JD1310-SFP-LC.S10-V2

1310nm SFP+ single-Mode Transceiver, With Diagnostic Monitoring
10G BASE-LW/LR
0.6 ~10Gb/s CPRI/OBSAI
Duplex SFP+ Transceiver, RoHS Compliant

Features

- Operating Data Rate up to 11.3Gbps
- 1310nm DFB-LD Transmitter
- Distance up to 10km
- Single 3.3V Power Supply and TTL Logic Interface
- Duplex LC Connector Interface
- Hot Pluggable
- Power Dissipation < 1.0W
- Compliant with MSA SFP+ Specification SFF-8431
- Compliant with IEEE 802.3ae 10GBASE-LR/LW
- Operating Case Temperature

  Standard: 0℃~+70℃

  Industrial: -40℃~+85℃

- Safety Certification: TUV/UL/FDA*Note1
- RoHS Compliant

Applications

- 10GBASE-LR at 10.31 Gbps
- 10GBASE-LW at 9.95 Gbps
- OBSAI Rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768 Gb/s
- CPRI Rates 10.138 Gb/s, 9.830 Gb/s, 7.373 Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614 Gb/s
- Other Optical Links

Ordering information

Part No.	Data Rate	Laser	Fiber Type	Distance	Optical Interface	Temp.	DDMI
JD1310-SFP-LC.S10-V2	0.614Gbps to 11.3Gbps	1310nm DFB	SMF	10km	LC	Standard	YES
JD1310-SFP-LC.S10-V2(WT)	0.614Gbps to11.3Gbps	1310nmDFB	SMF	10km	LC	Industrial	YES

Note 1: For the latest certification information, please check with Data Controls Inc.

*The product image only for reference purpose.

Product Description

The JD1310-SFP-LC.S10-V2 series single mode transceiver is small form factor pluggable module for serial optical data communications such as IEEE 802.3ae 10GBASE-LR/LW. It is with the SFP+ 20-pin connector to allow hot plug capability.

This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. The transmitter section uses a 1310nm multiple quantum well DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825.

The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

Absolute Maximum Ratings*Note2

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_S	-40	+85	°C
Supply Voltage	V_{CC}	-0.5	3.6	V
Input Voltage	Vin	-0.5	Vcc	V
Relative Humidity*Note3	RH	0	85	%

Note 2: Exceeding any one of these values may destroy the device permanently.

Note 3: Non-condensing.

Recommended Operating Conditions

Parameter	Symbol		Min.	Typ.	Max.	Unit
Operating Case Temperature	TC	JD1310-SFP-LC.S10-V2			+70	°C
		JD1310-SFP-LC.S10-V2(WT)			+85	
Power Supply Voltage	VCC		3.15	3.3	3.45	V
Power Supply Current	ICC				300	mA
Surge Current	ISurge				+30	mA
Baud Rate			0.6		11.3	Gbps

Performance Specifications – Electrical

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
CML Inputs (Differential)	Vin	150		1200	mVpp	AC coupled inputs
Input AC Common Mode Voltage		0		25	mV	RMS
Input Impedance (Differential)	Zin	85	100	115	ohm	Rin > 100 kohms @ DC
Differential Input S-parameter	$S_{DD}11$	-	-	-10	dB	
Differential to Common Mode Conversion	$S_{CD}11$	-	-	-10	dB	

Tx_DISABLE Input Voltage – High		2		3.45	V	
Tx_DISABLE Input Voltage – Low		0		0.8	V	
Tx_FAULT Output Voltage – High		2		Vcc+0.3	V	Io = 400µA; Host Vcc
Tx_FAULT Output Voltage – Low		0		0.5	V	Io = -4.0mA
Receiver						
CML Outputs (Differential)	Vout	350		700	mVpp	AC coupled outputs
Output AC Common Mode Voltage		0		15	mV	RMS
Output Impedance (Differential)	Zout	90	100	110	ohm	
Differential Output S-parameter	S_D22	-	-	-10	dB	
Rx_LOS Output Voltage – High		2		Vcc+0.3	V	Io = 400µA; Host Vcc
Rx_LOS Output Voltage – Low		0		0.8	V	Io = -4.0mA
MOD_DEF (0:2)	VoH	2.5			V	With Serial ID
	VoL	0		0.5	V	

