



**OPEN**

Compute Project

**Inventec DCS6072QS  
ToR/Leaf Switch Specification**

## Revision History

Revision	Date	Author	Description
.01	3/27/2015	Alex Johnstone	Initial Release
.02	5/28/2015	Alex Johnstone	Incorporated Engineering feedback. First version submitted to the OCP.

Author: Alex Johnstone

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<b>Description</b>	<b>Manufacturer</b>	<b>Part Number</b>
X86 CPU	Intel	C2538-2.4GHz FH8065501516762S R1S9
DDR3 8GB SO-DIMM w/ECC	Hynix	HMT41GA7BFR8A-PB
8GB SATA DOM	ADATA	ISMS312-008GWH
SPI NOR Flash 8MB	MXIC	MX25L6406EM2I-12G
pSoc	Cypress	CY8C3246LTI-149
CPLD	Lattice	LCMXO2-2000HC-4FTG256C
P2041 CPU	Freescale	P2041NSN7PNC 1.5GHz 1.0V FCPBGA780 FREESCALE
4GB USB DOM	ADATA	IUM01-004GFHS
AC Power Supply	LITEON	CPR-4011-4M11 Front to back airflow CPR-4011-4M21 Back to front airflow
Switching chip TD2	Broadcom	BCM56854
10/100/1000 NIC	Intel	WGI210AT S LJXQ
Fan	Delta	GFB0412EHS-AA04 (Front to Back airflow) GFB0412EHS-AA04 (Back to Front airflow)
Cage/Connector SFP+ 2x8 (x3)	Amphenol	UE86-K8427-10321
Cage/Connector QSFP+ 2x3 (x1)	AllBest	R-TR-Q3-4CMHM-A5C
Connector RJ45 2x1 (x1)	Amphenol	RJMG221MD44B9ER

**Table 1 – Licensed Components**

## 1.1 License

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## Scope

This document defines the technical specifications for the Inventec DCS6022QS submitted to the Open Compute Foundation.

## Overview

The Inventec DCS6072QS is a compact 1RU, low-latency, feature-rich, Top-of-Rack (ToR), Layer 2/3 Ethernet switch targeted as a mainstream Datacenter Leaf switch. It can also be deployed in Enterprise and Service provider networks as a general purpose, low latency, and high performance L2/L3 Ethernet switch. Magnolia has 48x10G SFP+ ports and 6x40G QSFP+ ports. Each of the 40G QSFP+ port can be split into 4x10G ports that provide a total of 72x10G ports at line rate.

The Inventec DCS6072QS also has hot-swappable dual power supplies (1+1 redundancy), hot-swappable N +1 redundant fan trays (i.e. 3+1 ), dual redundant 8MB Boot flash, 16GB RAM, one 8GB System flash, one SSD, one RS-232 serial console port, one USB port and one 1000Base-T Management port.

## Physical Overview

### 1.2 Dimensions

	Inches	Millimeters
<b>Length</b>	16.0	406.40
<b>Width</b>	17.32	440.00
<b>Height</b>	1.7	43.18

Table 2 - Inventec DCS6072QS Physical Dimensions

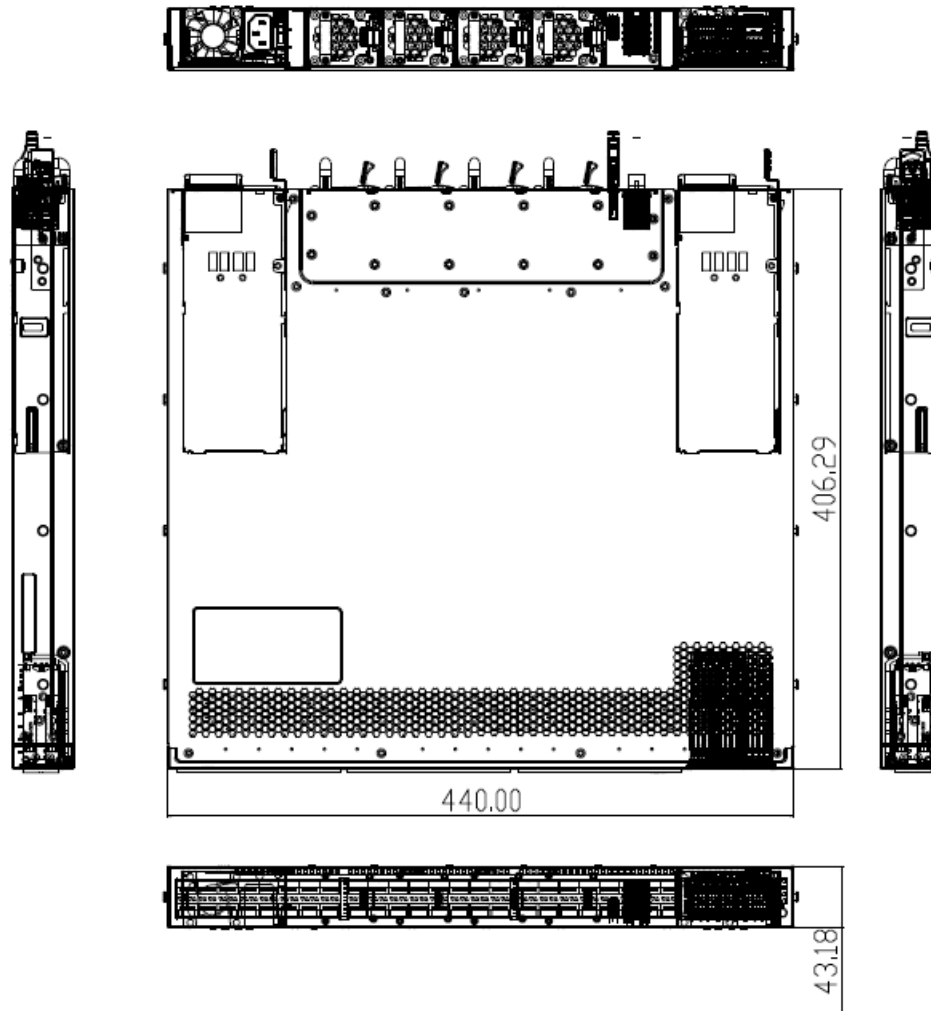


Figure 1 – Inventec DCS6072QS Physical Dimensions



### 1.3 Top View

The top view of the Inventec DCS6072QS shows the Printed Circuit Boards, and other chassis components of the system. Locations of the CPLDs, ASIC, and CPU Module are also highlighted.

