



OPEN
Compute Project

SILICON/SOFTWARE VALIDATION KIT COMPATIBLE
WITH THE 51.2T 64x800G 2RU SWITCH
("TH5") AND OTHER ETHERNET SWITCH CHIPS
DESIGN SPECIFICATION, VERSION 1.0

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1. Scope

This document outlines basic building blocks for system design compatible with the 51.2T Tomahawk 5 switch (“TH5”) using 100G serdes and other Ethernet switch chips. The design is for the reference platform called SVK (silicon/software validation kit) and involves board, SI, thermal and mechanical concepts for system design around an Ethernet switch chip.

2. Overview

The SVK platform, in general, is used by the customers and by the internal Broadcom teams for functional tests, software development and other system level tests like channel BER for varying link budgets, thermal evaluations under PVT conditions etc. that can be used as references for actual product development.

The SVK platform fits in a 2U, rack mountable chassis with 64 front panel OSFP ports for maximum 64 x 800G bandwidth. These ports support both DAC and optical cables.

The rear side of the chassis provides access to the CPU Ethernet and console ports(RJ45) along with pluggable fan modules and 2xPSU supplies.

3. Rack Compatibility

The SVK Switch will be rack mountable in a standard EIA-310 rack. Rack mounting will be accomplished by standard rack mounting rail kit.

4. Physical Specifications

SVK Physical Dimensions

Length	732mm.
Width	442mm.
Height	88mm.

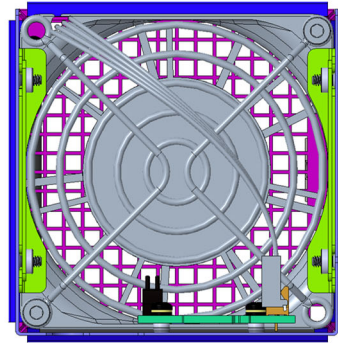
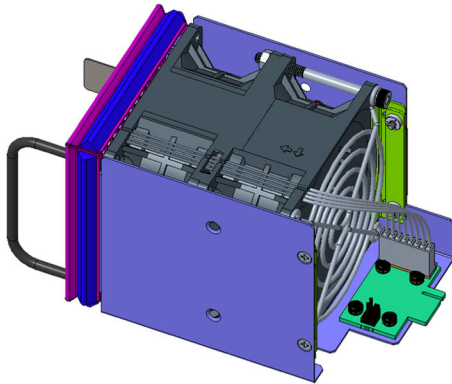
5. Thermal Design

The SVK is an air cooled system design with the system fans drawing air into the front of the unit and exhausting the air out the rear of the unit. The SVK system supports four fan modules on the rear of the unit

which provide the system cooling. The SVK includes a temperature sensor located on the main PCB to monitor system temperature

Fan units

The chassis for the TH5 or other Ethernet switch has 4x fan modules. Fan PN# Delta GFC0812DW-TD2G



Chassis

The SVK Chassis Bulk Airflow = 318CFM

6. I/O System

System Field Replaceable Units

- FRUs

Modules	Description
2x AC-DC PSU	110/220V, PSU modules
4x Fan modules	12V FRU modules

System LEDs

LEDs	Description
D9302	Green, System health
D9303	Red, Alarm status

External Ports

Port	Description
64 OSFP Serdes Ports	64 x 800GbE 128 x 400GbE 256 x 200GbE
1x QSFP28 Port	4 x 25G
1x Ethernet Port(RJ45)	CPU 10/100/1000BT
1x Serial Console(RJ45)	CPU UART console (115200Kbps)

