

# CFP4 LR4 Receiver

## 100G-BASE 10km CFP4



### Features:

- Hot pluggable CFP4 MSA package
- 3.3V Power supply and MDIO management interface for digital diagnostics
- LC Connector Interface
- Integrated 4-LAN WDM ROSA for up to 10km link over G.652 SMF
- Operating data rate at 112Gbps
- Compliant with 100GBASE-LR4
- CFP4-MSA-CFP4-HW-Specification compliant
- Operating Case Temperature: 0 ~ +70°C
- No external reference clock

### Applications:

- 100GBASE-LR4 Ethernet
- OTU4 4I1-9D1F

### Product Description

TC4-HG10-30DCR-R CFP4 receiver are designed for use in 100 Gigabit Ethernet links over 10km single module fiber, and it compliant to the CFP4 MSA CFP4 HW and IEEE 802.3ba 100GBASE-LR4. Digital diagnostics are available via MDIO as specified in the CFP4 MSA Management Interface Specification. The transceiver's designs are optimized for high performance and cost efficiency to provide customers the best solutions for Datacom and Telecom applications. The transceiver is RoHS-6 compliant and lead-free per Directive 2002/95/EC.

## Ordering information

Part No.	Data Rate	Laser	Fiber Type	Distance <sup>*Note1</sup>	Optical Interface	Bail color	Temp. <sup>*Note2</sup>	DDMI
TC4-HG10-30DCR-R	112G	-	SMF	10km	LC	Blue	ST	YES

Note1: 10km with 9/125µm SMF

Note2: ST: 0 ~ +70deg C

## Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000 V)
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compliant with standards Noise frequency range: 30 MHz to 6 GHz. Good system EMI design practice required to achieve Class B margins. System margins depend on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compliant with standards. 1kHz sine-wave, 80% AM, from 80 MHz to 1 GHz. No effect on transmitter/receiver performance is detectable between these limits.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1 EN (IEC) 60950-1:2006+A1+A11+A12	CDRH compliant and Class I laser product. TUV Certificate No. <a href="#">R50271605</a>
Component Recognition	UL and CUL EN60950-1:2006	TUV Certificate No. <a href="#">E344594</a> (CB:JPTUV-053877)
RoHS2.0	20011/65/EU	Compliant with standards

## Absolute Maximum Ratings<sup>\*Note3</sup>

Parameter	Symbol	Min	Max	Unit
Storage Temperature	TS	-40	+85	°C
Supply Voltage	V <sub>CC</sub>	-0.5	3.6	V
Operating Humidity	-	5	85	%

Note3: Exceeding any one of these values may destroy the device permanently.

## Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	T <sub>c</sub>	0		70	°C

Power Supply Voltage	V <sub>CC</sub>	3.2	3.3	3.4	V
Power dissipation	P			1.5	W

## Performance Specifications – Electrical

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Impedance	Z <sub>d</sub>	85	100	115	ohm	
Output Amplitude Voltage	V <sub>diff</sub>	360		900	mV	
Output Rise/Fall Time 20/80%	Tr/f	9.5			ps	

## Timing Specifications

Parameter	Symbol	Min	Typ.	Max	Unit
Receiver Loss of Signal Assert Time	t <sub>loss_assert</sub>			100	us
Receiver Loss of Signal De-Assert Time	t <sub>loss_deassert</sub>			100	us
Global Alarm Assert Delay Time	GLB_ALRMn_assert			150	ms
Global Alarm De-Assert Delay Time	GLB_ALRMn_deassert			150	ms
Host MDIO t <sub>setup</sub>	t <sub>setup</sub>	10			ns
Host MDIO t <sub>hold</sub>	t <sub>hold</sub>	10			ns
CFP4 MDIO t <sub>delay</sub>	t <sub>delay</sub>	0		300	ns
Initialization time from Reset	t <sub>initialize</sub>			2.5	s
Management Interface Clock Frequency	F <sub>MDC</sub>	0.1		4	MHz
Management Interface Clock Period	t <sub>prd</sub>	250		10000	ns
MDC high and low time	twidth	40		60	%
		160			ns
MDIO/MDC termination in CFP4	Z <sub>t</sub>	100			kOhm

## Performance Specifications – Optical

( OUT4 4I1-9D1F )

