



LTE3680P SFP GPON OLT Transceiver

CLASS C+ 2488/1244 Mb/s With Digital RSSI Function

Product Description

The LTE3680P is a low cost point to multi point (P2MP) Fiber to the Home, Business or Curb (FTTx) GPON OLT transceiver. It is designed for 2488Mb/s downstream / 1244Mb/s upstream duplex data links that employ high-speed burst mode TDM receivers/transmitters. It is based on the ITU-T G.984.2 Class C+ specifications for bidirectional communications over a single fiber and incorporates a high performance 1310nm Burst Mode APD/TIA receiver and 1490nm CW mode DFB transmitter with internal optical isolator. The Burst Signal Detect (BSD), the Burst Mode Receiver Reset (Rx_RESET), Transmit Disable (Tx_DIS), Transmit Fault (Tx_FAULT) and the SFF-8472 I²C diagnostic interface monitor and control functions are LVTTTL compatible. The industry standard 2x10 small form pluggable (SFP) package incorporates the SC receptacle. It is fabricated with a rugged die cast metal housing and cage assembly. Commercial and industrial temperature ranges are available. It is IEC 60825-1 Class I laser safety compliant and meets the EEC Directive 2002/95/EC for RoHS compliance.

Applications

- Access Networks
- Fiber to the Home, Curb, Office (FTTx)
- Point to Multi Point Service (P2MP)
 - ITU-T G.984.2
 - FSAN Class C+
 - SFF-8472

Features

- Dual Wavelength Bidirectional Transceiver
- 2488Mb/s Downstream
- 1244Mb/s Upstream
- BER<10⁻¹⁰, 1244Mb/s, PRBS 2²³-1
- 1310nm APD/TIA Burst Mode Receiver
- 1490nm CW Mode DFB Laser with Isolator
- ITU-T G.984.2 Complaint
- SFF-8472 Ver9.3 compliant
- Single 3.3V DC supply
- Low Power Consumption
- 2x10 SFF Package Outline
- Single Fiber, Full Duplex Operation
- SC Optical Receptacle
- Case Operating Temperature Ranges:
 - Commercial: 0 to +70°C
 - Industrial: -40 to +85°C
- Data and Control interfaces

Tx_Data	LVPECL/AC Coupled
Rx_Data	LVPECL/DC Coupled
Tx_DIS	LVTTTL
Tx_FAULT	LVTTTL
Rx_Reset	LVTTTL
BSD	LVTTTL
- RoHS6



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Absolute Maximum Ratings					
Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	T_{stg}	-40	+85	°C	Exceeding the Absolute Maximum Ratings may cause irreversible damage to the device. The device is not intended to be operated under the condition of simultaneous Absolute Maximum Ratings, a condition which may cause irreversible damage to the device.
Relative Humidity - Storage	RH_S	0	95	%	
Relative Humidity - Operating	RH_O	0	85	%	
Module Supply Voltage	V_{CC}	0	3.6	V	
Absolute Maximum Ratings: Optical and Electrical Signal Levels					
Parameter	Symbol	Min	Max	Units	Notes
Transmit DISABLE Logic HIGH State	Tx_DIS	0	$V_{CC}+0.5$	V	LVTTTL (Tx is OFF / DISABLED)
Transmit FAULT Logic HIGH State	Tx_FAULT	0	$V_{CC}+0.5$	V	LVTTTL (Laser is OFF / FAULT)
BSD Logic HIGH State	BSD	0	$V_{CC}+0.5$	V	LVTTTL
Receiver RESET Logic HIGH State	Rx_RESET	0	$V_{CC}+0.5$	V	LVTTTL (Receiver is being RESET)
I ² C Serial Data Logic HIGH State	SDA	-	$V_{CC}+0.5$	V	LVTTTL
I ² C Serial Clock HIGH State	SCL	-	$V_{CC}+0.5$	V	LVTTTL

Recommended Operating Conditions						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Case Operating Temperature	T_{case}	0	25	+70	°C	Temperature Range = C
		-40	25	+85	°C	Temperature Range = H
Module Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Module Supply Current	I_{IN}	-	350	500	mA	
Downstream Signaling Speed +/- 100 ppm	Sdown	-	2488	-	Mb/s	
Upstream Signaling Speed +/- 100 ppm	Sup	-	1244	-	Mb/s	

