

ViewFinder device Specification

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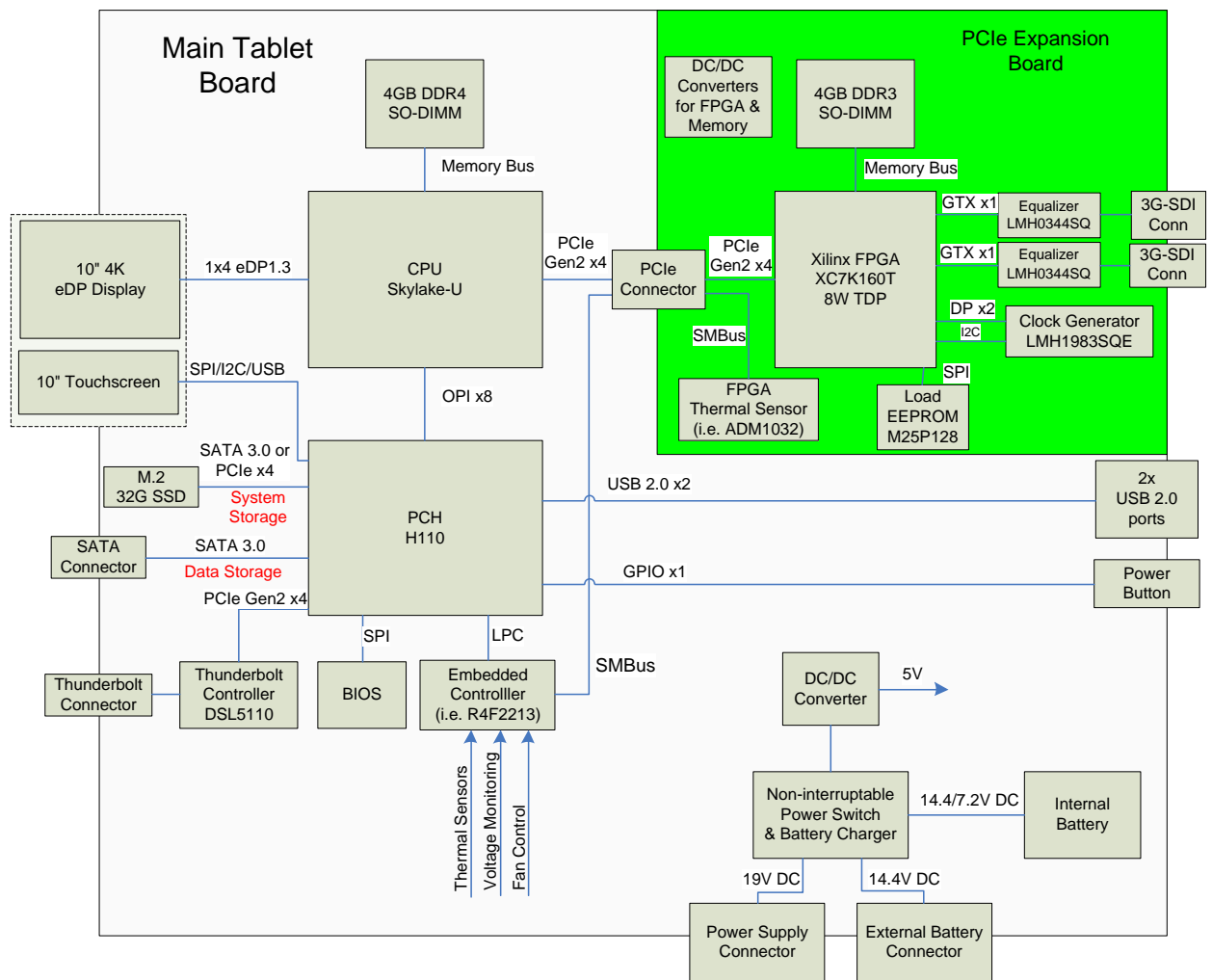
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1 Overview

