



# CAMMASTER+

## CAMERA PROCESSOR REFERENCE DESIGN



**NVIDIA TEGRA X1 PROCESSOR  
+ XILINX ULTRASCALE FPGA**



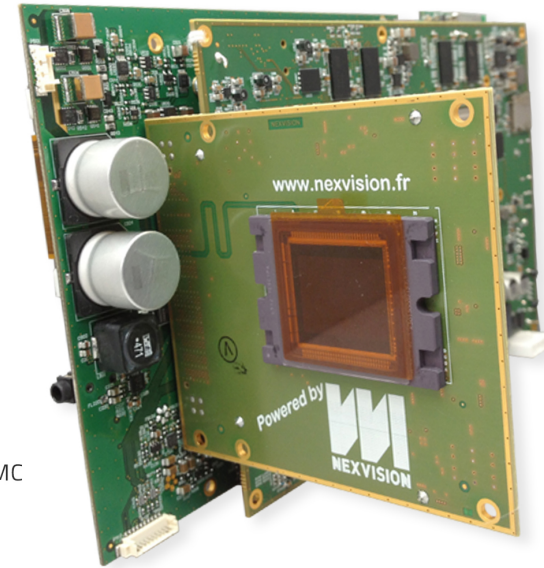
### OVERVIEW

Nexvision's CAMMASTER smart camera is a complete movie camera reference design  
Designed for **4.8 GigaPixel/s processing capability**  
On-board video analytics (Nvidia Tegra X1)  
Embedded Linux dedicated distribution



### HIGHLIGHTS

Multiple extra high resolution independent video inputs from 2 (Full-HD) to 20 (X-HD™) megapixels  
H265-HEVC codec : 4K 30fps  
On-board dedicated video enhancement image pipe (HDR, FPN, Noise reduction, EDoF), Nexvision's IP : PIXIP™  
GigaEthernet, USB2.0, USB3.0, SATA, CoaxPress, 6G-SDI, Audio, HDMI video output, PCIe, SPI, I2C, RS232, NVMe, HMC  
Video analysis framework (third party accessible)  
Onboard video recording and meta data storage : SSD NVMe (U.2), SD, SSD SATA (M.2)  
Onboard streaming server based on our NexStream™

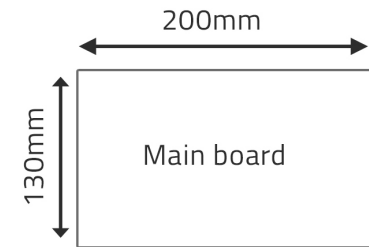


### FEATURES

Extra high resolution from 2 megapixels (Full-HD) to 20 megapixels (X-HD™)  
Full framerate, high quality video encoding  
On-board high-end FPGA with three DDR4 SDRAM banks, dedicated to video enhancement and advanced video processing (NexVision's IP : « PIXIP »)  
2x300 megapixels/s MSOC's video processing pipeline, two dedicated LPDDR4-SDRAM bank Codec (Tegra X1)  
H265-HEVC for minimal storage size and bandwidth : 600M pixel/s – Full HD 1080P (2 M pixels @ 60fps)  
Optional video codec : Motion-JPEG, MPEG4-part2, RGB444 , YUV422, RAW, Cinema DNG, VP9  
Image pre-processing (FPGA)  
Media processor image processing pipe  
Advanced 12-bit based color processing for high fidelity color reproduction (3D LUT)  
Temporal noise filtering and contrast enhancement  
Multiple exposure blending provides realtime HDR for high details retention in low and over exposed area  
Super resolution  
Multisensor capable  
Multispectral band image sensor fusion (Visible, Short Wave IR, Thermal IR)  
Multisensor panoramic or 360° immersive video realtime on board unwarp  
Audio/Video Streaming  
Live video streaming  
Low latency path for real time viewfinder  
Full Duplex Audio  
Open onboard video analysis, for example : Video analysis framework, third party accessible, with 100% dedicated GPU



### PHYSICAL DIMENSION



**MORE DETAILS**





## SYSTEM

MSOC : NVIDIA TEGRA X1 media processor  
 High multimedia computing power (256 GPU Cores, A53/A57 64 bit multi-core ARM CPU)  
 NAND FLASH : 512MBytes (up to 16GB)  
 Tegra X1 LPDDR4-SDRAM (up to 4GB)  
 FPGA : NexVision's IP video pre-processor front-end with 3 x 512MB dedicated DDR4-SDRAM banks Integrated hardware watchdog  
 Backed up Real Time Clock

## IMAGE SENSOR BOARD COMPATIBILITY

Video interface is compatible with any sensor ;  
 Progressive scan, color with 2, 5, 8, 11, 12, 17 or 20 megapixels (X-HD™)  
 High sensitivity up to 12V/Lux-sec, low read noise <2e-  
 Selectable video resolution and frame rate by image sensor daughter boards choose Up to 16 sensor boards, any combinations of Nexvision's board.