Ordering Information					
Part Number	Latch Option (X)		Temperature Option (Y)		RoHS Compliant (Z)
LTE3680P-XYZ	B	Bail	C	0 to 70 °C	+ RoHS Compliance
			H	-40 to 85 °C	



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Transmitter Electrical Specifications						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Tx_Data Differential Input Voltage	$V_{IH-V_{IL}}$	200	-	1600	mV	LVPECL Tx_DATA Electrical Signal
Tx_DIS = HIGH (Transmitter OFF / DISABLED)	V_{IH}	2.2	-	$V_{CC}+0.3$	V	LVTTTL (Control INPUT)
Tx_DIS = LOW (Transmitter ON / ENABLED)	V_{IL}	0	-	0.8	V	LVTTTL (Control INPUT)
Tx_FAULT = HIGH (Laser OFF / FAULT)	V_{OH}	2.4	-	$V_{CC}+0.3$	V	LVTTTL (Monitor OUTPUT)
Tx_FAULT = LOW (Laser ON / NORMAL)	V_{OL}	0	-	0.4	V	LVTTTL (Monitor OUTPUT)
Receiver Electrical Specifications						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Rx_Data Differential Output Voltage	$V_{IH-V_{IL}}$	200	-	1600	mV	LVPECL Rx_DATA Electrical Signal
BSD (Burst Signal Detect) = HIGH	V_{OH}	2.0	-	$V_{CC}+0.3$	V	LVTTTL
BSD (Burst Signal Detect) = LOW	V_{OL}	0	-	0.8	V	LVTTTL
Rx_RESET = HIGH (Receiver RESET)	V_{IH}	2.2	-	$V_{CC}+0.3$	V	LVTTTL (Control Input)
Rx_RESET = LOW (Receiver ON / NORMAL)	V_{IL}	0	-	0.8	V	LVTTTL (Control Input)
I ² C Serial Logic						
Parameter	Symbol	State	Logic	Min	Max	Units
I ² C Serial Data	SDA	HIGH	LVTTTL	2.2	$V_{CC}+0.3$	V
	SDA	LOW	LVTTTL	0	0.8	V
I ² C Serial Clock	SCL	HIGH	LVTTTL	2.2	$V_{CC}+0.3$	V
	SCL	LOW	LVTTTL	0	0.8	V

