



*ITU-T G.984.2 Class B+;
 FSAN G.984.5
 2X10 GPON OPTICAL MODULE*



DDMI, RoHS

FEATURES:

- 2x10 bi-directional SFF metallic package with SC Receptacle
- 1310nm DFB LD BM Transmitter @ 1.244Gbps
- 1490nm APD-TIA CM Receiver @ 2.488Gbps
- Support DDMI
- WDM filter for Voice/Data FTTx ONT/ONU applications
- Single +3.3V power supply, LVTTTL Bias
- LVPECL compatible data input
- CML compatible data output
- LVTTTL transmitter burst mode control
- Burst Enable: H-active
- LVTTTL receiver signal-detected indication
- Class 1 Laser eye safety
- Operating temperature from 0°C to 70°C
- RoHS compliance

ORDERING INFORMATION

P/N	Mbps	LD/PD	Reach	Vol.	DDM	Burst Control	Temp
G1250-BDR5-D3C3-T3-D	1250	1310nm DFB-LD/ 1490nm APD-PD	20km via SMF	3.3V	Yes	Enable: Logic "1"	0-70C

G1250= GPON 1250Mbps	BDR5= 2X10 SFF BIDI Receptacle	D3=DFB 1310nm C3=20km, 3.3Volt	T3= SD TTL DC-AC Coupling
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APPLICATIONS

- GPON ONU Class B+ for P2MP applications
- FTTx WDM Broadband Access

STANDARDS

- Compliant to ITU-T G.984.2 GPON ONU Class B+; FSAN G.984.5
- Compliant to SFF-8472 v9.5; MSA 2000

DESCRIPTION

- The GPON ONU Transceiver is designed for Gigabit Passive Optical Network (GPON) 20km transmission. The module incorporates 1310nm burst-mode transmitter and 1490nm continuous-mode receiver.
- The transmitter uses a 1310nm DFB laser and an integrated burst-mode laser driver to perform burst enable/disable delay time. The laser driver includes digital APC and temperature compensation circuit for keeping the launch optical power and extinction ratio constant over temperature and aging.
- The receiver uses an integrated 1490nm APD photodiode and preamplifier that indicates receiver signal-detected status (active high).
- An integrated WDM filter separate 1490nm input light and 1310nm output light.
- The metallic package performs better EMI and EMC characteristics.



G1250-BDR5-D3C3-T3-D
SFF 2x10 GPON Class B+ ONU Transceiver
2.488Gbps Downstream/1.244Gbps Upstream



ABSOLUTE MAXIMUM RATINGS

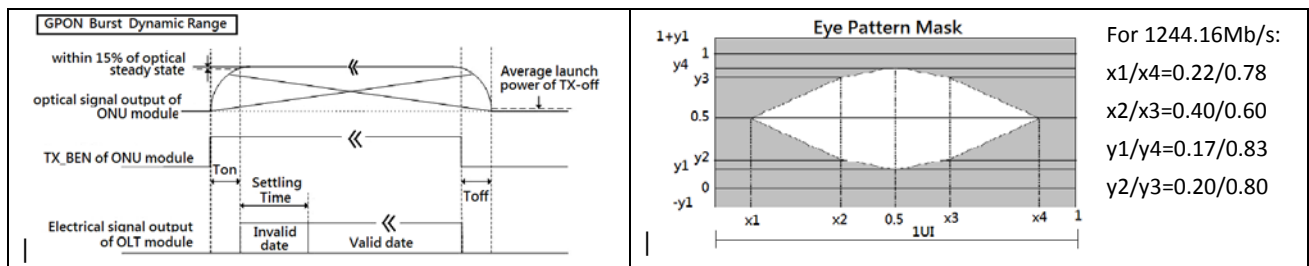
Parameter	Symbol	Min	Max	Unit	
Operating Case Temperature Range	T _c	0	70	°C	
Storage Temperature Range	T _s	-40	85	°C	
Relative Humidity	RH	5	95	%	
Power Supply Voltage	V _{cc}	0	4.6	V	
Pin Input Voltage		GND	V _{cc}	V	
Receiver Damage Threshold		+4	-	dBm	
Lead Solder Temperature / Duration		-	260 / 10	°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}			300	mA	

