

Pregão Eletrônico SRP Nº 90007/2024

Objeto: Formação de Ata de Registro de Preço para **AQUISIÇÃO DE LICENÇAS E INTERFACES ÓPTICAS PARA EQUIPAMENTOS DE TELECOMUNICAÇÕES** para uso na rede estadual, contemplando fornecimento, suporte em garantia,, conforme condições, quantidades e exigências estabelecidas neste instrumento.

À

PRODEPA – Empresa de Tecnologia da Informação e Comunicação do Estado do Pará

A/C Sr. Pregoeiro

PROPOSTA DE PREÇO

TELLYCOM BRASIL LTDA, CNPJ nº 28.329.622/0001-87, vem, por intermédio do seu representante legal, Sr. Fred dos Santos Brito, brasileiro, solteiro, portador do documento oficial RG nº 3199320 SSP/PA e CPF nº: 635.431.762-34, propor o **Valor Global de R\$ 53.524,00**, para a execução do objeto da contratação o pregão supracitado, de acordo com as condições,quantidade e prazos dispostos no edital, termo de referência e anexos.

ITEM	DESCRIÇÃO	UND	MARCA	MODELO	QTD	VALOR UNITÁRIO	VALOR TOTAL
1	TRANSCEIVER QSFP28 100GBASE-SR	UND	MILJET	MJ-QSFP100G-SR4	20	R\$ 372,40	R\$ 7.448,00
2	TRANSCEIVER QSFP28 100GBASE-LR4	UND	MILJET	MJ-QSFP100G-LR4	20	R\$ 1.600,00	R\$ 32.000,00
8	CABO DAC - DIRECT ATTACHED COPPER QSFP28 PARA QSFP28 (5 m)	UND	MILJET	MJ-QSFP100G-5M	20	R\$ 703,80	R\$ 14.076,00

Valor total do item 1: R\$ 7.448,00 (Sete mil, quatrocentos e quarenta e oito reais)

Valor total do item 2: R\$ 32.000,00 (Trinta e dois mil reais)

Valor total do item 8: R\$ 14.076,00 (Quatorze mil, setenta e seis reais)

Valor total da proposta: **R\$ 53.524,00** (Cinquenta e três mil, quinhentos e vinte e quatro reais)

Prazo de Validade da Proposta: **será de no mínimo 90 (noventa) dias.**

Prazo de entrega dos produtos: **será de até 60 (sessenta) dias.**

Prazo de Garantia dos produtos pelo período de 12 (doze) meses, de acordo com o item 2 do ANEXO I – TERMO DE REFERÊNCIA.

TELLYCOM BRASIL LTDA

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Declaramos que nos valores propostos acima estão incluídos:

- Seguro, fretes, tributos (impostos, contribuições, taxas), encargos previdenciários, trabalhistas e comerciais de qualquer espécie ou quaisquer outras despesas incidentes, direta ou indiretamente, sobre o referido objeto.
- O pagamento do diferencial da alíquota de responsabilidade da PRODEPA.
- Todos os serviços, peças, acessórios e equipamentos de reposição que, embora não mencionados, sejam necessários para a perfeita e integral execução do serviço.

Dados Bancários:

BANCO: 104 – Caixa Econômica Federal

AG. 1560 **OP** 003 **CONTA CORRENTE Nº** 03464-1

DADOS PARA ASSINATURA DO CONTRATO/ATA

Nome do signatário: Fred dos Santos Brito

Cargo: Diretor de Negócios/ Sócio Administrador

RG: 3199320 SSP/PA

CPF: 635.431.762-34

Nacionalidade: Brasileiro

DADOS DA PROPONENTE:

Razão Social: Tellycom Brasil LTDA

CNPJ: 28.329.622/0001-87

Endereço: Av. Desembargador Moreira nº 2120, Aldeota, Fortaleza/CE, CEP: 60.170-002

Telefone: (85) 3111-5390

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Fortaleza/CE, 27 de agosto de 2024.

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digital por FRED
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Identificador de autenticação: 60170-002 - 61431
Nº do Protocolo: 2024/2469754

Anexo/Sequência: 39

100Gb/s QSFP28-SR4 Optical Transceiver, 100m, 850nm, DDM function, MTP®/MPO Connector, Multimode Fiber



MJ-QSFP100G-SR4

Features

- MTP/MPO 12F optical connector
- Single +3.3V power supply
- Hot-pluggable QSFP28 MSA form factor
- Up to 100m OM4 MMF Distance
- 4x28G Electrical Serial Interface (CEI-28G-VSR)
- AC coupling of CML signals
- Low power dissipation (Max:3.5W)
- Built in digital diagnostic function
- Operating case temperature range:0°C to 70°C
- Compliant with 100GBASE-SR4
- I2C Communication Interface

Applications

- 100GBASE-SR4
- Infiniband QDR/DDR/SDR
- 100G Datacom connections

Standards

- Compliant with IEEE 802.3ba
- Compliant with QSFP28 MSA hardware specifications
- Compliant with RoHS and REACH

Description

The Miljet 100G QSFP28 SR4 optical transceiver integrates the transmit and receive path onto one module. It converts parallel electrical input signals into parallel optical signals, by a driven Vertical Cavity Surface Emitting Laser (VCSEL) array. The transmitter module accepts electrical input signals compatible with Common Mode Logic (CML) levels. All input data signals are differential and internally terminated. The receiver module converts parallel optical input signals via a photo detector array into parallel electrical output signals. All data signals are differential and support a data rate up to 27.9525Gb/s per channel. The receiver module outputs electrical signals are also voltage compatible with Common Mode Logic On This module features a hot-pluggable electrical interface, low power consumption, and 2-wire serial interface.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Supply Voltage	Vcc	-0.5	3.6	V	
Storage Temperature	TS	-40	85	°C	
Relative Humidity	RH	0	85	%	
Rx Damage Threshold, per Lane	PRdmg	5.5		dBm	

Note: Stress in excess of the maximum absolute ratings can cause permanent damage to the transceiver.

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units	Note
Operating Case Temperature	TC	0	-	+70	°C	
Power Supply Voltage	VCC	3.14	3.3	3.47	V	
Data rate			103.125	112	Gb/s	
Link Distance (OM3)				70	m	
Link Distance (OM4)				100	m	

Electrical Characteristics (Top=0~70°C, Vcc=3.14~3.47V)

(Tested under recommended operating conditions, unless otherwise noted)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter						
Signaling rate per lane	DRPL	25.78125 ± 100 ppm			Gb/s	
Differential pk-pk input voltage tolerance	Vin,dpp			900	mV	
Single-ended voltage tolerance	Vin,pp	-0.35		+3.3	V	
Module stress input test		Per IEEE 802.3bm				

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Datasheet 100G Series

ID 5028851 – 100GBASE-SR4 QSFP28 850nm 100m MMF DDM MTP/MPO-12F



Receiver						
Signaling rate per lane	DRPL	25.78125 ± 100 ppm			Gb/s	
Differential data output swing	Vout,p	400		800	mV	
Eye width	Ew	0.57			UI	
Vertical eye closure	VEC	5.5			dB	
Differential termination mismatch	Tm			10	%	
Transition time, 20% to 80%	Tr,Tf	12			ps	