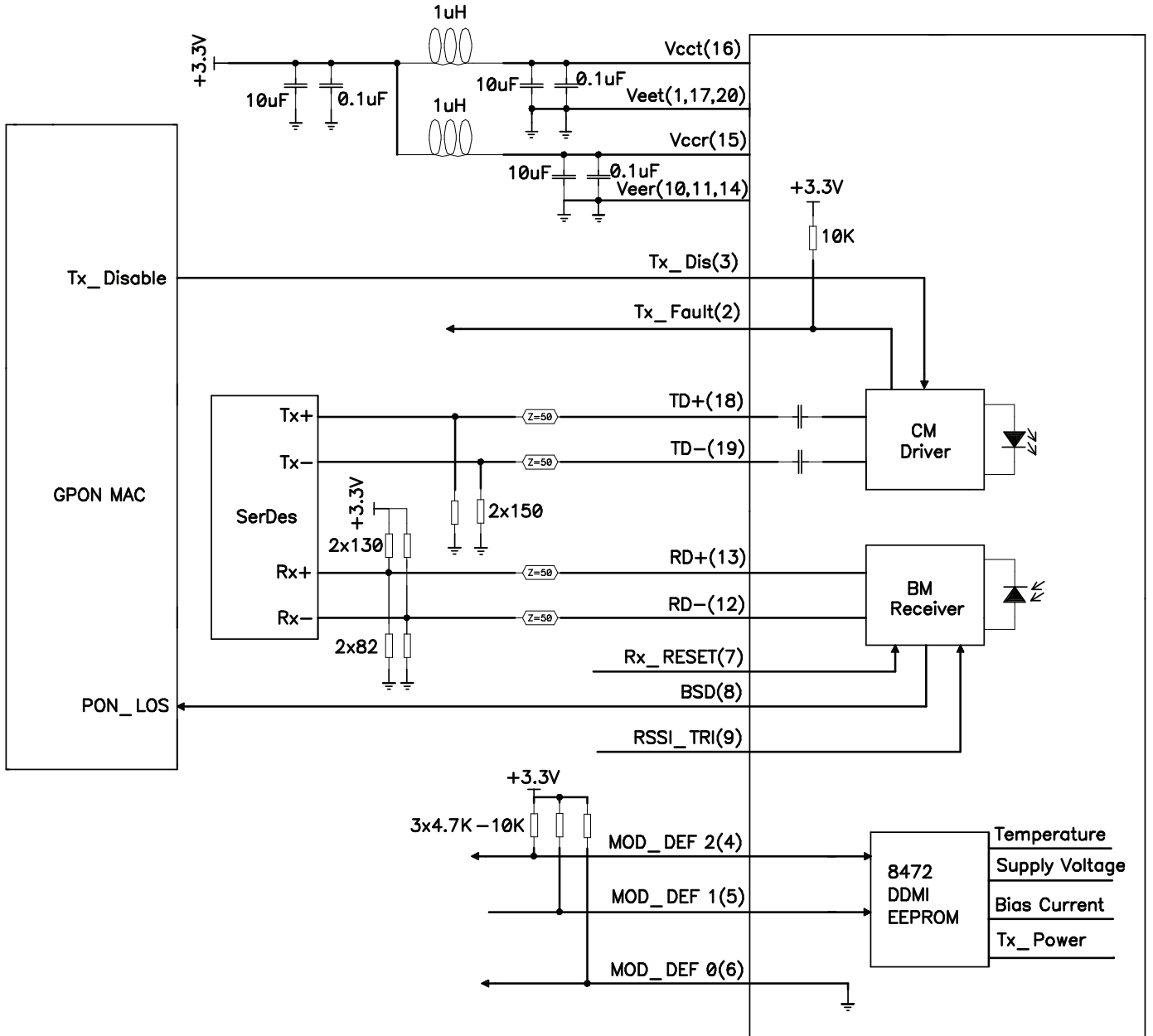


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Transmitter Optical Specifications						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Transmitter Type	1490nm DFB Laser with Isolator					CW Mode
Downstream Signaling Speed	STx		2488		Mb/s	
Average Launch Power (9/125 μ SMF)	P _{OUT}	3.0	-	7.0	dBm	
Average Launch Power with Tx OFF	P _{OFF}	-	-	-40	dBm	
Optical Rise and Fall Time	t _r / t _f	-	-	180	ps	20% to 80%
Optical Center Wavelength	λ	1480	1490	1500	nm	
Spectral Line Width @ -20 dB	$\Delta\lambda$	-	-	1.0	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Extinction Ratio	ER	8.2	-	-	dB	
Output Eye	Compliant with G.984.2					Data Rate = 2488 Mb/s
Receiver Optical Specifications						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Receiver Type	1310nm APD/TIA Burst Mode					
Optical Signal Indicator	Burst Packet Detect					
Upstream Signaling Speed	SRx		1244		Mb/s	
Optical Center Wavelength	λ	1280	1310	1360	nm	
Receiver Sensitivity	P _{IN}	-	-	-30	dBm	BER<10 ⁻¹⁰ , 1244 Mb/s, PRBS 2 ²³ -1
Receiver Optical Overload	Pin(SAT)	-12	-	-	dBm	BER<10 ⁻¹⁰ , 1244 Mb/s, PRBS 2 ²³ -1
Maximum Input Optical Power	Pin(MAX)	-	-	2	dBm	Damage Threshold
Receiver Reflectance	RFL	-	-	-20	dB	

Electrical Interface



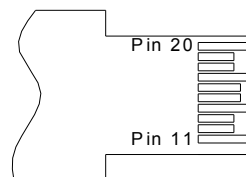
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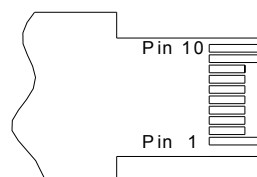
CLASS C+ 2488/1244 Mb/s With Digital RSSI Function