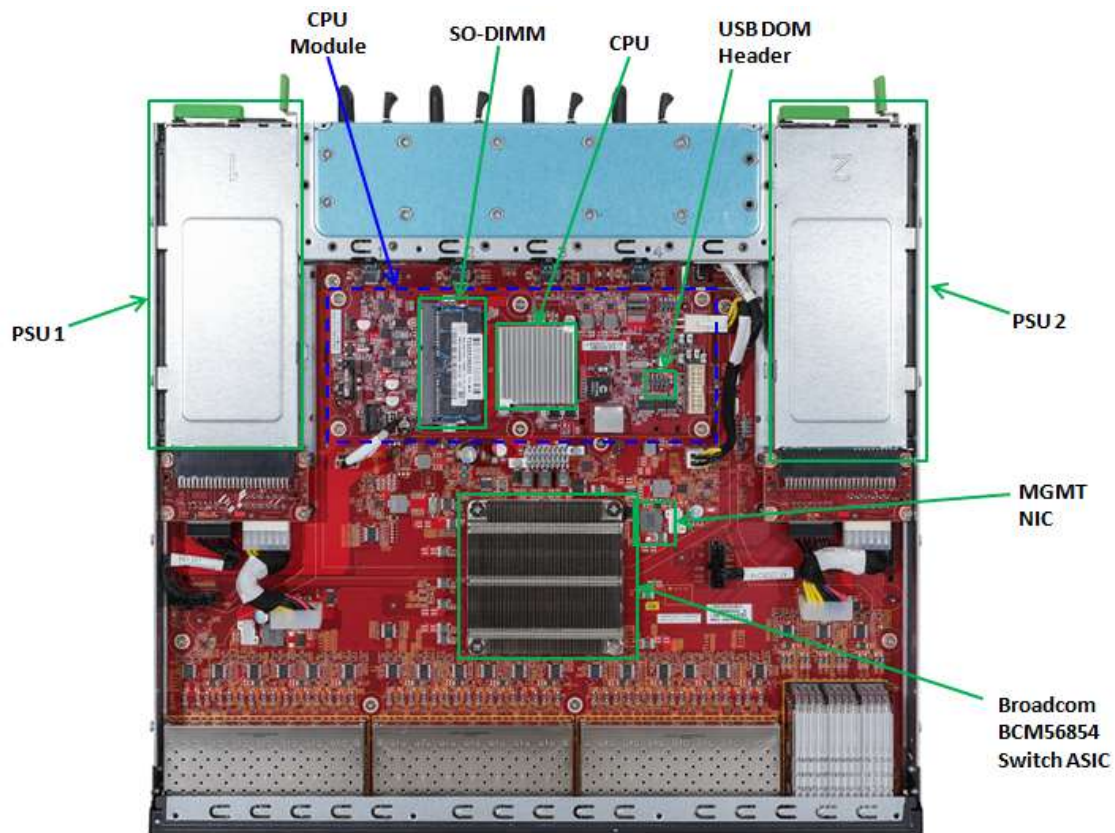


Figure 2 - Inventec DCS6072QS Top View with Key Components Identified

## 1.4 Front View



**Figure 3 - Inventec DCS6072QS Front View**

The front panel view of the Inventec DCS6072QS includes the following components:

- Forty-Eight (48) SFP+ Connectors (Three 2x8 Stacked)
- Six QSFP+ Connectors (One 2x3 Stacked)
- Two (2) IEC AC Power Jacks (One Each Side)
- System and Interface Status LEDs
- Reset Button with Status LED

## 1.4.1 Front Panel LED Definitions

Function	Color	Status	Description	
<b>Health/ Status LED (Bi-Color)</b>	Green (570nm)		<b>Xloader/U-boot/Linux (Before SYSTEM READY)</b>	<b>ICOS/HMD (After SYSTEM READY)</b>
		Solid	N/A	Switch Ready
		Blinking (0.5Hz)	Bootloader Execution	N/A
		Blinking (1Hz)	Linux Stage	UID
		Blinking (2Hz)	PSU Not Powered	PSU Not Powered
		Off	System Not Powered	System Not Powered
	Red (631nm)	Solid	Power Sequence Error	Critical Event
		Blinking (0.5Hz)	N/A	N/A
		Blinking (1Hz)	FW Error	Caution Event
		Blinking (2Hz)	Over Temperature Shutdown	Over Temperature Shutdown
		Off	System Not Powered	System Not Powered
<b>QSFP+40G mode Link/Activity LED (Bi-Color)</b>	Green (525nm)	Solid	Link Up (10G)	Link Up (10G)
		Blinking	Activity – XMT/RCV (10G)	Activity – XMT/RCV (10G)
		Off	Link Down	Link Down
	Amber (605nm)	Solid	Link Up (40G)	Link Up (40G)
		Blinking	Activity – XMT/RCV (40G)	Activity – XMT/RCV (40G)
<b>QSFP+10G mode Link/Activity LED (Qty. 4)</b>	Green (525nm)	Solid	Link Up (10G)	Link Up (10G)
		Blinking	Activity – XMT/RCV (10G)	Activity – XMT/RCV (10G)
		Off	Link Down or 40G Usage	Link Down or 40G Usage
<b>(SFP+)10GbE Link/Activity LED (Qty. 48)</b>	Green (525nm)	Solid	Link Up	N/A
		Blinking	Activity – XMT/RCV	N/A
		Off	Link Down	N/A
<b>(SFP+)1GbE Link/Activity LED (Qty. 48)</b>	Amber (590nm)	Solid	Link Up	N/A
		Blinking	Activity – XMT/RCV	N/A
		Off	Link Down	N/A

Table 3 - Inventec DCS6072QS Front Panel LED Definitions

## 1.4.2 Optics and Cable Support

Interface Type	SFP+ Ports	QSFP+ Ports
40GBASE-SR4	-	100m(OM3) and 150m(OM4)
40GBASE-XSR4	-	300m(OM3) and 450m(OM4)
AOC-40G-Q-Q	-	3-30m
40GBASE-CR4	-	0.5-7m QSFP+ to QSFP+
40G-PLRL4	-	1km(1km 4x10G LR/LRL)
40G-LRL4	-	1km
40GBASE-LR4	-	10km
10BASE-CR	SFP+ to SFP+: 0.5-5m	0.5-5m QSFP+ to 4 x SFP+
10BASE-SRL	100m	-
10BASE-SR	300m	-
10BASE-LRL	1km	-
10BASE-LR	10km	-
10BASE-ER	40km	-
10BASE-ZR	80km	-
10G-DWDM	80km	-
100 TX 1G SX/LX/TX	Yes	-

Table 4 - Inventec DCS6072QS Optics and Cable Support

## 1.5 Rear View

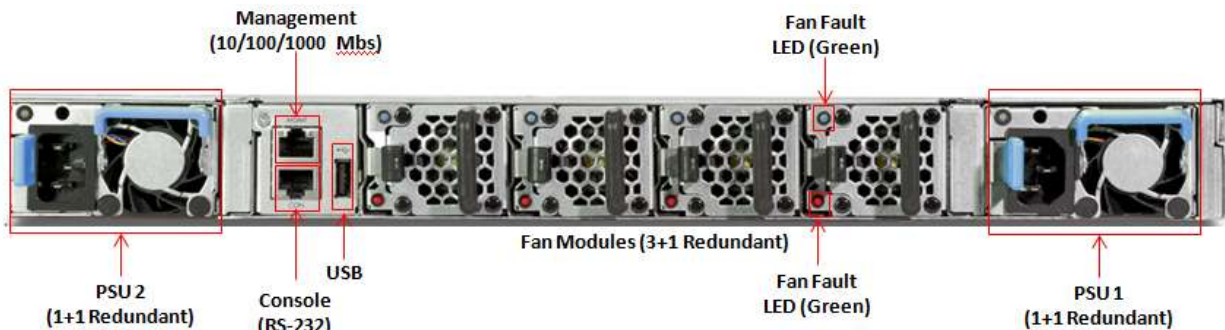


Figure 4 - Inventec DCS6072QS Rear View

The rear view of the Inventec DCS6072QS includes the following components:

- Two (1+1) Redundant, Hot Swappable, Power Supply Modules
  - Status LED (Per Power Supply)
  - Color Coding to Indicate Airflow Direction
- Five (4+1) Redundant, Hot Swappable, Fan Modules
  - LED Per Fan Module to Indicate Status
  - Color Coding to Indicate Airflow Direction

## 1.5.1 Field Replaceable Units

### 1.5.1.1 Power Supply Modules

The Inventec DCS6072QS supports two (1+1) redundant power supply modules as listed in the following table.

Delta 460 Watt PSU: AC Input Range: 115-230 VAC / xx-yyHz		
<ul style="list-style-type: none"> <li>PSU DPS-460DB-9 C Front-to-Rear or Rear-to-Front Airflow</li> </ul>		
	<b>Inches</b>	<b>Millimeters</b>
<b>Length</b>	7.3	185
<b>Width</b>	2.9	73.5
<b>Height</b>	1.53	39

