



OPEN

Compute Project

Alpha Networks Inc.

SNC-60x0-488F

48-port 25G SFP28 + 8-port 100G QSFP28
Enterprise DC & Carrier TOR Switch
(L3 Capable Switch)



Revision History

Version	Revised Date	Person Name	Content Revised
0.1	12/29/2017	Natalie Chang	Initial Version



Scope

This documents defines the technical specification for SNC-60x0-488F used in the Open Compute Project as 25G Enterprise DC and Carrier TOR switch

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Overview

The SNC-60x0-488F switch is a Top-of-Rack (TOR) or leaf switch for high-performance enterprise data centers and carrier cloud. In a compact 1RU form factor, the switch delivers complete L2/L3 switching and routing capabilities at high port density, supporting up to 48 x 25 GbE with 8 x 100 GbE uplinks.

The SNC-60x0-488F is a bare-metal switch loaded with the Open Network Install Environment (ONIE) which supports the installation of compatible Network Operating System (NOS) offerings.

The SNC-60x0-488F switch supports 1+1 redundant power supplies and 5+1 redundant fan modules to provide the system reliability.

The CPU was designed as modules, and the following CPU modules are supported.

- Intel Rangeley CPU based (C2558, 4 cores/2.4GHz), model number: SNC-60A0-488F
- Intel Broadwell DE CPU based (D1518, 4 cores/2.3GHz), model number: SNC-60B0-488F
- Intel Denverton CPU based (C3958, 16 cores/2.0GHz), model number: SNC-60D0-488F

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Items	Detailed Description	
MAC Controller	BCM56873*1 (TD3 Solution)	
PHY for Management Port (SNC-60A0-488F)	BCM54616S*1	
PHY for Management Port (SNC-60B0-488F & SNC-60D0-488F)	Intel I210*1	
PHY for 100G	N/A, PHY-less design	
TPM	NPCT650	
CPU Module for SNC-60A0-488F		
Modular CPU board	CPU	Intel Rangeley C2558 Quad Cores/2.4GHz
	RAM	DDR3 4GB for Intel Rangeley CPU(reserved to 32GB)
	Flash	M.2 SATA SSD 32GB for Intel Rangeley CPU(reserved to 128GB)
	Boot Flash	8MB for Intel Rangeley CPU(reserved to 16MB)
CPU Module for SNC-60B0-488F		



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Modular CPU board	CPU	Intel Broadwell DE D-1518 Quad Cores/2.3GHz (Designed reserved up to 8 cores)																								
	RAM	DDR4 8GB (reserved up to 32GB)																								
	Flash	M.2 SATA SSD 32GB for Intel Broadwell CPU (reserved up to 128GB)																								
	Boot Flash	16MB for Intel Broadwell CPU(reserved to 32MB)																								
CPU Module for SNC-60D0-488F																										
Modular CPU board	CPU	Intel Denverton C3958 16 Cores/2.0GHz *2~12 cores are optional <table border="1" style="margin: 5px auto;"> <thead> <tr> <th colspan="3">Support List</th> </tr> <tr> <th>SKU</th> <th>Core</th> <th>Core Frequency</th> </tr> </thead> <tbody> <tr> <td>C3958</td> <td>16</td> <td>2.0GHz</td> </tr> <tr> <td>C3858</td> <td>12</td> <td>2.0GHz</td> </tr> <tr> <td>C3758</td> <td>8</td> <td>2.2GHz</td> </tr> <tr> <td>C3558</td> <td>4</td> <td>2.2GHz</td> </tr> <tr> <td>C3538</td> <td>4</td> <td>2.1GHz</td> </tr> <tr> <td>C3338</td> <td>2</td> <td>1.5GHz</td> </tr> </tbody> </table> * C3338 doesn't support QAT and the LAN speed is 1 Gb only	Support List			SKU	Core	Core Frequency	C3958	16	2.0GHz	C3858	12	2.0GHz	C3758	8	2.2GHz	C3558	4	2.2GHz	C3538	4	2.1GHz	C3338	2	1.5GHz
	Support List																									
	SKU	Core	Core Frequency																							
	C3958	16	2.0GHz																							
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	C3558	4	2.2GHz																							
C3538	4	2.1GHz																								
C3338	2	1.5GHz																								
RAM	DDR4 SODIMM: 16GB*2 (reserved up to 32GB) * C3338 CPU is 16GB*1, others CPU are 16GB*2																									
Flash	M.2 SATA SSD 64GB for Intel Denverton CPU																									
Boot Flash	32MB for Intel Denverton CPU																									
eMMC	16GB (reserved up to 32GB) (Optional)																									
TPM	Optional																									

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1 Feature Highlights

- Modular CPU board with large flash and memory
- Temperature warning via Software-readable thermal monitor
- Real time clock (RTC) support
- Two Hot-swappable redundant power supply
- Six fan modules, (5+1) redundancy
- All I/O and management ports located on the front panel
- Dual RJ-45 type for management port and console port
- One USB (Type A) port for storage
- One reset button
- Two data ports
- 48 ports of SFP28 for 25Gbps Ethernet
- 8 ports of QSFP28 for 100Gbps Ethernet

2 Physical Overview

2.1 Mechanical Dimension

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

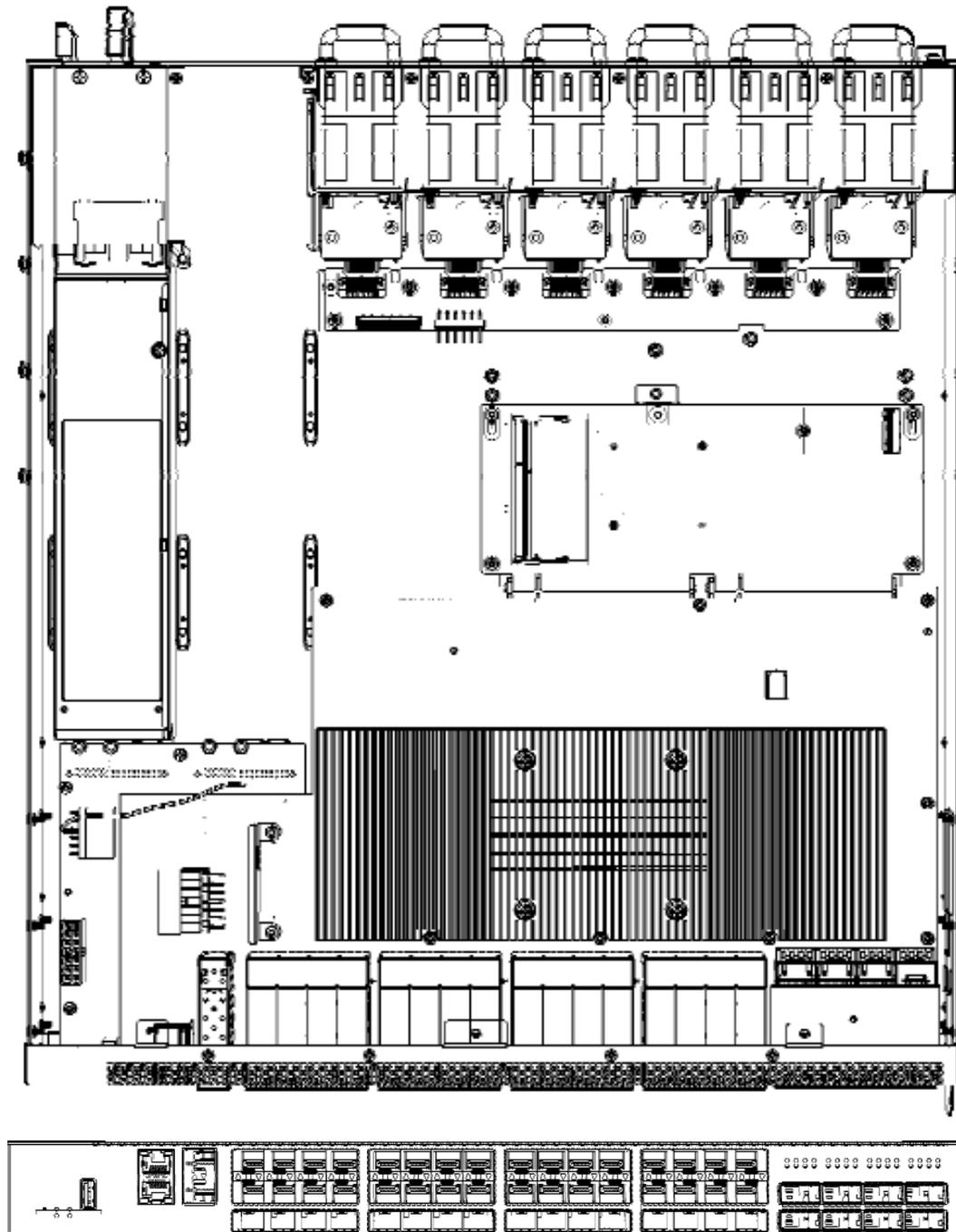
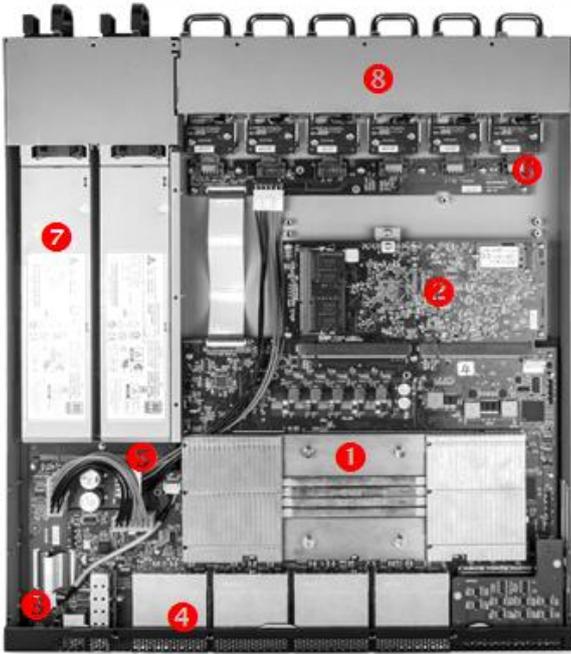