Performance Specifications – Optical

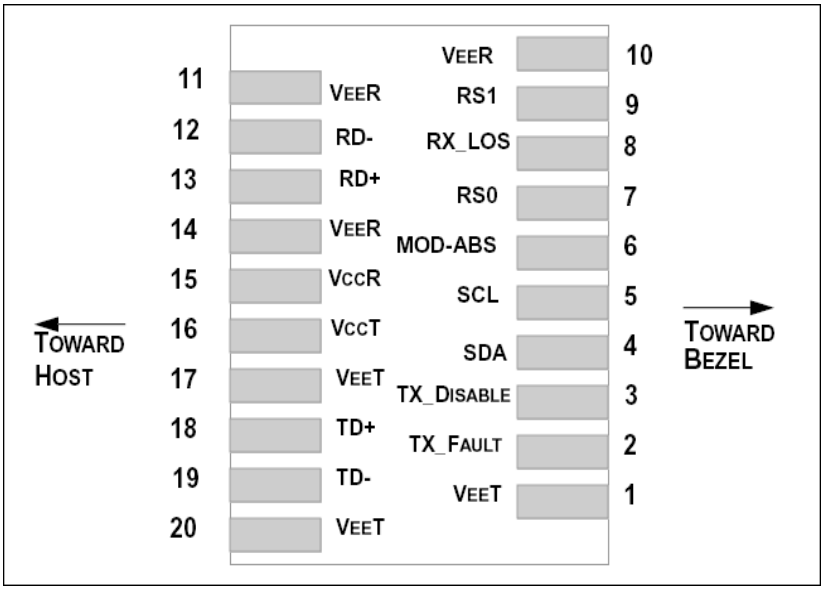
Parameter	Symbol	Min.	Typ.	Max.	Unit
9µm Core Diameter SMF			10		km
Data Rate		0.6		11.3	Gbps
Transmitter					
Centre Wavelength	λ_C	1270	1310	1355	nm
Spectral Width (-20dB)	Δλ			1	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power*Note4	P_{out}	-8.2		+0.5	dBm
Extinction Ratio	ER	3.5			dB
Average Power of OFF Transmitter	P_{off}			-30	dBm
Transmitter Dispersion Penalty	TDP			3.2	dB
TX Disable Assert Time	t_off	-	-	10	us
TX_DISABLE Negate Time	t_on	-	-	1	ms
TX_BISABLE Time to Start Reset	t_reset	10	-	-	us
Time to Initialize, Include Reset of TX_FAULT	t_init	-	-	300	ms
TX_FAULT from Fault to Assertion	t_fault	-	-	100	us