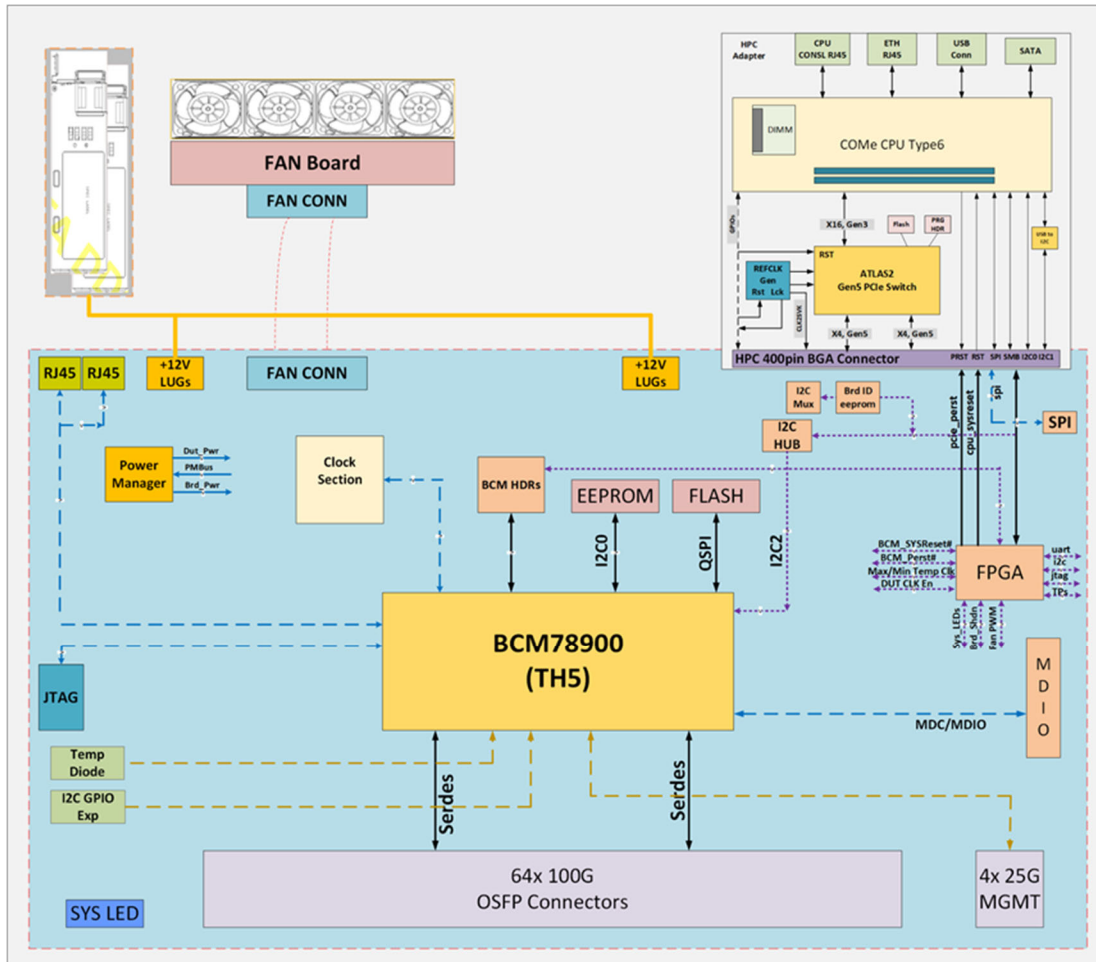
PCB Size and Descriptions

Board	Size	Board Description
SVK	17" x 12.8"	Main SVK PCB carrying, e.g., a TH5 chip
HPC CPU Adapter	8" x 6"	PCB to adapt COMe Conn to HPC conn
Fan board	13" x 1.2"	Fan PCB that interface to SVK
Fan Module	0.8: x 1.5"	Pluggable Fan module PCB

SVK PCB Block Diagram

The main PCB is comprised of the following sub-sections:-

- Control Plane:
 - COMe CPU module interface to SVK on the HPC Connector(PCIe, I2C)
 - System FPGA: Interfaces with CPU and BCM chip for SYS_Reset, Perst#, RefClk_En# and I2C
 - System Reference Clocks: Controlled by FPGA
- Data Plane:
 - TH5 or other Ethernet switch interfaced to Front panel pluggables
 - 64x 106G OSFP ports
 - 1x 100G Management port