SPECIFICATION OF TRANSMITTER

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Launched Power (EoL) into SMF	P _o	+0.5		+5	dBm	
Optical Extinction Ratio	ER	10			dB	
Center Wavelength (DFB LD)	λ _c	1260	1310	1360	nm	
-20dB Spectrum Width (RMS)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter OFF Output Power	P _{off}			-45	dBm	
Optical Rise/Fall Time (unfiltered 20-80%)	T _r /T _f			260	ps	
TX Enable / Disable (Burst on/off)	T _{on} / T _{off}			12	ns	Ref. Dynamic range
Maximum Reflectance (1260 to 1360nm)				-30	dB	@ 1310nm
Optical return loss tolerance				15	dB	
TX dispersion penalty (@20km SMF)	TDP			1	dB	
Output Eye Mask	Compliant with ITU-T G.984.2					Ref. Eye Mask





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SPECIFICATION OF RECEIVER

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Input Optical Wavelength (APD)	λ_{IN}	1480	1490	1550	nm	
Receiver Sensitivity (Measured with 1490nm, ER=10dB; BER =10^{-10} @ PRBS=2 ²³ -1 NRZ without FEC)	P_{IN}			-28	dBm	
Input Saturation Power(Overload) (Measured with PRBS 2 ²³ -1 test pattern @2.5Gbps with Tx on, ER=10dB, BER=10 ⁻¹²)	P_{SAT}	-8			dBm	
Signal Detect-Assert Power	P_A			-30	dBm	
Signal Detect-Deassert Power (When Signal Detect Deasserted, the data output is Low-level)	P_D	-40			dBm	
Signal Detect-Hysteresis	P_A-P_D	0.5		6	dB	
Optical Crosstalk (1310nm TX to 1490nm RX)	Xopt			-47	dB	
Isolation (1555nm RX to 1490nm)		30			dB	
WBF of G984.5	1530nm to 1539nm	7			dB	
	1540nm to 1625nm	22			dB	

ELECTRICAL INTERFACE CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Total Supply Current	I_{CC}			150	mA	
LVPECL Differential Data Input Swing	V_{DT}	300		1800	mV _{p-p}	DC-Coupled
Differential line input Impedance	R_{IN}	85	100	115	Ohm	
BiasCNT Input Voltage- High, TX on	V_{BCNTH}	2		V _{CC} +0.3		LVTTTL
BiasCNT Input Voltage- Low, TX off	V_{BCNTL}	0		0.8		
Receiver						
Total Supply Current	I_{CC}			125	mA	
CML Differential Data Output Swing (AC coupled to 100Ω differential Load)	V_{DR}	600		1900	mV _{p-p}	AC-Coupled
Output Impedance	R_{OUT}	85	100	115	Ohm	
Signal Detect Output Voltage- High	V_{LOSH}	2		V _{CC} +0.3	V	Assert High when signal is detected
Signal Detect Output Voltage- Low	V_{LOSL}	0		0.8	V	

