

10G BIDI SFP+ Transceiver Series

MBS-1C41-27/33



Features

- Up to 15km transmission on SMF
- Support Multi Rate 2.5~10.3Gbps
- 1270/1330 DFB transmitter, PIN photo-detector
- Single LC connector for bi-directional application
- SFI electrical interface
- 2-wire interface for integrated Digital Diagnostic monitoring
- Very low EMI and excellent ESD protection
- Hot pluggable
- +3.3V power supply
- Power consumption less than 1.2W
- ROHS compliant
- Operating case temperature:-40~+85°C

Applications

- High-speed storage area networks
- Computer cluster cross-connect
- Custom high-speed data pipes
- Wireless CPRI

Compliance

- Compliant with IEEE 802.3ae-2002
- Compliant with SFF-8431 & SFF-8432 & SFF 8472
- Compliant with FC-PI-4

Description

MBS-1C41-27/33 is a high performance, cost effective modules, which is supporting Multi Rate 2.5~10.3Gbps, and transmission distance up to 15km.

The transceiver consists of two sections: The BOSA section incorporates a DFB Laser and a PIN-TIA with a coarse WDM function of 1270nm and 1330nm. The PCB section consists of a MCU, a LD Driver and a post amplifier. The module is hot pluggable into the 20-pin connector. The high-speed electrical interface is base on low voltage logic, with nominal 100 Ohms 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. Digital diagnostics function are available via a 2-wire serial interface, as specified in SFF-8472.

Operating Conditions

Absolute Maximum Ratings					
Parameter	Symbol	Min.	Max.	Unit	
Storage Temperature	TS	-40	+85	°C	
Operating Case Temperature	TC	-40	+85	°C	
Relative Humidity (Non-condensing)	RH	5	+95	%	
Supply Voltage	VCC3	0	3.63	V	

Recommended Operating Conditions					
Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	TC	-40	-	85	°C
Power Supply Voltage	VCC3	3.13	3.3	3.47	V
Power Supply Current	ICC3	-	-	345	mA
Power Dissipation	PD	-	-	1.2	W
Data Rate	DR	2.5	-	10.3	Gbps
Transmission Distance	TD	15	-		Km

Operating Characteristics

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Transmitter Operating Characteristic- Optical, Electrical						
Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Center Wavelength(MBS-1C41-27)	λ_c	1260	1270	1280	nm	
Center Wavelength(MBS-1C41-33)	λ_c	1320	1330	1340	nm	
-20dB Spectral width	SW	-	-	1	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Optical Power for TX DISABLE	Poff	-	-	-30	dBm	
Average Optical Power	Pavg	-8.2	-	0.5	dBm	1
Extinction Ratio	ER	3.5	-	-	dB	
Optical Return Loss	ORL	12	-	-	dB	
Operating Data Rate	DR	2.5	-	10.3	Gbps	
Optical Eye Mask (1000 consecutive snapshots)	-	5%	-	-	-	
TX Input Diff Voltage	VI	180	-	700	mV	

Receiver Operating Characteristic- Optical, Electrical

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Center Wavelength(MBS-1C41-27)	λ_c	1320	1330	1340	nm	
Center Wavelength(MBS-1C41-33)	λ_c	1260	1270	1280	nm	
Receive Sensitivity	Psens	-	-	-14.4	dBm	1
Los Assert	LosA	-30	-	-	dBm	
Los Dessert	LosD	-	-	-16	dBm	
Los Hysteresis	LosH	0.5	-	6	dB	
Overload	OL	0.5	-	-	dBm	1
Operating Data Rate	DR	2.5	-	10.3	Gbps	
Rx Output Diff Voltage	Vo	300	-	850	mV	

Notes:

1. Average optical power shall be measured using the methods specified in TIA/EIA-455-95.

Digital Diagnostic Functions

Parameter	Symbol	Min.	Max.	Unit	Note
Temperature monitor absolute error	DMI_Temp	-3	3	°C	Over operating temperature
Laser power monitor absolute error	DMI_TX	-2	2	dB	
RX power monitor absolute error	DMI_RX	-2	2	dB	0.5dBm to -18dBm range
Supply voltage monitor absolute error	DMI_VCC	-3%	3%	V	Full operating range
Bias current monitor absolute error	DMI_Ibias	-10%	10%	mA	

