Preliminary Specification

Serial 40Gb/s CFP Optical Transceiver Module

SCF0420FRxNGG01

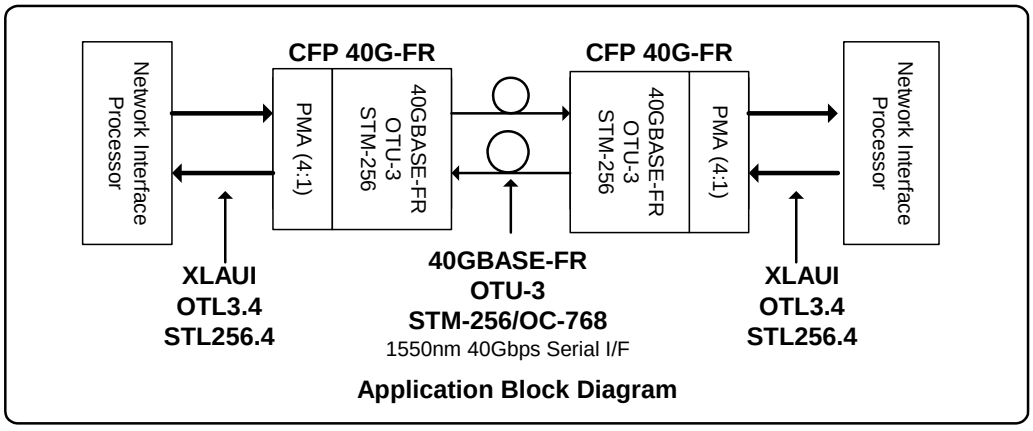
(40GBASE-FR, VSR2000-3R2,1550nm EML, PIN-PD, SMF 2km)

Features

- 40Gb/s Serial Optical Interface
  - High quality and reliability optical sub-assemblies
  - 1550nm CooledDFB-EML Optical Transmitter
  - High Sensitivity PIN-TIA Optical Receiver
  - Excelent performance for 2km over a SMF
- IEEE802.3bg Compliant
  - IEEE802.3 Clause 89 40GBASE-FR
  - XLAUI(4x10G) Electrical Interface
  - MDIO Interface for module management
- OTU-3 Rate Operation
  - 4x9.953 and up to 4x11.146 Gb/s host lane operation
  - ITU-T G.693 VSR2000-3R2 compliant interface
- CFP MSA Compliant
  - Easy supply management for hot pluggability
  - CFP MSA Form Factor
  - 148pin Electrical Connector
  - Duplex LC Receptacle
- Low Power Consumption
  - 3.3V single power supply
  - Power consumption less than 10W

Applications

- 40GE Enterprise switches and routers
- Carrier Grade 40GE Core-routers
- Point to Point and Ring Application
- Inter Rack Connection
- Other high speed data connections



Application Block Diagram

1. General Description

The SCF0420FR is a CFP optical transceiver module which is a hot pluggable form factor designed for high speed optical networking applications. The SCF0420FR converts 4-lane, 10.3125 Gb/s electrical input data streams to a 41.25 Gb/s serial optical output signal and a 41.25 Gb/s optical input signal to 4-lane, 10.3125 Gb/s electrical data streams. The SCF0420FR's optical and electrical interface is fully compliant with the IEEE 802.3bg 40GBASE-FR standard. The SCF0420FR supports SONET OC768 SR2, SDH VSR2000 3R2 and OTU3 client optical interface modes. The high performance DFB-EML transmitter and high sensitivity PIN receiver provide excellent performance for 40Gigabit Ethernet applications as well as SONET/SDH and OTN VSR applications up to 2km.

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2. Functional Description

The SCF0420FR optical transceiver is a bi-directional module with a transmitter and receiver in the CFP MSA form factor. Figure 2.1 shows the functional block diagram of SCF0420FR CFP transceiver. The SCF0420FR contains a 4:1 MUX, a 1:4 DMUX, optical transmitter (OTX), optical receiver (ORX), and a module management block including an MDIO interface.

Transmitter Operation

The transceiver module receives 4-lane, 10.3125 Gb/s electrical inputs and a reference clock. The reference clock frequency should be 1/64 or 1/16 of the electrical input lane (host lane) rate and should be synchronized to the electrical input lanes. Dejitter circuitry reduces phase noise of the reference clock before feeding it into the 4:1 MUX. The 4:1 MUX synthesizes the reference clock and generates a 41.25 GHz clock for multiplexing the input 4-lane signals. The 4:1 MUX multiplexes 4-lane electrical signals to a serial 41.25 Gb/s data stream after reshaping and retiming received electrical input lane signals. The OTX converts serial 41.25 Gb/s electrical data steam to an optical domain signal through Laser driver and Laser diode which is packaged in a Transmitter Optical Sub-Assembly package. The optical output power is held constant by an automatic power control (APC) circuit. The transmitter output can be turned off by using the TX_DIS hardware pin and/or through the MDIO module management Interface. The operation mode of the transmitter can be changed to SDH (SONET) mode or OTU3 mode by changing the MDIO register for "TX Rate Select",

Receiver Operation

The SCF0420FR receives 41.25 Gb/s optical signal. The ORX converts optical signal to electrical data stream. The 1:4 DMUX de-multiplexes 41.25 Gb/s data streams to 4-lane

10.3125 Gb/s electrical output signals which are compliant with XLAUI interface requirements. The receiver monitor clock, RX_MCLK, is recovered from received optical signal. This RX_MCLK is normally disabled and can be enabled through MDIO register. Received optical signal power is monitored and reported through the MDIO. If the received optical signal is weaker than the threshold level, RX_LOS hardware alarm will be asserted. The operation mode of the receiver can be changed to SDH (SONET) mode or OTU3 mode by changing the MDIO register for “RX Rate Select”.

Management Data I/O (MDIO)

The SCF0420FR supports the MDIO interface specified in IEEE802.3 Clause 45. This 2-wire management data I/O interface is provided for the module status monitoring and control. The management data clock (MDC) provides clocking for the data that is passed on the MDIO port. Five additional pins allow for loading of a port address (PORT_ADDR0-4) into the module.

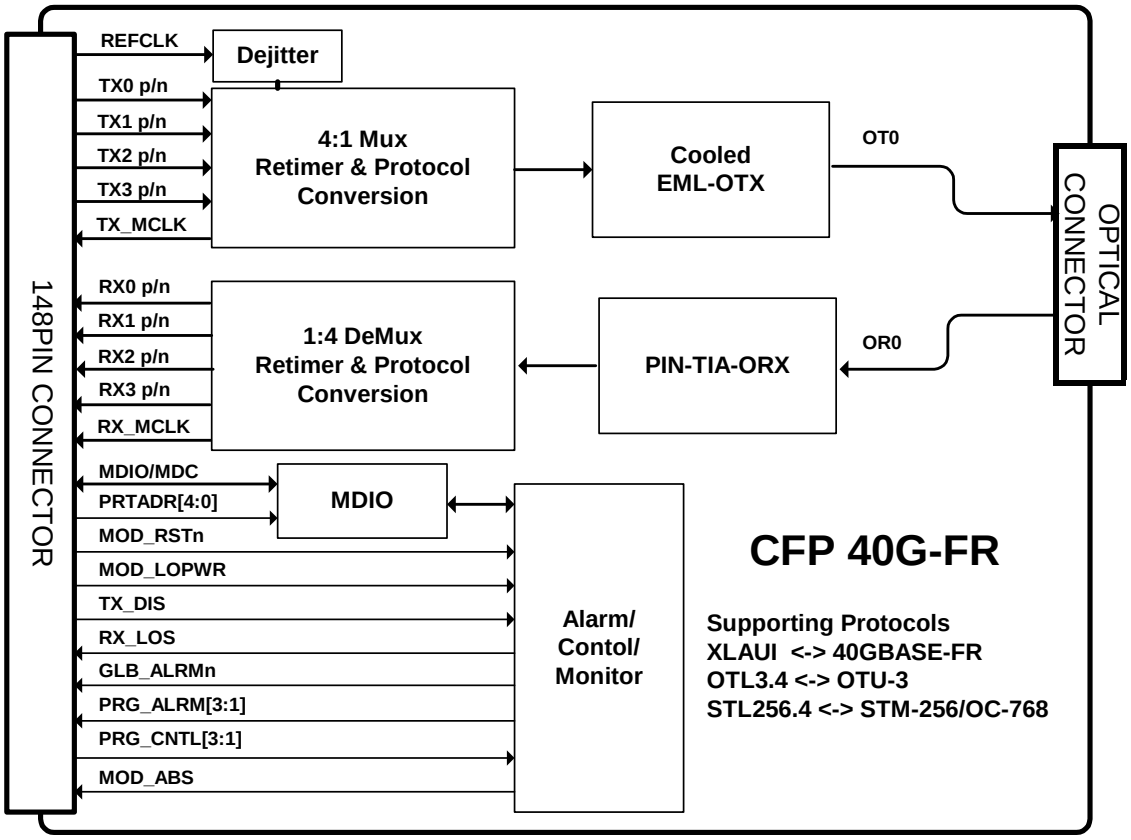
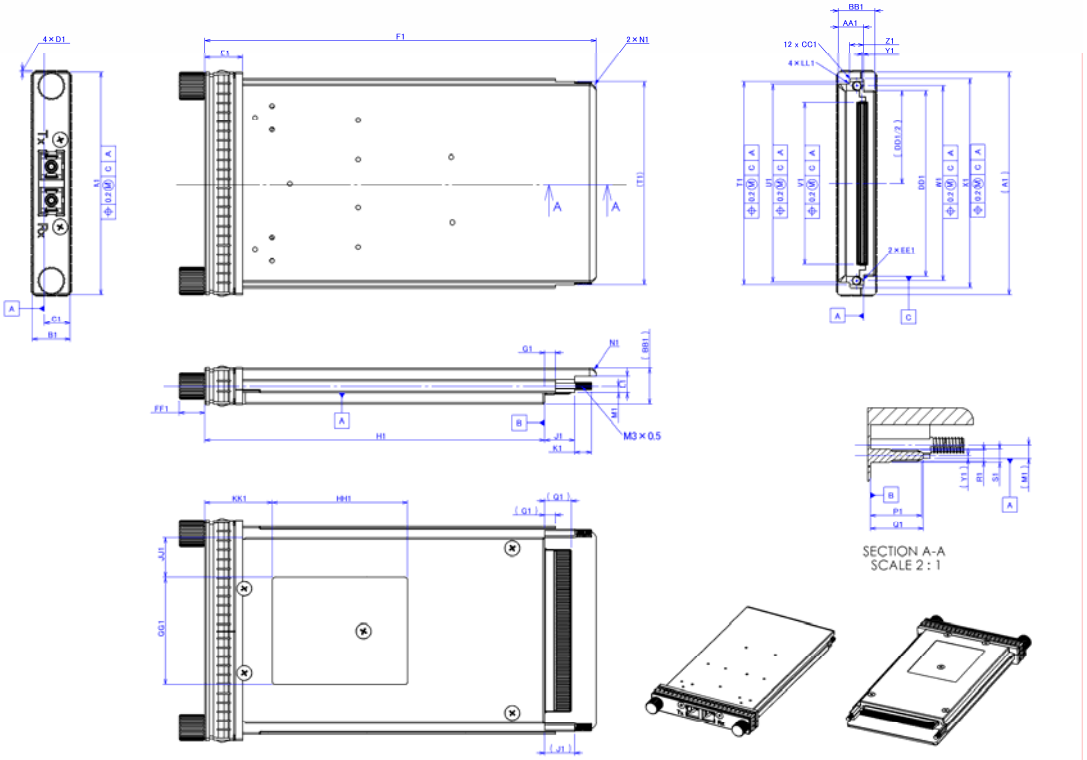


