

10G DWDM SFP+ C-band Tunable 80km DOM Transceiver

DW-SFP10G-80-C



Application

- DWDM 10Gb/s SONET/SDH
- DWDM 10Gb/s Ethernet & 10Gb/s Fibre Channel
- DWDM 10Gb/s SONET/SDH w/FEC
- DWDM 10Gb/s Ethernet & 10Gb/s Fibre Channel w/FEC

Features

- Up to 80km transmission on SMF
- Support Multi Rate 9.95Gbps to 11.3Gbps with CDR, 8.5Gbps bypass CDR
- Monolithic MZM Tunable TOSA
- APD receiver
- 50GHz ITU-based channel spacing (C-Band) with a wavelength locker
- Total 96 channels
- SFI electrical interface
- 2-wire interface for integrated Digital Diagnostic monitoring
- SFP+ MSA package with duplex LC conn
- Hot pluggable
- Very low EMI and excellent ESD protection
- Power consumption less than 2.5W
- Operating case temperature: -5~85°C
- Compliant with MSA SFF-8472, MSA SFF-8431 and MSA SFF-8690

Description

DWDM-SFP10G-C is a high performance, cost effective module, which is supporting multi rate 9.95Gbps to 11.3Gbps with CDR, 8.5Gbps bypass CDR, and transmission distance up to 80km on SM fiber. The transceiver consists of two sections: The transmitter section incorporates a laser driver and a TTOSA. The receiver section consists of an APD photodiode integrated with a transimpedance preamplifier (TIA). The module is hot pluggable into the 20-pin connector. The high-speed electrical interface is base on low voltage logic, with nominal 100ohms differential impedance and AC coupled in the module.

The optical output can be disabled by LVTTTL logic high-level input of TX_DIS. Transmit Fault (Tx_Fault) is provided to indicate that the module transmitter has detected a fault condition related to laser operation or safety. Loss of signal (RX_LOS) output is provided to indicate the loss of an input optical signal of receiver.

A serial EEPROM in the transceiver allows the user to access transceiver monitoring and configuration data via the 2-wire SFP management interface. This interface uses a single address, A0h, with a memory map divided into a lower and upper area. Basic digital diagnostic (DD) data is held in the lower area while specific data is held in a series of tables in the high memory area.

Product Specifications

I. Absolute Maximum Rating

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	TS	-40	85	°C	
Supply Voltage	Vcc3	0	3.63	V	
Relative Humidity	RH	5	+85	%	Note1

Notes:

[1] Non-condensing state.

II. Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TC	-5	25	85	°C	
Supply Voltage	Vcc	3.13	3.3	3.47	V	
Power Consumption	P	-	-	2.5	W	
Data Rate		8.5	10.3125	11.3	Gbps	
Transmission Distance		-	-	80	Km	

III. Transmitter Operating Characteristic--Optical, Electrical

Parameter	Symbol	Min	typical	Max	Unit	Notes
Data Rate	DR	8.5	10.3125	11.3	Gbps	
Center Wavelength	CW	191.30		196.05	THz	
Wavelength range	λC	1529.163		1567.13	nm	
Center Frequqncy Variation	CFV			+/-2.5	GHz	
-20dB Spectral Width	$\Delta\lambda_{20}$			0.3	nm	
Side mode Suppression Ratio	SMSR	30			nm	
Laser Off Power	Poff			-30	dBm	
Optical Eye Mask	EMM	5			%	
Average Optical Power	PO	-1		3	dBm	
ExtinctionRatio	ER	8.2			dB	
Cross Point of Eye	CP	40		52	%	
Transmitter Dispersion Penalty	TDP			2	dB	
Relative Intensity Noise	RIN120MA			-128	dB/Hz	
Optical Return Loss Tolerance	ORLT			-27	dB	
Tx Input Diff Voltage	VI	200		700	mV	