Optical Characteristics (Top=0~70°C, Vcc=3.14~3.47V)

(Tested under recommended operating conditions,unless otherwise noted)

Parameter	Symbol	Unit	Min	Typ	Max	Notes
Transmitter						
Signaling rate, each lane	DRpl	Gb/s	25.78125 ±100 ppm			1
Center Wavelength	λ	nm	840	850	860	
RMS Spectral Width		nm		0.6		
Average launch power, each lane	Pavg	dBm	-8.4		2.4	
Optical modulation amplitude, each lane (OMA)	OMA	dBm	-6.4		3	
Extinction ratio	ER	dB	2			
Average Launch Power of OFF Transmitter, per Lane	RIN	dBm			-30	
Encircled Flux	FLX	dBm	>86% at 19 um <30% at 4.5 um			
Optical return loss tolerance		dB			12	
Transmitter eye mask {X1, X2, X3, Y1, Y2, Y3}			{0.3,0.38,0.45,0.35,0.41,0.5}			2
Receiver						
Receive Rate for Each Lane	DRpl	Gb/s	25.78125 ±100 ppm			3
Four Lane Wavelength Range	λ	nm	840		860	
Overload Input Optical Power	Pmax	dBm	3.4			
Average Receive Power for Each Lane	Pin	dBm	-10.3		2.4	4
Receiver Sensitivity (OMA) per lane	Psens	dBm			-5.2	
Recevier Reflectance	Rfl	dB			-12	
Receiver Eye MaskDefinition {X1, X2, X3, Y1, Y2,Y3}		{0.28,0.5,0.5,0.33,0.33,0.4}				5
Los De-Assert	Pd	dBm			-13	
Los Assert	Pa	dBm	-30			
Loss Hysteresis	Pd-Pa	dBm	0.5			

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Datasheet 100G Series

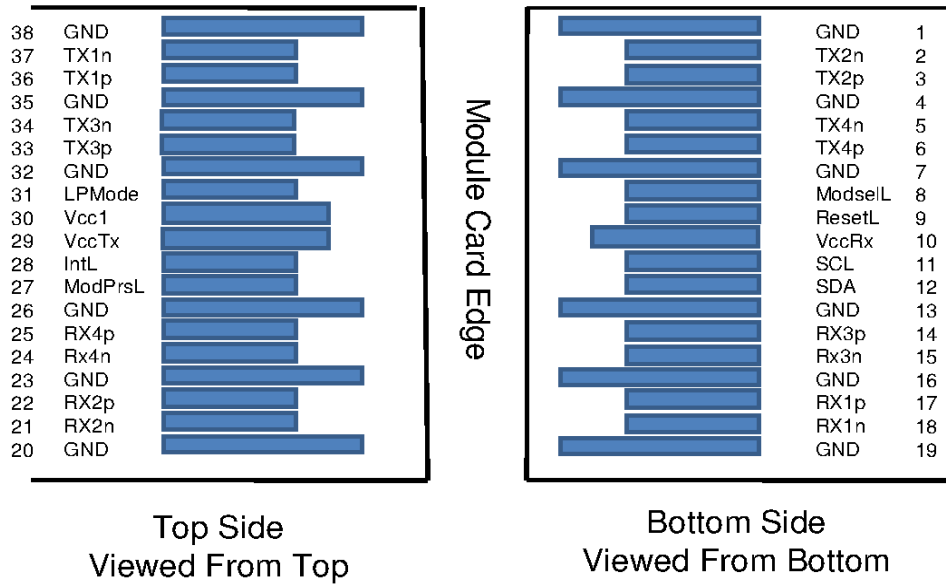
ID 5028851 – 100GBASE-SR4 QSFP28 850nm 100m MMF DDM MTP/MPO-12F



Notes:

- 1. Transmitter consists of 4 lasers operating at a maximum speed of 25.78125Gb/s ±100ppm each.
- 2. Hit Ratio 1.5 x 10-3 hits/sample.
- 3. Receiver consists of 4 photodetectors operating at a maximum speed of 25.78125Gb/s ±100ppm each.
- 4. Minimum value is informative only and not the principal indicator of signal strength.
- 5. Hit Ratio 5 x 10-5 hits/sample.

Pin Description



Pin	Name	Logic	Description	
1	GND		Ground	1
2	Tx2n	CML-I	Transmitter Inverted Data Input	10
3	Tx2p	CML-I	Transmitter Non-Inverted Data Input	10
4	GND		Ground	1
5	Tx4n	CML-I	Transmitter Inverted Data Input	10
6	Tx4p	CML-I	Transmitter Non-Inverted Data Input	10
7	GND		Ground	1
8	ModSelL	LVTTL-I	Module Select	3
9	ResetL	LVTTL-I	Module Reset	4
10	Vcc Rx		+3.3V Power Supply Receiver	2
11	SCL	LVCMOS-	2-wire serial interface clock	5
12	SDA	LVCMOS-	2-wire serial interface data	5
13	GND		Ground	1
14	Rx3p	CML-O	Receiver Non-Inverted Data Output	9
15	Rx3n	CML-O	Receiver Inverted Data Output	9
16	GND		Ground	1
17	Rx1p	CML-O	Receiver Non-Inverted Data Output	9
18	Rx1n	CML-O	Receiver Inverted Data Output	9
19	GND		Ground	1

Datasheet 100G Series

ID 5028851 – 100GBASE-SR4 QSFP28 850nm 100m MMF DDM MTP/MPO-12F



20	GND		Ground	1
21	Rx2n	CML-O	Receiver Inverted Data Output	9
22	Rx2p	CML-O	Receiver Non-Inverted Data Output	9
23	GND		Ground	1
24	Rx4n	CML-O	Receiver Inverted Data Output	9
25	Rx4p	CML-O	Receiver Non-Inverted Data Output	9
26	GND		Ground	1
27	ModPrsL	LVTTL-O	Module Present	6
28	IntL	LVTTL-O	Interrupt	7
29	Vcc Tx		+3.3V Power supply transmitter	2
30	Vcc1		+3.3V Power supply	2
31	LPMode	LVTTL-I	Low Power Mode	8
32	GND		Ground	1
33	Tx3p	CML-I	Transmitter Non-Inverted Data Input	10
34	Tx3n	CML-I	Transmitter Inverted Data Input	10
35	GND		Ground	1
36	Tx1p	CML-I	Transmitter Non-Inverted Data	
37	Tx1n	CML-I	Transmitter Inverted Data Input	10
38	GND		Ground	1

Notes:

1: GND is the symbol for signal and supply (power) common for the module. All are common within the 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 Vcc Tx shall be applied concurrently. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000 mA. Recommended host board power supply filtering is shown below.

3: The ModSelL is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple modules on a single 2-wire interface bus. When the ModSelL is "High", the module shall not respond to or acknowledge any 2-wire interface communication from the host. ModSelL signal input node shall be biased to the "High" state in the module. In order to avoid conflicts, the host system shall not attempt 2-wire interface communications within the ModSelL de-assert time after any modules are deselected. Similarly, the host shall wait at least for the period of the ModSelL assert time before communicating with the newly selected module. The assertion and de-asserting periods of different modules may overlap as long as the above timing requirements are met.