Figure 2.1. Functional Block Diagram

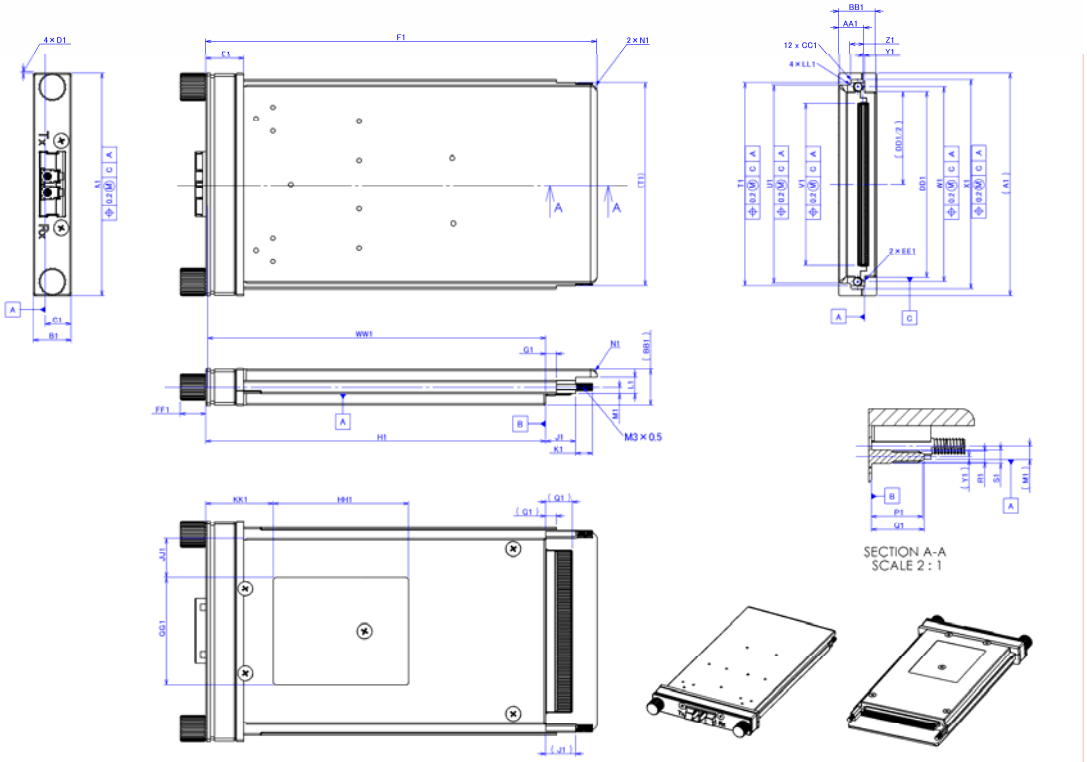
3. Package Dimensions

Figure 3.1 shows the package dimensions of the SCF0420FR. This transceiver is designed to be compliant to the CFP MSA specification.



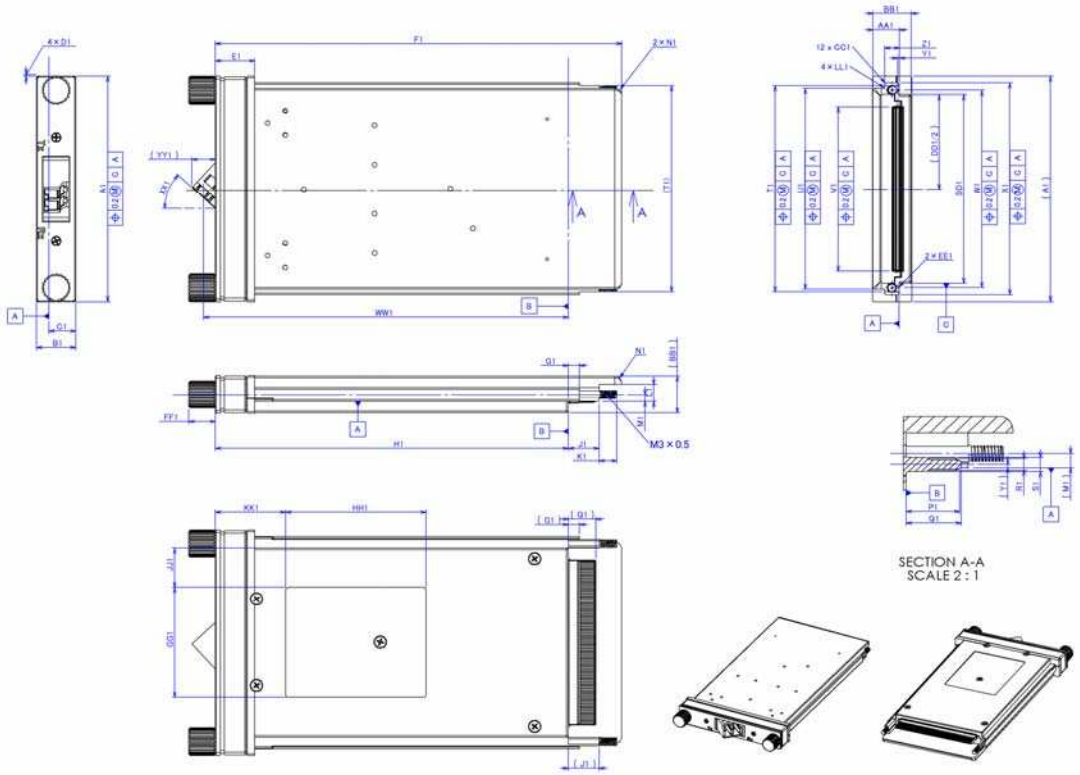
Dimensions in mm

Figure 3.1. (a) SC with Flat Top Package Drawing



Dimensions in mm

Figure 3.1. (b) LC with Flat Top Package Drawing



Dimensions in mm

Figure 3.1. (c) LC Angled with Flat Top Package Drawing

Table 3.1. Package dimensions

MODULE DIMENSIONS				Note
KEY	VALUE	TOLERANCE	DESCRIPTION	
A1	82.00	±0.10	WIDTH OF MODULE FACEPLATE, OVERALL	
B1	14.00	±0.10	HEIGHT OF MODULE FACEPLATE, OVERALL	
C1	9.60	±0.20	HEIGHT OF MODULE FACEPLATE TO DATUM -A-	
D1	0.65	MIN.	HEIGHT OF EMI SPRING FINGERS	
E1	14.50	MAX.	LENGTH OF MODULE FACEPLATE, OVERALL	
F1	144.75	±0.20	LENGTH OF MODULE, OVERALL	
G1	4.80	MAX.	LENGTH OF MODULE RAIL SHOULDER	
H1	125.70	±0.20	DISTANCE FROM MODULE FACEPLATE TO HARDSTOP DATUM -B-	
J1	11.00	±0.20	DISTANCE FROM CONNECTOR PROTECTOR TO HARDSTOP DATUM -B-	
K1	6.00	±0.50	M3 THUMBSCREW THREAD LENGTH IN FULLY LOADED POSITION	
L1	6.40	±0.20	DISTANCE FROM DATUM -A- TO BOTTOM SURFACE OF MODULE TAIL	
M1	2.60	±0.20	DISTANCE FROM DATUM -A- TO CENTERLINE OF M3 THUMBSCREW HOLE	
N1	R2.00	MIN.	TOP MODULE LEAD-IN RADIUS	
P1	9.08	±0.15	LENGTH OF CONNECTOR CONTACT PIN FROM DATUM -B-	
Q1	9.80	±0.08	LENGTH OF CONNECTOR END FROM DATUM -B-	
R1	2.18	±0.08	CONNECTOR TIP THICKNESS, OVERALL	
S1	2.62	±0.08	CONNECTOR SHOULDER THICKNESS, OVERALL	
T1	75.00	±0.20	WIDTH OF MODULE CONNECTOR PROTECTOR, OVERALL	
U1	73.20	±0.20	WIDTH, TOP SHOULDER, MODULE, OVERALL	
V1	60.05	±0.08	WIDTH, CONNECTOR, OVERALL	
W1	72.00	±0.20	CENTERLINE TO CENTERLINE DISTANCE OF M3 THUMB SCREW HOLES	
X1	77.20	±0.20	WIDTH, MODULE BODY, OVERALL	
Y1	0.60	±0.15	DATUM -A- TO CENTERLINE OF CONNECTOR	
Z1	5.20	±0.20	HEIGHT, RAIL SHOULDER, MODULE, OVERALL	
AA1	9.40	±0.20	DATUM -A- TO TOP OF MODULE	
BB1	13.60	±0.20	HEIGHT, MODULE BODY, OVERALL	
CC1	R0.6	±0.10	MODULE OUTSIDE CORNER RADIUS	
DD1	68.80	±0.20	WIDTH, MODULE BOTTOM, OVERALL	
EE1	R2.60	±0.20	RADIUS, CLEARANCE, MODULE, CONNECTOR PROTECTOR FEATURE	
FF1	9.50	±0.50	THUMBSCREW HEIGHT FROM MODULE FACEPLATE TOP FRONT SURFACE	
GG1	40.00	±0.20	LABEL RECESS WIDTH	
HH1	50.00	±0.20	LABEL RECESS LENGTH	
JJ1	14.40	±0.20	LABEL RECESS TO SIDE OF MODULE	
KK1	25.00	±0.20	LABEL RECESS TO MODULE FACEPLATE	
LL1	R0.4	MAX.	MODULE INSIDE CORNER RADIUS	
WW1	125.00	±0.50	CFP module stopper to LC connector Latch	1
WW1	129.90	±0.50	CFP module locking mechanism to the LC connector Latch	2
XX1	45°	±5°	Angular difference between module center and LC receptacle	2
YY1	8.50	Reference	Distance from module faceplate to LC receptacle	2