Table 5 - PSU Options and Dimensions

#### 1.5.1.1.1 Power Supply Modules: Mechanical Drawing

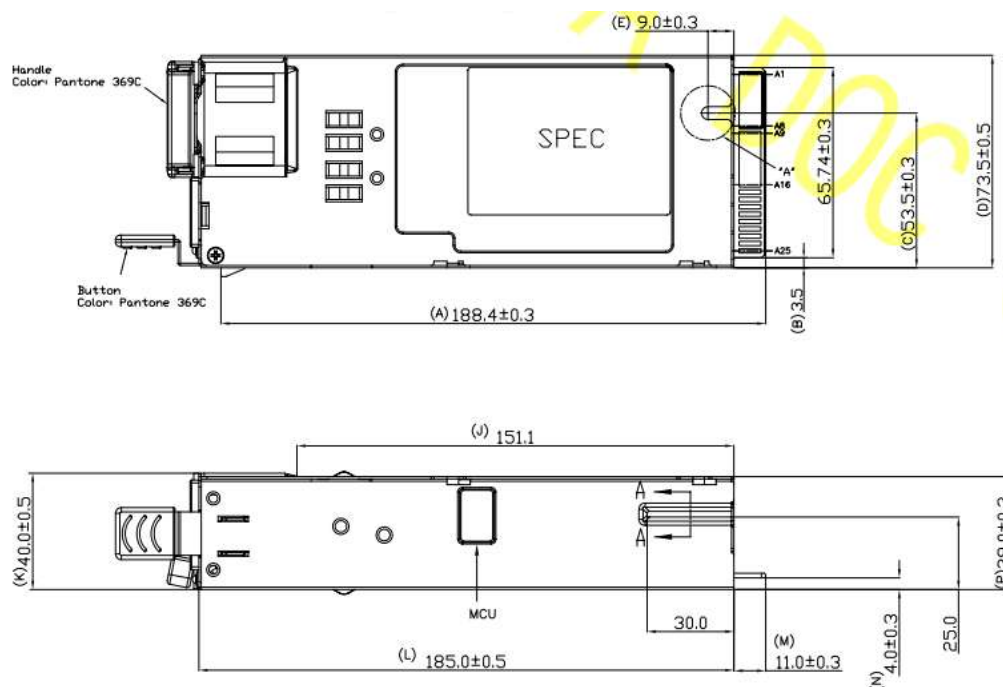


Figure 4 – PSU module drawing

### 1.5.1.1.2 PSU Pin-Out

PIN	SIGNAL NAME	PIN	SIGNAL NAME
A1	GND	B1	GND
A2	GND	B2	GND
A3	GND	B3	GND
A4	GND	B4	GND
A5	GND	B5	GND
A6	GND	B6	GND
A7	GND	B7	GND
A8	GND	B8	GND
A9	+12V	B9	+12V
A10	+12V	B10	+12V
A11	+12V	B11	+12V
A12	+12V	B12	+12V
A13	+12V	B13	+12V
A14	+12V	B14	+12V
A15	+12V	B15	+12V
A16	+12V	B16	+12V
A17	SDA	B17	A0
A18	SCL	B18	A1
A19	PWDK	B19	+12VSB
A20	LPD_N	B20	ACFAIL
A21	PSOFF	B21	PSKILL
A22	SMBAlert	B22	W_PROT
A23	RETURN_S	B23	12LS
A24	12VS	B24	PRESENT_N
A25	Smart_On	B25	KEY

Table 6 - PSU Golden Fingers Pinout Definitions

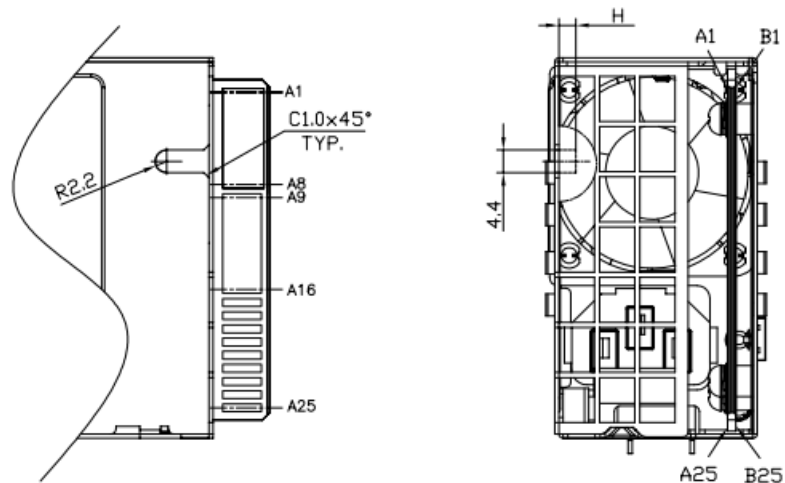
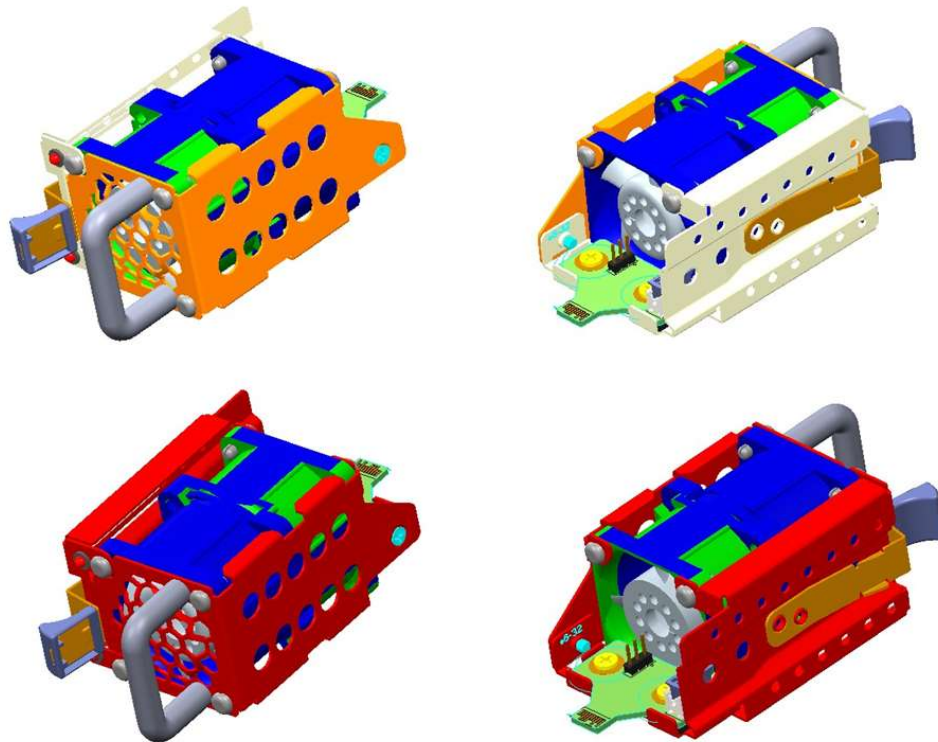


Figure 5 - PSU Golden Fingers Mechanical Drawing

#### 1.5.1.1.3 Fan Modules

The Inventec DCS6072QS supports five individual fan modules. Each fan module supports two 40 mmx40 mmx56 mm fans.

Description	Manufacturer	Part Number
Fan (Front-to-Rear Airflow)	Delta	GFB0412EHS-AA04
Fan (Rear-to-Front Airflow)	Delta	GFB0412EHS-AA04





