



**OPEN**  
Compute Project

**Alpha Networks Inc**

**SNX-60x0-486T**

48-port 10G BASE-T & 2-port 40G QSFP+ +  
4-port 100G QSFP28 Switch  
(ToR/Aggregation Switch)

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## Revision History

Version	Revised Date	Author	Content Revised
<b>0.1</b>	16/01/16	Alex Chen	Initial Version
<b>0.2</b>	26/01/16	Alex Chen	Fixed invalid link
<b>0.3</b>	03/02/16	Alex Chen	Fixed typo

# Scope

This documents defines the technical specification for SNX-60x0-486T used in the Open Compute Project as 10G Top of the Rack (ToR) or as an aggregation switch

# Contents

Revision History.....	2
Overview .....	6
License.....	6
1 Feature Highlights.....	8
2 Physical Overview .....	9
2.1 Mechanical Dimension.....	9
2.2 Top View.....	10
2.3 Front View.....	10
2.4 Rear View .....	11
3 LED Definition .....	11
4 Field Replaceable Components .....	13
4.1 Power Supply Modules .....	13
4.2 Fan Modules.....	16
5 System Overview .....	18
5.1 Main PCB.....	18
5.1 CPU Subsystem.....	20
5.1.1 Intel CPU (C2558).....	20
5.1.1.1 DDR3 SDRAM .....	26
5.1.1.2 PCIe Interface.....	26
6 IO and Connectors .....	26

6.1	RS232 Interface .....	26
6.2	Management Ethernet Interfaces.....	26
6.3	USB Interface .....	26
7	Power/Environmental/Agency Certifications .....	27

## List of Figures

Figure 1: SNX-60x0-486T Chassis dimension .....	9
Figure 2: SNX-60x0-486T top view .....	10
Figure 3: SNX-60x0-486T front view .....	11
Figure 4: SNX-60x0-486T rear view.....	11
Figure 5: Power Supply Mechanical specification.....	15
Figure 6: Fan module mechanical specification .....	18
Figure 7: Main board block diagram .....	19

## List of Tables

Table 1: LED behavior for system .....	12
Table 2: LED behavior for Port 1~48 10G Ethernet Port .....	12
Table 3: LED behavior for Port 49~50 40G, 51~54 100G Ethernet Port.....	13
Table 4: Power supply LED definition.....	13
Table 5: Power supplies usage .....	14
Table 6: Power supply connector pin out .....	14
Table 7: LED definition on power supply .....	15
Table 8: Power Supply EEPROM FRU data format .....	16
Table 9: Fan Modules part number .....	17



Open Compute Project Alpha Networks SNX-60x0-486T Specification v0.6

Table 10: Fan Modules connector pin out .....	17
Table 11: PCBs for SNX-60x0-486T .....	18
Table 12: CPU subsystem key Components .....	20
Table 13: Intel CPU module connector pin out .....	23
Table 14: Intel CPU module connector Pin Definitions .....	25
Table 16: Power consumption and environment table.....	27
Table 16: Regulatory Standards Compliance table .....	29

## Overview

The SNX-60x0-486T Series Data Center, Top-of-Rack (ToR)/aggregation switches, with a total combined bandwidth of 960 Gbps, feature 48 ports of 10 Gbps, 2 ports of 40 Gbps and 4 ports of 100 Gbps Ethernet wire-speeds. The Layer 3 capable, bare metal system also provides an RJ-45 console port and an Out-Of-Band (OOB) management port. It also provides a micro USB interface in the front panel for the administrators to upgrade code by using an extended cable.

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Items		Detailed Description
<b>MAC Controller</b>		BCM56860*1
<b>PHY for 10G</b>		BCM84868*12 or BGM84858*12
<b>PHY for 100G</b>		BCM82792*2
<b>10G NIC</b>		BCM57810S*1 (Optional)
<b>CPU Subsystem</b>		
<b>Modular CPU board</b>	CPU	Intel Rangeley C2558 4 Cores/2.4GHz
	RAM	DDR3 4GB for Intel Rangeley CPU (reserved up to 32G)
	Flash	SSD 16GB for Intel Rangeley CPU (reserved up to 64G)
	Boot Flash	8MB for Intel Rangeley CPU (reserved up to 16MB)
<b>PHY for CPU Management Port</b>		MVL88E1112*1



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# 1 Feature Highlights

The SNX-60x0-486T Series Data Center, leaf/ToR switches, with a total combined bandwidth of 960 Gbps, feature 48 ports of 10 Gbps RJ-45, 2 ports of 40 Gbps QSFP+ and 4 ports of 100Gbps QSFP28 at Ethernet wire-speeds. The Layer 3 capable, bare metal system also provides a RJ-45 and micro USB console port, an Out-Of-Band (OOB) management port using RJ-45 and an USB type A port for storage.

- OCP micro server modular CPU board with large flash and memory
- Temperature warning
- Software-readable thermal monitor
- Real time clock (RTC) support
- Two Hot-swappable redundant power supply
- Four redundant (4+1) fan modules
- The following are supported
- Front panel
  - One Reset Button
  - One Locator LED
  - Micro USB console port
- Rear panel
  - One Out-Of-Band (OOB) 10/100/1000 Mbps RJ-45 management port
  - One RJ-45 type console port
  - One USB (Type A) port for storage device
  - Two BNC ports for IEEE 1588 clock sync (Optional)



## 2 Physical Overview

### 2.1 Mechanical Dimension

Dimension	
Height x Width x Depth	44mm(H)440mm(W) x 487.4 mm(D)

