

SFP-Plus-CWDM27.23, SFP-Plus-CWDM29.23  
 SFP-Plus-CWDM31.23, SFP-Plus-CWDM33.23

**Optiset**

**Особенности:**

- CWDM DFB лазер + APD фотоприемник
- 23dB бюджет
- функция диагностики (DDMI) в соответствии с SFF-8472
- Data rate до 10.3Gbps
- соответствие спецификации MSA для SFP+



**Область применения:**

- 10GBASE-ER/EW 10G Ethernet

**Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>A</sub> SFP-Plus-CWDM27.23 SFP-Plus-CWDM29.23 SFP-Plus-CWDM31.23 SFP-Plus-CWDM33.23	-5		+70	°C
Power Supply Voltage	V <sub>CC</sub>	3.13	3.3	3.45	V
Power Supply Current	I <sub>CC</sub>			680	mA
Data Rate		9.95	10.3125		Gbps

**CWDM Wavelength**

Band	Nomenclature	Wavelength(nm)		
		Min.	Typ.	Max.
O-band Original	A	1264	1270	1277.5
	B	1284	1290	1297.5
	C	1304	1310	1317.5
	D	1324	1330	1337.5

**PERFORMANCE SPECIFICATIONS - ELECTRICAL**

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
<b>TRANSMITTER</b>						
CML Inputs(Differential )	V <sub>in</sub>	180		1000	mVp	After internal AC coupling
Input Impedance (Differential)	Z <sub>in</sub>	85	100	115	ohm	
Tx_DISABLE Input Voltage - High		2		V <sub>CC</sub> +0.3	V	
Tx_DISABLE Input Voltage -		0		0.8	V	

Low						
Tx_FAULT Output Voltage -- High		2		V <sub>cc</sub> +0.3	V	
Tx_FAULT Output Voltage -- Low		0		0.8	V	
RECEIVER						
CML Outputs (Differential)	V <sub>out</sub>	350		700	mV <sub>pp</sub>	After internal AC coupling
Output Impedance (Differential)	Z <sub>out</sub>	85	100	115	ohm	
Rx_LOS Output Voltage - High		2		V <sub>cc</sub> +0.3	V	
Rx_LOS Output Voltage - Low		0		0.8	V	
MOD_DEF ( 0:2 )	VoH	2.5			V	Reference the SFF-8472 MSA
	VoL	0		0.5	V	

### Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Note
Transmitter						
Output Opt. Pwr: 9/125 SMF	P <sub>out</sub>	+2		+5	dBm	
Optical Extinction Ratio	ER	3.5			dB	
Optical Wavelength	$\lambda$	$\lambda_c - 6.0$	$\lambda_c$	$\lambda_c + 7.5$	nm	ITU-T G.694.2, from 1310 to 1330nm, step 20nm
-20dB Spectrum Width	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power of OFF Transmitter	P <sub>OFF</sub>			-30	dBm	
TX Jitter	TX <sub>j</sub>	Per 802.3ae requirements				
Relative Intensity Noise	RIN			-128	dB/H <sub>z</sub>	
Receiver						
Receiver Sensitivity (OMA) @ 10.3125Gb/s	P <sub>min</sub>			-21	dBm	Average received power; BER less than 1E-12 and PRBS 2 <sup>31</sup> -1 test pattern

Maximum Input Power	Pmax	-9			dBm	
Optical Center Wavelength	$\lambda$	1260		1600	nm	
Receiver Reflectance	R <sub>rf</sub>			-12	dB	
LOS De-Assert	LOS <sub>D</sub>			-23	dBm	
LOS Assert	LOS <sub>A</sub>	-35			dBm	
LOS Hysteresis		1			dB	

### Pin Function Definitions

Pin Num.	Name	FUNCTION	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2, Module disables on high or open
4	SDA	Module Definition 2	3	Note 3, Data line for Serial ID.
5	SCL	Module Definition 1	3	Note 3, Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	3	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL).	1	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 7
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

**Notes:**

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10K $\Omega$  resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 K  $\Omega$  resistor. Its states are:

Low (0 – 0.8V): Transmitter on

(>0.8, < 2.0V): Undefined

High (2.0 – 3.465V): Transmitter Disabled

Open: Transmitter Disabled

3) Modulation Absent, connected to VEET or VEER in the module.

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10K $\Omega$  resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

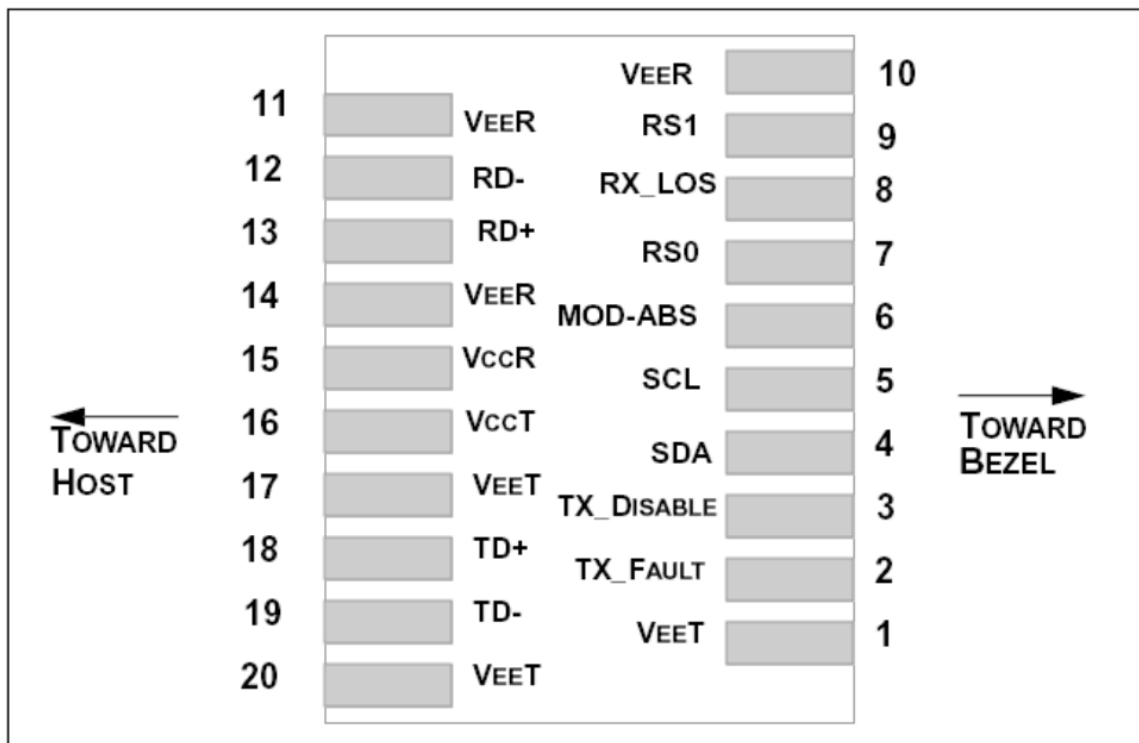
5) VeeR and VeeT may be internally connected within the SFP+ module.

6) RD-/+ : These are the differential receiver outputs. They are AC coupled 100 $\Omega$  differential lines which should be terminated with 100 $\Omega$  (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 –1000 mV single ended) when properly terminated.

7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V  $\pm$ 5% at the SFP+ connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot

plugging of the SFP+ transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver module.

8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 500 – 2400 mV (250 – 1200mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600mV single-ended) be used for best EMI performance.



## EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA) is bi-directional

for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. The diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following.

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**Mechanical Specifications**