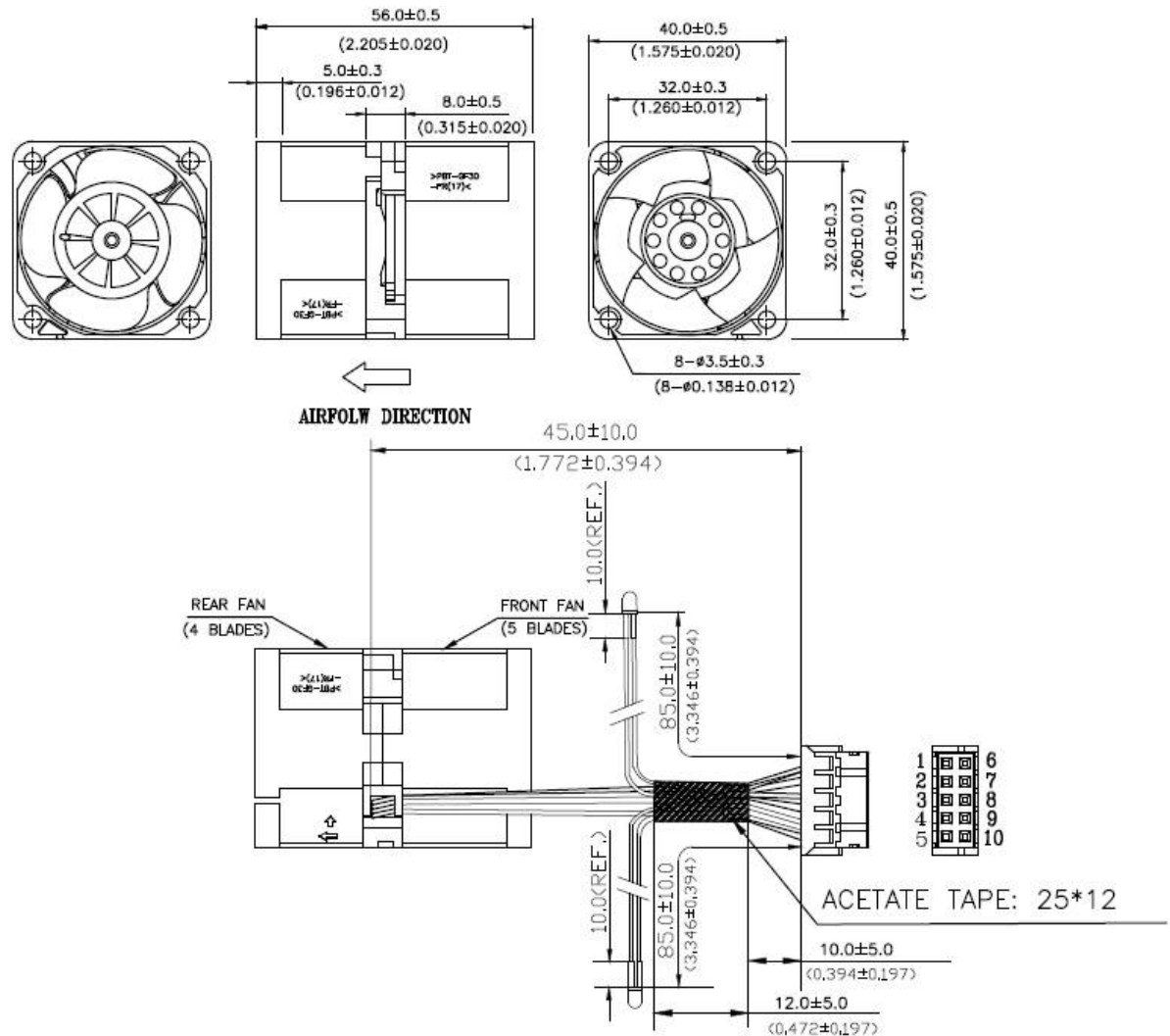


Figure 6 - Fan Modules Drawing

## 1.6 Inventec DCS6072QS System Description

The Inventec DCS6072QS consists of one baseboard, one PDB, one EMB, four fan trays and two power supplies. Both fan and power supplies are redundant and hot-swappable. Magnolia is a true PHY-Less design with forty-eight SFP+ plus six QSFP+ connections directly attaching to the BCM56854 TDII interfaces. The platform initially uses Intel x86 C2538 CPU for Phase I bring-up. CPU module will come in Phase II to support both Intel x86 C2538 and Freescale Power PC P2041 to provide the flexibility in CPU configurations.

The Inventec DCS6072QS I/O module consists of one 1GE RJ-45 port for management and one RJ-45 connector for console port at the front panel, and one USB connector and one Micro SD card at the rear panel. The Micro SD and USB are located in a module which can be removed based on customer's requirements.



## PCB Board Assemblies

The Inventec DCS6072QS is comprised of the following four (4) PCB assemblies:

Description	Dimensions	Layers
Switch PCB	12.7in x 16.9in x 0.092in (322.4mm x 431.3mm x 2.36mm)	12 Layers
CPU Module (2 Versions)	3.38in x 8.72in x 0.085in (85.85mm x 221.5mm x 2.16mm)	4 Layers
Power Distribution PCB	1.58in x 3.34in x 0.063in (40.13mm x 84.84mm x 1.6mm)	6 Layers
Fan tray module PCB	1.52in x 1.18in x 0.062in (38.5mm x 30mm x 1.58mm)	4 Layers
Rear I/O module PCB	1.26in x 2.94in x 0.062in (32mm x 74.68mm x 1.58mm)	4 Layers

### 1.6.1.1 Switch PCB

The Switch PCB is a multi-layer board supporting the Broadcom TDII switching silicon, front panel networking and management ports, LEDs, and the connections to other PCB boards in the system.

### 1.6.1.2 Switch PCB Top View

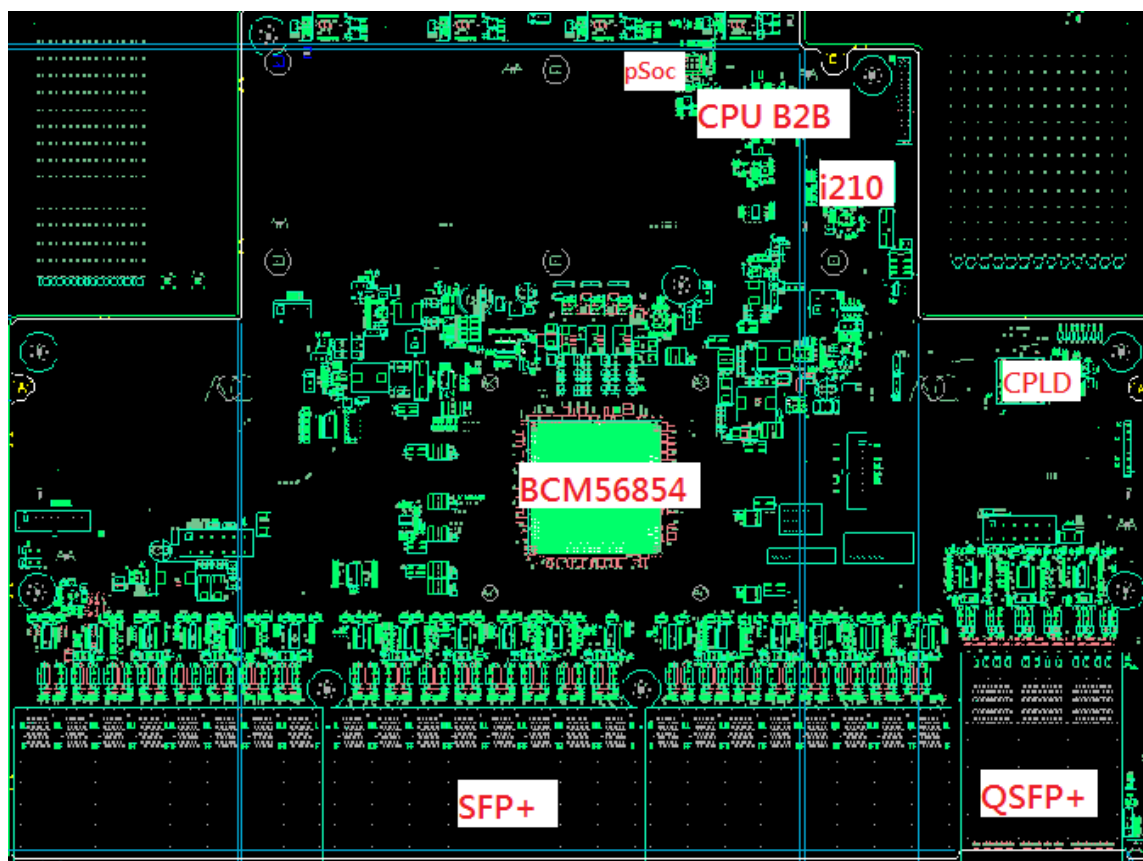


Figure 7 - Inventec DCS6072QS Switch PCB Top View With Major Components Highlighted