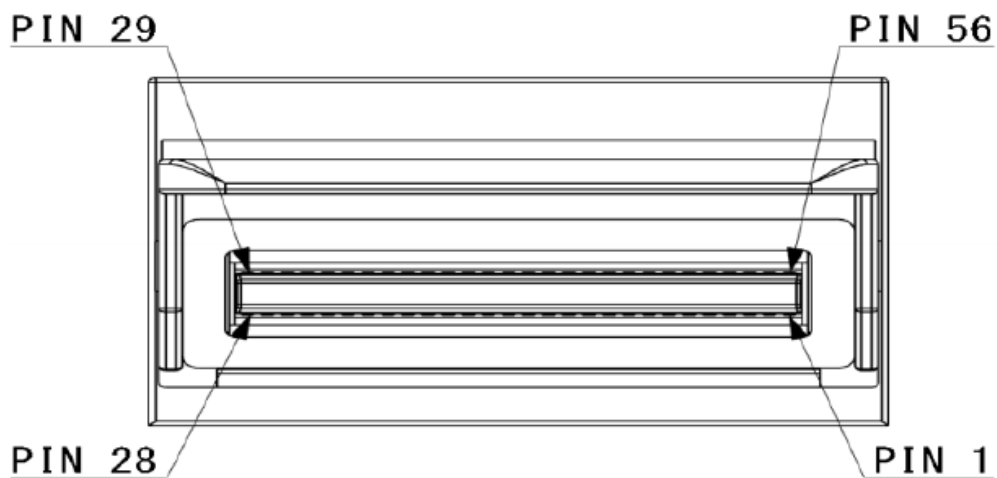
Parameter	Symbol	Min	Typ.	Max	Unit	Note
Receiver						
Channel data rate			27.95		Gbps	
Data rate variation		-20		20	ppm	
Centre Wavelength	λ <sub>C<sub>T0</sub></sub>	1294.53	1295.56	1296.59	nm	
	λ <sub>C<sub>T1</sub></sub>	1299.02	1300.05	1301.09	nm	
	λ <sub>C<sub>T2</sub></sub>	1303.54	1304.58	1305.63	nm	
	λ <sub>C<sub>T3</sub></sub>	1308.09	1309.14	1310.19	nm	
Damage threshold	λ <sub>c</sub>	5.5			dBm	
Average receiver power per	P <sub>in</sub>	-8.8		4.0	dBm	

lane			
Equivalent Receiver Sensitivity per lane	Psen	-10.6	dBm
Vertical eye closure penalty per Lane		1.5	dB
Rx-Lane LOS Assert		-21.3	dBm
Rx-Lane LOS De-assert		-11.3	dBm
Rx-Lane LOS Hysteresis		0.5	dB

( 100GBASE LR4 )

Parameter	Symbol	Min	Typ.	Max	Unit	Note
<b>Receiver</b>						
Channel data rate			25.78		Gbps	
Data rate variation		-100		+100	ppm	
Centre Wavelength	$\lambda_{CT0}$	1294.53	1295.56	1296.59	nm	
	$\lambda_{CT1}$	1299.02	1300.05	1301.09	nm	
	$\lambda_{CT2}$	1303.54	1304.58	1305.63	nm	
	$\lambda_{CT3}$	1308.09	1309.14	1310.19	nm	
Damage threshold	$\lambda_c$	5.5			dBm	
Average receiver power per lane	Pin	-10.6		4.0	dBm	
Receiver Sensitivity in OMA per lane	Psen			-8.6	dBm	
Stressed Sensitivity(OMA) per Lane	SRS			-6.8	dB	
Rx-Lane LOS Assert		-20.6			dBm	
Rx-Lane LOS De-assert				-10.6	dBm	
Rx-Lane LOS Hysteresis		0.5			dB	

