

# QBDTUSES0801 – QSFP-DD Dual Fibre DWDM

## DWDM Tunable 50GHz / Coherent / 400GBASE-ZR

For your product safety, please read the following information carefully before any manipulation of the transceiver:



**ESD**

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all others electrical input pins, tested per MIL-STD-883G, Method 3015.4 / ESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module.



**LASER SAFETY**

This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

The optical ports of the module need to be terminated with an optical connector or with a dust plug in order to avoid contamination.

### 1. Overview

QBDTUSES0801 is a high performance QSFP-DD transceiver module for 400 Gigabit Ethernet DP-16QAM modulated data links over two single mode fibres. The maximum reach is up to 120km without inline chromatic dispersion compensation. The narrow linewidth tunable laser is shared between the transmitter and receiver sections (LO). A tapped monitor diode is used to control the optical output power.

The receiver module is performing the coherent intradyne reception and O/E conversion of the incoming optical signal after being mixed with a local optical oscillator. Four pairs of balanced photo detectors perform quadratic detection and produce I and Q components of the two orthogonal polarizations (H and V).

This transceiver module is compliant with the QSFP-DD Multisource Agreement (MSA) and hot pluggable. Always contact Skylane Optics® commercial agents for compatibility with different equipment platforms.

### 2. Features

- QSFP-DD Multi-Source Agreement compliant
- Hot pluggable QSFP-DD footprint (Type 2A)
- Supports 425Gbps Data Rate
- 8× 26.5625GBd PAM4 Serial Electrical Interface (400GAUI-8, RS(544/514) FEC)
- Dual LC Optical Interface
- Tunable C-band Transmitter
- Coherent Receivers
- C-FEC (15%) with 10.7dB Net Coding Gain
- Up to 120km Point-to-Point Transmission on Single Mode Fibre
- Operating temperature range: -5°C to 80°C
- Power Dissipation < 18.3W
- Single +3.3V Power Supply

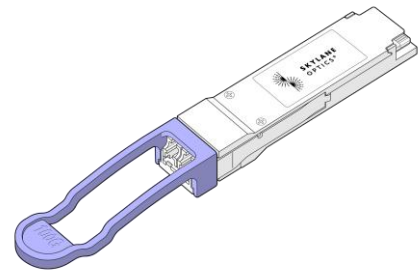


Figure 1. QSFP-DD LC  
(non-binding illustration)

### 3. Applications

- 400GBASE-ZR

### 4. Optical Interface

P/N	Wavelength	Protocol	Optical Output Power <sup>1</sup> [dBm]	Receiver Sensitivity <sup>2</sup> [dBm]	Optical Receiver Overload <sup>3</sup> [dBm]
QBDTUSES0801	ITU DWDM	400GBASE-ZR	-10 to -6	≤ -20	1

1. EOL over operating temperature range

2. Minimum input power needed to achieve post-FEC BER ≤10<sup>-15</sup>, 400G DP-16QAM, OSNR>35dB

3. The optical input to the receiver should not exceed this value. Transmitters must never be directly connected to receivers before ensuring that proper optical attenuation is used

## 5. Technical Parameters

5.1. Recommended Operating Conditions					
Parameter	Min	Typ	Max	Unit	Notes
Storage temperature	-40		85	°C	
Operating Case Temperature	-5		80	°C	
Relative Humidity			85	%	Non-Condensing
Power Supply Voltage	3.135	3.3	3.465	V	
Power Supply Current			6	A	
Power Consumption		15.8	18.3	W	4
			1.5		

4. Low power mode

5.2. General Specifications					
Parameter	Min	Typ	Max	Unit	Notes
Supported Host Signal Types		425		Gbps	5
Line Baud Rate		59.84375		GBd	6

5. As per IEEE 802.3bs-2017

6. 400G DP-16QAM, C-FEC

5.3. Transmitter Optical Specifications					
Parameter	Min	Typ	Max	Unit	Notes
Average Output Power	-10	-8.5	-6	dBm	7, 9
Laser Linewidth			300	kHz	
Transmitter VOA Dynamic Range	10			dB	8
Output Power Stability	-1		1	dB	
In-Band OSNR	40			dB/0.1nm	
Out-of-Band OSNR	35			dB/0.1nm	
Frequency Range	191.275		196.125	THz	10
Centre Frequency	$\nu_T - 1.5$	$\nu_T$	$\nu_T + 1.5$	GHz	11
Channel Spacing	6.25			GHz	
Centre Wavelength Range	1528.58		1567.34	nm	
Centre Wavelength	$\lambda_T - 15$	$\lambda_T$	$\lambda_T + 15$	pm	