### 1.6.1.3 Switch PCB Bottom View

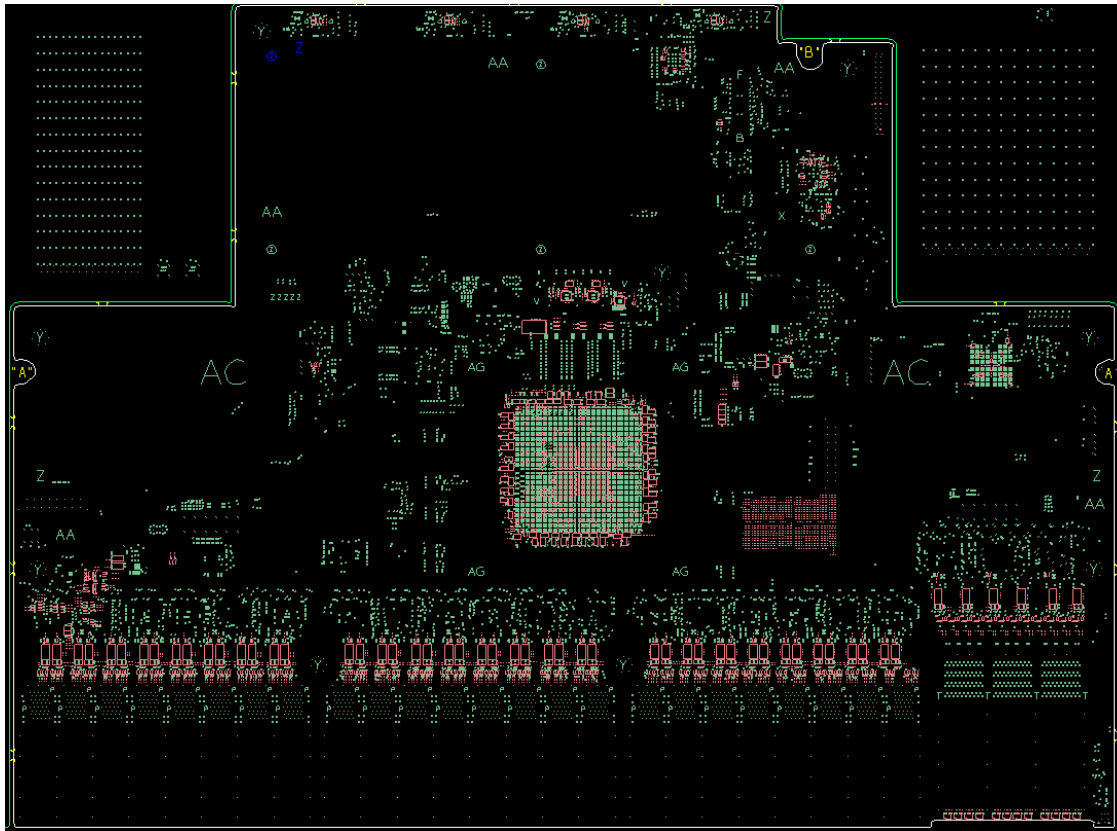


Figure 8 - Inventec DCS6072QS Switch PCB Bottom View

#### 1.6.1.3.1 Switch PCB Major Components

Description	Manufacturer	Part Number
Switching Silicon	Broadcom	BCM56854
MGMT NIC	Intel	WGI210AT S LJXQ
CPLD	Lattice	LCMXO2-2000HC-4FTG256C
pSoc	Cypress	CY8C3246LTI-149
CPU B2B	Molex	52885-0774
SFP+	Amphenol	UE86-K8427-10321
QSFP+	AllBest	R-TR-Q3-4CHMH-A5C

### 1.6.1.3.2 Switch PCB Block Diagram

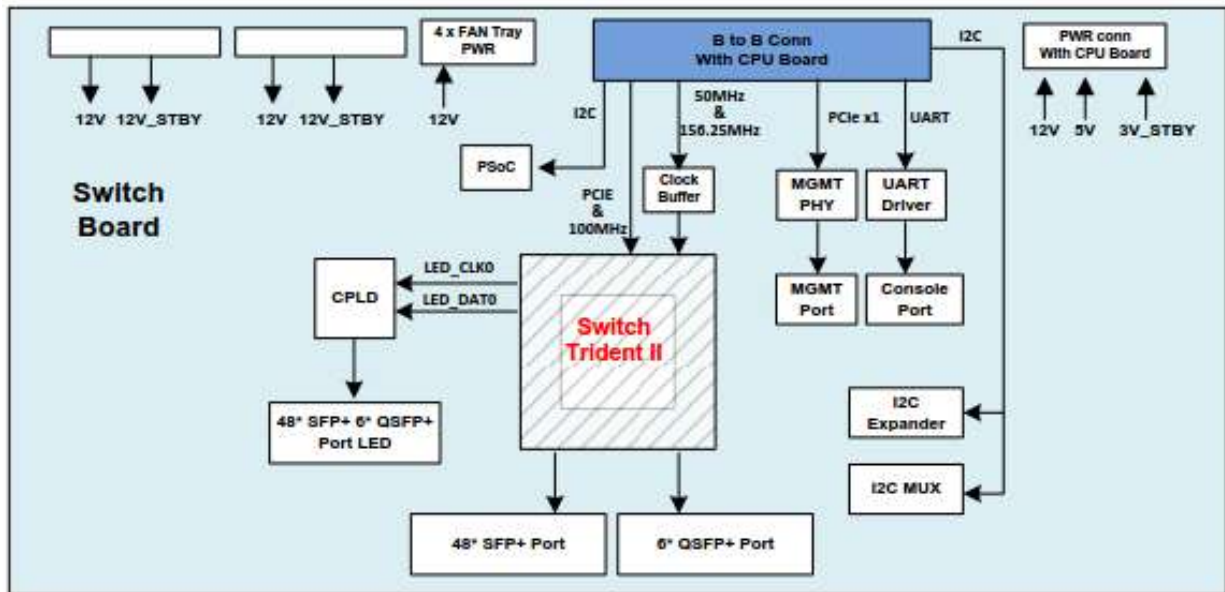
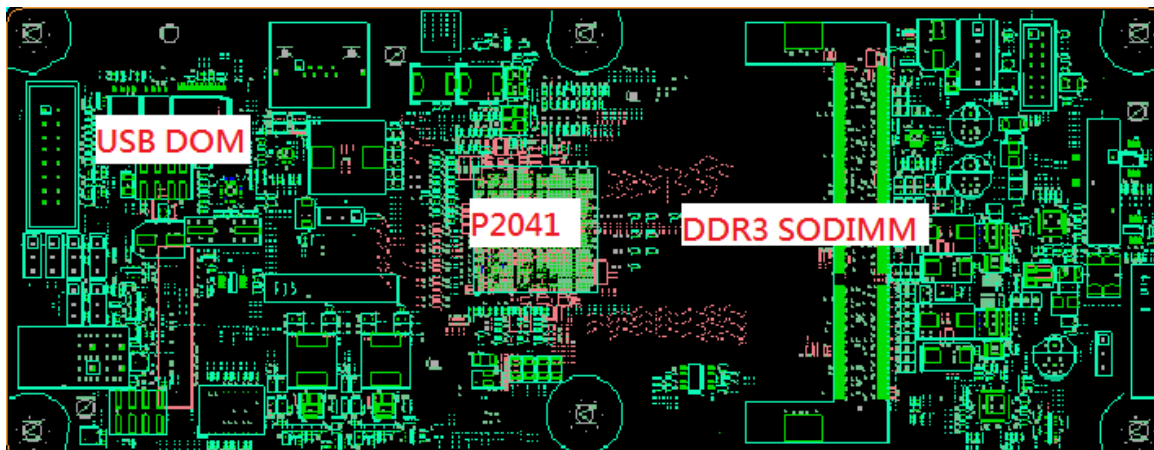


Figure 9 - Inventec DCS6072QS Main PCB Block Diagram

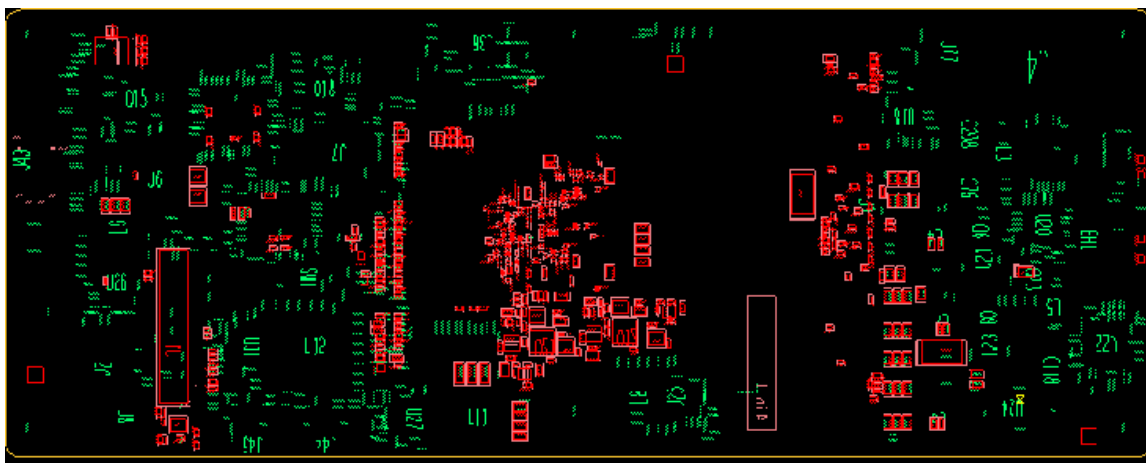
#### 1.6.1.4 Freescale P2041 CPU Module Description