4: The Reset L pin shall be pulled to Vcc in the module. A low level on the ResetL pin for longer than the minimum pulse length (t_{Reset_init}) initiates a complete module reset, returning all user module settings to their default state. Module Reset Assert Time (t_{init}) starts on the rising edge after the low level on the Reset L pin is released. During the execution of a reset (t_{init}) the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by asserting "low" an IntL signal with the Data_Not_Ready bit negated. Note that on power up (including hot insertion) the module should post this completion of reset interrupt without requiring a reset.

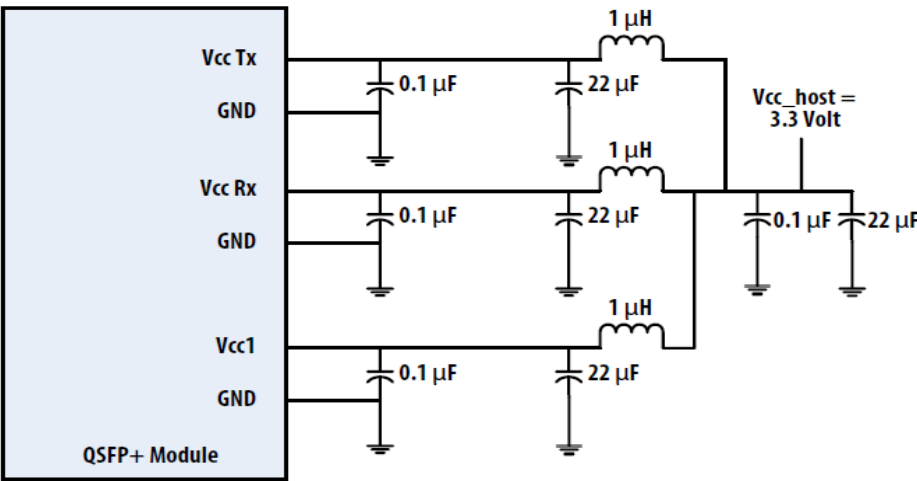
5: Low speed signaling other than SCL and SDA is based on Low Voltage TTL (LVTTL) operating at Vcc. Vcc refers to the generic supply voltages of VccTx, VccRx, Vcc_host or Vcc1.

Hosts shall use a pull-up resistor connected to Vcc_host on each of the 2-wire interface SCL (clock), SDA (data), and all low-speed status outputs. The SCL and SDA is a hot plug interface that may support a bus topology.

6: ModPrsL is pulled up to Vcc_Host on the host board and grounded in the module. The ModPrsL is asserted "Low" when inserted and deasserted "High" when the module is physically absent from the host connector.

7: IntL is an output pin. When IntL is "Low", it indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt using the 2-wire serial interface. The IntL pin is an open collector output and shall be pulled

Recommended Power Supply Filter



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Datasheet 100G Series

ID 5028851 – 100GBASE-SR4 QSFP28 850nm 100m MMF DDM MTP/MPO-12F



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Rv.2024.04-022

FICHA TÉCNICA

MODELO: MJ-QSFP100G-SR4

MARCA: Miljet Network

PRODUTO: 100GBASE-SR4 QSFP28, 850nm 100m MMF MTP/MPO DDM, transceptor óptico Miljet

CARACTERÍSTICAS TÉCNICAS:

Nome do Fabricante: MILJET SOLUTIONS, INC. Florida USA

Part Number: MJ-QSFP100G-SR4

Formato do Modelo: QSFP28 (Quad Small Form-factor Pluggable)

Taxa de dados/capacidade: 103.125Gbps

Distância de Máxima: Até **70m** em OM3 ou **100m** OM4.

Comprimento de onda: 850nm VSCSEL Laser (4 canais de 25G em 850nm)

TX Power/Potência: -8.4 ~ 2.4dBm

RX Sensibilidade de Recepção: < -10.3dBm

Interface: MTP/MPO 12F Fêmea.

Tipo de Cabo: Multi-Mode Fiber (MMF) - Multimodo 50/125µm OM3, OM4 e OM5.

MTBF: 2,578,324 horas

Monitoramento Digital Óptico DOM/DDM: Sim

Hot-swappable: Sim

Dimensões/Peso: 13mm x 72mm x 18.4mm - 32g

Faixa de Temperatura: 0°C to +70°C | Single +3.3V

Conformidade: FCC, CE, RoHS, REACH, MSA, IEEE 802.3bm, Infiniband FDR, 100GBASE Ethernet.



APLICAÇÃO:

O MJ-QSFP100G-SR4 Miljet é um transceptor **QSFP28** que opera sobre **4 canais de 25Gbps** paralelos **Tx/Rx em fibra óptica multimodo** no comprimento de onda de **850nm**, fornecendo nessas quatro faixas de comunicação óptica formas independentes. Ele possui um conector **MTP/MPO 12F Fêmea** para receber Cabos MTP ou MPO compatíveis, podendo ser **OM3, OM4 e OM5** considerando as distâncias limites pra cada tipo de cabo. Com esse transceptor você poderá realizar instalações em até **100mts em fibra Multimodo** utilizando Cordões ou cabos multimodo com conectores MTP/MPO nas extremidades. As aplicações mais populares são para provedores de **serviços de Internet (ISP)** em agregações de

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Nº do Protocolo: 2024/2469754

Nº do Protocolo: 2024/2469754 | Anexo/Sequencial: 39

tráfego, **operadoras móvel e 100G de back-haul**, Interconexões de sites de rede em **Data Centers** e outros links ópticos. Geralmente esse modelo tem como finalidade conexões internas entre equipamentos dentro do mesmo ambiente como forma uso mais comum.

COMPATIBILIDADE GARANTIDA E COMPROVADA:

Arista Networks	Ciena	Fiberhome	IBM	Nokia
Alcatel-Lucent	Dell	Furukawa	Intelbras	Raisecom
Aruba	D-link	HP	Juniper	TP-link
Avaya/Nortel	Datacom	H3C	Linksys	Ubiquiti
A10 Networks	Extreme	Harmonic	Lenovo	Unifiber
Brocade	Enterasys	Hatteras	Mikrotik	ZTE
Cisco	Force 10	Huawei	Meraki	Zyxel
Compaq	Fortinet	Intel	Netgear	3Com

SOBRE O PRODUTO:

1. Transceiver óptico MILJET SOLUTIONS, INC. Network Connections.
2. Produto distribuído com exclusividade no Brasil por Tellycom, origem EUA.
3. Aplicado para conectar interfaces/portas ópticas em Switches, Roteadores de Comutação, OLT's, Servidores, Firewalls, Placas PCI, Equipamentos de Audio e Video, Automação comercial, Conversores de Mídia entre outros, atendendo diversos tipos de aplicações para as áreas de Telecomunicações, IoT, Tecnologia da informação, informática, industria, Data Centers, Segurança e Automação de redes de dados em Geral.
4. Os transceivers/transceptores ópticos MILJET possuem alta qualidade e projeto de engenharia próprio certificado mundialmente, no qual todos os componentes são minuciosamente escolhidos e testados com base nas melhores práticas, parceiros e produtos internacionais, para que tenham o melhor desempenho, performance, compatibilidade e durabilidade.
5. Produto Certificado por: **ISO9001, FCC, CE, RoHS, MSA, IEEE 802.3bm, Infiniband FDR, 100GBASE Ethernet.**