7. Output power coupled into a 9/125  $\mu$ m single mode fibre

8. The output power is settable in steps of 0.1 dB within the specified wavelength range

9. With Tx VOA attenuation set to minimum

10. Per ITU-T G.694.1 DWDM grid definition

11. Applies also to LO

5.4. Receiver Optical Specifications					
Parameter	Min	Typ	Max	Unit	Notes
Receiver Operating Wavelength	1528.58		1567.34	nm	
Receiver Input Power Range	-12		1	dBm	12
Extended Receiver Input Power Range	-15		1	dBm	13
Receiver Sensitivity			-20	dBm	14
Acquisition Range	-3.6		3.6	GHz	15
Upstream Tx Linewidth			500	kHz	
OSNR Tolerance		24	26	dB	16
Crosstalk Tolerance			7	dB	17
Chromatic Dispersion Tolerance			2400	ps/nm	18

- 12. An input power in this range guarantees optimum OSNR performance
- 13. With  $\leq 1$ dB OSNR tolerance degradation
- 14. Minimum input power needed to achieve post-FEC BER  $\leq 10^{-15}$ , 400G DP-16QAM, OSNR > 35dB
- 15. Frequency offset between received carrier and LO
- 16. At optimum input power range
- 17. Ratio of accumulated crosstalk channels to signal power
- 18. Less than 0.5dB receiver sensitivity penalty compared to OSNR > 35dB

