

OETR 50 Series- QSFP28 50G 10km SM PAM4 BIDI Transceiver

➤ Applications

50G LR applications

Other Optical Links

➤ Standards

Compliant with QSFP+ MSA.

Compliant with SFF-8636

Compliant with IEEE802.3cd

Compliant with IEEE802.3bm

Compliant with RoHS6

➤ Features

Hot-pluggable QSFP28 form factor and Compliant with QSFP+ MSA.

I2C management interface

Single LC connector for BIDI

Power dissipation < 3.5W

0°C to 70°C Commercial Temperature Range

Single 3.3V power supply

Maximum link length of 10km on Single Mode Fiber(SMF)

IEEE STD 803.3cd Compliant

50GAUI-2 Serial Electrical Interface support

Optical 26.56GBaud PAM4

RoHS-6 compliant (lead-free)



➤ Description

The NEON OETR 50 Series QSFP28 transceiver modules is a high performance, cost effective module for 50 Gigabit Ethernet links over single mode fiber. They are compliant with the QSFP28 MSA, and IEEE 802.3cd. The optical transceiver integrated with DSP that translated two lanes 26.56GBd NRZ to 26.56GBd PAM4.

The Transmitter central wavelengths of each pair modules are 1271 and 1331 nm, the receiver central wavelengths are 1331 and 1271 nm. It contains a single LC connector for the optical interface and a 38-pin connector for the electrical interface. Digital Diagnostics functions are available via a 2-wire serial interface, as specified SFF-8636.

➤ Specifications

Table1-Absolute Maximum Ratingster					
Parameter	Symbol	Min	Typ.	Max	Unit
Storage Temperature Range	Ts	-40		85	°C
Operating case temperature Top	Top	-5		75	
Relative Humidity(non-condensing)	RH	5		85	%
Power Supply Voltage	Vcc	-0.5		4	V
Receiver Damage Threshold	PT	5.2			dBm
ESD Sensitivity				±500 for High speed lines ±2kV for others	V

Table2-Recommended Operating Conditions					
Parameter	Symbol	Min	Typ.	Max	Unit
Operating Case Temperature Range	Tc	0	-	70	°C
Power Supply Voltage	Vcc	3.135	3.3	3.465	V
Data Rate(Electrical)	DRe		26.5625		Gbps
Data Rate(Optical)	DRO		53.125		Gbps
Transmission Distance		2		10000	

Tested under recommended operating conditions, unless otherwise noted

Table3-Transmitter Operating Characteristic-Optical						
Parameter	Symbol	Min	Typ.	Max	Unit	Note
Signaling Rate(range)		26.5625 ± 100 ppm			GBd	
Wavelengths (range)	WL	1264.5	1271	1277.5	nm	1
		1324.5	1331	1337.5		
Module Format	PAM4					
Average Launch Power	P _{AVG}	-4.5		4.2	dBm	2
Optical modulation amplitude (OMA)	P _{OMA}	-1.5		4	dBm	3
Side-Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	3.5			dB	
Launch power in OMA minus TDECQ(min)		-2.9			dB	
Transmitter and dispersion eye closure for PAM4 (TDECQ)(max)				3.2	dB	
Average launch power of OFF transmitter(max)				-16	dBm	
RIN OMA(max)				-132	dB/Hz	
Optical return loss tolerance(max)				15.6	dB	
Transmitter Reflectance(max)				-26	dB	4

Notes:

[1] See ordering Information

[2] Min average power is informative and not the principal indicator of signal strength. Power below this value cannot be compliant; however, a value above this does not ensure compliance

