

Transceptor Óptico 100G QSFP28 ER4 40km (FWT-100G-40)

Hot Pluggable, Duplex LC, +3.3V, 4x25G, LWDM
DFB/EML, APD/SOA+PIN, Monomodo, DDM



1. Descrição Geral

O FWT-100G-40 é um transceptor óptico QSFP28 ER4 hot pluggable para taxas de linha de 103,125 Gb/s a 111,81 Gb/s (4 x 25 Gb/s). Utiliza TOSA LAN WDM refrigerada com lasers DFB/EML (1295,56, 1300,05, 1304,58 e 1309,14 nm) e receptor APD/SOA+PIN, conector Duplex LC e interface elétrica 4x25G (OIF CEI-28G-VSR), com alcance de até 40km em fibra monomodo (SMF). Opera com alimentação de 3,3 V e dissipação inferior a 4,0 W, oferece monitoramento de diagnóstico digital (DDM) e atende às especificações IEEE 802.3bm, QSFP28 MSA e SFF-8636.

2. Características

- Suporta taxas de linha de 103,125 Gb/s a 111,81 Gb/s
- Interface de monitoramento de diagnóstico digital (DDM)
- Receptáculo óptico Duplex LC
- Alcance de até 40km em fibra monomodo (SMF)
- Form factor QSFP28 MSA hot pluggable
- Receptor: APD/SOA+PIN 4 x 25 Gb/s
- Transmissor: TOSA LAN WDM DFB/EML refrigerada 4 x 25 Gb/s (1295,56, 1300,05, 1304,58, 1309,14 nm)
- Em conformidade com QSFP28 MSA com conector LC
- Temperatura de operação: comercial 0 °C a +70 °C; industrial -40 °C a +85 °C
- Interface elétrica 4x25G (OIF CEI-28G-VSR)
- Em conformidade com RoHS-6
- Dissipação de potência < 4,0 W

3. Aplicações

- Ethernet 100GBASE-ER4
- Conexões client-side 100G de telecom
- Data Center

4. Normas

- IEEE 802.3bm
- QSFP28 MSA
- SFF-8636

5. Valores Máximos Absolutos

Parâmetro	Símbolo	Mín	Máx	Unidades
Storage Ambient Temperature	TSTG	-40	85	°C
Operating Humidity	HO	5	95	%
Power Supply Voltage	Vcc	-0.5	3.6	V
Damage Threshold, each Lane	THd	-3		dBm

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6. Condições de Operação Recomendadas

Parâmetro	Símbolo	Mín	Típico	Máx	Unidades
Operating Case Temperature	Tc	0		70	°C
Power Supply Voltage	Vcc	3.135	3.3	3.465	V
Power Supply Current	ICC			1360	mA
Data Rate, each Lane			25.78125		Gbps
Control Input Voltage High		2		Vcc	V
Control Input Voltage Low		0		0.8	V
Data Rate Accuracy		-100		100	ppm
Link Distance with SMF (without FEC)	D1	-		30	km
Link Distance with SMF (with FEC)	D2			40	km

7. Características Elétricas do Transmissor

Parâmetro	Símbolo	Mín	Típico	Máx	Unidades	Notas
Power Consumption				4.0	W	
Overload Differential Voltage pk-pk	TP1a	900			mV	
Common Mode Voltage (Vcm)	TP1	-350		2850	mV	
Differential Termination Resistance Mismatch	TP1			10	%	
Differential Return Loss (SDD11)	TP1			See CEI-28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)	TP1			See CEI-28G-VSR Equation 13-20	dB	
Stressed Input Test	TP1a	See CEI-28G-VSR Section 13.3.11.2.1				

8. Características Elétricas do Receptor

Parâmetro	Símbolo	Mín	Típico	Máx	Unidades	Notas
Differential Voltage, pk-pk	TP4			900	mV	
Common Mode Voltage (Vcm)	TP4	-350		2850	mV	
Common Mode Noise, RMS	TP4			17.5	mV	
Differential Termination Resistance Mismatch	TP4			10	%	
Differential Return Loss (SDD11)	TP4			See CEI-28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22)	TP4			See CEI-28G-VSR Equation 13-21	dB	
Common Mode Return Loss (SCC22)	TP4			-2	dB	
Transition Time, 20 to 80%	TP4	9.5			ps	
Vertical Eye Closure (VEC)	TP4			5.5	dB	
Eye Width at 10^-15 probability (EW15)	tr	0.57			UI	
Eye Height at 10^-15 probability (EH15)	tf	228			mV	

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9. Características Ópticas do Transmissor