Note1: Apply to LC Duplex Option

Note2: Apply to Angled LC Option

4. Pin Assignment and Pin Description

4.1. CFP Transceiver Electrical Pin Assignment

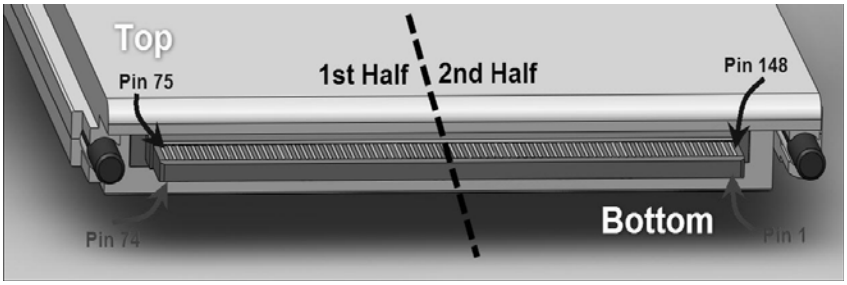


Figure 4.1. CFP Transceiver Electrical Pin Numbering

Table 4.1. CFP Transceiver Electrical Pin Assignment

Top Raw 2nd Half		Bottom Row 2nd Half		Top Raw 1st Half		Bottom Row 1st Half	
PIN#	Name	PIN#	Name	PIN#	Name	PIN#	Name
148	GND	1	3.3V_GND	111	GND	38	MOD_ABS
147	REFCLKn	2	3.3V_GND	110	NC	39	MOD_RSTn
146	REFCLKp	3	3.3V_GND	109	NC	40	RX_LOS
145	GND	4	3.3V_GND	108	GND	41	GLB_ALRMn
144	NC (note1)	5	3.3V_GND	107	NC	42	PRTADR4
143	NC (note1)	6	3.3V	106	NC	43	PRTADR3
142	GND	7	3.3V	105	GND	44	PRTADR2
141	NC (note2)	8	3.3V	104	NC	45	PRTADR1
140	NC (note2)	9	3.3V	103	NC	46	PRTADR0
139	GND	10	3.3V	102	GND	47	MDIO
138	NC (note1)	11	3.3V	101	NC	48	MDC
137	NC (note1)	12	3.3V	100	NC	49	GND
136	GND	13	3.3V	99	GND	50	NUC (note2)
135	NC (note1)	14	3.3V	98	NC	51	NUC (note2)
134	NC (note1)	15	3.3V	97	NC	52	GND
133	GND	16	3.3V_GND	96	GND	53	NUC (note2)
132	NC (note1)	17	3.3V_GND	95	NC	54	NUC (note2)
131	NC (note1)	18	3.3V_GND	94	NC	55	3.3V_GND
130	GND	19	3.3V_GND	93	GND	56	3.3V_GND
129	NC (note1)	20	3.3V_GND	92	NC	57	3.3V_GND
128	NC (note1)	21	NUC (note3)	91	NC	58	3.3V_GND
127	GND	22	NUC (note3)	90	GND	59	3.3V_GND
126	NC (note1)	23	GND	89	RX3n	60	3.3V
125	NC (note1)	24	TX_MCLKn	88	RX3p	61	3.3V
124	GND	25	TX_MCLKp	87	GND	62	3.3V
123	TX3n	26	GND	86	RX2n	63	3.3V
122	TX3p	27	NUC (note2)	85	RX2p	64	3.3V
121	GND	28	NUC (note2)	84	GND	65	3.3V
120	TX2n	29	NUC (note2)	83	RX1n	66	3.3V
119	TX2p	30	PRG_CNTL1	82	RX1p	67	3.3V
118	GND	31	PRG_CNTL2	81	GND	68	3.3V
117	TX1n	32	PRG_CNTL3	80	RX0n	69	3.3V
116	TX1p	33	PRG_ALRM1	79	RX0p	70	3.3V_GND
115	GND	34	PRG_ALRM2	78	GND	71	3.3V_GND
114	TX0n	35	PRG_ALRM3	77	RX_MCLKn	72	3.3V_GND
113	TX0p	36	TX_DIS	76	RX_MCLKp	73	3.3V_GND
112	GND	37	MOD_LOPWR	75	GND	74	3.3V_GND

1: These pins are not used for this product. These pins are internally terminated by AC 100ohm.

2: These pins are internally used and NOT allowed to connect any signal, power supply and GND.

4.2. Host PCB CFP Foot Print

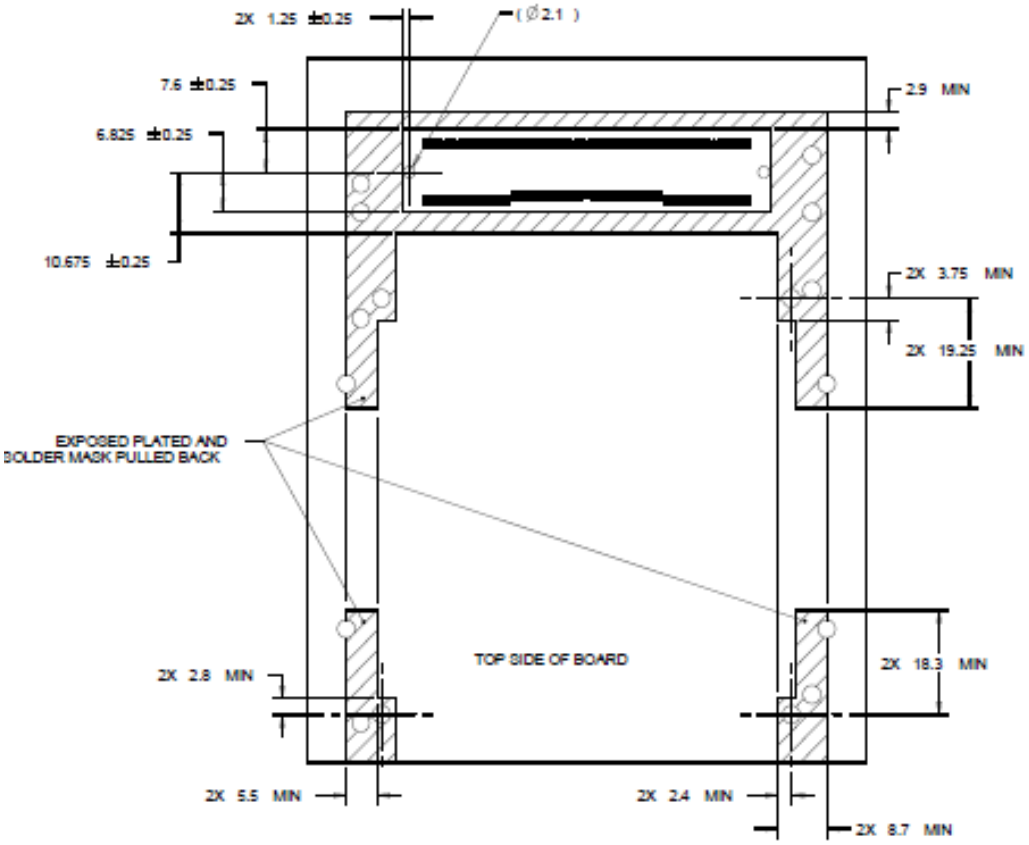


Figure 4.2. Host PCB CFP Foot Print

Table 4.2. Host Connector Assembly Information

Part Name	Supplier	Part Number
External Blacket Assy.	Tyco Electronics	2057626-1
Guide Rail	Tyco Electronics	2057592-2
Host Connector Cover Assy.	Tyco Electronics	2057631-1
Backer Plate Assy.	Tyco Electronics	2057930-1
Host Connector	Tyco Electronics	2057630-1

4.3. Pin Descriptions

Table 4.3. Pin Description

PIN#	Name	I/O	Logic	Description
1	3.3V_GND			3.3V Module Supply Voltage Return Ground, can be separate or tied together with Signal Ground
2	3.3V_GND			
3	3.3V_GND			
4	3.3V_GND			
5	3.3V_GND			
6	3.3V			3.3V Module Supply Voltage
7	3.3V			3.3V Module Supply Voltage
8	3.3V			3.3V Module Supply Voltage
9	3.3V			3.3V Module Supply Voltage
10	3.3V			3.3V Module Supply Voltage
11	3.3V			3.3V Module Supply Voltage
12	3.3V			3.3V Module Supply Voltage
13	3.3V			3.3V Module Supply Voltage
14	3.3V			3.3V Module Supply Voltage
15	3.3V			3.3V Module Supply Voltage
16	3.3V_GND			3.3V Module Supply Voltage Return Ground, can be separate or tied together with Signal Ground
17	3.3V_GND			
18	3.3V_GND			
19	3.3V_GND			
20	3.3V_GND			
21	NUC			Module Vendor I/O. Must No Connect at host board
22	NUC			Module Vendor I/O. Must No Connect at host board
23	GND			
24	NC			Not Connected Internally
25	NC			Not Connected Internally
26	GND			
27	NUC			Module Vendor I/O. Must No Connect at host board
28	NUC			Module Vendor I/O. Must No Connect at host board
29	NUC			Module Vendor I/O. Must No Connect at host board
30	PRG_CNTL1	I	LVCMOS w/ PUR	Programmable Control 1 set over MDIO, MSA Default: TRXIC_RSTn, TX & RX ICs reset, "0": reset, "1" or NC: enabled = not used
31	PRG_CNTL2	I	LVCMOS w/ PUR	Programmable Control 2 set over MDIO, MSA Default: Hardware Interlock LSB, "00": ≤8W, "01":≤16W, "10": ≤24W, "11" or NC: ≤32W = not used
32	PRG_CNTL3	I	LVCMOS w/ PUR	Programmable Control 2 set over MDIO, MSA Default: Hardware Interlock MSB, "00": ≤8W, "01":≤16W, "10": ≤24W, "11" or NC: ≤32W = not used
33	PRG_ALRM1	O	LVCMOS	Programmable Alarm 1 set over MDIO, MSA Default: HIPWR_ON, "1": module power up completed, "0": module not high powered up
34	PRG_ALRM2	O	LVCMOS	Programmable Alarm 2 set over MDIO, MSA Default: MOD_READY, "1": Ready, "0": not Ready.
35	PRG_ALRM3	O	LVCMOS	Programmable Alarm 3 set over MDIO, MSA Default: MOD_FAULT, fault detected, "1": Fault, "0": No Fault
36	TX_DIS	I	LVCMOS w/ PUR	Transmitter Disable for all lanes, "1" or NC = transmitter disabled, "0" = transmitter enabled
37	MOD_LOPWR	I	LVCMOS w/ PUR	Module Low Power Mode. "1" or NC: module in low power (safe) mode, "0": power-on enabled