Control and Status I/O Timing Characteristics

Parameter	Symbol	Min.	Max.	Unit	Note
TX Disable Assert Time	t_off	-	10	μs	1
TX Disable Negate Time	t_on	-	1	ms	2
Time to initialize including reset of TX_Fault	t_init	-	300	ms	3
TX Fault Assert Time	t_fault	-	100	us	4
TX Fault Reset	t_reset	10	-	μs	5
LOS Assert Time	t_loss_on	-	100	μs	6
LOS Deassert Time	t_loss_off	-	100	μs	7
Two-wire serial interface Clock rate	f_serial_clock	-	400	kHz	

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. Time from fault to TX fault on
5. Time TX Disable must be held high to reset TX_fault
6. Time from LOS state to RX LOS assert
7. Time from non-LOS state to RX LOS deassert.

Pin-out Definition

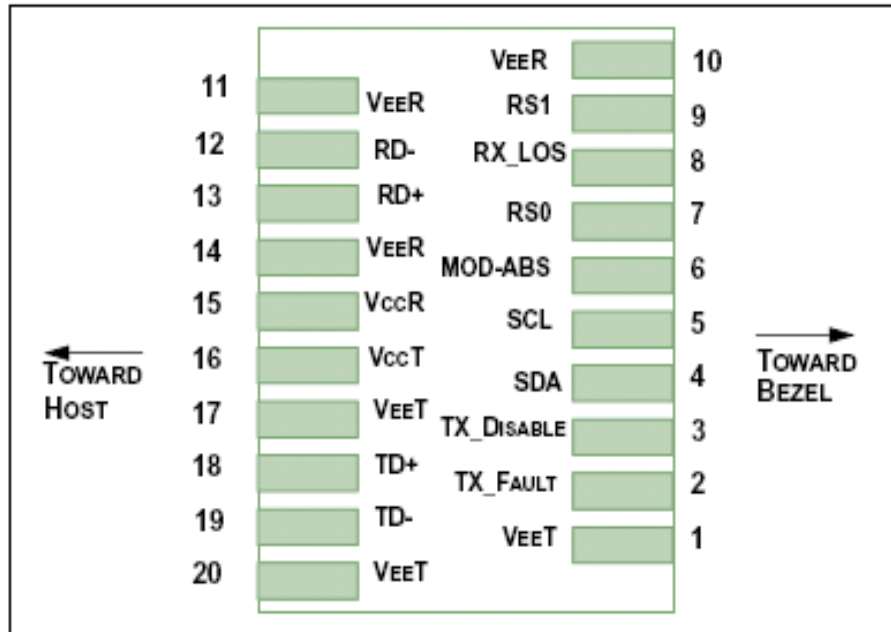


Figure1

Pin Assignment

Pin	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	Not used	
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 at Signal Detect)	Note2
9	LVTTTL-I	RS1	Not used	
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	
17		VeeT	Module Transmitter Ground	Note1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	

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 $V_{ccT/R} + 0.5$ 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.

