



2X10 EPON OPTICAL MODULE



DDMI, RoHS

FEATURES:

- 2x10 pin SFF package with SC Receptacle
- 1310nm FP LD BM Transmitter @ 1250 Mbps
- 1490nm PIN-TIA CM Receiver @ 1250 Mbps
- Support DDMI
- WDM filter for Voice/Data FTTx ONT/ONU applications
- Single +3.3V power supply
- Control input and Rx Signal Detect output
- Operating temperature from 0°C to 70°C
- RoHS compliance

ORDERING INFORMATION

P/N	Mbps	LD/PD	Reach	Vol.	DDM	Burst Control	Temp
E1250-BDR5-F3C3-T2-D	1250	1310nm FP-LD 1490nm PIN-PD	20km via SMF	3.3V	Yes	Enable: Logic "1"	0-70C

E1250= EPON 1250Mbps	BDR5=2X10 SFF BIDI Receptacle	F3=FP 1310nm	T2= SD TTL AC-AC Coupling
		C3=20km, 3.3Volt	

APPLICATIONS

- Optical transceiver for Gigabit Ethernet Passive Optical Networks (EPON) ONU side.

STANDARDS

- IEEE802.3ah 1000BASE-PX20
- Small Form Factor Transceiver Multisource Agreement July 5,2000
- Compliant with SFF-8472 V9.5

DESCRIPTION

- The EPON ONU Transceiver module is designed for Gigabit Ethernet Passive Optical Network (EPON) 20km transmission. The module incorporates 1310nm burst-mode transmitter and 1490nm continuous-mode receiver.
- The transmitter section uses a 1310nm FP laser and an integrated burst-mode laser driver to perform burst enable/disable delay time. The laser driver also includes digital APC and temperature compensation circuit for keeping the launch optical power and extinction ratio constant over temperature and aging.
- The receiver section uses an integrated 1490nm PIN photodiode and preamplifier that indicates receiver signal-detected status (active high).



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit	
Operating Case Temperature Range	T _c	0	70	°C	
Storage Temperature Range	T _s	-40	85	°C	
Relative Humidity	RH	5	95	%	
Power Supply Voltage	V _{cc}	0	4.6	V	
Pin Input Voltage		GND	V _{cc}	V	
Receiver Damage Threshold		+4	–	dBm	
Lead Solder Temperature / Duration		–	350 / 5	°C / s	

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	T _c	0		+70	°C	
Ambient Humidity		5		90	%	Non-condensing
Power Supply Voltage	V _{cc}	3.13	3.3	3.47	V	
Power Supply Current	I _{cc}			400	mA	

SPECIFICATION OF TRANSMITTER

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Launched Power (EoL) into SMF	P _o	0.0		+4.0	dBm	
Optical Extinction Ratio	ER	10			dB	
Center Wavelength	λ _c	1280	1310	1350	nm	
-20dB Spectrum Width (RMS)	Δλ			3	nm	
Transmitter OFF Output Power	P _{off}			-45	dBm	
Optical Rise/Fall Time (unfiltered 20-80%)	t _r /t _f			260	ps	
Tx Enable / Disable	Ton/ Toff			16	bits	
Transmitter Reflectance				-12	dB	
Tolerance to the Transmitter's Incident Light Power		-15			dB	
Output Eye Mask	Compliant with IEEE 802.3ah					



SPECIFICATION OF RECEIVER

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Input Optical Wavelength	λ_{IN}	1480	1490	1500	nm	
Receiver Sensitivity (Measured with 1490nm, ER=10dB; BER =10^{-12} @ PRBS=2 ⁷ -1 NRZ)	P_{IN}			-27	dBm	
Input Saturation Power(Overload)	P_{SAT}	-3			dBm	
Signal Detect-Assert Power	P_A			-28	dBm	
Signal Detect-Deassert Power (When Signal Detect Deasserted, the data output is Low-level)	P_D	-44			dBm	
Signal Detect-Hysteresis	P_A-P_D	0.5		6	dB	

