

## DJxx-SFP-LC.S80 Series

**SFP+ Single-Mode for DWDM Application**  
**Duplex SFP+ Transceiver**  
**Digital Diagnostic Function**  
**RoHS6 Compliant**



### Features

- ◆ Supports up to 11.3Gbps
- ◆ Available in all C-Band Wavelengths on the 100GHz DWDM ITU Grid
- ◆ Temperature-Stabilized DWDM EML Transmitter
- ◆ Duplex LC Connector
- ◆ Power Dissipation < 1.8W
- ◆ Dispersion tolerance from -500ps/nm to 1600ps/nm
- ◆ Hot-Pluggable SFP+ Footprint
- ◆ Compliant with SFF-8431 MSA
- ◆ Compliant with SFF-8432 MSA
- ◆ Operating Case Temperature  
 Standard: 0°C to 70°C  
 Extended: -20°C to 75°C

### Applications

- ◆ 10GBASE-ZR/ZW
- ◆ 10G FC
- ◆ OBSAI rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768Gb/s
- ◆ CPRI rates 10.138Gb/s ,9.830 Gb/s,7.373Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614Gb/s
- ◆ Other optical links

### Ordering Information

Part No.	Data Rate	Laser	Power budget	CDR	Temp.
DJxx-SFP-LC.S80 <sup>(note1)</sup>	0.6~11.3Gbps	DWDM EML	23dB	NO	Standard
DJxx-SFP-LC.S80(WT) <sup>(note1)</sup>	0.6~11.3Gbps	DWDM EML	23dB	NO	Extended

Note1: XX refers to DWDM Wavelength channel as ITU-T specified, please refer the following table for detailed center wavelength information.

\*The product image only for reference purpose.

**XX- Channel refers to the following table:**

*Channel (XX)	Part NO.	Frequency (THz)	Center Wavelength (nm)
15	DJ15-SFP-LC.S80	191.5	1565.50
16	DJ16-SFP-LC.S80	191.6	1564.68
17	DJ17-SFP-LC.S80	191.7	1563.86
18	DJ18-SFP-LC.S80	191.8	1563.05
19	DJ19-SFP-LC.S80	191.9	1562.23
20	DJ20-SFP-LC.S80	192.0	1561.42
21	DJ21-SFP-LC.S80	192.1	1560.61
22	DJ22-SFP-LC.S80	192.2	1559.79
23	DJ23-SFP-LC.S80	192.3	1558.98
24	DJ24-SFP-LC.S80	192.4	1558.17
25	DJ25-SFP-LC.S80	192.5	1557.36
26	DJ26-SFP-LC.S80	192.6	1556.55
27	DJ27-SFP-LC.S80	192.7	1555.75
28	DJ28-SFP-LC.S80	192.8	1554.94
29	DJ29-SFP-LC.S80	192.9	1554.13
30	DJ30-SFP-LC.S80	193.0	1553.33
31	DJ31-SFP-LC.S80	193.1	1552.52
32	DJ32-SFP-LC.S80	193.2	1551.72
33	DJ33-SFP-LC.S80	193.3	1550.92
34	DJ34-SFP-LC.S80	193.4	1550.12
35	DJ35-SFP-LC.S80	193.5	1549.32
36	DJ36-SFP-LC.S80	193.6	1548.51
37	DJ37-SFP-LC.S80	193.7	1547.72
38	DJ38-SFP-LC.S80	193.8	1546.92
39	DJ39-SFP-LC.S80	193.9	1546.12
40	DJ40-SFP-LC.S80	194.0	1545.32
41	DJ41-SFP-LC.S80	194.1	1544.53
42	DJ42-SFP-LC.S80	194.2	1543.73
43	DJ43-SFP-LC.S80	194.3	1542.94
44	DJ44-SFP-LC.S80	194.4	1542.14
45	DJ45-SFP-LC.S80	194.5	1541.35
46	DJ46-SFP-LC.S80	194.6	1540.56
47	DJ47-SFP-LC.S80	194.7	1539.77
48	DJ48-SFP-LC.S80	194.8	1538.98
49	DJ49-SFP-LC.S80	194.9	1538.19
50	DJ50-SFP-LC.S80	195.0	1537.40
51	DJ51-SFP-LC.S80	195.1	1536.61
52	DJ52-SFP-LC.S80	195.2	1535.82
53	DJ53-SFP-LC.S80	195.3	1535.04

