



## Features

- Class B+ GPON OLT transceiver
- Small Form Factor, 2 x 10 pigtailed bi-directional
- 1490 nm DFB Tx /1310 nm APD Rx
- 2488 Mbps downstream Tx/1244 Mbps upstream Rx
- -40 to 85°C case temperature operation
- Single 3.3 V supply
- ITU-T G.984.2 compliant
- 20 km reach
- SC/UPC fiber connector; IEC 61754-4 compliant
- RoHS compliance
- Meets UL 94V-1 flammability

**Table 1 – General Operating**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Voltage	V <sub>cc</sub>	3.14	3.3	3.46	V	
Supply Current	I <sub>cc</sub>	-	-	450	mA	
Operating Temperature(case)	T <sub>opr</sub>	-40		85	°C	
Storage Temperature	T <sub>stg</sub>	-40	-	85	°C	

**Table 2 – General Optical Parameters**

Parameter	Min.	Typical	Max.	Unit
Back Reflection at 1490 nm	-	-	-20	dB
Back Reflection at 1310 nm	-	-	-20	dB
1490 nm to 1310 nm crosstalk	-	-	-45	dB

**Table 3 – Optical Characteristics**

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Centre Wavelength	$\lambda_C$	1480	1490	1500	nm	
Optical Spectrum Width (-20dB)	$\Delta\lambda$	-	-	1	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Average Launch Power	$P_{OUT}$	1.5	-	5	dBm	
Average Launch Power-OFF Transmitter	$P_{OFF}$	-	-	-40	dBm	
Extinction Ratio	ER	10	-		dB	1
Laser Overshoot		-	-	300	%	
Optical Path Penalty				0.5	dB	2
Optical Rise and Fall Time		-	-	160	ps	3
Tolerance to TX back reflection		-15	-	-	dB	4
Data Rate		-	2488	-	Mbps	
Optical Eye Diagram	Compliant With ITU-T G984.2					
Receiver						
Operating Wavelength	$\lambda_C$	1260	1310	1360	nm	
Upstream Data Rate +/- 100ppm (burst-mode)		-	1244	-	Mbps	
Sensitivity	$P_{SEN}$	-	-	-28	dBm	
Overload	$P_{OL}$	-8	-	-	dBm	
Maximum Reflectance of Receiver	$RX_r$	-	-	-20	dB	

Notes:

1. PRBS  $2^{23}-1$ , NRZ, 50% duty cycle
2. Over 20km with dispersion value of 300ps/nm.
3. 20% to 80%
4. 1 dB degradation of receiver sensitivity

**Table 4 – Electrical Characteristics**

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Input Differential Impedance	$R_{IN}$	80	100	120	$\Omega$	
Single Ended data input swing	$V_{IN, p-p}$	300	-	1200	mV	
Tx Disable (LVTTL)	$V_d$	2	-	Vcc	V	
Tx Enable (LVTTL)	$V_{en}$	0	-	0.8	V	
SD_High	$V_{SDH}$	2	-	Vcc	V	
SD_Low	$V_{SDL}$	0	-	0.4	V	
Tx_Fail_High (LVTTL)	$V_{Fail}$	2	-	Vcc	V	

Tx_Fail_Normal (LVTTTL)	V <sub>Normal</sub>	0	-	0.4	V	
<b>Receiver</b>						
Data Output Rise and Fall Time	T <sub>OUT</sub>	-	250	-	ps	1
Single ended data output swing (LVPECL)	V <sub>OUT, p-p</sub>	300	-	1200	mV	
Signal Detect Output LOW	V <sub>DETL</sub>	0	-	0.8	V	
Signal Detect Output HIGH	V <sub>DETH</sub>	2.4	-	V <sub>CC</sub>	V	
Signal Detect Response Time	T <sub>SD</sub>	-	-	-	ns	

Notes:

1. 20% to 80%

**Table 5 – Digital RSSI Timing Specification**

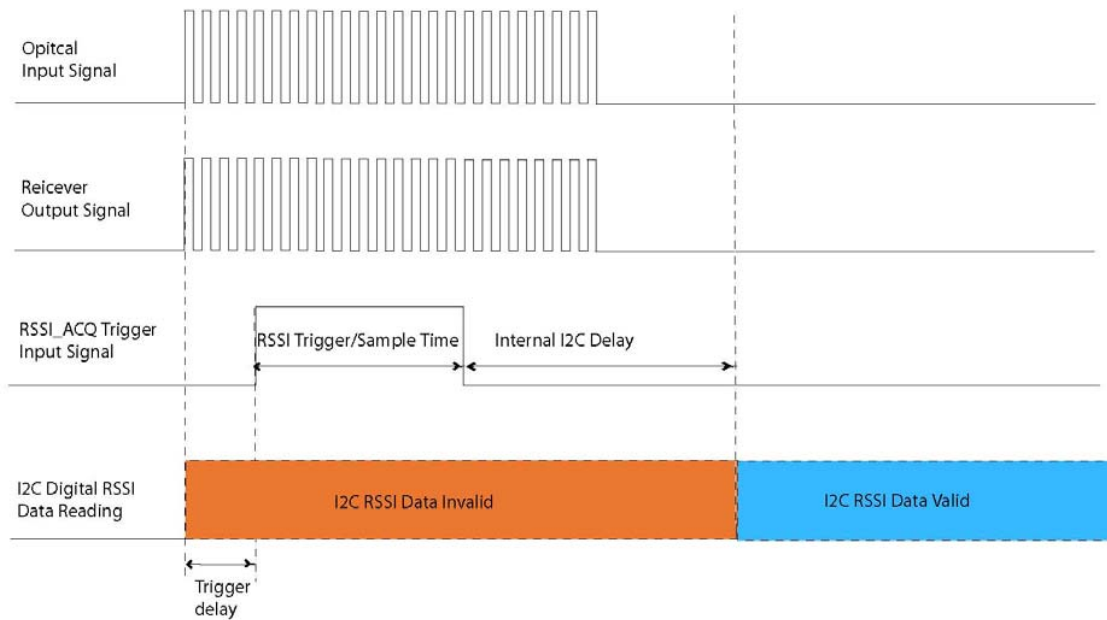
Parameter	Symbol	Min	Typical	Max	Unit
RSSI Trigger Delay <sup>a</sup>	T <sub>Trigger</sub>	25	-	-	ns
RSSI Sampling Time	RSSI <sub>sample</sub>	300	-	-	ns
Internal I2C Delay	T <sub>I2C</sub>	-	-	500	μs
Receiver Power DDM (RSSI) Error <sup>b</sup>	RX <sub>DDM</sub>	-	-	+/- 3	dB

- a) RSSI\_ACQ input signal rising edge will trigger RSSI sampling, and falling edge will trigger internal digital RSSI information written to I2C. It is recommended that host shall not trigger RSSI\_ACQ input again until RSSI data is valid in I2C from previous RSSI trigger.
- b) RSSI DDM working range between -10 to -30dBm. RSSI DDM accuracy is better than +/-3dB for input power range between -12 to -30dBm and the accuracy reduces to +/-5dB for input power range between -10 to -12dBm. If the data pattern is at least 2<sup>7</sup>-1 or longer, a minimum average of 8 times is strongly recommended to maintain the RSSI reading accuracy.

**Table 6 –Pin Function Definitions**

Pin	Name	Description
1	Acquire/ $\overline{\text{Hold}}$	LVTTTL input. High is Acquire mode and low is Hold mode.
2	RSSI_ACQ	RSSI acquisition. LVTTTL input. Acquired RSSI value is converted and read via I2C bus.
3	RX_GND	Rx Ground
4	Reserved	No User Connection; Internal use
5	Reserved	No User Connection; Internal use
6	RX_GND	Rx Ground
7	RX_Vcc	Rx Vcc
8	BRST_Det	LVTTTL output, active high. BRST_Det assert low when module reset, assert high when incoming burst detected
9	RXD-	Negative Data Output, LVPECL; DC coupled
10	RxD+	Positive Data Output, LVPECL; DC coupled
11	TX_Vcc	Tx Vcc
12	TX_GND	Tx Ground
13	TX_DIS	Tx Disable. LVTTTL input. Laser output is disabled when this pin is asserted high or left unconnected. Laser output is enabled when this pin is asserted low.
14	TXD+	Positive Data Input, LVPECL or CML (AC coupled; internally 100 ohms differential termination).
15	TXD-	Negative Data Input, LVPECL or CML (AC coupled; internally 100 ohms differential termination).
16	TX_GND	Tx Ground
17	SCL	2-Wire Serial Clock Input. Clocks data into and out of the device.
18	SDA	2-Wire Serial Data I/O Pin. Transfers serial data to and from the device.
19	TX_FAIL	Tx Fail Alarm. LVTTTL Output Active high.
20	TX_GND	Tx Ground

### Digital RSSI Timing



**Figure 1. Digital RSSI Timing.**

RSSI\_ACQ Input signal rising edge will trigger RSSI sampling, and falling edge will trigger internal digital RSSI information written to I2C. It is recommended that host shall not trigger RSSI\_ACQ input again until RSSI data is valid in I2C from previous RSSI trigger.