Block Diagram of Transceiver

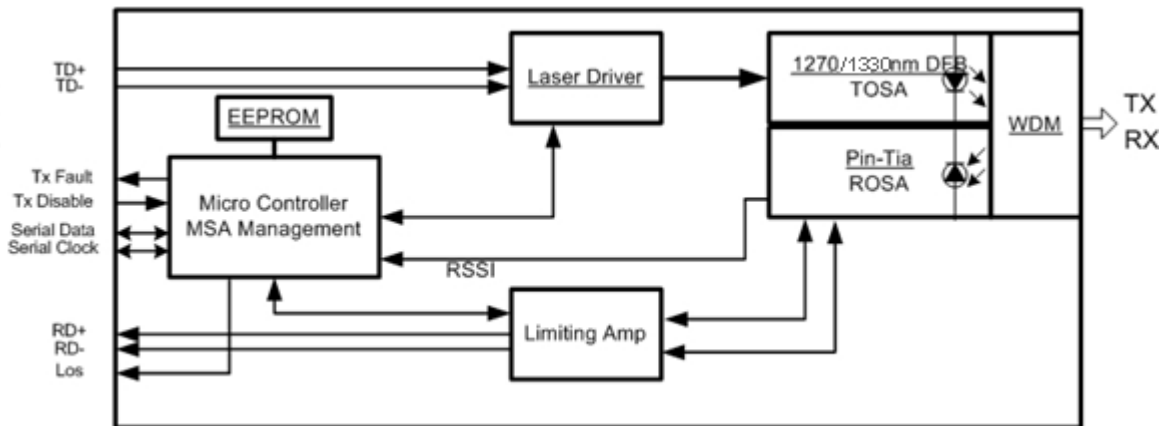


Figure2

Transmitter Section

The transmitter converts 10Gbit/s serial PECL or CML electrical data into serial optical data compliant with the IEEE802.3 standard. 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. The transmitter has an internal automatic power control loop (APC) to ensure constant optical power output across supply voltage and temperature variations. 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.