[3] Even if the TDECQ < 1 .4dB, the OMAouter (min) must exceed this value

[4] Transmitter reflectance is defined looking into the transmitter

Table4-Receiver Operating Characteristic-Optical						
Parameter	Symbol	Min	Typ.	Max	Unit	Note
Signaling Rate(range)		26.5625 ± 100 ppm			GBd	
Wavelengths (range)	WL	1264.5	1271	1277.5	nm	1
		1324.5	1331	1337.5		
Damage threshold		5.2			dBm	2
Average receive power		-10.8		4.2	dBm	3
LOS Assert	LOSA	-30		18	dBm	
LOS De-Assert	LOSD			-15	dBm	
LOS Hysteresis		0.5			dB	
Receiver Sensitivity (OMA)	RS			-8.9	dBm	4
Stressed Receiver Sensitivity (OMA)	RSS			-6.4	dBm	5
Receiver Reflectance				-26	dB	
Condition of Stressed sensitivity test						
Stressed Eye Closure	SECQ		3.2		dB	6

Notes:

[1] See ordering Information

[2] The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level

[3] Average receive power (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance

[4] Receiver sensitivity (OMAouter) (max) is informative and is defined for a transmitter with a value of SECQ up to 3.2 dB for 50GBASE-LR , The BER is below 2.4E-5 before FEC at the begin of life and below 2.4E-4 before FEC at the end of life

[5] Measured with conformance test signal at TP3 (see 139.7.10) for the BER specified in 139.1.1 (IEEE802.3cd)

[6] These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver

Table5- Operating Characteristic- Electrical					
Parameter	Symbol	Min	Typ.	Max	Unit
Input Differential Impedance			100		Ω
Differential Data Input Swing				900	mV
Differential Data Output Swing				900	mV

Table6- Digital Diagnostic Functions					
Parameter	Symbol	Min	Max	Unit	Note
Temperature monitor absolute error	DMI_Temp	-3	+3	degC	
Supply voltage monitor absolute error	DMI_VCC	-5%	5%		Full operating range
Channel RX power monitor absolute error	DMI_RX	-3	+3	dB	
Channel Bias current monitor	DMI_Ibias	-10%	10%		
Channel TX power monitor absolute error	DMI_TX	-3	+3	dB	

Table7- Control and Status I/O Timing Characteristics

Parameter	Symbol	Min	Max	Unit	Note
Initialization time	t_init		2000	ms	1
Reset Init Assert Time	t_reset_init	10		us	2
Serial Bus Hardware Ready Time	t_serial		2000	ms	3
Reset Assert Time	t_reset		2000	ms	4
LPMODE Assert Time	ton_LPMODE		100	us	5
LPMODE Deassert Time	Toff_LPMODE		500	ms	6
IntL Assert Time	ton_IntL		200	ms	7
IntL Deassert Time	toff_IntL		500	us	8
Rx LOS Assert Time	ton_los		100	ms	9
Tx Fault Assert Time	ton_Txfault		200	ms	10
Flag Assert Time	ton_flag		200	ms	11
Mask Assert Time	ton_mask		100	ms	12
Mask Deassert Time	toff_mask		100	ms	13
Power_override or Power_set Assert Time	ton_Pdown		100	ms	14
Power_override or Power_set Deassert Time	toff_Pdown		600	ms	15

Notes:

[1] Time from power on, hot plug or rising edge of reset until the module is fully functional. This time does not apply to non-Power level 0 modules in Low Power State.

[2] A Reset is generated by a low level longer than t_reset_init present on the ResetL input.

[3] Time from power on until the module responds to data transmission over the two wire serial bus.

[4] Time from assertion of LPMODE (Vin:LPMODE = Vih) until module power consumption reaches Power Level 1.

[5] Time from deassertion of LPMODE (Vin:LPMODE = Vil) until module is fully functional,

[6] Time from occurrence of condition triggering IntL until Vout:IntL=Vol.

[7] Time from clear on read operation of associated flag until Vout:IntL=Voh. This includes deassert times for Rx LOS,Tx Fault and other flag bits.

[8] Time from Rx LOS state to Rx LOS bit set (value = 1b) and IntL asserted.

[9] Time from Tx Fault state to Tx Fault bit set (value = 1b) and IntL asserted.