### Timing Diagram

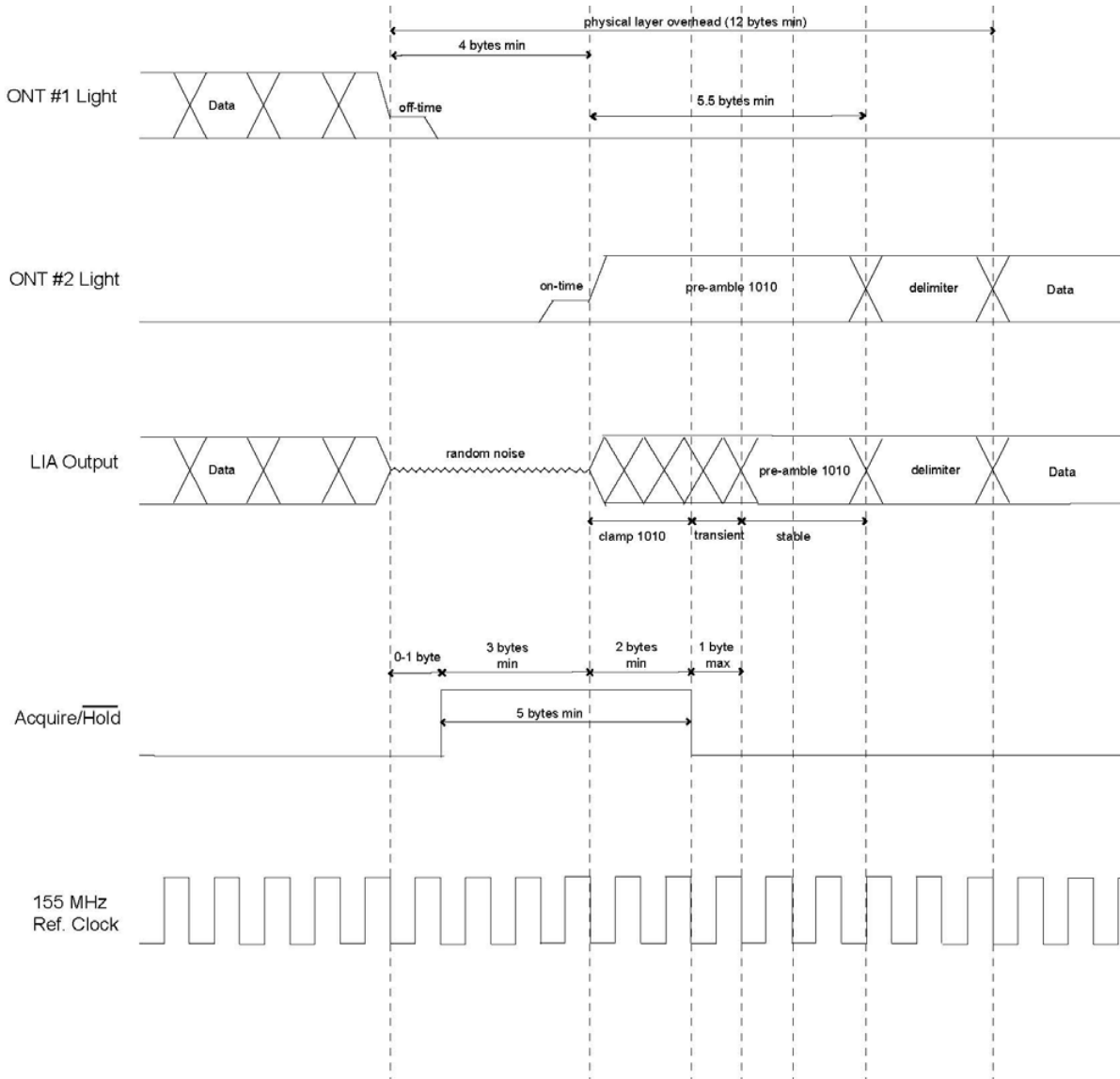


Figure 2. Timing Diagram

**Table 7 – EEPROM Content (A0h)**

I <sup>2</sup> C A0h Address					
DEC Addr.	HEX Addr.	Field Size (bytes)	Name	Default Value	Description
0	00	1	Identifier	02h	Module soldered to motherboard
1	01	1	Extended Identifier	04h	Function defined by serial ID
2	02	1	Connector	0Bh (pigtail).	Optical pigtail
3	03	8	Transceiver	00 00 00 00 00 00 00 00h	Transceiver Code Field, not applicable
11	0B	1	Encoding	03h	NRZ encoding
12	0C	1	Nominal Bit Rate in 100 MBps	19h	2488.32 Mbps
13	0D	1	Reserved	00h	Reserved
14	0E	1	Length (9μ,km) in km	14h	20km
15	0F	1	Length (9μ,m) in 100m	C8h	20km
16	10	1	Length (50μ) in 10m	00h	Not Supported
17	11	1	Length (62.5μ) in 10m	00h	Not Supported
18	12	1	Length (Copper) in m	00h	Not Supported
19	13	1	Reserved	00h	Reserved
20	14	16	Vendor Name (ASCII)	"SOURCEPHOTONICS"	Vendor Name (ASCII)
36	24	1	Reserved	00h	Reserved
37	25	3	Vender IEEE Company ID	00 06 B5h	Source Photonics IEEE ID
40	28	16	Vendor Part Number (ASCII)	"SFU4348HHPTDE"	Vendor Part Number (ASCII)
56	38	4	Vendor Rev (ASCII)	31 20 20 20	Revision
60	3C	2	Laser Wavelength in nm	05 D2h	1490nm Tx Wavelength
62	3E	1	Reserved	00h	Reserved
63	3F	1	Check Code for Base ID Fields	xxh	Checksum from byte 0-62
64	40	2	Options	00 1Ch	TX_DIS, TX_Fault, SD
66	42	1	Upper Bit Rate Margin in %	00h	BR, Max not specified
67	43	1	Lower Bit Rate Margin in %	00h	BR, Min not specified
68	44	16	Vendor Serial Number (ASCII)	"xxxxxxxxxxxxxxxx"	16 byte Serial number field (ASCII)
84	54	8	Date Code	xx xx xx xx xx xx 20 20h	Year(2 bytes) month(2 bytes) day(2 bytes)

92	5C	1	Diagnostic Monitoring Type	58h	Ext Calibration, Average Power Measurement
