

FPQFP3140GL-40D

40G QSFP+ ER 40KM Optical Transceiver

Features

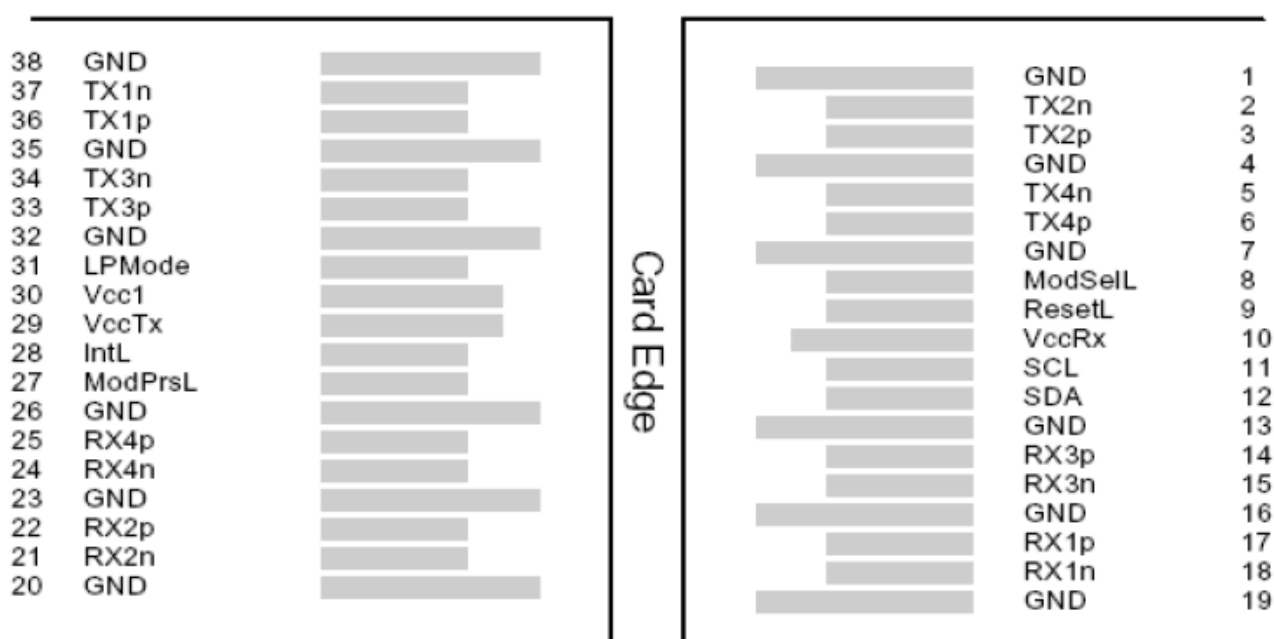
- Hot-pluggable QSFP+ form factor
- Supports 39.8 Gb/s to 41.3 Gb/s aggregate bit rates
- Power dissipation < 3.5W
- 18.5 dB link insertion loss budget
- RoHS-6 compliant
- Commercial case temperature range 0°C to 70°C
- Single 3.3V power supply
- Maximum link length of 40km on Single Mode Fiber (SMF)
- Uncooled 4x10Gb/s CWDM transmitter
- XLPPI electrical interface
- Duplex LC receptacles
- Built-in digital diagnostic functions, including Tx/Rx power monitoring

Applications

- 40GBASE-ER4 40G Ethernet

FPQFP3140GL-40D QSFP+ transceiver modules are designed for use in 40 Gigabit Ethernet links over single mode fiber. They are compliant with the QSFP+ MSA1 and IEEE 802.3bm 40GBASE-ER42. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP+ MSA. The transceiver is RoHS compliant per Directive 2011/65/EU3.

Pin Descriptions



Top side viewed from top

Bottom side viewed from bottom

Pin	Symbol	Name/Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc Rx	+3.3 V Power supply receiver	
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc Tx	+3.3 V Power supply transmitter	
30	Vcc1	+3.3 V Power Supply	
31	LPMODE	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Notes:

1. Circuit ground is internally isolated from chassis ground.

General Product Characteristics

Parameter	Value	Unit	Notes
Module Form Factor	QSFP+		
Maximum Aggregate Data Rate	44.6	Gb/s	
Maximum Data Rate per Lane	11.2	Gb/s	
Protocols Supported	Typical applications include OTN OTU3, 40G Ethernet, Infiniband, Fiber Channel, SATA/SAS3		
Electrical Interface and Pin-out	38-pin edge connector		Pin-out as defined by the QSFP+ MSA
Maximum Power Consumption	3.5	Watts	
Management Interface	Serial, I2C-based, 400 kHz maximum frequency		As defined by the QSFP+ MSA