ELECTRICAL INTERFACE CHARACTERISTICS

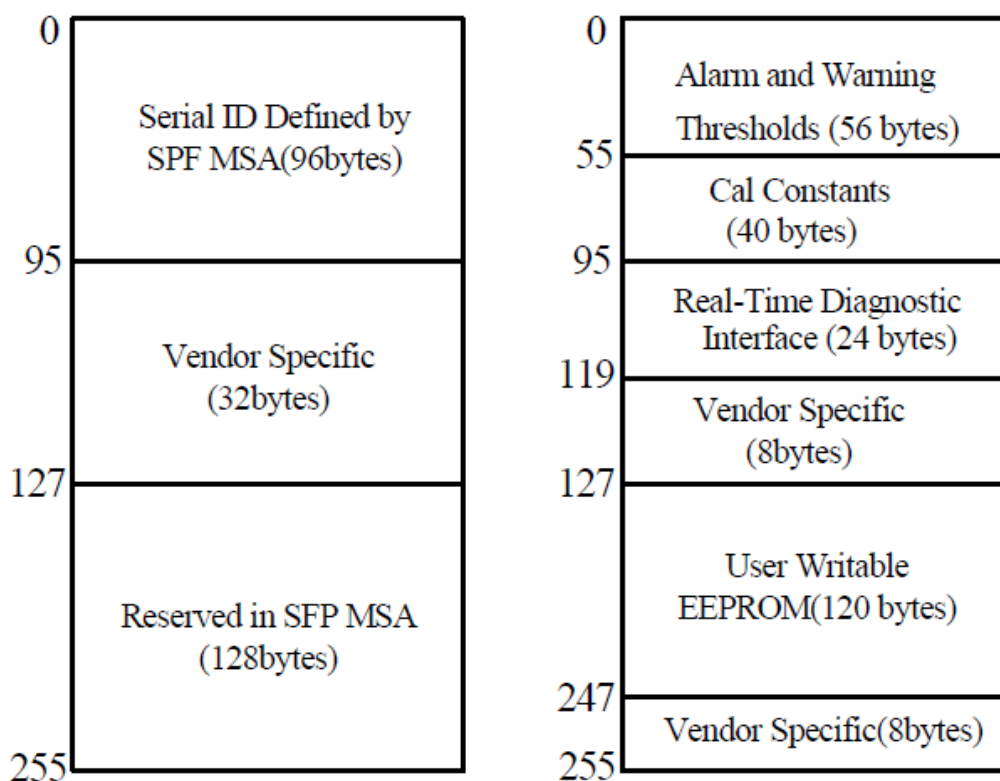
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Total Supply Current	I_{CC}			A	mA	** (1)
Differential line input Impedance	R_{IN}	90	100	110	Ohm	
LVPECL Single Ended Data Input Swing		100		800	mV _{p-p}	
CML Single Ended Data Output Swing		300		500	mV _{p-p}	
BiasCNT Input Voltage- High	V_{BCNTH}	2		V _{CC}		LVTTTL
BiasCNT Input Voltage- Low	V_{BCNTL}	0		0.8		
Receiver						
Total Supply Current	I_{CC}			B	mA	** (1)
Signal Detect Output Voltage- High	V_{LOSH}	2.4		V _{CC}	V	LVTTTL
Signal Detect Output Voltage- Low	V_{LOSL}	0		0.8	V	

** (1). A (TX)+ B (RX) = 300mA (Not include termination circuit)



ENHANCED DIGITAL DIAGNOSTIC INTERFACE

Following memory map describes an extension defined in SFF-8472 MSA. The enhanced interface uses 1010001X(A2h) to provide diagnostic information of the module operating conditions.





