

SSC359G

High Performance IP Camera System-on-Chip

Preliminary Product Brief Version 0.9

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1. FEATURES

■ High Performance Processor Core

- ARM Cortex-A53 Dual Core with max. clock rate 1.2GHz
- 32KB L1 I-cache and 32KB L1 D-cache
- 256KB L2 cache
- Neon and FPU
- Stand-alone voltage domain

■ Video Input Interface

- BT.601-like 12-bit parallel interface for Bayer or YUV422 data input, with data rate up to 150Mbps
- BT.656 8/10-bit parallel interface for YUV422 data input, with data rate up to 300Mbps (DDR mode)
- One set of BT.1120 16-bit parallel interface for YUV422 data input, with data rate up to 600Mbps (DDR mode)
- BT.1120 input can support SDR and DDR mode with 1-to-1 and 1-to-2 mode
- Two sets of MIPI RX interface, each block supporting 4-lane data x1 or 2-lane data x2
- MIPI CSI-2 ver. 1.1 and D-PHY ver. 1.1
- MIPI RX virtual channel 1 to 4
- MIPI RX data rate up to 1.5Gbps
- MIPI RX supports special data input like TOF, PDAF, and Gyro data
- Supports max. 4-CH HDR video input

■ Image Signal Processor

- Supports up to 13M (4208x3120) pixels video recording and image snapshot
- Bad pixel compensation
- Noise Reduction (NR)
- Optical black correction
- Lens shading compensation
- Auto White Balance (AWB) / Auto Exposure (AE) / Auto Focus (AF)
- CFA color interpolation
- Color correction
- Gamma correction

- Wide Dynamic Range (WDR)
- Rotation with 90 or 270 degrees
- Mirror and flip
- High Dynamic Range (HDR) with two exposure frames
- Lens distortion correction and Fisheye mode
- Fully programmable multi-function scaling engines
- Graphics overlap process with RGB or Index mode and private region block mode
- Multiple read/write DMAs for flexible image processing
- Dual channels for Bayer and YUV data process

■ H.265/HEVC Encoder

- Fully compatible with ISO/IEC 23008-2 High Efficiency video coding
- Main Profile, Level 5.0 encode
- Supports I-frame and P-frame
- 1/4-pixel precision motion vectors
- Deblocking filter and Sample Adaptive Offset (SAO)
- Picture/CTU/subCTU level rate control
- Region of Interest (ROI) encoding with custom QP map

■ H.264/AVC Encoder

- Compatible with the ITU-T Recommendation H.264 specification
- Baseline/Constrained Baseline/Main/High Profile, Level 5.1 encode
- 1/4-pixel precision motion vectors
- In-loop deblocking filter
- CABAC/CAVLC support
- Error resilience tools
- Frame level and MB level rate control
- Region of Interest (ROI) encoding with custom QP map

