

6G SFP+ Transceiver

MTRS-6A11-01

Features

- Support Multi Rate 1.228-6.144Gbps
- Up to 300m transmission distance on 50µm OM3 MMF or 120m transmission distance on 50µm OM2 MMF.
- 850nm VCSEL and PIN receiver
- SFI electrical interface
- 2-wire interface for integrated Digital Diagnostic monitoring
- SFP+ MSA package with duplex LC connector
- Hot pluggable
- Very low EMI and excellent ESD protection
- +3.3V power supply
- Power consumption less than 1W
- Operating case temperature: -40~+85°C

Applications

- CPRI/ OBSAI/FC
- Other optical links

Compliance

- Compliant with SFP+ MSA
- Compliant with IEEE 802.3ae-2002
- Compliant with SFF-8472
- RoHS compliance



Description

MTRS-6A11-01 is a high performance, cost effective modules, which is optimized for 6.144G CPRI application, and transmission distance up to 300m on OM3 MMF , or 120m transmission distance on OM2 MMF. The transceiver consists of two sections: The transmitter section incorporates an 850nm VCSEL driver. The receiver section consists of a PIN 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 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. 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.

Specification

Absolute Maximum Ratings				
Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _s	-40	+85	°C
Supply Voltage	V _{CC3}	0	3.6	V
Relative Humidity(Non-condensing)	RH	5	85	%
RX Input Average Power	P _{max}	-	0	dBm

Recommended Operating Conditions						
Parameter	Symbol	Min.	Typical	Max.	Unit	
Operating Case Temperature	T _c	-40		85	°C	
Power Supply Voltage	V _{CC3}	3.135	3.3	3.465	V	
	I _{CC3}			300	mA	
Power Dissipation	P _D			1	W	
Data Rate	R	1.228		6.144	Gbps	
Transmission Distance				300	m	OM3
				120	m	OM2

Transmitter Operating Characteristic-Optical, Electrical							
Parameter	Symbol	Min.	Typical	Max.	Unit	Note	
Center Wavelength	λ _c	840	850	860	nm	Note1	
RMS Spectral width		-	-	0.65	nm		
Optical Power for TX DISABLE	P _{off}	-	-	-30	dBm		
Output average power(EOL)	P _{avg}	-9	-	-1	dBm		
Optical Modulation Amplitude	OMA	-5.2	-	-	dBm		
Extinction Ratio	ER	3	-	-	dB		
Transmitter Dispersion Penalty	TDP	-	-	3.7	dB		
Relative Intensity Noise	R _{in}	-	-	-128	dB/Hz		
Optical Return Loss Tolerance		-	-	12	dB		
Operating Data Rate		1.228		6.144	Gbps		
Optical Eye Mask		Compliant with IEEE 802.3ae					
Optical Eye Margin		5%					
Differential data input swing	V _I	180		1200	mV		
Transmit Disable Voltage	V _{DIS}	2.4		V _{CC}	V		
Transmit Enable Voltage	V _{EN}	-0.3		0.4	V		
Transmit Fault Assert Voltage	V _{FA}	2.4		V _{CC}	V		
Transmit Fault De-Assert Voltage	V _{FDA}	-0.3		0.4	V		

Notes:

Tel: +86-27-87180102 Fax: +86-27-87180220 Email: market@genuine-opto.com

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

Receiver Operating Characteristic-Optical, Electrical						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Center Wavelength	λ_r	840	850	860	nm	
Receiver Sensitivity (EOL)				-9.9	dBm	Note1
Receiver Sensitivity (OMA EOL)				-11.1	dBm	
Stressed Receiver Sensitivity(OMA EOL)				-7.5		
Los Assert	LosA	-30		-	dBm	
Los Dessert	LosD			-13	dBm	
Los Hysteresis	LosH	0.5		-	dB	
Overload	Pin			-1	dBm	
Receiver Reflectance				-12	dB	
Operating Data Rate	R	1.228		6.144	Gbps	
RX Squelch		deactivated				
Differential data output swing	Vo	370		850	mV	

Notes:

[1] Receiver sensitivity is informative. shall be measured with conformance test signal for BER = 1×10^{-12} .