Pin Assignment

TOP VIEW
OF BOARD



BOTTOM VIEW
OF BOARD



Pin Description			
Pin	Symbol	Description	Notes
1	V _{EET}	Transmitter Ground	
2	Tx_FAULT	Transmitter Fault, LOW = Normal Operation, HIGH = Fault Indication	Note 1
3	Tx_DIS	Transmit Disable, LOW = Normal Operation, HIGH = Disables Module	Note 1
4	MOD_DEF 2	Module Definition 2 - Two-Wire Interface - Serial Data	Note 1
5	MOD_DEF 1	Module Definition 1 - Two-Wire Interface - Clock Signal	Note 1
6	MOD_DEF 0	Module Definition 0 - Two-Wire Interface Digital Ground	
7	Rx_RESET	Rx Reset Pulse Input, High Level Input at the end of Previous Packet	
8	BSD	Burst Signal Detect, Assert High when Burst Packet Coming, Assert Low when Reset Pulse Input	
9	RSSI_TRI	RSSI Trigger Input	
10	V _{EER}	Receiver Ground	
11	V _{EER}	Receiver Ground	
12	RD-	Rx_Data Output (Inverted)	Note 2
13	RD+	Rx_Data Output (Non Inverted)	Note 2
14	V _{EER}	Receiver Ground	
15	V _{CCR}	Receiver DC Power	3.3 V +/- 5%
16	V _{CCT}	Transmitter DC Power	3.3 V +/- 5%
17	V _{EET}	Transmitter Ground	
18	TD+	Tx_Data Input (Non Inverted)	Note 3
19	TD-	Tx_Data Input (Inverted)	Note 3
20	V _{EET}	Transmitter Ground	
Notes			
1. The uncommitted Tx_Fault, MOD_DEF 1 and MOD_DEF 2 LVTTTL monitor and control pins each require a pull up resistor of 4.7k to 10k Ohms			
2. The 100 Ohm differential Rx Data output is internally DC coupled.			
3. The 100 Ohm differential Tx Data input is internally AC coupled and terminated.			



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EEPROM Serial ID Memory Contents

Accessing Serial ID Memory uses the 2 wire address 1010000X (A0). Memory Contents of Serial ID are shown in Table below.

I ² C Memory Map (Page A0 HEX, Unlisted Fields are Blank / Empty)				
IIC Addr	Size	Name	Description	Values (HEX)
0	1	Identifier	SFP	03
1	1	Extended Identifier	Extended Identifier	04
2	1	Connector	Connector Type = SC	01
3-10	8	Transceiver	Compatibility	00 14 00 00 00 00 00 00
11	1	Encoding	Encoding Type = NRZ	03
12	1	BR, Nominal	Nominal Bit Rate 2488Mb/s	19
13	1	Reserved	Reserved	00
14	1	Length(9μm)-km	60 km Link Length in Kilometers / SMF	14
15	1	Length (9μm)-100m	60 km Link Length in Hundreds of Meters / SMF	C8
16	1	Length (50μm)-10m	50-micron MMF Link Length = N/A	00
17	1	Length (62.5μm)-10m	62.5-micron MMF Link Length = N/A	00
18	1	Length (Copper)	Copper Link Length = N/A	00
19	1	Reserved	Reserved	00
20-35	16	Vendor name	Hisense	ASCII Format
36	1	Reserved	Reserved	00
37-39	3	Vendor OUI	SFP Vendor IEEE Company ID	Programmed by Factory
40-55	16	Vendor PN	Hisense Part Number on this datasheet	ASCII Format
56-59	4	Vendor Revision Number	Programmed by Factory	Programmed by Factory
60-61	2	Wavelength	Laser Wavelength = 1490nm	05 D2
62	1	Reserved	Reserved	00
64-65	2	Transceiver Options	1. Rx_SD 2. Tx_FAULT 3. Tx_Disable	00 1C
66	1	BR, max	20%	14
67	1	BR, min	20%	14
68-83	16	Vendor SN	Programmed by Factory	Programmed by Factory
84-91	8	Date code	Programmed by Factory	Programmed by Factory
92	1	Diagnostic Monitoring Type	Digital Diagnostic Monitoring Implemented Address Change Required	58
93	1	Enhanced Options	1. Alarm/Warning Flags 2. Soft Tx_DISABLE Monitor and Control 3. Soft Tx_FAULT Monitor	E0
94	1	SFF-8472 Compliance	SFF 8472 Revision 9.3 Implemented	02
95	1	CC_EXT	Check_Sum (64 to 94)	Programmed by Factory
96-127	32	Vendor Specific	Vendor Specific EEPROM	Programmed by Factory
128-255	128	Reserved	Reserved	Filled by zero

