

RoHS Compliant Copper Small Form Factor Pluggable (SFP) Transceiver for Gigabit Ethernet



Description

The LCP-1250RJ3SRxx series are 3.3V copper small form-factor pluggable (SFP) transceivers. They offer full duplex 1000 Mb/s Ethernet by transporting data over CAT 5 UTP cable (category 5 unshielded twisted pair) with RJ-45 connector.

The Gigabit Ethernet SFP ports on host systems can work well plugging with both of Delta fiber SFP transceivers and Delta copper SFP transceivers, so there is no need of software to configure MAC on host system.

The LCP-1250RJ3SR-L provides the SFP's Rx_LOS pin for the link indication of cable side, and also, 1000Base-T auto-negotiation is enabled at default over cable link. The system host (MAC) should disable 1000 BASE-X auto-negotiation while LCP-1250RJ3SR-L is used.

The system host (MAC) must enable SGMII auto-negotiation while LCP-1250RJ3SR-S is operated to setup the partner linking at one speed of 10/100/1000 Mbps by 1000Base-T auto-negotiation.

Features

- Compatible with specifications for IEEE 802.3ab/Gigabit Ethernet
- Compliant with MSA specifications for Small Form Factor Pluggable (SFP) Ports
- Hot-pluggable SFP footprint
- 1000 BASE-T operation in the host system with SerDes interface (Default for LCP-1250RJ3SR and LCP-1250RJ3SR-L)
- 10/100/1000 BASE-T operation in the host system with SGMII interface (Default for LCP-1250RJ3SR-S)
- Compliant with industry standard RFT electrical connector and cage
- EEPROM with serial ID functionality
- Rx_LOS Indication (For LCP-1250RJ3SR-L)
- Internal PHY IC is configurable by host system software via SFP 2-wire interface

Application

- Gigabit Ethernet over copper
- Switch to Switch interface
- Switched backplane applications
- File server interface

Performance

- LCP-1250RJ3SRxx data link up to 100m on standard CAT 5 UTP.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	T_s	-40		85	°C	
Supply Voltage	V_{CC}	0		5	V	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Ambient Operating Temperature	T_A	0		70	°C	Note1
Supply Voltage	V_{CC}	3.135		3.465	V	

Note1: Industrial Operating Temperature Available upon request.

Electrical Characteristics

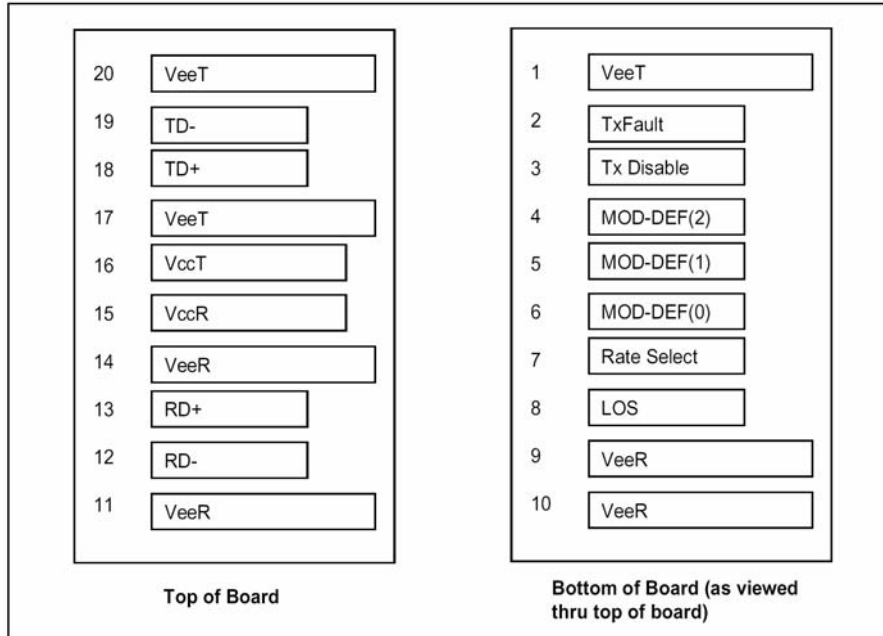
($T_A = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$, $V_{CC} = 3.135\text{V}$ to 3.465V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Current	I_{CC}		350	400	mA	
Transmitter						
Transmitter Differential Input Voltage	$V_{D,Tx}$	0.5		2.4	V	Note 1
Differential Input Impedance	Z_{Tx}	80	100	120	Ohm	
Transmitter Disable Input-High	V_{DISH}	2.0		$V_{CC} + 0.3$	V	
Transmitter Disable Input-Low	V_{DISL}	0		0.8	V	
Receiver						
Data Output Differential Voltage	$V_{D,Rx}$	0.35		2	V	Note 3
Differential Output Impedance	Z_{Rx}	80	100	120	Ohm	
Data Output Rise/Fall Time	$t_{r,Rx} / t_{f,Rx}$		180		ps	Note 4
LOS Output Voltage-High	V_{LOSH}	2.0		$V_{CC} + 0.3$	V	Note 2
LOS Output Voltage-Low	V_{LOSL}	0		0.8	V	