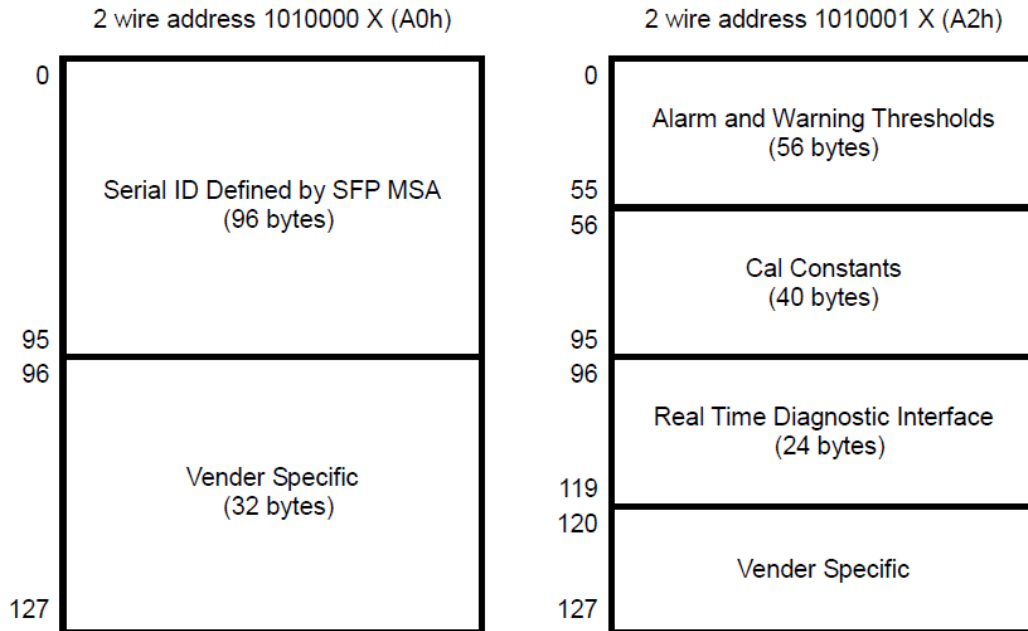


DIGITAL DIAGNOSTIC MONITOR ACCURACY

Parameter	Accuracy	Calibration	Note
Transceiver Internal Temperature	±3°C	Internal	T _A =0~+70°C
Power Supply Internal Voltage	±3%	Internal	V _{CC} =3.13~3.47V
TX Optical Power	±3dB	Internal	+0.5 to 5.0 dBm
TX Bias Current	±10%	Internal	Specified by nominal bias value
RX Optical Power	±3dB	Internal	-28 to -8dBm

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.





G1250-BDR5-D3C3-T3-D
SFF 2x10 GPON Class B+ ONU Transceiver
2.488Gbps Downstream/1.244Gbps Upstream



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	04	Serial ID module supported
02	Connector	01	SC receptacle
03-10	Transceiver Codes	00	Undefined
11	Encoding	03	Compatible with NRZ encoding code
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	Reserved	00	
37-39	Vendor OUI	00	Undefined
40-55	Vendor P/N	47 31 32 35 30 42 44 52 35 44 33 43 33 54 33 44	(ASCII character) G1250-BDR5-D3C3-T3-D
56-59	Vendor P/N Rev.	20 20 20 20	“V1” (ASCII character)
60-61	Laser Wavelength	05 1E	1310nm in Hex byte
62	Reserved	00	
63	CC BASE	XX	Check sum of bytes 0-62
Extended ID Fields			
64-65	Options	00 04	TX disable, Tx Fault and Loss of signal not implemented
66	BR. Max.	00	Undefined
67	BR. Min.	00	Undefined
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	C0	Alarm/Warning and Tx Disable
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
128-255	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	00	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	5	mA
24-25	2	TX Power High Alarm	5.5	dBm
26-27	2	TX Power Low Alarm	0	dBm
28-29	2	TX Power High Warning	5.0	dBm
30-31	2	TX Power Low Warning	0.5	dBm
32-33	2	RX Power High Alarm	-7	dBm
34-35	2	RX Power Low Alarm	-30	dBm
36-37	2	RX Power High Warning	-8	dBm
38-39	2	RX Power Low Warning	-28	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	Temp (Slope)	01 00	Set to 1 for "internally calibrated" devices.
86-87	2	Temp (Offset)	00 00	Set to zero for "internally calibrated" devices.
88-89	2	Vcc (Slope)	01 00	Set to 1 for "internally calibrated" devices.
90-91	2	Vcc(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 Vcc (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)	Internally measured Tx Optical power
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	Reserved	
110	6	Soft TX Disable	Read/write bit that allows software disable of Tx. Writing 1 disables Tx
110	5	Tx continuously light indicate	Set to 1, when the module emit continuous light more than 20ms
110	4	Rx Rate Select State	Not implemented, set to 0
110	3	Soft Rate Select control	Not implemented, set to 0
110	2	TX Fault State	1=Tx failure state, 0=Tx normal state
110	1	RX_LOS State	Not implemented.
110	0	Data_Ready_Bar	Not implemented.
111	7-0	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
120-127	8	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
128-247	120	User EEPROM Select	
248-255	8	Reserved	Reserved for future use