54	DJ54-SFP-LC.S80	195.4	1534.25
55	DJ55-SFP-LC.S80	195.5	1533.47
56	DJ56-SFP-LC.S80	195.6	1532.68
57	DJ57-SFP-LC.S80	195.7	1531.90
58	DJ58-SFP-LC.S80	195.8	1531.12
59	DJ59-SFP-LC.S80	195.9	1530.33
60	DJ60-SFP-LC.S80	196.0	1529.55
61	DJ61-SFP-LC.S80	196.1	1528.77

\* Note2: Please contact with DATA CONTROLS INC. for the channel availability.

## Regulatory Compliance\*

Product Certificate	Certificate Number	Applicable Standard
TUV	R50135086	EN 60950-1:2006+A11+A1+A12+A2
		EN 60825-1:2014
		EN 60825-2:2004+A1+A2
UL	E317337	UL 60950-1
		CSA C22.2 No. 60950-1-07
EMC CE	AE 50384190 0001	EN 55032:2012
		EN 55032:2015
		EN 55024:2010
		EN 55024:2010+A1
'FCC	WTF14F0514417E	47 CFR PART 15 OCT., 2013
FDA	/	CDRH 1040.10
ROHS	/	2011/65/EU

\*The above certificate number updated to June 2018, because some certificate will be updated every year, such as FDA and ROHS. For the latest certification information, please check with Data Controls Inc..

## Product Description

The DJxx-SFP-LC.S80series single mode transceiver is small form factor pluggable module for duplex optical data communications. This module is designed for single mode fiber and operates at a nominal DWDM wavelength from 1528nm to 1566nm as specified by the ITU-T. It is designed to deploy in the DWDM networking equipment in metropolitan access and core networks.

It is with the SFP+ 20-pin connector to allow hot plug capability. The transmitter section uses a DWDM EML laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an APD detector and a limiting post-amplifier IC.

The DJxx-SFP-LC.S80 series are designed to be compliant with SFP+ Multi-Source Agreement (MSA) Specification SFF-8431 and 8432.

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

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+85	°C
Supply Voltage	Vcc	-0.5	3.6	V
Operating Relative Humidity		-	95	%

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

**Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>c</sub>	Standard	0	+70	°C
		Extended	-20	+75	°C
Power Supply Voltage	Vcc	3.15	3.3	3.45	V
Power Supply Current	I <sub>cc</sub> (0°C to 70°C)			435	mA
	I <sub>cc</sub> (-20°C to 75°C)			522	mA
Data Rate	DR	0.6	10.3	11.3	Gbps

**Performance Specifications – Electrical**

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
<b>Transmitter</b>						
CML Inputs(Differential)	V <sub>in</sub>	250		1000	mVpp	AC coupled input <sup>*(note6)</sup>
Input Impedance (Differential)	Z <sub>in</sub>	85	100	115	ohm	R <sub>in</sub> > 100 kohm @ DC
TX_Dis	Disable	2		Vcc+0.3	V	
	Enable	0		0.8		
TX_FAULT	Fault	2		Vcc+0.3	V	
	Normal	0		0.5		
<b>Receiver</b>						
CML Outputs (Differential)	V <sub>out</sub>	350		700	mVpp	AC coupled output <sup>*(note6)</sup>
Output Impedance (Differential)	Z <sub>out</sub>	85	100	115	ohm	
RX_LOS	LOS	2		Vcc+0.3	V	
	Normal	0		0.8	V	
MOD_DEF ( 0:2 )	VoH	2.5			V	With Serial ID
	VoL	0		0.5	V	