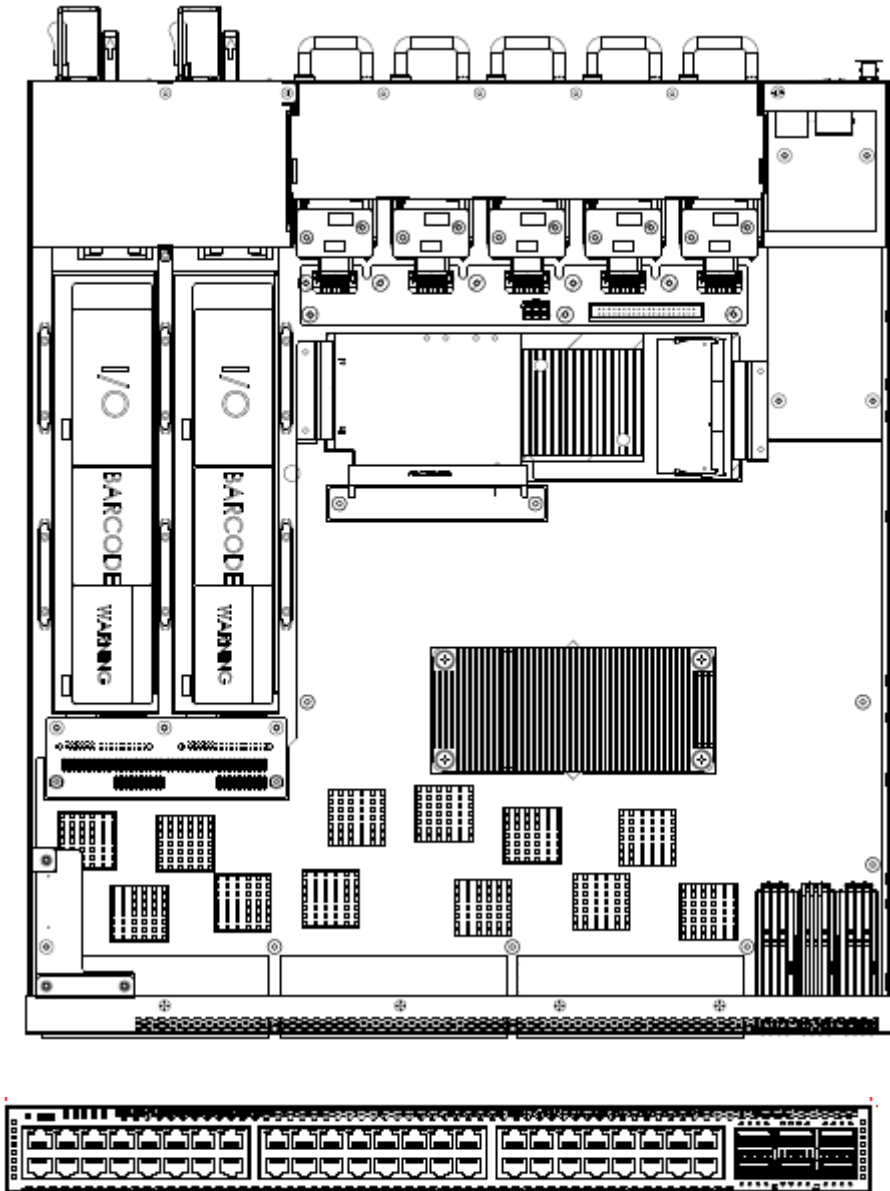


Figure 1: SNX-60x0-486T Chassis dimension

## 2.2 Top View

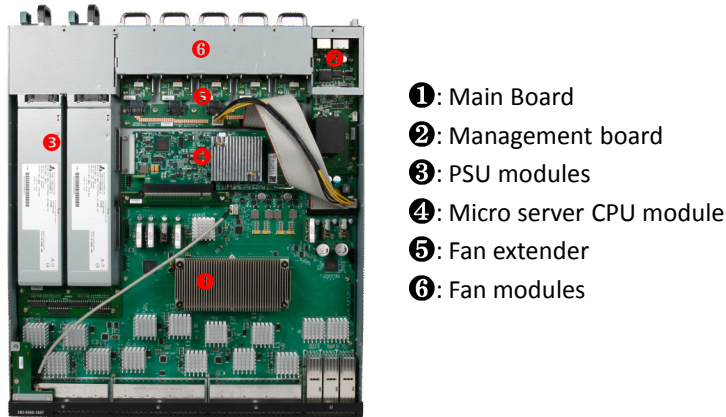


Figure 2: SNX-60x0-486T top view

## 2.3 Front View



- ❶: Reset button
- ❷: Micro USB console port
- ❸: 48\* 10G Base-T ports
- ❹: 2\* 40G QSFP+ ports
- ❺: 4\* 100G QSFP28 ports

Figure 3: SNX-60x0-486T front view

## 2.4 Rear View



- ①: Hot swappable fan modules
- ②: Hot swappable power supply
- ③: Console Port
- ④: BMC port
- ⑤ : Type A USB storage port
- ⑥ : Out of band management port
- 1588 BNC port Design Reserved

Figure 4: SNX-60x0-486T rear view

## 3 LED Definition

The following table defines the per device LEDs' behaviors:

Items	LED Indication	Color	Behavior	Description
1	Locator	Blue	Blinking	Locator function is enable
			Off	Locator function is disable
2	STAT	Green	Solid Light	POST Passed, normal operation
			Blinking	POST in progress
		Amber	Blinking	POST failed or overheat or power supply failed or Fan module fail or over temperature
3	MGMT	Green	Solid Light	Link up
			Blinking	Packet transmitting or receiving
			Light off	No link up or port disable

4	FAN 1 FAN 2 FAN 3 FAN 4 FAN 5	Green	Solid Light	All diagnostics pass. The module is operational.
	Off		The module is not receiving power	
	Amber	Blinking	Failure	
5	PWR (P1, P2)	Green	Solid Light	Power On
			Off	Power Off and no power attached
		Amber	Blinking	Power supply failures, over voltage, over current, over temperature

Table 1: LED behavior for system

The following defines the 10G BASE-T Ethernet port LEDs' behaviors:

Location	Speed	LED Indication	Color	Behavior	Description
LED Port 1~48	10G bps(high speed) LED	Link/Act	Green	Solid Light	The port has a link and is operating at 10Gbps
				Blinking	
	5, 2.5, 1 G bps(low speed)		Amber	Solid Light	The port has a link and is operating at 5/2.5/1Gbps
				Blinking	The port is sending or receiving data at 5/2.5/1Gbps
Off		Light off	Link down or no link		

Table 2: LED behavior for Port 1~48 10G Ethernet Port

The following table defines the 40G & 100G QSFP28 Ethernet port LEDs' behaviors:

Location	Speed	LED Indication	Color	Behavior	Description
LED number 49~56 in group of 4 (40Gbps)	40G	Link/Act/Speed	Green	Solid Light	When there is a secure 40G connection (or link)
				Blinking	Packet transmitting or receiving
				Light off	No link up or port disable
LED number	100G	Link/Act/Speed	Green	Solid Light	When there is a secure 100G

<b>57~72, group of 4</b>					connection (or link)	
				Blinking	Packet transmitting or receiving	
	40G			Amber	Solid Light	When there is a secure 40G connection (or link)
					Blinking	Packet transmitting or receiving
Off				Light off	No link up or port disable	

Table 3: LED behavior for Port 49~50 40G, 51~54 100G Ethernet Port

Each power supply module has a bi-color LED, which behavior is described in the following:

LED Color	Behavior	Description
<b>Green</b>	Solid Light	Output ON and OK
	Blinking	AC present / AC Line 12VSB Holdup
	Light off	No AC power to all power supplies
<b>Amber</b>	Solid Light	Power supply critical event causing a shutdown; failure, Fan Fail
	Blinking	Power supply warning events where the power supply continues to operate; high temp, high power, high current, slow fan.