IV. Receiver Operating Characteristic-Optical, Electrical

Parameter	Symbol	Min	typical	Max	Unit	Notes
Data Rate	DR	8.5	10.3125	11.3	Gbps	
Center Wavelength	CW	1260		1600	nm	
Sensitivity @(BER=1E-12, PRBS 2^31-1, NRZ, 9.95Gbps~10.7Gbps data rate)	Psen			-23	dBm	
Sensitivity @(BER=1.0E-04, PRBS 2^31- 1, NRZ,11.3Gbps data rate)	Psen			-26	dBm	
B2B OSNR Tolerance @ 1E-4				16	dB	
Input Optical Power(no damaged)	IOP	4			dBm	
Saturation Power (EOL)	SP	-7			dBm	
Loss of Signal - Asserted	LosA	-35			dBm	
Loss of Signal- Deasserted	LosD			-28	dBm	
Hysteresis	LosH	0.5			dB	
Rx Output Diff Voltage	Vo	250		850	mV	
Loss of Signal Voltage	VOH	Vcc-0.5		Vcc+0.3	V	
	VOL	0		0.4	V	

V. Digital Diagnostic Functions

Parameter	Symbol	Min	Typical	Max	Units	Notes
Temperature monitor absolute error	DMI_Temp	-3		3	°C	Over operating temperature
Supply voltage monitor absolute error	DMI_Vcc	-3%		3%	V	
Bias current monitor absolute error	DMI_Ibias	-10%		10%	mA	
Laser power monitor absolute error	DMI_Tx	-3		3	dB	
RX power monitor absolute error	DMI_Rx	-3		3	dB	

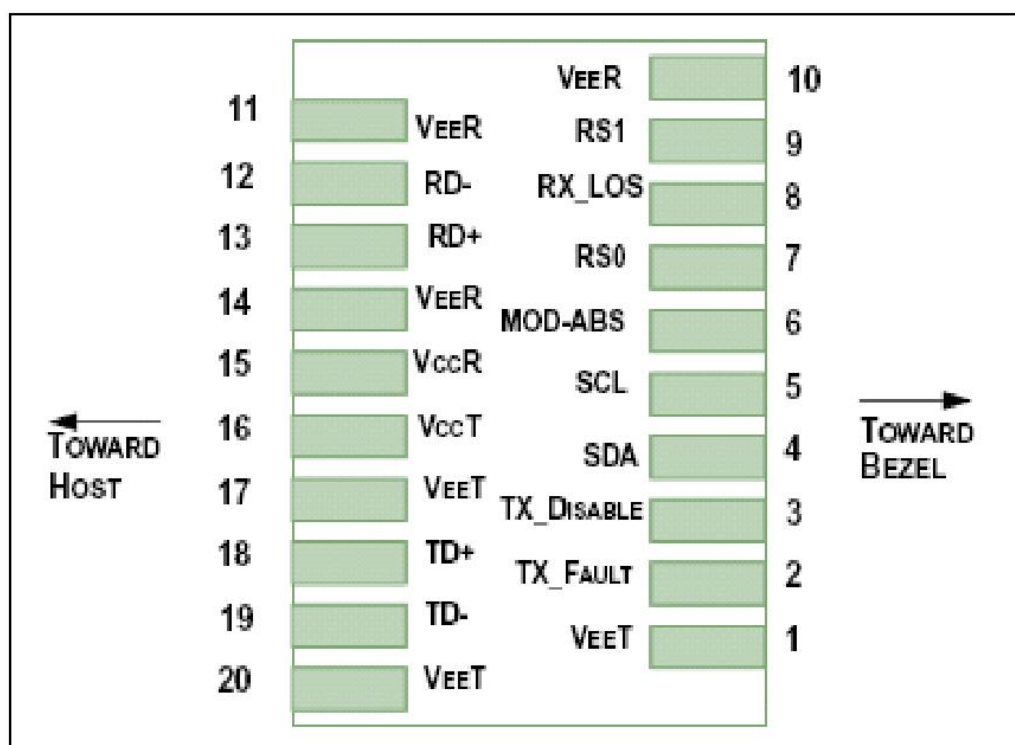
VI. Control and Status I/O Timing Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
TX Disable Assert Time	t_off			100	µs	Note1
TX Disable Negate Time	t_on			2	ms	Note2
Time to initialize including reset of TX_Fault	t_init			300	ms	Note3
Time to initialize cooled module and time to power up a cooled module to Power Level II	t_start_up_cooled			90	s	Note4
TX Fault Assert Time	t_fault_on			1	ms	Note5
TX Fault Reset Time	t_reset	10			µs	Note6
LOS Assert Time	t_loss_on			100	µs	Note7
LOS Deassert Time	t_loss_off			100	µs	Note8

Notes:

- [1] Time from rising edge of TX Disable to when the optical output falls below 10% of nominal.
- [2] Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal.
- [3] From power on or negation of TX Fault using TX Disable.
- [4] From power supply or hot plug or TX Disable negated during power up, or TX Fault recovery, until cooled power level I part (or cooled power level II part during Fault recovery) the SFP+ is fully operational
- [5] Time from fault to TX fault on.
- [6] Time from TX fault to TX nominal.
- [7] Time from LOS state to RX LOS assert.
- [8] Time from non-LOS state to RX LOS deassert.