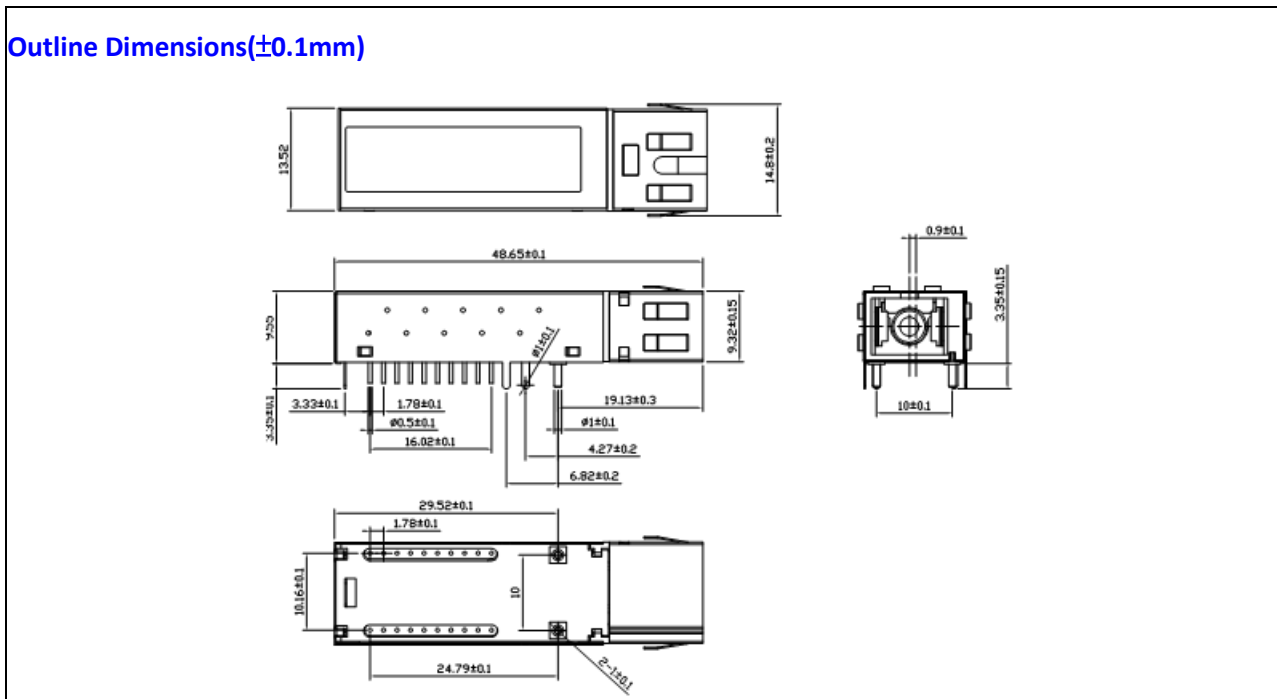
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Pin Description

Tx/Rx	Pin No.	Pin Name	Description
Rx	1	NC	No Function Definition
	2	RX GND	Receiver Ground
	3	RX GND	Receiver Ground
	4	NC	No Function Definition
	5	NC	No Function Definition
	6	RX GND	Receiver Ground
	7	V _{CCR}	Receiver Power Supply
	8	SD	LVTTTL Signal-detect output. 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	TX V _{CCT}	Transmitter Power Supply
	12	TX GND	Transmitter Ground
	13	TX EN	LVTTTL Logic "High" to Enable Burst Transmitter, and Disable Burst Transmitter by Logic "Low".
	14	TD(+)	Non-Inverted Transmitter Data Input (DC-Coupled)
	15	TD(-)	Inverted Transmitter Data Input (DC-Coupled)
	16	TX GND	Transmitter Ground
	17	SCL	I2C Serial Clock (LVTTTL)
	18	SDA	I2C Serial Data (LVTTTL)
	19	TX_FAULT	LVTTTL Transmitter Fault, internally pull up. Asserts high when the fault is detected by the laser driver.
	20	TX GND	Transceiver Ground.