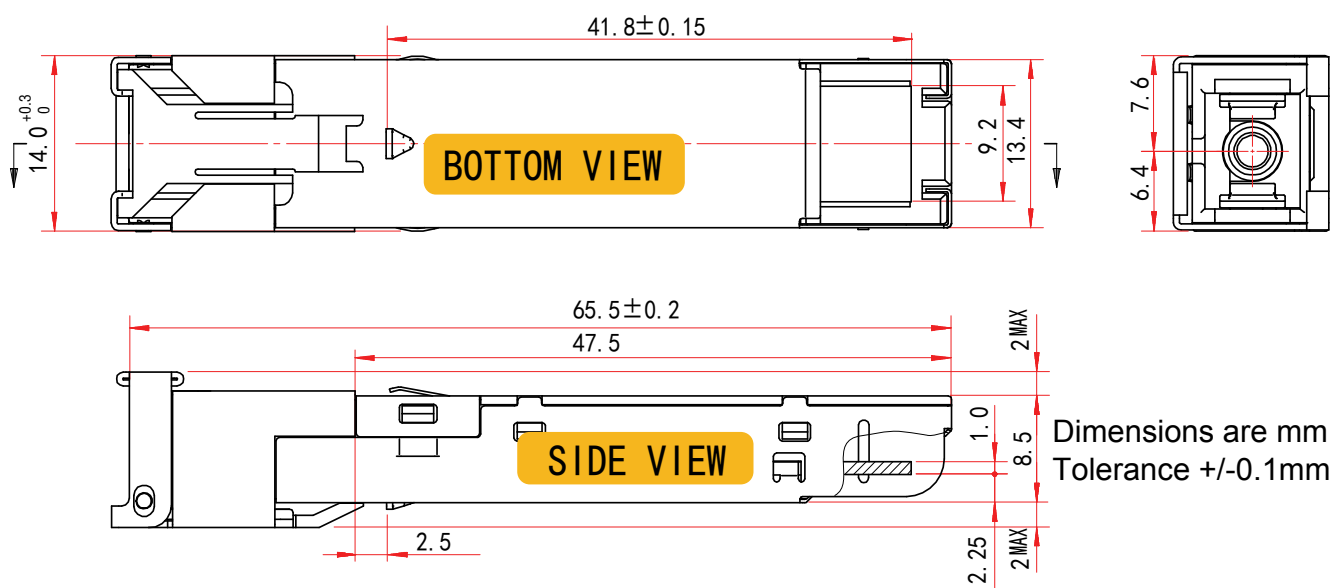
A2 (hex) 8472 Digital Diagnostic Table - Summary of Parameters in the A2 (hex) Parametric Table

The data in the parameter tables are compared with the data in the measured data tables in order to create a warning or alarm status bit

