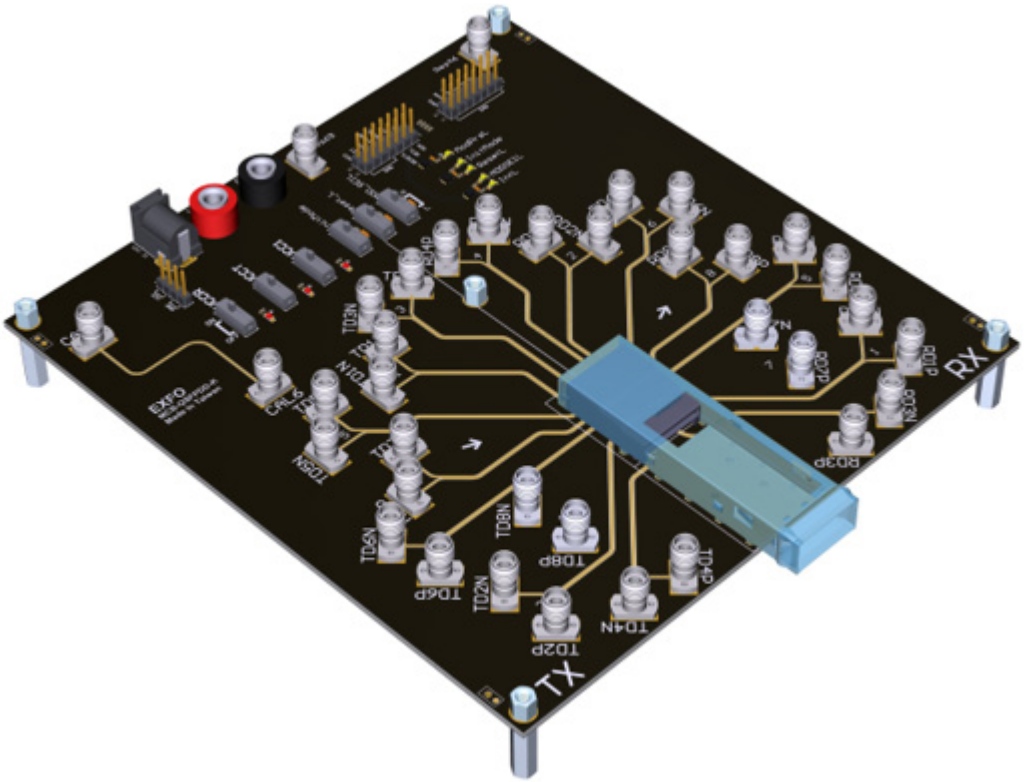
User Guide

MCB

Module Compliance Board



www.EXFO.com

Trademarks

Units of Measurement

Units of measurement in this publication conform to SI standards and practices.

Patents

The exhaustive list of patents is available at EXFO.com/patent.

Version number: 1.0.0.1

Contents

1 MCB Models

The MCB (module compliance board) tests next generation transceivers by enabling serial communication between the BER (bit error rate) tester and the optical transceiver. The following table lists and describes all of the MCB models.

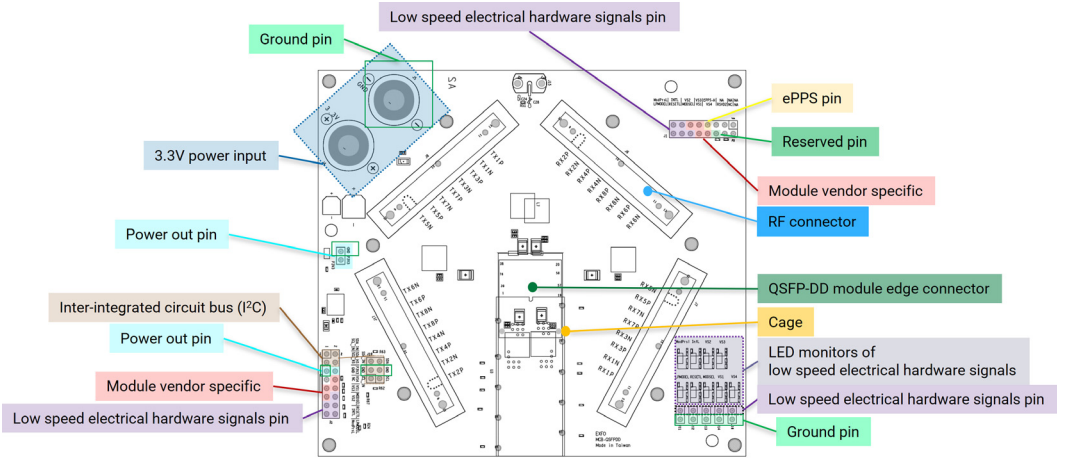
MCB Model	Form Factor	RF Connector	Size (W x D) (mm)	Operation Temperature (°C)	Max. Current (mA)	Connector Durability (Typical Cycle)
QSFPDD-O	QSFP-DD	1 x 8 O-SMPM	127 x 114	-20 to 85	6000	100
QSFPDD-K	QSFP-DD	K (2.92 mm)	170 x 160	-40 to 85	6000	100
OSFP-O	OSFP	1 x 8 O-SMPM	127 x 127	-20 to 85	6000	100
OSFP-K	OSFP	K (2.92 mm)	170 x 160	-40 to 85	6000	100
QSFP28-K	QSFP28	K (2.92 mm)	130 x 100	-40 to 85	2500	250
SFPDD	SFP-DD	K (2.92 mm)	160 x 90	-40 to 85	2500	100
DSFP	DSFP	K (2.92 mm)	160 x 90	-40 to 85	6000	100
QSFP56-O	QSFP56	1 x 8 O-SMPM	124 x 114	-20 to 85	2500	100
SFP28-90	SFP28	90° K (2.92 mm)	100 x 65	-40 to 85	2500	250
SFP28-180	SFP28	180° K (2.92 mm)	100 x 65	-40 to 85	2500	250

All models support the following:

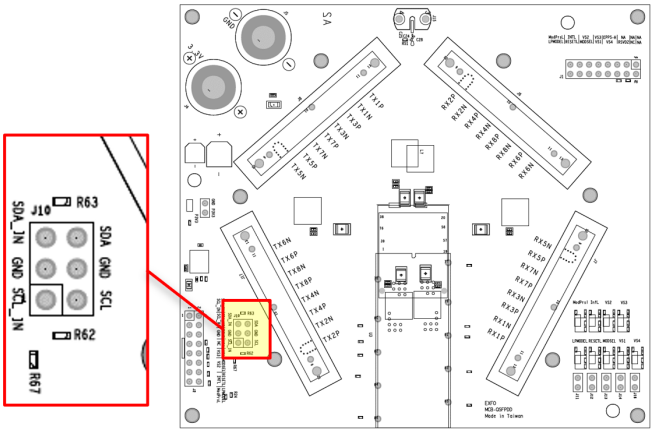
- VNA test ports
- Inter-Integrated Circuit Bus (I^2C)
- Standard MSA low speed electrical hardware signals
- Input Voltage of 3.1 V to 3.5 V, typically 3.3 V

It is recommended to use external max. current slow acting fuse to protect the board in case the power supply has current limit issues.

2 QSFPDD-O



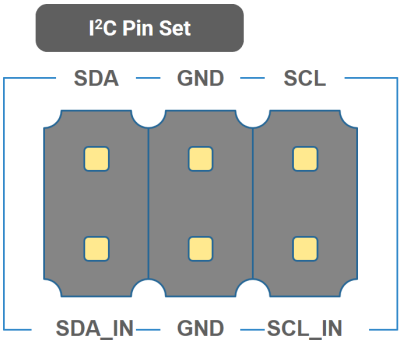
I²C Pin Set Configuration

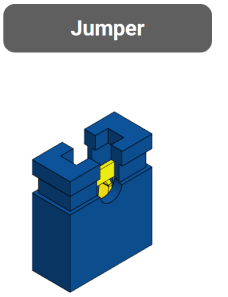


On the Module Test Board, there is an I²C pin set.

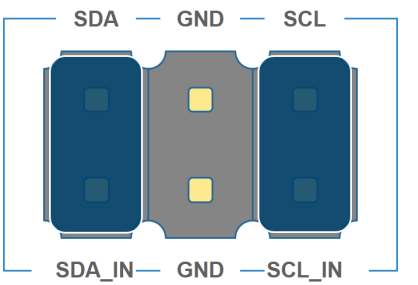
To access I²C signal by the EXFO USB-I²C Controller:

Using the I²C pin set and 2 jumpers,



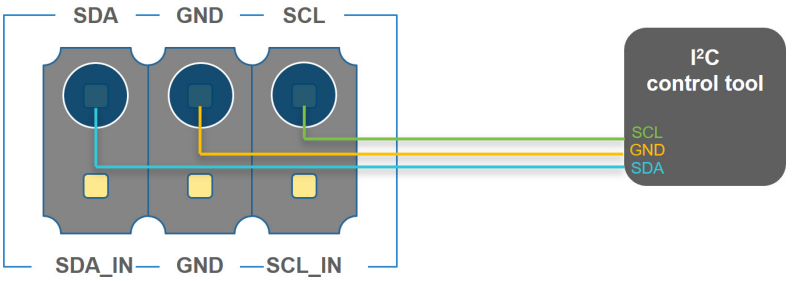


connect 2 jumpers joining SDA to SDA_IN and SCL to SCL_IN.