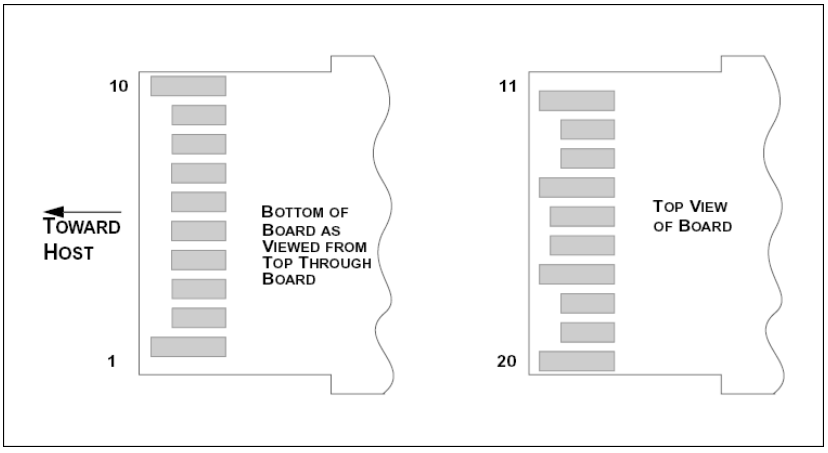
Receiver					
Centre Wavelength	λ	1260		1565	nm
Receiver Sensitivity (Average)*Note5	P_{min}			-14.4	dBm
Receiver Sensitivity (OMA) *Note5	P_{min}			-12.6	dBm
Stressed Receiver Sensitivity (OMA) *Note5	P_{min}			-10.3	dBm
Receiver Overload	P_{max}	0.5			dBm
Optical Return Loss	ORL			-12	dB
LOS De-Assert	LOS_D			-16	dBm
LOS Assert	LOS_A	-28			dBm

Note4: Output is coupled into a 9/125um SMF.

Note5: Minimum optical power measured at the BER less than 1E-12, back to back. The measure pattern is PRBS 2^{31}-1.

SFP+ Transceiver Electrical Pad Layout





Pin Function Definitions

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 5
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	2-wire Serial Interface Data Line.
5	SCL	Module Definition 1	3	2-wire Serial Interface Clock.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTL).	3	No Function Implement
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTL).	1	No Function Implement
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	3.3V ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3V ± 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 – 10KΩ 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 4.7K – 10 KΩ 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) Module 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 – 10KΩ 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) The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.

6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.

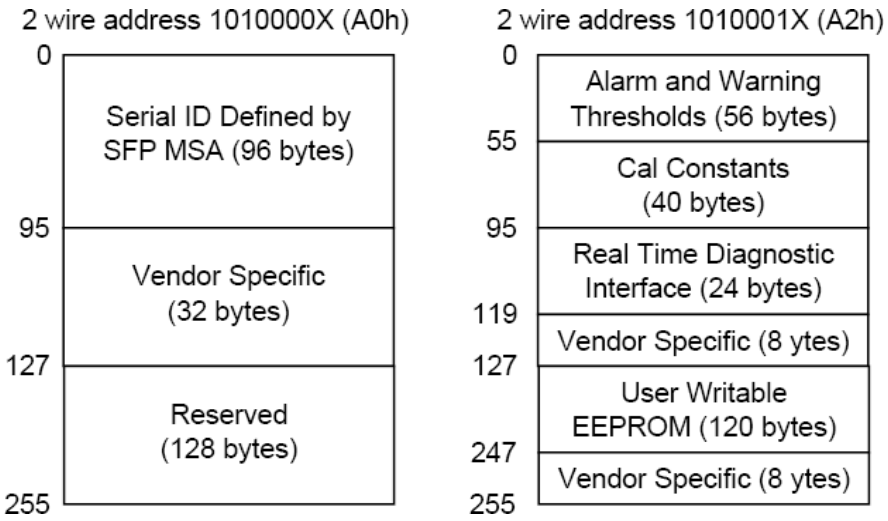
7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP+ connector pin. Maximum supply current is 300mA. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. 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.

EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol. 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 written 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. If the module is defined as external calibrated, 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. For detail EEPROM information, please refer to the related document of SFF 8472 Rev 10.2.