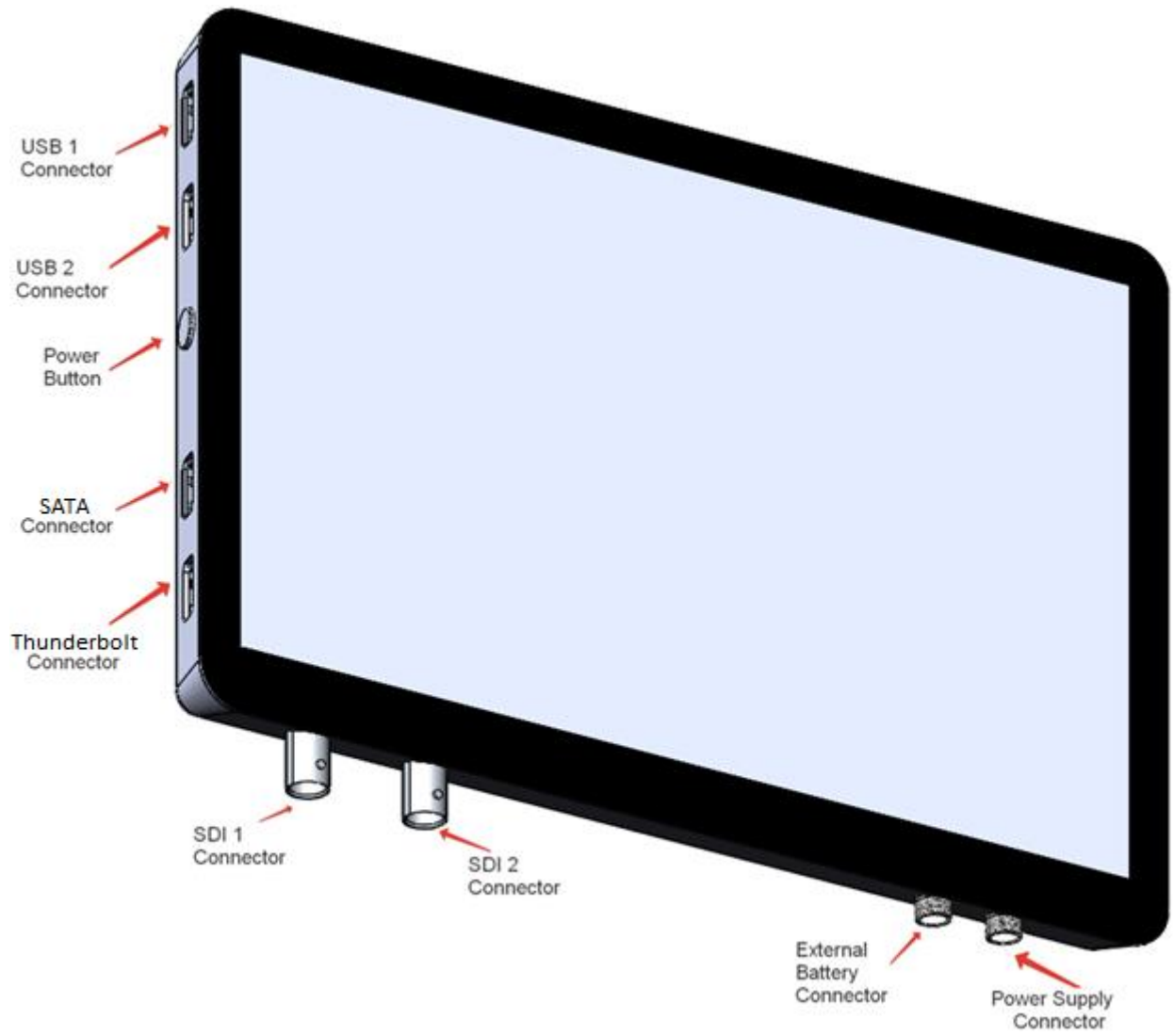
When video operators make scene shots, they need to have portable monitor (called ViewFinder) to control shot parameters, i.e. focal length, focus point, depth of field and so one. Devices that are already presented on the market usually have weak video processing power, low display resolution in accordance with high cost. The key objective is to provide flexible, cheap, intelligent and highly configurable device with true 4K 10" screen.

1.1 Block Diagram

The figure below illustrates the functional block diagram of the ViewFinder. Green area means that on EVT stage the design can be divided into two boards, connected via PCIe connector, if an ODM does not have enough experience to implement whole board at EVT stage.



1.2 Case



2 Detailed specifications

2.1 Electronics

2.1.1 Display

The ViewFinder uses 10" 4K display from JDI:



The display has following parameters:

Display mode	IPS
Screen size (diagonal)	10.07-inch (25.58cm)
Number of pixels	3840 (x RGB) x 2160 (4K2K)
Resolution density	438 ppi
Dimensions	231.6mm (W) x 140.9mm (H) x 2.35mm (D)
NTSC ratio	71%
Contrast ratio	1100:1 (Typ.)
Viewing angle	>160 degree (CR>100:1)
Surface luminance	400 cd/m ² (Typ.)