## Performance Specifications – Optical

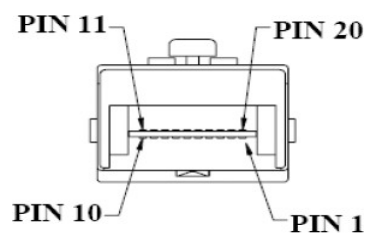
Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate	DR	0.6	10.3	11.3	Gbps
<b>Transmitter</b>					
Center Wavelength Spacing			100		GHz
			0.8		nm
Spectral width(RMS)	$\Delta\lambda$		0.15	0.3	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power*(note4)	Pout	0		5	dBm
Average Launch Power (Tx: OFF)	Poff			-30	dBm
Extinction Ratio	ER	3.5			dB
Pout@TX Disable Asserted	Pout			-45	dBm
Transmitter Dispersion Penalty@1600ps/nm	TDP			3.5	dB
Relative Intensity Noise	RIN			-128	dB/Hz
TX Jitter	TXj	Per 802.3ae requirements			
<b>Receiver</b>					
Receiver Sensitivity*(note5)	Pmin			-23	dBm
Receiver Overload	Pmax	-6			dBm
LOS De-Assert	LOSD			-24	dBm
LOS Assert	LOSA	-40			dBm
LOS Hysteresis		1			dB

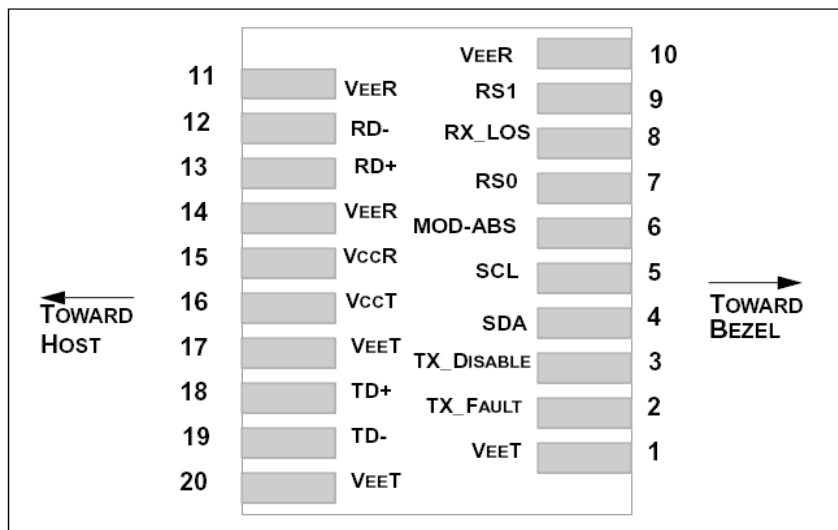
Note4: Output is coupled into a 9/125 $\mu$ m single-mode fiber.

Note5: Minimum average optical power measured at the BER less than 1E-12, OSNR > 30dB. The measure pattern is PRBS 2<sup>31</sup>-1.

Note6: CML logic, internally AC coupled.

## SFP+ Transceiver Electrical Pad Layout





## Pin Function Definition

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 (LVTTTL).	3	No Function Implement.
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL).	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	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 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 – 10K $\Omega$  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 4.7 – 10 K $\Omega$  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 – 10K $\Omega$  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 100 $\Omega$  differential lines which should be terminated with 100 $\Omega$  (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  $\pm$ 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 100 $\Omega$  differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