6. Transceiver Electrical Pad Layout

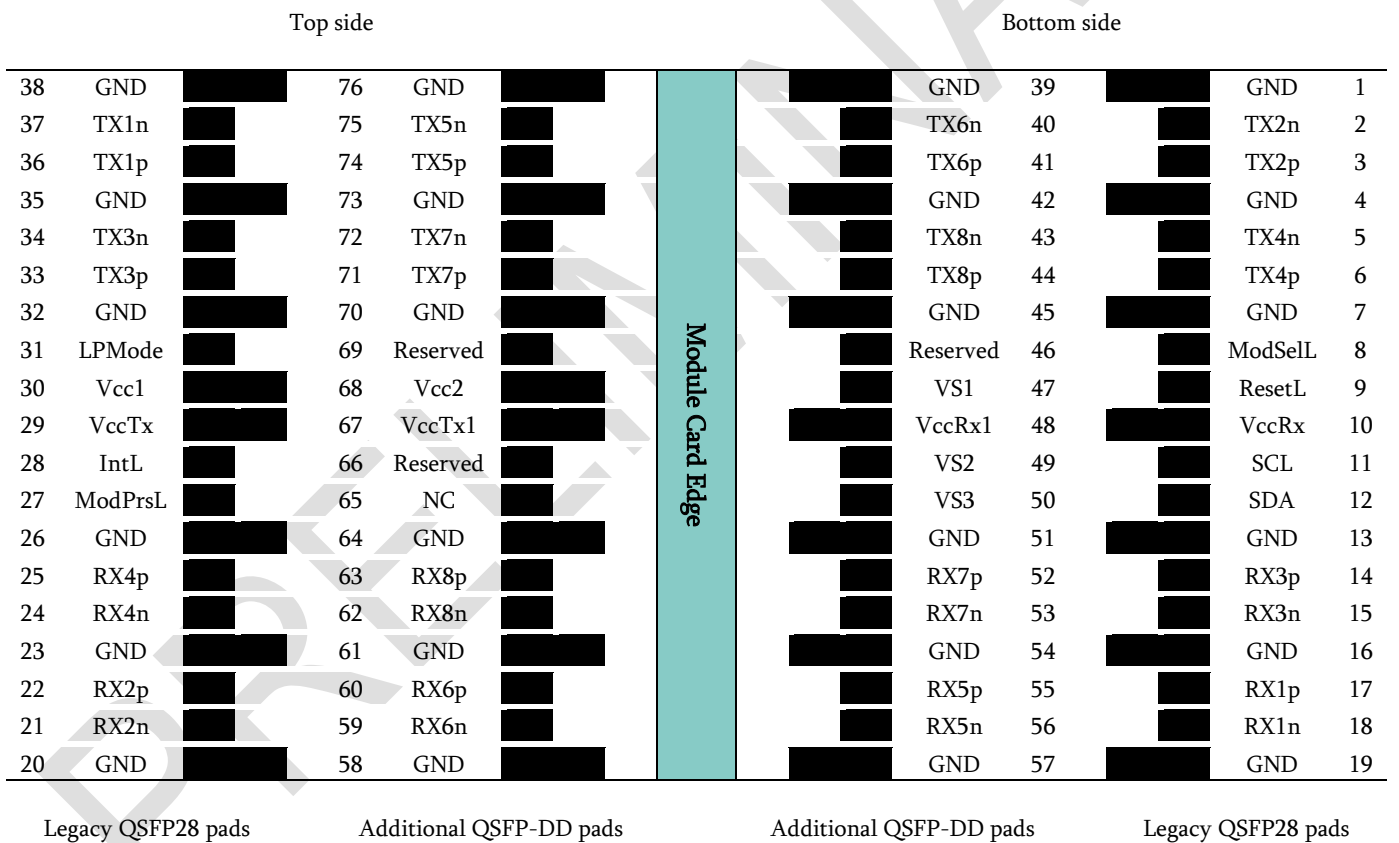


Figure 2. QSFP-DD Electrical Pad Layout

## 7. Module Electrical Pin Definition

Pin Number	Name	Function	Pin Number	Name	Function
1	GND	Ground	39	GND	Ground
2	TX2n	Transmitter Inverted Data Input	40	TX6n	Transmitter Inverted Data Input
3	TX2p	Transmitter Non-Inverted Data Input	41	TX6p	Transmitter Non-Inverted Data Input
4	GND	Ground	42	GND	Ground
5	TX4n	Transmitter Inverted Data Input	43	TX8n	Transmitter Inverted Data Input
6	TX4p	Transmitter Non-Inverted Data Input	44	TX8p	Transmitter Non-Inverted Data Input
7	GND	Ground	45	GND	Ground
8	ModSelL	Module Select	46	Reserved	For future use
9	ResetL	Module Reset	47	VS1	Module Vendor Specific 1
10	VccRx	+3.3V Power Supply Receiver	48	VccRx1	3.3V Power Supply
11	SCL	2-wire serial interface clock	49	VS2	Module Vendor Specific 2
12	SDA	2-wire serial interface data	50	VS3	Module Vendor Specific 3
13	GND	Ground	51	GND	Ground
14	RX3p	Receiver Non-Inverted Data Output	52	RX7p	Receiver Non-Inverted Data Output
15	RX3n	Receiver Inverted Data Output	53	RX7n	Receiver Inverted Data Output
16	GND	Ground	54	GND	Ground
17	RX1p	Receiver Non-Inverted Data Output	55	RX5p	Receiver Non-Inverted Data Output
18	RX1n	Receiver Inverted Data Output	56	RX5n	Receiver Inverted Data Output
19	GND	Ground	57	GND	Ground
20	GND	Ground	58	GND	Ground
21	RX2n	Receiver Inverted Data Output	59	RX6n	Receiver Inverted Data Output
22	RX2p	Receiver Non-Inverted Data Output	60	RX6p	Receiver Non-Inverted Data Output
23	GND	Ground	61	GND	Ground
24	RX4n	Receiver Inverted Data Output	62	RX8n	Receiver Inverted Data Output
25	RX4p	Receiver Non-Inverted Data Output	63	RX8p	Receiver Non-Inverted Data Output
26	GND	Ground	64	GND	Ground
27	ModPrsL	Module Present	65	NC	No Connect
28	IntL	Interrupt	66	Reserved	For future use
29	VccTx	+3.3V Power supply transmitter	67	VccTx1	3.3V Power Supply
30	Vcc1	+3.3V Power supply	68	Vcc2	3.3V Power Supply
31	LPMMode	Low Power Mode	69	Reserved	For future use
32	GND	Ground	70	GND	Ground
33	TX3p	Transmitter Non-Inverted Data Input	71	TX7p	Transmitter Non-Inverted Data Input
34	TX3n	Transmitter Inverted Data Input	72	TX7n	Transmitter Inverted Data Input
35	GND	Ground	73	GND	Ground
36	TX1p	Transmitter Non-Inverted Data Input	74	TX5p	Transmitter Non-Inverted Data Input
37	TX1n	Transmitter Inverted Data Input	75	TX5n	Transmitter Inverted Data Input
38	GND	Ground	76	GND	Ground

