SSC9351D/SSC9351Q High-Integrated USB Camera SoC Processor

Preliminary Product Brief

CHIP OVERVIEW

The SSC9351D/SSC9351Q products are highly integrated multimedia System-on-Chip (SoC) products for high-resolution intelligent video recording applications like USB camera.

The chip includes a 32-bit Dual-core RISC processor, advanced Image Signal Processor (ISP), high performance MJPEG/H.264/H.265 video encoder, Deep Learning Accelerator (DLA), Intelligent Video Engine (IVE), as well as high speed I/O interfaces like MIPI.

Advanced low-power, low-voltage architecture and optimized design flow are implemented to fulfill long time usage applications. Hardwired AES/DES/3DES cipher engines are integrated to support secure boot, authentication, and video/audio stream encryption in security system.

The SSC9351D/SSC9351Q, powered by SigmaStar Technology, comes with a complete hardware platform and software SDK, allowing customers to speed up "Time-to-Market."

BLOCK DIAGRAM

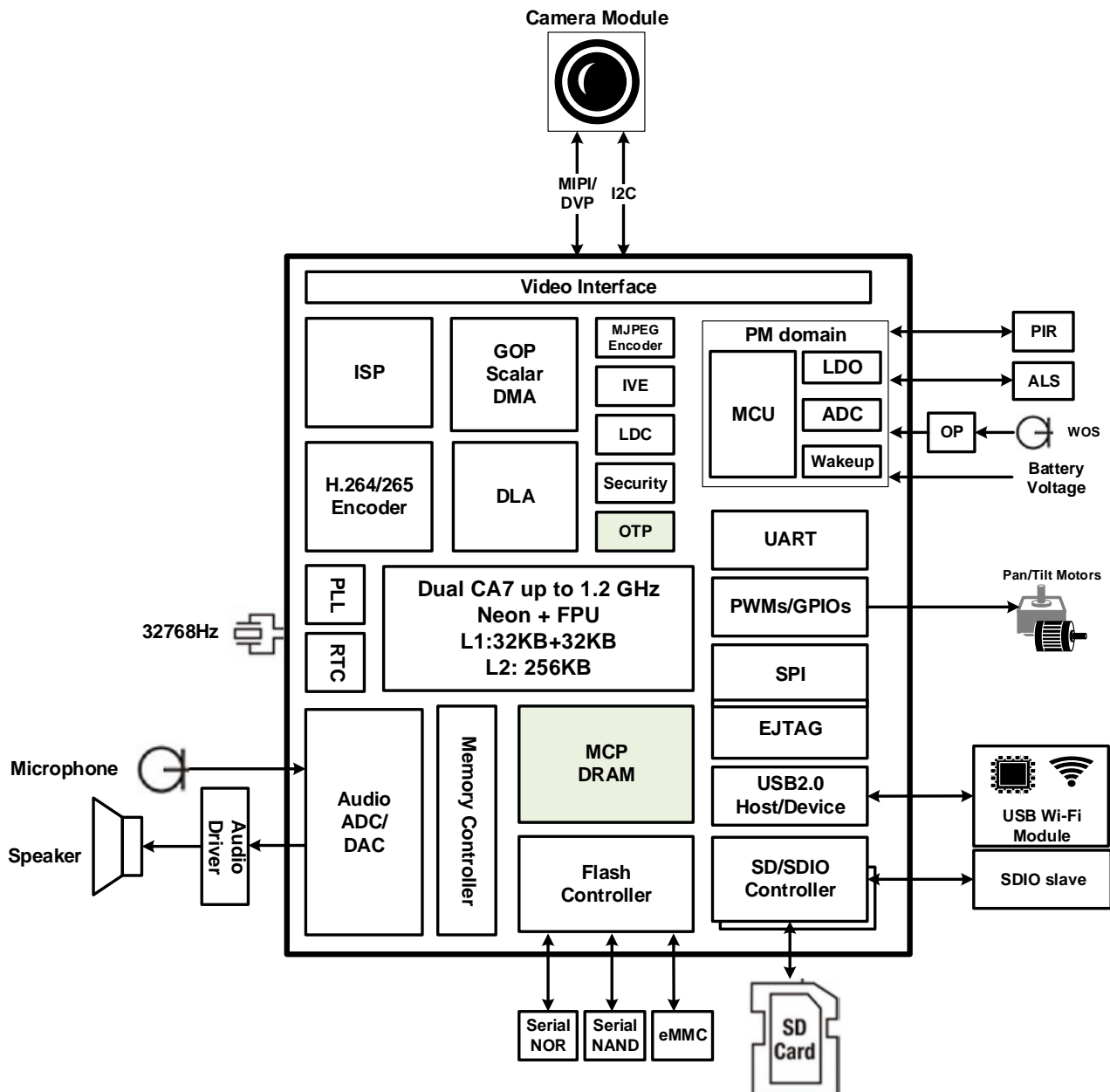Figure 1 shows the major functional blocks of SSC9351D/SSC9351Q series chip.