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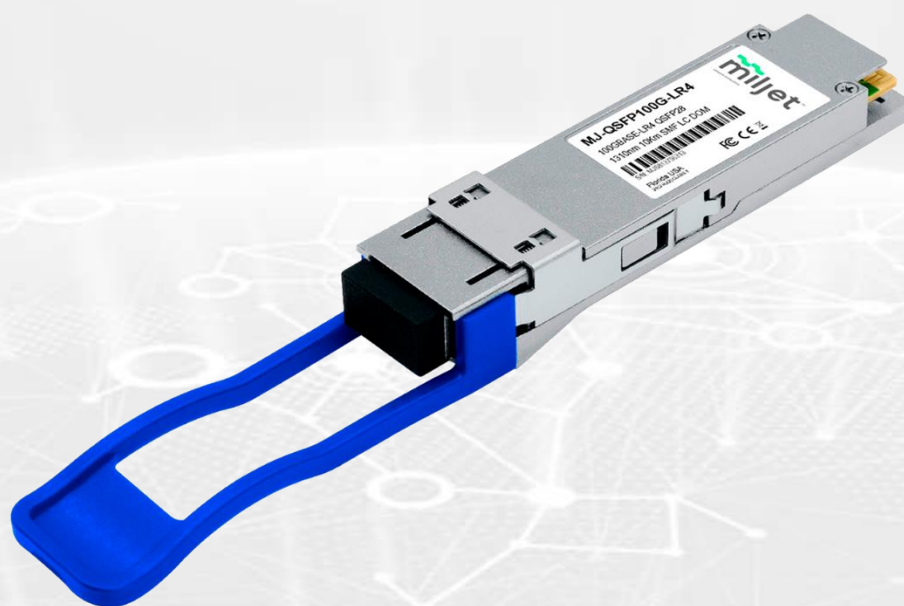
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100Gb/s QSFP28-LR4 Transceiver, 10km, 1310nm LWDM4, DDM function, Duplex LC Connector, Single Mode Fiber



MJ-QSFP100G-LR4

Features

- 4 lanes MUX/DEMUX design
- Integrated LAN WDM EML TOSA/PIN ROSA for up to 10km reach over SMF
- Support 100GBASE-LR4 for line rate of 103.125Gbps and OTU4 for line rate of 111.81Gbps
- Hot-pluggable QSFP28 MSA
- Compliant with IEEE 802.3ba, QSFP28 MSA, 100GBASE-LR4, CEI-28G-VSR.
- Duplex LC connectors
- Single +3.3V power supply operating
- Built-in digital diagnostic functions DDM/DOM
- Temperature range 0°C to 70°C
- RoHS and REACH Compliant Part
- Support FEC (Forward Error Correction)

Applications

- Local Area Network (LAN)
- Wide Area Network (WAN)
- Ethernet switches and router applications
- 100GBASE-LR4 100G Ethernet
- 112GBASE-OTU4 112G
- Infiniband QDR and DDR
- 100G Datacom Connections

Description

The MJ-QSFP100G-LR4 is a transceiver module designed for 10km optical communication applications. The design is compliant to 100GbASE-LR4 of the IEEE 802.3-2012 Clause 88 standard IEEE 802.3bm CAUI-4 chip to module electrical standard ITU-T G.959.1-2012-02 standard. The module converts 4 inputs channels (ch) of 25.78 Gbps to 27.95Gbps electrical data to 4 lanes optical signals and multiplexes them into a single channel for 100Gb/s optical transmission. Reversely, on the receiver side, the module optically de-multiplexes a 100Gb/s input into 4 lanes signals and converts them to 4 lanes output electrical data.

The central wavelengths of the 4 lanes are 1296.56nm, 1300.05 nm, 1304.58 nm and 1309.14nm. It contains a duplex LC connector for the optical interface and a 38-pin connector for the electrical interface. To minimize the optical dispersion in the long-haul system, single-mode fiber (SMF) must be applied in this module.

The product is designed with form factor, optical/electrical connection, and digital diagnostic interface according to the QSFP28 Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity, and EMI interference.

The module operates from a single +3.3V power supply and LVCMOS/LVTTL global control signals such as Module Present, Reset, Interrupt and Low Power Mode are available with the modules. A 2-wire serial interface is available to send and receive more complex control signals and to obtain digital diagnostic information. Individual channels can be addressed, and unused channels can be shut down for maximum design flexibility.

The MJ-QSFP100G-LR4 is designed with form factor, optical/electrical connection, and digital diagnostic interface according to the QSFP28 Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity, and EMI interference. The module offers very high functionality and feature integration, accessible via a two-wire serial interface.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T _S	-40		+85	°C
Supply Voltage	V _{CC} T, R	-0.5		4	V
Relative Humidity	RH	0		85	%

Recommended Operating Environment

Parameter	Symbol	Min.	Typical	Max.	Unit
Case operating Temperature	T _C	0		+70	°C
Supply Voltage	V _{CCT, R}	+3.13	3.3	+3.47	V
Supply Current	I _{CC}		1100	1500	mA
Power Dissipation	PD			5	W

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Optical Modulation Amplitude, each Lane	OMA	-4		4.5	dBm	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-4.8	-		dBm	
TDP, each Lane	TDP			2.2	dB	
Extinction Ratio	ER	4	-	-	dB	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				
Optical Return Loss Tolerance		-	-	20	dB	
Average Launch Power OFF Transmitter, each Lane	Poff			-30	dBm	
Relative Intensity Noise	Rin			-128	dB/HZ	1
Optical Return Loss Tolerance		-	-	12	dB	
Receiver						
Damage Threshold	THd	3.3			dBm	1
Equivalent Sensitivity per Channel	Rxsens			-10.6	dBm	1
Average Power at Receiver Input, each Lane	R	-10.6		0	dBm	
RSSI Accuracy		-2		2	dB	
Receiver Reflectance	Rrx			-26	dB	
Receiver Power (OMA), each Lane		-	-	3.5	dBm	
LOS De-Assert	LOS _D			-15	dBm	
LOS Assert	LOS _A	-25			dBm	
LOS Hysteresis	LOS _H	0.5			dB	

Note:

- 1. 12dB Reflection

Diagnostic Monitoring Interface

Digital diagnostics monitoring function is available on all QSFP28 LR4. A 2-wire serial interface provides user to contact with module. The structure of the memory is shown in flowing. The memory space is arranged into a lower, single page, address space of 128 bytes and multiple upper address space pages. This structure permits timely access to addresses in the lower page, such as Interrupt Flags and Monitors. Less time critical time entries, such as serial ID information and threshold settings, are available with the Page Select function. The interface address used is A0xh and is mainly used for time critical data like interrupt handling in order to enable a one-time-read for all data related to an interrupt situation. After an interrupt, IntL has been asserted, the host can read out the flag field to determine the affected channel and type of flag.