Recommended Interface Circuit

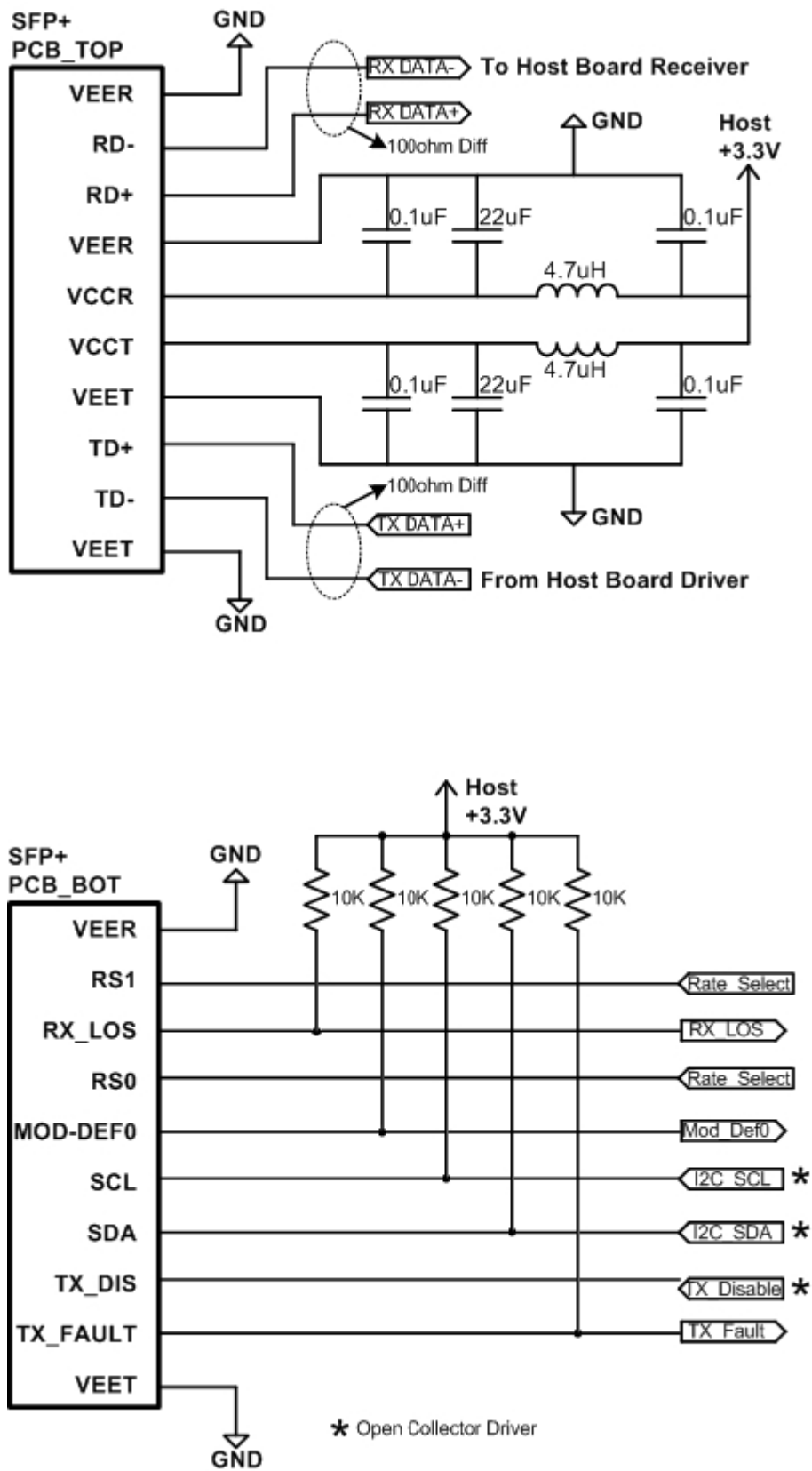


Figure3

Dimensions

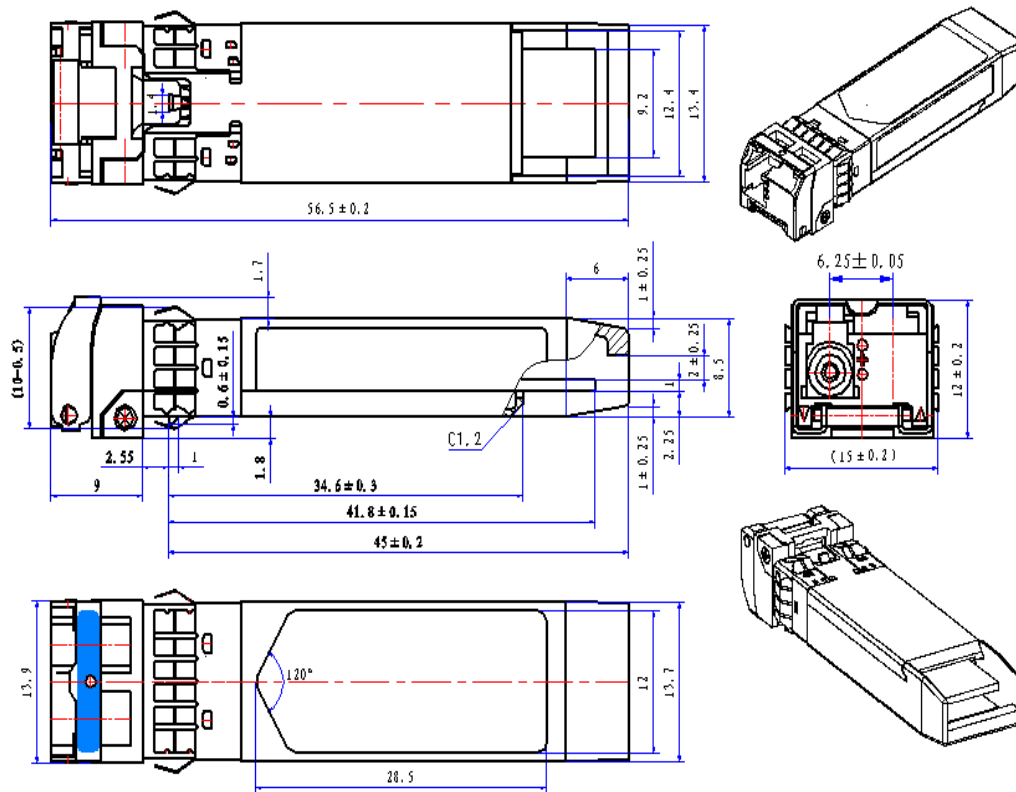
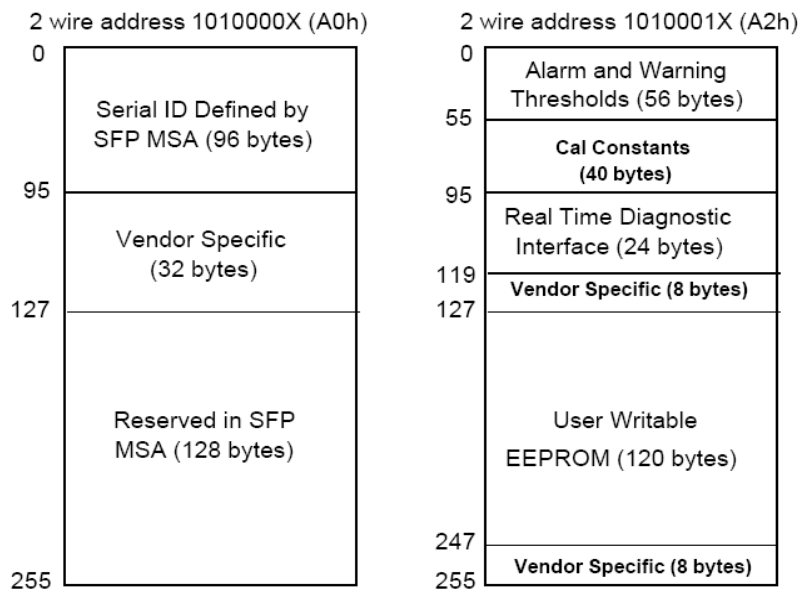