93	5D	1	Enhanced Options	E0h	Optical Alarm/warning implemented Soft TX_DIS, TX_FAULT implemented
94	5E	1	SFF-8472 Compliance	02h	Compliance to SFF-8472 Rev 9.4
95	5F	1	Check Code for Extended ID Fields	xxh	Checksum from byte 64-69
96	60	30	Vendor Specific	"SFU-43-48H-HP-TDE"	SP part number (ASCII)
126	7E	2	Vendor Specific	00 00h	Reserved
128	80	128	Reserved	00...00h	Reserved; return to 0

Note: The "xx" byte should be filled in according to practical case. For more information, please refer to the related document of SFF-8472 Rev 9.5.

**Table 9 – EEPROM Content (A2h)**

I <sup>2</sup> C A2h Address					
DEC Addr.	HEX Addr.	Field Size (bytes)	Name	Default Value	Description
0	00	2	Temp High Alarm	xx xxh	Temperature high alarm threshold
2	02	2	Temp Low Alarm	xx xxh	Temperature low alarm threshold
4	04	2	Temp High Warning	xx xxh	Temperature high warning threshold
6	06	2	Temp Low Warning	xx xxh	Temperature low warning threshold
8	08	2	Voltage High Alarm	94 70h	3.8V
10	0A	2	Voltage Low Alarm	6D 60h	2.8V
12	0C	2	Voltage High Warning	8C A0h	3.6V
14	0E	2	Voltage Low Warning	75 30h	3.0V
16	10	2	Bias High Alarm	83 81h	110mA
18	12	2	Bias Low Alarm	02 64h	2mA
20	14	2	Bias High Warning	77 8Ch	100mA
22	16	2	Bias Low Warning	03 96h	3mA
24	18	2	TX Power High Alarm	xx xxh	+5.5 dBm
26	1A	2	TX Power Low Alarm	xx xxh	+0.5dBm
28	1C	2	TX Power High Warning	xx xxh	+5.0dBm
30	1E	2	TX Power Low Warning	xx xxh	+1.0dBm
32	20	2	RX Power High Alarm	FF FFh	No alarm
34	22	2	RX Power Low Alarm	00 00h	No alarm
36	24	2	RX Power High Warning	FF FFh	No alarm
38	26	2	RX Power Low Warning	00 00h	No alarm
40	28	16	Reserved	00...000h	Reserved
56	38	4	RX_PWR(4) Calibration	xx xx xx xxh	4 <sup>th</sup> order RSSI calibration coefficient