- **JPEG/MJPEG Encoder**
 - JPEG/MJPEG baseline encoding
 - YUV422 or YUV420 format
 - Max. 8192x8192 frame resolution
 - Supports real-time mode and frame encode mode
- **Video Encoding Performance**
 - 12M@25fps + D1@25fps H.265/H.264 encoding
 - 4K@30fps or 48M@2fps JPEG/MJPEG encoding
- **Intelligence Processing Unit (IPU)**
 - Clock rate 1.0GHz
 - Programmable 8/16-bit process
 - Supports RGB/YUV data format R/W DMA
 - Stand-alone voltage domain
- **Intelligent Video Engine (IVE)**
 - Supports 30 functions (CSC/Filter/Erode/Dilate/SAD/3x3/DOT, etc.) for video analysis
 - Max. resolution 1920x1080
 - Read/Write DMA
- **Audio Processor**
 - Two stereo ADCs with max. 4-CH single-ended or differential microphone inputs
 - One stereo DAC with max. 2-CH single-ended lineout
 - Supports 8K/16K/32KHz sampling rate audio recording
 - ADC and DAC SNR over 92dB
 - Digital and analog gain adjustment
 - One I2S interface with input max. 8-ch and output 2-ch TDM mode
 - I2S master or slave mode with 16- or 32-bit data and 8/16/32/48/96/192K sampling rate
 - Supports 4-CH DMIC (1 clock + 2 data)
 - I2S digital audio input
- **Video Output Interface**
 - Dual read DMAs and display channels
 - Picture quality enhancement (gamma, AWB, contrast, saturation, sharpness, brightness, 3x3 matrix)
 - Each display channel can output to MIPI/TTL
 - TTL/Parallel-RGB interface, 16/24-bit, 1280x720@60fps
 - Serial-RGB interface, 8/16-bit, 800x480@60fps
- **800x480@60fps**
 - i80 TFT LCD panel, 8/16/18-bit, 320x240@30fps
 - MIPI DSI TX, RGB 16/18/24-bit, 2560x1600@60fps
 - MIPI CSI TX, RGB/YUV, 3840x2160@30fps
 - MIPI TX virtual channel 1 to 4
 - MIPI TX data rate up to 1.5Gbps
 - BT.656/1120 interface, 8/16-bit, up to 1920x1080@60fps
 - BT.601-like/BT.656 output 8-bit progressive mode or BT.1120 16-bit progressive mode YUV format
 - NTSC/PAL interlace mode
 - Scale-down and write-back DMA
- **SPI NOR/NAND Flash Interface**
 - Compliant with standard, dual and quad SPI flash memory components
 - Max. 108MHz clock rate
- **SD/eMMC Interface**
 - SD card 2.0 x1 and SD card 3.0 (SDR104 or SDR50/DDR50) x1, data bus 1/4-bit mode
 - SDIO 2.0 (SDR25) x1 and SDIO 3.0 (SDR50) x1, data bus 1/4-bit mode
 - eMMC ver4.3 with 4/8 data bit and max. 50MHz clock rate
- **USB Interface**
 - USB2.0 port0 configurable Host or Device
 - Device mode supports 7 endpoints (3 for UVC and 3 for CDC)
 - USB2.0 port1 Host
 - Host mode supports EHCI specifications
- **DRAM Memory**
 - External 16-bit DDR3/DDR3L x2 or 32-bit LPDDR3 x1
 - Supports memory space up to 16Gb
 - Data rate up to 2133Mbps
- **Connectivity**
 - Built-in 10/100M Ethernet MAC and PHY x1
 - One SDIO 2.0 Host Controller

■ Security Engines

- Supports AES128/AES192/AES256/DES/3DES/RSA/SHA-I/SHA-256
- Supports secure booting
- FIPS 140-1 compliant random number generator
- Embedded OTP (One Time Programmable) memory to store secure and calibration data

■ Boot Options

- ROM (32KB)
- SPI NOR
- SPI NAND
- SD Card
- eMMC
- USB2.0 device mode

■ Peripherals

- Dedicated GPIOs for system control
- Supports up to 11 PWM outputs (shared with GPIOs)
- Up to four generic UARTs and one fast UART with flow control

- Three generic timers and one watchdog timer
- Up to three SPI masters
- Up to six I2C Masters
 - Supports 1to4 mode x1
 - Supports 1to2 mode x2
- Built-in 10-bit SAR ADC with 4-channel analog inputs for different kinds of application
- Supports IrDA
- Supports RTC with 32768Hz crystal I/F
- Supports POR (Power On Reset)
- Supports internal temperature sensor
- Supports ISP sensor clock 12MHz, 24MHz, 37.125MHz

■ Operating Voltage Range

- VDD: 0.92V~1.0V
- CPU VDD: 0.95V~1.02V
- IPU VDD: 0.95V~1.02V
- I/O: 1.8/3.3V
- DRAM: 1.5/1.35
- Power Consumption: TBD.

■ Package

- 439-ball BGA, 15mm x 15mm
- Moisture Sensitivity Level: 3

2. GENERAL DESCRIPTIONS

The SSC359G products are highly integrated multimedia System-on-Chip (SoC) products for high-resolution intelligent video recording and playback applications like Automotive and Action/Sports Camera.

The chip includes a 64-bit dual-core RISC processor, advanced Image Signal Processor (ISP), high performance H.265/H.264/MJPEG video encoder, Intelligence Processing Unit (IPU) as well as high speed I/O interfaces like USB, and Ethernet. These features in combination make the SSC359G an ideal solution that facilitates design and development of high-performance, high-picture-quality, and low-cost products.

The powerful SigmaStar proprietary ISP integrated in the SSC359G provides various WDR, advanced NR, and image enhancement and correction algorithms aimed to produce images of optimal quality. The programmable neural network inference engine and the IVE featured in the SSC359G allow customers to achieve a rich variety of intelligent applications with ease.

Implemented with the dual-core ARM Cortex-A53 CPU as well as an IPU, the SSC359G enables fast startup, real-time performance, and connections with various peripheral interfaces.

Efficient computing resources are available to help customers develop industry and consumer applications. 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 SSC359G, powered by SigmaStar Technology, comes with a complete hardware platform and software SDK, allowing customers to speed up "Time-to-Market."

3. BLOCK DIAGRAM