Control and Status I/O Timing Characteristics					
Parameter	Symbol	Min	Max.	Unit	Note
TX Disable Assert Time	t_off		100	μ s	Note1
TX Disable Negate Time	t_on		2	ms	Note2
Time to initialize including reset of TX_Fault	t_init		300	ms	Note3
TX Fault Assert Time	t_fault		1	ms	Note4
Tx_Fault Reset	t_reset	10		μ s	Note5
LOS Assert Time	t_loss_on		100	μ s	Note6
LOS Deassert Time	t_loss_off		100	μ s	Note7
Serial ID Clock Rate	f_serial_clock	100	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.

[8] Time from rising or falling edge of Rate Select input until receiver bandwidth is in conformance with appropriate specification

Pin-out Definition

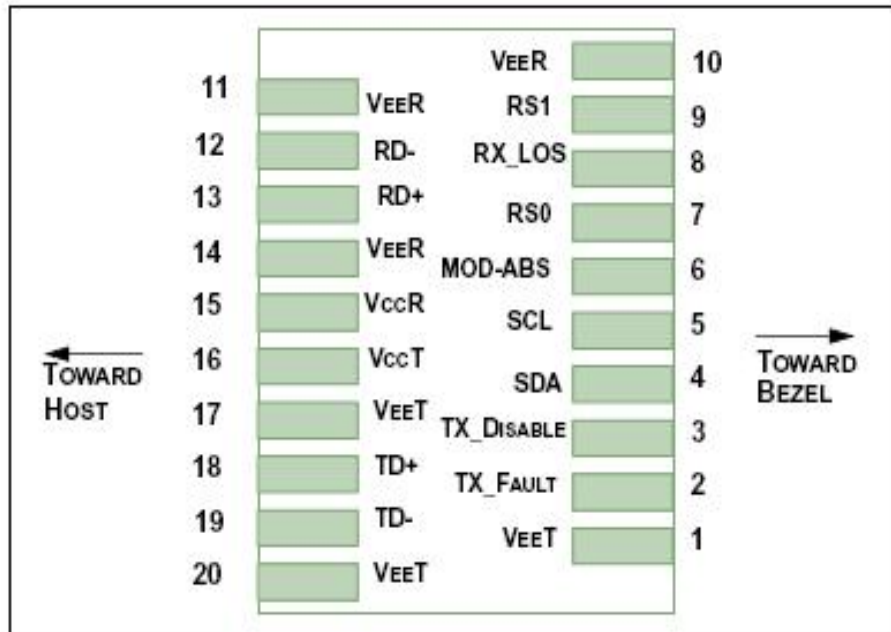


Figure1

Pin Assignment

Pin	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	Note1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	Note2
3	LVTTL-I	TX_Disable	Transmitter Disable; Turns off transmitter laser output	Note3
4	LVTTL-I/O	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 as defined in the INF-8074i)	Note4
5	LVTTL-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	LVTTL-I	RS0	Not used	
8	LVTTL-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	LVTTL-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 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.