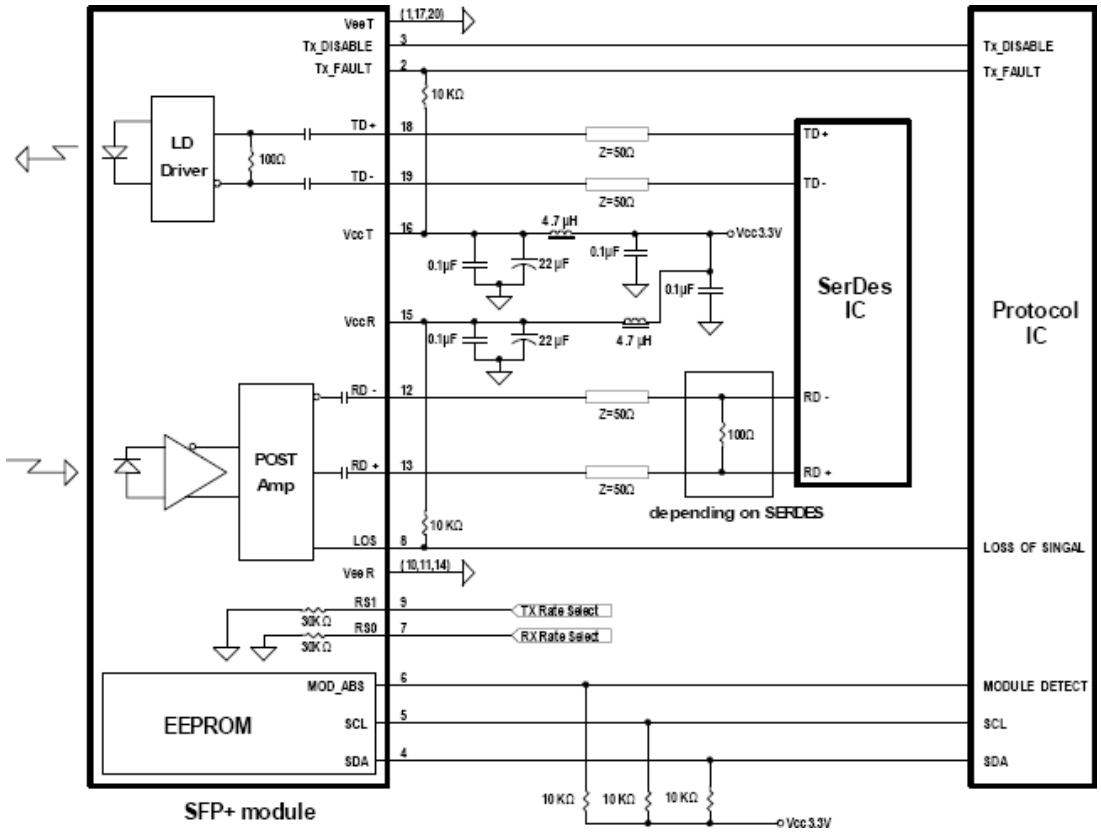
EEPROM Address			A0h	Version	V1.0
Data Addr	**Field Size (Byte)**	**Name Of filed**	**Description of field**	**Coded value**	**Hex**
BASE ID FIELDS					
0	1	Identifier	Type of serial transceiver	SFP+	03
1	1	Ext.Identifier	Extended identifier of Type of serial transceiver	MOD_DEF 4	04
2	1	Connector	Code for connector type	LC	07
3	8	Transceiver	10G Ethernet Compliance Codes & Infiniband Compliance Codes	10G Base-LR	20
4			Part of SONET Compliance Codes		00
5			SONET Compliance Codes		00
6			Ethernet Compliance Codes		00
7			Fiber Channel link length & part of Fibre Channel technology		00
8			Part of Fiber Channel transmitter technology		00
9			Fiber Channel Transmission media		00
10			Fiber Channel speed		00
11	1	Encoding	Code for high speed serial encoding algorithm	64B/66B	06
12	1	BR, Nominal	Nominal ignaling rate, units of 100MBd.	10.3Gbps	67
13	1	Rate Identifier	Type of rate select functionality		00