Figure 1: SSC9351D/SSC9351Q Block Diagram

FEATURES

■ High Performance Processor Core
- ARM Cortex-A7 Dual Core
- Clock rate up to 1.2GHz
- Neon and FPU
- Memory Management Unit for Linux support
- DMA Engine

■ Image/Video Processor
- Supports 8/10/12-bit parallel interface for raw data input
- Supports MIPI interface with 2/4 data lanes and 1 clock lane
- Supports one MIPI interface
- Supports sensor interface with both parallel and MIPI
- Supports 8/10-bit CCIR656 interface
- Supports max. 5M (2560x1920) pixels video recording and image snapshot
- Bad pixel compensation
- Temporal-domain Noise Reduction (3DNR)
- Bayer domain Spatial-domain Noise Reduction (2DNR)
- Bayer domain filter to remove purple false color in highlight regions
- Optical black correction
- Lens shading compensation
- Auto White Balance (AWB) / Auto Exposure (AE) / Auto Focus (AF)
- CFA color interpolation
- Color correction
- Gamma correction
- Video stabilization
- High Dynamic Range (HDR) with two exposure frames and de-ghost function
- Frame buffer data compression and de-compression to save memory bandwidth
- Wide Dynamic Range (WDR) with local tone mapping

- Flip, Mirror, and Rotation with 90 or 270 degree
- Lens distortion correction (LDC/FishEye)
- Rolling shutter compensation
- Fully programmable multi-function scaling engines

■ Advanced Color Engine
- Luma gain/offset adjustment
- Supports 2D peaking with user definition filter
- Horizontal noise masking
- Direct Luma Correction (DLC)
- Black/White Level Extension (BLE/WLE)
- IHC/ICC/IBC for chroma adjustment
- Histogram statistics
- Spatial domain IIR filter to reduce noise

■ H.265/HEVC
- Supports H.265/HEVC main profile
- Supported Prediction Unit (PU) size: 32x32, 16x16, 8x8
- Supported Transform Unit (TU) size: 32x32 to 4x4
- Search range [H: +/-128, V: +/-64]
- Supports up to quarter-pixel
- Supports frame level and MB level rate control
- Supports ROI encoding with custom QP map
- Supports max. 5M with 30 fps encoding

■ H.264 Encoder
- Supports H.264 baseline, constrained baseline, main, and high profile
- Supports 16x16, 8x8 and 4x4 block sizes
- Search range [H: +/-64, V: +/-32]
- Supports up to quarter-pixel
- Supports frame level and MB level rate control
- Supports ROI encoding with custom QP map
- Supports max. 5M with 30 fps encoding

■ JPEG Encoder
- Supports JPEG baseline encoding
- Supports YUV422 or YUV420 formats
- Supports max. 5M with 30 fps encoding
- Supports real-time mode and frame encode mode

■ Video Encoding Performance
- Supports 5M 30 fps H.265/HEVC encoding
- Supports 5M 30 fps H.264 encoding
- Supports MJPEG up to 5M 30 fps encoding

■ Deep Learning Accelerator (DLA)
- Pure hardwired accelerator
- Supports various video analysis functions like FD/FR, human detection, MD/OD, object tracking, etc.

■ Audio Processor
- One stereo ADC for microphone input
- 2-pin DMIC input
- One mono DAC for lineout
- Supports 8K/16K/32KHz/48KHz sampling rate audio recording
- Digital and analog gain adjustment
- I2S digital audio input and output with TDM up to 8-ch input and 2-ch output

■ NOR/NAND Flash Interface
- Compliant with standard, dual and quad SPI Flash memory components
- High speed clock/data rate up to 108MHz

■ SD Card/eMMC Interface
- Compatible with SD spec. 2.0, data bus 1/4 bit mode
- Supports eMMC 4.3 interface

■ SDIO 2.0 Interface
- Compatible with SDIO spec. 2.0, data bus 1/4 bit mode
- Compatible with SD spec. 2.0, data bus 1/4 bit mode

■ USB Interface
- One USB 2.0 configurable host or device
  – Host mode supports EHCI specification
  – Device mode supports up to 8 endpoints
- Supports suspend/hibernation/wake-up power saving mode

■ DRAM Memory
- Embedded 1Gb or 2Gb 16-bit DDR3 memory with max. 1866Mbps

■ Connectivity
- USB 2.0 Host Controller could be used for USB Wi-Fi Dongle or Module
- One SDIO 2.0 Host Controller could be used for SDIO Wi-Fi module
- Supports Wake-on-LAN (WOL)
- Supports BT.656 8-bit output with max. 75MHz clock rate (single clock edge)
- Supports BT.656 YUV422 format and progressive mode

■ Security Engines
- Supports AES/DES/3DES/RSA/SHA-I/SHA-256
- Supports secure booting

■ Real Time Clock (RTC)
- Built-in RTC working with 32.768 KHz crystal
- Alarm interrupt for wakeup
- Tick time interrupt (millisecond)
- Built-in regulator
- Supports low leakage RTC-mode for long battery application

■ Power Management Unit (PM)
- Built-in LDO to provide both 0.9V and 1.8V power sources
- Built-in RC FRO to generate clock source
- Supports multiple GPIOs for power control and RTC events
- Supports PIR (Passive Infrared Sensor) interface
- Supports ALS (Ambient Light Sensor) interface
- Supports WOS (Wake on Sound) function
- Supports 1.8V serial flash interface for MCP under low power application

- Peripherals
  - Dedicated GPIOs for system control
  - Supports max. 11 PWM outputs
  - Three generic UARTs and one fast UART with flow control
  - Three generic timers and one watchdog timer
  - Two SPI masters
  - Four I2C Masters
  - Built-in SAR ADC with 4-channel analog inputs for different kinds of applications
  - Supports internal temperature sensor

- Operating Voltage Range
  - Core: Typ. 0.9V
  - I/O: 1.8/3.3V
  - DRAM: 1.5V (DDR3) or 1.35V (DDR3L)
  - Power Consumption: TBD
- Package
  - QFN with 128 pins, 12.3mm x 12.3mm
  - Moisture Sensitivity Level: 3