hardware Revision

- **ML4027-ACO-RevA:** Initial Version
- **ML4027-ACO-RevB:** Add two additional holes for the mechanical layout
- **ML4027-ACO-RevC:** Adjusting TX3 for better SI
- **ML4027-ACO-RevD:**
 - Changing TX3 routing
 - Changing programing pins

7. Firmware Revision

- **CFP2-CXP_Host_6-23-2015_BLD5 V1.1:** latest FW revision, compatible with ML4027-ACO-RevD hardware.

8. 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 (D12, D13) 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

Revision History

| Date | Revision | Description |
|-----------|----------|---------------|
| 1/14/2021 | 0.1 | ▪ Preliminary |

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