Data Rate Specifications	Symbol	Min.	Typ.	Max.	Units	Ref.
Bit Rate per Lane	BR	9.95		10.3125	Gb/s	1
Bit Error Ratio	BER			10^{-12}		2
Link distance on SMF-28	d	0.002		40	kilometers	3

Notes:

1. Compliant with 40GBASE-ER4 and XLPP1 per IEEE 802.3bm.
2. Tested with a PRBS 231-1 test pattern.
3. Per 40GBASE-ER4, IEEE 802.3bm. Links longer than 30km are considered to be engineered links, with losses less than the worst case specified for the fiber type.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Units	Ref.
Maximum Supply Voltage	V _{cc1} , V _{ccTx} , V _{ccRx}	-0.5		3.6	V	
Storage Temperature	T _s	-40		85	°C	
Case Operating Temperature	T _{OP}	0		70	°C	
Relative Humidity	RH	0		85	%	1
Damage Threshold, per Lane	DT	3.4			dBm	

Notes:

1. Non-condensing.

Electrical Characteristics (TOP = 0 to 70°C, VCC = 3.1 to 3.47 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Units	Ref.
Supply Voltage	Vcc1, VccTx, VccRx	3.1		3.47	V	
Supply Current	Icc			1.13	A	
Link turn-on time						
Transmit turn-on time				2000	ms	2
Transmitter (per Lane)						
Single ended input voltage tolerance	VinT	-0.3		4.0	V	
Differential data input swing	Vin,pp	120		1200	mVpp	3
Differential input threshold			50		mV	
AC common mode input voltage tolerance (RMS)		15			mV	
Differential input return loss		Per IEEE P802.3ba, Section 86A.4.1.1			dB	4
J2 Jitter Tolerance	Jt2	0.17			UI	
J9 Jitter Tolerance	Jt9	0.29			UI	
Data Dependent Pulse Width Shrinkage	DDPWS	0.07			UI	
Eye mask coordinates {X1, X2 Y1, Y2}		0.11, 0.31 95, 350			UI mV	5
Receiver (per Lane)						
Single-ended output voltage		-0.3		4.0	V	
Differential data output swing	Vout,pp	0		800	mVpp	6
AC common mode output voltage (RMS)				7.5	mV	
Termination mismatch at 1 MHz				5	%	
Differential output return loss		Per IEEE P802.3ba, Section 86A.4.2.1			dB	4
Common mode output return loss		Per IEEE P802.3ba, Section 86A.4.2.2			dB	4
Output transition time, 20% to 80%		28			ps	
J2 Jitter output	Jo2			0.42	UI	
J9 Jitter output	Jo9			0.65	UI	
Eye mask coordinates #1 {X1, X2 Y1, Y2}		0.29, 0.5 150, 425			UI mV	
Power Supply Ripple Tolerance	PSR	50			mVpp	

Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. From power-on and end of any fault conditions.
3. After internal AC coupling. Self-biasing 100Ω differential input.
4. 10 MHz to 11.1 GHz range.
5. Hit ratio = 5 x 10E-5.
6. AC coupled with 100Ω differential output impedance.

Optical Characteristics (TOP = 0 to 70°C, VCC = 3.1 to 3.47 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Units	Ref.
Transmitter						
Signaling Speed per Lane		9.95		10.3125	GBd	1
Lane center wavelengths (range)		1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5 1324.5 – 1337.5			nm	
Total Average Launch Power	P _{OUT}			10.5	dBm	
Transmit OMA per Lane	TxOMA	0.3		5.0	dBm	
Average Launch Power per Lane	TXPx	-2.7		4.5	dBm	
Difference in launch power between any two lanes (OMA)				4.7	dB	
Transmitter Dispersion Penalty	TDP			2.6	dB	
Launch power (OMA) minus TDP per lane		-0.5			dBm	
Optical Extinction Ratio	ER	5.5			dB	
Sidemode Suppression ratio	SSR _{min}	30			dB	
Average launch power of OFF transmitter, per lane				-30	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	
Optical Return Loss Tolerance				20	dB	
Transmitter Reflectance				-12	dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				
Jitter Generation		Per OTL3.4 section 4.14.1				
Receiver						
Signaling Speed per Lane		9.95		10.3125	Gbd	4
Lane center wavelengths (range)		1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5 1324.5 – 1337.5			nm	
Receive Power (OMA) per Lane	RxOMA			-4.0	dBm	
Average Receive Power per Lane	RXPx	-21.2		-4.5	dBm	
Receiver Sensitivity (OMA) per Lane	Rxsens			-19	dBm	
Stressed Receiver Sensitivity (OMA) per Lane	SRS			-16.8	dBm	
Damage Threshold per Lane	P _{MAX}			3.8	dBm	
Return Loss	RL			-26	dB	
Jitter Tolerance		Per OTL3.4, G.8251				
Vertical eye closure penalty, per lane				2.2	dB	
Receive electrical 3 dB upper cutoff frequency, per lane				12.3	GHz	
LOS De-Assert	LOS _D			TBD	dBm	
LOS Assert	LOS _A	TBD			dBm	
LOS Hysteresis			1		dB	