VII. Pin-out Definitions



VIII. Pin Function Definitions

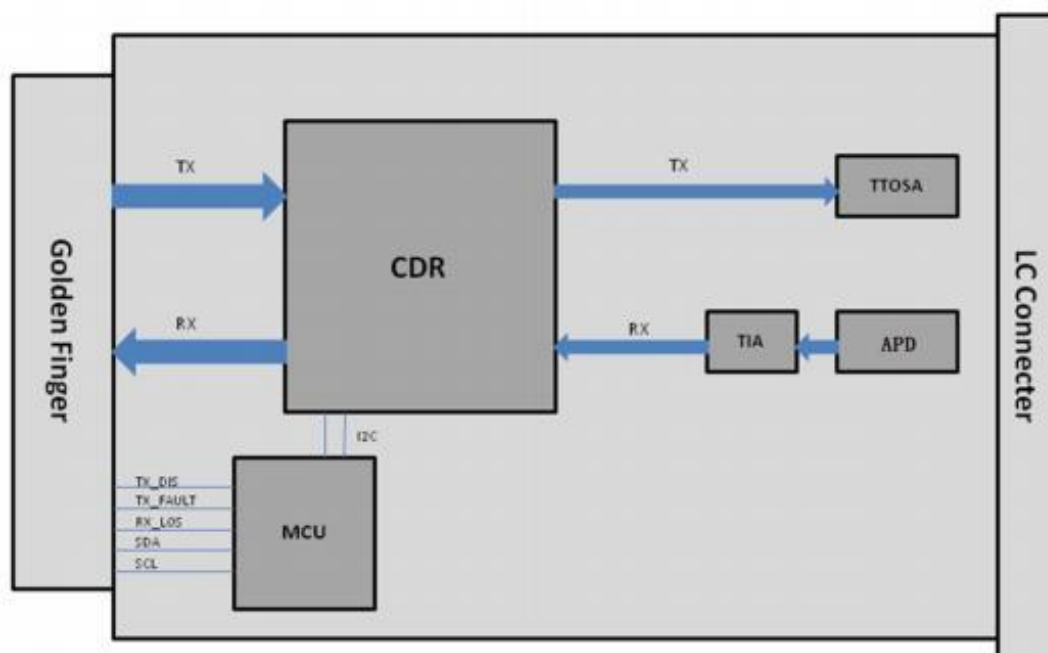
	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	Note1
2	LVTTTL-O	TX_Fault	Module Transmitter Fault	Note2
3	LVTTTL-I	TX_Disable	Transmitter Disable;Turns off transmitter laser output	Note3
4	LVTTTL-I/O	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 as defined in the INF-8074i)	Note4
5	LVTTTL-I/O	SCL	2-wire Serial Interface Clock (Same as MOD-DEF1 as defined in the INF-8074i)	Note4
6		MOD_ABS	Module Absent, connected to VeeT or VeeR in the module	Note5
7	LVTTTL-I	RS0	Rate Select 0	
8	LVTTTL-O	RX_LOS	Receiver Loss of Signal Indication (In FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated as Signal Detect)	Note2
9	LVTTTL-I	RS1	Rate Select 1	
10		VeeR	Module Receiver Ground	Note1
11		VeeR	Module Receiver Ground	Note1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		VeeR	Module Receiver Ground	Note1
15		VccR	Module Receiver 3.3 V Supply	

16		VccT	Module Transmitter 3.3 V Supply	Note1
17		VeeT	Module Transmitter Ground	
18	CML-I	TD+	Transmitter Non-Inverted Data Inpu	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	Note1

Notes:

- [1] The module signal ground pins, VeeR and VeeT, shall be isolated from the module case.
- [2] This pin is an open collector/drain output pin and shall be pulled up with 4.7k-10kohms to Host_Vcc on the host board. Pull ups can be connected to multiple power supplies, however the host board design shall ensure that no module pin has voltage exceeding module VccT/R + 0.5 V.
- [3] This pin is an open collector/drain input pin and shall be pulled up with 4.7k-10kohms to VccT in the module.
- [4] See SFF-8431 4.2 2-wire Electrical Specifications.
- [5] This pin shall be pulled up with 4.7k-10kohms to Host_Vcc on the host board.