The P2041 CPU module is a multi-layer PCB which accommodates the communication processor and the associated components for the CPU subsystem. The processor residing on this CPU module is Freescale P2041 QorIQ integrated communication processor which provides four Power Architecture® processor cores with high performance data path acceleration logic and peripheral bus interfaces required for Networking and Telecommunication. Freescale P2041 CPU

##### 1.6.1.4.1 Module Top View



##### 1.6.1.4.2 Freescale P2041 CPU Module Bottom View



## 1.6.1.4.3 Freescale P2041CPU Module Major Components

Description	Manufacturer	Part Number
P2041 CPU	Freescale	P2041NSN7PNC 1.5GHz 1.0V FCPBGA780 FREESCALE
DDR3 8GB SO-DIMM w/ECC	Hynix	HMT41GA7BFR8A-PB
4GB USB DOM	ADATA	IUM01-004GFHS

## 1.6.1.4.4 Freescale P2041 CPU Module Block Diagram

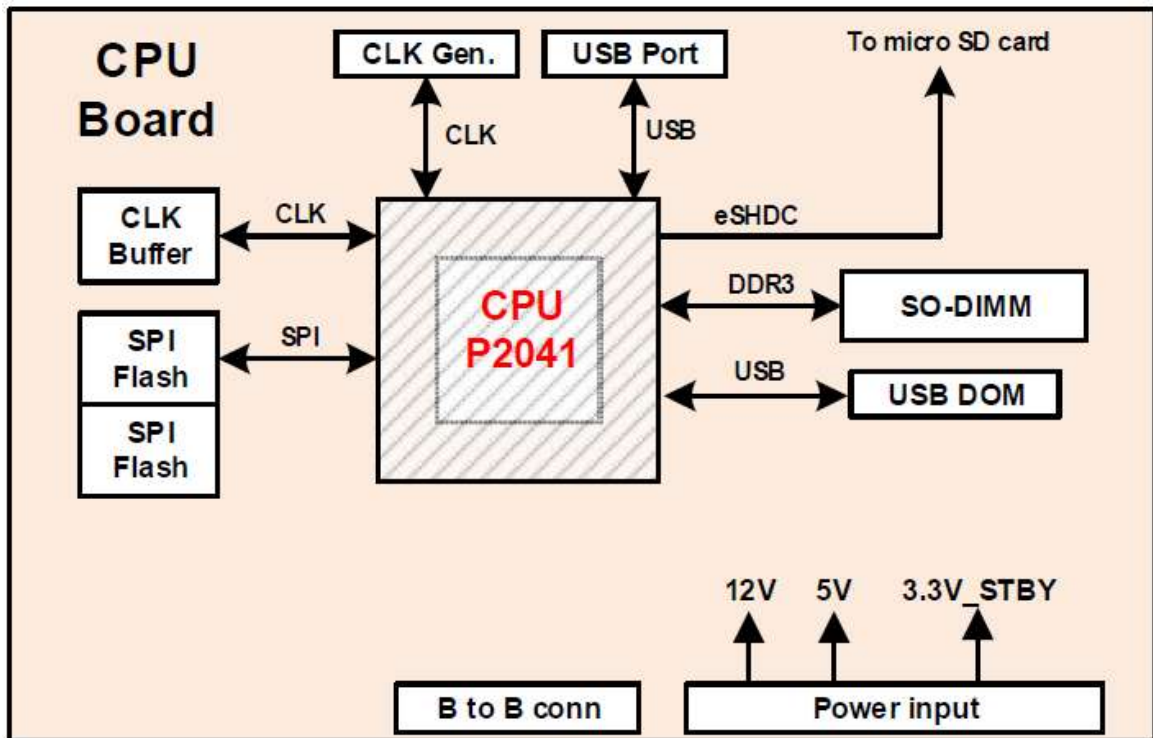


Figure 10 - Freescale P2041 CPU Module

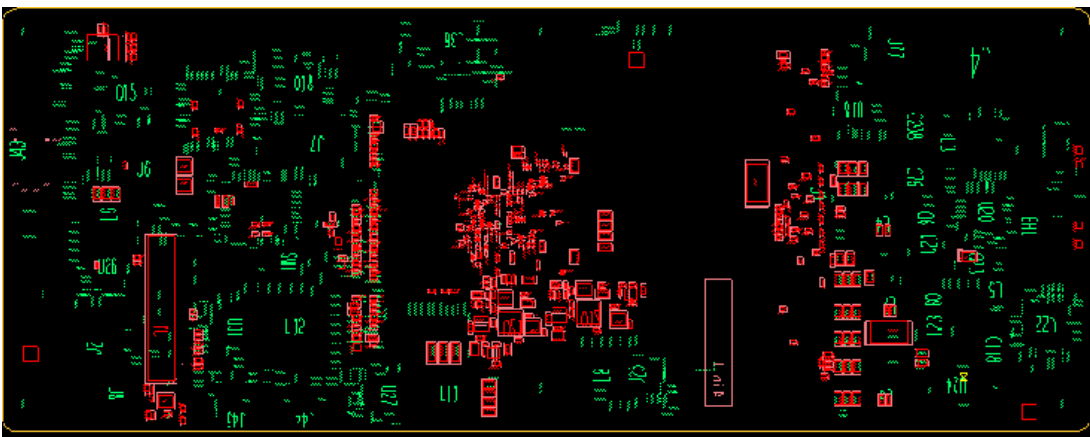
### 1.6.1.5 Intel C2538 CPU Module

The x86 CPU module is a multi-layer PCB which accommodates the communication processor and the associated components for the CPU subsystem. The communication processor residing on this CPU module is Intel Atom C2538. Intel C2538 processor has four cores with the thermal design power (TDP) around 15W, the integrated HW acceleration, and the Intel Xeon Instruction Set Architecture compatibility.

#### 1.6.1.5.1 Intel C2538 CPU Module Top View



#### 1.6.1.5.2 Intel C2538 CPU Module Bottom View



## 1.6.1.5.3 Intel C2538 CPU Module Major Components

Description	Manufacturer	Part Number
CPU	Intel	C2538 FH8065501516762S R1S9
8GB DDR3 SODIMM	Hynixx	HMT41GA7BFR8A-PB
SATA DOM 8GB	ADATA	ISMS312-008GWH