Notes:

1. Transmitter consists of 4 lasers operating at up to 10.3 Gb/s each, +/- 20ppm

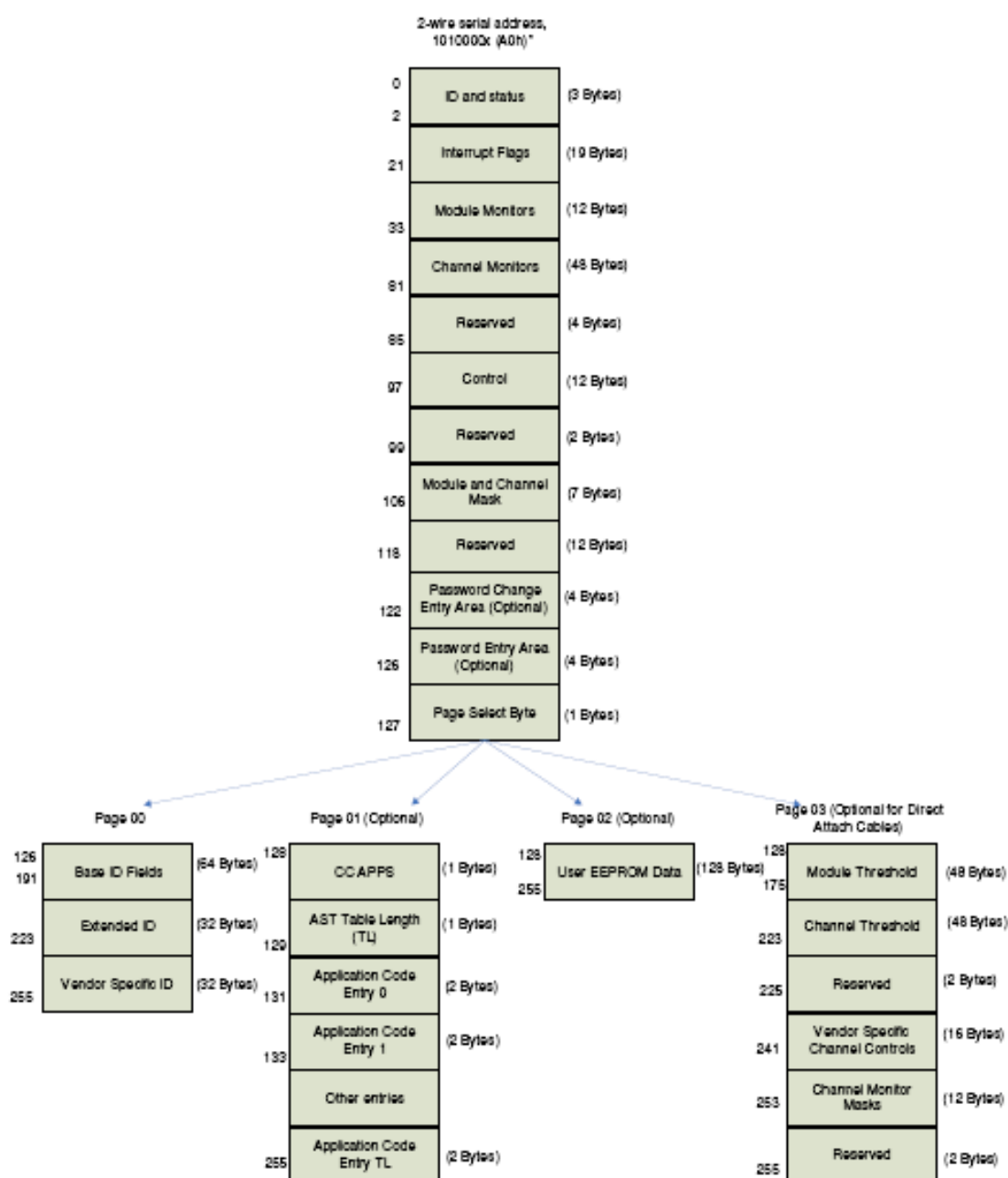
2. Minimum value is informative.
3. RIN is scaled by $10 \cdot \log(10/4)$ to maintain SNR outside of transmitter.
4. Receiver consists of 4 photodetectors operating at up to 10.3125 Gb/s each, +/- 100ppm
5. Minimum value is informative, equals min TxOMA with infinite ER and max channel insertion loss.