Figure 1: SNC-60x0-488F chassis dimension

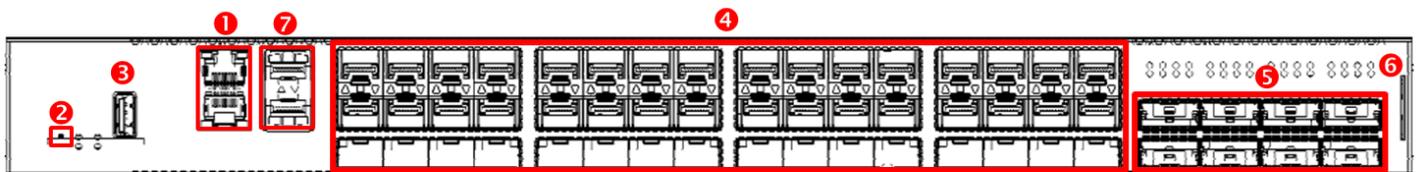
2.2 Top View



Number	Items
1	Main Board
2	CPU Board
3	MGMT Board
4	LED Board
5	PSU Extender Board
6	Fan Extender Board
7	PSU x 2
8	FAN x 6

Figure 2: SNC-60x0-488F top view

2.3 Front View



- ① : Management & Console port
- ② : Reset button
- ③ : USB for Storage Port

- ④ : 48 x 25G SFP28 Ports
- ⑤ : 8 x 100G QSFP28
- ⑥ : Label tag
- ⑦ : 2 x 10G Data Ports

Figure 3: SNC-60x0-488F front view

2.4 Rear View

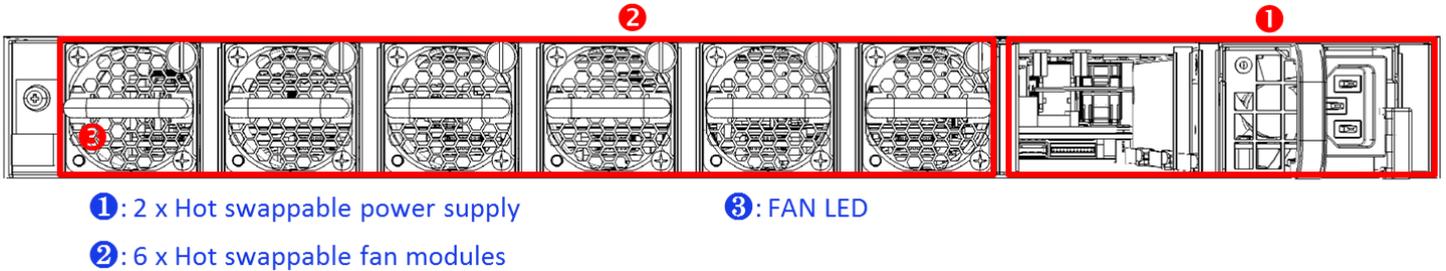


Figure 4: SNC-60x0-488F rear view

3 LED Definition

The following table defines the per device LEDs' behaviors:

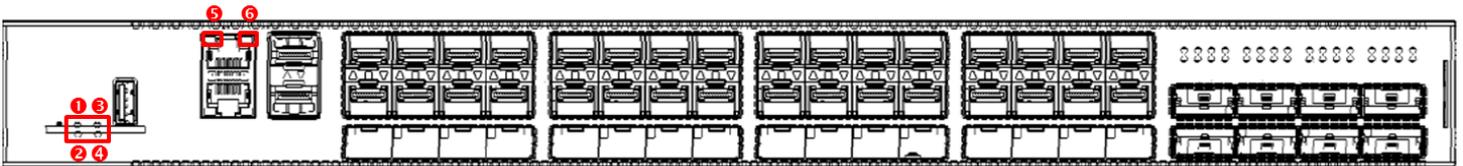


Figure 5: Detail LED definition and Location of port LED

The following table defines the per device LEDs' behaviors:

Items	LED Indication	Color	Behavior	Description
1	Locator	Blue	Solid Light	Console switch (5 sec then go back last status)
			Blinking	Locator function is enable
			Off	Locator function is disable
2	STAT	Green	Solid Light	Factory reset
			Blinking	Hardware reset
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	PWR	Green	Solid Light	Power On
			Off	Power Off and no power attached
		Amber	Blinking	Power supply failures, over voltage, over

				current, over temperature
4	FAN	Green	Solid Light	All diagnostics pass. Fan modules are operational.
			Off	Fan modules are not receiving power
		Amber	Blinking	Failure
5	MGMT & Console Link	Green	Solid Light	Link up
			Blinking	Packet transmitting or receiving
			Light off	No link up or port disable
6	MGMT & Console Speed	Green	Off	10M/100M speed
			On	1G speed

Table 1: LED definition and behavior

The following table defines 1~48 port LEDs' behaviors:

Location	LED Indication	Color	Behavior	Description
LED Port 1~48 (25G bps)	Status	Green	Solid Light	A transceiver module or cable has been correctly installed. The port has a link and is operating at 25Gbps
			Blink	Packet transmitting or receiving
		Amber	Solid Light	A transceiver module or cable has been correctly installed. The port has a link and is operating at 10Gbps
			Blink	Packet transmitting or receiving

Table 2: LED behavior of Port 1~48 25G SFP28 Port

The following table defines the QSFP28 Ethernet port LEDs' behaviors:

Location	LED Indication	Color	Behavior	Description
LED number 49~56, group of 1 (100Gbps)	Link/Act/Speed	White (LED 1 On)	Solid Light	When there is a secure 100G connection (or link)
			Blinking	Packet transmitting or receiving
LED number 49~56, group of 1 (40Gbps)	Link/Act/Speed	Blue (LED 4 On)	Solid Light	When there is a secure 40G connection (or link)
			Blinking	Packet transmitting or receiving
LED number 49~56, group of 1 (50Gbps)	Link/Act/Speed	Amber (LED 2,3 On)	Solid Light	When there is a secure 50G connection (or link)
			Blinking	Packet transmitting or receiving
LED number	Link/Act/Speed	Green	Solid Light	When there is a secure 10/25G

49~56, group of 1 (10/25Gbps)	(All LED On)	connection (or link)
	Blinking	Packet transmitting or receiving
49~56, group of 1	Light off	No link up or port disable

Table 3: LED behavior for Port 49~56 QSFP28 Ethernet Port

Each power supply module has a bi-color LED, which behavior is described in the Table 12:

LED Color	Behavior	Description
Green	Solid Light	Output ON and OK
	Blinking	PSU is OFF but 5VSB(standby power) is on
	Light off	No AC(DC) power to all power supplies or PSU is ON but with warning events
Amber	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.
	Light off	Power supply is healthy or No AC power to all power supplies

Table 4: LED behavior for power supply modules

4 Field Replaceable Components

4.1 Power Supply Modules

The switch is powered through one or two internal power supply modules, depends on the power supply's output wattage.

Supported power supply modules:

- AC-770W-12-FB
- AC-770W-12-BF
- DC-1100W-54-FB
- DC-1100W-54-BF

In the general case, the switch installs two power supply modules (AC-770W-12-FB or AC-770W-12-BF) that only one power supply is operating and the other is only for redundancy.

In some case, only one power supply module (DC-1100W-54-FB or DC-1100W-54-BF) is installed. The power open slots have to always fill with the power supply module or the filler panel.

When both power supply slots are loaded, the power supplies must be of the same type, i.e. same wattage and

airflow direction.

Please refer to Table 11 for the recommended power supply usage for each switch model.

Switch Model Number	Equipped CPU Model	Power Supply Model Number	Minimum Number of Power Supply Need
SNC-60A0-488F-AF-X	Intel Rangely C2558	AC-770W-12-FB	1
SNC-60A0-488F-AB-X	Intel Rangely C2558	AC-770W-12-BF	1
SNC-60A0-488F-DF-X	Intel Rangely C2558	DC-1100W-54-FB	1
SNC-60A0-488F-DB-X	Intel Rangely C2558	DC-1100W-54-BF	1
SNC-60B0-488F-AF-X	Intel Broadwell DE D-1518	AC-770W-12-FB	1
SNC-60B0-488F-AB-X	Intel Broadwell DE D-1518	AC-770W-12-BF	1
SNC-60B0-488F-DF-X	Intel Broadwell DE D-1518	DC-1100W-54-FB	1
SNC-60B0-488F-DB-X	Intel Broadwell DE D-1518	DC-1100W-54-BF	1
SNC-60D0-488F-AF-X	Intel Denverton C3xx8	AC-770W-12-FB	1
SNC-60D0-488F-AB-X	Intel Denverton C3xx8	AC-770W-12-BF	1
SNC-60D0-488F-DF-X	Intel Denverton C3xx8	DC-1100W-54-FB	1
SNC-60D0-488F-DB-X	Intel Denverton C3xx8	DC-1100W-54-BF	1

Table 5: Power supply usage

4.2 FAN Modules

The SNC-60x0-488F supports up to 5+1 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 Back	AVC_DFTA0456B2UP116
Back to Front	AVC_ DFTA0456B2UP145

Table 6: Fan Modules part number

All fan modules are hot-swappable.

The fan speed of each module can be programmed via command line (fan speed register in Power CPLD) and related to the operating temperature of the switch.

The switch has six fan module slots. The switch requires at least six fan modules for it to operate normally. If it operates with five operational fans and one nonfunctional fan, the failed fan should be replaced as soon as possible to avoid a service interruption. By default the switch is shipped six fan modules in slots 1~ 6.

A replacement/redundancy fan tray with the same airflow direction can be added. Never leave a fan module slot empty, always fill the slot with a filler panel or a fan tray.

The following table is the pin out of the golden finger in the fan module. The detail spec would be referred to the Fan Module H/W Specification.

#	NAME	Description	#	NAME	Description
1	FAN_CON_TACH_0	FAN tachometer 0	11	FAN_DIR	FAN Direction
2	LED_Y	Yellow LED	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	LED_G	Green LED	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 7: Fan Modules connector pin out

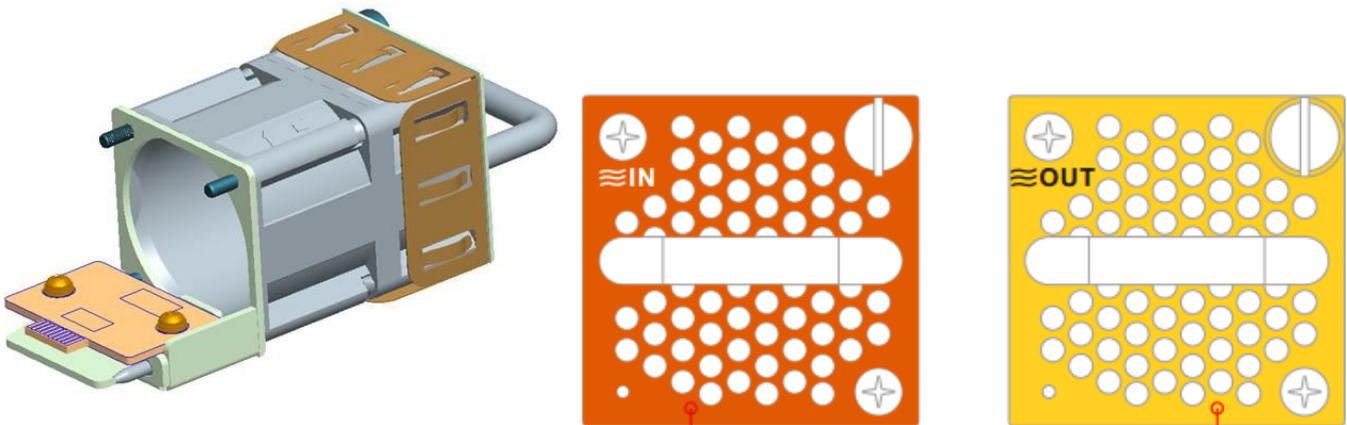


Figure 6: Fan module mechanical specification

5 System Overview

The SNC-60x0-488F comprised of the following PCB

PCB Function	PCB Layer	Dimension (L*W)mm
Main board	16	299 x 291
USB board	4	116 x 157
LED board	2	86.5 x 85
PSU board	4	41.3 x 132.4
CPU transfer board	4	223 x 16
CPU board (Rangeley)	12	210 x 90
CPU board (Broadwell DE)	12	210 x 117
CPU board (Denverton)	12	210 x 100

Table 8: PCBs for SNC-60x0-488F

5.1 Main PCB

The main PCB is a 16 layer PCB where the switch MAC resides. It also supports the following functions:

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

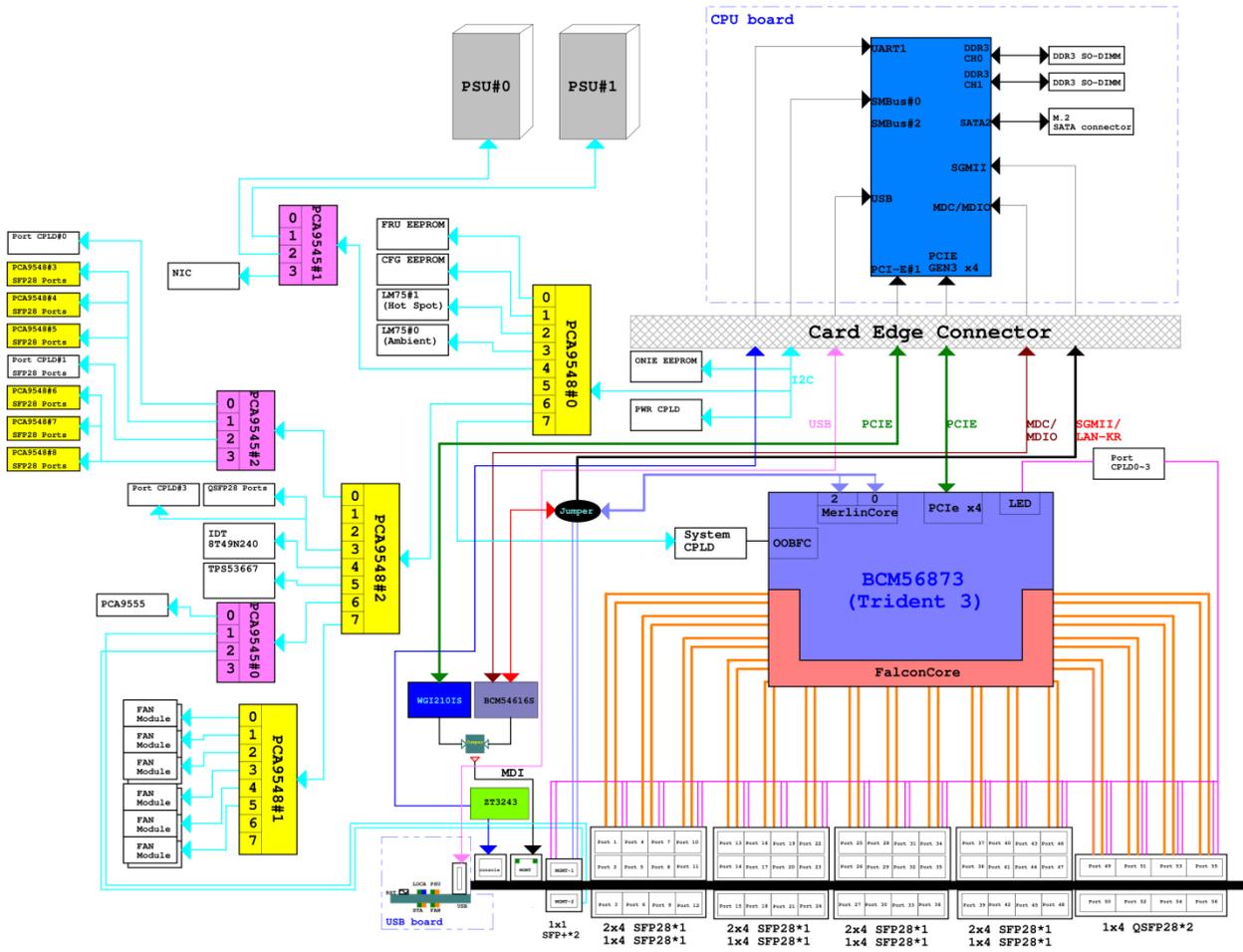


Figure 7: Main board block diagram

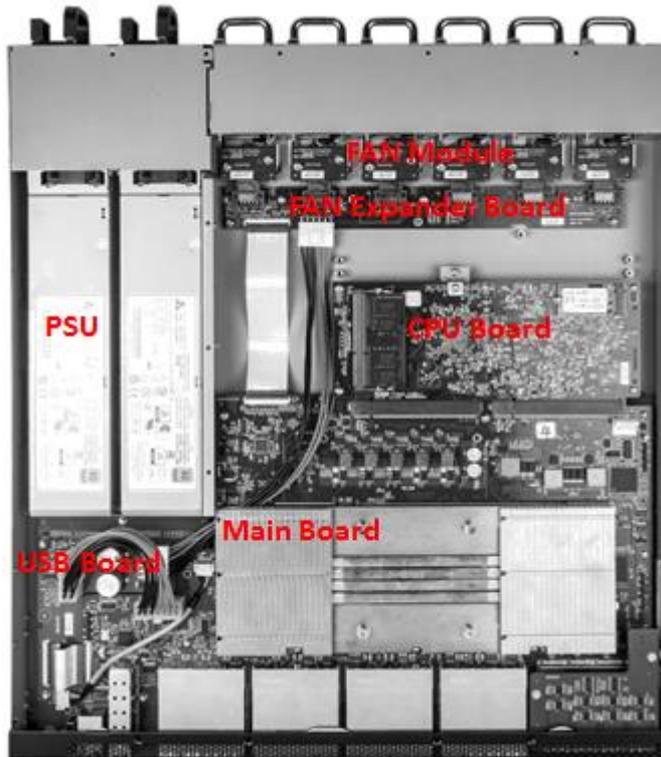


Figure 8: Main PCB top view

5.2 CPU Subsystem

The following Table is the list of key components used in SNC-60x0-488F

CPU Module for SNC-60A0-488F		
Modular CPU board	CPU	Intel Rangeley C2558 Quad Cores/2.4GHz
	RAM	DDR3 4GB for Intel Rangeley CPU(reserved to 32GB)
	Flash	M.2 SATA SSD 32GB for Intel Rangeley CPU(reserved to 128GB)
	Boot Flash	8MB for Intel Rangeley CPU(reserved to 16MB)
CPU Module for SNC-60B0-488F		
Modular CPU board	CPU	Intel Broadwell DE D-1518 Quad Cores/2.3GHz (Designed reserved up to 8 cores)
	RAM	DDR4 8GB (reserved up to 32GB)
	Flash	M.2 SATA SSD 32GB for Intel Broadwell CPU (reserved up to 128GB)
	Boot Flash	16MB for Intel Broadwell CPU(reserved to 32MB)
CPU Module for SNC-60D0-488F		
Modular CPU board	CPU	Intel Denverton C3958 16 Cores/2.0GHz *2~12 cores are optional

		Support List		
		SKU	Core	Core Frequency
		C3958	16	2.0GHz
		C3858	12	2.0GHz
		C3758	8	2.2GHz
		C3558	4	2.2GHz
		C3538	4	2.1GHz
		C3338	2	1.5GHz
		* C3338 doesn't support QAT and the LAN speed is 1 Gb only		
	RAM	DDR4 SODIMM: 16GB*2 (reserved up to 32GB) * C3338 CPU is 16GB*1, others CPU are 16GB*2		
	Flash	M.2 SATA SSD 64GB for Intel Denverton CPU		
	Boot Flash	32MB for Intel Denverton CPU		
	eMMC	16GB (reserved up to 32GB) (Optional)		
	TPM	Optional		