Block Diagram of Transceiver

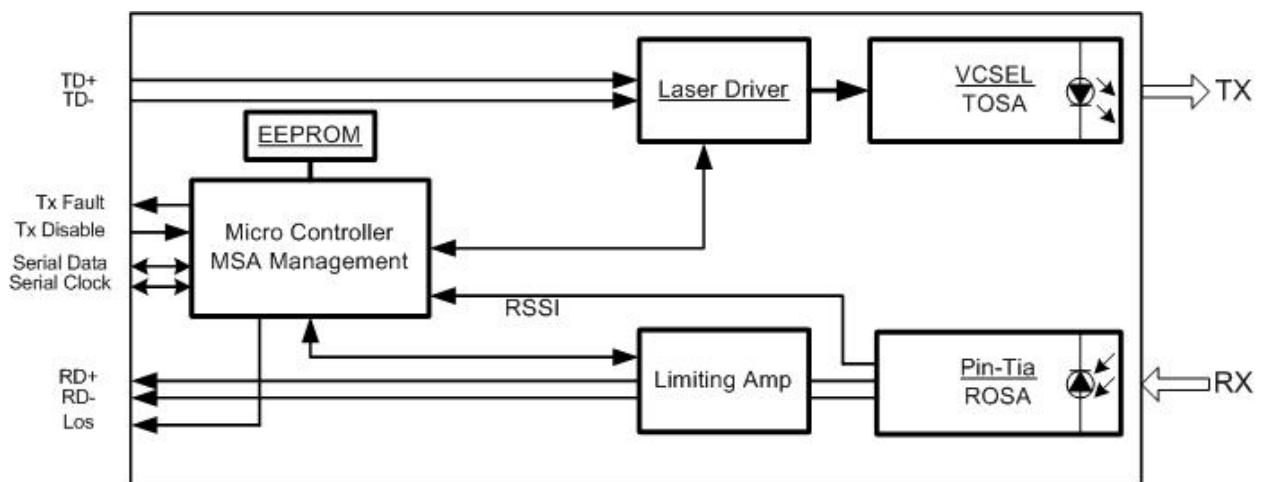


Figure2

Transmitter Section

The transmitter converts 6Gbit/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. 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 6Gbit/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 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