## 1.6.1.5.4 Intel C2538 CPU Module Block Diagram

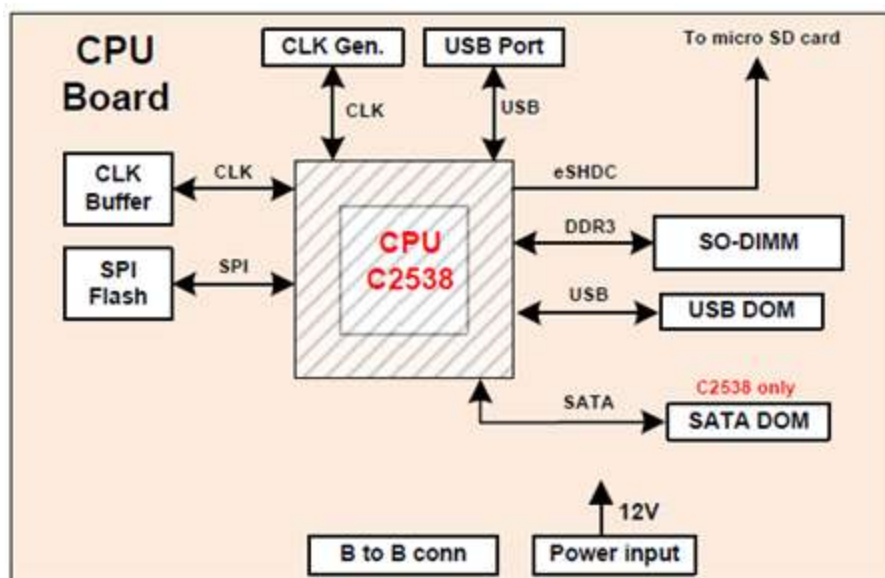
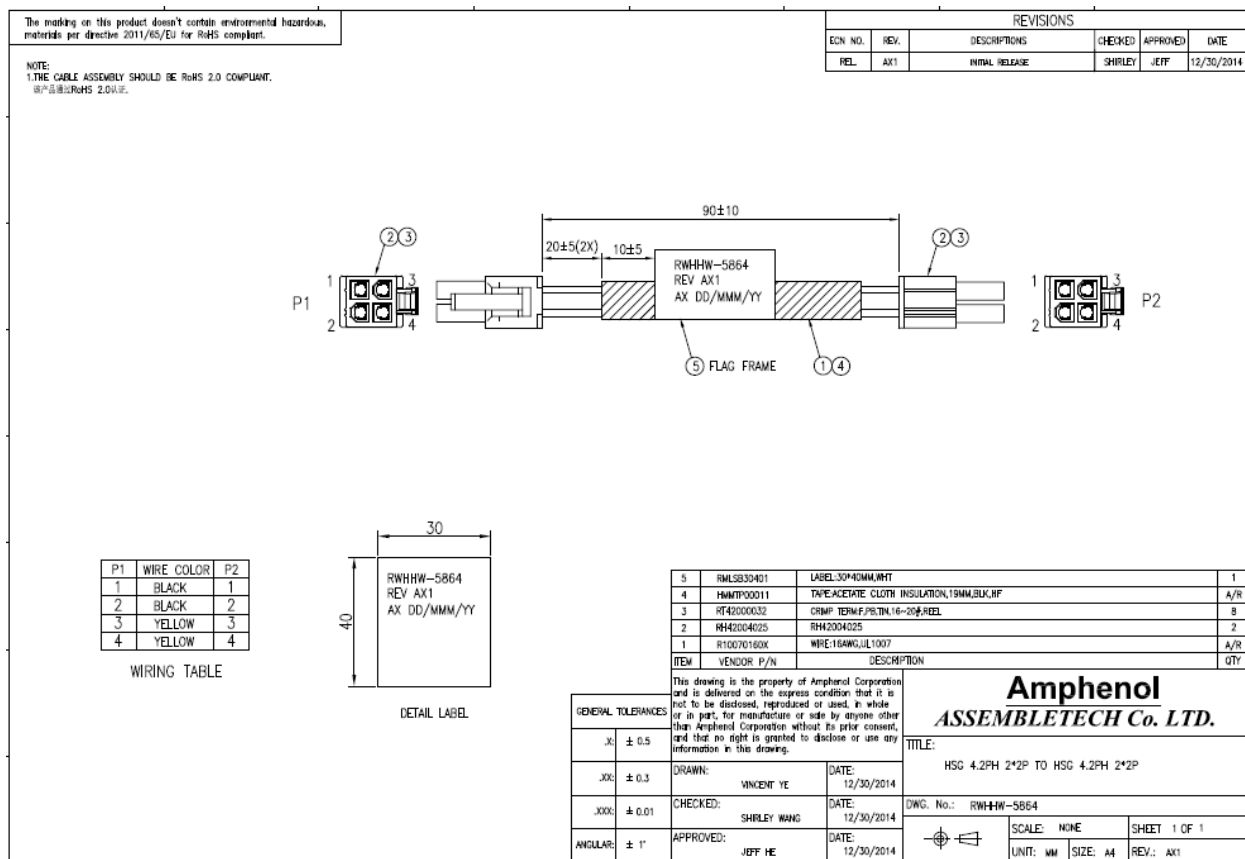


Figure 11 - Intel C2538 CPU Module



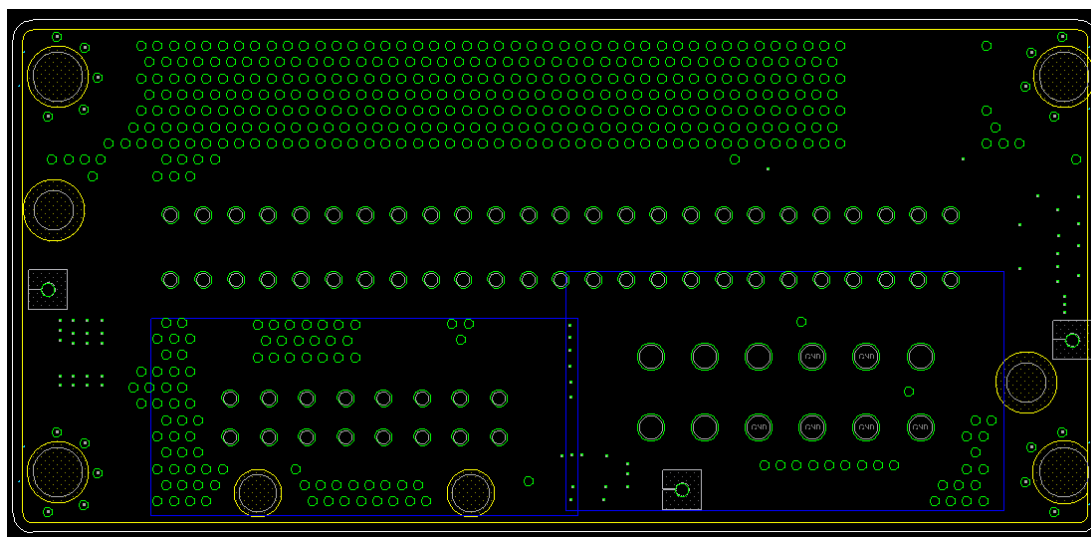
### 1.6.1.5.5 CPU Module power cable





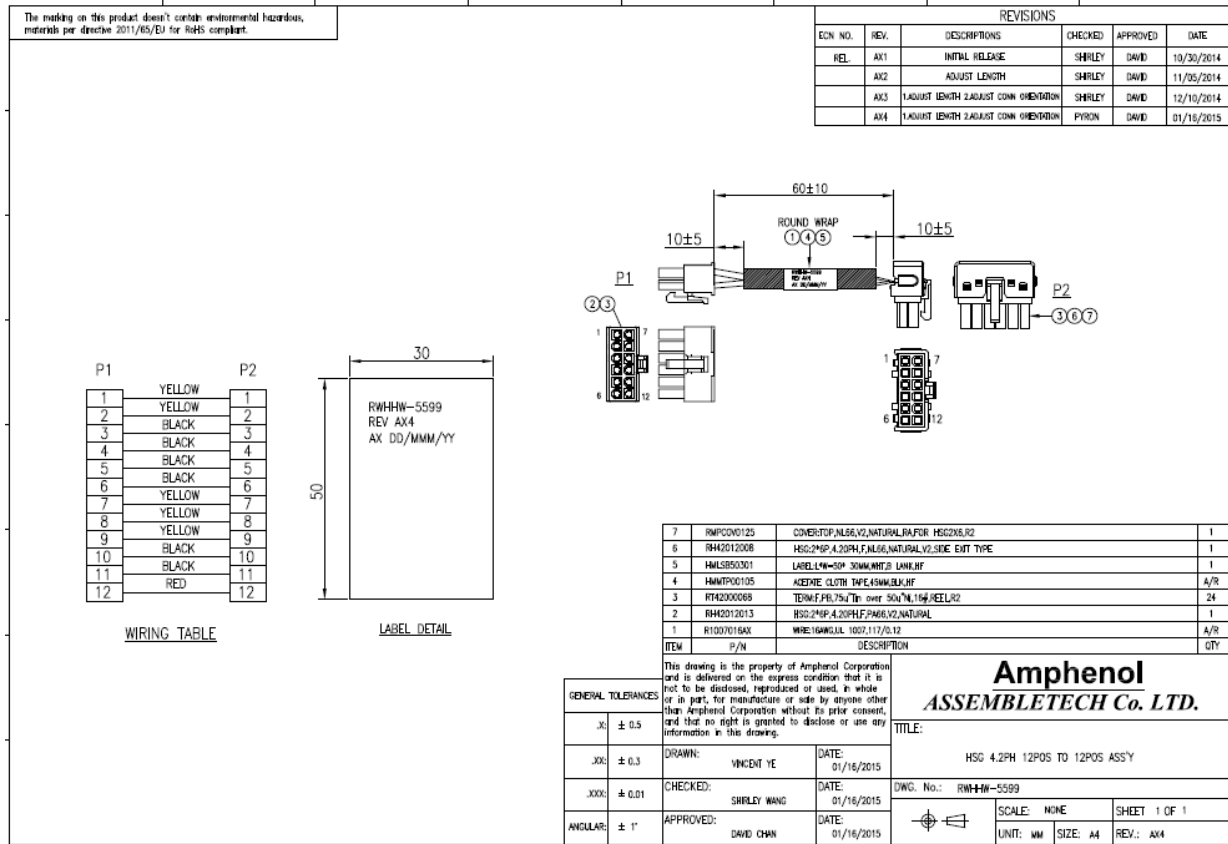


#### 1.6.1.6.1 Power Distribution PCB Top View





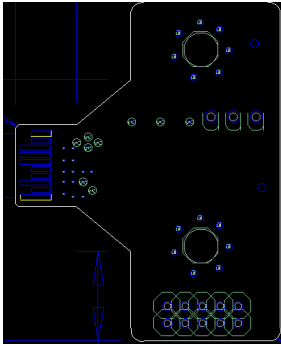
## 1.6.1.5.4. Power Distribution PCB power cable



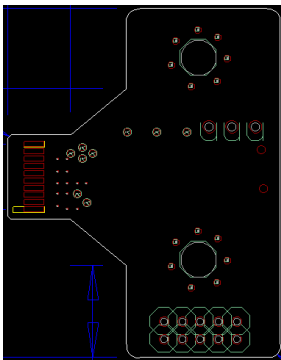
#### 1.6.1.7 *Fan Tray module PCB Description*

The Fan Tray module PCB is connected to the main board by golden finger. It only deliver Fab control signal.