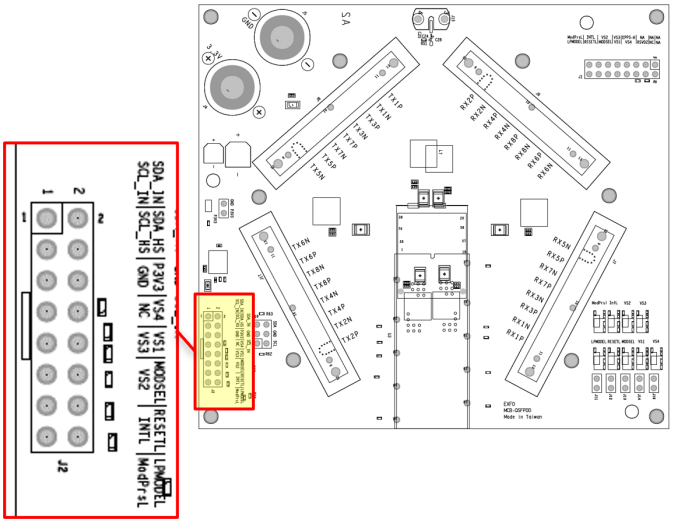


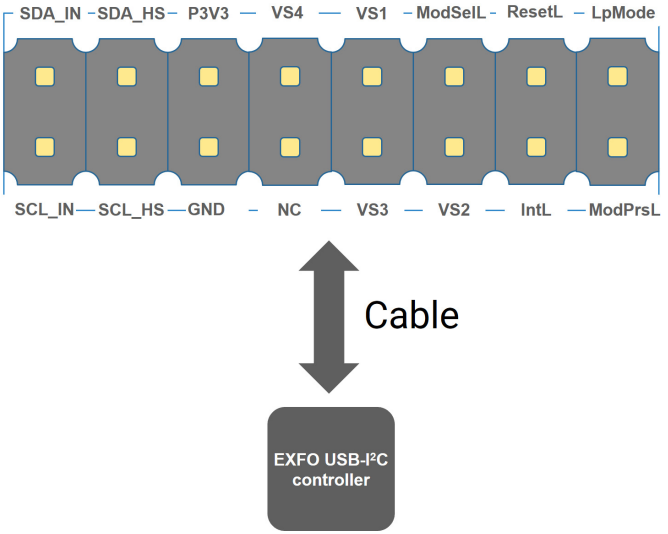
To access I²C signal by an external tool:

Remove the above jumpers and connect SDA and SCL to the tool.



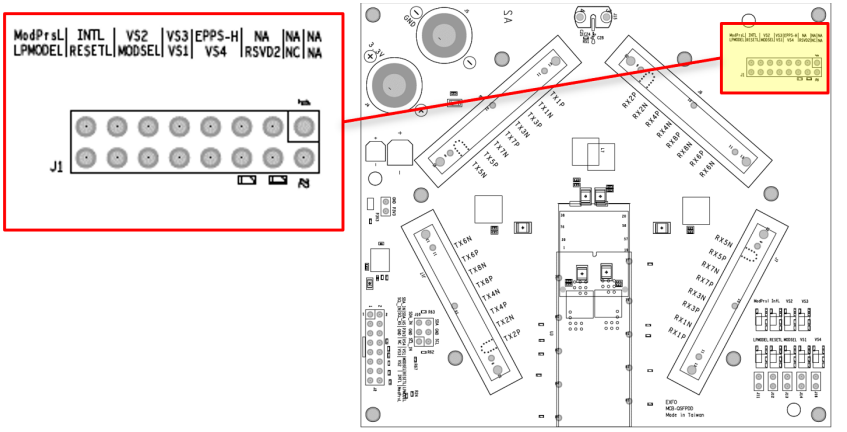
Pin

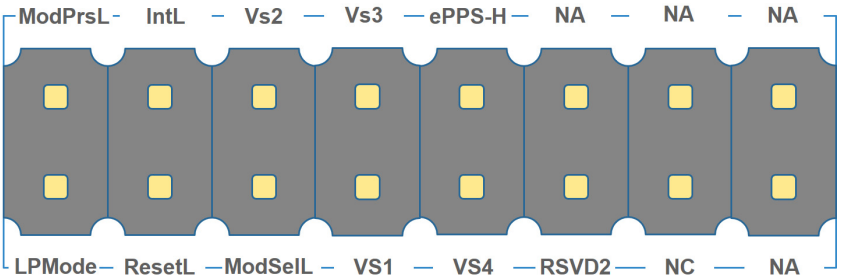

SDA_IN SDA_HS P3V3 VS4 VS1 MODSEL RESETL LPMODE
SCL_IN SCL_HS GND NC VS3 VS2 INTL MODPRSL
J2

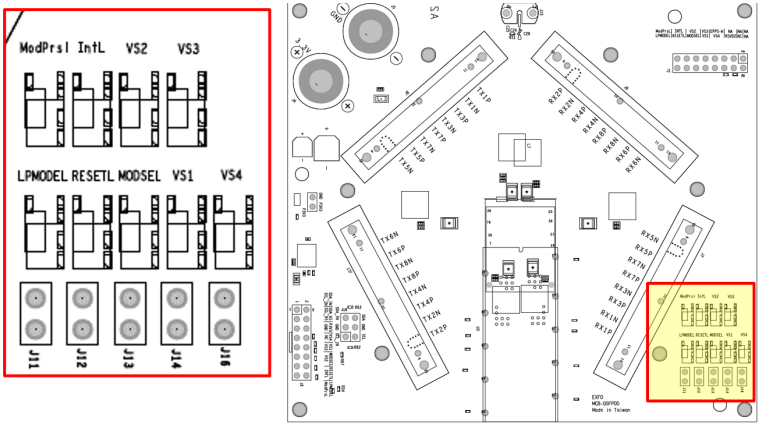

SDA_IN
SDA_HS
P3V3
VS4
VS1
ModSelL
ResetL
LpMode
SCL_IN
SCL_HS
GND
NC
VS3
VS2
IntL
ModPrsL
Cable
EXFO USB-I²C controller

QSFPDD-O

Pin


ModPrsL INTL VS2 VS3 EPPS-H NA NA NA
LPMODEL RESETL MODSEL VS1 VS4 RSVD2 NC NA
J1


ModPrsL
IntL
Vs2
Vs3
ePPS-H
NA
NA
NA
LPMode
ResetL
ModSelL
VS1
VS4
RSVD2
NC
NA

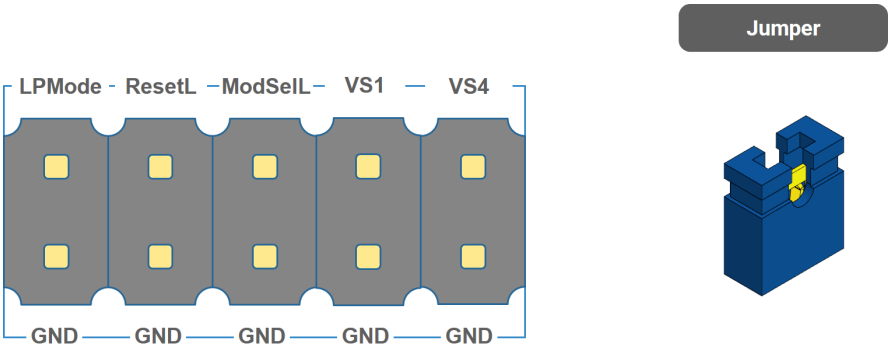


LED On = High, LED Off = Low

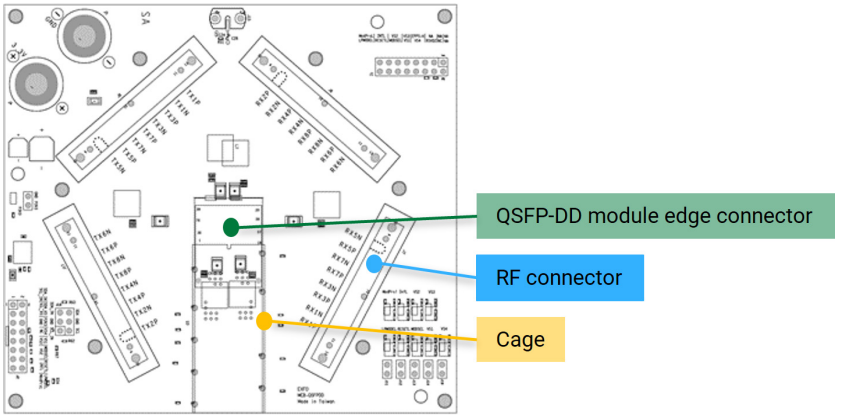
All LEDs will turn on when the board power is on without TRx and any jumper.

To connect the low speed signal pin and ground:

Attach the jumper. LED turns Off.

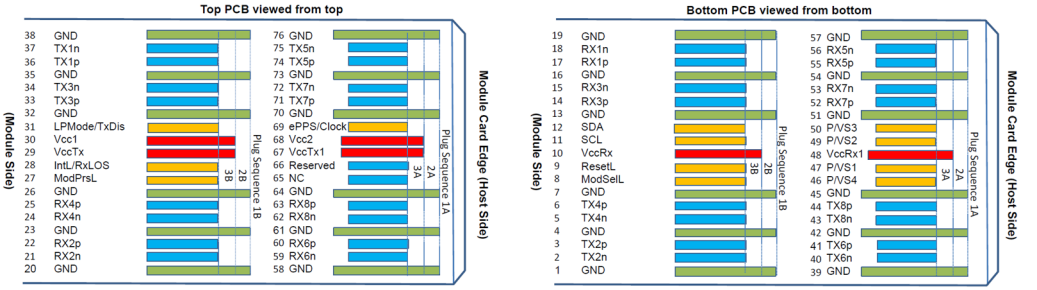


Module Edge Connector and Cage



- QSFP-DD module edge connector (no warranty: limited insertion life)
  - Connector durability is 100 cycles (typical)
  - Brand: Yamaichi
- RF connector type: O-SMPM
- Cage brand: Amphenol (w/ heat sink)

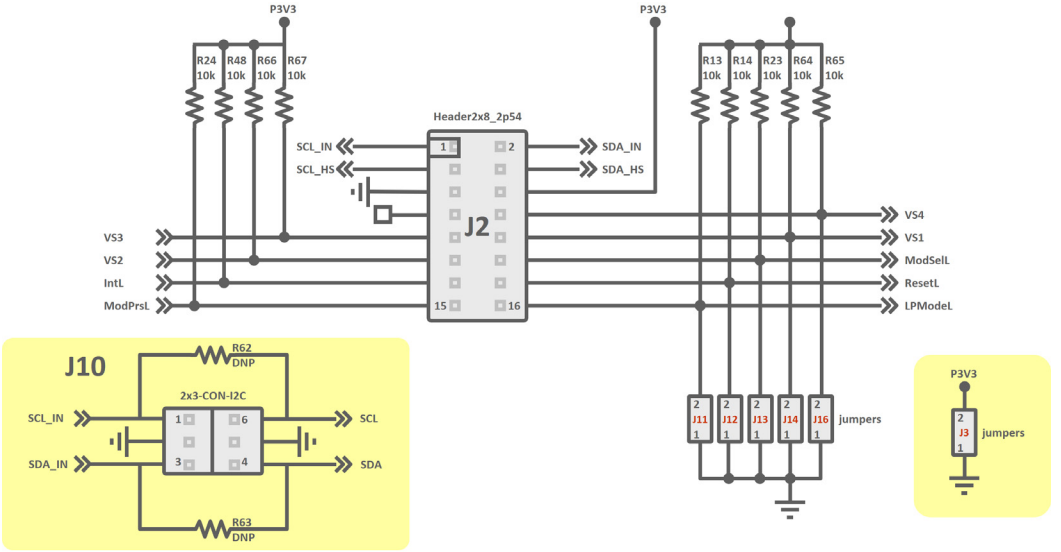
Module Pad Layout



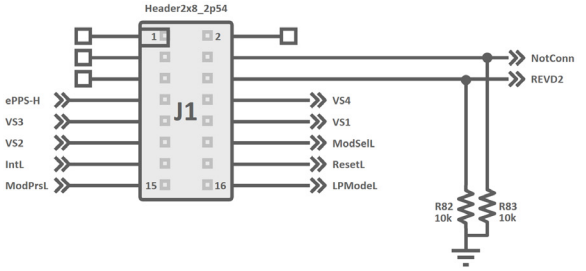
(Ref. QSFP-DD Hardware Rev 6.01)