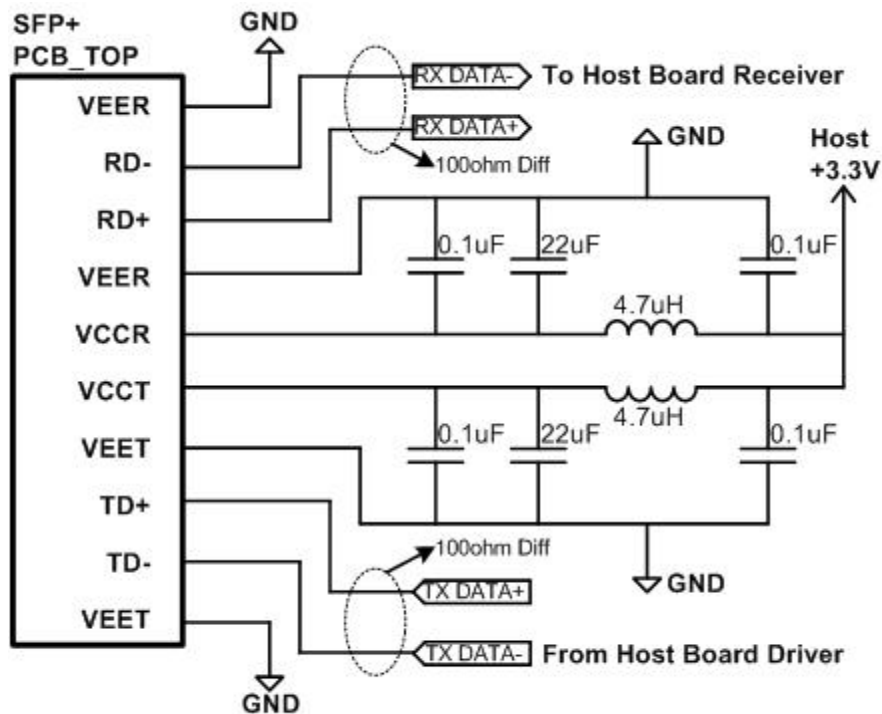


Figure3

Dimensions

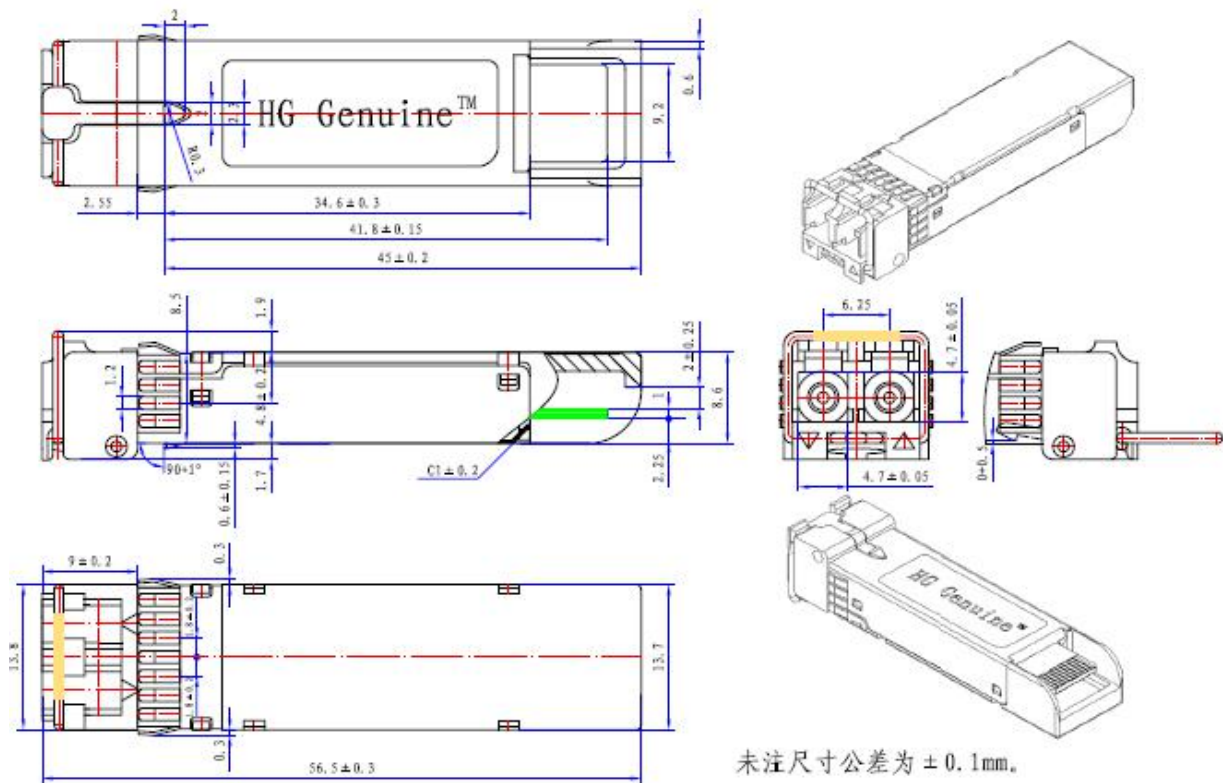
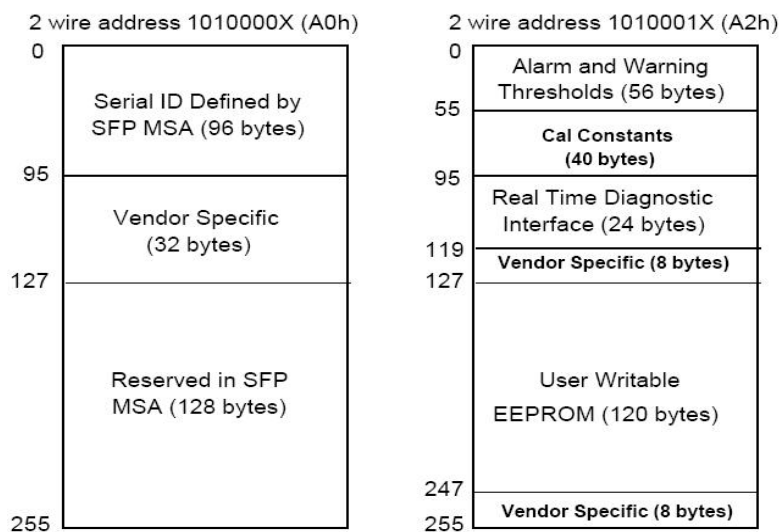


Figure4

Digital Diagnostic Memory Map



EEPROM Information (A0h)