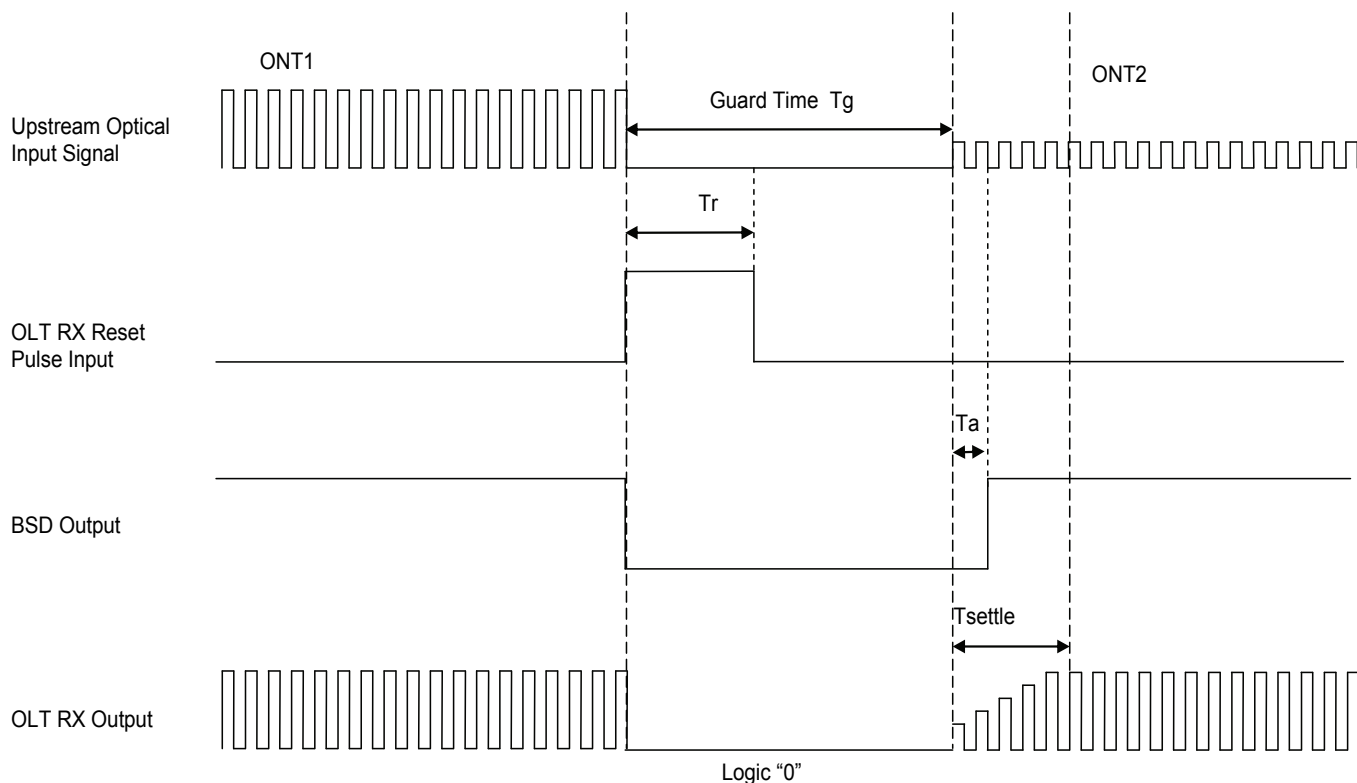
The Warning or Alarm bit is set when the parameter drops below or exceeds the Low or High values stored in memory.

SFF-8472 Rev 9.3 A2 (HEX) Address Table for Alarm and Warning Data														
8472 Parameter	Alarm Threshold Data				Warning Threshold Data				Internally Measured Values		Alarm Bit (Set) Address + Position		Warning Bit (Set) Address + Position	
	High Value		Low Value		High Value		Low Value				High	Low	High	Low
	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	High	Low	High	Low
Temperature	00	01	02	03	04	05	06	07	96	97	112(7)	112(6)	116(7)	116(6)
Vcc	08	09	10	11	12	13	14	15	98	99	112(5)	112(4)	116(5)	116(4)
Tx Bias	16	17	18	19	20	21	22	23	100	101	112(3)	112(2)	116(3)	116(2)
Tx Out	24	25	26	27	28	29	30	31	102	103	112(1)	112(0)	116(1)	116(0)
Rx Input	32	33	34	35	36	37	38	39	104	105	113(7)	113(6)	117(7)	117(6)