[10] Time from condition triggering flag to associated flag bit set (value = 1b) and IntL asserted.

[11] Time from mask bit set (value = 1b) until associated IntL assertion is inhibited.

[12] Time from mask bit cleared (value = 0b) until associated IntL operation resumes.

[13] Time from change of state of Application or Rate Select bit until transmitter or receiver bandwidth is in conformance with appropriate specification.

[14] Time from P_Down bit set (value = 1b) until module power consumption reaches Power Level 1

[15] Time from P_Down bit cleared (value = 0b) until module is fully functional.

➤ Pin-out Definition

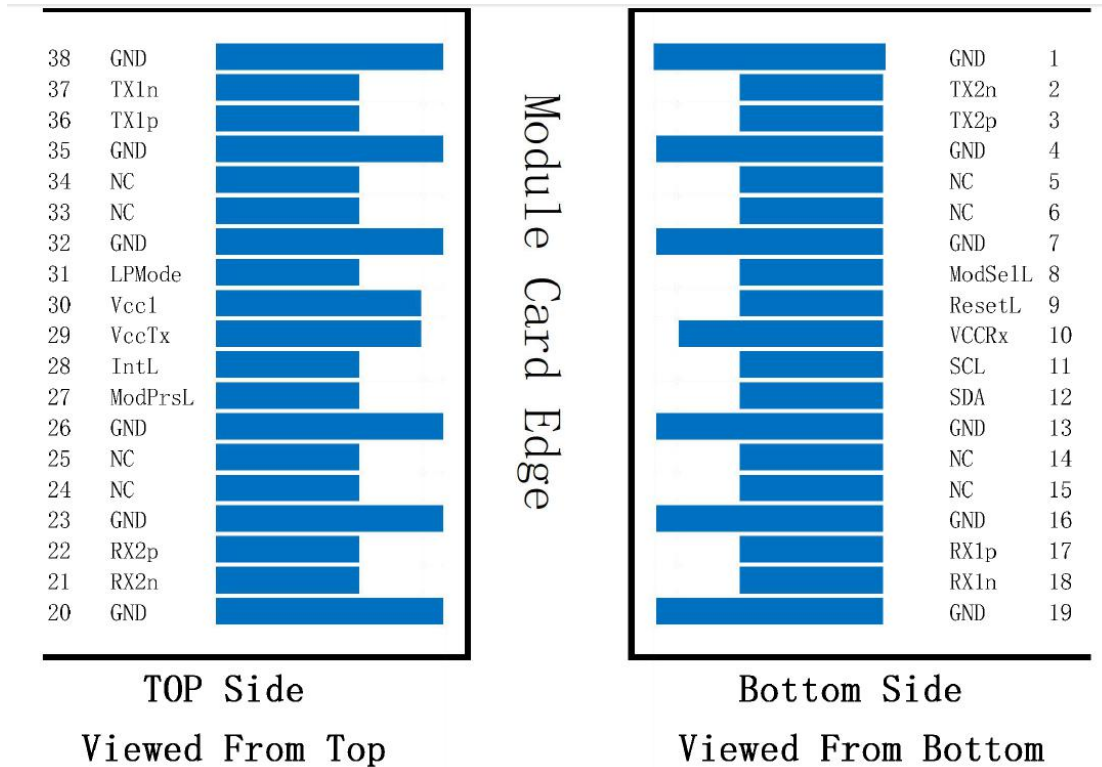


Figure1 Pin map

Table8-Pin Function Definitions			
Pin	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	NC		3
6	NC		3
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc Rx	+3.3V Power Supply Receiver	2
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	NC		3
15	NC		3
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	

18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	NC		3
25	NC		3
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	VccTx	+3.3V Power supply transmitter	2
30	Vcc1	+3.3V Power supply	2
31	LPMODE	Low Power Mode	
32	GND	Ground	1
33	NC		3
34	NC		3
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Notes:

[1] GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane

[2] Vcc Rx, Vcc1 and VccTx are the receiver and transmitter power supplies and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3. Vcc Rx Vcc1 and VccTx may be internally connected within the QSFP+ Module in any combination. The connector pins are each rated for a maximum current of 500 mA

[3] NC is Not Connect

➤ **Block Diagram of Transceiver**

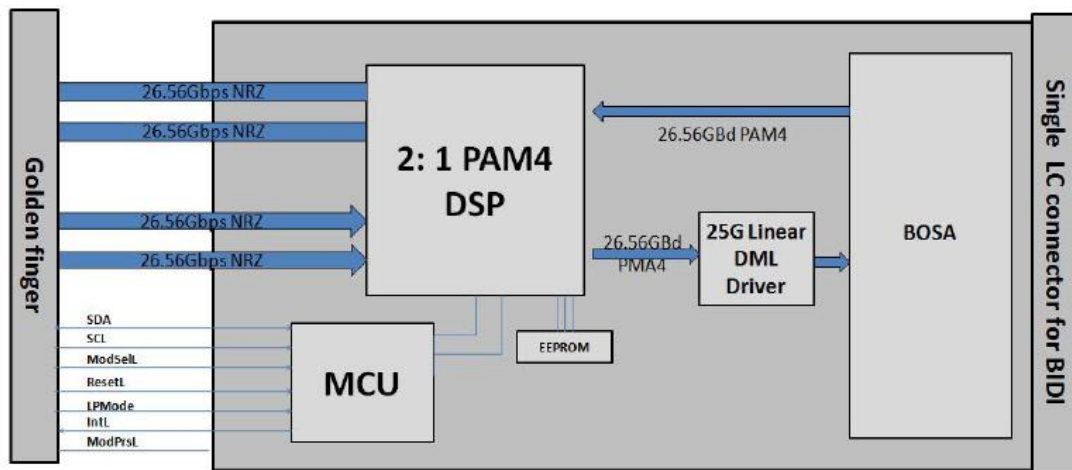


Figure2 - Block Diagram of Transceiver

➤ **Recommended Interface Circuit**

The host board should use the power supply filtering equivalent to that shown in Figure4. Any voltage drop across a filter network on the host is counted against the host DC set point accuracy specification. Inductors with DC resistance of less than 0.1 Ohm should be used in order to maintain the required voltage at the Host Edge Card Connector. It is recommended that the 22 uF capacitors each have an equivalent series resistance of 0.22 ohm.

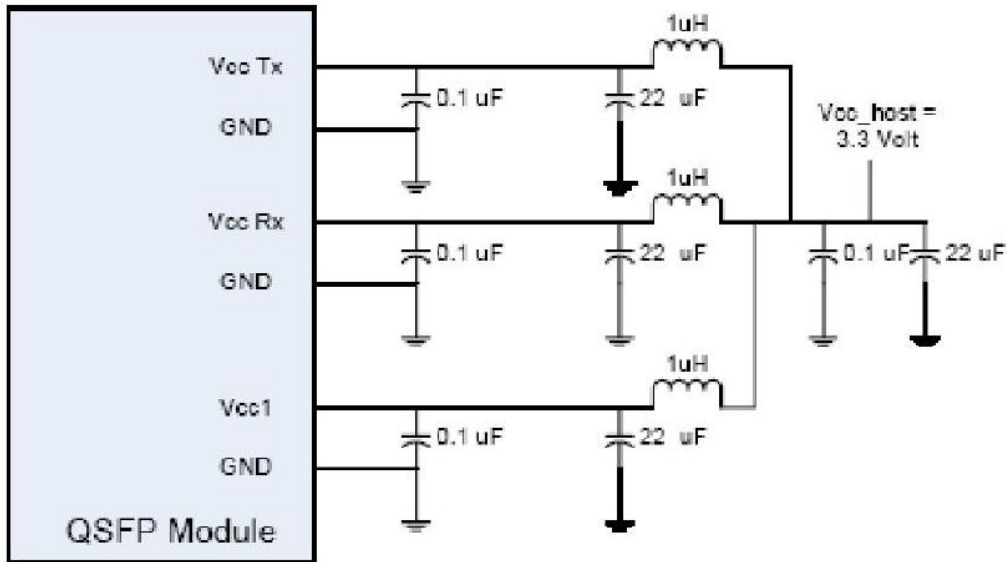


Figure3 Host Board Power Supply Filtering

➤ **Mechanical Dimensions**

Unit is millimeter.