Table 4: Power supply LED definition

## 4 Field Replaceable Components

### 4.1 Power Supply Modules

The switch is powered through one or two internal power supply modules.

Supported power supply modules:

- AC-770-12-FB
- AC-770-12-BF
- DC-1100-12-FB
- DC-1100-12-BF

The switch requires only one power supply for its operations, but you can include a second one for redundancy. By default the switch is installed one power supply in the second power supply slot, and filled the first slot with a filler panel. You can order

extra power supplies with forward airflow or reverse airflow. Be sure to order the same direction of airflow as is used with the switch. Never leave a power supply slot empty. Please fill the slot with a filler panel.

Please refer to Table 5 for the recommended power supply usage for each switch model.

Switch Model Number	Equipped CPU Model	Power Supply Vender	Power Supply Model Number	Minimum Number of Power Supply Need
<b>SNX-60X0-486T-AF-B</b>	Intel Rangely C2558	Delta Electronics	AC-770-12-FB	1
<b>SNX-60X0-486T-AB-B</b>	Intel Rangely C2558	Delta Electronics	AC-770-12-BF	1
<b>SNX-60X0-486T-DF-B</b>	Intel Rangely C2558	Delta Electronics	DC-1100-12-FB	1
<b>SNX-60X0-486T-DB-B</b>	Intel Rangely C2558	Delta Electronics	DC-1100-12-BF	1

Table 5: Power supplies usage

Power Supply connector: Molex 45984-4343

Pin #	Descriptin	Pin #	Descriptin3
<b>S1</b>	+12VRS+	<b>S13</b>	N/A
<b>S2</b>	+12VRS-	<b>S14</b>	SGND
<b>S3</b>	12LS	<b>S15</b>	A0
<b>S4</b>	SMB ALERT	<b>S16</b>	N/A
<b>S5</b>	SDA	<b>S17</b>	Vs
<b>S6</b>	SCL	<b>S18</b>	N/A
<b>S7</b>	PSKILL	<b>S19</b>	N/A
<b>S8</b>	PSON	<b>S20</b>	N/A
<b>S9</b>	PWOK	<b>S21</b>	N/A
<b>S10</b>	A1	<b>S22</b>	N/A
<b>S11</b>	5VSB	<b>S23</b>	+5VSB
<b>S12</b>	5VSB	<b>S24</b>	+5BSB
<b>P1</b>	+12_VOUT	<b>P3</b>	GND
<b>P2</b>	+12_VOUT	<b>P4</b>	GND

Table 6: Power supply connector pin out

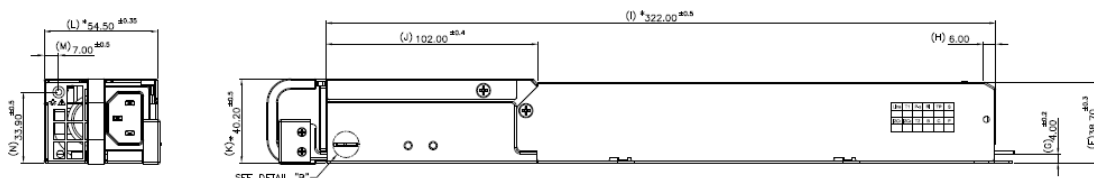


Figure 5: Power Supply Mechanical specification

## LED definition on power supply

Power Supply Condition	LED Status
PSU is switched on and is running (Output ON and OK)	Green
No AC power to all power supplies or PSU is ON but with warning events	Off
PSU is OFF but 5VSB is on	1Hz on Blink Green
PSU critical event causing a shutdown: failure, OCP, OTP, OVP, UVP, Fan Fail	Amber
PSU warning events: high temp, high power, high current, slow fan, under input voltage	1Hz on Blink Amber

Table 7: LED definition on power supply

## FRU

FRU data format compliant with IPMI ver 1.0 (per rev 1.1 from Sept. 25, 1999) specification. The FRU device will implement the same protocols as the commonly used AT24C02 device, including the Byte Read, Sequential Read, Byte Write and Page Read protocols.

The EEPROM content is as following

Area Type	Description
Common Header	Format Version Number
Internal Use Area	Not required, do not reserve
Chassis Info Area	Not applicable, do not reserve
Board Info Area	Not applicable, do not reserve
Product Info Area	As defined by the IPMI FRU document. Product information is defined as following
Field name	Field Description
Manufacturer Name	{Formal name of manufacturer}
Product Name	{Manufacturer's model number}
Product part/model number	Customer part number
Product Version	Customer current revision
Product Serial Number	{Defined at time of manufacture}
Asset Tag	{Not used, code is zero length byte}
FRU File ID	{Not required}
PAD Bytes	{Added as necessary to allow for 8-byte offset to next

	area}
Mult-Record Area	As defined by the IPMI FRU documentation. The following information shall be used by this power supply: Power Supply Information (Record type 0x00) DC Output (Record Type 0x01) No other record types are required for power supply Multi-Record information shall be defined as following
Field Name (PS Info)	Field Information Definition
Overall Capacity (watts)	770
Peak VA	770
Inrush current (A)	40
Inrush interval (msec)	5
Low end input voltage range 1	100
High end input voltage range 1	127
Low end input voltage range 2	200
High end input voltage range 2	240
Low End Input Frequency Range	47
High End Input Frequency Range	63
Holdup Time (msec)	12
Binary flags	Set for: Hot Swap support, Auto switch and PFC
Peak Wattage	839 Watts
Peak Wattage Time in seconds	12
Combined wattage	770
Predictive fail tach support	Supported
Field Name (Output)	Field Description : Two output are to be defined from #1 to #2, as follows: +12V and +5VSB
Output Information	Set for: Standby on +5VSB, no 5VSB on all others
All other output fields	Format per IPMI specification , using parameters in this specification

Table 8: Power Supply EEPROM FRU data format

## 4.2 Fan Modules

The SNX-60x0-486T supports up to 5 fan modules. For front to rear and rear to front



air flow, different types of fan modules are required.