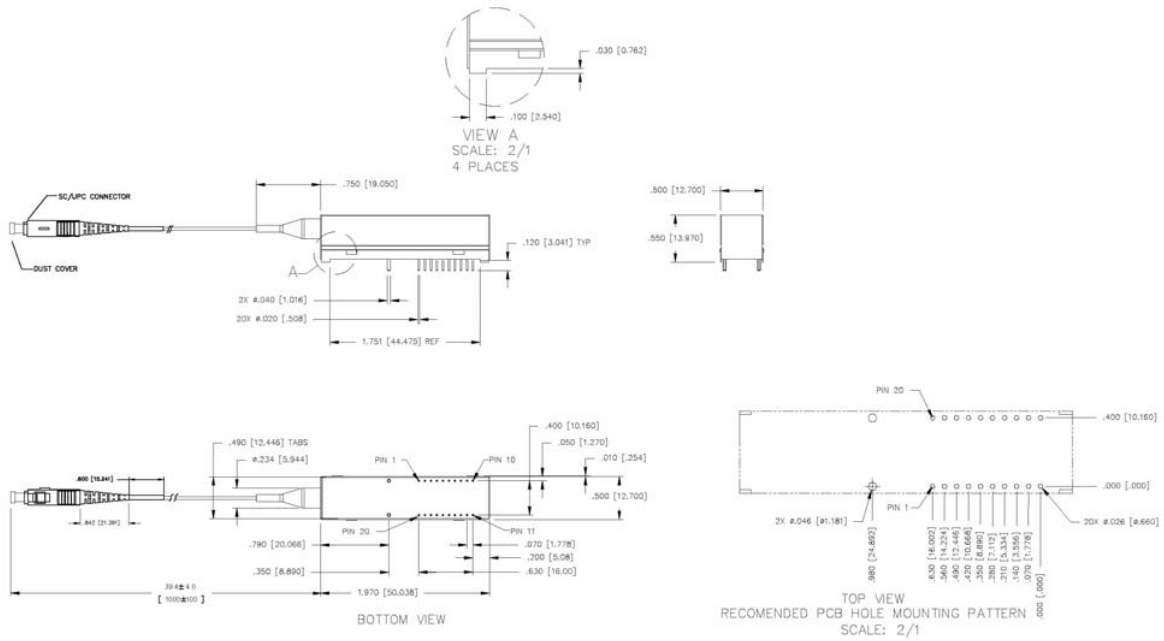


60	3C	4	RX_PWR(3) Calibration	xx xx xx xxh	3 <sup>rd</sup> order RSSI calibration coefficient
64	40	4	RX_PWR(2) Calibration	xx xx xx xxh	2nd order RSSI calibration coefficient
68	44	4	RX_PWR(1) Calibration	xx xx xx xxh	1 <sup>st</sup> order RSSI calibration coefficient
72	48	4	RX_PWR(0) Calibration	xx xx xx xxh	0 <sup>th</sup> order RSSI calibration coefficient
76	4C	2	TX_I(Slope) Calibration	01 A3h	Slope for Bias calibration
78	4E	2	TX_I(Offset) Calibration	00 00h	Offset for Bias calibration
80	50	2	TX_PWR(Slope) Calibration	xx xxh	Slope for TX Power calibration
82	52	2	TX_PWR(Offset) Calibration	xx xxh	Offset for TX Power calibration
84	54	2	T(Slope) Calibration	01 00h	Slope for Temperature calibration
86	56	2	T(Offset) Calibration	xx xxh	Offset for Temperature calibration, in units of 256ths C
88	58	2	V(Slope) Calibration	01 00h	Slope for VCC calibration
90	5A	2	V(Offset) Calibration	00 00h	Offset for VCC calibration
92	5C	3	Reserved	00h	reserved
95	5F	1	Checksum	xxh	Checksum
96	60	2	Transceiver Temperature	xx xxh	Temperature in C/256
98	62	2	Supply Voltage	xx xxh	Vcc
100	64	2	TX Bias Current	xx xxh	BIASMON
102	66	2	TX Optical Output Power	xx xxh	Back facet monitor
104	68	2	RX Optical Input Power	xx xxh	RSSI
106	6A	2	Reserved	0000h	Reserved
108	6C	2	Reserved	0000h	Reserved
110	6E.7	1bit	TX_DIS State	x	Digital state of the TX Disable Input Pin.
	6E.6	1bit	Soft TX Disable	x	Read/write bit that allows software disable of laser.
	6E.5	1bit	Reserved.	0	Reserved.
	6E.4	1bit	Rate Select State	0	NOT SUPPORTED.
	6E.3	1bit	Rate Select	0	NOT SUPPORTED.
	6E.2	1bit	TX_FAULT	x	Digital state of the TX Fault Output Pin.
	6E.1	1bit	LOS	0	Digital state of the LOS Output Pin. NOT SUPPORTED
111	6E.0	1bit	Data_ready_bar	x	Indicates transceiver has achieved power up and data is ready.
	6F.7	1bit	Reserved	0	Reserved
	6F.6	1bit	Reserved	0	Reserved
	6F.5	1bit	Reserved	0	Reserved
	6F.4	1bit	Reserved	0	Reserved