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Timing for Soft Control and Status Functions

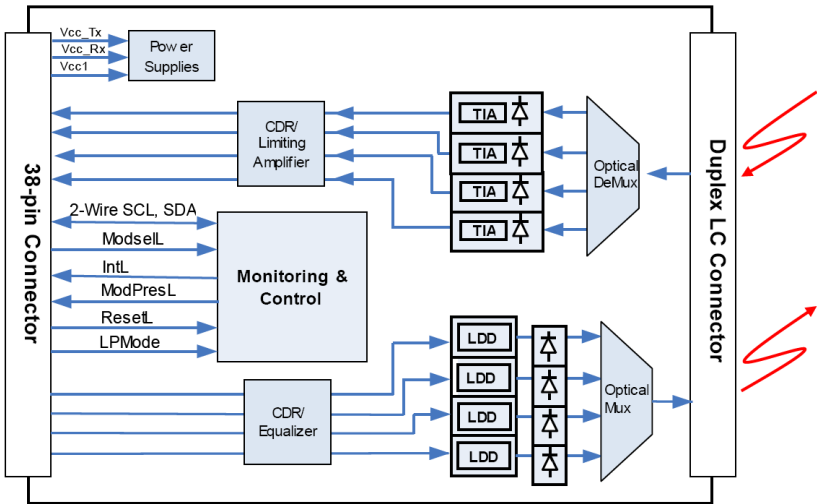
Parameter	Symbol	Max	Unit	Conditions
Initialization Time	t_init	2000	ms	Time from power on1, hot plug or rising edge of Reset until the module is fully functional2
Reset Init Assert Time	t_reset_init	2	µs	A Reset is generated by a low level longer than the minimum reset pulse time present on the ResetL pin.
Serial Bus Hardware Ready Time	t_serial	2000	ms	Time from power on1 until module responds to data transmission over the 2-wire serial bus
Monitor Data Ready Time	t_data	2000	ms	Time from power on1 to data not ready, bit 0 of Byte 2, deasserted and IntL asserted
Reset Assert Time	t_reset	2000	ms	Time from rising edge on the ResetL pin until the module is fully functional2
LPMMode Assert Time	ton_LPMMode	100	µs	Time from assertion of LPMMode (Vin:LPMMode =Vih) until module power consumption enters lower Power Level
IntL Assert Time	ton_IntL	200	ms	Time from occurrence of condition triggering IntL until Vout:IntL = Vol
IntL Deassert Time	toff_IntL	500	µs	toff_IntL 500 µs Time from clear on read3 operation of associated flag until Vout:IntL = Voh. This includes deassert times for Rx LOS, Tx Fault and other flag bits.
Rx LOS Assert Time	ton_los	100	ms	Time from Rx LOS state to Rx LOS bit set and IntL asserted
Flag Assert Time	ton_flag	200	ms	Time from occurrence of condition triggering flag to associated flag bit set and IntL asserted
Mask Assert Time	ton_mask	100	ms	Time from mask bit set4 until associated IntL assertion is inhibited
Mask De-assert Time	toff_mask	100	ms	Time from mask bit cleared4 until associated IntL operation resumes
ModSelL Assert Time	ton_ModSelL	100	µs	Time from assertion of ModSelL until module responds to data transmission over the 2-wire serial bus
ModSelL Deassert Time	toff_ModSelL	100	µs	Time from deassertion of ModSelL until the module does not respond to data transmission over the 2-wire serial bus
Power_over-ride or Power-set Assert Time	ton_Pdown	100	ms	Time from P_Down bit set 4 until module power consumption enters lower Power Level
Power_over-ride or Power-set De-assert Time	toff_Pdown	300	ms	Time from P_Down bit cleared4 until the module is fully functional3

Note:

1. Power on is defined as the instant when supply voltages reach and remain at or above the minimum specified value.

- 2. Fully functional is defined as IntL asserted due to data not ready bit, bit 0 byte 2 de-asserted.
- 3. Measured from falling clock edge after stop bit of read transaction.
- 4. Measured from falling clock edge after stop bit of write transaction.

Transceiver Block Diagram



Pin Assignment

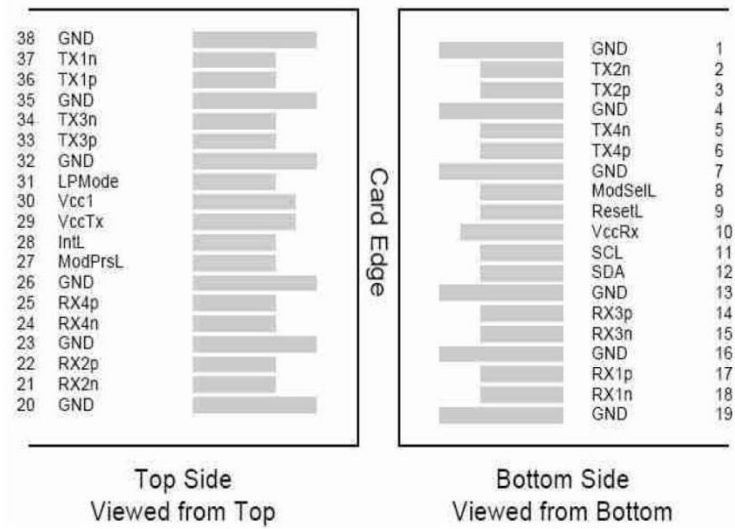


Diagram of Host Board Connector Block Pin Numbers and Name

Pin Description

Pin	Logic	Symbol	Name/Description	Ref.
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1

Datasheet 100G Series

ID 50283110 – 100GBASE-LR4 QSFP28 1310nm 10KM SMF LC DDM DUPLEX



5	CML-I	Tx4n	Transmitter Inverted Data Output	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Output	
7		GND	Ground	1
8	LVTTL-I	ModSelL	Module Select	
9	LVTTL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	1
14	CML-O	Rx3p	Receiver Inverted Data Output	
15	CML-O	Rx3n	Receiver Non-Inverted Data Output	
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Inverted Data Output	
18	CML-O	Rx1n	Receiver Non-Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3V Power Supply Transmitter	2
30		Vcc1	+3.3V Power Supply	2
31	LVTTL-I	LPMODE	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Inverted Data Output	
34	CML-I	Tx3n	Transmitter Non-Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Inverted Data Output	
37	CML-I	Tx1n	Transmitter Non-Inverted Data Output	
38		GND	Ground	1

Notes:

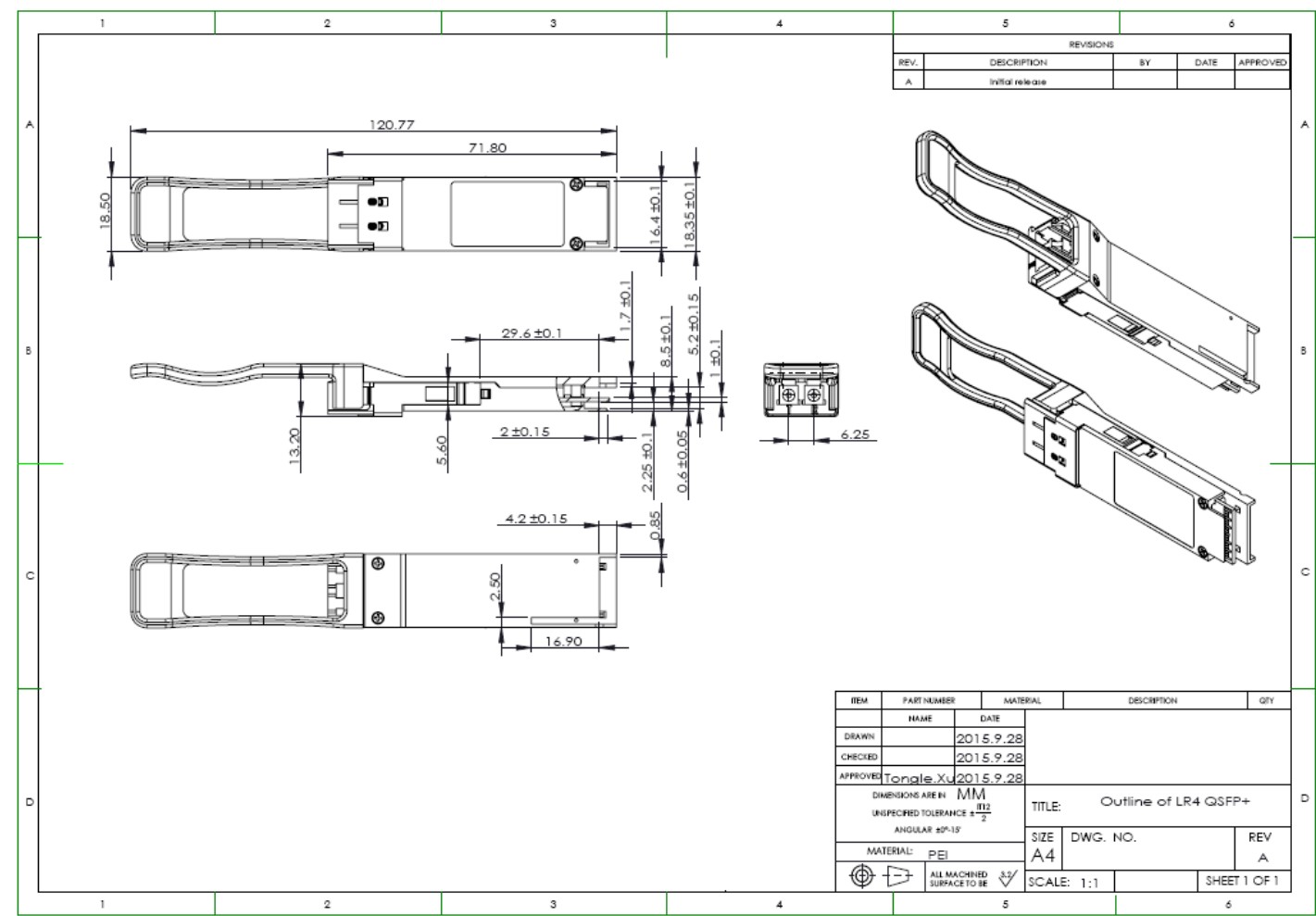
- GND is the symbol for single and supply(power) common for QSFP28 modules, All are common within the QSFP28 module and all module voltages are referenced to this potential otherwise noted. Connect these directly to the host board signal common ground plane. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.



- 2. VccRx, Vcc1 and VccTx are the receiver and transmitter power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. VccRx, Vcc1 and VccTx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for maximum current of 500mA.

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Mechanical Dimensions



Ordering Information

Part Number	Description
MJ-QSFP100G-LR4	100GBASE-LR4 QSFP28 1310nm 10KM SMF LC DDM DUPLEX

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Datasheet 100G Series

ID 50283110 – 100GBASE-LR4 QSFP28 1310nm 10KM SMF LC DDM DUPLEX



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Rv.2024.04-022

FICHA TÉCNICA

MODELO: MJ-QSFP100G-LR4

MARCA: Miljet Network

PRODUTO: 100GBASE-LR4 QSFP28, 1310nm 10km SMF LC DDM Duplex, transceptor óptico Miljet

CARACTERÍSTICAS TÉCNICAS:

Nome do Fabricante: MILJET SOLUTIONS, INC. Florida USA

Part Number: MJ-QSFP100G-LR4

Formato do Modelo: QSFP28 (Quad Small Form-factor Pluggable)

Taxa de dados/capacidade: 103.125Gbps LR4 / 112Gbps OTU4 (Dual Rate)

Distância de Máxima: 10km

Comprimento de onda: 1295~1310nm (4 x LAN WDM DML TOSA)

TX Power/Potência: -4 ~ 4.5dBm

RX Sensibilidade de Recepção: < -10.6dBm

Interface: LC Conector Duplex (Polimento Indicado PC ou UPC)

Tipo de Cabo: Single-Mode Fiber (SMF) - Monomodo 9/125µm OS2

MTBF: 2,578,324 horas

Monitoramento Digital Óptico DOM/DDM: Sim

Hot-swappable: Sim

Dimensões/Peso: 13mm x 72mm x 18.4mm - 32g

Faixa de Temperatura: 0°C to +70°C | Single +3.3V

Conformidade: ISO9001, FCC, CE, RoHS, UL.

Protocolos: IEEE 802.3ba, 100GBASE-LR4, 112GBASE-OTU4, IEEE 802.3bm, QSFP28 MSA, SFF-8665, SFF-8636.

Parâmetros de comprimento de onda por linha 4x25Gbps:

L0: 1295.56nm (1294.53~1296.59nm)

L1: 1300.05nm (1299.02~1301.09nm)

L2: 1304.58nm (1303.54~1305.63nm)

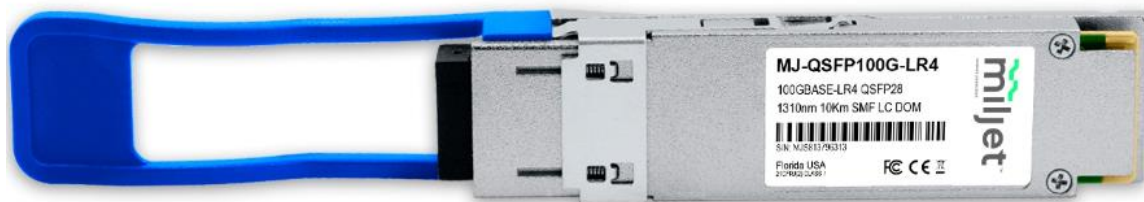
L3: 1309.14nm (1308.09~1310.19nm)



APLICAÇÃO:
O **MJ-QSFP100G-LR4** Miljet é um transceptor do tipo QSFP28 que opera sobre **4 canais de 25Gbps** paralelos **Tx/Rx em fibra óptica monomodo** no comprimento de onda de **1310nm**, e também **112GBASE-OTU4** fornecendo nessas quatro faixas de comunicação óptica formas independentes. Ele possui um conector **LC Duplex** para receber Cabos Monomodo (SMF). Com esse transceptor você poderá realizar instalações em até 10km utilizando Cordões ou cabos monomodo com conectores **LC/UPC** ou **LC/PC** em suas extremidades. As aplicações mais populares são para provedores de **serviços de Internet (ISP)** em agregações de tráfego de curta e longa distância, **operadoras móvel e 100G de back-haul**, Interconexões de sites de rede em **Data Centers** e outros links ópticos. Esse modelo tem como finalidade conexões externas de longa distância e também internas entre equipamentos no mesmo ambiente, pois possui negociação automática.