IX. Block Diagram of Transceiver



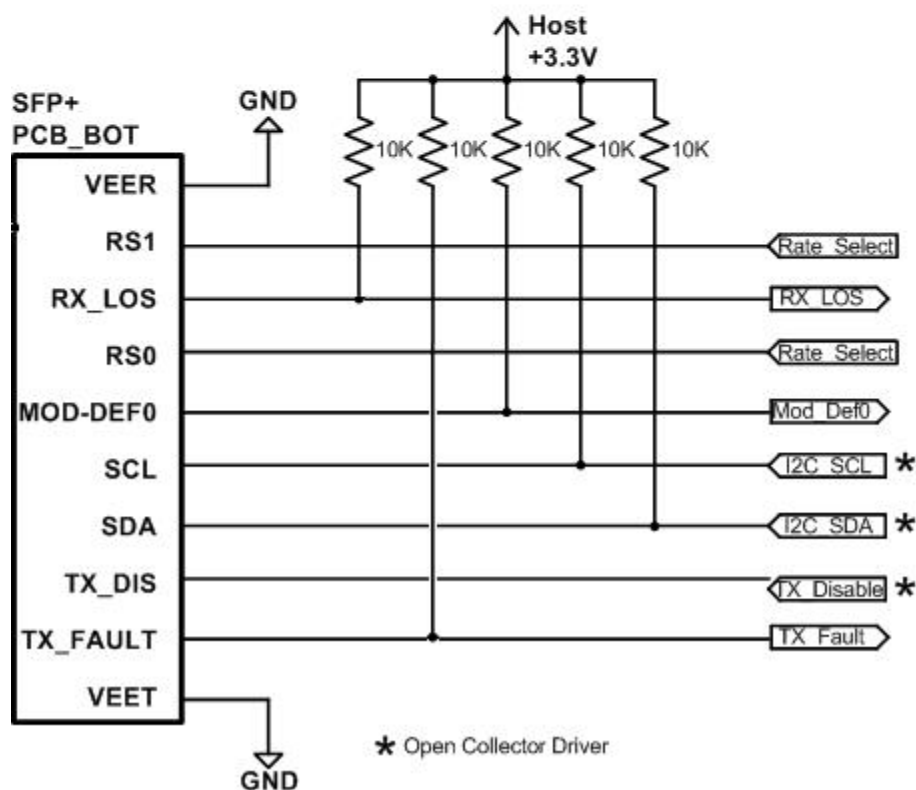
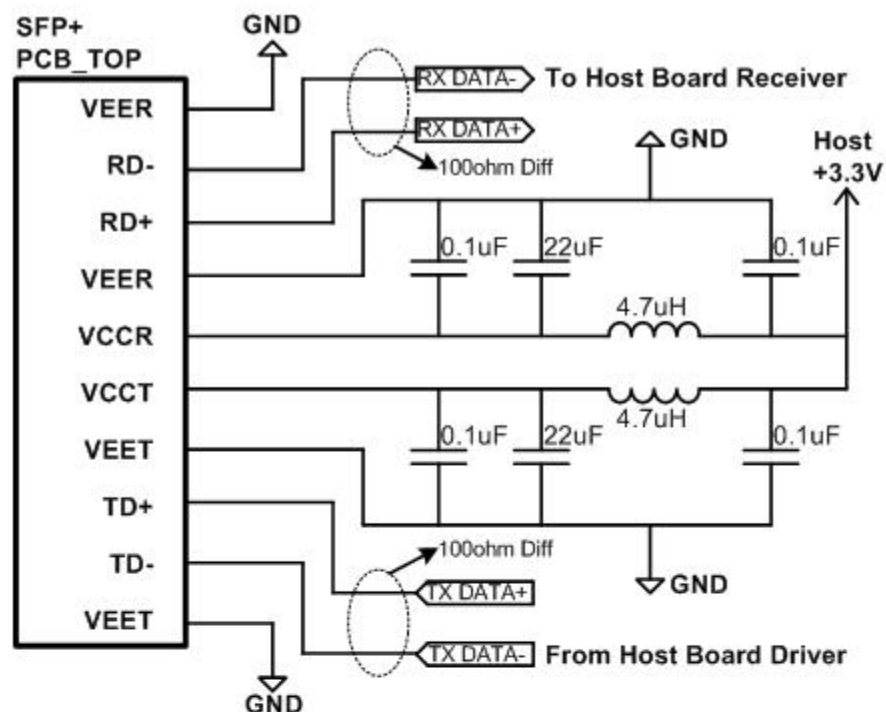
<Transmitter Section>:

The transmitter converts 10Gbit/s serial PECL or CML electrical data into serial optical data. An open collector compatible Transmit Disable (Tx_Dis) is provided. A logic "1" or no connection on this pin will disable the laser from transmitting. A logic "0" on this pin provides normal operation. An open collector compatible Transmit Fault (Tx_Fault) is provided. TX_Fault is a module output contact that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output contact is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7-10 kΩ. TX_Disable is a module input contact. When TX_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor.

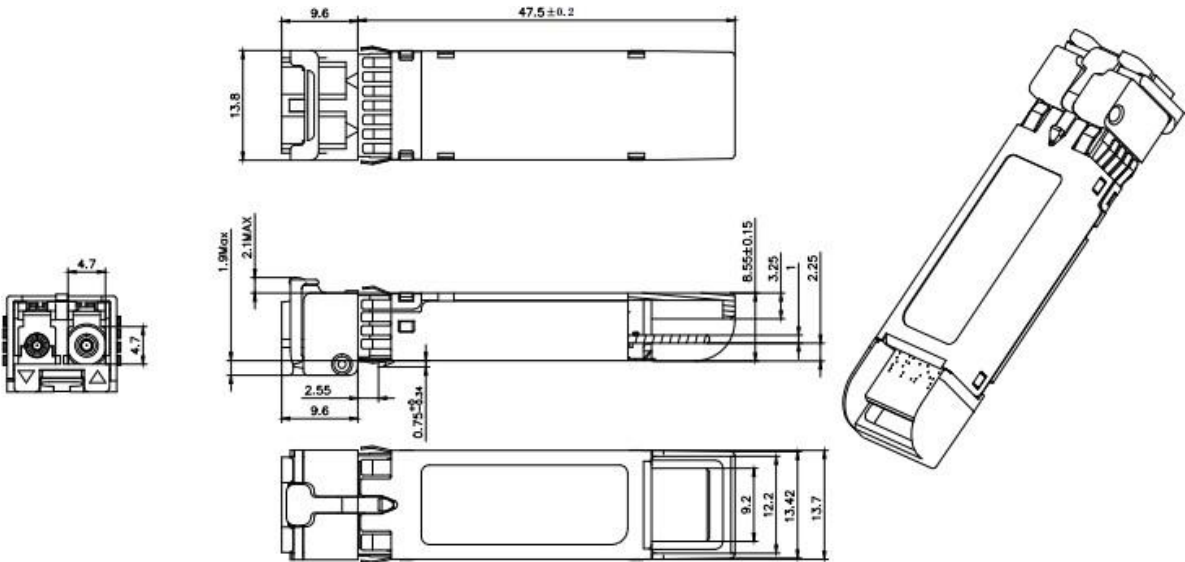
<Receiver Section>:

The receiver converts 10Gbit/s serial optical data into serial PECL/CML electrical data. An open collector compatible Loss of Signal is provided. Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. The Rx_LOS contact is an open drain/collector output and shall be pulled up to Vcc_Host in the host with a resistor in the range 4.7-10 kΩ, or with an active termination. Power supply filtering is recommended for both the transmitter and receiver. The Rx_LOS signal is intended as a preliminary indication to the system in which the SFP+ is installed that the received signal strength is below the specified range. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.