Notes:

1. Internally AC coupled and terminated to 100-Ohm differential load.
2. Pull up to V_{CC} with a 4.7K – 10K Ohm resistor on host Board.
3. Internally AC coupled, but requires a 100-Ohm differential termination at MAC side.
4. These are unfiltered 20%~80% values.

SFP Transceiver Electrical Pad Layout



Pin Definition

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 5
2	Tx Fault	Transmitter Fault Indication	3	Note 1 - Function not available
3	Tx Disable	Transmitter Disable	3	Note 2 - Module disables on high or open
4	MOD-DEF2	Module Definition 2	3	Note 3 - Two-wire serial ID interface
5	MOD-DEF1	Module Definition 1	3	Note 3 - Two-wire serial ID interface
6	MOD-DEF0	Module Definition 0	3	Note 3 - grounded in module
7	Rate Select	Not Connect	3	Function not available
8	LOS	Loss of Signal	3	Note 4
9	VeeR	Receiver Ground	1	Note 5
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inverse Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 6
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	Note 7 - 3.3V ± 5%
16	VccT	Transmitter Power	2	Note 7 - 3.3V ± 5%
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmitter Data In	3	Note 8
19	TD-	Inverse Transmitter Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

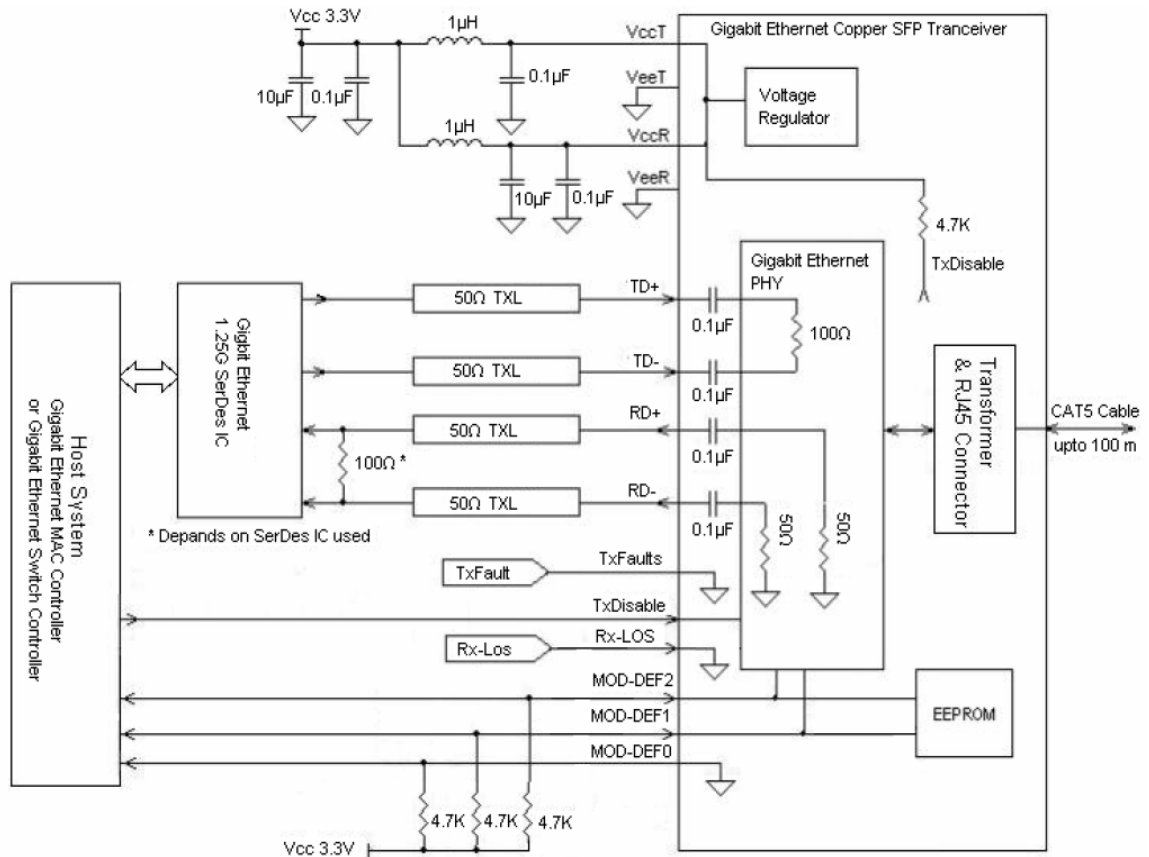
Plug Seq.: Pin engagement sequence during hot plugging.

Notes:

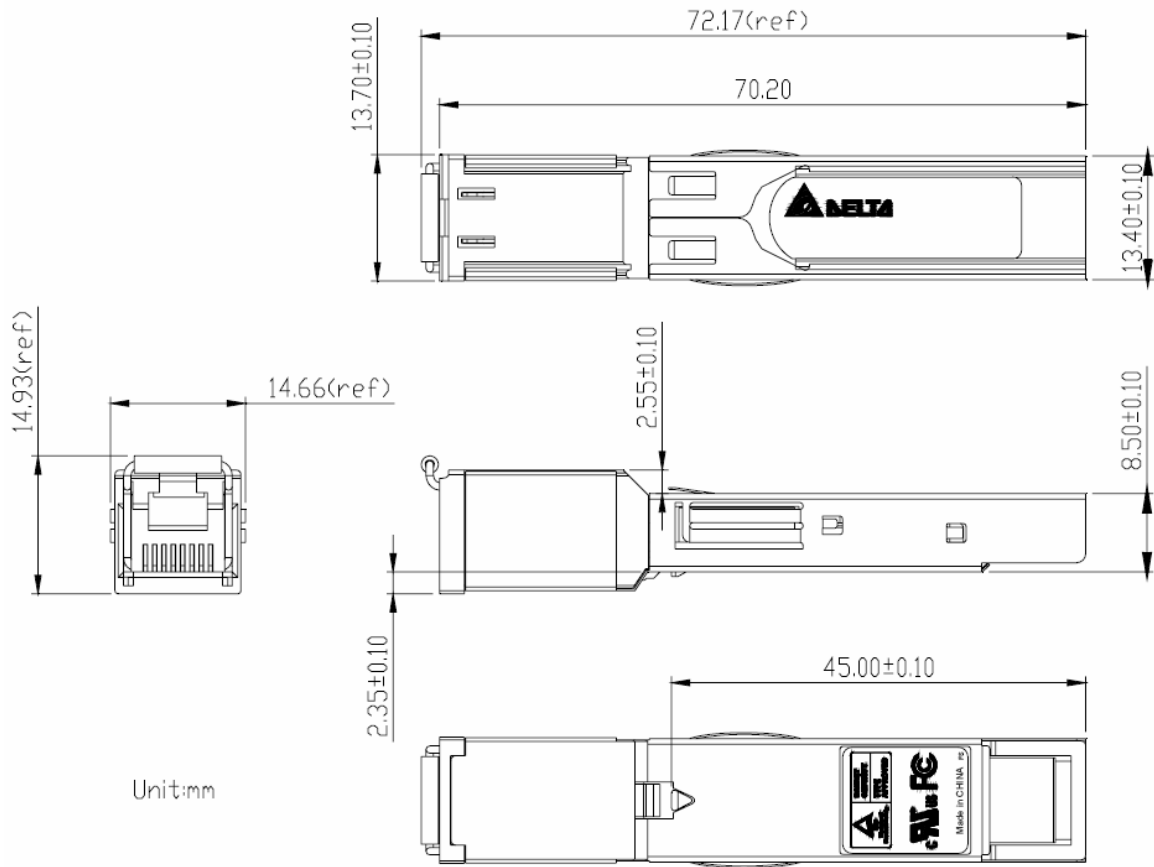
1. Tx Fault is not supported and tied to ground.
2. Tx disable is an input that is used to reset the chip of Gigabit Ethernet PHY inside the copper SFP. It is pulled up within the module with a 4.7 – 10 K Ω resistor.