Parâmetro	Símbolo	Mín	Típico	Máx	Unidades	Notas
Launched Power (avg.)	Pavg	-2.5		4.5	dBm	
Total Output Power	Pout			10.5	dBm	
OMA, each Lane	POMA	0.1		4.5	dBm	
Difference in Launch Power between any Two Lanes (OMA)	Ptx,diff			3.6	dB	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-0.65			dBm	
Wavelength Assignment	λ_0	1294.53	1295.56	1296.59	nm	
	λ_1	1299.02	1300.05	1301.09	nm	
	λ_2	1303.54	1304.58	1305.63	nm	
	λ_3	1308.09	1309.14	1310.19	nm	
TDP, each Lane	TDP			2.5	dB	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	7			dB	
Transmitter OFF Output Power	POff			-30	dBm	
RIN20 OMA	RIN			-130	dB/Hz	
Output Eye Mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				

10. Características Ópticas do Receptor

Parâmetro	Símbolo	Mín	Típico	Máx	Unidades	Notas
Damage Threshold, each Lane	THd	-3			dBm	
Average Receive Power, each Lane		-16.9		-4.9	dBm	@30km
Average Receive Power, each Lane		-20.9		-4.9	dBm	@40km
Receive Power (OMA), each Lane				-1.9	dBm	
Receiver Sensitivity (OMA), each Lane	SEN1			-14.5	dBm	For BER = 1×10^{-12}
Stressed Receiver Sensitivity (OMA), each Lane				-12.5	dBm	For BER = 1×10^{-12}
Receiver Sensitivity (OMA), each Lane	SEN2			-18.5	dBm	For BER = 5×10^{-5}
Stressed Receiver Sensitivity (OMA), each Lane				-16.65	dBm	For BER = 5×10^{-5}
Receiver reflectance				-26	dB	
Difference in Receive Power between any Two Lanes (Average and OMA)	Ptx,diff			3.6	dB	
LOS Hysteresis	LOSH	0.5			dB	
LOS Optical De-assert	Pd		-24		dBm	
LOS Optical Assert	Pa		-26		dBm	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	Fc			31	GHz	
Vertical Eye Closure Penalty, each Lane				1.5	dB	
Stressed Eye J2 Jitter, each Lane				0.3	UI	
Stressed Eye J9 Jitter, each Lane				0.47	UI	

Notas:

- 1) Medido com padrão de teste PRBS 2³¹-1, a 25,78 Gb/s, BER < 5x10⁻⁵.

11. Pinagem e Descrição

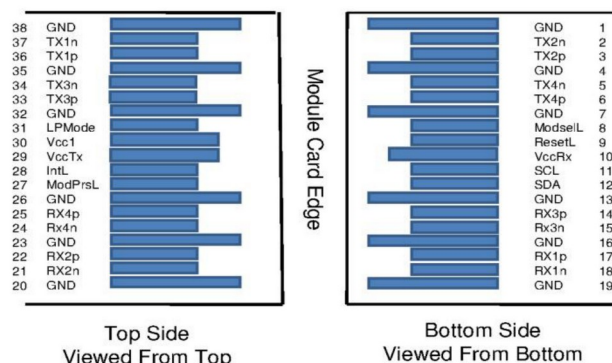


Figura 1. Conector de 38 pinos compatível com QSFP MSA

Tabela 1. Definição de pinos do módulo QSFP28

Pino	Símbolo	Name/Description	Notas
1	GND	Transmitter Ground (Common with Receiver 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	2
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	2
30	Vcc1	+3.3 V Power Supply	2
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	TX3P	Transmitter Non-Inverted Data Input	

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Pino	Símbolo	Name/Description	Notas
34	TX3N	Transmitter Inverted Data Input	1
35	GND	Ground	
36	TX1P	Transmitter Non-Inverted Data Input	
37	TX1N	Transmitter Inverted Data Input	1
38	GND	Ground	

Notas:

- 1) GND é o símbolo do comum de sinal e de alimentação dos módulos QSFP28. Todos são comuns dentro do módulo QSFP28 e todas as tensões do módulo são referenciadas a esse potencial, salvo indicação em contrário. Conecte-os diretamente ao plano de terra comum de sinal da placa host.
- 2) VccRx, Vcc1 e VccTx são as alimentações de recepção e transmissão e devem ser aplicadas simultaneamente. A filtragem recomendada da alimentação na placa host é mostrada na Figura 2. VccRx, Vcc1 e VccTx podem estar interligados internamente no módulo QSFP28 em qualquer combinação. Cada pino do conector suporta corrente máxima de 1000 mA.