Table 4.3. Pin Description (Continued)

PIN#	Name	I/O	Logic	Description
38	MOD_ABS	O	GND	Module Absent. "1" or NC: module absent, "0": module present, Pull Up Resistor on Host
39	MOD_RSTn	I	LVCMOS w/ PDR	Module Reset. "0" resets the module, "1" or NC = module enabled, Pull Down Resistor in Module
40	RX_LOS	O	LVCMOS	Receiver Loss of Optical Signal, "1": low optical signal, "0": normal condition
41	GLB_ALRMn	O	LVCMOS	Global Alarm. “0": alarm condition in any MDIO Alarm register, "1": no alarm condition, Open Drain, Pull Up Resistor on Host
42	PRTADR4	I	1.2V CMOS	MDIO Physical Port address bit 4
43	PRTADR3	I	1.2V CMOS	MDIO Physical Port address bit 3
44	PRTADR2	I	1.2V CMOS	MDIO Physical Port address bit 2
45	PRTADR1	I	1.2V CMOS	MDIO Physical Port address bit 1
46	PRTADR0	I	1.2V CMOS	MDIO Physical Port address bit 0
47	MDIO	I/O	1.2V CMOS	Management Data I/O bi-directional data (electrical specs as per 802.3ae and ba)
48	MDC	I	1.2V CMOS	Management Data Clock (electrical specs as per 802.3ae and ba)
49	GND			
50	NUC			Module Vendor I/O. Must No Connect at host board
51	NUC			Module Vendor I/O. Must No Connect at host board
52	GND			
53	NUC			Module Vendor I/O. Must No Connect at host board
54	NUC			Module Vendor I/O. Must No Connect at host board
55	3.3V_GND			3.3V Module Supply Voltage Return Ground, can be separate or tied together with Signal Ground
56	3.3V_GND			
57	3.3V_GND			
58	3.3V_GND			
59	3.3V_GND			
60	3.3V			3.3V Module Supply Voltage
61	3.3V			3.3V Module Supply Voltage
62	3.3V			3.3V Module Supply Voltage
63	3.3V			3.3V Module Supply Voltage
64	3.3V			3.3V Module Supply Voltage
65	3.3V			3.3V Module Supply Voltage
66	3.3V			3.3V Module Supply Voltage
67	3.3V			3.3V Module Supply Voltage
68	3.3V			3.3V Module Supply Voltage
69	3.3V			3.3V Module Supply Voltage
70	3.3V_GND			3.3V Module Supply Voltage Return Ground, can be separate or tied together with Signal Ground
71	3.3V_GND			
72	3.3V_GND			
73	3.3V_GND			
74	3.3V_GND			

Table 4.3. Pin Description (Continued)

PIN#	Name	I/O	Logic	Description
75	GND			
76	RX_MCLKp	O	HS I/O	Receiver monitor clock which operates at a rate relative to the optical lane rate of 1/16
77	RX_MCLKn	O	HS I/O	rate. Internally AC coupled with 100ohm back termination.
78	GND			
79	RX0p	O	HS I/O	Lane 0 Receiver Output (Positive)
80	RX0n	O	HS I/O	Lane 0 Receiver Output (Negative)
81	GND			
82	RX1p	O	HS I/O	Lane 1 Receiver Output (Positive)
83	RX1n	O	HS I/O	Lane 1 Receiver Output (Negative)
84	GND			
85	RX2p	O	HS I/O	Lane 2 Receiver Output (Positive)
86	RX2n	O	HS I/O	Lane 2 Receiver Output (Negative)
87	GND			
88	RX3p	O	HS I/O	Lane 3 Receiver Output (Positive)
89	RX3n	O	HS I/O	Lane 3 Receiver Output (Negative)
90	GND			
91	NC			Not Connected Internally
92	NC			Not Connected Internally
93	GND			
94	NC			Not Connected Internally
95	NC			Not Connected Internally
96	GND			
97	NC			Not Connected Internally
98	NC			Not Connected Internally
99	GND			
100	NC			Not Connected Internally
101	NC			Not Connected Internally
102	GND			
103	NC			Not Connected Internally
104	NC			Not Connected Internally
105	GND			
106	NC			Not Connected Internally
107	NC			Not Connected Internally
108	GND			
109	NC			Not Connected Internally
110	NC			Not Connected Internally
111	GND			

Table 4.3. Pin Description (Continued)

PIN#	Name	I/O	Logic	Description
112	GND			
113	TX0p	I	HS I/O	Lane 0 Transmitter Input (Positive)
114	TX0n	I	HS I/O	Lane 0 Transmitter Input (Negative)
115	GND			
116	TX1p	I	HS I/O	Lane 1 Transmitter Input (Positive)
117	TX1n	I	HS I/O	Lane 1 Transmitter Input (Negative)
118	GND			
119	TX2p	I	HS I/O	Lane 2 Transmitter Input (Positive)
120	TX2n	I	HS I/O	Lane 2 Transmitter Input (Negative)
121	GND			
122	TX3p	I	HS I/O	Lane 3 Transmitter Input (Positive)
123	TX3n	I	HS I/O	Lane 3 Transmitter Input (Negative)
124	GND			
125	NC			Internally terminated with AC 100 Ohm
126	NC			
127	GND			
128	NC			Internally terminated with AC 100 Ohm
129	NC			
130	GND			
131	NC			Internally terminated with AC 100 Ohm
132	NC			
133	GND			
134	NC			Internally terminated with AC 100 Ohm
135	NC			
136	GND			
137	NC			Internally terminated with AC 100 Ohm
138	NC			
139	GND			
140	NC			Internally terminated with AC 100 Ohm
141	NC			
142	GND			
143	NC			Not Connected Internally
144	NC			Not Connected Internally
145	GND			
146	REFCLKp	I	HS-I/O	Reference Clcok for transmitter CMU. Internally terminated with AC 100 Ohm
147	REFCLKn	I	HS-IO	
148	GND			

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5. Absolute Maximum Ratings and Recommended Operating Conditions

Table 5.1. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Strage Temperature	Tst	-40	85	degC	
Relative Humidity (non-condensation)	RH		85	%	
Operating Case Temperature	Topc	-5	75	degC	
Supply Voltage	Vcc	-0.3	3.6	V	
Voltag on any XLAUI pin	V_{XAUI}	-0.3	1.9	V	
Voltage on any 3.3V LVCMOS pin	V_{LVCMOS}	-0.3	Vcc+0.3	V	
Voltage on any 1.2V LVCMOS pin	V_{LVCMOS}	-0.3	1.65	V	
Receiver Average Input Optical Power	Mip		4	dBm	

Table 5.2. Recommended Operating Conditions and Supply Requirements

Parameter	Symbol	Min	Max	Unit	Note
Operating Case Temperature	Topc	-5	75	degC	
Relative Humidity (non-condensing)	Rhop		85	%	
Power Supply Voltage	Vcc	3.135	3.465	V	
Power Supply Current for 3.3V			2.886	A	
Total Power Dissipation	Pw	-	10	W	
Low Power Mode dissipation	Plow	-	2	W	
In-rush Curent (Class 1 and 2)	I-inrush	-	50	mA/us	
Turn-off rush Curent (Class 1 and 2)	I-turnoff	-50	-	mA/us	
Power Supply Nose	Vrip	-	2	%	DC-1MHz
		-	3	%	1-10MHz

6. Electrical Interface

6.2. Electrical High Speed I/O Interface

Table 6.1.1. XLAUI Input Interface

XLAUI Receiver Parameters	symbol	Min	Typ	Max	Units	Note
Signal Rate Per Lane			10.3125		Gb/s	
Signal Rate tolerance		-100		100	ppm	
AC Common Mode Voltage Tolerance, RMS	CMVLTac			20	mV	
Minimum Differential Input Return Loss	Rldiff	IEEE802.3ba Equation 83B-5			dB	
Total Input Jitter Tolerance	Tjin			0.62	UI	
Deterministic Input Jitter Tolerance	Tdin			0.42	UI	
Transmitter Input Eye Mask (X1, X2)		(0.31, 0.5)			UI	1
Transmitter Input Eye Mask (Y1, Y2)		(42.5, 425)			mV	1

Table 6.1.2 XLAUI Output Interface

XLAUI Driver Parameters	symbol	Min	Typ	Max	Units	Note
Signal Rate Per Lane			10.3125		Gb/s	
Signal Rate tolerance		-100		100	ppm	
Single-end Output Voltage	Vosingle	-0.4		4	V	
Output AC Common Mode Voltage, RMS	Vocomac			15	mV	
Output Rise and Fall Time (20%-80%)	Trftl	24			ps	
Minimum Differential Output Return Loss	Rldiff	IEEE802.3ba Equation 83B-6			dB	
Total Output Jitter	Tjo			0.4	UI	
Deterministic Output Jitter	Tdo			0.25	UI	
Receiver Output Eye Mask (X1, X2)		(0.2, 0.5)			UI	2
Receiver Output Eye Mask (Y1, Y2)		(136, 380)			mV	2