Low (0 – 0.8V):	Transmitter on
(>0.8, < 2.0V):	Undefined
High (2.0 – 3.465V):	Transmitter Disabled
Open:	Transmitter Disabled
3. These are the module definition pins. They should be pulled up with a 4.7K – 10K Ω resistor on the host board. The pull-up voltage shall be VccT or VccR. MOD-DEF 0 is grounded in the module to indicate that the module is present. MOD-DEF 1 and MOD-DEF 2 are the clock and data lines of the two-wire serial interface, respectively.
4. LOS (Loss of Signal) is the indicator signal of 1000BASE-T link-up/ link-down status. HIGH indicates link-down while LOW indicates link-up. It should be pulled up with a 4.7K – 10K Ω resistor on the host board. This function is only available for LCP-1250RJ3SR-L.
5. VeeR and VeeT are internally connected.
6. RD+ and RD- are the received differential outputs, and they are AC-coupled 100 Ω differential lines that should be terminated with 100 Ω (differential) at user's SERDES.
7. VccR and VccT are the receiver and transmitter power supplies, and they are internally connected.
8. TD+ and TD- are the transmitted differential inputs, and they are terminated with 100 Ω differential load inside the module.

Recommend Circuit Schematic



Package Outline Drawing for Metal Housing



LCP-1250RJ3SRxx EEPROM Serial ID Memory Contents (Two-Wire Address A0h)

Address	Hex	ASCII	Address	Hex	ASCII	Address	Hex	ASCII	Address	Hex	ASCII	Address	Hex	ASCII
00	03		26	20		52	52	R	78	SN	Note3	104	00	
01	04		27	20		53		Note1	79	SN		105	00	
02	00		28	20		54			80	SN		106	00	
03	00		29	20		55	20		81	SN		107	00	
04	00		30	20		56	30	0	82	SN		108	00	
05	00		31	20		57	30	0	83	SN		109	00	
06	08		32	20		58	30	0	84	DC	Note4	110	00	
07	00		33	20		59	30	0	85	DC		111	00	
08	00		34	20		60	00		86	DC		112	00	
09	00		35	20		61	00		87	DC		113	00	
10	00		36	00		62	00		88	DC		114	00	
11	01		37	00		63	CS1	Note2	89	DC		115	00	
12	0D		38	00		64	00		90	DC	116	00		
13	00		39	00		65	01		91	DC	117	00		
14	00		40	4C	L	66	00		92	00	118	00		
15	00		41	43	C	67	00		93	00	119	00		
16	00		42	50	P	68	SN	Note3	94	00	120	00		
17	00		43	2D	-	69	SN		95	CS2	Note5	121	00	
18	64		44	31	1	70	SN		96	00		122	00	
19	00		45	32	2	71	SN		97	00		123	00	
20	44	D	46	35	5	72	SN		98	00		124	00	
21	45	E	47	30	0	73	SN		99	00		125	00	
22	4C	L	48	52	R	74	SN		100	00		126	00	
23	54	T	49	4A	J	75	SN		101	00		127	00	
24	41	A	50	33	3	76	SN		102	00				
25	20		51	53	S	77	SN		103	00				Note6