12. Filtro de Alimentação Recomendado

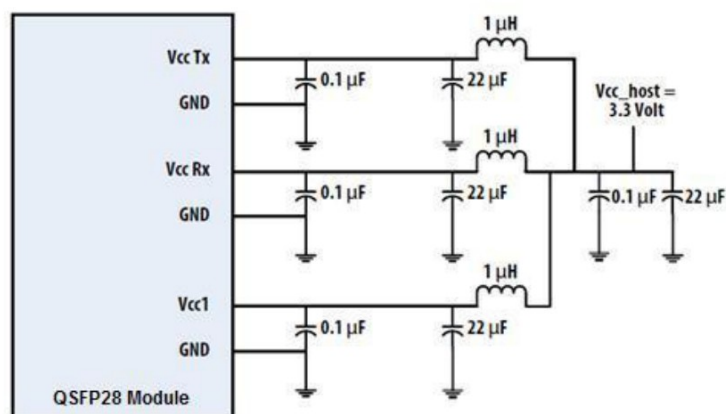


Figura 2. Filtro de alimentação recomendado na placa host

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13. Diagrama de Blocos

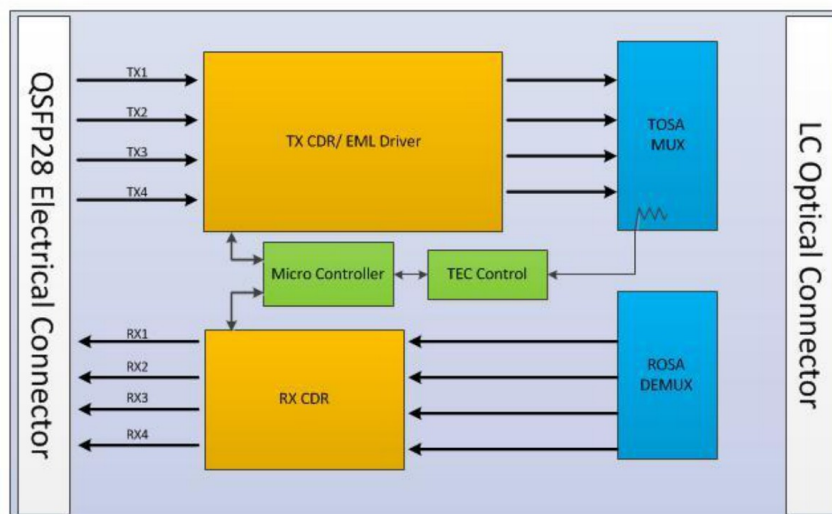


Figura 3. Diagrama de blocos do transceptor

14. Dimensões Mecânicas

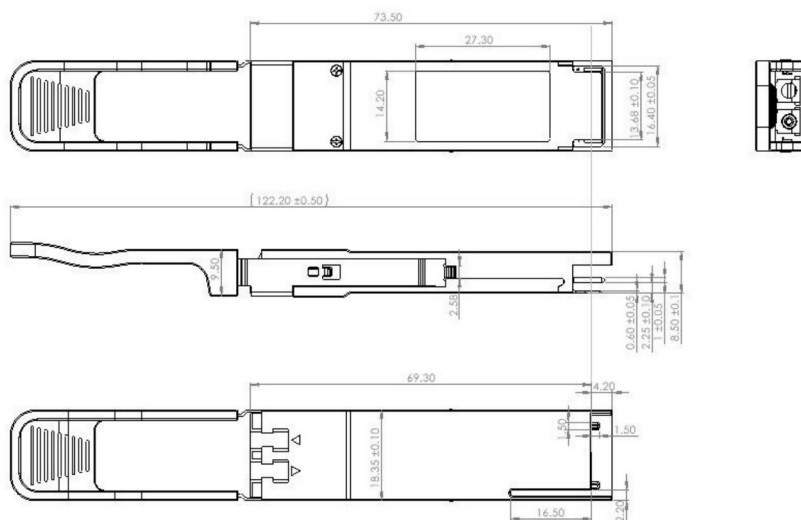


Figura 4. Dimensões do módulo. Cotas em mm, tolerância de $\pm 0,2$ mm salvo indicação em contrário

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15. Conformidade Regulatória

Item	Teste	Método / Resultado
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1 (>1000V for SFI pins, >2000V for other pins)
Electrostatic Discharge (ESD) Immunity	IEC61000-4-2	Class 2 (>4.0kV)
Electromagnetic Interference (EMI)	CISPR22 ITE Class B; FCC Class B; CENELEC EN55022; VCCI Class 1	Comply with standard
Immunity	IEC61000-4-3	Comply with standard
Eye Safety	FDA 21CFR 1040.10 and 1040.11; EN (IEC) 60825-1,2	Compatible with Class I laser product

16. Part Number

Part Number	Encaps.	Taxa	Tx	Po (dBm)	RX	Sens. (dBm)	Temp. (°C)	Alcance	DDM
FWT-100G-40	QSFP28	111.8 1G	DFB/ EML LWDM	-2.5~4.5	APD / SOA +PIN	<-18.5	0~70	40km	Y