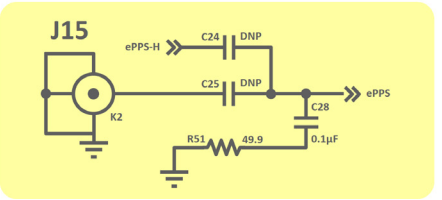
Schematic of QSFP-DD MCB (O-SMPM)

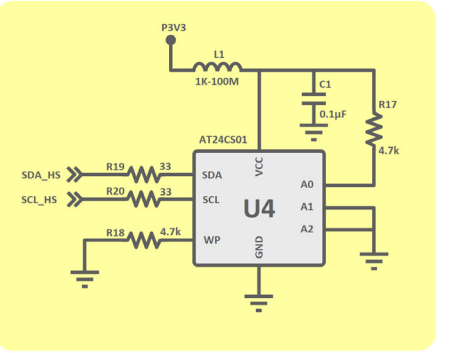
Rev. D2 (1/2)



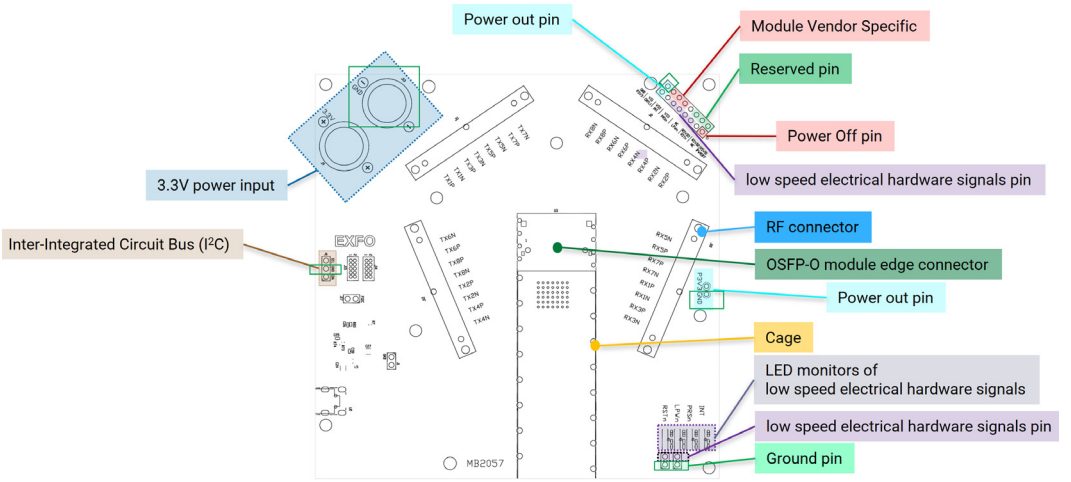
Rev. D2 (2/2)


Header2x8_2p54
J1
1
2
15
16
ePPS-H
VS3
VS2
IntL
ModPrsL
VS4
VS1
ModSelL
ResetL
LPModeL
NotConn
REVD2
R82
10k
R83
10k