2.1.2 Touch Screen

The ViewFinder uses capacitive touchscreen with 10,1" active area. The touchscreen has 10 touchpoints, which can be used independently.

2.1.3 CPU

The ViewFinder should use one of Intel® CPUs: i7-6560U, i7-6650U, i7-6567U, i5-6287U, i5-6267U, i5-6360U, i5-6260U, i3-6167U. Lower power and lower price are preferable. Actual comparison information can be checked at Intel Web site:

<http://ark.intel.com/compare/91163,91497,91167,91164,91166,91156,91160,91154>

2.1.4 Memory

2.1.4.1 System Memory

The ViewFinder should use one of the following SO-DIMM 4G memory modules: DDR4-2133, LPDDR3-1866, DDR3L-1600. Lower power is preferable.

2.1.4.2 Video Memory

The ViewFinder should use SODIMM 4G DDR3-1600 module for video memory

2.1.5 Platform Controller Hub

The ViewFinder board uses the Intel platform controller hub (PCH), which supports the following features:

USB 2.0 ports connected with external USB connectors, for work with Human Interface Devices (HID) to control the device in engineer's mode

SATA port connected with external SATA connector, for storing captured video data to external SSD drive.

PCIe Gen1 port connected with internal mSATA connector, used for internal mSATA SSD 16Gb with operating system

SPI interface for connection with BIOS chip

LPC interface, for connection with Embedded Controller

SMBus interface, for connection with internal thermal sensors

2.1.6 BIOS

The ViewFinder will support flash BIOS located on the PCH SPI bus.

BIOS should support RAID0 feature.

2.1.7 Thunderbolt Controller

Intel DSL5110 should be used for implementation Thunderbolt 2.0 interface controller

2.1.8 Storage Subsystems

2.1.8.1 System Storage

System storage is used by default for load operating system after power is switched on. System storage is SSD with M.2 interface attached over Legacy SATA or PCIe –AHCI or PCIe-NVMe.

2.1.8.2 Data storage

Data storage is used for storage received video data.

If it is required to store 6G video stream (3840x2160 pixels, 60 fps), data storage subsystem uses Thunderbolt storage configured in RAID0, configured for 2 or 4 SATA 3.0 SSD disks, to store 6Gbps video stream real-time

If it is required to store 3G video stream (3840x2160 pixels, 30 fps), data storage subsystem can use either SATA 3.0 SSD disk (with sequential write speed more than 400 Mb/s) or Thunderbolt storage, mentioned above.

2.1.9 Hardware Monitoring

Embedded Controller should be used for board monitoring. The ODM should provide a system access interface and application for hardware monitoring sensors reading.

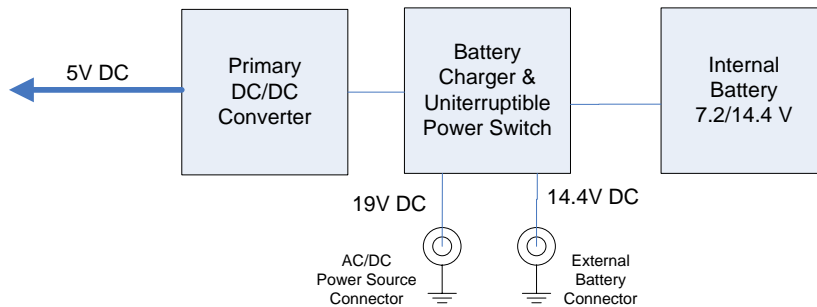
2.1.10 Thermal Sensors

Embedded Controller should perform reading of 5 internal and 5 external temperature sensors. Thermal sensors are listed in following table:

N	Component	Description	Interface	Mandatory
1	CPU	internal thermal sensor	I2C	Implemented
2	PCH	internal thermal sensor	I2C	Implemented
3	FPGA XC7K160T	internal thermal sensor	I2C	Implemented
4	DDR3 SO-DIMM	internal thermal sensor in SPD chip	I2C	Implemented
5	DDR4 SO-DIMM	internal thermal sensor in SPD chip	I2C	Implemented
6	PCH	external thermal sensor , placed near PCH	SMBus	Desired
7	FPGA XC7K160T	external thermal sensor, placed near FPGA	SMBus	Mandatory
8	DDR3 VRM	external thermal sensor, placed near power switch	SMBus	Desired
9	DDR4 VRM	external thermal sensor, placed near power switch	SMBus	Desired
10	CPU VRM	external thermal sensor, placed near power switch	SMBus	Desired

2.1.11 Power System

Power System Structure Diagram



2.1.11.1 Primary DC/DC Converter

Primary DC/DC converter is intended to convert any of three power sources, described below, in 5V DC voltage required to powering all other secondary DC converters. Output current of the primary DC/DC converter should be equal or exceed 10A. Fuse protection circuits on the inputs of each converter should be added.