Table 9: CPU subsystem key Components

5.2.1 Management CPU Board

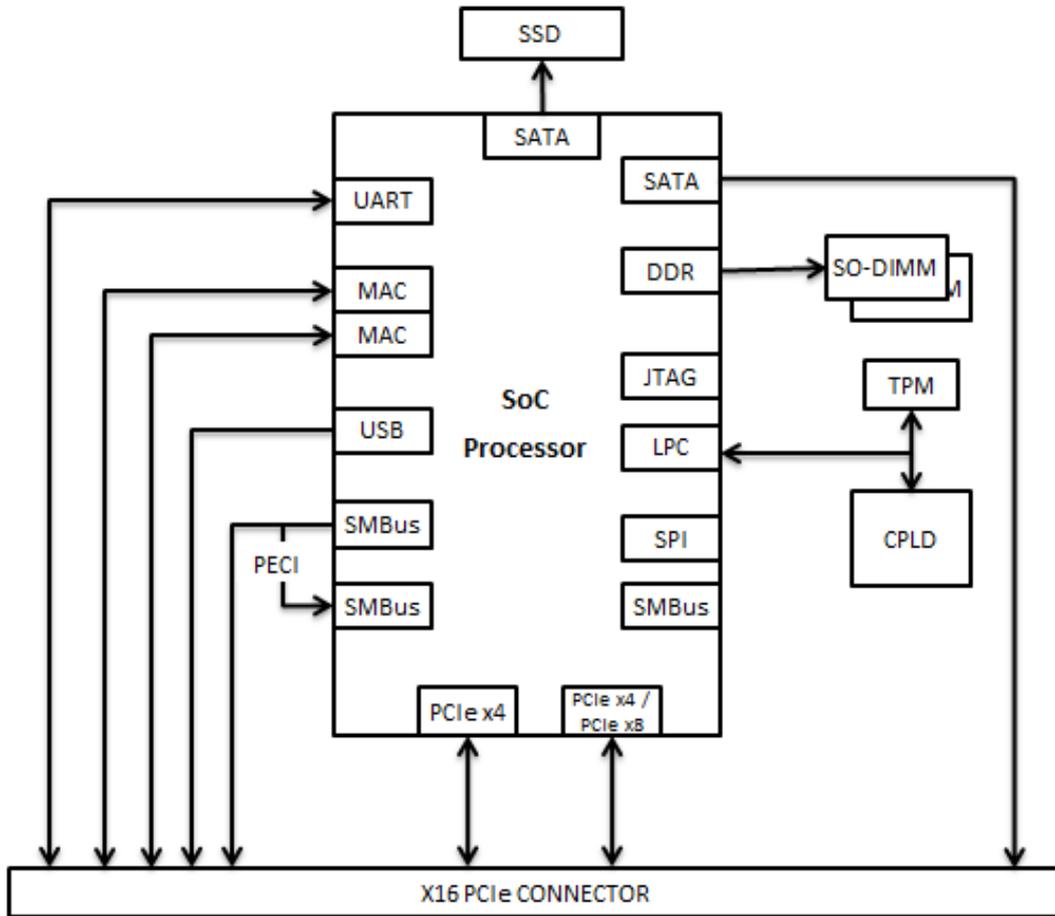


Figure 9: CPU Module Block Diagram

CPU board card must plug into x16 PCIe edge connectors. Specifically, the mainboard will use the following FCI SMT connector: 10061913-112TLF. The following table shows the default pin-out. Other variations are possible (see below for more details).

CPU Board Pin Out List-Connector A			
Pin	Pin Name of Rangeley CPU BD	Pin Name of BDW-DE CPU BD	Pin Name of main board
A1	GND	GND	CPU_A_PRSNT_L
A2	V12A	P12V	VDD12V0
A3	V12A	P12V	VDD12V0
A4	GND	GND	GND
A5	SMBus0_ALT_L	MB_BMC_INT	SMB_CPLD_INT (Pull High)
A6	CPU_PWRGD	CPU_POWERGOOD	CPU_PG (Pull High)

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A7	UART1_SOC_TXD	C33_UART_BDX_TX0	UART1_SOC_TXD
A8	UART1_SOC_RXD	C33_UART_BDX_RX0	UART1_SOC_RXD
A9	PHY_MDIO1_I2C_CLK	PHY_LAN_MDC0_3P3V	CPU_MDC
A10	PHY_MDIO1_I2C_DATA	PHY_LAN_MDIO0_3P3V	CPU_MDIO
A11	CPU_BMC_RST_N	PLTRST_PCIE0_N	PCIE0_RST_L
A12	GND	GND	GND
A13	CLK_100M_PCIE0_SLOT_DP	CLK4_100M_SLOT4_DP	CLK_100M_PCIE0_SLOT_DP
A14	CLK_100M_PCIE0_SLOT_DN	CLK4_100M_SLOT4_DN	CLK_100M_PCIE0_SLOT_DN
A15	GND	GND	GND
A16	GND	GND	GND
A17	LPC_LAD3_PCI	LPC_LAD3_PCI	PCIE0_RX0_P
A18	LPC_LAD2_PCI	LPC_LAD2_PCI	PCIE0_RX0_N
A19	GND	GND	GND
A20	GND	GND	GND
A21	LPC_LAD1_PCI	LPC_LAD1_PCI	PCIE0_RX1_P
A22	LPC_LAD0_PCI	LPC_LAD0_PCI	PCIE0_RX1_N
A23	GND	GND	GND
A24	GND	GND	GND
A25	CLK_LPC0_B	CLK_LPC0_B	CLK_LPC0_B_PCIE
A26	N/A	N/A	N/A
A27	GND	GND	GND
A28	GND	GND	GND
A29	LPC_FRAME_N_PCI	LPC_FRAME_N_PCI	LPC_FRAME_N_R_PCIE
A30	N/A	N/A	N/A
A31	GND	GND	GND
A32	GND	GND	GND
A33	SATA3G_RX_DP0	SATA_RX_DP_1	SATA3G_RX_DP0
A34	SATA3G_RX_DN0	SATA_RX_DN_1	SATA3G_RX_DN0
A35	GND	GND	GND
A36	GND	GND	GND
A37	GPIO3 (BMC_TO_HOST_INT_L)	GPIO3_CPLD_PCIE	GPIO3_PCIE
A38	GPIO4	GPIO4_CPLD_PCIE	GPIO4_PCIE
A39	GND	GND	GND
A40	GND	GND	GND
A41	N/A	N/A	N/A

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A42	SMB_GBE_CPU_ALERT_N	C33_LAN_SMBALERT_N	SMB_GBE_CPU_ALERT_N
A43	GND	GND	GND
A44	GND	GND	GND
A45	SGMII_RX_DP1	SFPP0_KR_RX0_P	PHY_CPU_SGMII_P
A46	SGMII_RX_DN1	SFPP0_KR_RX0_N	PHY_CPU_SGMII_N
A47	GND	GND	GND
A48	GND	GND	GND
A49	SGMII_RX_DP0	SFPP1_KR_RX1_P	56960_EC_T2P
A50	SGMII_RX_DN0	SFPP1_KR_RX1_N	56960_EC_T2N
A51	GND	GND	GND
A52	GND	GND	GND
A53	SGMII_RX_DP2	N/A	PCIE0_RX5_P
A54	SGMII_RX_DN2	N/A	PCIE0_RX5_N
A55	GND	GND	GND
A56	GND	GND	GND
A57	SGMII_RX_DP3	N/A	PCIE0_RX6_P
A58	SGMII_RX_DN3	N/A	PCIE0_RX6_N
A59	GND	GND	GND
A60	GND	GND	GND
A61	GPIO1 (HOST_TO_MM_INT_L)	HOST_TO_MM_INT_L	PCIE0_RX7_P
A62	GPIO2	GPIO2_CPLD_PCIE	PCIE0_RX7_N
A63	GND	GND	GND
A64	GND	GND	GND
A65	MB_PCIE0_RX4_P	MB_PCIE2_RX0_P	TH_CPU_PCIE_0P
A66	MB_PCIE0_RX4_N	MB_PCIE2_RX0_N	TH_CPU_PCIE_0N
A67	GND	GND	GND
A68	GND	GND	GND
A69	MB_PCIE0_RX5_P	MB_PCIE2_RX1_P	TH_CPU_PCIE_1P
A70	MB_PCIE0_RX5_N	MB_PCIE2_RX1_N	TH_CPU_PCIE_1N
A71	GND	GND	GND
A72	GND	GND	GND
A73	MB_PCIE0_RX6_P	MB_PCIE2_RX2_P	TH_CPU_PCIE_2P
A74	MB_PCIE0_RX6_N	MB_PCIE2_RX2_N	TH_CPU_PCIE_2N
A75	GND	GND	GND
A76	GND	GND	GND