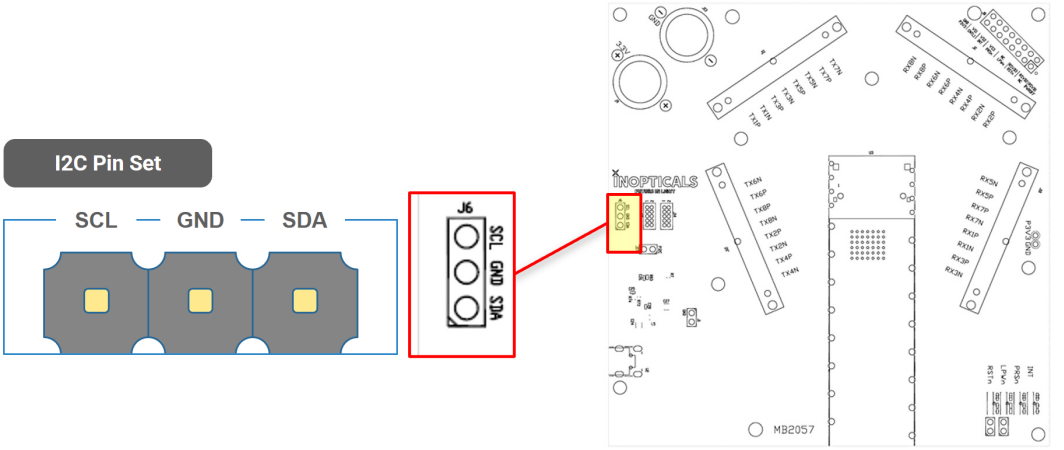

J15
K2
ePPS-H
C24
DNP
C25
DNP
ePPS
C28
0.1µF
R51
49.9


P3V3
L1
1K-100M
C1
0.1µF
R17
4.7k
AT24CS01
U4
SDA_HS
SCL_HS
R19
33
R20
33
R18
4.7k
SDA
SCL
WP
VCC
GND
A0
A1
A2

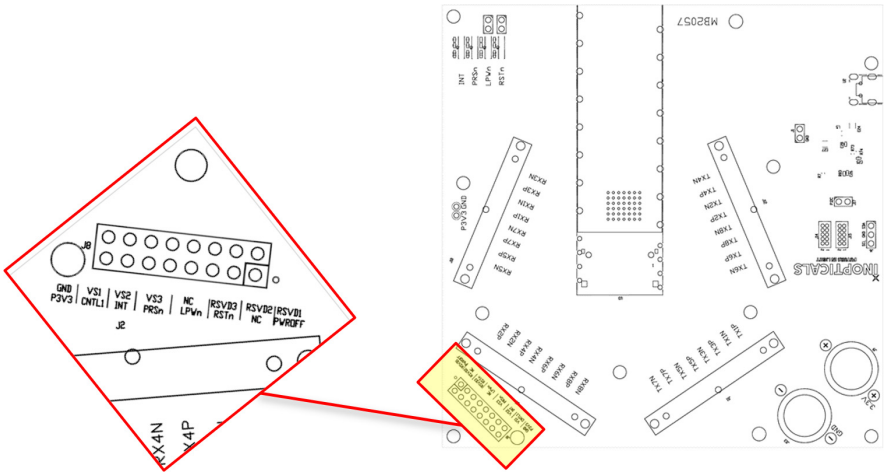
3 OSFP-O

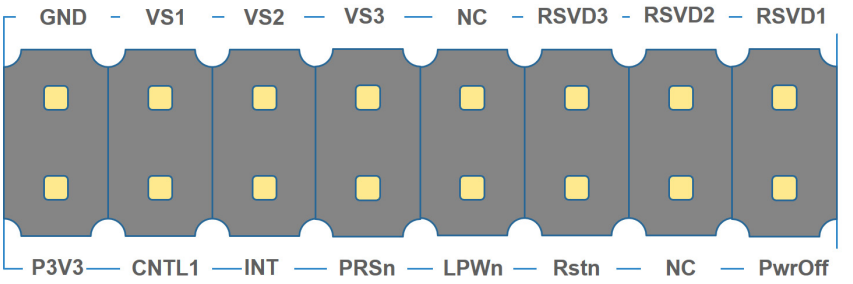


I²C Pin Set Configuration

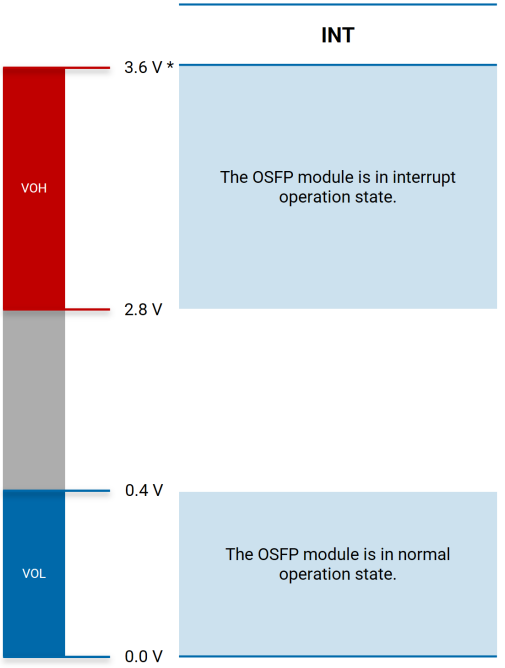


Pin

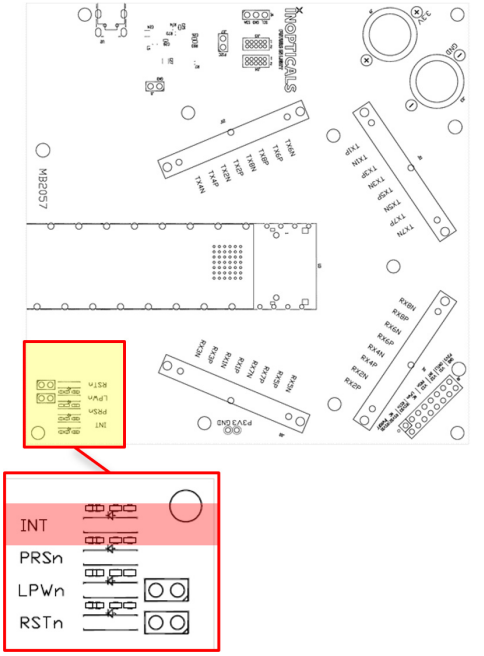

GND
P3V3
VS1
CNTL1
VS2
INT
VS3
PRSn
NC
LPWn
RSVD3
RSTn
RSVD2
NC
RSVD1
PWROFF
J2
J8
MB2057
MOPTICALS


GND
VS1
VS2
VS3
NC
RSVD3
RSVD2
RSVD1
P3V3
CNTL1
INT
PRSn
LPWn
Rstn
NC
PwrOff

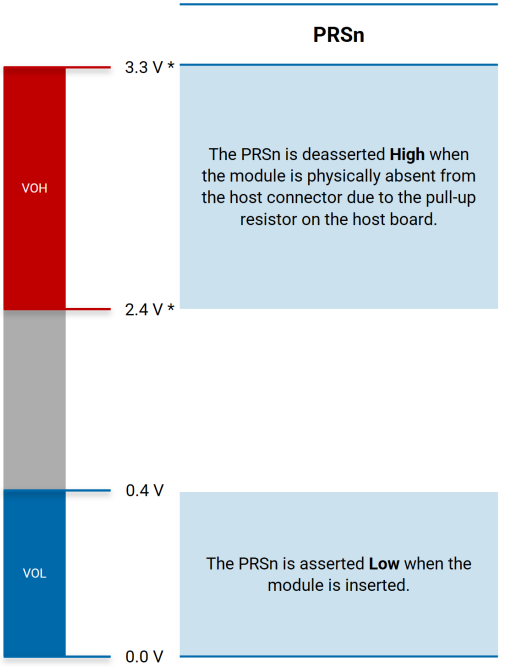
INT Pin



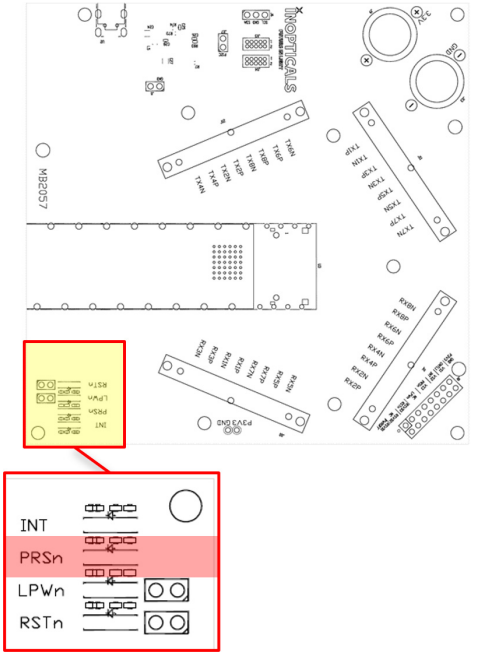
*Note : Based on the reference value of Vcc as 3.3 V



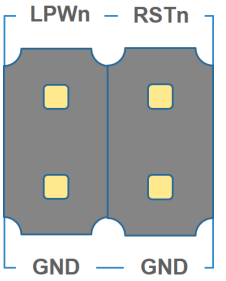
PRSn Pin

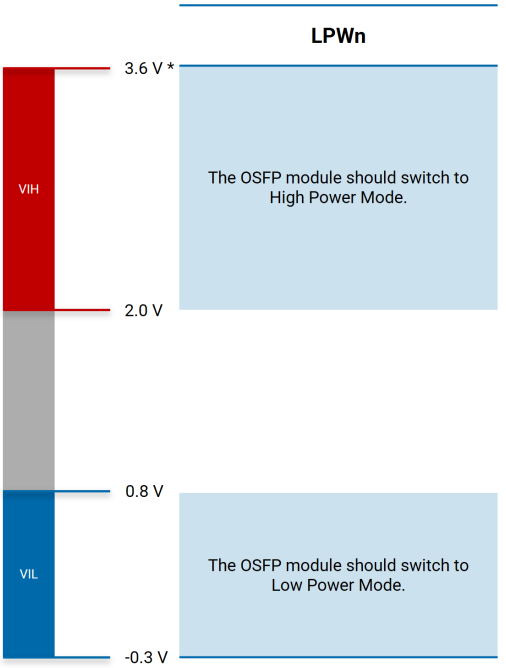


*Note : Based on the reference value of Vcc as 3.3 V

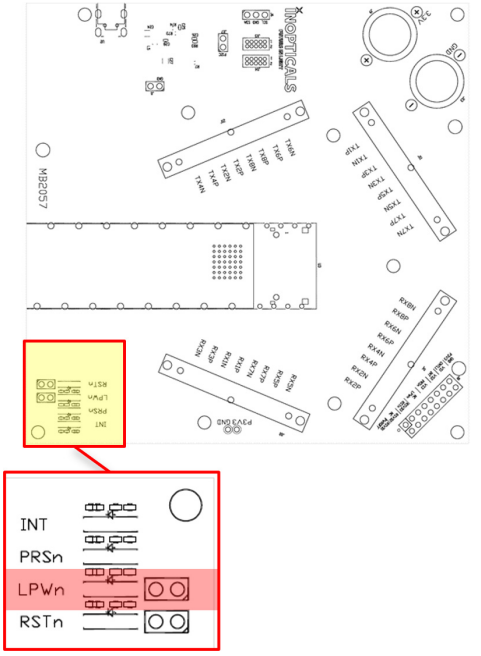


LPWn Pin

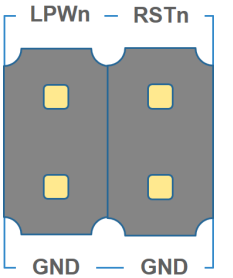


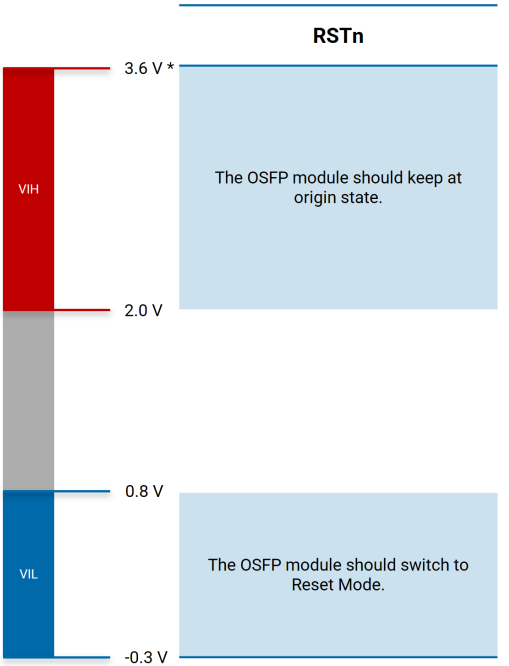


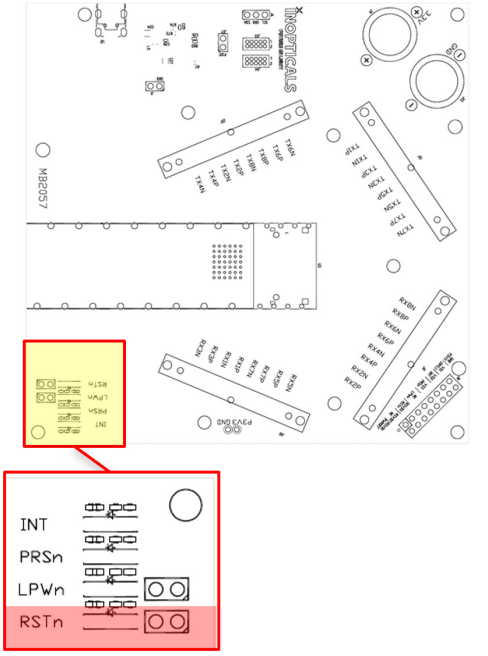
*Note : Based on the reference value of Vcc as 3.3 V



RSTn Pin

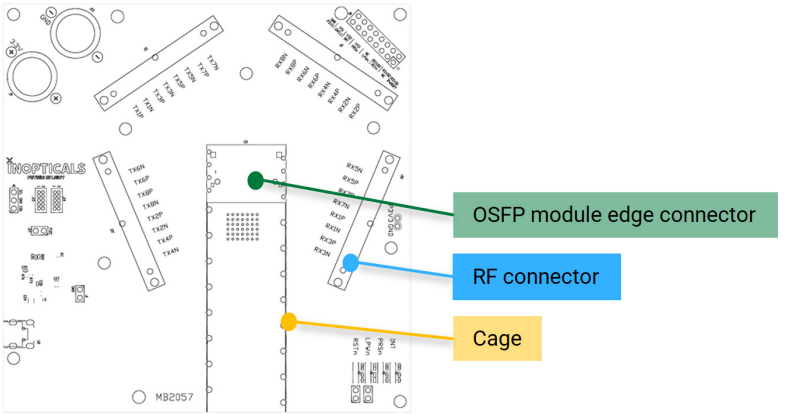






*Note : Based on the reference value of Vcc as 3.3 V

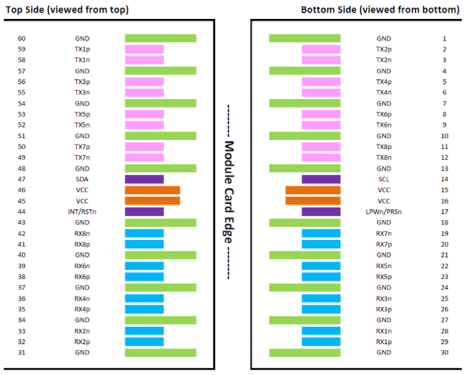
Module Edge Connector and Cage



- OSFP module edge connector (no warranty: limited insertion life)
  - Connector durability is 100 cycles (typical)
  - Brand: Yamaichi
- Cage brand: Amphenol (w/ heat sink)
- RF connector type: O-SMPM