EEPROM Serial ID Memory Contents (2-Wire Address A0h)

Address	Name of Field	Hex	Description
Base ID Fields			
00	Identifier	02	SFF physical device(soldered device)
01	Ext. Identifier	FF	Reserved
02	Connector	01	SC
03-10	Transceiver Codes		Transceiver Codes
11	Encoding	01	8B10B
12	BR. Nominal	0C	Nominal 1244Mbps
13	Reserved	00	
14	Length (9μm)-km	14	20km @9/125μm fiber
15	Length (9μm)-100m	C8	20000m @9/125μm fiber
16-18	Length for MMF	00	Undefined
19	Reserved	00	
20-35	Vendor Name	57 41 4D 49 4E 20 20 20 20 20 20 20 20 20 20 20	“WAMIN”(ASCII character)
36	Channel Spacing	00	Undefined
37-39	Vendor OUI	00	Undefined
40-55	Vendor P/N	45 31 32 35 30 42 44 52 35 46 33 43 33 54 32 44	(ASCII character) E1250BDR5F3C3T2D
56-59	Vendor P/N Rev.	20 20 20 20	
60-61	Laser Wavelength	05 1E	1310nm in Hex byte
62	DWDM Wavelength Fraction	00	Undefined
63	CC BASE	XX	Check sum of bytes 0-62
Extended ID Fields			
64-65	Options	00 04	Signal Detect is implemented
66	BR. Max.	0A	10%
67	BR. Min.	0A	10%
68-83	Vendor SN	SN	Vendor serial number in ASCII character
84-91	Date Code	DC	Vendor date code in ASCII character
92	Diagnostic Monitoring Type	68	Implemented with internal calibration and received power measurement type by Avg. power
93	Enhanced options	B0	Alarm/Warning flags monitor are implemented
94	SFF-8472 compliant	02	SFF-8472 compliant with V. 9.5
95	CC_EXT	XX	Check sum of bytes 64-94
Vendor Specific ID Fields			
96-127	Vendor Specific	00	Vendor specific EEPROM
128-256	Reserved	00	Reserved for future use



DDM Interface (2-Wire Address A2h), Alarm and Warning Thresholds

Address	# Bytes	Name of Field	Real Value	Unit
00-01	2	Temp High Alarm	80	C
02-03	2	Temp Low Alarm	-10	C
04-05	2	Temp High Warning	70	C
06-07	2	Temp Low Warning	0	C
08-09	2	Voltage High Alarm	3.6	V
10-11	2	Voltage Low Alarm	3.0	V
12-13	2	Voltage High Warning	3.5	V
14-15	2	Voltage Low Warning	3.1	V
16-17	2	Bias High Alarm	70	mA
18-19	2	Bias Low Alarm	2	mA
20-21	2	Bias High Warning	60	mA
22-23	2	Bias Low Warning	4	mA
24-25	2	TX Power High Alarm	6.0	dBm
26-27	2	TX Power Low Alarm	-2.0	dBm
28-29	2	TX Power High Warning	4.0	dBm
30-31	2	TX Power Low Warning	0.0	dBm
32-33	2	RX Power High Alarm	0.0	dBm
34-35	2	RX Power Low Alarm	-29.0	dBm
36-37	2	RX Power High Warning	-3.0	dBm
38-39	2	RX Power Low Warning	-26.0	dBm
40-55	16	Reserved		

Calibration Constants (2 Wire Address A2h)

Address	# Bytes	Name of Field	HEX	Description
56-59	4	Rx_PWR (4)	00 00 00 00	Set to zero for "internally calibrated" devices.
60-63	4	Rx_PWR (3)	00 00 00 00	Set to zero for "internally calibrated" devices.
64-67	4	Rx_PWR (2)	00 00 00 00	Set to zero for "internally calibrated" devices.
68-71	4	Rx_PWR (1)	3F 80 00 00	Set to 1 for "internally calibrated" devices.
72-75	4	Rx_PWR (0)	00 00 00 00	Set to zero for "internally calibrated" devices.
76-77	2	Tx_I (Slope)	01 00	Set to 1 for "internally calibrated" devices.
78-79	2	Tx_I (Offset)	00 00	Set to zero for "internally calibrated" devices.
80-81	2	Tx_PWR (Slope)	01 00	Set to 1 for "internally calibrated" devices.
82-83	2	Tx_PWR (Offset)	00 00	Set to zero for "internally calibrated" devices.
84-85	2	T (Slope)	01 00	Set to 1 for "internally calibrated" devices.
86-87	2	T (Offset)	00 00	Set to zero for "internally calibrated" devices.
88-89	2	V (Slope)	01 00	Set to 1 for "internally calibrated" devices.
90-91	2	V (Offset)	00 00	Set to zero for "internally calibrated" devices.
92-94	3	Reserved	00 00 00	Reserved
95	1	Checksum	XX	Checksum of bytes 0 - 94.