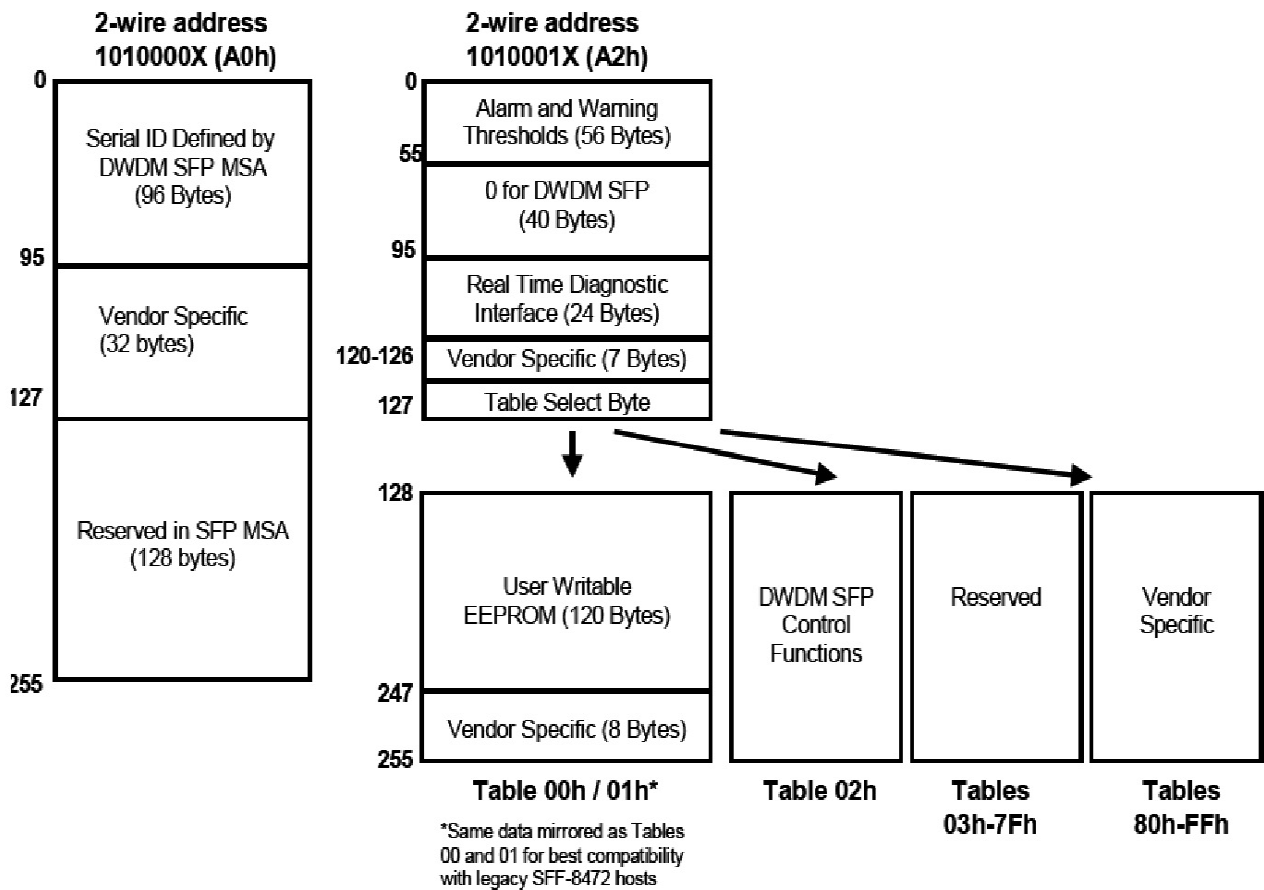
**EEPROM**

The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

The serial interface uses the 2-wire serial CMOS EEPROM protocol. When the serial protocol is

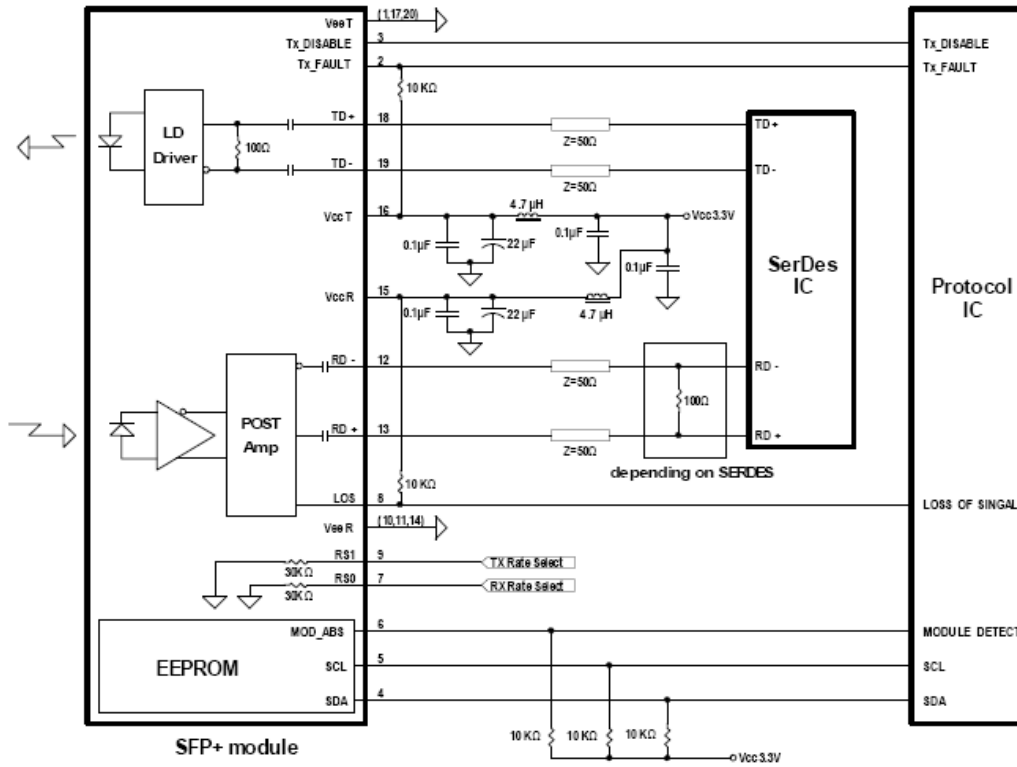
activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional 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. Alarm/warning threshold data is written during device manufacture. TEC current monitoring, laser temperature monitoring, received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and transceiver temperature monitoring all are implemented. The diagnostic data are internal calibration and stored in memory locations 96 – 109 at wire serial bus address A2h. The transceiver memory map specific data field defines as following.