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A77	MB_PCIE0_RX7_P	MB_PCIE2_RX3_P	TH_CPU_PCIE_3P
A78	MB_PCIE0_RX7_N	MB_PCIE2_RX3_N	TH_CPU_PCIE_3N
A79	GND	GND	GND
A80	GND	GND	GND
A81	V12A	P12V	VDD12V0
A82	V12A	P12V	VDD12V0
B1	V12A	P12V	VDD12V0
B2	V12A	P12V	VDD12V0
B3	V12A	P12V	VDD12V0
B4	GND	GND	GND
B5	SMB_3V3A_HOST_CLK	SMB_3V3A_HOST_CLK	SMBus0_SCL
B6	SMB_3V3A_HOST_DATA	SMB_3V3A_HOST_DATA	SMBus0_SDA
B7	GND	GND	GND
B8	FP_PWR_BTN_N	FP_PWR_BTN_N	PUSH_BTN_RST_L
B9	USB_SOC_DP0	USB2_PORT1_DP_1	USB_SOC_DP
B10	USB_SOC_DN0	USB2_PORT1_DN_1	USB_SOC_DN
B11	SYS_RST_L	SYS_RST_L	SYS_RST_N
B12	SMB_3V3_HOST_ALERT_N	SMB_LVC3_ALERT	SMBus0_ALT_L
B13	GND	GND	GND
B14	GND	GND	GND
B15	SMB_CLK1_PCI	N/A	N/A
B16	SMB_DATA1_PCI	N/A	N/A
B17	GND	GND	GND
B18	GND	GND	GND
B19	UART0_TXD	C33_UART_BDX_TX1_PCIE	N/A
B20	UART0_RXD	C33_UART_BDX_RX1_PCIE	N/A
B21	GND	GND	GND
B22	GND	GND	GND
B23	GPIO7	GPIO7_CPLD_PCIE	PCIE0_TX2_P
B24	GPIO8	GPIO8_CPLD_PCIE	PCIE0_TX2_N
B25	GND	GND	GND
B26	GND	GND	GND
B27	GPIO5	GPIO5_CPLD_PCIE	PCIE0_TX3_P
B28	GPIO6	GPIO6_CPLD_PCIE	PCIE0_TX3_N
B29	GND	GND	GND

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B30	GND	GND	GND
B31	SATA3G_TX_DP0	SATA_TX_DP_1	UART0_SOC_TXD
B32	SATA3G_TX_DN0	SATA_TX_DN_1	UART0_SOC_RXD
B33	GND	GND	GND
B34	GND	GND	GND
B35	CLK_100M_PCIE1_SLOT_DP	CLK3_100M_SLOT3_DP	CLK_100M_PCIE1_SLOT_DP
B36	CLK_100M_PCIE1_SLOT_DN	CLK3_100M_SLOT3_DN	CLK_100M_PCIE1_SLOT_DN
B37	GND	GND	GND
B38	GND	GND	GND
B39	MB_RST	PLTRST_PCIE1_N	PCIE1_RST
B40	MB_I2C_RST	MB_I2C_RST	MB_I2C_RST
B41	GND	GND	GND
B42	GND	GND	GND
B43	SMB_GBE_CPU_CLK	C33_LAN_SMBCLK	SMBus3_SCL
B44	SMB_GBE_CPU_DATA	C33_LAN_SMBDATA	SMBus3_SDA
B45	GND	GND	GND
B46	GND	GND	GND
B47	SGMII_TX_DP1	SFPP0_KR_TX0_P	CPU_PHY_SGMII_P
B48	SGMII_TX_DN1	SFPP0_KR_TX0_N	CPU_PHY_SGMII_N
B49	GND	GND	GND
B50	GND	GND	GND
B51	SGMII_TX_DP0	SFPP1_KR_TX1_P	56960_EC_R2P
B52	SGMII_TX_DN0	SFPP1_KR_TX1_N	56960_EC_R2N
B53	GND	GND	GND
B54	GND	GND	GND
B55	SGMII_TX_DP2	N/A	PCIE0_TX5_P
B56	SGMII_TX_DN2	N/A	PCIE0_TX5_N
B57	GND	GND	GND
B58	GND	GND	GND
B59	SGMII_TX_DP3	N/A	PCIE0_TX6_P
B60	SGMII_TX_DN3	N/A	PCIE0_TX6_N
B61	GND	GND	GND
B62	GND	GND	GND
B63	BMC_CPU_NMI_PCI	BMC_CPU_NMI_PCI	BRD_NMI
B64	N/A	N/A	N/A

B65	GND	GND	GND
B66	GND	GND	GND
B67	PCIE0_MB_TX4_P	PCIE2_MB_TX0_P	CPU_TH_PCIE_0P
B68	PCIE0_MB_TX4_N	PCIE2_MB_TX0_N	CPU_TH_PCIE_0N
B69	GND	GND	GND
B70	GND	GND	GND
B71	PCIE0_MB_TX5_P	PCIE2_MB_TX1_P	CPU_TH_PCIE_1P
B72	PCIE0_MB_TX5_N	PCIE2_MB_TX1_N	CPU_TH_PCIE_1N
B73	GND	GND	GND
B74	GND	GND	GND
B75	PCIE0_MB_TX6_P	PCIE2_MB_TX2_P	CPU_TH_PCIE_2P
B76	PCIE0_MB_TX6_N	PCIE2_MB_TX2_N	CPU_TH_PCIE_2N
B77	GND	GND	GND
B78	GND	GND	GND
B79	PCIE0_MB_TX7_P	PCIE2_MB_TX3_P	CPU_TH_PCIE_3P
B80	PCIE0_MB_TX7_N	PCIE2_MB_TX3_N	CPU_TH_PCIE_3N
B81	GND	GND	GND
B82	GND	GND	GND

Table 10: CPU Board Pin Out List Connector A

CPU Board Pin Out List-Connector B			
Pin	Pin Name of Rangeley CPU BD	Pin Name of BDW-DE CPU BD	Pin Name of main board
A1	GND	GND	CPU_B_PRSNT_L
A2	V12A	P12V	VDD12V0
A3	V12A	P12V	VDD12V0
A4	GND	GND	GND
A5	N/A	N/A	N/A
A6	N/A	N/A	N/A
A7	N/A	N/A	N/A
A8	GND	GND	GND
A9	N/A	CLK0_100M_SLOT0_DP	N/A
A10	N/A	CLK0_100M_SLOT0_DN	N/A
A11	GND	GND	GND
A12	GND	GND	GND

A13	N/A	N/A	N/A
A14	N/A	N/A	N/A
A15	GND	GND	GND
A16	GND	GND	GND
A17	N/A	N/A	N/A
A18	N/A	N/A	N/A
A19	GND	GND	GND
A20	GND	GND	GND
A21	N/A	N/A	N/A
A22	N/A	N/A	N/A
A23	GND	GND	GND
A24	GND	GND	GND
A25	N/A	N/A	N/A
A26	N/A	N/A	N/A
A27	GND	GND	GND
A28	GND	GND	GND
A29	N/A	N/A	N/A
A30	N/A	N/A	N/A
A31	GND	GND	GND
A32	GND	GND	GND
A33	N/A	MB_PCIE3_RX0_P	N/A
A34	N/A	MB_PCIE3_RX0_N	N/A
A35	GND	GND	GND
A36	GND	GND	GND
A37	N/A	MB_PCIE3_RX1_P	N/A
A38	N/A	MB_PCIE3_RX1_N	N/A
A39	GND	GND	GND
A40	GND	GND	GND
A41	N/A	MB_PCIE3_RX2_P	N/A
A42	N/A	MB_PCIE3_RX2_N	N/A
A43	GND	GND	GND
A44	GND	GND	GND
A45	N/A	MB_PCIE3_RX3_P	N/A
A46	N/A	MB_PCIE3_RX3_N	N/A
A47	GND	GND	GND