Environmental Specifications

FPQFP3140GL-40D transceivers have an operating temperature range from 0°C to +70°C case temperature.

Environmental Specifications	Symbol	Min.	Typ.	Max.	Units	Ref.
Case Operating Temperature	Top	0		70	°C	
Storage Temperature	Tsto	-40		85	°C	

Digital Diagnostic Memory Map



Lower Memory Map

The lower 128 bytes of the 2-wire serial bus address space, see Table 1, is used to access a variety of measurements and diagnostic functions, a set of control functions, and a means to select which of the various upper memory map pages are accessed on subsequent reads.

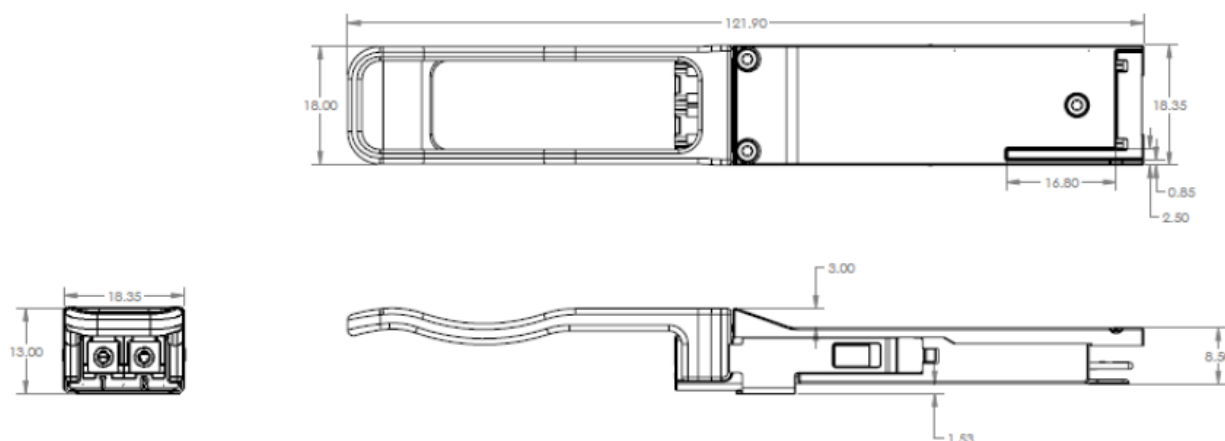
Table 1 Lower Memory Map (A0h)

Data Address	Size (Bytes)	Name of Field	Description
0	1	Identifier	Read-Only
1-2	2	Status	Read-Only
3-21	19	Interrupt Flags	Read-Only
22-33	10	Module Monitors	Read-Only
34-81	48	Channel Monitors	Read-Only
82-85	4	Reserved	Read-Only
86-97	12	Control	Read/Write
98-99	2	Reserved	Read/Write
100-106	7	Module and Channel Masks	Read/Write
107-118	12	Reserved	Read/Write
119-122	4	Password Change Entry	Read/Write
123-126	4	Password Change Entry Area (optional)	Read/Write
127	1	Page Select Byte	Read/Write

Note: See SFF-8436 v3.4 for details.

Mechanical Specifications

The FPQFP3140GL-40D mechanical specifications are compliant to the QSFP+ MSA transceiver module specifications.



Regulatory Compliance

FPQFP3140GL-40D transceivers are RoHS-6 Compliant. Copies of certificates are available upon request.

FPQFP3140GL-40D transceiver modules are Class 1 laser eye safety compliant per IEC 60825-1.

Order Information

Product Number	Orbis product code	Package	Data Rate	Fiber	Distance	Interface	Temp.	DDM
FPQFP3140GL-40D	3008929	QSFP+	40Gbps	SMF	40Km	LC	0°C~70°C	Yes