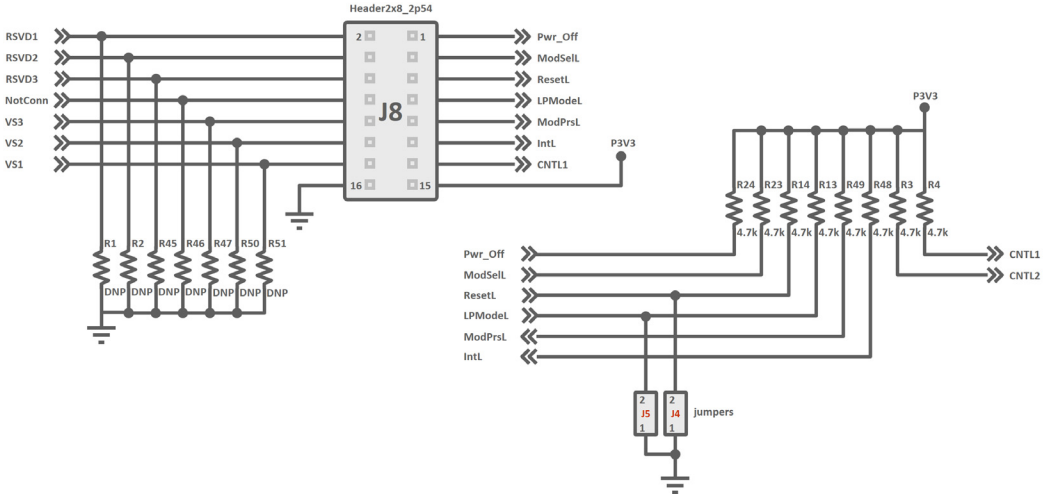
Module Pad Layout

(Ref. OSFP Module Specification Rev 3.0)

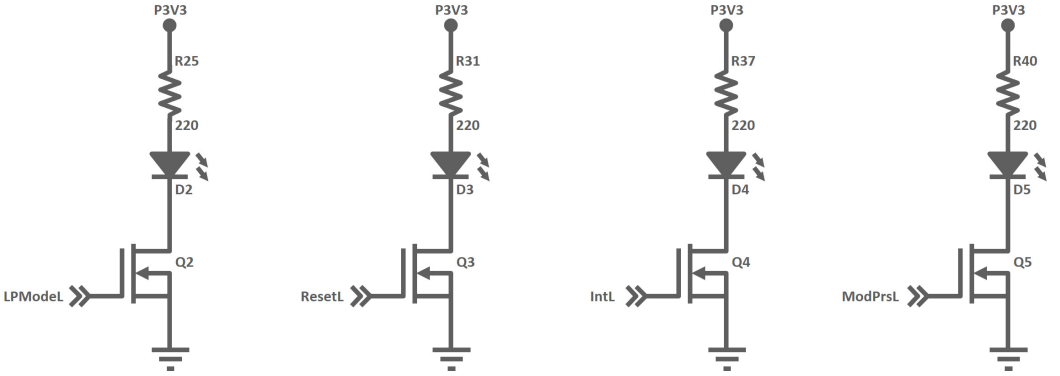


Schematic of OSFP MCB (O-SMPM)

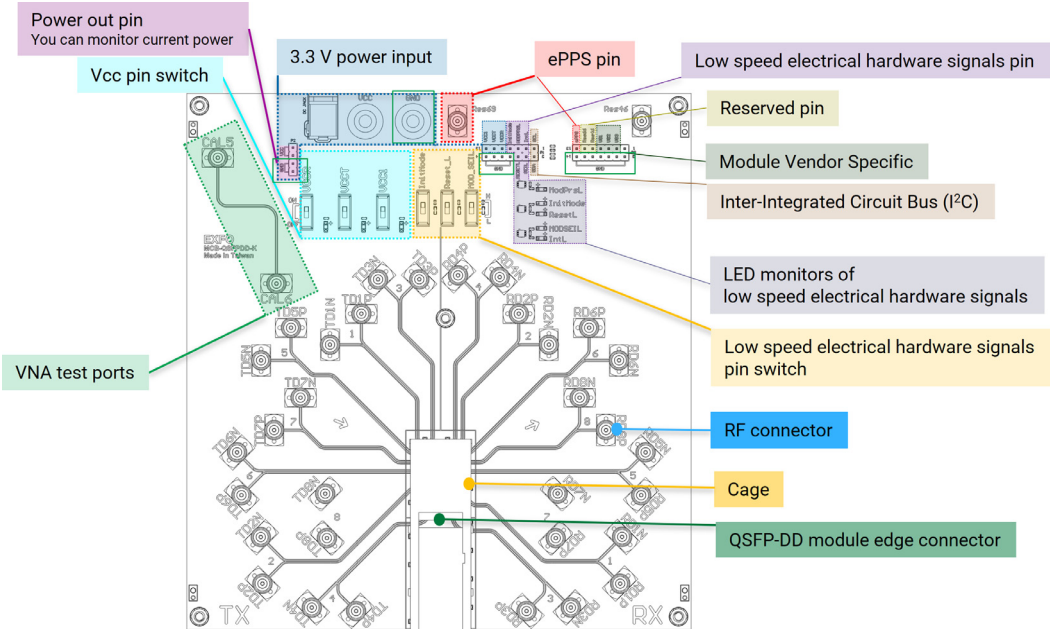
Rev. D (1/2)



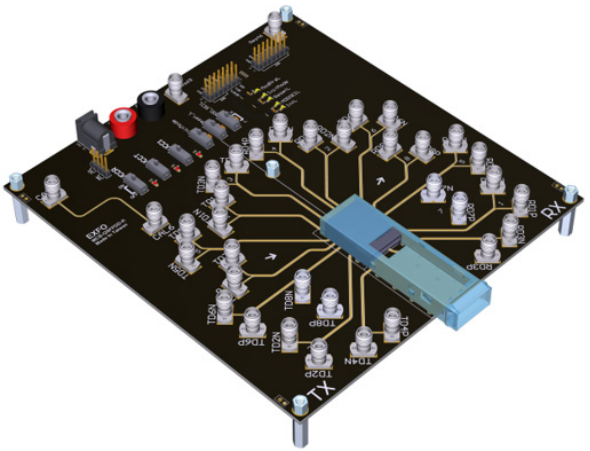
Rev. D (2/2)


P3V3
R25
220
D2
Q2
LPModeL
P3V3
R31
220
D3
Q3
ResetL
P3V3
R37
220
D4
Q4
IntL
P3V3
R40
220
D5
Q5
ModPrsL

4 QSFPDD-K



Introduction

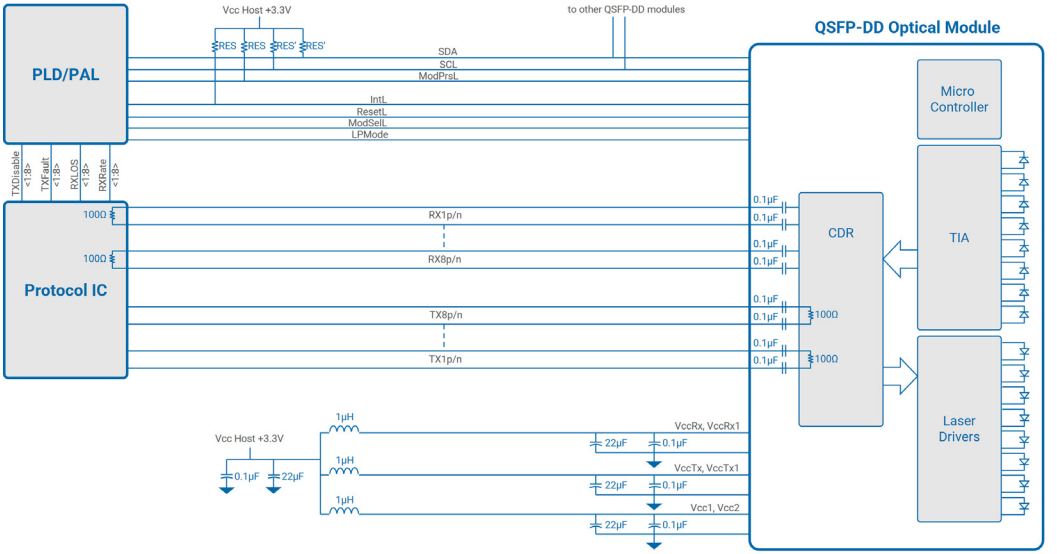


Features

- Supported transceiver:
  - 200G QSFP-DD
  - 400G QSFP-DD
- Operation input voltage: 3.1 to 3.5 V (typically 3.3 V)
- Operation temperature: -40 to +85 °C
- Board dimensions[1]: 170 x 160 mm^2 (w/o cage and hexagonal copper stud)
- RF connector: K (2.92 mm)
- Connector durability: 100 cycles (typical)[2]
- Supported features are as follows:
  - VNA test ports
  - Inter-Integrated Circuit Bus (I^2C)
  - Standard MSA low speed electrical hardware signals
  - 3 types of Vcc input

1. For a drawing file, contact EXFO at support@exfo.com.
2. No warranty – insertion life limited.

Reference Schematic



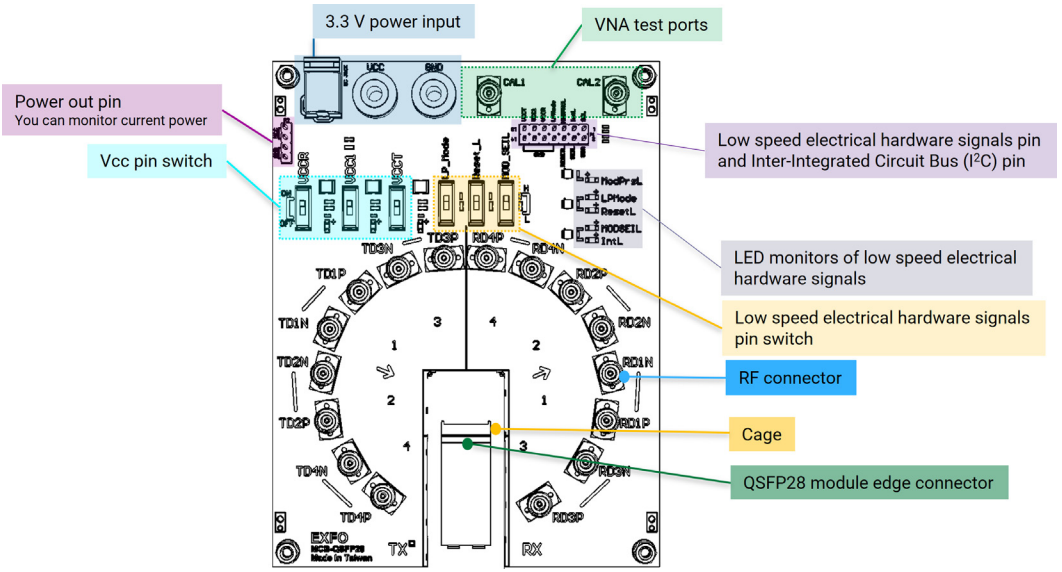
Note: *Filter capacitor values are informative and vary depending on applications. 0.1µF capacitors should be placed in close proximity to power pins and may be duplicated for individual pins to provide additional high frequency filtering.*