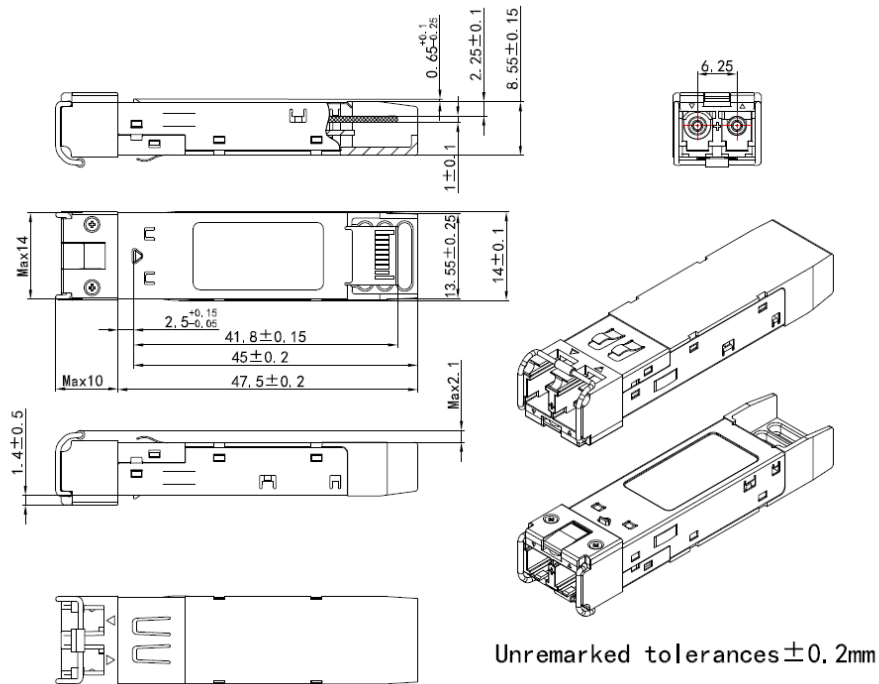


### Recommend Circuit Schematic



### Mechanical Specifications

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



## Laser Emission



## Obtaining Document

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

## Revision History

Revision	DCN	Release Date
V1.a	New Released.	July 16, 2012
V1.b	Update mechanical spec. & power dissipation & Er & application.	July 24, 2012
V1.c	Update photo & Delete CDR.	July 27, 2012
V1.d	Update power dissipation	Dec,17,2012
V1.e	Update power dissipation	Feb 20, 2013
V1.f	Update Data rate	Dec 23, 2013
V1.g	Update Mechanical Specifications	Feb 5, 2015
V1.h	Add industrial case temperature and OBSAI/CPRI application, update the tolerances of 2D drawing.	May 18,2015
V1.i	Correct the 2D drawing.	July 8, 2015
V1.j	Update the temperaturerange and regulatory compliance.	Dec 17,2015
V1.k	Add the spectral width and update 2D drawing.	July 19,2016
V1.l	Update the part number of Extended products.	August 16, 2017
V1.m	Update the Pin function definition of Pin7(RS0) and Pin9(RS1). Update the contact.	December12,2017
V1.n	Update the CPRI data rates, picture and 2D drawing	March 21, 2018
V1.o	Updated the regulatory compliance. Change the max power dissipation of extended temperature series from 1.5W to 1.8W.	October 8, 2018

## Notice:

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