## SOFTWARE DEVELOPMENT

Embedded Linux own distribution based on Linux 3.10, U-boot bootloader Nexvision's multimedia framework  
 Multiple path video processing pipeline for simultaneous :  
 > Multiple resolution  
 > Multiple compression codec  
 > Third party accessible video analysis and painting  
 Embedded NVR (Network Video Recorder) concurrent recording & streaming :  
 > RTP/RTSP/RTCP Video Streaming onboard server is standard compliant  
 > It also support real time bandwidth adjustment (from 40K up to 25Mbit/s),  
 > Video stream encryption (128 bits AES) when used with NexStream™ technologies  
 > HTTP server (only for Motion JPEG streaming)  
 > DSP Integration with TI codec engine framework

## REMOTE MANAGEMENT

Compatible with any H265, H264, VP9 RTP/RTSP compliant client like VLC, NexRMC\*  
 Compatible with any MJPEG HTTP compliant client like VLC, NexRMC\*  
 NexRMC is our Remote Media Center software, from our video management system NexVMS  
 \*NexRMC is our top edge software supporting CAMMASTER's advanced features like X-HD™ resolution, sensors monitoring, firewall pass-through, innovative search in recorded video content, intuitive and user configurable interface Web-based management configuration and viewer.

## NETWORK

Gigabit Ethernet 10BaseT/100Base/1000base TX – RJ-45 connector  
 Wireless : WIFI (802.11ac/n/g)  
 Optional via USB 2.0 port : Zigbee™ for remote control / Bluetooth / 4G LTE

## STORAGE

4 x lane PCIe Gen3 (FPGA) : SSD (NVMe) – SFF-8639 expansion connector (U.2)  
 SATA link (Tegra X1) : SSD M.2 (USB compliant Storage : Flash Disk on USB Key (USB2.0))  
 EEPROM 128Kbits (FPGA) / EEPROM 128Kbits (Tegra X1)  
 2 Gbit SPI Flash (FPGA)

## SERIAL LINKS

UART (RX/TX) + I2C + SPI or GPIO – Expansion connector  
 UART (RX/TX/CTS/RTS) or I2C or 4 x GPIO – Board to Cable connection  
 RS232/JTAG for system debug on board connector (Jack 3.5mm for FTDI cable /20 pins)

## VIDEO INPUT/OUTPUT

RAW video interface on FPGA – 74 x LVDS Pairs – 320 pins connector  
 GENLOCK IN or OUT + Composite video output – MCX connector  
 1 x 3G-SDI IN or OUT by software – MCX connector  
 2 x CoaXPress CXP6 IN + 1 x CoaXPress CXP6 OUT by hardware assembly  
 > MCX connector (Power over Coax output with 12W@24V)  
 Linear Time Code (LTC) IN and OUT – Lemo5 connector  
 LCD display (with OpenGL) – HDMI 2 (with audio) – HDMI 19 pins connector  
 D1 PAL/NTSC composite analog output from FPGA – MCX connector  
 3 x 6G-SDI OUT (can be used as SD, HD, or 3G-SDI) – MCX connector  
 1 x 3G-SDI (IN/OUT)

## ENVIRONMENT SENSORS & ACTUATOR

Inertial sensors (3D accelerometer, 3D Gyroscope, 3D Magnetometer) on IO board  
 Pressure sensor on IO board  
 Temperature sensors on Main & IO board  
 GPS with integrated antenna  
 2 x piezo actuators (+100V) – Board to Cable connection on IO board

## GENERAL PURPOSE I/O

MIPI-DSI LCD display + Backlight controller on IO board  
 General purpose IO : Buttons + LED indicators + scroll wheel (I2C extender on IO board)  
 8 x general purpose button – 6 x display menu selection button – 1 x power ON/OFF button

## USB & PCIe

1 x USB3.0 Device (5Gb/s) for high speed video output – Micro AB connector  
 1 x USB2.0 Host or Device high speed (up to 480Mb/s) – Micro AB connector 5V@0.5A protected power outputs  
 1 x PCIe 4 x lanes – SFF- 8639 connector on extension board for NVME 500 connections  
 1 x USB2.0 – Type A USB connector on IO board typically for 4G-LTE link.

## AUDIO

Digital I/O : I2S link on TEGRA X1 & FPGA – Expansion connector  
 Digital Output : HDMI connector  
 Analog Output : Stereo headphone amplified – Jack 3.5mm IO board  
 Analog Inputs : Stereo balanced + switchable phantom 48V – Lemo5 connector IO board

## POWER SUPPLY

Input : 10-33VDC, 15W-50W – 3.96mm terminal block connector  
 Power voltage level and reset supervision  
 Super Cap or Battery charger (LiPo or Li-Ion – 6 cell) – Terminal block connector  
 Transient voltage suppressor and EMI common mode filters with resettable fuse  
 Output : 2 x 12v@5A buck mode – Lemo2 connector on IO board  
 2 x 24v@5A buck/boost mode + remote start (RS) – Fisher3 connector on IO board

## PHYSICAL DIMENSION - ENVIRONMENT

Main board : 200mm (L) x 130mm (l) x 40 (h)  
 Temperature : 0 to +50 °C (–40 °C to +85 °C optional)  
 Humidity : 10-90% non condensing