1: Refer to Figure 6.1.1

2: Refer to Fig.6.1.2

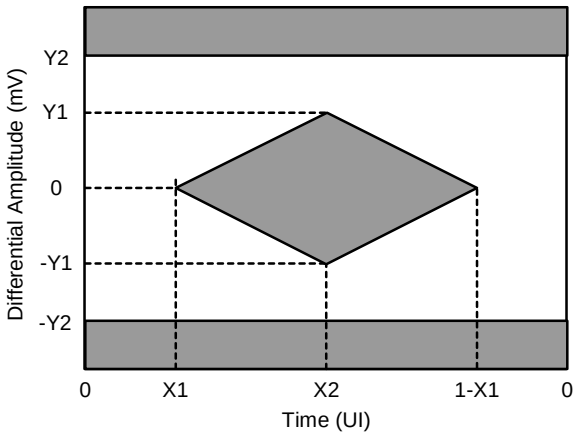


Figure 6.1.1. XLAUI Receiver Eye Mask

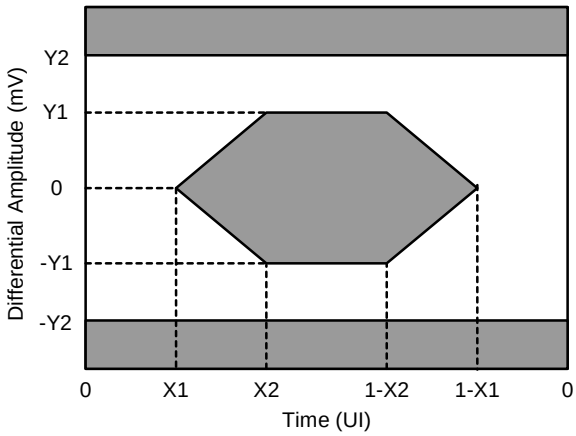


Figure 6.1.2. XLAUI Transmitter Eye Mask

Table 6.1.3. REFCLK Input Interface

XLAUI Driver Parameters	symbol	Min	Typ	Max	Units	Note
Imput Impedance	Zd	80	100	120	ohm	
Frequency		1/64 of host lane rate				1
Frequency Stability	df1	-100		100	ppm	2
	df2	-20		20	ppm	2
Input Differential Voltage	Vindiff	400		1200	mV	
RMS Jitter	Sj			10	ps	3
Input Duty Cycle		40		60	%	
Input Rise/Fall Time	trf1	200		1250	ps	4
	trf2	50		315	ps	5

1: Initial setting. 1/16 rate optional, 2: For Ethernet application, 3: For Telecom applications

4: Random Jitter. Over frequency band of 10kHz < f < 10MHz , 5: 1/64 of host (electrical) lane rate

6: 1/16 of host (electrical) lane rate

Table 6.1.4 MCLK Output Interface

Parameter	symbol	Min	Typ	Max	Units	Note
Impedance	Zd	80	100	120	Ω	
Frequency		1/16 of network lane rate				1
Output Differential Voltage	VDIFF	400		1200	mV	
Clock Duty Cycle		40.0		60	%	

1: Default disabled.

Table 6.1.5 MDIO Register for REFCLK

MDIO Hex Addr.	Bit	Register Name	Value and Description
A011h	0	TX Reference CLK Rate Select	0: 1/16 of host lane, 644MHz 1: 1/64 of host lane, 161MHz (Initial Value)

Table 6.1.6 MDIO Register for MCLK

MDIO Hex Addr.	Bit	Register Name	Value and Description
A011h	7 : 5	TX MCLK Control	000b: Disabled (Initial Value) 001b: 1/16 of network lane (2.6GHz) 111b: 1/16 of host lane (644MHz)
A012h	7 : 5	RX MCLK Control	000b: Disabled (Initial Value) 001b: 1/16 of network lane (2.6GHz) 111b: 1/16 of host lane (644MHz)

6.2. Electrical Low Speed I/O Interface

Table 6.2.1. 3.3V CMOS DC parameters

(MOD_RSTn, MOD_LOPWR, TX_DIS, PRG_CNTL, MOD_ABS, RX_LOS, GLB_ALRMn, PRG_ALRM)

Parameter	symbol	Min	Typ	Max	Units	Note
Intput High Voltage	Vih	2		Vcc+0.3	V	
Input Low Voltage	Vil	-0.3		0.8	V	
Input Leakage Current	IIN	-10		10	µA	
Output High Voltage (IOH=-100uA)	Voh	Vcc-0.2		Vcc+0.3	V	
Output Low Voltage (IOL=100uA)	Vol	-0.3		0.2	V	
Minimun Pulse Width of Control Pin Signal	t_CNTL	100			µS	

Table 6.2.2. 1.2V CMOS DC parameters (MDIO, MDC, PRTADR4:0)

Parameter	symbol	Min	Typ	Max	Units	Note
Intput High Voltage	Vih	0.84		1.5	V	
Input Low Voltage	Vil	-0.3		0.36	V	
Input Leakage Current	IIN	-100		100	µA	
Output High Voltage	Voh	1.0		1.5	V	
Output Low Voltage	Vol	-0.3		0.2	V	
Output high current (Vi =1.0V)	Iioh			-4	mA	
Output low current (Vi = 0.2V)	Iol	4			mA	
Input Capacitance	Ci			10	pF	

Table 6.2.3. Timing Parameters for CFP Hardware Signal PINS

Parameter	symbol	Min	Max	Units	Note
Hardware MOD_LOPWR assert	t_MOD_LOPWR_assert		1	ms	
Hardware MOD_LOPWR deassert	t_MOD_LOPWR_deassert		4000	ms	
Receiver Loss of Signal Assert Time	t_loss_assert		100	µs	
Receiver Loss of Signal De-Assert Time	t_loss_deassert		100	µs	
Global Alarm Assert Delay Time	GLB_ALRMn_assert		150	ms	
Global Alarm De-Assert Delay Time	GLB_ALRMn_deassert		150	ms	
Initialization time from Reset	t_initialize		2.5	s	
Transmitter Disabled (TX_DIS asserted)	t_deassert		100	µs	
Transmitter Enabled (TX_DIS de-asserted)	t_assert		100	ms	

Table 6.2.4. MDIO and MDC AC parameters

Parameter	symbol	Min	Typ	Max	Units	Note
MDC clock Frequency	fMDC	0.1		4	MHz	
MDC clock period	tprd	250		10000	ns	
MDIO data hold time	Thold	10			ns	
MDIO data setup time	Tsetup	10			ns	
MDC high and low time	twidth	40		60	%	
		160			ns	
Delay from MDC rising edge to MDIO data change	Tdelay			175	ns	
MDIO/MDC termination in CFP	Zt	100			kOhm	

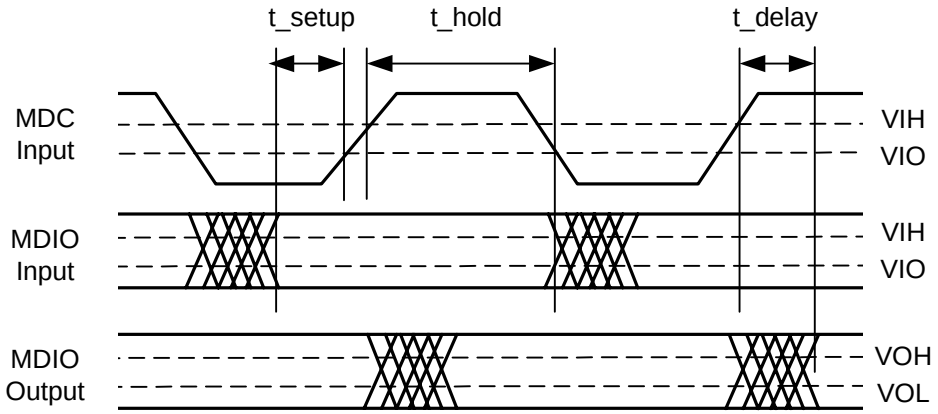


Table 6.2.1. MDIO and MDC AC parameters

7 Optical Interface

Table 7.1. Optical Interface

CFP 40G-FR					
Parameter	**Symbol**	**Value**		**Unit**	**Note**
		40GBASE-FR	**VSR2000 3R2(F)**		
Fiber Type		SMF			
Signaling Rate		41.2500	-	Gbps	1
		-	39.813120		2
		-	43.018413		3
Signaling rate tolerance		+/- 100	+/- 20	ppm	
Operating reach		0 to 2		km	
Channel insertion loss		0 to 4		dB	
Transmission power penalty (max)		2		dB	
Total Link Budget (min)		6		dB	
Transmitter Optical Interface					
Parameter	**Symbol**	**40GBASE-FR**	**VSR2000 3R2(F)**	**Unit**	**Note**
Center wavelength range	lc	1530 to 1565		nm	
Side-mode suppression ratio (SMSR), (min)	SMSR	35		dB	
Average launch power (max)	Polnmax	3		dBm	
Average launch power (min)	Polnmin	0		dBm	
Maximum optical path penalty		2		dB	
Average power of OFF (max)	Podis	-30		dBm	
Extinction Ratio (min)	ER2	8.2		dB	
RIN20OMA (max)	RIN	-132		dB/Hz	
Optical Return Loss Tolerance (max)	Torlt	20		dB	
Transmitter Refrectance (max)	TORF	-12		dB	
Eye Mask 1 {X1, X2, X3, Y1, Y2, Y3}	EM1	{0.25, 0.4, 0.45, 0.22, 0.25, 0.4}	-		4
Eye Mask 2 {X3-X2, X3, Y1, Y2, Y3, Y4}	EM2	-	{0.2, 0.25, 0.75, 0.25, 0.25}		5
Receiver Optical Interface					
Parameter	**Symbol**	**40GBASE-FR**	**VSR2000 3R2(F)**	**Unit**	**Note**
Center wavelength range	Pindm	1290 to 1330 1530 to 1565		nm	
Damage threshold	Pindm	4		dBm	
Average receive power (max)	Pinmax	3		dBm	6
Average receive power (min)	Pinmin	-6		dBm	6
Receiver reflectance (max)	RORF	-27		dB	
Rx-LOS assert level	LOSas	-30 to -12		dBm	
Rx-LOS deassert level (max)	LOSdea	-9		dBm	
Rx-LOS Hysteresis	LOShys	0.5	5	dB	

1: 40GbE mode, 2: SDH mode, 3: OTU3 mode, 4: Refer to Fig. 7.1, 5: Refer to Fig. 7.2,