COMPATIBILIDADE GARANTIDA E COMPROVADA:

Arista Networks	Ciena	Fiberhome	IBM	Nokia
Alcatel-Lucent	Dell	Furukawa	Intelbras	Raisecom
Aruba	D-link	HP	Juniper	TP-link
Avaya/Nortel	Datacom	H3C	Linksys	Ubiquiti
A10 Networks	Extreme	Harmonic	Lenovo	Unifiber
Brocade	Enterasys	Hatteras	Mikrotik	ZTE
Cisco	Force 10	Huawei	Meraki	Zyxel
Compaq	Fortinet	Intel	Netgear	3Com



SOBRE O PRODUTO:

1. Transceiver óptico MILJET SOLUTIONS, INC. Network Connections.
2. Produto distribuído com exclusividade no Brasil por Tellycom, origem EUA.
3. Aplicado para conectar interfaces/portas ópticas em Switches, Roteadores de Comutação, OLT's, Servidores, Firewalls, Placas PCI, Equipamentos de Audio e Video, Automação comercial, Conversores de Mídia entre outros, atendendo diversos tipos de aplicações para as áreas de Telecomunicações, IoT, Tecnologia da informação, informática, indústria, Data Centers, Segurança e Automação de redes de dados em Geral.
4. Os transceivers/transceptores ópticos MILJET possuem alta qualidade e projeto de engenharia próprio certificado mundialmente, no qual todos os componentes são minuciosamente escolhidos e testados com base nas melhores práticas, parceiros e produtos internacionais, para que tenham o melhor desempenho, performance, compatibilidade e durabilidade.
5. Produto Certificado por: **ISO9001, FCC, CE, RoHS, MSA, IEEE 802.3bm, Infiniband FDR, 100GBASE Ethernet.**

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Identificador de autenticação: 60170-002 - 61251
Busque a autenticidade deste documento em <https://www.sistemas.pa.gov.br/validacao-protocolo>

Nº do Protocolo: 2024/2469754

Nº do Protocolo: 2024/2469754 Anexo/Sequencial: 39

Página 48 de 58

100G QSFP28 to QSFP28, DAC Direct Attach Copper, Twinax Cable LSZH



Features

- Support for multi-gigabit data rates up to 100Gbps
- Wire AWG: AWG30, AWG28, AWG26, AWG24
- Cable type: Passive Copper Twinax Cable
- Jacket Material: LSZH Low Smoke Zero Halogen
- Improved Pluggable Form Factor (IPF) compliant for enhanced EMI/EMC performance
- Commercial temperature range (COM): 0~ 70 °C
- Low power consumption < 0.5W
- Power supply: +3.3V
- Small diameter cable design
- Compatible to QSFP28 MSA
- Electrical interface compliant to SFF-8431

Applications

- 100G Ethernet
- 100G Datacom Telecom connections

Standards

- Compliant with IEEE 802.3ba
- Compliant with QSFP28 MSA hardware specifications
- Compliant with RoHS and REACH

Description

The QSFP28 passive cable assemblies are high performance, cost effective I/O solutions for 100G Ethernet and 100G Fiber Channel applications. QSFP28 copper modules allow hardware manufactures to achieve high port density, configurability and utilization at a very low cast and reduced power budget. The high-speed cable assemblies meet and exceed Gigabit Ethernet and Fiber Channel industry standard requirements for performance and reliability.

These assemblies are called “passive” copper cables because there isn’t any signal conditioning circuitry (e.g. crosstalk or echo cancellation) contained within the QSFP28 connector. Sometimes these assemblies are referred to as “DAC” or “Direct Attached Copper” cables. Inside the QSFP28 MSA footprint optical cables can be used that require optical transceivers or Active Optical Cables (AOC) that contain the transceiver as part of the cable. Various choices of wire gauge are available from 30 to 26 AWG with various choices of cable length (up to 7m).

General Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Rate	DR		100		Gbps	
Bit Error Rate	BER			10 ⁻¹²		
Operating Temperature	Tc	0		70	°C	
Storage Temperature	Tstg	-40		85	°C	
Power Supply Voltage	Vcc	3.14	3.30	3.46	V	

Cable Specification

Parameter	Symbol	Min.	Typ.	Max.	Unit
Wire Gauge			26AWG		AWG
Cable Impedance	Z	95	100	105	Ω
Cable Diameter	OD		6.9		mm
Minimum Bending Radius	R		35		mm
Tolerance Range <u>±</u>			2		cm

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100G DAC Direct Attach Copper Series



Pin	Logic	Symbol	Name/Description	Note
1		GND	Ground	
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	
5	CML-I	Tx4n	Transmitter Inverted Data Output	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Output	
7		GND	Ground	
8	LVTTL-I	ModSelL	Module Select	
9	LVTTL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Inverted Data Output	
15	CML-O	Rx3n	Receiver Non-Inverted Data Output	
16		GND	Ground	
17	CML-O	Rx1p	Receiver Inverted Data Output	
18	CML-O	Rx1n	Receiver Non-Inverted Data Output	
19		GND	Ground	
20		GND	Ground	
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	
24	CML-O	Rx4n	Receiver Inverted Data Output	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3V Power Supply Transmitter	
30		Vcc1	+3.3V Power Supply	
31	LVTTL-I	LPMODE	Low Power Mode	
32		GND	Ground	
33	CML-I	Tx3p	Transmitter Inverted Data Output	
34	CML-I	Tx3n	Transmitter Non-Inverted Data Output	
35		GND	Ground	
36	CML-I	Tx1p	Transmitter Inverted Data Output	
37	CML-I	Tx1n	Transmitter Non-Inverted Data Output	
38		GND	Ground	

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Low Speed Electrical Hardware Pins

In addition to the 2-wire serial interface, the QSFP28 module has the following low speed pins for control and status:

(1) TX_Fault

TX_Fault is a module output pin that when High, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output pin is an open drain/collector and must be pulled up to the Host_Vcc with 4.7k-10k ohms on the host board.

(2) TX_Disable

TX_Disable is a module input pin. When TX_Disable is asserted High or Left open, the QSFP28 module transmitter output must be turned off. The TX_DIS pin must be pulled up to VccT in the QSFP28 module.

(3) RS0/RS1

RS0 and RS1 are module input rate select pins and are pulled low to VeeT with a > 30kΩ resistor in the module. RS0 is an input hardware pin which optionally selects the optical receive data path rate coverage for an QSFP28 module. RS1 is an input hardware pin which optionally selects the optical transmit path data rate coverage for an QSFP28 module.

(4) MOD_ABS

Mod_ABS is pulled up to Host_Vcc with 4.7k-10k ohms on the host board and connected to VeeT or VeeR in the QSFP28 module. MOD_ABS is then asserted “High” when the QSFP28 module is physically absent from a host slot. In the SFP MSA (INF8074i) this pin had the same function but is called MOD_DEF0.

(5) SCL/SDA

SCL is the 2-wire interface clock and SDA is the 2-wire interface data line. SCL and SDA are pulled up to a voltage in the range of 3.14V to 3.46V on the host.

(6) RX_LOS

RX_LOS when High indicated an optical signal level below that specified in the relevant standard. The RX_LOS pin is an open drain/collector output and must be pulled up to host Vcc with a 4.7k-10k ohms on the host board. RX_LOS assert min and de-assert max are defined in the relevant standard.