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A48	GND	GND	GND
A49	N/A	N/A	N/A
A50	N/A	N/A	N/A
A51	GND	GND	GND
A52	GND	GND	GND
A53	N/A	N/A	N/A
A54	N/A	N/A	N/A
A55	GND	GND	GND
A56	GND	GND	GND
A57	N/A	N/A	N/A
A58	N/A	N/A	N/A
A59	GND	GND	GND
A60	GND	GND	GND
A61	N/A	N/A	N/A
A62	N/A	N/A	N/A
A63	GND	GND	GND
A64	GND	GND	GND
A65	MB_PCIE1_RX4_P	MB_PCIE4_RX0_P	NIC_CPU_PCIE_P
A66	MB_PCIE1_RX4_N	MB_PCIE4_RX0_N	NIC_CPU_PCIE_N
A67	GND	GND	GND
A68	GND	GND	GND
A69	MB_PCIE1_RX5_P	MB_PCIE4_RX1_P	PCIE5_RX1_P
A70	MB_PCIE1_RX5_N	MB_PCIE4_RX1_N	PCIE5_RX1_N
A71	GND	GND	GND
A72	GND	GND	GND
A73	MB_PCIE1_RX6_P	MB_PCIE4_RX2_P	PCIE5_RX2_P
A74	MB_PCIE1_RX6_N	MB_PCIE4_RX2_N	PCIE5_RX2_N
A75	GND	GND	GND
A76	GND	GND	GND
A77	MB_PCIE1_RX7_P	MB_PCIE4_RX3_P	PCIE5_RX3_P
A78	MB_PCIE1_RX7_N	MB_PCIE4_RX3_N	PCIE5_RX3_N
A79	GND	GND	GND
A80	GND	GND	GND
A81	V12A	P12V	VDD12V0
A82	V12A	P12V	VDD12V0

B1	V12A	P12V	VDD12V0
B2	V12A	P12V	VDD12V0
B3	V12A	P12V	VDD12V0
B4	GND	GND	GND
B5	N/A	N/A	N/A
B6	N/A	N/A	N/A
B7	N/A	N/A	N/A
B8	N/A	N/A	N/A
B9	N/A	N/A	N/A
B10	GND	GND	GND
B11	N/A	PLTRST_PCIE3_N	N/A
B12	N/A	PLTRST_PCIE4_N	N/A
B13	N/A	N/A	N/A
B14	GND	GND	GND
B15	N/A	N/A	N/A
B16	N/A	N/A	N/A
B17	GND	GND	GND
B18	GND	GND	GND
B19	N/A	N/A	N/A
B20	N/A	N/A	N/A
B21	GND	GND	GND
B22	GND	GND	GND
B23	N/A	N/A	N/A
B24	N/A	N/A	N/A
B25	GND	GND	GND
B26	GND	GND	GND
B27	N/A	N/A	N/A
B28	N/A	N/A	N/A
B29	GND	GND	GND
B30	GND	GND	GND
B31	N/A	CLK1_100M_SLOT1_DP	N/A
B32	N/A	CLK1_100M_SLOT1_DN	N/A
B33	GND	GND	GND
B34	GND	GND	GND
B35	N/A	PCIE3_MB_TX0_P	N/A

B36	N/A	PCIE3_MB_TX0_N	N/A
B37	GND	GND	GND
B38	GND	GND	GND
B39	N/A	PCIE3_MB_TX1_P	N/A
B40	N/A	PCIE3_MB_TX1_N	N/A
B41	GND	GND	GND
B42	GND	GND	GND
B43	N/A	PCIE3_MB_TX2_P	N/A
B44	N/A	PCIE3_MB_TX2_N	N/A
B45	GND	GND	GND
B46	GND	GND	GND
B47	N/A	PCIE3_MB_TX3_P	N/A
B48	N/A	PCIE3_MB_TX3_N	N/A
B49	GND	GND	GND
B50	GND	GND	GND
B51	N/A	N/A	N/A
B52	N/A	N/A	N/A
B53	GND	GND	GND
B54	GND	GND	GND
B55	N/A	N/A	N/A
B56	N/A	N/A	N/A
B57	GND	GND	GND
B58	GND	GND	GND
B59	N/A	N/A	N/A
B60	N/A	N/A	N/A
B61	GND	GND	GND
B62	GND	GND	GND
B63	N/A	N/A	N/A
B64	N/A	N/A	N/A
B65	GND	GND	GND
B66	GND	GND	GND
B67	PCIE1_MB_TX4_P	PCIE4_MB_TX0_P	CPU_NIC_PCIE_P
B68	PCIE1_MB_TX4_N	PCIE4_MB_TX0_N	CPU_NIC_PCIE_N
B69	GND	GND	GND
B70	GND	GND	GND

B71	PCIE1_MB_TX5_P	PCIE4_MB_TX1_P	PCIE5_TX1_P
B72	PCIE1_MB_TX5_N	PCIE4_MB_TX1_N	PCIE5_TX1_N
B73	GND	GND	GND
B74	GND	GND	GND
B75	PCIE1_MB_TX6_P	PCIE4_MB_TX2_P	PCIE5_TX2_P
B76	PCIE1_MB_TX6_N	PCIE4_MB_TX2_N	PCIE5_TX2_N
B77	GND	GND	GND
B78	GND	GND	GND
B79	PCIE1_MB_TX7_P	PCIE4_MB_TX3_P	PCIE5_TX3_P
B80	PCIE1_MB_TX7_N	PCIE4_MB_TX3_N	PCIE5_TX3_N
B81	GND	GND	GND
B82	N/A	N/A	N/A

Table 11: CPU Board Pin Out List-Connector B

5.2.2 PCIe Interface

PCI-Express Interface is used for management of the main board devices. They are connected as below.

CPU PCIe Lane 0-3 : Unused

CPU PCIe Lane 4-7 : MAC

CPU PCIe Lane 8-11 : Unused

CPU PCIe Lane 12-15 : Reserved

5.2.3 PCIe Ethernet Port Connectivity for Rangeley CPU

Rangeley SoC has 4 SGMII interfaces. The Ethernet ports on the CPU are connected as follows:

CPU SGMII 0 : Unused

CPU SGMII 1 :

Option#1 : 10/100/1000 Mgmt Port (BCM54616S)

Option#2 : BCM56873 Merlin Core

CPU SGMII 2-3 : Unused

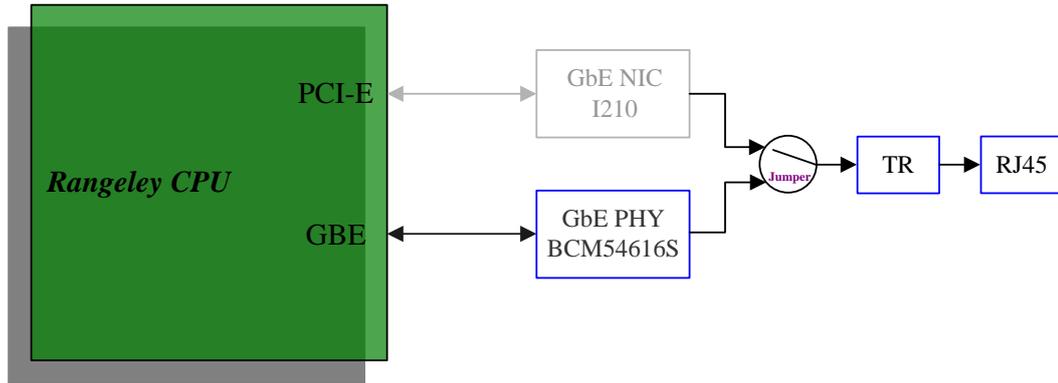


Figure 10: Ethernet Port Connection for Rangeley

5.2.4 PCIe Ethernet Port Connectivity for Broadwell DE CPU

Broadwell-DE SoC has 2 10-Gigabit Ethernet interfaces. The Ethernet ports on the CPU are connected as follows:

CPU KR 0 : Reserved.