6: BER < 1E-12, w/o FEC

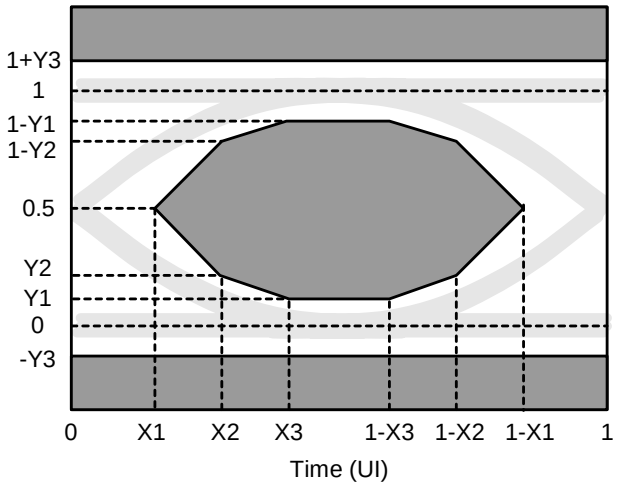


Fig 7.1. Transmission eye mask definition for 40GBASE-FR

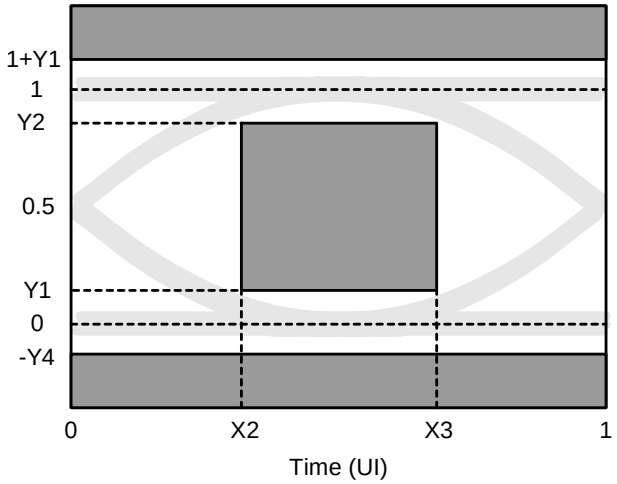


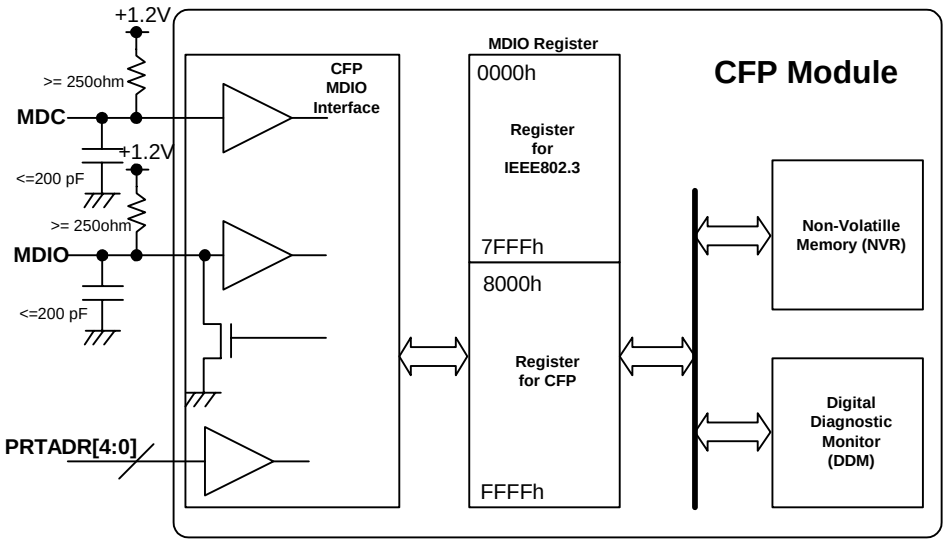
Fig 7.2. Transmission eye mask definition for VSR-2000

Table 7.1. MDIO Register for Signal Rate and Operation Mode

MDIO Hex Addr.	Bit	Register Name	Value and Description
A011h	3 : 1	TX Rate Select (10G lane rate)	000b: GbE=10.31 Gb/s (Initial Value) 001b: SDH=9.95 Gb/s 010b: OTU3=10.7 Gb/s
A012h	3 : 1	RX Rate Select (10G lane rate)	000b: GbE=10.31 Gb/s (Initial Value) 001b: SDH=9.95 Gb/s 010b: OTU3=10.7 Gb/s

8 MDIO and Non-Volatile Registers Map

8.1 MDIO Interface and CFP Register Allocation



Note: Capacitor represents stray capacity

> 600ohm pull-up is preferred

Figure 8.1. CFP MDIO Interface

Table 8.1. CFP Register Allocation

Starting Address in Hex	Ending Address in Hex	Access Type	Allocated Size	Data Bit Width	Table Name and Description
0000	7FFF	N/A	32768	N/A	Reserved for IEEE 802.3 Use.
8000	807F	RO	128	8	CFP NVR 1. Basic ID registers.
8080	80FF	RO	128	8	CFP NVR 2. Extended ID registers.
8100	817F	RO	128	8	CFP NVR 3. Network lane specific registers.
8180	81FF	RO	128	8	CFP NVR 4.
8200	83FF	RO	4x128	N/A	MSA Reserved.
8400	847F	RO	128	8	Vendor NVR 1. Vendor data registers.
8480	84FF	RO	128	8	Vendor NVR 2. Vendor data registers.
8500	86FF	RO	6x128	N/A	Reserved by CFP MSA.
8800	887F	R/W	128	8	User NVR 1. User data registers.
8880	88FF	R/W	128	8	User NVR 2. User data registers.
8900	8FFF	RO	14x128	N/A	Reserved by CFP MSA.
9000	9FFF	RO	4096	N/A	Reserved for vendor private use.
A000	A07F	R/W	128	16	CFP Module VR 1. CFP Module level control / DDM registers.
A080	A0FF	RO	128	16	Reserved by CFP MSA.
A100	A1FF	RO	2x128	N/A	Reserved by CFP MSA.
A200	A27F	R/W	128	16	Network Lane VR 1. Network lane specific registers.
A280	A2FF	R/W	128	16	Network Lane VR 2. Network lane specific registers.
A300	A3FF	RO	2x128	N/A	Reserved by CFP MSA.
A400	A47F	R/W	128	16	Host Lane VR 1. Host lane specific registers.
A480	AFFF	RO	23x128	N/A	Reserved by CFP MSA.
B000	FFFF	RO	5x4096	N/A	Reserved by CFP MSA.

8.2 Non-Volatile Register (NVR) Map

Table 8.2.1. CFP NVR-1

Hex Addr	Size	Access Type	Bit	Register Name Bit Filed Name	Value		Description	LSB Unit
					Value	Hex		
Base ID Information								
8000	1	RO		Module Identifier		0Eh	0E: CFP	N/A
8001	1	RO		Extended Identifier		40h	01000000	N/A
			7	Power Class	0		01b: Class 2 (=<16W)	N/A
			6		1			N/A
			5	Lane Ratio Type	0		00b: 1 : n Mux Type	N/A
			4		0			N/A
			3	WDM Type	0		000b: Non-WDM	N/A
			2		0			N/A
			1		0			N/A
			0	CLEI Presence	0		0: No CLEI code present	N/A
8002	1	RO		Connector Type Code		01h	01: SC	N/A
8003	1	RO		Ethernet Application Code		0Fh	0F: 40GBASE-FR	N/A
8004	1	RO		Fiber Channel Application Code		00h	00h: Undefined type	N/A
8005	1	RO		Copper Link Application Code		00h	00h: Undefined type	N/A
8006	1	RO		SONET/SDH Application Code		00h	00: Undefined type	N/A
8007	1	RO		OTN Application Code		01h	01: VSR2000-3R2F	N/A
8008	1	RO		Additional Capable Rates Supported		07h	00000111	N/A
			7	Reserved	0		0: Reserved	N/A
			6	Reserved	0		0: Reserved	N/A
			5	Reserved	0		0: Reserved	N/A
			4	111.8 Gbps	0		0: Not supported	N/A
			3	103.125 Gbps	0		0: Not supported	N/A
			2	41.25 Gbps	1		1: Supported	N/A
			1	43 Gbps	1		1: Supported	N/A
			0	39.8 Gbps	1		1: Supported	N/A
8009	1	RO		Number of Lanes Supported		14h	00010100	N/A
			7	Number of Network Lanes	0		0001: 1 lanes	N/A
			6		0			
			5		0			
			4		1			
			3	Number of Host Lanes	0		0100: 4 lanes	N/A
			2		1			
			1		0			
			0		0			
800A	1	RO		Media Properties		01h	00000001	N/A
			7	Media Type	0		00b: SMF	N/A
			6		0			
			5	Directionality	0		0: Normal	N/A
			4	Optical Mux and DeMux	0		0: without optical MUX/DEMUX	N/A
			3	Active Fiber per Connector	0		0001b: 1 TX lane and 1 RX lane	N/A
			2		0			
			1		0			
			0		1			
800B	1	RO		Maximum Network Lane Bit Rate		D8h	D8h: 43.0184Gbps / 0.2	0.2 Gbps
800C	1	RO		Maximum Host Lane Bit Rate		36h	36h: 10.7546Gbps / 0.2	0.2 Gbps
800D	1	RO		Maximum Single Mode Optical Fiber		02h	02h: 2 km	1 km
800E	1	RO		Maximum Multi-Mode Optical Fiber		00h	00h: not supported	10 m
800F	1	RO		Maximum Copper Cable Length		00h	00h: not supported	1 m
8010	1	RO		Transmitter Spectral Characteristics 1		01h	00000001	N/A
			7	Reserved	0		0: Reserved	N/A
			6		0		0: Reserved	
			5		0		0: Reserved	
			4	Number of Active Transmit Fibers	0		00001b: 1 Fiber	N/A
			3		0			
			2		0			
			1		0			
			0		1			

Table 8.2.1. CFP NVR-1 (Continued)