X. Recommended Interface Circuit



XI. Dimensions



XII. Digital Diagnostic Memory Map

2 wire address 1010000X (A0h)	
0	Serial ID Defined by SFP MSA (96 bytes)
95	Vendor Specific (32 bytes)
127	Reserved in SFP MSA (128 bytes)
255	

2 wire address 1010001X (A2h)	
0	Alarm and Warning Thresholds (56 bytes)
55	Cal Constants (40 bytes)
95	Real Time Diagnostic Interface (24 bytes)
119	Vendor Specific (8 bytes)
127	User Writable EEPROM (120 bytes)
247	Vendor Specific (8 bytes)
255	

XIII. EEPROM Serial ID Memory Contents (A0h)

Addr.	Field Size (Bytes)	NameofField	Hex	Description
0	1	Identifier	03	SFP+
1	1	Ext.Identifier	04	SFP function is defined by serial ID only
2	1	Connector	07	LC Connector
3-10	8	Transceiver	00 00 00 00 00 00 00 00	
11	1	Encoding	06	64B/66B
12	1	BR,Nominal	67	103 *100MBd
13	1	Rate Identifier	0E	
14	1	Length(9um)km	50	Transceiver transmit distance,80km
15	1	Length (9um)100m	FF	Transceiver transmit distance, > 25.4 Km
16	1	Length(50um)10m	00	Transceiver transmit distance
17	1	Length(62.5um)10m	00	Transceiver transmit distance
18	1	Length(Copper)	00	Not compliant
19	1	Length(50umOM3)	00	Not compliant
20-35	16	Vendor name	48 47 20 47 45 4E 55 49 4E 45 20 20 20 20 20 20	"FS" Vendor Name(ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	DA 28 EC	
40-55	16	VendorPN	4D 54 52 53 2D 32 54 37 37 2D 30 31 20 20 20 20	"DWDM-SFP10G-C"Part No.(ASCII)
56-59	4	Vendorrev	31 2E 30 20	"1.0" (ASCII)
60-61	2	Wavelength	Variable	Transceiver wavelength
62	1	Reserved	00	
63	1	CC_BASE	Variable	Check code for Base ID Fields
64-65	2	Options	7C FA	a cooled laser Power Level 4 a conventional limiting output paging is implemented the transceiver has an internal retimer or CDR RDT implemented Tunable transmitter (SFF-8690) RATE_SELECT TX_DISABLE TX_FAULT Rx_LOS
66	1	BR,MAX	0A	11.3G

67	1	BR,MIN	12	8.5G
68-83	16	Vendor SN	SN(Variable)	Serial Number of transceiver(ASCII).
84-91	8	Date code	DC(Variable)	Manufactory Date Code.
92	1	Diagnostic MonitoringType	60	Digital diagnostic monitoring Internally calibrated OMA
93	1	Enhanced Options	FA	soft Rate Select Alarm/warning flags soft TX_DISABLE soft TX_FAULT soft RX_LOS soft RATE_SELECT
94	1	SFF_8472 Compliance	09	functionality described in Rev 12.4 of SFF-8472
95	1	CC_EXT	CS(Variable)	Check sum for Extended ID Field.

XIV. Memory contents of Diagnostic Monitor Function(A2h)

Addr.	FieldSize	NameofField	Description
	(Bytes)		
00-01	2	Temperature High Alarm	95°C
02-03	2	Temperature Low Alarm	-15 °C
04-05	2	Temperature High Warning	85°C
06-07	2	Temperature Low Warning	-5 °C
08-09	2	Vcc High Alarm	3.63V
10-11	2	Vcc Low Alarm	2.97V
12-13	2	Vcc High Warning	3.465V
14-15	2	Vcc Low Warning	3.135V
16-17	2	Bias High Alarm	80mA
18-19	2	Bias Low Alarm	0mA
20-21	2	Bias High Warning	70mA
22-23	2	Bias Low Warning	0mA
24-25	2	TX Power High Alarm	5dBm
26-27	2	TX Power Low Alarm	-3dBm
28-29	2	TX Power High Warning	3dBm
30-31	2	TX Power Low Warning	-1dBm
32-33	2	RX Power High Alarm	-5dBm
34-35	2	RX Power Low Alarm	-25dBm
36-37	2	RX Power High Warning	-7dBm
38-39	2	RX Power Low Warning	-23dBm

XV. Ordering Information

PartNo	Specification								
	Pack	Rate	Tx	Pout	Rx	S	Top	Reach	Others
DW-SFP10G-80-C	SFP+	10G	DWDM	-1~3dBm	APD	<-23dBm	0 - 70°C	80km	DDM/RoHS