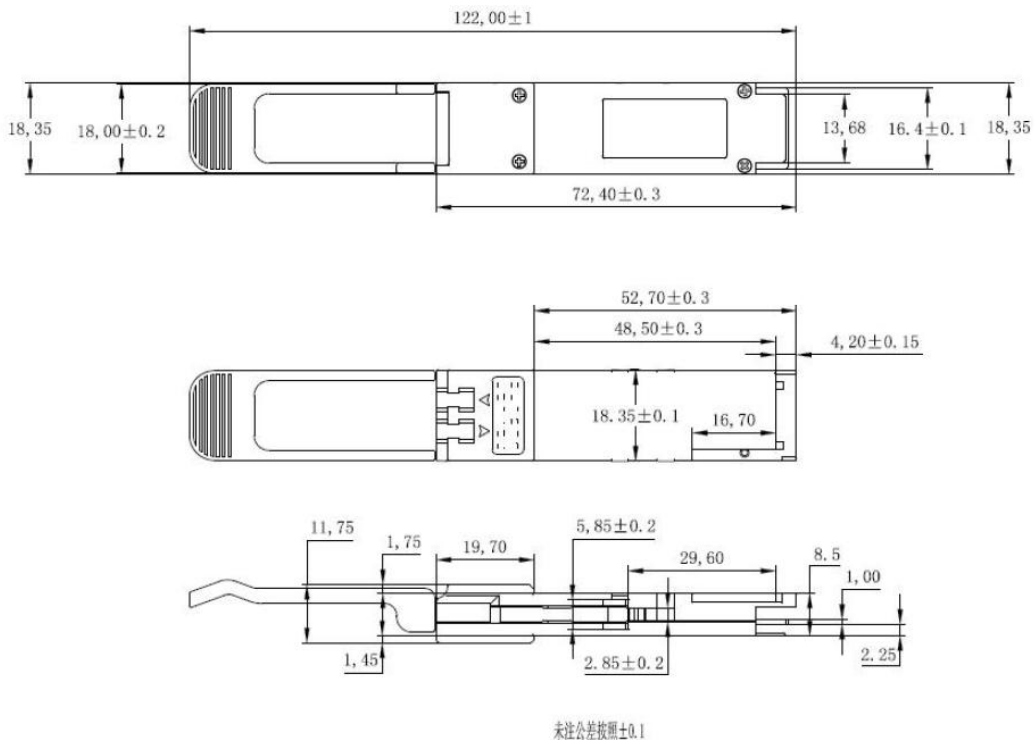


Figure4 Mechanical Dimension

➤ Digital Diagnostic Memory Map

2-Wire Serial Address: 1010000x (A0H)