Hex Addr	Size	Access Type	Bit	Register Name Bit Filed Name	Value		Description	LSB Unit
					Value	Hex		
Base ID Information								
8011	1	RO		Transmitter Spectral Characteristics 2		01h	00000001	N/A
			7	Reserved	0		0: Reserved	N/A
			6		0		0: Reserved	N/A
			5		0		0: Reserved	N/A
			4	Number of Wavelengths per active Transmit Fiber	0		00001b: 1 Wavelengths	N/A
			3		0			
			2		0			
			1		0			
			0		1			
8012	2	RO		Minimum Wavelength per Active Fiber		EFh	EF10h: 1530 nm	0.025 nm
8013						10h		
8014	2	RO		Maximum Wavelength per Active Fiber		F4h	F488h: 1565 nm	0.025 nm
8015						88h		
8016	2	RO		Maximum per Lane Optical Width		88h	88B8h: 35 nm	1 pm
8017						B8h		
8018	1	RO		Device Technology 1		21h	00100001	N/A
			7	Laser Source Technology	0		0010b: DFB	N/A
			6		0			N/A
			5		1			N/A
			4		0			N/A
			3	Transmitter modulation technology	0		0001b: EML	N/A
			2		0			N/A
			1		0			N/A
			0		1			N/A
8019	1	RO		Device Technology 2		44h	01000100	N/A
			7	Wavelength control	0		0: No wavelength control	N/A
			6	Cooled transmitter	1		1: Cooled or Semi-cooled transmitter device	N/A
			5	Tunability	0		0: Transmitter NOT Tunable	N/A
			4	VOA implemented	0		0: Detector side VOA NOT implement	N/A
			3	Detector Type	0		01b: PIN Detector	N/A
			2		1			
			1	CDR with EDC	0		0: CDR without EDC	N/A
			0	Reserved	0		0: Reserved	N/A
801A	1	RO		Signal Code		40h	01000000	N/A
			7	Modulation	0		01b: NRZ	N/A
			6		1			
			5	Signal coding	0		0000b: Non-PSK	N/A
			4		0			
			3		0			
			2		0			
			1	Reserved	0		0: Reserved	N/A
			0		0		0: Reserved	N/A
801B	1	RO		Maximum Total Optical Output Power per Connector		14h	1995.3uW	100 uW
801C	1	RO		Maximum Optical Input Power per Network Lane		14h	1995.3uW	100 uW
801D	1	RO		Maximum Power Consumption		50h	16000mW	200 mW
801E	1	RO		Maximum Power Consumption in Low Power Mode		64h	2000mW	20 mW
801F	1	RO		Maximum Operating Case Temp Range		46h	70degC	1 degC
8020	1	RO		Minimum Operating Case Temp Range		FBh	-5degC	1 degC

Table 8.2.1. CFP NVR-1 (Continued)

Hex Addr	Size	Access Type	Bit	Register Name Bit Filed Name	Value		Description	LSB Unit
					Value	Hex		
Base ID Information								
8021	16	RO		Vendor Name	S	53h	SumitomoElectric	ASCII
8022					u	75h		ASCII
8023					m	6Dh		ASCII
8024					i	69h		ASCII
8025					t	74h		ASCII
8026					o	6Fh		ASCII
8027					m	6Dh		ASCII
8028					o	6Fh		ASCII
8029					E	45h		ASCII
802A					l	6Ch		ASCII
802B					e	65h		ASCII
802C					c	63h		ASCII
802D					t	74h		ASCII
802E					r	72h		ASCII
802F					i	69h		ASCII
8030					c	63h		ASCII
8031	3	RO		Vendor OUI		00h	00005Fh	N/A
8034	16	RO		Vendor Part Number	S	53h	SCF0420FRCNGG01	ASCII
8035					C	43h		ASCII
8036					F	46h		ASCII
8037					0	30h		ASCII
8038					4	34h		ASCII
8039					2	32h		ASCII
803A					0	30h		ASCII
803B					F	46h		ASCII
803C					R	52h		ASCII
803D					C	43h		ASCII
803E					N	4Eh		ASCII
803F					G	47h		ASCII
8040					G	47h		ASCII
8041					0	30h		ASCII
8042					1	31h		ASCII
8043						20h		ASCII
8044	16	RO		Vendor Serial Number	$	24h	Manufacturer serial number in ASCII code.	ASCII
8054	8	RO		Date Code	$	24h	Date code in YYYYMMDD	ASCII
805C	2	RO		Lot Code	$	24h	Lot code in ASCII code.	ASCII
805D					$	24h		ASCII
805E	10	RO		CLEI Code		20h	' ' in ASCII code.	ASCII
805F						20h		ASCII
8060						20h		ASCII
8061						20h		ASCII
8062						20h		ASCII
8063						20h		ASCII
8064						20h		ASCII
8065						20h		ASCII
8066						20h		ASCII
8067						20h		ASCII
8068	1	RO		CFP MSA Hardware Specification Revision Number		0Eh	Rev. 1.4	N/A
8069	1	RO		CFP MSA Management Interface Specification Revision Number		0Eh	Rev. 1.4	N/A
806A	2	RO		Module Hardware Version Number		00h	Version 0.2	N/A
806B						02h	(0.1: DS, 0.2: ES, 1.0 and higher: CS)	
806C	2	RO		Module Firmware Version Number		00h	Version 0.2	N/A
806D						02h	(0.1: DS, 0.2: ES, 1.0 and higher: CS)	

Table 8.2.1. CFP NVR-1 (Continued)

Hex Addr	Size	Access Type	Bit	Register Name Bit Filed Name	Value		Description	LSB Unit
					Value	Hex		
Base ID Information								
806E	1	RO		Digital Diagnostic Monitoring Type		0Ch	00001100	N/A
			7	Reserved	0		0: Reserved	N/A
			6		0		0: Reserved	N/A
			5		0		0: Reserved	N/A
			4		0		0: Reserved	N/A
			3	Received power measurement type	1		1: Averaged Power	N/A
			2	Transmitted power measurement type	1		1: Averaged Power	N/A
			1	Reserved	0		0: Reserved	N/A
			0		0		0: Reserved	N/A
806F	1	RO		DDM Capability 1		03h	00000011	N/A
			7	Transceiver auxiliary monitor 2	0		00b: Not supported	N/A
			6		0			N/A
			5	Transceiver auxiliary monitor 1	0		00b: Not supported	N/A
			4		0			N/A
			3	Reserved	0		0: Reserved	N/A
			2	Transceiver SOA Ibias monitor	0		0: Not supported	N/A
			1	Transceiver Supply voltage monitor	1		1: Supported	N/A
			0	Transceiver temperature monitor	1		1: Supported	N/A
8070	1	RO		DDM Capability 2 (per Lane)		0Fh	00001111	N/A
			7	Reserved	0		0: Reserved	N/A
			6		0		0: Reserved	N/A
			5		0		0: Reserved	N/A
			4		0		0: Reserved	N/A
			3	Network Lane received power monitor	1		1: Supported	N/A
			2	Network Lane laser output power	1		1: Supported	N/A
			1	Network Lane laser bias current	1		1: Supported	N/A
			0	Network Lane laser temperature	1		1: Supported	N/A
8071	1	RO		Module Enhanced Options		68h	01101000	
			7	Host Lane Loop-back	0		0: Not supported	N/A
			6	Host Lane PRBS Supported	1		1: Supported	N/A
			5	Host Lane emphasis control	1		1: Supported	N/A
			4	Network Lane Loop-back	0		0: Not supported	N/A
			3	Network Lane PRBS	1		1: Supported	N/A
			2	Decision Threshold Voltage control	0		0: Not supported	N/A
			1	Decision Phase control functions	0		0: Not supported	N/A
			0	Unidirectional TX/RX only Operation	0		0: Not supported	N/A
8072	1	RO		Maximum High-Power-up Time		0Fh	0Fh: 15 sec.	1 sec
8073	1	RO		Maximum TX-Turn-on Time		01h	01h: 1 sec.	1 sec
8074	1	RO		Host Lane Signal Spec		02h	02h: XLAUI	N/A
8075	1	RO		Heat Sink Type		00h	00000000	N/A
			7	Reserved	0		0: Reserved	N/A
			6		0		0: Reserved	N/A
			5		0		0: Reserved	N/A
			4		0		0: Reserved	N/A
			3		0		0: Reserved	N/A
			2		0		0: Reserved	N/A
			1		0		0: Reserved	N/A
			0	Heat Sink Type	0		0: Flat Top	N/A
8076	1	RO		Maximum TX-Turn-off Time		96h	96h: 150 ms	1ms
8077	1	RO		Maximum High-Power-down Time		01h	01h: 1 sec.	1sec

Table 8.2.1. CFP NVR-1 (Continued)

Hex Addr	Size	Access Type	Bit	Register Name Bit Filed Name	Value		Description	LSB Unit
					Value	Hex		
Base ID Information								
8078	1	RO		Module Enhanced Options 2		0Fh	00001111	
			7	Reserved	0		0: Reserved	N/A
			6		0		0: Reserved	N/A
			5		0		0: Reserved	N/A
			4	Active Decision Voltage and Phase Function	0		0: Not supported	N/A
			3	RX FIFO Reset	1		1: Supported	N/A
			2	RX FIFO Auto Reset	1		1: Supported	N/A
			1	TX FIFO Reset	1		1: Supported	N/A
			0	TX FIFO Auto Reset	1		1: Supported	N/A
8079	1	RO		Transmitter Monitor Clock Options		41h	01000001	
			7	1/16 of Host Lane Rate	0		0: Not supported	N/A
			6	1/16 of Network Lane Rate	1		1: Supported	N/A
			5	1/64 of Host Lane Rate	0		0: Not supported	N/A
			4	1/64 of Network Lane Rate	0		0: Not supported	N/A
			3	Reserved	0		0: Reserved	N/A
			2	1/8 of Network Lane Rate	0		0: Not supported	N/A
			1	Reserved	0		0: Reserved	N/A
			0	Monitor Clock Option	1		1: Supported	N/A
807A	1	RO		Receiver Monitor Clock Options		41h	01000001	
			7	1/16 of Host Lane Rate	0		0: Not supported	N/A
			6	1/16 of Network Lane Rate	1		1: Supported	N/A
			5	1/64 of Host Lane Rate	0		0: Not supported	N/A
			4	1/64 of Network Lane Rate	0		0: Not supported	N/A
			3	Reserved	0		0: Reserved	N/A
			2	1/8 of Network Lane Rate	0		0: Not supported	N/A
			1	Reserved	0		0: Reserved	N/A
			0	Monitor Clock Option	1		1: Supported	N/A
807B	1	RO		Reserved		00h	0: Reserved	N/A
807C	1	RO		Reserved		00h	0: Reserved	N/A
807D	1	RO		Reserved		00h	0: Reserved	N/A
807E	1	RO		Reserved		00h	0: Reserved	N/A
807F	1	RO		CFP NVR 1 Checksum	0	24h	The 8-bit unsigned sum of all CFP NVR 1 contents from address 8000h through 807Eh inclusive.	N/A