Energy required for charging external battery is delivered from AC/DC Power Supply Unit directly and does not involve primary DC/DC converter, to isolate any affects from external battery charging to normal operation.

EMC Filter circuit on the inputs of the converters should be added for common-mode and differential mode noise suppression (TBD)

2.1.11.2 Power Sources

The ViewFinder (or Primary DC/DC Converter) can be powered from any of 3 power sources:

DC/DC Power Supply Unit

The nominal DC voltage delivered from DC power supply is 19 VDC, to work with most AC/DC power adapters for notebooks. The ViewFinder should accept and operate normally with an input voltage tolerance range between 12V and 24V (TBD).

External Battery

External battery is intended to work in environment when AC power for AC/DC converter is unavailable. External battery is Li-Ion battery. It should conform following requirements:

- 14,4V DC nominal voltage.
- Upper value of battery's power capacity is restricted up to 160Wh, to conform IATA rules to take sparse battery in carry baggage.
- Lower value can be any, provided that the battery should be able to power load up to 50W without overcurrent.

External battery example is GB-BP 160.

Internal Battery

Internal battery is intended to power ViewFinder in short period of time (3 min) while external batteries are interchanging, to provide uninterruptible work

Internal battery should conform following requirements:

- 7.2V DC nominal voltage
- Battery capacity can be any, provided that the battery should be able to power load up to 50W without overcurrent and at least 3 minutes.

2.1.11.3 Power sources switching

The ViewFinder should have possibility of power source switching without interruption of work.

Switching algorithm is: voltage monitor checks every 5 seconds (TBD) every power source for its voltage and select power source that has for most high voltage. Switching circuits should be fast enough to attach ViewFinder to new power source while ViewFinder is still powers from input capacitors in DC/DC converters.

Power sources switching circuits should contain voltage monitor circuits that prevent both external and internal batteries from over discharge.

2.1.11.4 VRM Voltage monitoring

External Hardware Monitor ICs should be used to measure onboard VRMs output voltage values. Embedded Controller should perform reading measured data from external Hardware Monitor ICs through I²C or SPI bus.

2.1.11.5 Battery charging

The ViewFinder should be able to provide 2A maximum current to charge external and/or internal battery.

Charging of Internal Battery is on when either AC/DC Power Supply or External Battery is attached, in order to be ready to power the ViewFinder when AC power is unavailable

2.1.11.6 ACPI Power States

The ViewFinder should be able to work in 2 power states:

1. G0 (S0), Working
2. G2 (S5), Soft Off

All other power modes (include S3) are not necessary, because the Viewfinder can be left on the shelf for months without any battery charging, unlike notebook and tablets.

2.1.11.7 Power connectors

Power connectors should conform to two requirements:

1. At least 5A continuous current for simultaneous powering ViewFinder (2,5A) and External Battery charging (2A)
2. Prevent to fall off connector plug from connector socket during operation

Connector example is RAPC10P from Switchcraft (but they are current redundant (11A) and expensive):