Figure4

Digital Diagnostic Memory Map



EEPROM definitions

Serial ID Memory Contents(A0h)

Data Address	Size (Bytes)	Name of Field	Hex	Description
0	1	Identifier	03	SFP "Plus"
1	1	Ext.Identifier	04	GBIC/SFP Function is defined by two-wire interface ID only
2	1	Connector	07	LC Connector
3-10	8	Transceiver	20 00 00 00 00 00 00 00	10G Base-LR
11	1	Encoding	06	64B/66B
12	1	BR, Nomina	67	10.3Gbps
13	1	Rate Identifier	00	No rate-select pin
14	1	Length(SMF, km)	0F	15km
15	1	Length(SMF)	96	15km
16	1	Length(50um)	00	not support
17	1	Length(62.5um)	00	not support
18	1	Length(Copper)	00	not support

19	1	Length(OM3)	00	not support
20-35	16	Vendor name	48 47 20 47 45 4E 55 49 4E 45 20 20 20 20 20 20	"HG GENUINE" Vendor Name(ASCII)
36	1	Transceiver	00	Unallocated
37-39	3	Vendor OUI	00 00 00	SFP vendor IEEE company ID
40-55	16	Vendor PN	4D 42 53 2D 31 43 34 31 2D 32 37 20 20 20 20 20	MBS-1C41-27 (ASCII)
			4D 42 53 2D 31 43 35 31 2D 33 33 20 20 20 20 20	MBS-1C51-33 (ASCII)
56-59	4	Vendor rev	31 2E 30 20	"1.0" (ASCII)
60-61	2	Wavelength	04 F6	1270 nm
			05 32	1330 nm
62	1	Unallocated	00	
63	1	CC_BASE	Checksum(Variable)	Check code (0 to 62)
64-65	2	Options	00	Uncoold LD, Power Level 1, Limiting Receiver Output
			1A	TxDisable, TxFault , Rx_LOS implemented
66	1	BR, max	00	Upper bit rate margin, units of %
67	1	BR, min	4B	Lower bit rate margin, units of %
68-83	16	Vender SN	SN(Variable)	Serial number provided by vendor (ASCII)
84-91	8	Date code	DC(Variable)	Vendor's manufacturing date code
92	1	Diagnostic Monitoring Type	68	Digital diagnostic monitoring, Internally calibrated

93	1	Enhanced Options	B0	Alarm/Warning flags, Soft TxFault, Soft RxLOS implemented
94	1	SFF-8472 Compliance	08	Includes functionality described in Rev 12.0 of SFF-8472
95	1	CC_EXT	Checksum(Variable)	Check code (64 to 94)
96-127	32	Vendor Specific		
128-255	128	Reserved	Read only	