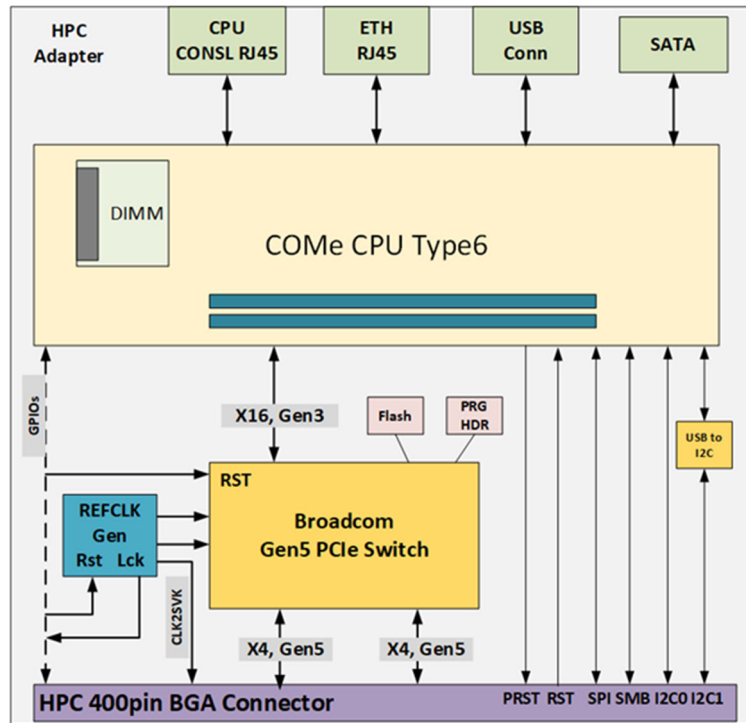
CPU Block Diagram

The SVK uses COMe (Type6) Module as the CPU for the control plane. Any suitable SDK can be used. For example, the SDK for the TH5 chip runs on linux with CLI interface compatible with previous generations of Tomahawk family. The CPU module features Intel® Pentium® processor D1508, dual 10GbE (KR), single GbE Ethernet, 2x DDR4 SO-DIMM.

The SVK interfaces to the CPU assembly include:

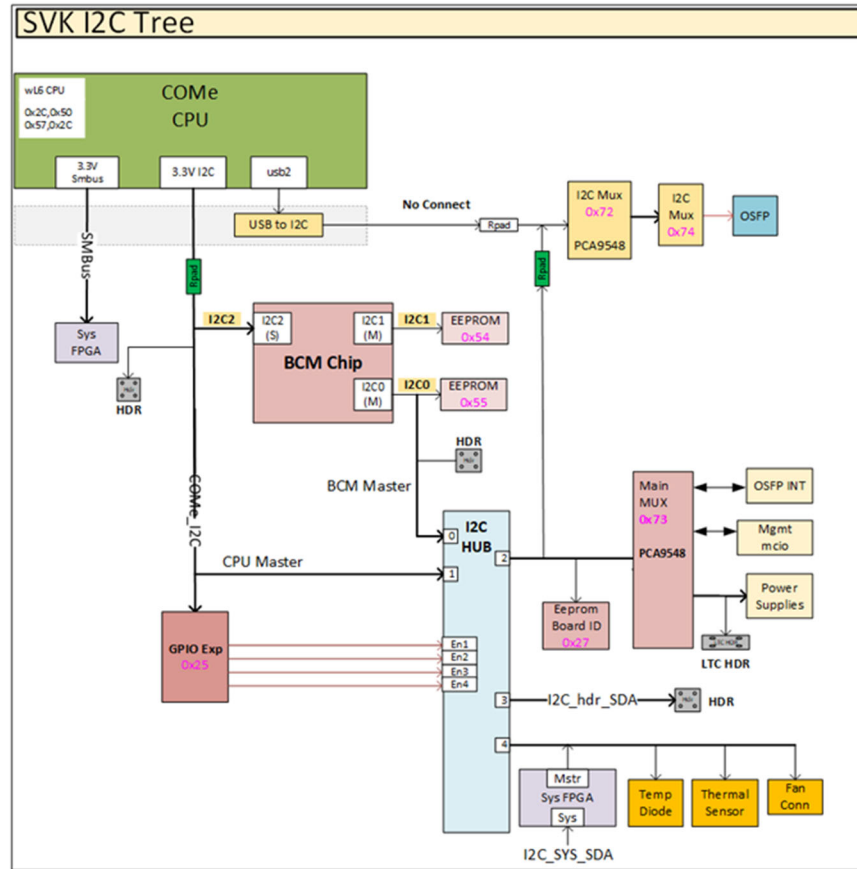
- PCIe x4, Gen5 for the control plane management
 - CPU to Atlas2: PCIe x16, Gen3
 - Atlas2 to TH5: PCIe x4, Gen5
- 1x I2C connecting all slave devices on board including, e.g., TH5(I2C_2)
- 1x I2C (USB to I2C) with option to connect to all devices on board
- 1x 10/100/1000B-T Ethernet port
- 1x Uart terminal(115K)
- 2x USB Connectors