A/D Value (2 Wire Address A2h)

Address	# Bytes	Name of Field	Description
96-97	2	Temperature (MSB, LSB)	Internally measured module temperature
98-99	2	Supply Voltage (MSB, LSB)	Internally measured supply voltage in module
100-101	2	Tx Bias Current (MSB, LSB)	Internally measured Tx Bias current
102-103	2	Tx Optical Power (MSB, LSB)	Not Implemented
104-105	2	Rx Received Power (MSB, LSB)	Measured Rx input power
106-109	4	Reserved	



Status Bits and Alarm/Warning Flag Bits (2 Wire Address A2h)

Address	Bit	Name	Description
110	7	TX Disable State	Digital state of Tx disable (1) and enabled (0)
110	6	Soft TX Disable	Read/write bit that allows software disable of Tx. Writing 1 disables Tx
110	5-3	Reserved	
110	2	TX Fault State	1=Tx failure state, 0=Tx normal state
110	1	Signal Detect State	Digital state of SD output pin. 1=optical signal detected, 0=no optical signal detected
110	0	Data_Ready_Bar	Not implemented.
111	1-0	Soft Tx Mode	Not implemented.
112	7	Temp High Alarm	Set when internal temperature exceeds high alarm level.
112	6	Temp Low Alarm	Set when internal temperature is below low alarm level.
112	5	Vcc High Alarm	Set when internal supply voltage exceeds high alarm level.
112	4	Vcc Low Alarm	Set when internal supply voltage is below low alarm level.
112	3	TX Bias High Alarm	Set when TX Bias current exceeds high alarm level.
112	2	TX Bias Low Alarm	Set when TX Bias current is below low alarm level.
112	1	TX Power High Alarm	Set when Tx power exceeds high alarm level.
112	0	TX Power Low Alarm	Set when Tx power exceeds low alarm level.
113	7	RX Power High Alarm	Set when Received Power exceeds high alarm level.
113	6	RX Power Low Alarm	Set when Received Power is below low alarm level.
113	5-0	Reserved Alarm	
114-115	All	Reserved	
116	7	Temp High Warning	Set when internal temperature exceeds high warning level.
116	6	Temp Low Warning	Set when internal temperature is below low warning level.
116	5	Vcc High Warning	Set when internal supply voltage >high warning level.
116	4	Vcc Low Warning	Set when internal supply voltage < low warning level.
116	3	TX Bias High Warning	Set when TX Bias current exceeds high warning level.
116	2	TX Bias Low Warning	Set when TX Bias current is below low warning level.
116	1	TX Power High Warning	Set when Tx power exceeds high warning level.
116	0	TX Power Low Warning	Set when Tx power exceeds low warning level.
117	7	RX Power High Warning	Set when Received Power exceeds high warning level.
117	6	RX Power Low Warning	Set when Received Power is below low warning level.
117	5-0	Reserved Warning	
118-119	All	Reserved	

Vendor Specific and User Accessible EEPROM (2 Wire Address A2h)

Address	# Bytes	Name	Description
120-122	3	Reserved	
123	1	Password Byte 3	High order byte of 32 bit password
124	1	Password Byte 2	Second highest order byte of 32 bit password
125	1	Password Byte 1	Second lowest order byte of 32 bit password
126	1	Password Byte 0	Low order byte of 32 bit password
127	1	User EEPROM Select	"1" selects user writable EEPROM at locations 128-247
128-255	128	Reserved	Reserved for future use