CPU KR 1 : Reserved

CPU PCIe Gen2 Lane5: GbE NIC; PCIe V2.1

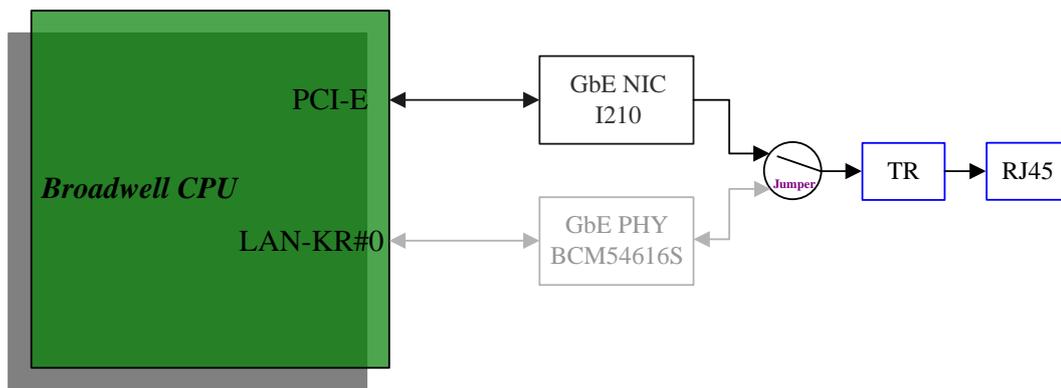


Figure 11: Ethernet Port Connection for Broadwell

5.2.5 PCIe Ethernet Port Connectivity for Denverton CPU

The SoC has two LAN controllers (LAN0 and LAN1) with two ports each, providing a total of four ports. Each



port contains an independent LAN Media Access Control (MAC) that supports a XGMII-like interface link to an internal PHY.

For CPU SKU C3338/C3508/C3508/C3308, the internal MAC/PHY support 1GbE operation.

Four CPU SKU C3958/C3858/C3758/C3558/C3538/C3708/C3808, the internal MAC/PHY support 1GbE and 10GbE operation through various modes of operation.

Each LAN controller must run the same LAN configuration. The supported NVM show as below:

NVM	LAN Interface (LAN 0 or 1)
LEK1	SFI to SFP+
LEK2	KR to Inphi to SFP+
LEK3	KR to Coppervale/Intel X557 to 10G BASE-T
LEK4	SGMII TO Backplane
LEK5	SGMII to Marvell 88E1512/88E1514 to 10/100/1000BASE-T
LEK6	KR/KX to Backplane
LEK7	2500 BASE-X to Backplane
LEK8	SGMII to Marvell 88E1543 to 10/100/1000 BASE-T

For CPU SKU C3958/C3858/C3758/C3708/C3808

LAN Interface	Port#	NVM	Interface	Device
LAN 0	Port 0	LEK 6	10G KR/KX	TBD
LAN 0	Port 1		10G KR/KX	TBD
LAN 1	Port 0	LEK 6	10G KR/KX	TBD
LAN 1	Port 1		10G KR/KX	TBD

For CPU SKU C3558/C3538

LAN Interface	Port#	NVM	Interface	Device
LAN 0	Port 0	LEK 6	10G KR/KX	TBD
LAN 0	Port 1		10G KR/KX	TBD
LAN 1	Port 0	LEK 4	SGMII	TBD
LAN 1	Port 1		SGMII	TBD

For CPU SKU C3958/C3858/C3758/C3708/C3808

LAN Interface	Port#	NVM	Interface	Device
LAN 0	Port 0	LEK 5	SGMII	88E1512/88E1514

LAN 0	Port 1		SGMII	88E1512/88E1514
LAN 1	Port 0	LEK 4	SGMII	TBD
LAN 1	Port 1		SGMII	TBD

5.2.6 UART Port Connectivity for Rangely

The Intel CPU has two on-chip UART interfaces supporting RS232 serial ports. UART0 is unused and UART1 is used to drive the console port.

CPU UART0 : Reserved

CPU UART1 : Serial console port (RJ45)

5.2.7 UART Port Connectivity for Broadwell DE

The Broadwell-DE has two on-chip UART interfaces supporting RS232 serial ports. UART1 is unused and UART0 is used to drive the console port.

CPU UART0 : Serial console port (RJ45)

CPU UART1 : Reserved

5.2.8 UART Port Connectivity for Denverton

The Denverton SoC has three UART interfaces namely UART0, UART1, and UART2. Only UART0 and UART1 are implemented in the CPU board. UART0 and UART1 are connected to edge connector.

6 IO and Connectors

6.1 USB Interface

The external USB port is used by Main CPU for image update purpose. The USB port will be implemented on a USB female connector. The USB signals from CPU interface pass through low capacitance ESD protection device.

Note: This port only supports endpoint devices such as a USB key and does not support USB host devices.

7 Regulatory Standards Compliance

Regulatory Standards Compliance		
Safety	UL North American safety	UL 60950-1, 2nd Ed., 2014-10-14, Listed Device (U.S.) CAN/CSA C22.2 No. 60950-1-07, 2nd Ed. 2014-10, (Canada)
	CB	CB Report & Certificate per IEC 60950-1:2005 2nd Ed. + Am 1:2009 + Am 2:2013
	Taiwan BSMI Safety Report (CB Report Translated)	CNS14336-1 for BSMI.
	CE/LVD	EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013
	CCC	GB4943.1-2011
EMC	FCC, Canada	FCC CER Title 47 Part 15 Sub part B, ICES-003, Issue 6 (Class A)
	CE/EMC, RCM	EN50032, AS/NZS CISPR32 EN55024, EN300386, (Class A)
	BSMI EMI	CNS13438 (Class A)
	CCC	GB9254-2008(Class A) YD/T993-1998
RoHS	RoHS	RoHS 2011/65/EU
Reliability Test Reports		
Test Items	Standards	Remarks
MTBF Prediction Report	Telcordia SR-332, Issue 3	
Free Fall Test Report	IEC 60068-2-32: 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"> Drop Range: $\leq 20\text{Kg}$, 1000mm; $\leq 50\text{kg}$, 500mm; Max. Load: 500 kg; FCS: 1 carton.
Vibration Test Report	IEC 60068-2-34:1973: Environmental testing Test Fd: Random vibration wide band-General requirements	<ul style="list-style-type: none"> Frequency: 20Hz ~500Hz; Method: Random; Test Time: 30 min/Per Axis; FCS: 1 carton.

Storage Test Report	IEC 60068-2-48: 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"> • Low Temp.: -40°C,72Hours • High Temp. /Low Humidity : 70 °C,25%R.H.,72Hours • High Temp. /High Humidity : 40 °C,95%R.H.,96Hours • FCS: 1 carton
Cold Test Report	IEC 60068-2-1: Environmental Testing Part 2: Tests - Tests A: Cold-Fifth Edition; Amendment 1-1993; Amendment 2-1994	<ul style="list-style-type: none"> • Temperature: -10±3°C • Humidity: Uncontrolled • Test Time: 72 Hours • FCS: 2 sets
Dry Heat Cyclic Test Report	IEC 60068-2-2: 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"> • Temperature: 55±2°C • Humidity: 5%R.H. • Test Time: 72 Hours • FCS: 2 sets
Damp Heat Steady State Report	IEC 60068-2-78: 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"> • Temperature: 40±2°C • Humidity: 95+2-3%R.H. • Test time: 96 Hours • FCS: 2 sets
Damp Heat Cyclic Report	IEC 60068-2-30: 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"> • Temperature: 40±2°C • Humidity: 95+2-3%R.H. • Cycle Time: 24 Hours • Number of Cycle: 2 Cycles • FCS: 2 sets
ESD Simulation Test Report	IEC 61000-4-2: Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test-Edition; IEC 61000-4-2: second edition,2008	<ul style="list-style-type: none"> • Air Discharge: ±8KV; • Contact Discharge: ±4KV; • FCS: 1 set.
Electrical Isolation Test Report	For Class I equipment only.	<ul style="list-style-type: none"> • Primary (L-N) to Earth (Metal frame or Ground Pin): Minimum 1,5 kV ac, at least 60 seconds; • Lan Port (RJ-45) to Ground (Metal frame) Minimum 1,5 kV ac at least 60 seconds.

Table 12: Regulatory Standards Compliance