##### 1.6.1.7.1 Fan Tray module PCB Top View



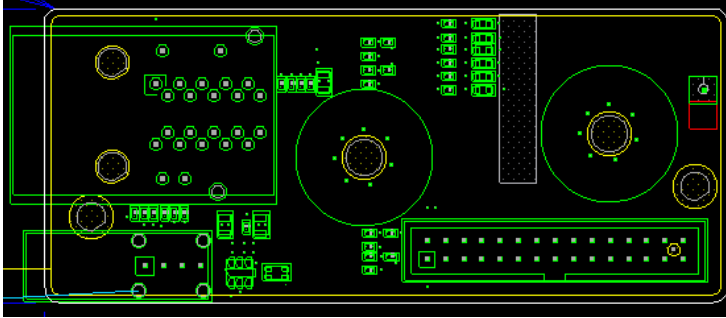
##### 1.6.1.7.2 Fan Tray module PCB Bottom View



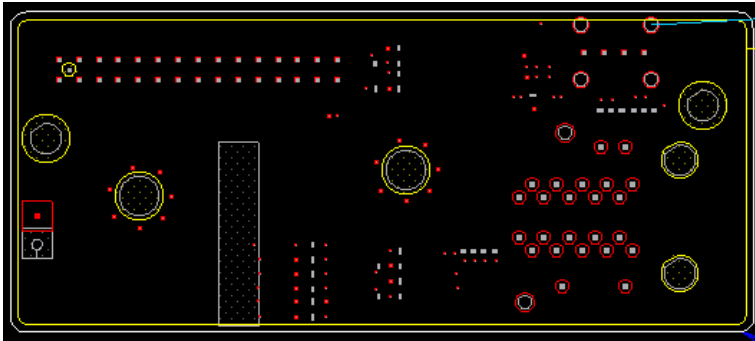
### 1.6.1.8 Rear I/O module PCB Description

The rear-IO card include LAN-console stacked connector and one USB type A right-angle connectors. It connects to main switching board by cable.

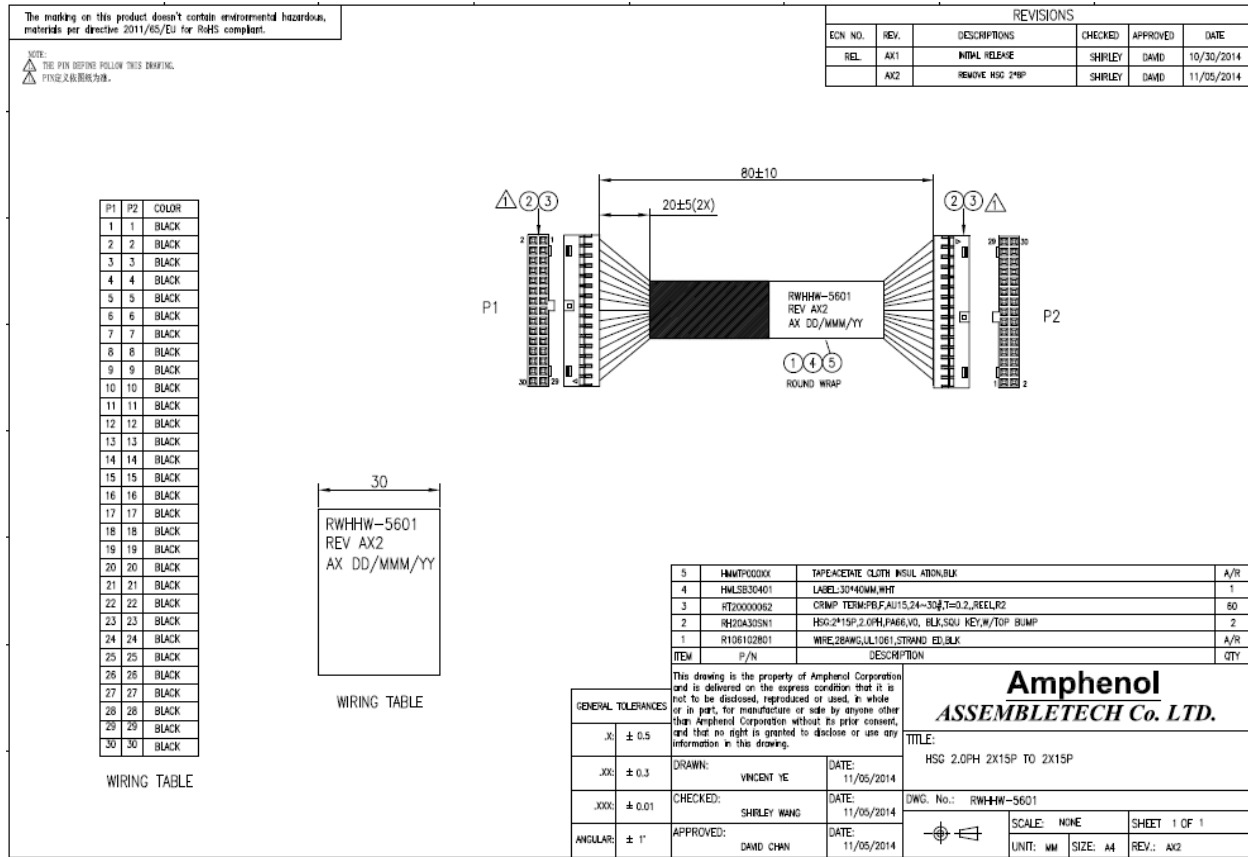
#### 1.6.1.8.1 Rear I/O module PCB Top View



#### 1.6.1.8.2 Rear I/O module PCB Bottom View



### 1.6.1.8.3 Rear I/O module PCB cable



## 1.7 Software Support

### 1.7.1 BIOS

A BIOS provided by AMI with our customization will be used. Diagnostics will be run at the UEFI shell.

### 1.7.2 ONIE

ONIE is supported.

### 1.7.3 Open Network Linux (ONL)

ONL is supported.

## 1.8 Environmental Requirements

- 0 to 45 Degrees C standard operating range
- -40 to 70 Degrees C storage
- Humidity 10% to 90% non-condensing
- Vibration – IEC 68-2-36, IEC 68-2-6
- Shock – IEC 68-2-29
- Acoustic Noise Level – Under 60dB in 40 degree C

## 1.9 Regulatory Compliance

The system meets the regulatory compliances and safety requirements of North America, EU, China, Japan, Taiwan, Singapore, India, and South Korea.

- FCC part 15 and CISPR 22 Class A
- EN 61000-3-2 Harmonics
- EN 61000-3-3 Voltage Flicker
- EN 55024 Immunity
- EN 61000-4-2 Electrostatic Discharge, 8kV Contact, 15 kV Air,
- EN 61000-4-3 Radiated Immunity 3V/m, Criteria A
- EN 61000-4-4 Transient Burst, 1 kV, Criteria B
- EN 61000-4-5 Surge, 2 kV L-L, 2 kV L-G, Level 3, Criteria B
- EN 61000-4-6 Conducted Immunity, 0.15-80 MHz, 3V
- EN 61000-4-11 Power Dips & Interruptions, >30%, 25 periods

## 1.10 ROHS

### Restriction of Hazardous Substances (6/6)

Compliance with Environmental procedure 020499-00 primarily focused on Restriction of Hazardous Substances (ROHS Directive 2002/95/EC) and Waste and Electrical and Electronic Equipment (WEEE Directive 2002/96/EC)