Note: *Vcc1 and/or Vcc2 may be connected to VccTx, VccTx1 or VccRx, VccRx1 provided the applicable derating of the max current limit is used.*

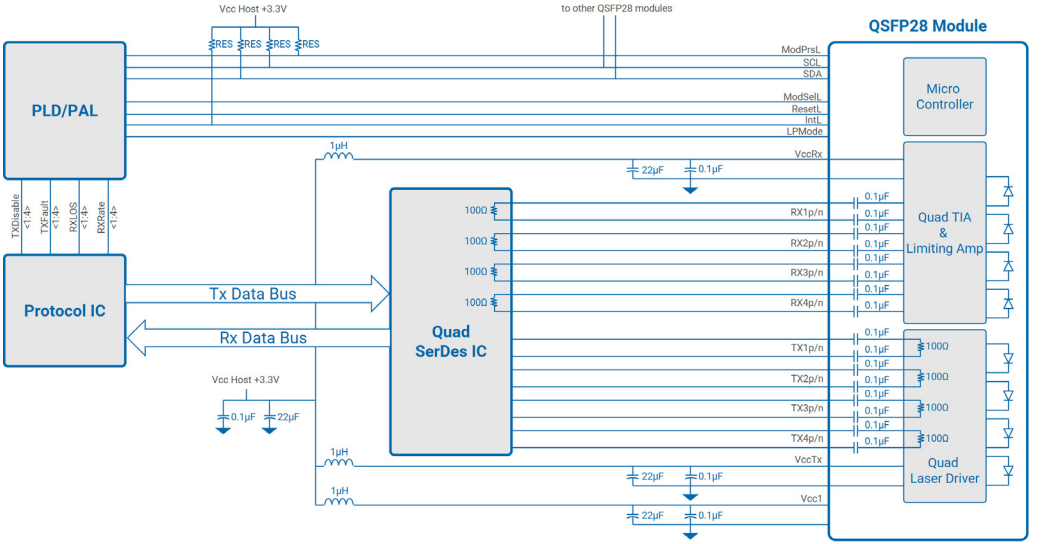
Note: *RES is a 4.7k to 10kΩ resistor; RES' is a 1.0k to 3.3Ω resistor.*

5 QSFP28-K

Hardware Diagram



Reference Schematic



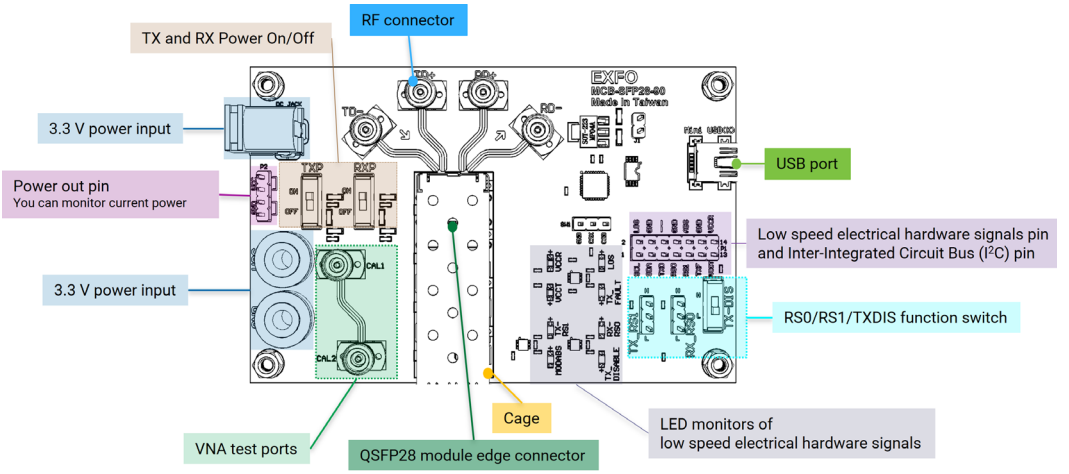
Note: *Decoupling capacitor values are informative and vary depending on applications.*

Note: *: Vcc1 connection may be connected to VccTx or VccRx provided the applicable derating of the max current limit is used.*