Outline Dimensions(±0.1mm)





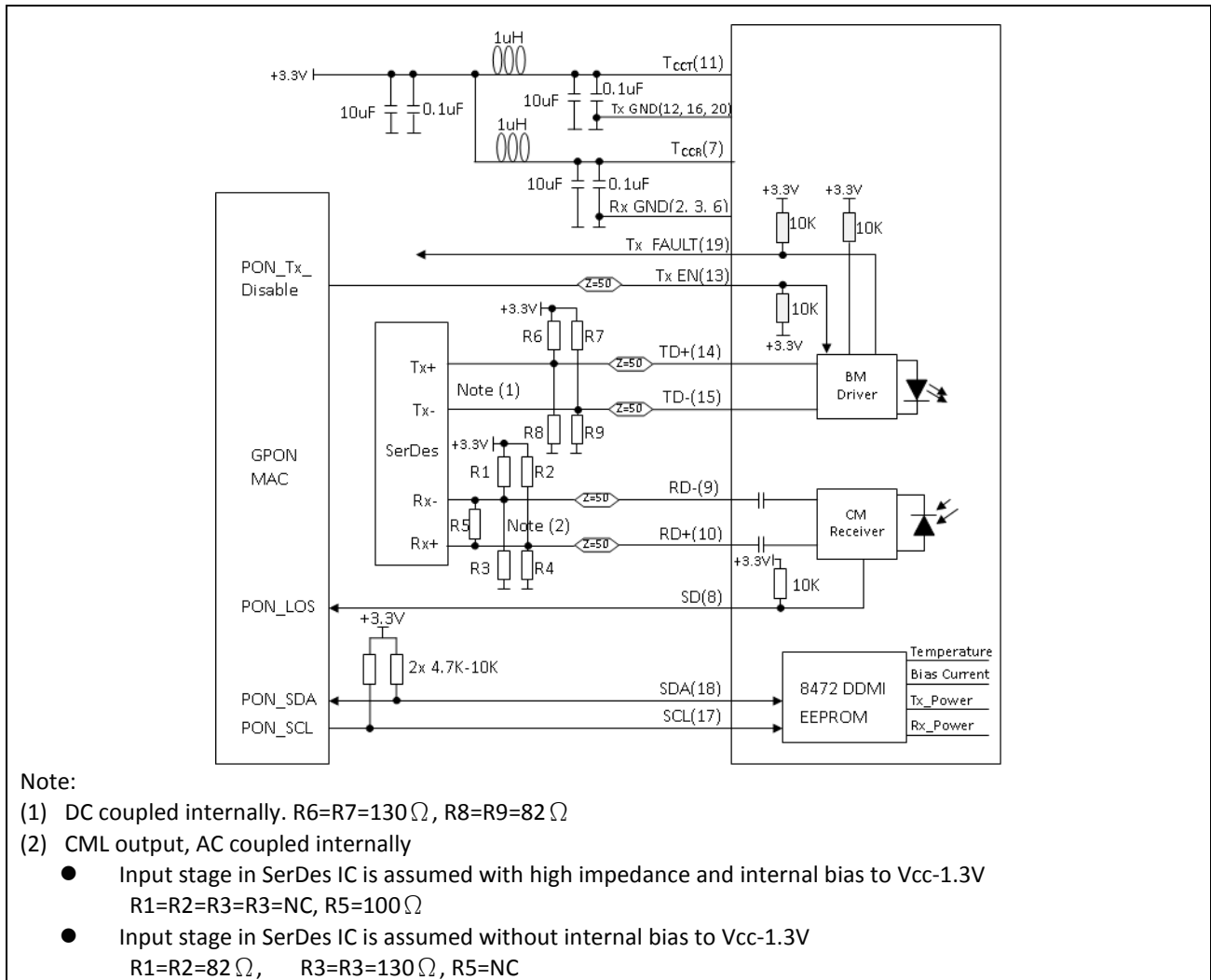
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Recommended Interface Circuit (please enlarge to view)



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-mai sales@wamin.com.tw
- ❖ The information and datasheets above are subject to change without prior notice.
- ❖ Document No.: SPC 11004-V.01