Diagnostic Monitor Functions(A2)

Data Address	Field Size (bytes)	Name	Contents and Description
Alarm and Warning Thresholds			
00-01	2	Temperature High Alarm	Set to 93°C
02-03	2	Temperature Low Alarm	Set to -48°C
04-05	2	Temperature High Warning	Set to 88°C
06-07	2	Temperature Low Warning	Set to -43°C
08-09	2	Vcc High Alarm	Set to 3.63 V
10-11	2	Vcc Low Alarm	Set to 2.97V
12-13	2	Vcc High Warning	Set to 3.498V
14-15	2	Vcc Low Warning	Set to 3.102V
16-17	2	Bias High Alarm	Set to 110mA
18-19	2	Bias Low Alarm	Set to 2mA
20-21	2	Bias High Warning	Set to 100mA
22-23	2	Bias Low Warning	Set to 3mA
24-25	2	TX Power High Alarm	Set to 2.5dBm
26-27	2	TX Power Low Alarm	Set to -10.2dBm
28-29	2	TX Power High Warning	Set to 1.5dBm
30-31	2	TX Power Low Warning	Set to -9.2dBm

32-33	2	RX Power High Alarm	Set to 2.5dBm
34-35	2	RX Power Low Alarm	Set to -16.4dBm
36-37	2	RX Power High Warning	Set to 1.5dBm
38-39	2	RX Power Low Warning	Set to -15.4 dBm
40-55	16	Reserved	-
Calibration Constants			
56-59	4	RX Power Calibration Data4	00 00 00 00
60-63	4	RX Power Calibration Data3	00 00 00 00
64-67	4	RX Power Calibration Data2	00 00 00 00
68-71	4	RX Power Calibration Data1	3F 80 00 00
72-75	4	RX Power Calibration Data0	00 00 00 00
76-77	2	Bias Calibration Data1	01 00
78-79	2	Bias Calibration Data0	00 00
80-81	2	TX Power Calibration Data1	01 00
82-83	2	TX Power Calibration Data0	00 00
84-85	2	Temperature Calibration Data1	01 00
86-87	2	Temperature Calibration Data0	00 00
88-89	2	VCC Calibration Data1	01 00
90-91	2	VCC Calibration Data0	00 00
92-94	3	Reserved	00 00 00
95	1	Check Sum	Checksum of bytes 0-94
96-97	2	Measured Temperature	Internally measured module temperature
98-99	2	Measured Vcc	Internally measured supply voltage in transceiver
100-101	2	Measured Bias	Internally measured TX Bias Current
102-103	2	Measured TX Power	Measured TX output power
104-105	2	Measured RX Power	Measured RX input power.
106-109	4	Unallocated	Reserved for future diagnostic definitions
	7	1	Tx Disable State supported

110	6		Soft TX Disable Select	supported
	5		RS State	Not supported
	4		Rate Select State	Not supported
	3		Soft Rate Select Select	Not supported
	2		TX Fault State	Optional digital state of the Tx Fault output pin.
	1		Rx_LOS State	Optional digital state of the LOS output pin.
	0		Data_Ready_Bar State	Indicates transceiver has achieved power up and data is ready. Bit remains high until data is ready to be read at which time the device sets the bit low.
111	1	Reserved	Reserved for SFF-8079	
112-119	8	Alarm and Warning Flags	Compliant with SFF-8472	
Vendor Specific				
120-127	8	Vendor Specific	Vendor specific memory addresses	
128-247	120	User writable EEPROM	-	
248-255	8	Vendor Specific	Vendor specific control functions	

Ordering Information

Part No.	Specification								
	Pack	Rate	Tx	Pout	Rx	S	Top	Reach	Others
MBS-1C41-27	SFP+	10G	1270nm DFB	-8.2—0.5dBm	PIN-TIA	<-14.4dBm	-40~85℃	15km	DDM/RoHS
MBS-1C41-33	SFP+	10G	1330nm DFB	-8.2—0.5dBm	PIN-TIA	<-14.4dBm	-40~85℃	15km	DDM/RoHS

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