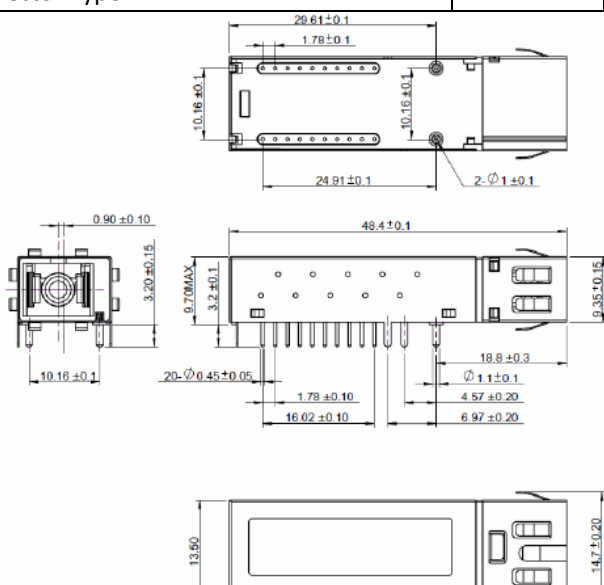


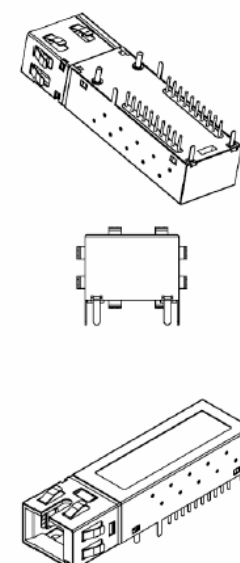
Pin Description

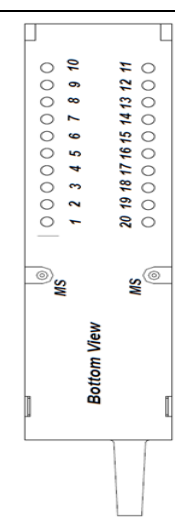
Tx/Rx	Pin No.	Pin Name	Description
Rx	1	NC	No Function Definition
	2	V _{CCR}	Receiver Ground
	3	V _{CCR}	Receiver Ground
	4	NC	No Function Definition
	5	NC	No Function Definition
	6	V _{eeR}	Receiver Ground
	7	V _{CCR}	Receiver Power Supply
	8	SD	Normal Optical Input indicated by logic "High", and No Optical Input indicated by logic "Low".
	9	RD(-)	Inverted Receiver Data Output (AC-Coupled internally)
	10	RD(+)	Non-Inverted Receiver Data Output (AC-Coupled internally)
Tx	11	V _{CCT}	Transmitter Power Supply
	12	V _{EET}	Transmitter Ground
	13	BiasCNT	LVTTTL Logic "High" to Enable Burst Transmitter, and Disable Burst Transmitter by Logic "Low".
	14	TD(+)	Non-Inverted Transmitter Data Input (AC-Coupled)
	15	TD(-)	Inverted Transmitter Data Input (AC-Coupled)
	16	V _{EET}	Transmitter Ground
	17	SCL	I2C Serial Clock (LVTTTL)
	18	SDA	I2C Serial Data (LVTTTL)
	19	Tx_Fault	LVTTTL Transmitter Fault
MS	MS	MS	Mounting Studs/Connect this pin to Chassis ground

Outline Dimensions

Parameter	Unit	Description	Note
Mechanical Dimensions	mm	~48.5x13.5x12.6	
Connector Type	-	SC	