Air Flow Direction	Part Number
Front to Rear	AVC DFTA0456B2UP057
Rear to Front	AVC DFTA0456B2UP058

Table 9: Fan Modules part number

Fan module connector: LCU SM401V-20P

#	NAME	Description	#	NAME	Description
1	FAN_CON_TACH_0	FAN tachometer 0	11	FAN_DIR	FAN Direction
2	GND	GND	12	GND	GND
3	FAN_12VIN	12V	13	FAN_12VIN	12V
4	FAN_CON_PWM_0	PWM control for FAN0	14	EE_GND	EEPROM GND
5			15	EE_SDA	EEPROM SDA
6	EE_SCL	EEPROM SCL	16	EE_VDD	EEPROM VDD
7	EE_A0	EEPROM ADDR_0	17	FAN_CON_PWM_1	PWM control for FAN1
8	FAN_12VIN	12V	18	FAN_12VIN	12V
9	GND	GND	19	GND	GND
10	FAN_PRESENT#	Exist FAN module	20	FAN_CON_TACH_1	FAN tachometer 0

Table 10: Fan Modules connector pin out

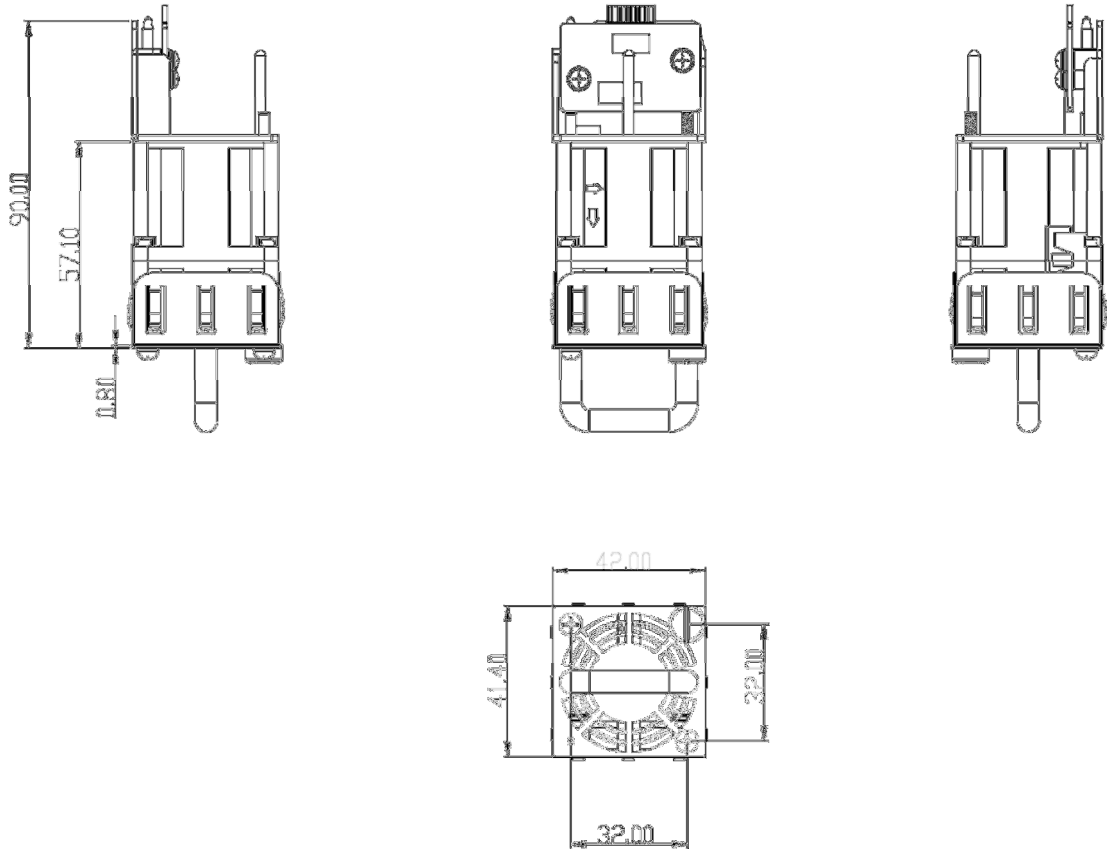


Figure 6: Fan module mechanical specification

## 5 System Overview

The SNX-60x0-486T comprised of the following PCB

PCB Function	PCB Layer	Dimension (mmxmm)
Main board	14	431*326.3
FAN module	2	38.5*29
FAN Adapter	2	228*30
LED board	2	50*91.5
PCIE Adapter	4	135.5*16
PSU Adapter	4	132.4*41.3
CPU board	12	210*73.8
Management board	4	58*180

Table 11: PCBs for SNX-60x0-486T

### 5.1 Main PCB

The main PCB is a 12 layer PCB where the switch MAC resides. It also supports the

following functions:

- Networking I/O ports
- Management ports
- LED
- Connectivity to power supply and fan
- Power conversion circuit
- Etc