Mechanical Dimensions



LTE3680P Timing Diagram

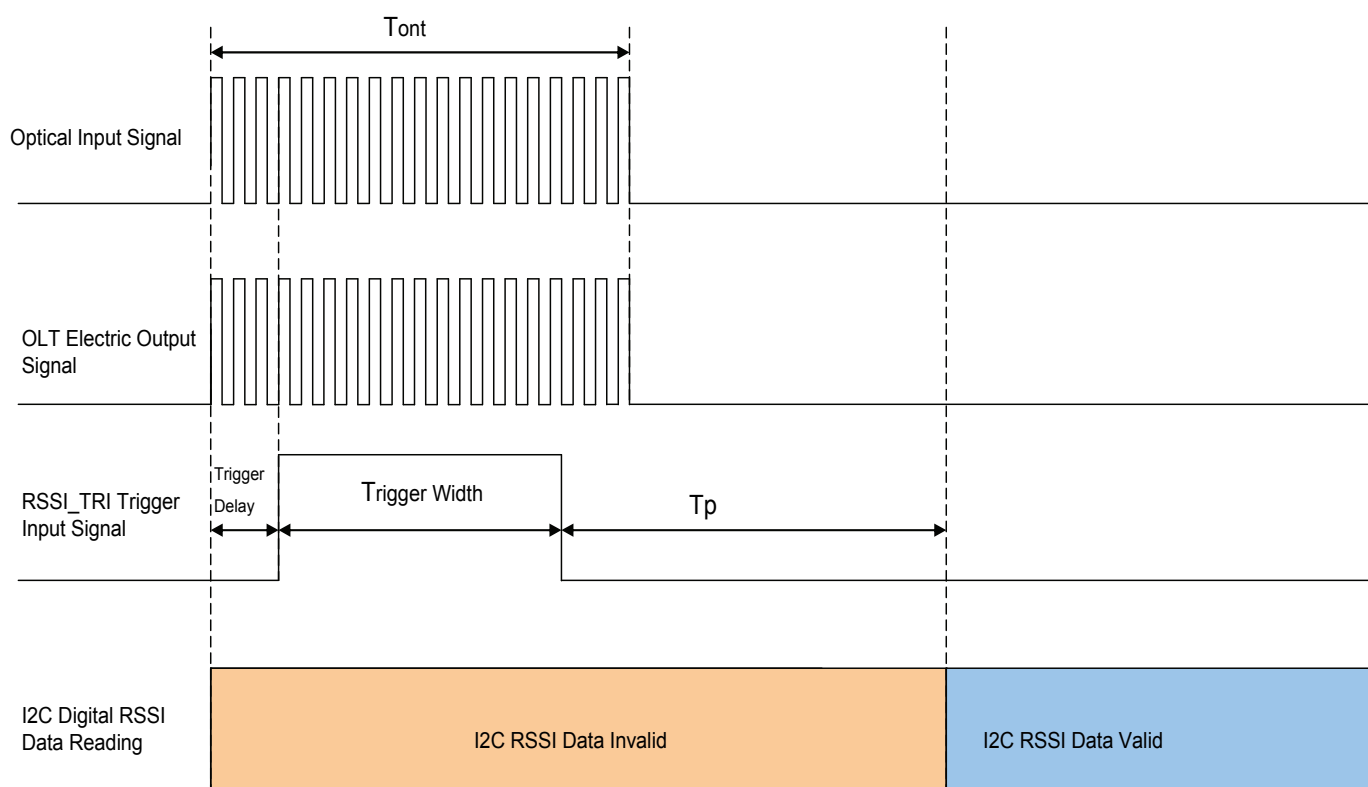


Parameter	Symbol	Min	Typical	Max	Unit	Note
Guard Time	T_g	4	-	-	byte	
Reset Pulse Width	T_r	3	16	-	bit	Note 1
Burst Signal Detect Assert	T_a	-	-	5	ns	Note 2
Burst Mode Receiver Setting Time	T_{settle}	-	-	44	bit	

Note 1: The RESET signal should be occurred during the GUARD BAND time slot, it is recommended assert HIGH at the end of the previous burst ONT signal.

Note 2: The Rx BSD assert LOW when the RESET signal is applied, assert HIGH when another incoming burst is detected and latch to HIGH state until next RESET signal input.

Digital RSSI Sample/Hold Timing Specification



Parameter	Symbol	Min	Typical	Max	Unit
Optical Input Signal Width	T_{ont}	300	-	-	ns
RSSI Trigger Delay	T_{tri}	0	6.4	-	ns
RSSI Trigger Width	T_w	300	-	$T_{ont} - T_{tri}$	ns(Note1)
I2C Access Prohibited Time	T_p	-	-	500	μ s(Note2)
RSSI Monitor Range	P_{mon}	-10		-30	dBm
RSSI Precision	P_{rssi}	-3	+/-1	3	dB

Note 1: RSSI Trigger signal rising edge will trigger RSSI sampling, and falling edge will trigger MCU hold the RSSI information.

Note 2: RSSI Data is invalid during I2C access prohibited time, it is recommended the host do not execute any I²C operation and do not input another RSSI Trigger during the meantime.



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Warnings

Handling Precautions:

This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety:

Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

Notice:

The information provided on this page contains the product target specifications which are subject to change without notice.

Check with your Hisense Sales Office for product updates, changes in specifications, sample availability and production release dates.

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