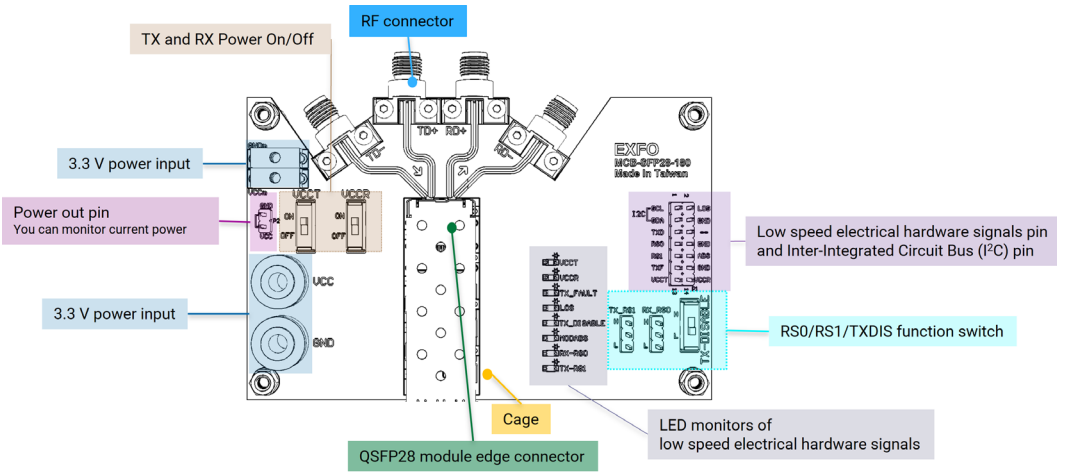
Note: *RES is a 4.7k to 10kΩ resistor.*

6 SFP28-K

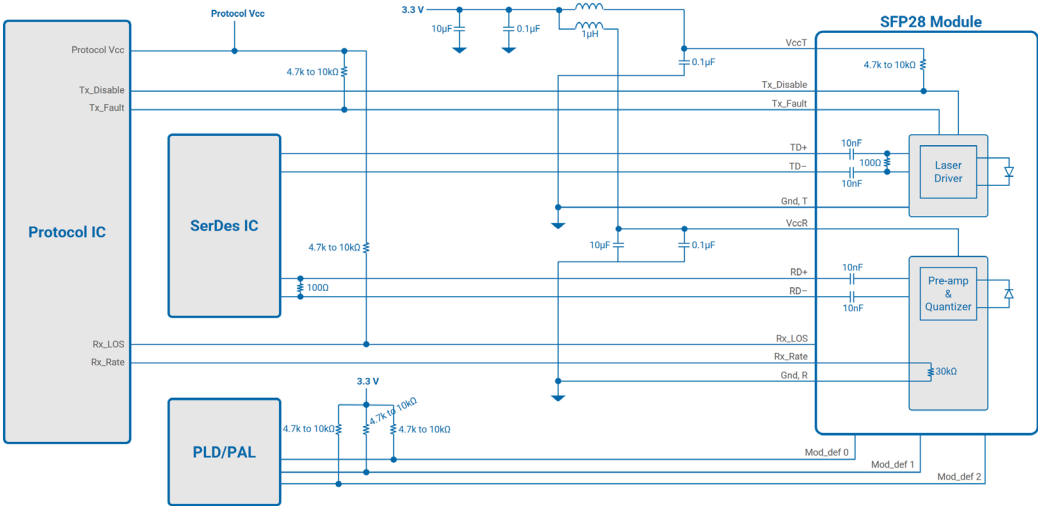
SFP28-K-90



SFP28-K-180



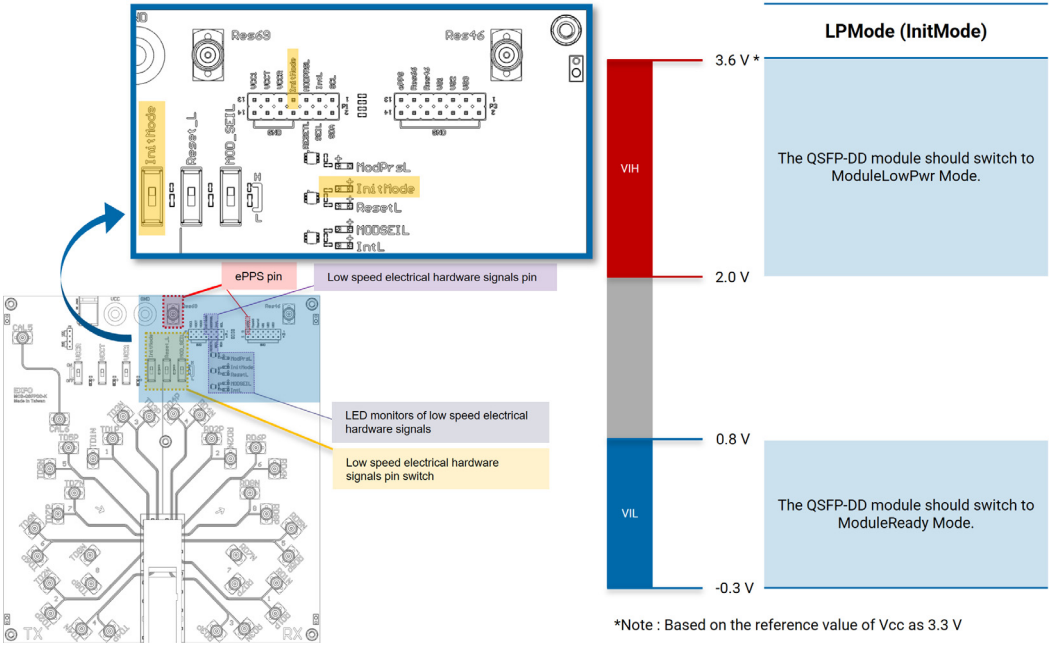
Reference Schematic



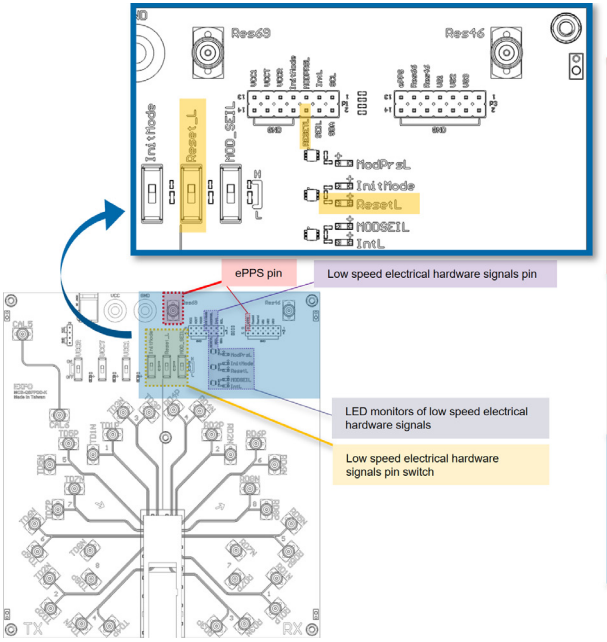
7 Low Speed Electrical Hardware Signals

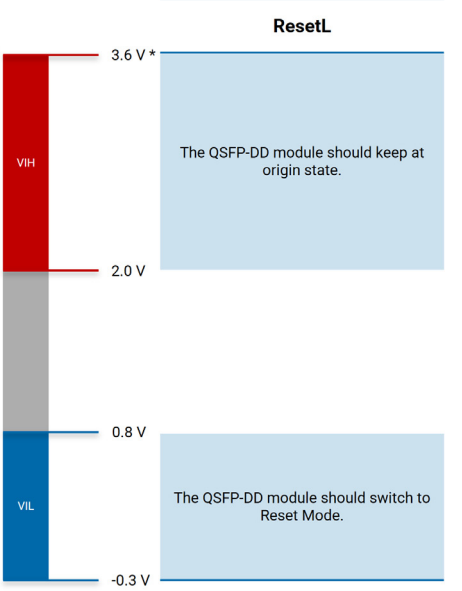
QSFPDD-K Examples

LPMode (InitMode)



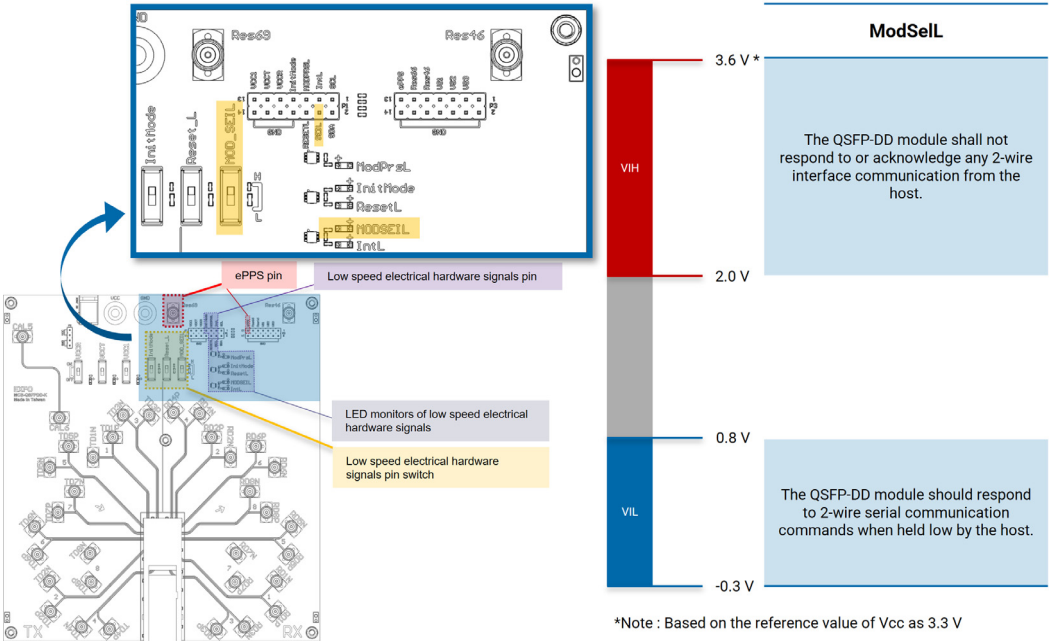
ResetL





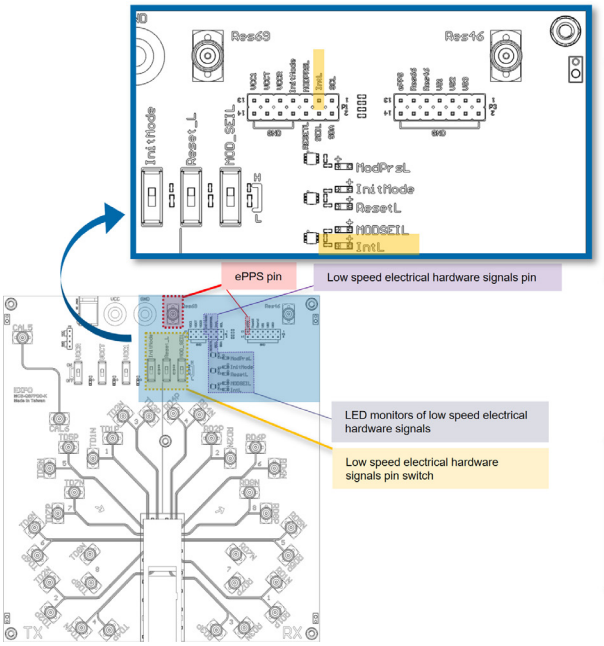
*Note : Based on the reference value of Vcc as 3.3 V

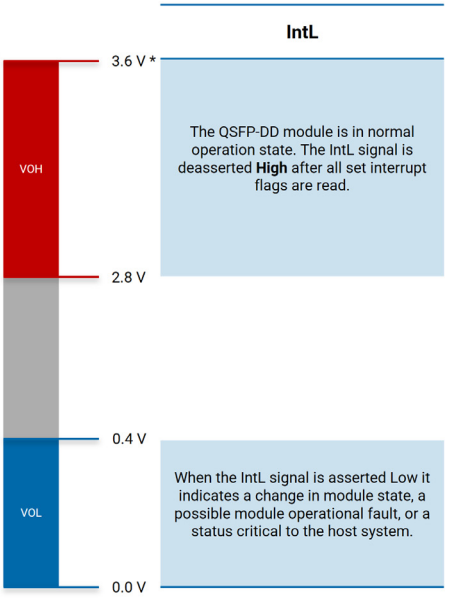
ModSelL



*Note : Based on the reference value of Vcc as 3.3 V

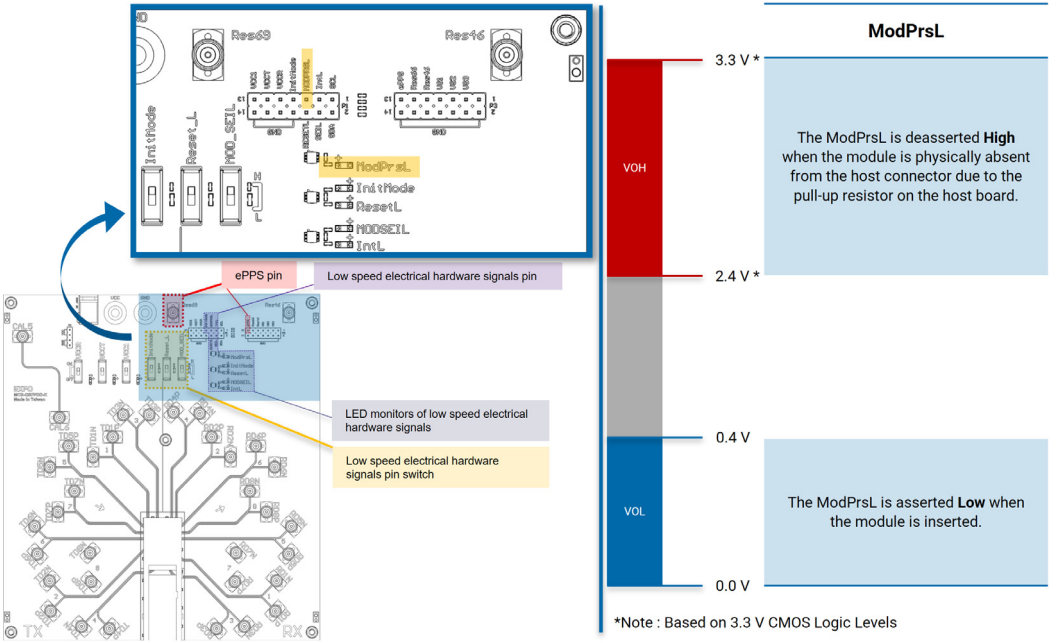
IntL





*Note : Based on the reference value of Vcc as 3.3 V

ModPrsL

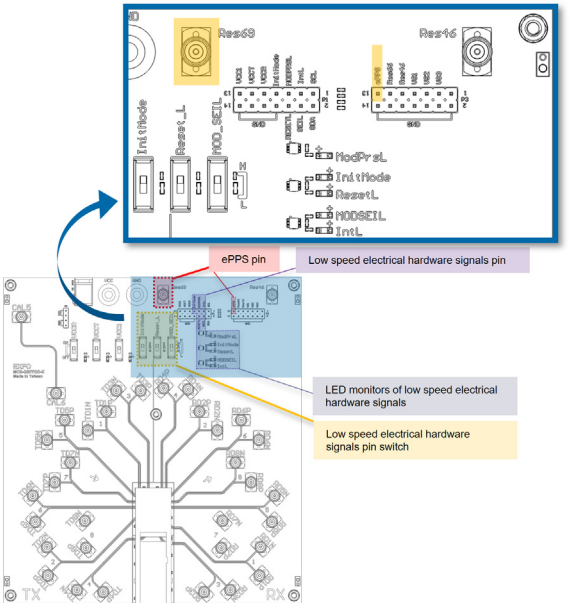

ModPrsL
3.3 V *
VOH
2.4 V *
The ModPrsL is deasserted **High** when the module is physically absent from the host connector due to the pull-up resistor on the host board.
0.4 V
VOL
0.0 V
The ModPrsL is asserted **Low** when the module is inserted.
*Note : Based on 3.3 V CMOS Logic Levels
ePPS pin
Low speed electrical hardware signals pin
LED monitors of low speed electrical hardware signals
Low speed electrical hardware signals pin switch
ModPrsL
InitMode
ResetL
MODSELL
IntL

ePPS (Enhanced Pulse Per Second)

For high-performance Precision Time Protocol (PTP) applications, a PTP reference cl °Ck with Pulse Per Second modulation, ePPS may be provided from the host to the module.