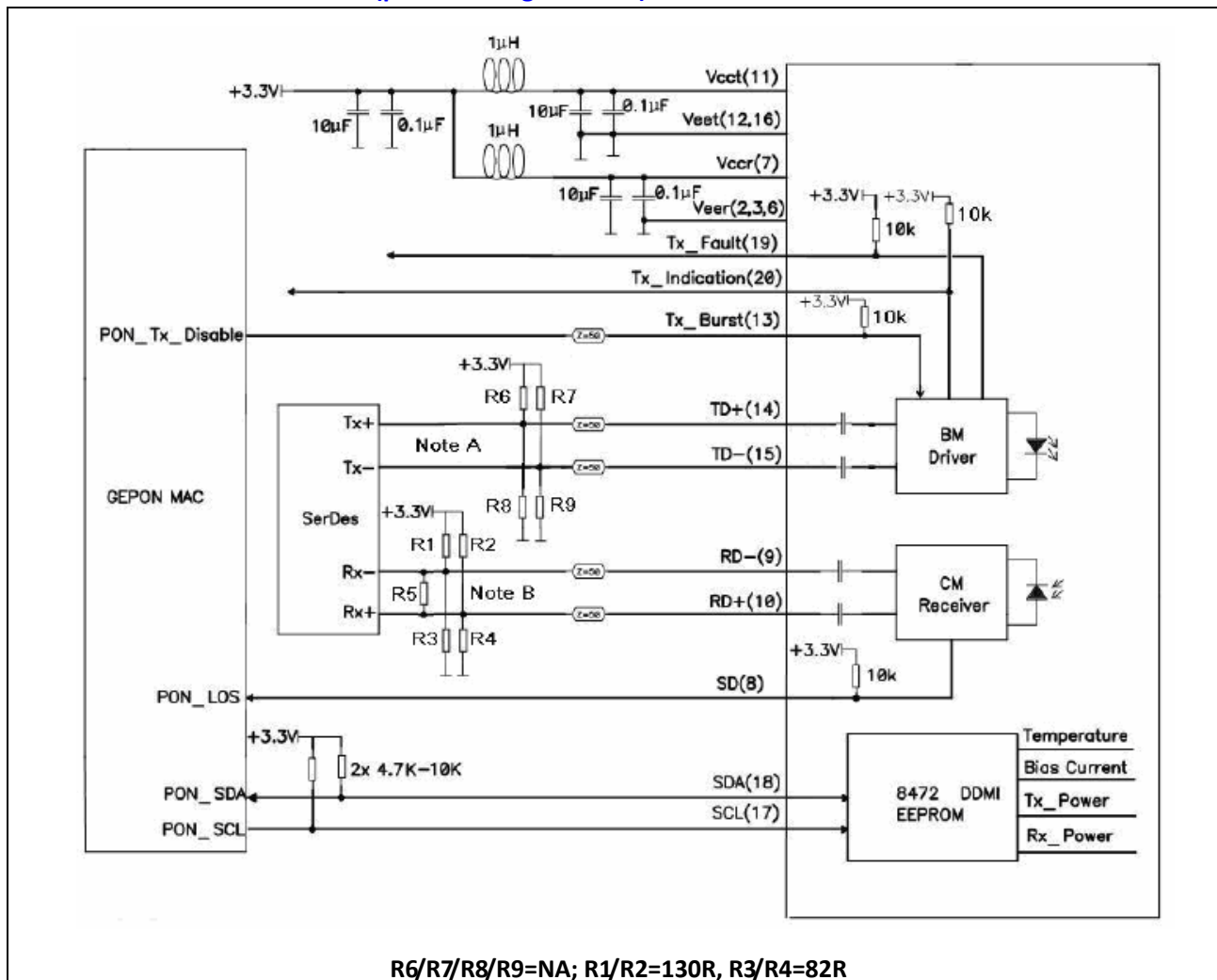




Bottom View



Recommended Interface Circuit (please enlarge to view)



Regulatory Compliances:

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1 (>1.0kV) – Human Body Model
Electrostatic Discharge (ESD) Immunity	IEC61000-4-2	Class 2(>4.0kV)
Electromagnetic Interference (EMI)	CISPR22 ITE Class B EN55022 Class B	Compliant with standards
Immunity	IEC61000-4-3 Class 2 EN55024	Typically show no measurable effect from a 3V/m field swept from 80 to 1000MHz applied to the transceiver without a chassis enclosure.
Eye Safety	FDA 21 CFR 1040.10/11 IEC 60825-1	Compliant with Class 1 laser product

- ❖ For more information, please e-mail sales@wamin.com.tw
- ❖ The information and datasheets above are subject to change without prior notice.
- ❖ Document No.: SPC 11003-V.3