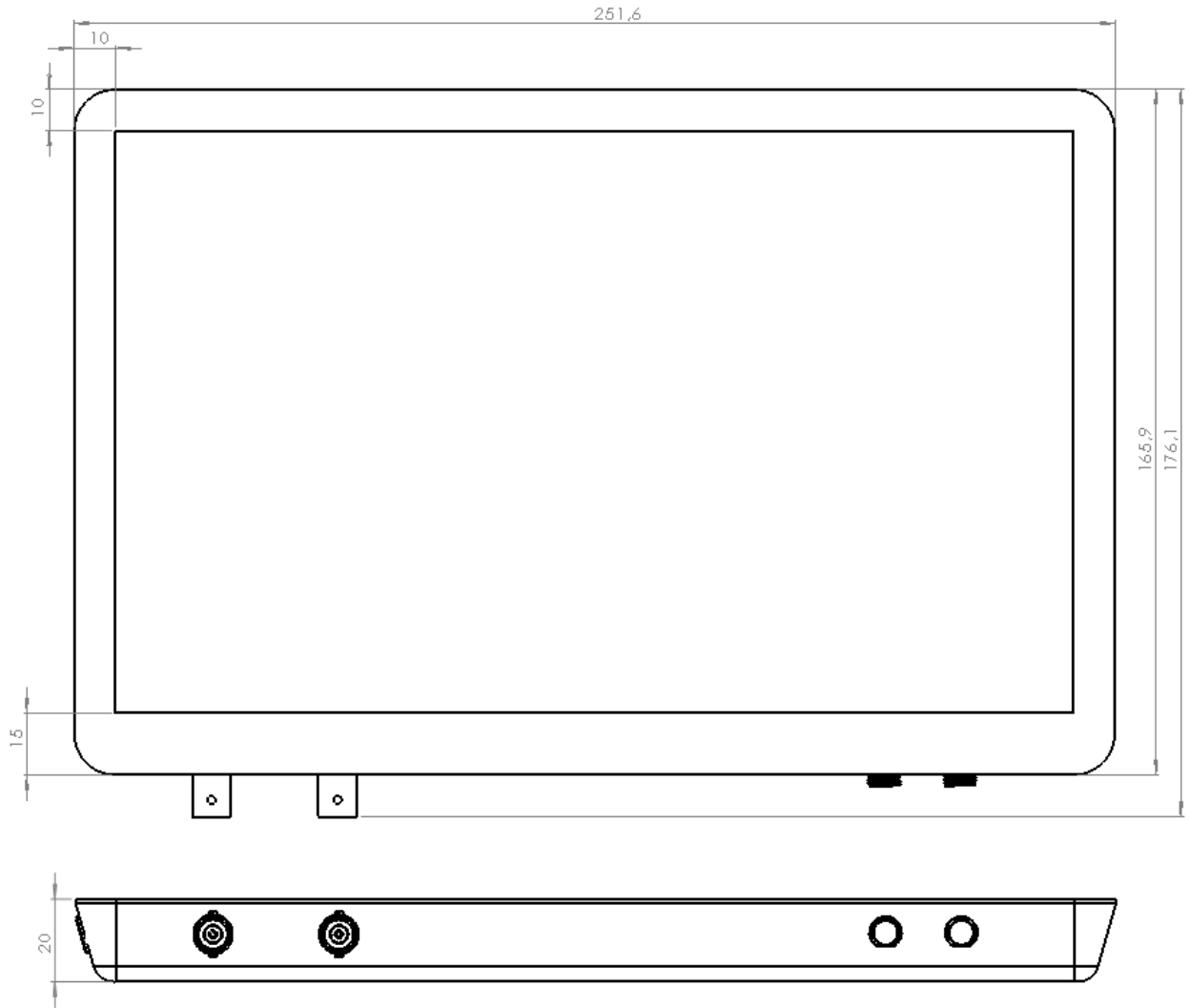


2.2 Software requirements

The operating system supported by ViewFinder is CentOS 4.1.9.

2.3 Placement and Form Factor

The ViewFinder has following dimensions (preliminary, should be confirmed when 3D model will be finished):



The placement below shows only relative position of connectors and switches on the device.

2.4 Operating conditions

Parameter	Value	
	Min	Max
Operating Temperature	10°C	30°C
Storage Temperature	0°C	80°C
Relative Humidity (non-condensing)	5%	85%
Operating Altitude	0m	3000m
Transportation/Storage Altitude		12000m

2.5 Regulatory and standards compliance

2.5.1 Regulatory compliance

ViewFinder should comply with CE Markings according to directives 2004/108/EC and 2006/108/EC.

2.5.1.1 Safety

- UL 60950-1
- CAN/CSA-C22.2 No. 60950-1
- EN 60950-1
- IEC 60950-1
- AS/NZS 60950-1
- GB4943
- EU RoHS

2.5.1.2 EMC emissions compliance

- 47CFR Part 15 (CFR 47) Class A
- AS/NZS CISPR22 Class A
- CISPR2 2 Class A
- EN55022 Class A
- ICES003 Class A
- VCCI Class A
- EN61000-3-2
- EN61000-3-3
- KN22 Class A
- CNS13438 Class A

2.5.1.3 EMC immunity

- EN50082-1
- EN61000-6-1
- EN55024
- CISPR24
- EN300386
- KN 61000-4 Series

3 Revision history

No	Description	Date
1.00	Initial draft	10.31.2015
1.01	Changed power subsystem requirements	11.06.2015
1.02	Added Thunderbolt interface	11.09.2015