8. EEPROM

QSFP-DD CMIS Rev 4.0

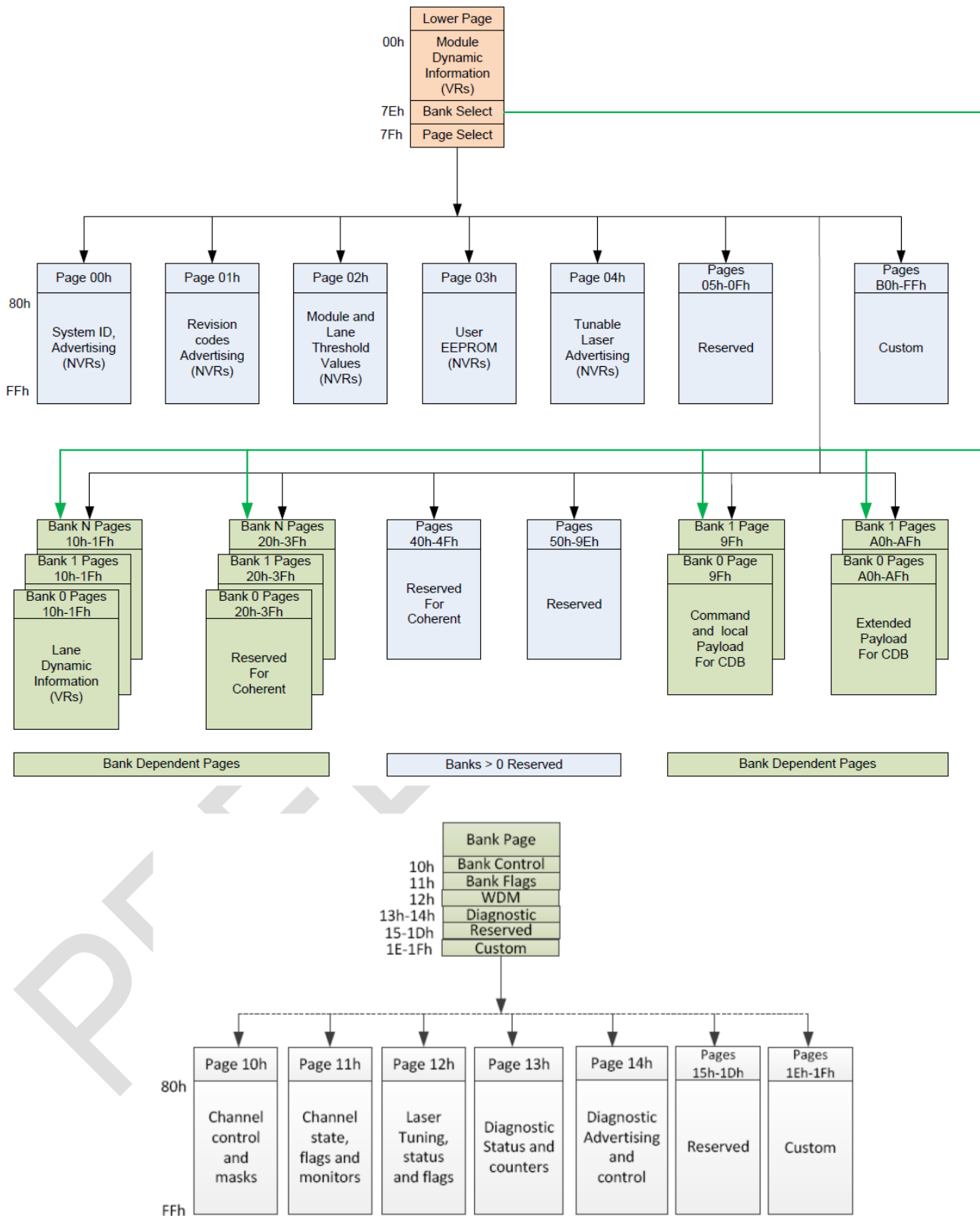


Figure 3. QSFP-DD Memory Map

## 9. Ordering Information

Part Number	Description
QBDTUSES0801	QSFP-DD DCO, DWDM, Tx (tunable), Rx (coherent), 120km reach on SMF, 400Gigabit Ethernet, dual LC connector, 0°C to 70°C, DDM

## 10. Document Revision Information

Revision	Description
A	Initial release

Skylane Optics® supplies a broad range of optical transceivers. Our engineers work closely with our customers to find the best solutions for every application. We are committed to provide high quality products and services to our customers.

For questions on this product please contact:  
[support@skylaneoptics.com](mailto:support@skylaneoptics.com)

**Beyond  
Quality**

**Reliable  
Alliance**

**Performing  
Smartly**