Notes:

1. Byte 53-54: 2D 4C For LCP-1250RJ3SR-L, 2D 53 For LCP-1250RJ3SR-S, 20 20 For LCP-1250RJ3SR.
2. Byte 63(CS1): Check sum of bytes 0-62.
3. Byte 68-83 (SN): Serial number.
4. Byte 84-91 (DC): Date code.
5. Byte 95 (CS2): Check sum of bytes 64-94.
6. Byte 128-255 had been set hex.00.

Product Selection

Parameter	LCP-1250RJ3SR	LCP-1250RJ3SR-L	LCP-1250RJ3SR-S
Rx_LOS Pin	N/A	Available	N/A
Auto-negotiation on MAC side Enabled by default	1000Base-X with Auto-Neg	1000Base-X without Auto-Neg	SGMII
MAC side Interface	1.25Gbps SerDes	1.25Gbps SerDes	SGMII without clock
Auto-negotiation on copper side Enabled by default	1000Base-T	1000Base-T	1000Base-T
Speed Mode (default)	1000Mbps only	1000Mbps only	10/100/1000Mbps
Note	Note1	Note2	Note3

Notes:

1. This part supports the 1000 Base-T with SerDes interface by default. It can operate in 10/100/1000 Base-T with SGMII interface by reconfiguration of the PHY within the SFP. The PHY Two-Wire Address is 0xA6.
2. This part uses the SFP's Rx-Los pin for link indication and 1000 Base-X auto-negotiation should be disabled on the host system. It can operate in 10/100/1000 Base-T with SGMII interface by reconfiguration of the PHY within the SFP. The PHY Two-Wire Address is 0xAC.
3. This part supports the 10/100/1000 Base-T with SGMII interface by default. It can operate in 1000 Base-T with SerDes interface by reconfiguration of the PHY within the SFP. The PHY Two-Wire Address is 0xAC.

Serial Interface Configuration

Register	Bits	Field	Mode	Description
27	3:0	HWCFG_MODE	R/W	Changes to these bits are disruptive to the normal operation; hence, any changes to these registers must be followed by software reset to take effect. Upon hardware reset Register 27.3:0 defaults to the value in HWCFG_MODE[3:0]. 0100 = SGMII without Clock with SGMII Auto-Neg to copper 1000 = 1000BASE-X without Clock with 1000BASE-X Auto-Neg to copper (GBIC) 1100 = 1000BASE-X without Clock without 1000BASE-X Auto-Neg to copper

Electromagnetic Emission

FCC Class A, CE Class A, VCCI Class A, C-Tick.



Order Information

LCP- 1250RJ3SX₁X₂X₃

X₁ RoHS

R: RoHS Compliant

X₂ X₃ Extended Function

-S: With SGMII interface

-L: With Rx_LOS indication

Appendix A. Document Revision

Version No.	Date	Description
1.02	2007-10	Release
1.03	2009-04	Document Style Revise; Combined Copper SFP PNs together; Add Order Information; Adjust the sequece of Product Selection and Configuration; Modify the Pin Notes descriptions.