Table 8.2.2. CFP NVR-2

Hex Addr	Size	Access Type	Bit	Register Name Bit Filed Name	Value		Description	LSB Unit
					Value	Hex		
Alarm/Warning Threshold Registers								
8080	2	RO		Transceiver Temp High Alarm Threshold		4Bh	75 degC	1/256 degC
8081						00h		
8082	2	RO		Transceiver Temp High Warning Threshold		46h	70 degC	
8083						00h		
8084	2	RO		Transceiver Temp Low Warning Threshold		00h	0 degC	
8085						00h		
8086	2	RO		Transceiver Temp Low Alarm Threshold		FBh	-5 degC	
8087						00h		
8088	2	RO		VCC High Alarm Threshold		87h	3.465V	0.1 mV
8089						5Ah		
808A	2	RO		VCC High Warning Threshold		86h	3.432V	
808B						10h		
808C	2	RO		VCC Low Warning Threshold		7Bh	3.168V	
808D						C0h		
808E	2	RO		VCC Low Alarm Threshold		7Ah	3.135V	
808F						75h		
80A8	2	RO		Laser Bias Current High Alarm Threshold		EAh	120 mA	2uA
80A9						60h		
80AA	2	RO		Laser Bias Current High Warning Threshold		D6h	110 mA	
80AB						D8h		
80AC	2	RO		Laser Bias Current Low Warning Threshold		57h	45 mA	
80AD						E4h		
80AE	2	RO		Laser Bias Current Low Alarm Threshold		44h	35 mA	
80AF						5Ch		
80B0	2	RO		Laser Output Power High Alarm Threshold		62h	4 dBm	0.1 uW
80B1						1Eh		
80B2	2	RO		Laser Output Power High Warning Threshold		4Dh	3 dBm	
80B3						F0h		
80B4	2	RO		Laser Output Power Low Warning Threshold		27h	0 dBm	
80B5						10h		
80B6	2	RO		Laser Output Power Low Alarm Threshold		1Fh	-1 dBm	
80B7						07h		
80B8	2	RO		Laser Temperature High Alarm Threshold		37h	55 degC	1/256 degC
80B9						00h		
80BA	2	RO		Laser Temperature High Warning Threshold		32h	50 degC	
80BB						00h		
80BC	2	RO		Laser Temperature Low Warning Threshold		19h	25 degC	
80BD						00h		
80BE	2	RO		Laser Temperature Low Alarm Threshold		14h	20 degC	
80BF						00h		
80C0	2	RO		Receive Optical Power High Alarm Threshold		4Dh	3 dBm	0.1 uW
80C1						F0h		
80C2	2	RO		Receive Optical Power High Warning Threshold		3Dh	2 dBm	
80C3						E8h		
80C4	2	RO		Receive Optical Power Low Warning Threshold		09h	-6 dBm	
80C5						CFh		
80C6	2	RO		Receive Optical Power Low Alarm Threshold		07h	-7 dBm	
80C7						CBh		
80C8	55	RO		Reserved		00h	0000h: Reserved	N/A
80FF	1	RO		CFP NVR 2 Checksum		24h	The 8-bit unsigned sum of all CFP NVR 2 contents from address 8080h through 80FEh inclusive.	N/A

Table 8.2.3. CFP NVR-3

Hex Addr	Size	Access Type	Bit	Register Name Bit Filed Name	Value		Description	LSB Unit
					Value	Hex		
Network Lane BOL Measurements								
8100	2	RO		RX Sensitivity for network lanes 0		24h	Measured Value	0.01 dBm
8101						24h		
8120	2	RO		TX Power for network lanes 0		24h	Measured Value	0.01 dBm
8121						24h		
8140	2	RO		Measured ER for network lanes 0		24h	Measured Value	0.01 dB
8141						24h		
8160	2	RO		Path Penalty for network lanes 0		00h	1 dB	0.01dB
8161						64h		

Table 8.2.4. CFP NVR-4

Hex Addr	Size	Access Type	Bit	Register Name Bit Filed Name	Value		Description	LSB Unit
					Value	Hex		
User data registers.								
8180	1	RO	7~0	CFP NVR 3 Checksum	$	24h	The 8-bit unsigned sum of all CFP NVR 3 contents from address 8100h through 817Fh inclusive.	N/A
8181	127	RO	7~1	Reserved		00h	00h: Reserved	N/A

8.3 Registers for Degital Diagnostic Monitors (DDM)

Table 8.3.1. Network Lane VR2 A/D value measurement Registers DDM

CFP Module VR1						
Hex Addr.	**Size**	**Access Type**	**Bit**	**Register Name Bit Field Name**	**Description**	**Init Value**
Module Analog A/D Value Registers						
A02F	1	RO	15~0	Module Temp Monitor A/D Value	Internally measured temperature in degrees Celsius, a 16-bit signed integer with LSB = 1/256 of a degree Celsius, representing a total range from -128 to + 127 255/256 degC. MSA valid range is between –40 and +125C. Accuracy shall be better than +/- 3 degC over the speified operating temperture and voltage range.	0000h
A030	1	RO	15~0	Module Power supply 3.3 V Monitor A/D Value	Internally measured transceiver supply voltage, a 16-bit unsigned integer with LSB = 0.1 mV, yielding a total measurement range of 0 to 6.5535 Volts. Accuracy shall be better than +/-3% of the nominal value over specified operating temperature and voltage range.	0000h

Table 8.3.2. Network Lane VR2 A/D value measurement Registers

Network Lane VR 2						
Hex Addr.	**Size**	**Access Type**	**Bit**	**Register Name Bit Field Name**	**Description**	**Init Value**
Network Lane A/D value Measurement Registers						
A2A0	16	RO	15~0	Network Lane n Laser Bias Current monitor A/D value	16 registers, one for each network lane, represent 16 network lanes. n = 0, 1, …, N-1. N_max = 16. Measured laser bias current in uA, a 16-bit unsigned integer with LSB = 2 uA, representing a total measurement range of 0 to 131.072 mA. Accuracy shall be +/- 10% of the nominal value over the specified operating temperature and voltage.	0000h
A2B0	16	RO	15~0	Network Lane n Laser Output Power monitor A/D value	16 registers, one for each network lane, represent 16 network lanes. n = 0, 1, …, N-1. N_max = 16. Measured TX output power in uW, a 16-bit unsigned integer with LSB = 0.1 uW, representing a range of laser output power from 0 to 6.5535 mW. Accuracy shall be +/- 2 dB over the specified temperature and voltage range.	0000h
A2D0	16	RO	15~0	Network Lane n Receiver Input Power monitor A/D value	16 registers, one for each network lane, represent 16 network lanes. n = 0, 1, …, N-1. N_max = 16. Measured received input power in uW, a 16-bit unsigned integer with LSB = 0.1 uW, representing a power range from 0 to 6.5535 mW. Value can represent average received power. The accuracy shall be +/- 2dB when input average power is between -14dBm and +2.3dBm, over the specified operating temperature and voltag.	0000h

9. Qualification Testing

The SCF0420FR series 40Gb/s transceivers are qualified to Sumitomo Electric Industries internal design and manufacturing standards. Telecordia GR-468-CORE reliability test standards, using methods per MIL-STD-883 for mechanical integrity, endurance, moisture, flammability and ESD thresholds, are followed.

10 RoHS COMPLIANCY

The SCF0420FR is compliant to the requirements contained inside the following reference document: ”Directive 2002/95/EC of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment" from official journal of European Union (European Parliament and of the Council). This product is Compliant at RoHS-6/6 level and contains no leaded solders.

11. Laser Safety Information

The SCF0420FR series transceivers use a semiconductor laser that is classified as Class 1 laser products per the laser safety requirements of FDA/CDRH, 21 CFR1040.10 and 1040.11. These products have also been tested and certified as Class 1 laser products per IEC60825-1:2007 and IEC60825-1:2001 International standards.

Caution

If this product is used under conditions not recommended in the specification or is used with unauthorized revision, the classification for laser product safety is invalid. Reclassify the product at your responsibility and take appropriate safety measures.

12. Electromagnetic Compatibility

EMI (Emission)

The SCF0420FR series 40Gb/s transceivers are designed to meet FCC Class B limits for emissions and noise immunity per CENELEC EN50 081 and 082 specifications.

RF Immunity

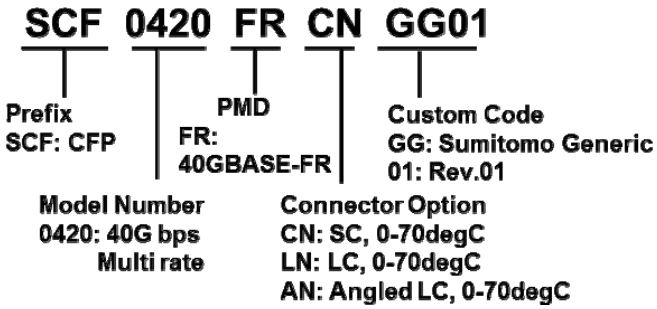
The SCF0420FR has an immunity to operate when tested in accordance with IEC 61000-4-3 (80- 1000MHz, Test Level 3) and GR-1089.

Electrostatic Discharge (ESD) Immunity

The SCF0420FR has an immunity against direct and indirect ESD when tested accordance with IEC 61000-4-2.

13. Ordering Information

Part Numbering System



Evaluation Board Kit

For test purposes the evaluation board model number SK0400A may be ordered to use with the SCF0420FR series transceivers.

SK0400A : SCF0400/0410/0420 CFP evaluation board

Ordering Number

Table 14. SCF0420FR Series Part Number Information

MPN	Description	Optical Connector	Housing Top
SCF0420FRCNGG01	CFP 40G-FR	SC Duplex Receptacle	Flat
SCF0420FRLNGG01	CFP 40G-FR	LC Duplex Receptacle	Flat
SCF0420FRANGG01	CFP 40G-FR	Angled LC Receptacle	Flat

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