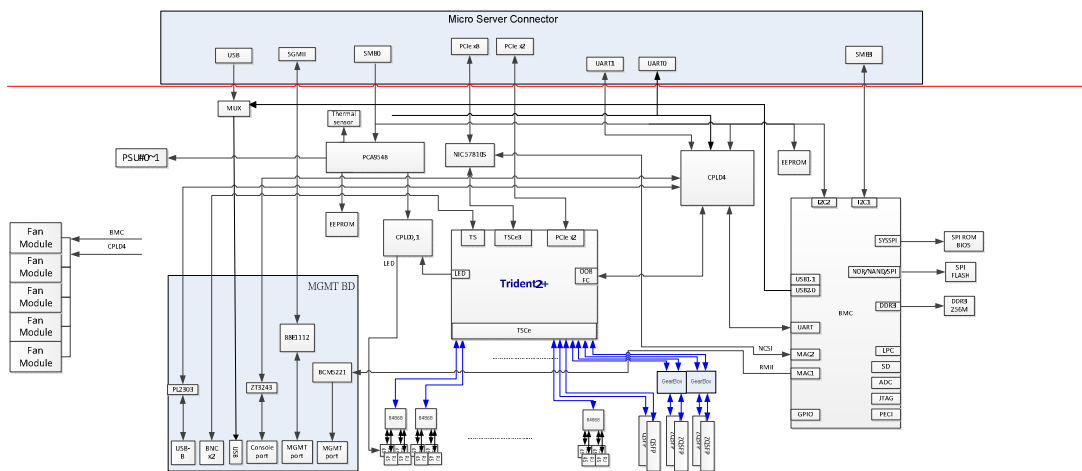
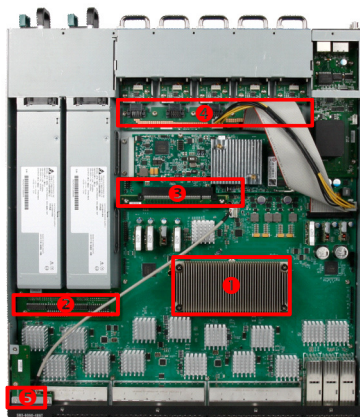


Figure 7: Main board block diagram



- 1: MAC BMC5686
- 2: Power supply connector
- 3: Connector for CPU module
- 4: Fan module connector
- 5: MGMT board

Figure 8: Main PCB top view

## 5.1 CPU Subsystem

The following Table is the list of key components used in SNX-60x0-486T

Items		Detailed Description
Intel		
<b>Modular CPU board (Option 2)</b>	CPU	Intel Rangeley C2558 4 Cores/2.4G
	RAM	DDR3 4GB for Intel Rangeley CPU
	Flash	SSD 8GB for Intel Rangeley CPU
	Boot Flash	8MB for Intel Rangeley CPU