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
0	1	Identifer	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	Transceiver Codes
11	1	Encoding	01	8B/10B
12	1	BR, Nominal	3F	6300Mb/s
13	1	Rate Identifier	00	Unspecified
14	1	Length (9um) km	00	Transceiver transmit distance
15	1	Length (9um) 100m	00	Transceiver transmit distance
16	1	Length (50um)10m	0C	Transceiver transmit distance,120m
17	1	Length (62.5um) 10m	05	Transceiver transmit distance 50m
18	1	Length (Copper)	00	Not compliant
19	1	Length (50um OM3)	1E	Transceiver transmit distance,300m
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	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN	4D 54 52 53 2D 36 41 31 31 2D 30 31 20 20 20 20	"MTRS-6A11-01"Part No.(ASCII)
56-59	4	Vendor rev	31 2E 30 20	"1.0" (ASCII)
60-61	2	Wavelength	03 52	Transceiver wavelength
62	1	Reserved	00	
63	1	CC_BASE	55	Check code for Base ID Fields
64-65	2	Options	00 1A	TX_DISABLE, TX_FAULT and Loss of Signal implemented.
66	1	BR,MAX	00	Not Specified
67	1	BR,MIN	00	Not Specified
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 Monitoring Type	68	Digital diagnostic monitoring implemented, "Internally calibrated" is implemented
93	1	Enhanced Options	F0	Optional Alarm/Warning flags implemented for all monitored quantities, Optional Soft TX_Disable control and monitoring implemented, Optional Soft TX_FAULT monitoring

				implemented, Optional Soft RX_LOS monitoring implemented
94	1	SFF_8472 Compliance	04	Includes functionality described in Rev10.4 SFF-8472
95	1	CC_EXT	CS(Variable)	Check sum for Extended ID Field.
96-127	32	Vendor Specific	Read only	Depends on customer information Filled by zero
128-255	128	Reserved	Read only	Filled by zero

Diagnostic Monitor Functions

Diagnostic Monitor Functions interface uses the 2 wire address 1010001X (A2). Memory contents of Diagnostic Monitor Functions are shown in Table 2.

Table 2 Memory contents of Diagnostic Monitor Function

Address	Field Size (Byte)	Bits	Name of Field	Description
00~01	2	ALL	Temp High Alarm Thresholds	MSB at low address,95°C
02~03	2	ALL	Temp Low Alarm Thresholds	MSB at low address,-50°C
04~05	2	ALL	Temp High Warning Thresholds	MSB at low address,85°C
06~07	2	ALL	Temp Low Warning Thresholds	MSB at low address,-40°C
08~09	2	ALL	Voltage High Alarm Thresholds	MSB at low address,3.63V
10~11	2	ALL	Voltage Low Alarm Thresholds	MSB at low address,2.97V
12~13	2	ALL	Voltage High Warning Thresholds	MSB at low address,3.465V
14~15	2	ALL	Voltage Low Warning Thresholds	MSB at low address,3.135V
16~17	2	ALL	Bias High Alarm Thresholds	MSB at low address,12mA
18~19	2	ALL	Bias Low Alarm Thresholds	MSB at low address,0.5mA
20~21	2	ALL	Bias High Warning Thresholds	MSB at low address,11mA
22~23	2	ALL	Bias Low Warning Thresholds	MSB at low address,1mA
24~25	2	ALL	TX Power High Alarm Thresholds	MSB at low address,1dBm
26~27	2	ALL	TX Power Low Alarm Thresholds	MSB at low address,-11dBm
28~29	2	ALL	TXPower High Warning Thresholds	MSB at low address, -1dBm
30~31	2	ALL	TX Power Low Warning Thresholds	MSB at low address, -9dBm
32~33	2	ALL	RX Power High Alarm Thresholds	MSB at low address,1dBm
34~35	2	ALL	RX Power Low Alarm Thresholds	MSB at low address,-11.9dBm
36~37	2	ALL	RXPower High Warning Thresholds	MSB at low address,-1dBm
38~39	2	ALL	RXPower Low Warning Thresholds	MSB at low address, -9.9dBm
40~55	16	ALL	Reserved	
56~59	4	ALL	Rx_PWR(4)	Single precision floating point calibration data - Rx optical power. Bit7 of byte 56 is MSB. Bit 0 of byte 59 is LSB. For “internally calibrated” devices, Rx_PWR(4) should be set to zero , and useless.