## Pin Layout



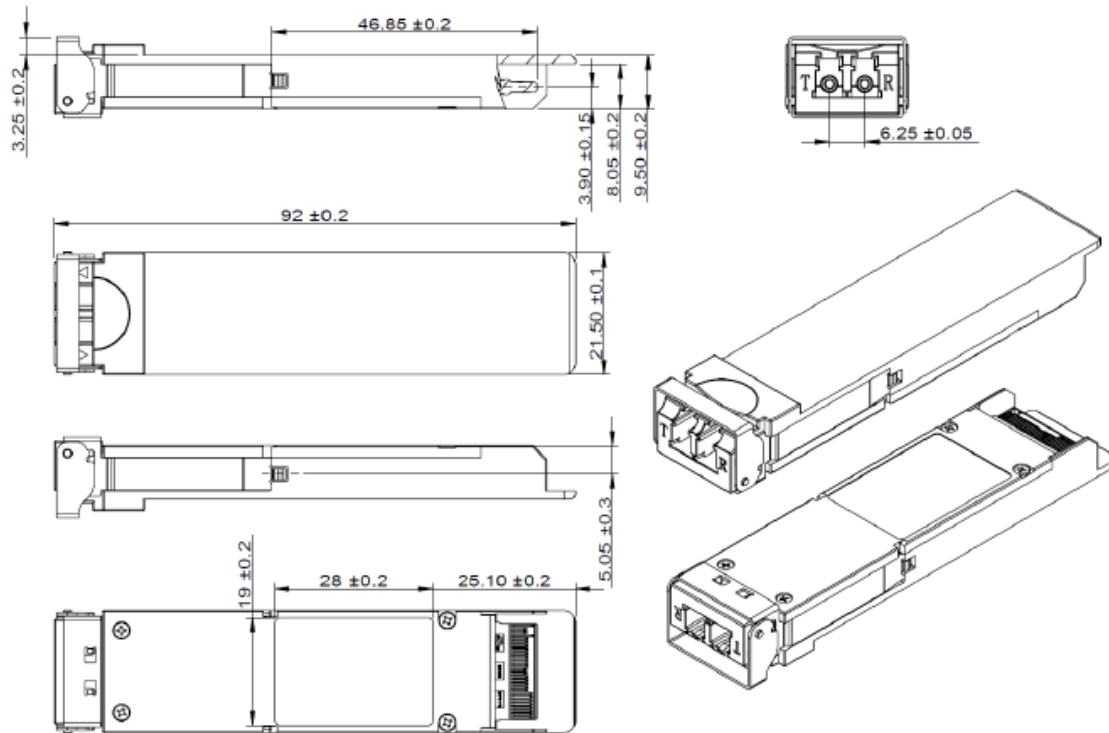
Bottom Row		Top Row	
1	3.3V_GND	56	GND
2	3.3V_GND	55	NC
3	3.3V	54	NC
4	3.3V	53	GND
5	3.3V	52	NC
6	3.3V	51	NC
7	3.3V_GND	50	GND
8	3.3V_GND	49	NC
9	VDN_IO_A	48	NC
10	VDN_IO_B	47	GND
11	TX_DIS(PNG_CNTL1)	46	NC
12	TX_LOS(PNG_ALRM1)	45	NC
13	GLB_ALRMn	44	GND
14	MOD_LOPWR	43	(REFCLKn)
15	MOD_ABS	42	(REFCLKp)
16	MOD_RSTn	41	GND
17	MDC	40	RX3n
18	MDIO	39	RX3p
19	PRTADR0	38	GND
20	PRTADR1	37	RX2n
21	PRTADR2	36	RX2p
22	VDN_IO_C	35	GND
23	VDN_IO_D	34	RX1n
24	VDN_IO_E	33	RX1p
25	3.3V_GND	32	GND
26	(MCLKn)	31	RX0n
27	(MCLKp)	30	RX0p
28	3.3V_GND	29	GND

## Pin Function Definitions

Pin Num.	Name	Function	Notes
1,2,7,8	3.3V_GND	GROUND	3.3V Module Supply Ground, Internally connected to Signal Ground
3,4,5,6	3.3V	3.3V Module Supply Voltage	3.3V ± 5%
9	VDN_IO_A	I/O	Module Vendor I/O A. NC
10	VDN_IO_B	I/O	Module Vendor I/O B. NC
11	TX_DIS (PNG_CNTL1)	I	"1" or NC = transmitter disable," 0" = transmitter enable
12	TX_LOS (PNG_ALRM1)	O	"1" = loss of signal(low optical signal) "0" = normal condition
13	GLB_ALRMn	O	"0" = alarm condition in any MDIO Alarm register "1" = no alarm conditon

14	MOD_LOPW	I	"1" or NC=module in low power mode "0" =power_on enable
15	MOD-ABS	O	"1" or NC=module absent "0" =module present
16	MOD_RSTn	I	"0" =resets the module "1" or NC=module enabled
17	MDC	1.2V CMOS I	Management Data Clock
18	MDIO	1.2V CMOS I/O	Management Data I/O bi-directional data
19	PRTADR0	1.2V CMOS I	MDIO Physical Port address bit 0
20	PRTADR1	1.2V CMOS I	MDIO Physical Port address bit 1
21	PRTADR2	1.2V CMOS I	MDIO Physical Port address bit 2
22	VDN_IO_C	I/O	Module Vendor I/O C. NC
23	VDN_IO_D	I/O	Module Vendor I/O D. NC
24	VDN_IO_E	I/O	Module Vendor I/O E. NC
25,28,29,32,35,38, 41,44,47,50,53,56	GND	Ground	Signal Ground
26	(MCLKn)	CML O	For optical waveform testin
27	(MCLKp)	CML O	For optical waveform testin
30	RX0p	Lane 0 RX Output O	CML OUTPUT
31	RX0n		
33	RX1p	Lane 1 RX Output O	CML OUTPUT
34	RX1n		
36	RX2p	Lane 2 RX Output O	CML OUTPUT
37	RX2n		
39	RX3p	Lane 3 RX Output O	CML OUTPUT
40	RX3n		
42	(REFCLKn)	Reference Clock I	Reference Clock Input
43	(REFCLKn)		
45,46,48,49, 51,52,54,55	NC		

## Mechanical Specifications



## Eye Safety

This single-mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

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Add: # 202, Section A, Building 1 No.209, Sanshe Road, Jinjiang District Industry Park Chengdu  
610063. Sichuan P.R. CHINA

Tel: (+86) 028-85925400/Fax: (+86) 028-85925445

E-mail: [info@trixontech.com](mailto:info@trixontech.com)

<http://www.trixontech.com>

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