Table 12: CPU subsystem key Components

### 5.1.1 Intel CPU (C2558)

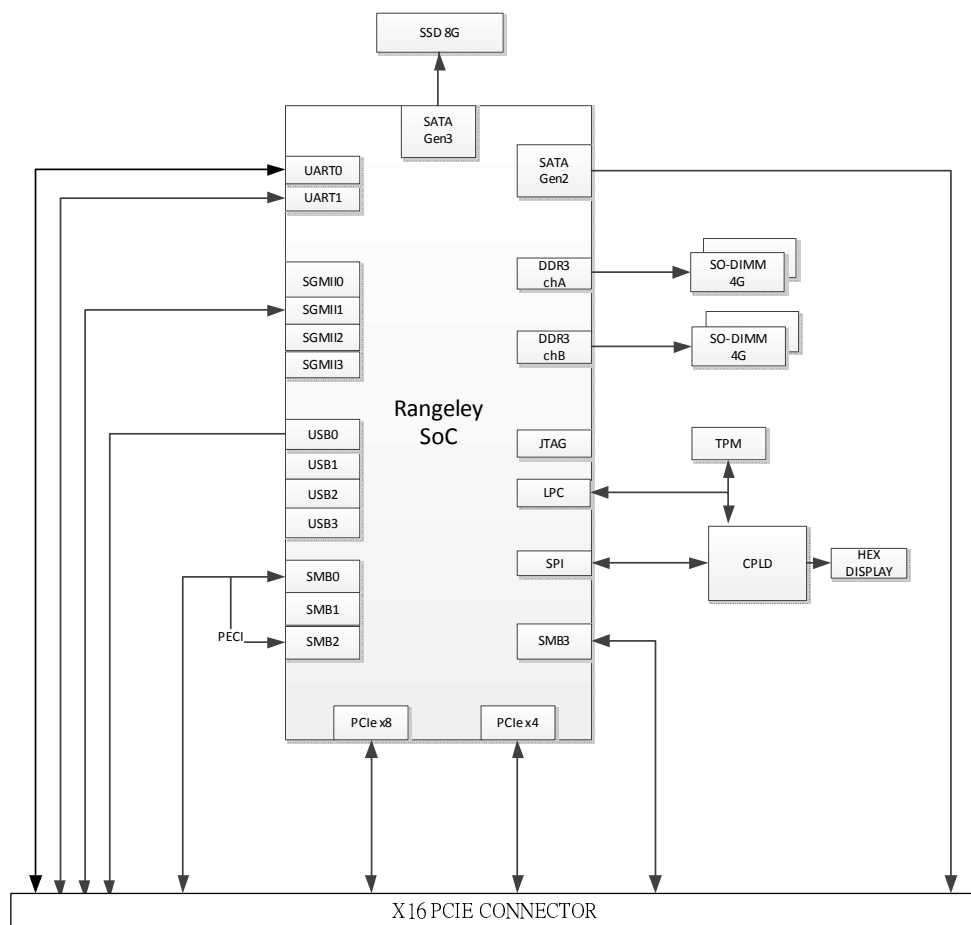


Figure 9: Intel CPU board block diagram

## Intel CPU module connector: x16 PCIe Edge Connector

For 80 PIN connector			
#	Pin Name	#	Pin Name
<b>B1</b>	P12V	<b>A1</b>	PRSNT#
<b>B2</b>	P12V	<b>A2</b>	P12V
<b>B3</b>	P12V	<b>A3</b>	P12V
<b>B4</b>	GND	<b>A4</b>	GND
<b>B5</b>	I2C_SCL	<b>A5</b>	RFU
<b>B6</b>	I2C_DATA	<b>A6</b>	RFU
<b>B7</b>	GND	<b>A7</b>	COM_TX
<b>B8</b>	PWR_BTN#	<b>A8</b>	COM_RX
<b>B9</b>	USB_P	<b>A9</b>	GE0_MDC
<b>B10</b>	USB_N	<b>A10</b>	GE0_MDIO
<b>B11</b>	SYS_RESET#	<b>A11</b>	PCIE0_RESET#
KEY			
<b>B12</b>	I2C_ALERT#	<b>A12</b>	GND
<b>B13</b>	GND	<b>A13</b>	PCIE0_REFCLK_P
<b>B14</b>	GND	<b>A14</b>	PCIE0_REFCLK_N
<b>B15</b>	PCIE0_TX0_P	<b>A15</b>	GND
<b>B16</b>	PCIE0_TX0_N	<b>A16</b>	GND
<b>B17</b>	GND	<b>A17</b>	PCIE0_RX0_P
<b>B18</b>	GND	<b>A18</b>	PCIE0_RX0_N
<b>B19</b>	PCIE0_TX1_P	<b>A19</b>	GND
<b>B20</b>	PCIE0_TX1_N	<b>A20</b>	GND
<b>B21</b>	GND	<b>A21</b>	PCIE0_RX1_P
<b>B22</b>	GND	<b>A22</b>	PCIE0_RX1_N
<b>B23</b>	PCIE0_TX2_P	<b>A23</b>	GND
<b>B24</b>	PCIE0_TX2_N	<b>A24</b>	GND
<b>B25</b>	GND	<b>A25</b>	PCIE0_RX2_P
<b>B26</b>	GND	<b>A26</b>	PCIE0_RX2_N
<b>B27</b>	PCIE0_TX3_P	<b>A27</b>	GND
<b>B28</b>	PCIE0_TX3_N	<b>A28</b>	GND
<b>B29</b>	GND	<b>A29</b>	PCIE0_RX3_P
<b>B30</b>	GND	<b>A30</b>	PCIE0_RX3_N
<b>B31</b>	UART0_TXD	<b>A31</b>	GND
<b>B32</b>	UART0_RXD	<b>A32</b>	GND
<b>B33</b>	GND	<b>A33</b>	RFU
<b>B34</b>	GND	<b>A34</b>	RFU
<b>B35</b>	PCIE1_REFCLK_P	<b>A25</b>	GND
<b>B36</b>	PCIE1_REFCLK_N	<b>A36</b>	GND
<b>B37</b>	GND	<b>A37</b>	RFU
<b>B38</b>	GND	<b>A38</b>	RFU

<b>B39</b>	PCIE1_RESET#	<b>A39</b>	GND
<b>B40</b>	RFU	<b>A40</b>	GND
<b>B41</b>	GND	<b>A41</b>	RFU
<b>B42</b>	GND	<b>A42</b>	NIC_SMBUS_ALERT#
<b>B43</b>	NIC_SMBUS_SCL	<b>A43</b>	GND
<b>B44</b>	NIC_SMBUS_SDA	<b>A44</b>	GND
<b>B45</b>	GND	<b>A45</b>	GEO_RX_P
<b>B46</b>	GND	<b>A46</b>	GEO_RX_N
<b>B47</b>	GEO_TX_P	<b>A47</b>	GND
<b>B48</b>	GEO_TX_N	<b>A48</b>	GND
<b>B49</b>	GND	<b>A49</b>	RFU
<b>B50</b>	GND	<b>A50</b>	RFU
<b>B51</b>	RFU	<b>A51</b>	GND
<b>B52</b>	RFU	<b>A52</b>	GND
<b>B53</b>	GND	<b>A53</b>	RFU
<b>B54</b>	GND	<b>A54</b>	RFU
<b>B55</b>	RFU	<b>A55</b>	GND
<b>B56</b>	RFU	<b>A56</b>	GND
<b>B57</b>	GND	<b>A57</b>	RFU
<b>B58</b>	GND	<b>A58</b>	RFU
<b>B59</b>	RFU	<b>A59</b>	GND
<b>B60</b>	RFU	<b>A60</b>	GND
<b>B61</b>	GND	<b>A61</b>	RFU
<b>B62</b>	GND	<b>A62</b>	RFU
<b>B63</b>	RFU	<b>A63</b>	GND
<b>B64</b>	RFU	<b>A64</b>	GND
<b>B65</b>	GND	<b>A65</b>	PCIE1_RX0_P
<b>B66</b>	GND	<b>A66</b>	PCIE1_RX0_N
<b>B67</b>	PCIE1_TX0_P	<b>A67</b>	GND
<b>B68</b>	PCIE1_TX0_N	<b>A68</b>	GND
<b>B69</b>	GND	<b>A69</b>	PCIE1_RX1_P
<b>B70</b>	GND	<b>A70</b>	PCIE1_RX1_N
<b>B71</b>	PCIE1_TX1_P	<b>A71</b>	GND
<b>B72</b>	PCIE1_TX1_N	<b>A72</b>	GND
<b>B73</b>	GND	<b>A73</b>	PCIE1_RX2_P
<b>B74</b>	GND	<b>A74</b>	PCIE1_RX2_N
<b>B75</b>	PCIE1_TX2_P	<b>A75</b>	GND
<b>B76</b>	PCIE1_TX2_N	<b>A76</b>	GND
<b>B77</b>	GND	<b>A77</b>	PCIE1_RX3_P
<b>B78</b>	GND	<b>A78</b>	PCIE1_RX3_N
<b>B79</b>	PCIE1_TX3_P	<b>A79</b>	GND
<b>B80</b>	PCIE1_TX3_N	<b>A80</b>	GND
<b>B81</b>	GND	<b>A81</b>	P12V
<b>B82</b>	GND	<b>A82</b>	P12V

Table 13: Intel CPU module connector pin out

## Intel CPU module pin definitions

#	Pin	Direction (from CPU side)	Required/ Configurable	Pin Definition
	P12V	Input	Required	12 V-AUX power
	I2C_SCL	Input/Output	Required	I2C clock signal. I2C is the primary sideband interface for server management functionality. 3.3 VAUX signal. Pull-up is provided on the baseboard.
	I2C_SDA	Input/Output	Required	I2C data signal. I2C is the primary sideband interface for server management functionality. 3.3 VAUX signal. Pull-up is provided on the baseboard.
	I2C_ALERT#	Output	Required	I2C alert signal. Alerts the Baseboard Management Controller (BMC) that an event has occurred that must be processed. 3.3 V-AUX signal. Pull-up is provided on the baseboard.
	NIC_SMBUS_SCL	Input/Output	Required	Dedicated SMBus clock signal for network traffic between the BMC and the NIC. 3.3 V-AUX signal. Pullup is provided on the baseboard.
	NIC_SMBUS_SDA	Input/Output	Required	Dedicated SMBus data signal for network traffic between the BMC and the NIC. 3.3 V-AUX signal. Pullup is provided on the baseboard.
	NIC_SMBUS_ALERT#	Output	Required	Dedicated SMBus alert signal for network traffic between the BMC and the NIC. 3.3 V-AUX signal. Pullup is provided on the baseboard.
	PWR_BTN#	Input	Required	Power on signal. When driven low, it indicates that the server will begin its power-on sequence. 3.3 VAUX signal. Pull-up is provided on the baseboard. If PWR_BTN# is held low for