- 1x SMB to the FPGA
- 1x SPI to on board HDR
- Resets(system reset, Perst#), GPIOs, PCIe Refclk Enable



I2C

The SVK provides the option for either CPU or BCM device to be I2C master and still access all the devices on board.



I2C Address Mapping

SVK I2C MAPPING			
device name	I2C Address	device name	I2C Address
Board ID	0x27	PS1	0x60
AVS GPIO Expander	0x26	PS2	0x61
Main I2C Mux	0x73	PS3	0x66
Thermal Sensor	0x18	PS4	0x64
Temp Diodes	0x4C	PS5	0x65
AC-DC PSU	0xA0, 0xA2	Power Manager	0x5C, 0x5D, 0x5E, 0x5F
I2C EPROM1	0x54	I2C GPIO Exp	0x77
I2C EPROM2	0x56/0x55	SYS FPGA	0x35
HUB GPIO Expander	0x25	I2C Mux (Baseboard)	0x72
PS6	0x41	I2C Mux (OSFPx)	0x74

SVK Clocks

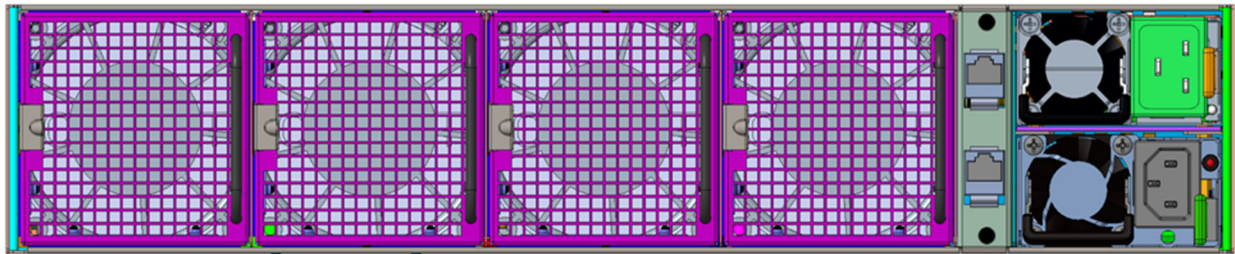
Reference clock	Description	Clock frequency
CORE_REFCLK	Core PLL	50 MHz
IPROC_REFCLK	IPROC PLL	50 MHz

PCIE_REFCLK	PCIe Gen5 Refclk	100MHz
SERDES_REFCLK	SERDES PLL	312.5 MHz
MGMT_REFCLK	SERDES PLL	156.25 MHz

System FPGA

The device operates at 3.3V core supply and has I/O banks at 1.8V for signals interfacing the TH5 chip and 3.3V for board interfacing signals.

7. Rear Side Power/I/O

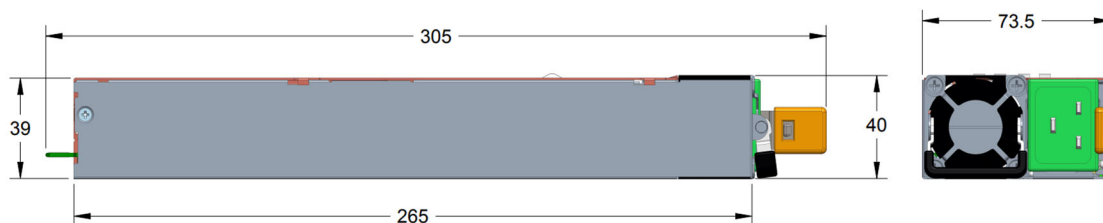


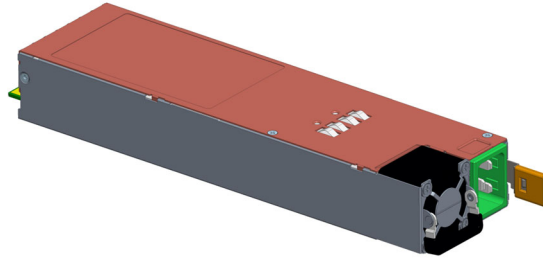
The rear view of the SVK shows the following components:

- The four system fan modules
- The system 10/100/1000 Ethernet port
- The System serial console management port
- The two system power supply modules

The chassis supports x2 Delta 2200W PSU modules supporting 110V to 220V AC input voltage range. The Low line and High line specs are mentioned below:

AC Line Input	Min - Max	Typ
Low Line(Vac)	90V - 140V	110V - 127 V
High Line(Vac)	180V - 264V	200V - 240V

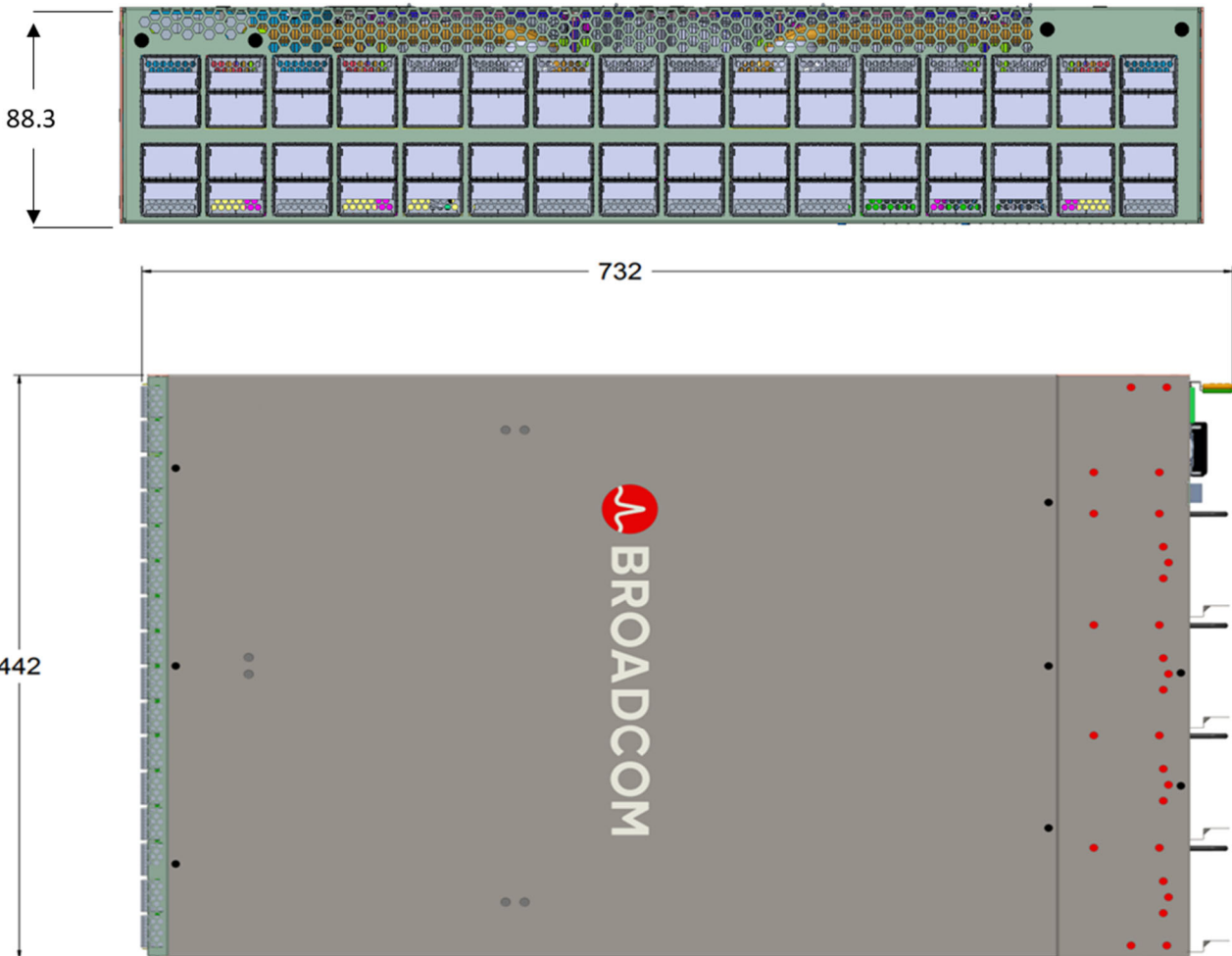


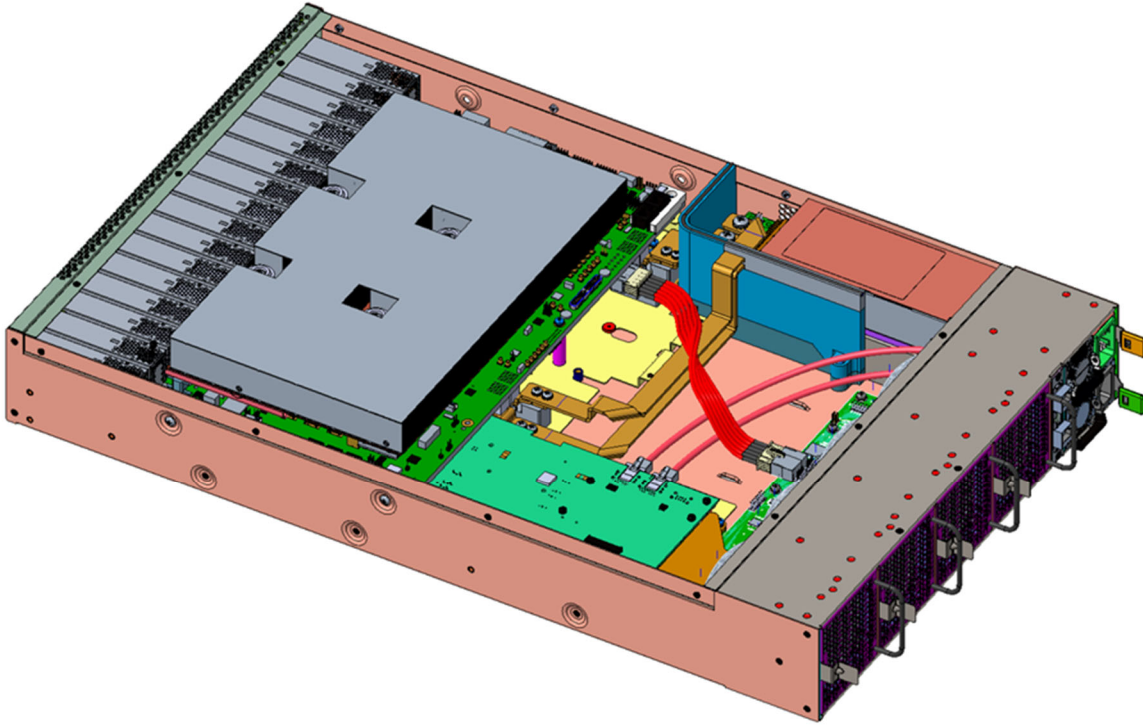


8. Mechanical

Physical Dimensions

Length	700mm
Width	442mm
Height	88.3mm





9. Onboard Power System

TH5 power rail specs can be found in the device datasheet. The power tree on the SVK board is as below:

Power Rail	Description
VDD_CORE	BCM Core Supply
0.9V	Analog 0.9V supply
0.75V	Analog 0.75V supply
1.5V	Analog 1.5V supply
0.8V	Analog 0.8V supply
VDD_MDIO	MDIO 1.2V supply
1.8V	Digital 1.8V supply

3.3V	Board 3.3V
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10. Software support

- Linux Linux 5.10.111 #Broadcom XLR/GTS-6.1.1 SMP PREEMPT
- SDK hsdk-6.5.27

11. System Firmware

- BIOS American Megatrends, Inc. Version 2.18.1260