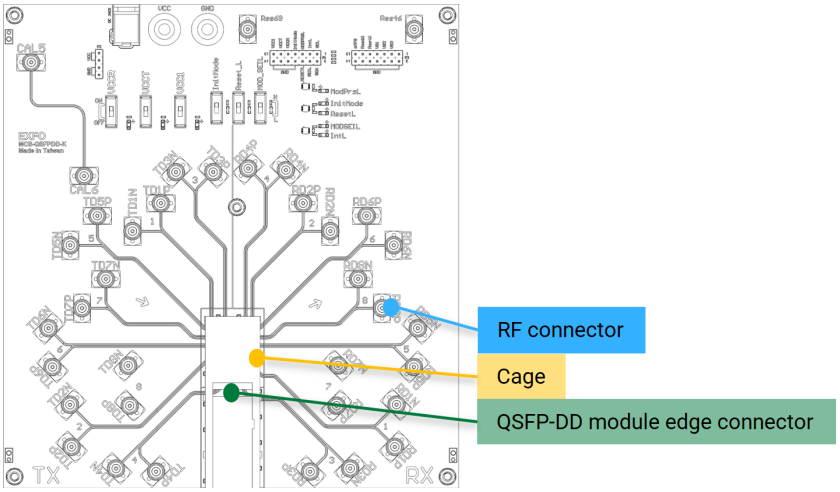
This can be used for either offline delay characterization or real-time delay compensation within the module.

The cl °Ck is used to tightly synchronize the Host Time-of-Day counter to the module's internal Time-of-Day Counter.



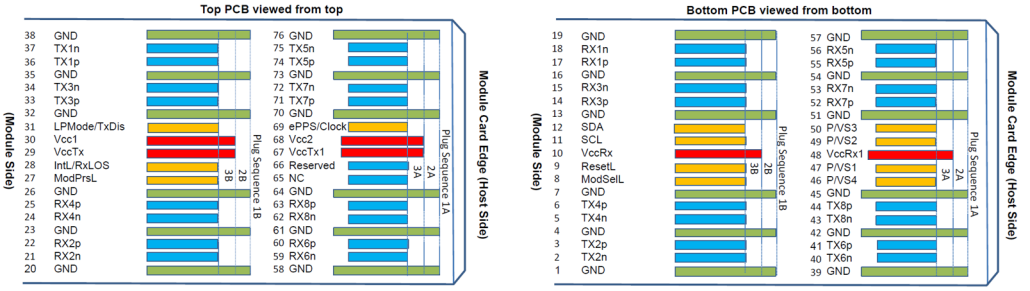
Note: *ePPS is only implemented on QSFPDD.*

Module Edge Connector and Cage



- QSFP-DD module edge connector (no warranty: limited insertion life)
  - Connector durability is 100 cycles (typical)
  - Brand: Yamaichi
- Cage brand: Amphenol (w/ heat sink)
- RF connector:
  - Type: K (2.92 mm)
  - The nominal impedance of differential ports is 100 Ω

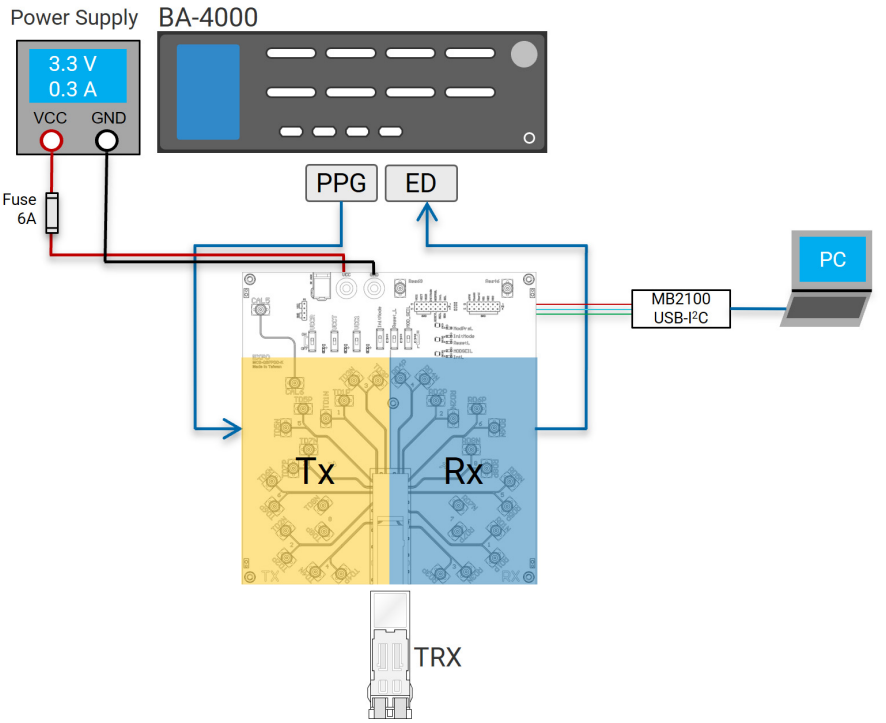
Module Pad Layout



(Ref. QSFP-DD Hardware Rev 6.01)

A QSFPDD-K Examples

Low Power Mode



For low power mode:

1. LPMode pin set High.
2. ResetL pin set High.
3. ModSelL pin set Low.
4. Power on Power Supply.
5. Set voltage 3.3 V and max. current.[1]

Note: *It is recommended to use external max. current slow-acting fuse for safety.*

1. Ref by QSFP-DD CMIS 4.0

6. Check ModPrsL LED is On (High Voltage).
7. Plug-in QSFP-DD transceiver.
8. Check ModPrsL LED is Off (Low Voltage).
9. Read Byte 0x03 Bits 1-3 should be 001b.

8.2.1 ID and Status

The ID and Status fields described in Table 8-2 provide fundamental memory map characteristics (module type, flat or paged memory, memory map version) as well as module status indicators.

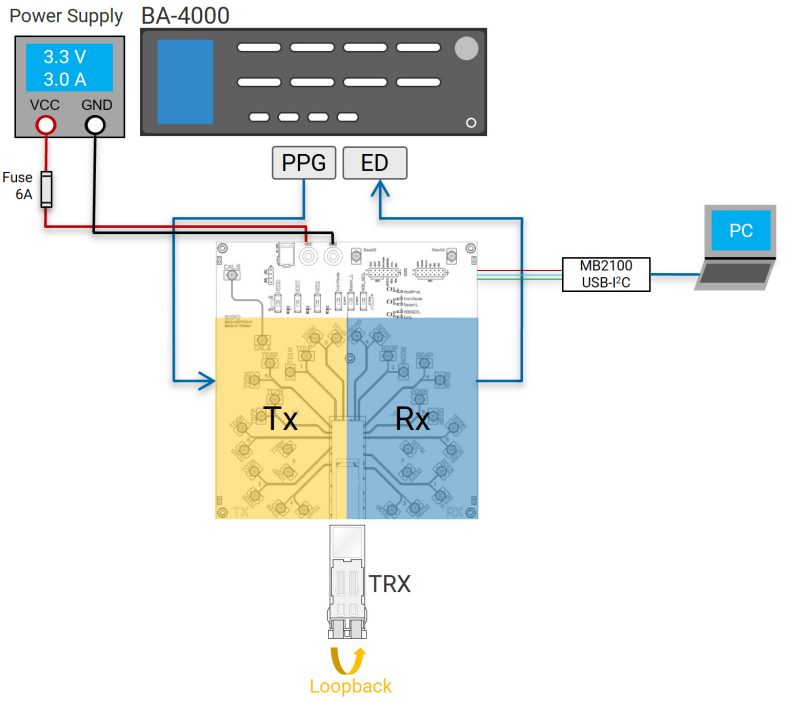
Table 8-2 Identifier and Status Summary (Lower Page)

Byte	Bits	Field Name	Description	Type
0	7-0	Identifier	Identifier - Type of Serial Module - See SFF-8024.	RO RQD
1	7-0	Revision Compliance	Identifier – CMIS revision; the upper nibble is the whole number part and the lower nibble is the decimal part. Example: 01h indicates version 0.1, 21h indicates version 2.1.	RO RQD
2	7	Flat_mem	Upper memory flat or paged. 0b=Paged memory (pages 00h, 01h, 02h, 10h and 11h are implemented) 1b=Flat memory (only page 00h implemented)	RO RQD
	6	Reserved		
	5-4	Reserved		
	3-2	TWI Maximum speed	Indicates maximum two-wire serial speed supported by module 00b=Module supports up to 400 kHz 01b=Module supports up to 1 MHz 10b=Reserved 11b=Reserved	RO RQD
	1-0	Reserved		
3	7-4	Reserved		
	3-1	Module state	Current state of Module (see Table 8-3)	RO RQD
	0	Interrupt	Digital state of interrupt output signal 0b=Interrupt asserted 1b=Interrupt not asserted (default)	

Table 8-3 Module State Encodings

Code	Module state
000b	Reserved
001b	ModuleLowPwr state
010b	ModulePwrUp state
011b	ModuleReady state (reported by flat memory modules)
100b	ModulePwrDn state
101b	Fault state
110b	Reserved
111b	Reserved

High Power Mode



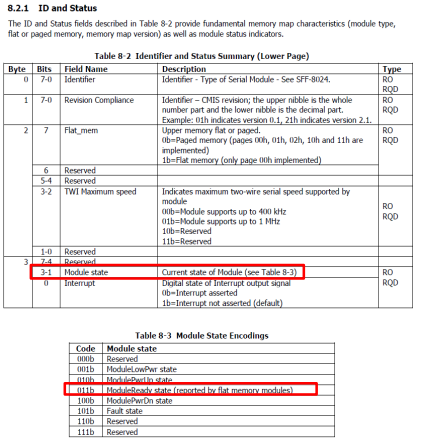
For high power mode:

1. LPMode pin set Low.
2. ResetL pin set High.
3. ModSelL pin set Low.
4. Power on Power Supply.
5. Set voltage 3.3 V and max. current.[1]

Note: *It is recommended to use external max. current slow-acting fuse for safety.*

1. Ref by QSFP-DD CMIS 4.0

6. Check ModPrsL LED is On (High Voltage).
7. Plug-in QSFP-DD transceiver.
8. Check ModPrsL LED is Off (Low Voltage).
9. Read Byte 0x03 Bits 1-3 should be 011b.
10. Loopback QSFP-DD transceiver.
11. Set BA-4000 amplitude and other parameters.
12. Read BER value from BA-4000.



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	6	Reserved		
	5-4	Reserved		
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101b	Fault state
110b	Reserved
111b	Reserved

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