				< 4 seconds, then this indicates a soft (graceful) power off. Otherwise, a hard shutdown is initiated.
SYS_RESET#	Input	Required		System reset signal. When driven low, it indicates that the server will begin its warm reboot process. 3.3 V-AUX signal. Pull-up is provided on the baseboard.
PRSNT#	Output	Required		Present signal. This is pulled low on the card to indicate that a card is installed. 3.3 V-AUX signal. Pull-up is provided on the baseboard.
COM_TX	Output	Required		Serial transmit signal. Data is sent from the micro-server module to the BMC. 3.3 V-AUX signal.
COM_RX	Input	Required		Serial receive signal. Data is sent from the BMC to the micro-server module. 3.3 V-AUX signal.
UART0_TXD	Output	Required		Serial transmit signal. Data is sent from the micro-server module to the BMC. 3.3 V-AUX signal.
UART0_RXD	Input	Required		Serial receive signal. Data is sent from the BMC to the micro-server module. 3.3 V-AUX signal.
GE0_TX_P/N	Output	Required		Primary Ethernet transmit signal. Data is sent from the micro-server module to the baseboard.
GE0_RX_P/N	Input	Required		Primary Ethernet receive signal. Data is sent from the baseboard to the micro-server module.
GE0_MDC	Output	Required		Primary Ethernet management interface clock signal.
GE0_MDIO	Input/Output	Required		Primary Ethernet management interface data signal.
PCIe0_RESET#	Output	Required		PCIe reset signal. If a PCIe bus is connected, this signal provides the reset signal indicating the card VRs and clocks are stable when driven high to 3.3V.



PCIE0_TX0/1/2/3_P/N	Output	Configurable	<p>PCIe x4 bus-transmit signals. Data is sent from the micro-server module to the baseboard.</p> <p>These signals may or may not be connected on the baseboard.</p>
PCIE0_RX0/1/2/3_P/N	Input	Configurable	<p>PCIe x4 bus-receive signals. Data is sent from the baseboard to the micro-server module.</p> <p>These signals may or may not be connected on the baseboard.</p>
PCIE0_REFCLK_P/_N	Output	Configurable	<p>PCIe reference clock. This signal may or may not be connected on the baseboard.</p>
PCIE1/2_RESET#	Output	Configurable	<p>PCIe reset signals for to 2x additional PCIe buses. If a PCIe bus is connected, this signal provides the reset signal indicating the card VRs and clocks are stable when driven high to 3.3V.</p>
PCIE1_TX0/1/2/3_P/N	Output	Configurable	<p>Second set of PCIe x4 bus-transmit signals. Data is sent from the microserver module to the baseboard. These signals may or may not be connected on the baseboard.</p>
PCIE1_RX0/1/2/3_P/N	Input	Configurable	<p>Second set of PCIe x4 bus-receive signals. Data is sent from the baseboard to the micro-server module. These signals may or may not be connected on the baseboard.</p>
PCIE1_REFCLK_P/_N	Output	Configurable	<p>Two additional PCIe reference clocks. These signals may or may not be connected on the baseboard.</p>
USB_P/N	Input/Output	Configurable	<p>USB 2.0 differential pair.</p>
RSVD	Input/Output	Configurable	<p>Available differential pairs that could be configured as PCIe, SATA, SAS, Ethernet, or other high-speed interfaces.</p>
RFU	Input/Output	Not connected	<p>These pins are reserved for future use and are not used.</p>

Table 14: Intel CPU module connector Pin Definitions

### 5.1.1.1 DDR3 SDRAM

The Rangeley Memory Controller supports up to 64 GB. The memory controller supports a 64-bit data bus with 8-bit ECC. When only one of the two memory channels is used in a platform board design, Channel 0 must be used. In all designs, Channel 0 must be populated by DRAM devices. Within each memory channel DIMMs are populated in slot order; slot 0 is populated first and slot 1 last. If a DIMM has two ranks, the ranks must be symmetrical (same chip width, same chip density, and same total memory size per rank). If both memory channels of the memory controller are used, then both channels must be populated identically. The CPU board is used a DDR3-1333 4GB SO-DIMM.

### 5.1.1.2 PCIe Interface

The Rangeley has up to 16 PCIe ports. Each port consists of a Transmitter differential pair and a Receiver differential pair which are in the 1.0-Volt Core power well of the SoC. The Rangeley supports devices with 5.0 GT/s and 2.5 GT/s capabilities.

## 6 IO and Connectors

### 6.1 RS232 Interface

- Baud Rate: s/w define
- Data bits: 8
- Stop Bit: 1
- Parity: None
- Flow control: None

### 6.2 Management Ethernet Interfaces

There are one single PHY on front panel PCBA, use SGMII interface from CPU module convert to 10/100/1000 RJ-45 GbE Management port. The PHY used is Marvell 88E1112.

### 6.3 USB Interface

The CPU contains one Enhanced Host Controller Interface (EHCI) and complies to the EHCI 1.0 Specification. The EHCI supports up to four USB 2.0 root ports. USB 2.0 allows data transfers up to 480 Mbps. The controller integrates a Rate-Matching Hub (RMH) to support USB 1.1 devices. The USB Port 1 interface is configured by the debug software to be a debug port.