Electrical Design

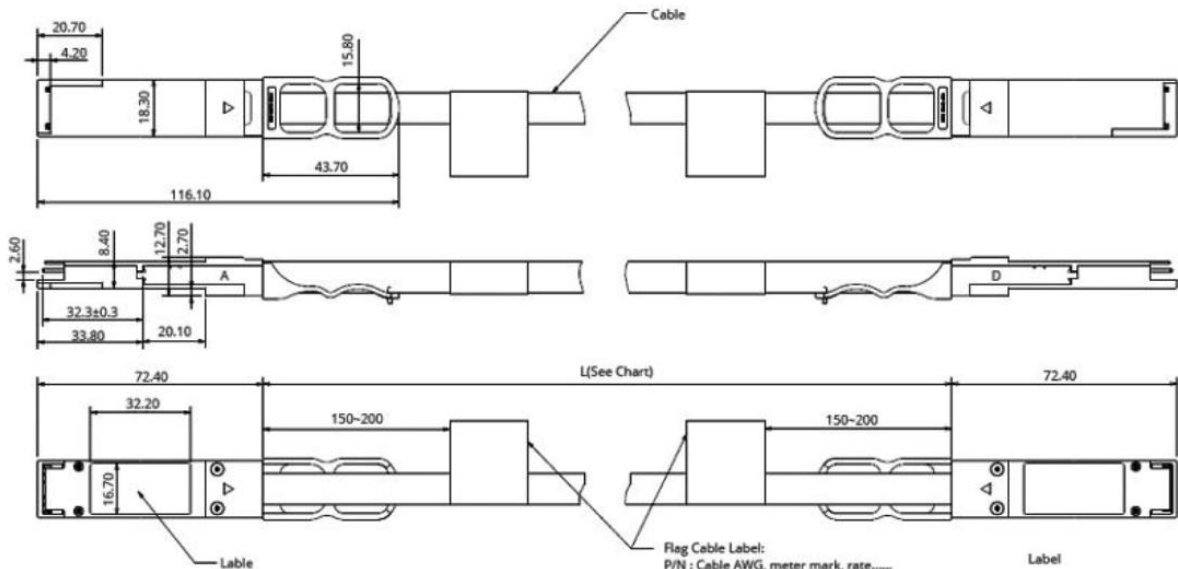
The electrical design of the passive QSFP28 direct attach copper cable assembly is fully compliant to the QSFP28 MSA. The electrical design incorporates a PCB and wire management design to minimize crosstalk, insertion loss, and return loss.



Reducing these frequency domain characteristics result in improved WDP measurements. Because of the common use of EDC (Electronic Dispersion Compensation) with passive QSFP28 cable assemblies WDP measurements are a requirement instead of time domain measurements such as eye patterns.

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Mechanical Dimensions



Ordering Information

Part Number	Data Rate (Gbps)	Connectors	Cable Type	Copper Type	Minimum Bending Radius	Cape	Available Lengths
MJ-QSFPH100G-xxM	100	QSFP28 to QSFP28	Passive Twinax	AWG26, AWG30	26mm/ 30mm	LSZH	1m, 1,5m, 2m, 3m, 5m, 7m.

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FICHA TÉCNICA

MODELO: MJ-QSFP100G-5M

MARCA: Miljet Network

PRODUTO: Cabo 100G QSFP28 para QSFP28 5m, DAC Direct Attach Copper, Twinax LSZH 26AWG Miljet

CARACTERÍSTICAS TÉCNICAS:

Nome do Fabricante: MILJET SOLUTIONS, INC. Florida USA

Part Number: MJ-QSFP100G-5M

Modelo: DAC (*Direct Attach Copper*)

Taxa de Dados Suportados: 100Gbps

Conector de Interface: QSFP28 para QSFP28

Tamanho do Cabo: 5 metros

Tipo de Cabo: Passive Twinax Cable

Tipo de Cobre DAC: AWG26

Revestimento do Cabo: PVC

Raio de Curvatura Mínima: 50mm

Monitoramento Digital Óptico DOM/DDM: Sim

Consumo de Energia: 0.2W

Faixa de Temperatura: 0°C ~ +70°C

Tensão de Alimentação: +3.3V Single

Potência Máxima de Operação: 1.5W

Impedância do Cabo: 100 Ω

MTBF: 1,000,000 Horas

Peso: 0.6kg

Conformidades: ISO9001, CE, FCC, RoHS, InfiniBand SDR/DDR/QDR, QSFP28 MSA, IEEE 802.3bj



O Cabo DAC Miljet **MJ-QSFP100G-5M** possui transceivers ópticos **QSFP28 de 100Gbps** possuindo 4 canais internos de 25G, em ambas as extremidades do cabo, e são usados para conectar diretamente as portas entre equipamentos ativos; Switches, roteadores, servidores, Placas PCI, Firewalls entre outros dispositivos com **Interfaces QSFP28**, sem a necessidade de usar cordões ópticos, pois, eles já são prontos para uso. O seu principal benefício é o custo, embora haja outros benefícios, os cabos DAC são extremamente confiáveis. Os módulos que se conectam diretamente às portas do equipamento fazem um contato elétrico físico que garante uma conexão sólida. Os cabos são feitos de cobre twinax de 26 a 30 AWG e, portanto, são fisicamente fortes e, portanto, dificilmente serão danificados pelo manuseio. Esses dois fatores significam que é possível fazer conexões de forma rápida, confiável e acessível em todos os tipos de aplicações. Entre outras vantagens, o cabo DAC Miljet diferente de varios outros fabricantes.

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Arista Networks	Ciena	Fiberhome	IBM	Nokia
Alcatel-Lucent	Dell	Furukawa	Intelbras	Raisecom
Aruba	D-link	HP	Juniper	TP-link
Avaya/Nortel	Datacom	H3C	Linksys	Ubiquiti
A10 Networks	Extreme	Harmonic	Lenovo	Unifiber
Brocade	Enterasys	Hatteras	Mikrotik	ZTE
Cisco	Force 10	Huawei	Meraki	Zyxel
Compaq	Fortinet	Intel	Netgear	3Com

SOBRE O PRODUTO:

- 1. Transceiver óptico MILJET SOLUTIONS, INC. Network Connections.
- 2. Produto distribuído com exclusividade no Brasil por Tellycom, origem EUA.
- 3. Aplicado para conectar interfaces/portas ópticas em Switches, Roteadores de Comutação, OLT's, Servidores, Firewalls, Placas PCI, Equipamentos de Audio e Video, Automação comercial, Conversores de Mídia entre outros, atendendo diversos tipos de aplicações para as áreas de Telecomunicações, IoT, Tecnologia da informação, informática, indústria, Data Centers, Segurança e Automação de redes de dados em Geral.
- 4. Os cabos DAC MILJET possuem alta qualidade e projeto de engenharia próprio certificado mundialmente, no qual todos os componentes são minuciosamente escolhidos e testados com base nas melhores práticas, parceiros e produtos internacionais, para que tenham o melhor desempenho, performance, compatibilidade e durabilidade.
- 5. Produto Certificado por: ISO9001, CE, FCC, RoHS, InfiniBand SDR/DDR/QDR, QSFP28 MSA, IEEE 802.3bj