	6F.3	1bit	Reserved	0	Reserved
	6F.2	1bit	INTERRUPT_NOT	x	Interrupt state (active low)
	6F.1	1bit	MODE_EN	0	TX FAULT pin enable
	6F.0	1bit	APD_SHUTDOWN	x	APD shut-down latch. Write 0 to clear condition
112	70.7	1bit	Temperature too high alarm	x	Temperature too high alarm
	70.6	1bit	Temperature too low alarm	x	Temperature too low alarm
	70.5	1bit	VCC too high alarm	x	VCC too high alarm
	70.4	1bit	VCC too low alarm	x	VCC too low alarm
	70.3	1bit	BIASMON too high alarm	x	BIASMON too high alarm
	70.2	1bit	BIASMON too low alarm	x	BIASMON too low alarm
	70.1	1bit	BFMON too high alarm	x	BFMON too high alarm
	70	1bit	BFMON too low alarm	x	BFMON too low alarm
113	71.7	1bit	RSSI too high alarm	x	RSSI too high alarm
	71.6	1bit	RSSI too low alarm	x	RSSI too low alarm
	71.5	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
	71.4	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
	71.3	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
	71.2	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
	71.1	1bit	Reserved interrupt status bit	x	TX Fail went HIGH
	71	1bit	Reserved interrupt status bit	x	APD Shutdown event detected
114	72	1	Reserved	00h	Interrupt Mask for ISRC0
115	73	1	Reserved	00h	Interrupt Mask for ISRC1
116	74.7	1bit	Temperature too high warning	x	Temperature too high warning
	74.6	1bit	Temperature too low warning	x	Temperature too low warning
	74.5	1bit	VCC too high warning	x	VCC too high warning
	74.4	1bit	VCC too low warning	x	VCC too low warning
	74.3	1bit	BIASMON too high warning	x	BIASMON too high warning
	74.2	1bit	BIASMON too low warning	x	BIASMON too low warning

	74.1	1bit	BFMON too high warning	x	BFMON too high warning
	74	1bit	BFMON too low warning	x	BFMON too low warning
117	75.7	1bit	RX Power High Warning	x	RSSI too high warning
	75.6	1bit	RX Power Low Warning	x	RSSI too low warning
	75.5	1bit	Reserved	0	Reserved
	75.4	1bit	Reserved	0	Reserved
	75.3	1bit	Reserved	0	Reserved
	75.2	1bit	Reserved	0	Reserved
	75.1	1bit	Reserved	0	Reserved
	75	1bit	Reserved	0	Reserved
118	76	1	Reserved	00h	Interrupt Mask for ISRC2
119	77	1	Reserved	00h	Interrupt Mask for ISRC3
120	78	8	Vendor Specific	00 00 00 00 00 00 00 00h	Vendor Specific
128	80	120	User EEPROM	all 00h	User EEPROM
248	F8	1	ER Control	00h	Default 00h
249	F9	1	ALU proprietary ID,MSB	02h	ALU Specific Control Address, 02 for B+, active high SD
250	FA	1	ALU proprietary IDs,LSB	01h	ALU Specific Control Address, 01 for digital RSSI
251	FB	5	Vendor specific	00 00 00 00 00h	Vendor specific

**Mechanical Diagram**



**Figure 3, Mechanical Diagram**

## 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.

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