Address	Field Size (Byte)	Bits	Name of Field	Description
60~63	4	ALL	Rx_PWR(3)	Single precision floating point calibration data - Rx optical power. Bit 7 of byte 60 is MSB. Bit 0 of byte 63 is LSB. For “internally calibrated” devices, Rx_PWR(3) should be set to zero , and useless.
64~67	4	ALL	Rx_PWR(2)	Single precision floating point calibration data, Rx optical power. Bit 7 of byte 64 is MSB, bit 0 of byte 67 is LSB. For “internally calibrated” devices, Rx_PWR(2) should be set to zero, and useless .
68~71	4	ALL	Rx_PWR(1)	Single precision floating point calibration data, Rx optical power. Bit 7 of byte 68 is MSB, bit 0 of byte 71 is LSB. For “internally calibrated” devices, Rx_PWR(1) should be set to 1 , and useless.
72~75	4	ALL	Rx_PWR(0)	Single precision floating point calibration data, Rx optical power. Bit 7 of byte 72 is MSB, bit 0 of byte 75 is LSB. For “internally calibrated” devices, Rx_PWR(0) should be set to zero , and useless.
76~77	2	ALL	Tx_I(Slope)	Fixed decimal (unsigned) calibration data, laser bias current. Bit 7 of byte 76 is MSB, bit 0 of byte 77 is LSB. For “internally calibrated” devices, Tx_I(Slope) should be set to 1, and useless.
78~79	2	ALL	Tx_I(Offset)	Fixed decimal (signed two’s complement) calibration data, laser bias current. Bit 7 of byte 78 is MSB, bit 0 of byte 79 is LSB. For “internally calibrated” devices, Tx_I(Offset) should be set to zero , and useless.
80~81	2	ALL	Tx_PWR(Slope)	Fixed decimal (unsigned) calibration data, transmitter coupled output power. Bit 7 of byte 80 is MSB, bit 0 of byte 81 is LSB. For “internally calibrated” devices, Tx_PWR(Slope) should be set to 1 , and useless.
82~83	2	ALL	Tx_PWR(Offset)	Fixed decimal (signed two’s complement) calibration data, transmitter coupled output power. Bit 7 of byte 82 is MSB, bit 0 of byte 83 is LSB. For “internally calibrated” devices, Tx_PWR(Offset) should be set to

Address	Field Size (Byte)	Bits	Name of Field	Description
				zero , and useless.
84~85	2	ALL	T (Slope)	Fixed decimal (unsigned) calibration data, internal module temperature. Bit 7 of byte 84 is MSB, bit 0 of byte 85 is LSB.For “internally calibrated” devices, T(Slope) should be set to 1 , and useless.
86~87	2	ALL	T (Offset)	Fixed decimal (signed two’s complement) calibration data, internal module temperature. Bit 7 of byte 86 is MSB, bit 0 of byte 87 is LSB. For “internally calibrated” devices, T(Offset) should be set to zero , and useless.
88~89	2	ALL	V (Slope)	Fixed decimal (unsigned) calibration data, internal module supply voltage. Bit 7 of byte 88 is MSB, bit 0 of byte 89 is LSB. For “internally calibrated” devices, V(Slope)should be set to 1 , and useless.
90~91	2	ALL	V (Offset)	Fixed decimal (signed two’s complement) calibration data, internal module supply voltage. Bit 7 of byte 90 is MSB. Bit 0 of byte 91 is LSB. For “internally calibrated” devices, V(Offset) should be set to zero , and useless.
92~94	3	ALL	Reserved	Reserved
95	1	ALL	Checksum	Byte 95 contains the low order 8 bits of the sum of bytes 0 – 94.
96	1	ALL	Temperature MSB	Internally measured module temperature.
97	1	ALL	Temperature LSB	
98	1	ALL	Vcc MSB	Internally measured supply voltage in transceiver.
99	1	ALL	Vcc LSB	
100	1	ALL	TX Bias MSB	Internally measured TX Bias Current.
101	1	ALL	TX Bias LSB	
102	1	ALL	TX Power MSB	Measured TX output power.
103	1	ALL	TX Power LSB	
104	1	ALL	RX Power MSB	Measured RX input power.
105	1	ALL	RX Power LSB	
106~109	4	ALL	Reserved	Reserved
110	1	7	TX Disable State	Reserved