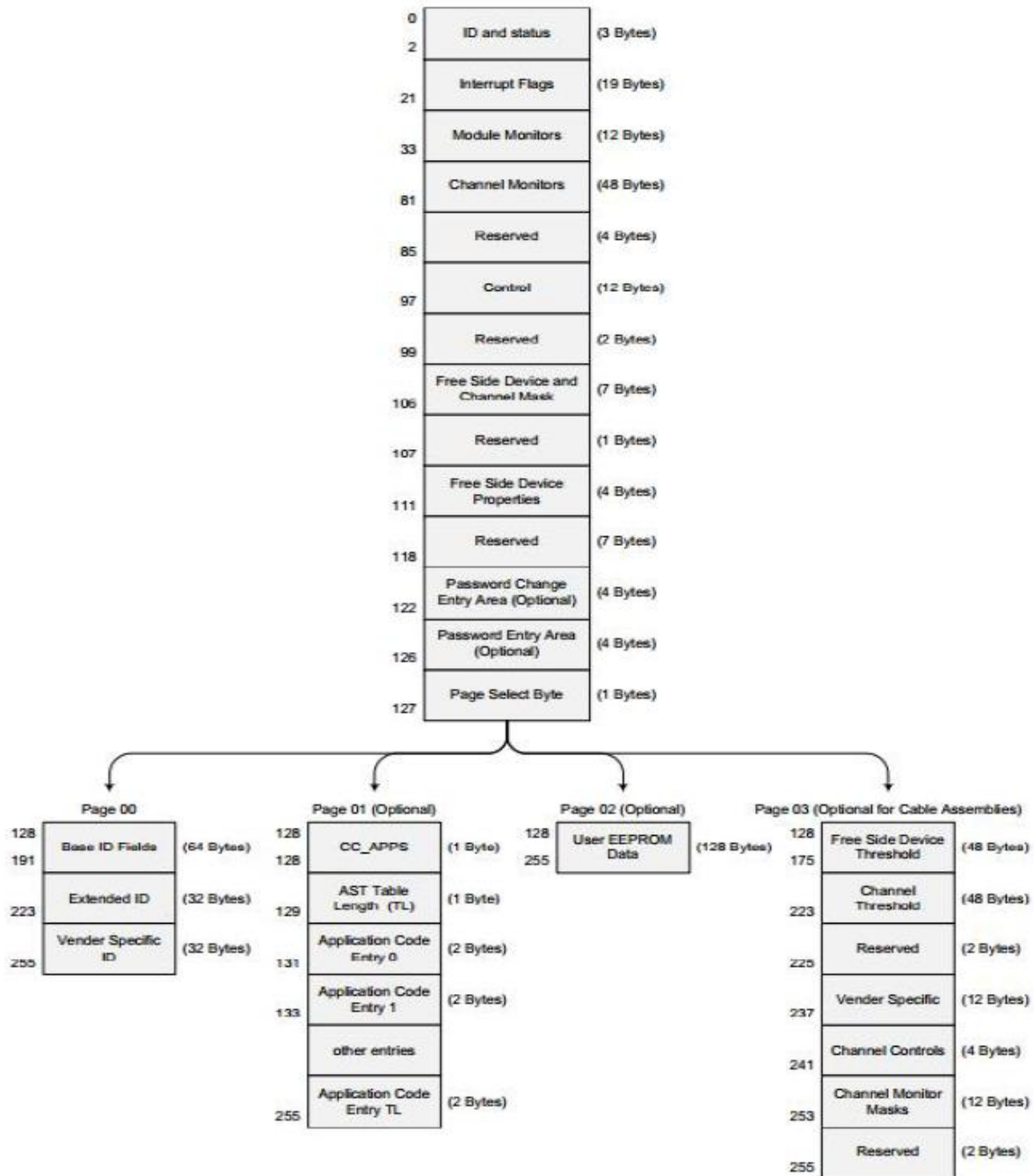


Figure5 QSFP28 Memory Map

➤ EEPROM Information

Table9-EEPROM Serial ID Memory Contents (Upper page 00h)				
Addr.	Field Size	Name of Field	Hex	Description
	(Bytes)			
128	1	Identifer	11	QSFP28
129	1	Ext. Identifier	CC	Serial ID module
130	1	Connector	07	LC Connector
131-138	8	Transceiver	80 00 00 00 00 00 00 00	
139	1	Encoding	08	PAM4
140	1	Nominal Bit Rate	FF	See Byte 222
141	1	Rate Select	00	Not compliant
142	1	Link Length(Standard SM Fiber)	0A	Transceiver transmit distance,10*km
143	1	Link Length(OM3)	00	Not compliant
144	1	Link Length(OM2)	00	Not compliant
145	1	Link Length(OM1)	00	Not compliant
146	1	Link Length(Cooper)	00	Not compliant
147	1	Device Tech	40	1310nm DFB;No wavelength control;Uncooled transmitter device;PINdetector;Transmitter not tuneable
148-163	16	Vendor name	48 47 20 47 45 4E 55 49 4E 45 20 20 20 20 20 20	“NEON” Vendor Name(ASCII)
164	1	Electronic or optical interfaces for InfiniBand	00	
165-167	3	Vendor OUI	00 00 00	
168-183	16	Vendor PN	4D 54 52 51 2D 31 4C 41 30 32 2D 33 33 42 20 20	“OETR-50-A” Part No.(ASCII) For TX1330nM
			4D 54 52 51 2D 31 4C 41 30 32 2D 32 37 42 20 20	“OETR-50-B” Part No.(ASCII) For TX1270nM
184-185	2	Vendor rev	41 30	
186-187	2	Wavelength	67 E8	Transceiver wavelength, 1330nm
			63 38	Transceiver wavelength, 1270nm
188-189	2	Wavelength Tolerance	05 14	± 6.5nm

190	1	Max Case Temp	46	Max Case Temp 70° C
191	1	Check Sum	B2	OETR-50-A Address 128-190 Checksum
			01	OETR-50-B Address 128-190 Checksum
192-195	4	Rate Select, TX Disable, TX Fault, LOS, Warning indicators	00 08 00 98	