## 7 Power/Environmental/Agency Certifications

Power	
<b>Number of power supply</b>	2
<b>Power supply types</b>	AC (forward and reversed airflow) DC (forward and reversed airflow)
<b>Typical operating power</b>	TBD
<b>Maximum power</b>	511W
<b>AC PSUs</b>	770W
<ul style="list-style-type: none"> <li>● <b>Input voltage</b></li> <li>● <b>Frequency</b></li> <li>● <b>Efficiency</b></li> </ul>	<ul style="list-style-type: none"> <li>● 100 to 240 VAC</li> <li>● 50 to 60 Hz</li> </ul>
<b>DC PSUs</b>	1100W
<ul style="list-style-type: none"> <li>● <b>Input voltage range</b></li> <li>● <b>Efficiency</b></li> </ul>	<ul style="list-style-type: none"> <li>● 40.5V/23.8A 48V/19.0A -60V/15.6</li> </ul>
Environment	
<b>Operating temperature</b>	0 ~ 45°C (at sea level with Fan Failure condition)
<b>Altitude</b>	0 ~ 10,000ft at 40°C*
<b>Storage temperature</b>	-40~70°C
<b>Operating relative humidity</b>	0%-95% RH (non-condensing)
<b>Storage relative humidity</b>	0%~95% RH (non-condensing)
<b>Dimensions (height x width x depth)</b>	44mmx440mmx487.4mm
<b>Weight</b>	TBD

Table 15: Power consumption and environment table

Regulatory Standards Compliance	
<b>Regulatory compliance Safety</b>	Comply with CE markings per directives 2004/108/EC and 2006/95/EC FCC/IC Report Class A BSMI UL/cUL Listed Mark CCC
<b>Safety</b>	IEC60950-1 FCC/IC Report Class A EN 60950-1 FCC/IC Report Class A UL/CSA 60950-1 CNS 14336-1 GB4943.1
<b>EMC: Emissions</b>	IEC60950-1 FCC/IC Report Class A EN 60950-1 FCC/IC Report Class A UL/CSA 60950-1 CNS 14336-1

		GB4943.1	
RoHS Requirement			
Level	#	Description	Limitation/ ppm
A	A1	Cadmium/ Cadmium Compounds	80
	A2	Hexavalent Chromium/ Hexavalent Chromium Compounds	800
	A3	Lead/ Lead Compounds	800
	A4	Mercury/ Mercury Compounds	800
	A5	Polybrominated Biphenyls (PBBs)	800
	A6	Polybrominated Diphenylethers (PBDEs)	800
Reliability Test Reports			
Test Items	Standards		Remarks
<b>MTBF Prediction Report</b>	Telcordia SR-332, Issue 2		
<b>Free Fall Test Report</b>	<b>IEC 60068-2-32:</b> Basic Environmental Testing Procedures Part 2: Tests Test Ed: Free Fall-Second Edition; Incorporating Amendment 1; Amendment 2: 10-1990		<ul style="list-style-type: none"> <li>Drop Range: <math>\leq</math> 20Kg,1000mm; <math>\leq</math> 50kg, 500mm;</li> <li>Max. Load: 500 kg;</li> <li>FCS: 1 carton.</li> </ul>
<b>Vibration Test Report</b>	<b>IEC 60068-2-34:1973:</b> Environmental testing Test Fd: Random vibration wide band-General requirements		<ul style="list-style-type: none"> <li>Frequency: 20Hz ~500Hz;</li> <li>Method: Random;</li> <li>Test Time: 30 min/Per Axis;</li> <li>FCS: 1 carton.</li> </ul>
<b>Storage Test Report</b>	<b>IEC 60068-2-48:</b> Basic Environmental Testing Procedures Part 2: Tests Guidance on the Application of the Tests of IEC Publication 68 to Simulate the Effects of Storage-First Edition		<ul style="list-style-type: none"> <li>Low Temp.: -40°C,72Hours</li> <li>High Temp. /Low Humidity : 70 °C,25%R.H.,72Hours</li> <li>High Temp. /High Humidity : 40 °C,95%R.H.,96Hours</li> <li>FCS: 1 carton</li> </ul>
<b>Cold Test Report</b>	<b>IEC 60068-2-1:</b> Environmental Testing Part 2: Tests - Tests A: Cold-Fifth Edition; Amendment 1-1993; Amendment 2-1994		<ul style="list-style-type: none"> <li>Temperature: -10±3°C</li> <li>Humidity: Uncontrolled</li> <li>Test Time: 72 Hours</li> <li>FCS: 2 sets</li> </ul>
<b>Dry Heat Cyclic Test Report</b>	<b>IEC 60068-2-2:</b> Basic Environmental Testing Procedures Part 2: Tests - Tests B: Dry Heat-Fourth Edition; Supplement A-1976; Amendment 1-1993; Amendment 2-1994		<ul style="list-style-type: none"> <li>Temperature: 55±2°C</li> <li>Humidity: 5%R.H.</li> <li>Test Time: 72 Hours</li> <li>FCS: 2 sets</li> </ul>

<b>Damp Heat Steady State Report</b>	<b>IEC 60068-2-78:</b> Environmental Testing - Part 2-78: Tests - Test 2-78: Body Cab: Damp Heat, Steady State-First Edition; (Replaces IEC 60068-2-3 and 60068-2-56)	<ul style="list-style-type: none"> <li>• Temperature: 40±2°C</li> <li>• Humidity: 95+2-3%R.H.</li> <li>• Test time: 96 Hours</li> <li>• FCS: 2 sets</li> </ul>
<b>Damp Heat Cyclic Report</b>	<b>IEC 60068-2-30:</b> Basic Environmental Testing Procedures Part 2: Tests - Test Db and Guidance: Damp Heat, Cyclic (12 + 12-Hour Cycle)-Second Edition; Amendment 1-08/1985	<ul style="list-style-type: none"> <li>• Temperature: 40±2°C</li> <li>• Humidity: 95+2-3%R.H.</li> <li>• Cycle Time: 24 Hours</li> <li>• Number of Cycle: 2 Cycles</li> <li>• FCS: 2 sets</li> </ul>
<b>ESD Simulation Test Report</b>	<b>IEC 61000-4-2:</b> Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test-Edition 1.2; Edition 1:1995 Consolidated with Amendments 1:1998 and 2:2000	<ul style="list-style-type: none"> <li>• Air Discharge: ±8KV;</li> <li>• Contact Discharge: ±4KV;</li> <li>• FCS: 1 set.</li> </ul>
<b>Electrical Isolation Test Report</b>	<b>For Class I equipment only.</b>	<ul style="list-style-type: none"> <li>• Primary (L-N) to Earth (Metal frame or Ground Pin): Minimum 1,5 kV ac, at least 60 seconds;</li> <li>• Lan Port (RJ-45) to Ground (Metal frame) Minimum 1,5 kV ac at least 60 seconds.</li> </ul>

Table 16: Regulatory Standards Compliance table