14	1	Length(SMF,km)	Link length supported for single mode fiber, units of km	10(km)	0A
15	1	Length (SMF)	Link length supported for single mode fiber, units of 100 m	10(km)	64
16	1	Length (50um)	Link length supported for 50 um OM2 fiber, units of 10 m		00
17	1	Length (62.5um)	Link length supported for 62.5 um OM1 fiber, units of 10 m		00
18	1	Length (Copper)	Link length supported for copper, units of meters		00
19	1	Length (OM3)	Link length supported for 50 um OM3 fiber, units of 10 m		00
20	16	Vendor name	Vendor name (ASCII)	D	44
21				a	61
22				t	74
23				a	61
24				<space>	20
25				C	43
26				o	6F
27				n	6E
28				t	74
29				r	72
30				o	6F
31				l	6C
32				s	73
33				<space>	20
34				<space>	20
35				<space>	20
36	1	Reserved			00
37	3	Vendor OUI	SFP vendor IEEE company ID		00
38					00
39					00
40	16	Vendor PN	Part number provided by vendor (ASCII)	J	4A
41				D	44
42				1	31
43				3	33
44				1	31
45				0	30
46				S	53
47				F	46
48				P	50
49				L	4C

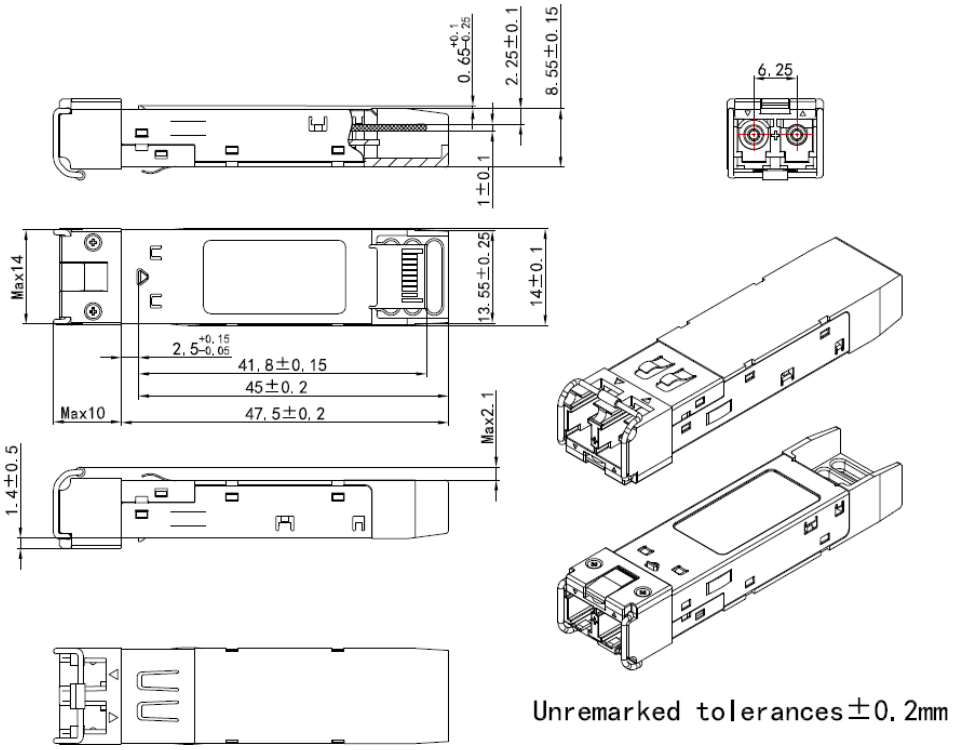
50				C	43
51				S	53
52				1	31
53				0	30
54				<space>	20
55				<space>	20
56	4	Vendor rev	Revision level for part number provided by vendor (ASCII)	1	31
57				.	2E
58				0	30
59				<space>	20
60	2	Wavelength	Laser Wavelength	1310nm	05
61					1E
62	1	Reserved			00
63	1	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)	Note6	xx
64	2	Options	Indicates which optional transceiver signals are implemented	TX_DISABLE, TX_FAULT signal,Rx_LOS	00
65					1A
66	1	BR, max	Upper bit rate margin, units of %		00
67	1	BR, min	Lower bit rate margin, units of %		00
68	16	Vendor SN	Serial number provided by vendor (ASCII)	x	xx
69				x	xx
70				x	xx
71				x	xx
72				x	xx
73				x	xx
74				x	xx
75				x	xx
76				x	xx
77				x	xx
78				<space>	20
79				<space>	20
80				<space>	20
81				<space>	20
82				<space>	20
83				<space>	20
84	8	Date code	Vendor's manufacturing date code	Year	xx
85				Year	xx
86				Month	xx
87				Month	xx
88				Day	xx
89				Day	xx