Address	Field Size (Byte)	Bits	Name of Field	Description
		6	Soft TX Disable	Read/write bit that allows software disable of laser. Writing '1' disables laser.
		5	Reserved	Reserved
		4	Rate Select State	Reserved
		3	Soft Rate Select	Reserved
		2	TX Fault	Tx Fail Status: 1=TX Fail; 0=TX Normal
		1	LOS	Reserved
		0	Data_Ready_Bar	Reserved
111	1	ALL	Reserved	Reserved
112	1	7	Temp High Alarm	Set when internal temperature exceeds high alarm level.
		6	Temp Low Alarm	Set when internal temperature is below low alarm level.
		5	Vcc High Alarm	Set when internal supply voltage exceeds high alarm level.
		4	Vcc Low Alarm	Set when internal supply voltage is below low alarm level.
		3	TX Bias High Alarm	Set when TX Bias current exceeds high alarm level.
		2	TX Bias Low Alarm	Set when TX Bias current is below low alarm level.
		1	TX Power High Alarm	Set when TX output power exceeds high alarm level.
		0	TX Power Low Alarm	Set when TX output power is below low alarm level.
113	1	7	RX Power High Alarm	Set when Received Power exceeds high alarm level.
		6	RX Power Low Alarm	Set when Received Power is below low alarm level.
		5	Reserved	Reserved
		4	Reserved	Reserved
		3	Reserved	Reserved
		2	Reserved	Reserved
		1	Reserved	Reserved
		0	Reserved	Reserved
114	1	ALL	Reserved	Reserved
115	1	ALL	Reserved	Reserved
116	1	7	Temp High Warning	Set when internal temperature exceeds high warning level.

Address	Field Size (Byte)	Bits	Name of Field	Description
		6	Temp Low Warning	Set when internal temperature is below low warning level.
		5	Vcc High Warning	Set when internal supply voltage exceeds high warning level.
		4	Vcc Low Warning	Set when internal supply voltage is below low warning level.
		3	TX Bias High Warning	Set when TX Bias current exceeds high warning level.
		2	TX Bias Low Warning	Set when TX Bias current is below low warning level.
		1	TX Power High Warning	Set when TX output power exceeds high warning level.
		0	TX Power Low Warning	Set when TX output power is below low warning level.
117	1	7	RX Power High Warning	Set when Received Power exceeds high warning level.
		6	RX Power Low Warning	Set when Received Power is below low warning level.
		5	Reserved	Reserved
		4	Reserved	Reserved
		3	Reserved	Reserved
		2	Reserved	Reserved
		1	Reserved	Reserved
		0	Reserved	Reserved
118	1	ALL	Reserved	Reserved
119	1	ALL	Reserved	Reserved
120-127	8	ALL	Vendor Specific	Vendor Specific
128-247	120	ALL	User EEPROM	User writable EEPROM
248-255	8	ALL	Vendor Specific	Vendor Specific

数字诊断精度要求 DDM accuracy requirements		
Parameters	Unit	Requirements
温度/ temperature	℃	±3
电压/ voltage	V	±3%
偏置电流/ I _{bias}	mA	±10%
接收光功率/ Rx power	dB	±2
发送光功率/ Tx power	dB	±2

Ordering Information

Part No	Specification								
	Pack	Rate	Tx	Pout	Rx	Sensitivity (OMA)	Top	Reach	Others
MTRS-6A11-01	SFP+	6G	850nm VCSEL	-9~ -1dBm	PIN	<-11.1dBm	-40~85℃	300m	DDM/RoHS

Contact Information

Wuhan Huagong Genuine Optics Technology Co., Ltd

Address: Science & Technology Region of HUST, Donghu High-Tech Zone

Wuhan, Hubei Province, 430223, China

● Tel: +86-27-87180102

● Fax: +86-27-87180220

Email: market@genuine-opto.com

Website: <http://www.genuine-opto.com> www.sfp.by

Statement

HG Genuine possesses the authority for ultimate explanation of all information contained in this document, which is subject to change without prior notice. All the information was obtained in specific environments; and HG Genuine will not be responsible for verifying the products performance in customers' operating environments, neither liable for the performance of users' products. All information contained is only for the users' reference and shall not be considered as warranted characteristics. HG Genuine will not be liable for damages arising directly or indirectly from any use of the information contained in this document.

Publishing Date: 2015-06-02

Copyright © HG Genuine

All Right Reserved