196-211	16	Vendor SN	SN(Variable)	Serial Number of transceiver(ASCII).
212-219	8	Date code	DC(Variable)	Manufactory Date Code.
220	1	Diagnostic Monitoring Type	0C	Average Power
221	1	Enhanced Options	10	
222	1	Extended bit rate	D5	Nominal bit rate per lane, units of 250 Mbps-
223	1	Check Sum	(Variable)	Address 192-222
224-225		Reserved	Read only	Filled by zero

Table10-EEPROM DDM Alarm & Warning Threshold (Upper page 03h)

Addr.	Field Size	Name of Field	Hex	Description
	(Bytes)			
128-129	2	Temperature High Alarm	50 00	80°C
130-131	2	Temperature Low Alarm	F6 00	-10°C
132-133	2	Temperature High Warning	46 00	70°C
134-135	2	Temperature Low Warning	00 00	0°C
144-145	2	Vcc High Alarm	8D CC	3.63V
146-147	2	Vcc Low Alarm	74 04	2.97V
148-149	2	Vcc High Warning	87 5A	3.465V
150-151	2	Vcc Low Warning	7A 76	3.135V
176-177	2	RX Power High Alarm	CD 00	7.2dBm
178-179	2	RX Power Low Alarm	02 85	-11.9dBm
180-181	2	RX Power High Warning	66 BE	4.2dBm
182-183	2	RX Power Low Warning	05 08	-8.9dBm
184-185	2	Bias High Alarm	AF C8	90mA
186-187	2	Bias Low Alarm	09 C4	5mA
188-189	2	Bias High Warning	9C 40	80mA
190-191	2	Bias Low Warning	13 88	10mA
192-193	2	TX Power High Alarm	CD 00	7.2dBm
194-195	2	TX Power Low Alarm	06 F2	-4.5dBm
196-197	2	TX Power High Warning	66 BE	4.2dBm
198-199	2	TX Power Low Warning	0D DC	-7.5dBm

➤ **Ordering Information**

Table11- Ordering Information									
Part No	Specification								
	Pack	Rate	Tx	Pout	Rx	S	Top	Reach	Others
OETR-50-A	QSFP28	50G	DFB/1331	-4.5~4.2dBm	PIN/1271	<-8.9dBm	0~70°C	10KM	DDM/RoHS
OETR-50-B	QSFP28	50G	DFB/1271	-4.5~4.2dBm	PIN/1331	<-8.9dBm	0~70°C	10KM	DDM/RoHS