90				<Space>	20
91				<Space>	20
92	1	Diagnostic Monitoring Type	Type of diagnostic monitoring is implemented	DD Implemented; Internally Calibrated; Average Power	68
93	1	Enhanced Options	Optional enhanced features are implemented	Optional Alarm/warning Flags Implemented,Optional soft TX_FAULT monitoring,Optional soft RX_LOS monitoring	B0
94	1	SFF-8472 Compliance	Revision of SFF-8472 the transceiver complies with	Rev 10.2 of SFF-8472.	03
95	1	CC_EXT	Check code for the Extended ID Fields (addresses 64 to 94)	Note7	
Note 6: The check code shall be the low order 8 bits of the sum of the contents of all the bytes from byte 0 to byte 62, inclusive.					
Note7: The check code shall be the low order 8 bits of the sum of the contents of all the bytes from byte 64 to byte 94, inclusive.					

Recommend Circuit Schematic



Mechanical Specifications



*This 2D drawing only for reference, please check with Data Controls Inc. before ordering.

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.

Obtaining Document

You can visit our website:

https://www.dci.jp/

Or contact Data Controls Inc. Listed at the end of the documentation to get the latestdocument.

Revision History

Revision	Revision History	Release Date
V1.b	Released.	2008-9-17
V1.c	Adding the suitable application.	2009-7-17
V1.d	Updated output power value.	2010-11-3
V1.e	Add customized suffix, update temp. range.	2011-2-22
V1.f	Update case temp. symbol.	2011-6-9
V2.0	Update spelling mistake	Aug 10, 2011
V2.a	Add power dissipation and industrial product.	Aug 23, 2011
V2.b	Add TDP.	Aug 25, 2011
V2.c	Update pin definition notes	Jan 24, 2013
V2.d	Add CPRI&OBSAI application	June 18, 2013
V2.e	Add notes	July 1, 2013
V2.f	Delete Industrial Temperature and update RegulatoryCompliance	Sep 25, 2013
V2.g	Add the extended temperature range	Nov 25,2013
V3.0	Update Pout	Jan 4, 2014
V3.a	Add industrial temperature range. Update max data rate,regulatory compliance and the tolerances of 2D drawing.	April 23,2015
V3.b	Correct a mistake	Nov 27, 2015
V3.c	Update the CPRI data rates,regulatory compliance and 2D drawing.	July 17, 2017
V3.d	Add the EEPORM contents of A0h.	August 11, 2017
V3.e	Update the optical specifications and contact.	Feb 05,2018
V3.f	Update the RS0/RS1 Pinfunction definition notes,picture and 2D drawing.	March 21, 2018
V3.g	Updated the regulatory compliance.	August 27, 2018
V3.h	Updated the regulatory compliance information.	December 14, 2018
V3.i	Add the parameters of receiver sensitivity (OMA)and stressed receiver sensitivity (OMA).	Jul 18, 2019

Notice:

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Contact:

Add: 8F, Fukashiro Bldg. 1-20-4 Yanagibashi, Taito-ku, Tokyo Japan 111-0052
Tel: 81-3-5829-5805 Fax: 81-3-5829-5806
E-mail: info@dci.jp Website: https://www.dci.jp/