

**SI-5100RGB MegaCamera™**  
**5.17 Megapixel, 10-Bit Digital**  
**USB 2.0 Smart Color Digital Camera**

**Silicon Imaging Inc.**



**Silicon Imaging** is proud to continue its innovation in high-resolution color vision camera. Driven by the growing demand for consumer Digital Still Cameras, CMOS sensors are continuing to break technical barriers and surpass the performance characteristics of CCD's in many photonic, imaging and consumer applications. By utilizing a single highly integrated CMOS device, which incorporates Megapixel sensing areas, timing generation, signal processing and high bandwidth outputs, Silicon Imaging has developed a very compact, low-power, ultra high speed Megapixel digital camera system.

**5.1 Megapixel - Ultra Resolution (2592 x 1944)**

The SI-5100 is an all-digital CMOS camera that delivers 5.1 Million pixels of resolution and is capable of running at 4 frames/second at its full 2592 x 1944 resolution. The entire package is only 45 x 52 x 50mm (33 x 40mm x 22mm in PCB) and is small enough to be placed on a robot for semiconductor machine vision inspection or placed in an outdoor housing for remote surveillance. It is ideal for live visualization of documents or films and scanning of biometrics for handprint or facial recognition.

**10-Bits Sampling – Sub-Pixel Accuracy**

The SI-5100 MegaCamera uses 10-Bit digitizers to sample the pixel data. Converting the pixel data directly to digital at the sensor head eliminates pixel-sampling jitter and enables accurate sub-pixel metrology, image analysis and improved live video reconstruction. A programmable clock which ranges from 7~25MHz allows for trade-offs in speed versus exposure time and lower noise.

**15FPS SXGA Zooming and Subsampling - Fast Preview**

Ideal for high-speed preview and focusing, the SI-5100 is capable of generating imagery at higher frame rate by reducing the size of the readout image. In subsampling Mode, the entire imager is readout by skipping pairs of pixels to maintain color information of neighboring bayer groups. In this way, the 1280x960 (15fps) or 640x480 (30fps) image accurately represents the full size 2560x1920 field of view. Zoom Mode delivers the same resolutions and increase of readout speed but in a cropped area of the sensor. These zoomed windows can be positioned anywhere within the sensors field of view.

**Automatic Color & Exposure Processing**

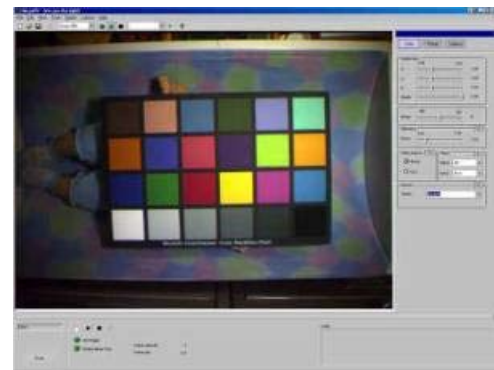
The SI-5100 has built in Automatic White Balance, Automatic Exposure and Automatic Gain Controls. As lighting conditions vary, the camera will automatically adjust the exposure and gain in combination to obtain an image with a target brightness range, on a frame-by-frame basis. It also analyzes the distribution of RGB values in the scene and adjusts individual channel gains to maintain white balance. For controlled lighting and inspection applications, gain and exposure values can be set manually via simple commands and software presets.

**USB2.0 Bus-Powered – 40MB/sec Transfers**

For low-cost and portable connectivity, with data transfer rates up to 40MB/sec, the SI-5100U provide convenient capture using the High-Speed 480Mb/sec USB 2.0 interface. It is a bus-powered unit, consuming less than 500mA at 5VDC and will operate without any external power supply. The precision-machined C-mount housing includes an integrated tethered USB cable and optional 3-pin trigger/strobe connection. For OEM board level configurations, two General Purpose Outputs are accessible; Pull-Up and pull-down driven transistors to be used to control light sources and switches.

**Microsoft-XP™ Live Mode Kernel Driver - Fast captures**

For applications which require a combination of high-resolution and streaming high-frame rate video images, Silicon Imaging has developed a custom driver which can request and capture double buffered images at the driver level. This method enables immediate request to camera for next image without user level software intervention. The double-buffers allow one image to be processed by the host PC, while another image is being readout from the camera and filled into the user allocated memory space.



**FEATURES**

- 2592 x 1944 Resolution (5.1 Million Pixels)
- 1/1.8" Imaging Format , 2.775um Square Pixel
- Rolling Shutter, Progressive scan
- 1280 x 960 SXGA Subsampling & Zooming at 15fps
- 10 Bits per Pixel, 60dB Dynamic Range
- 7 ~ 25MHz Programmable Clock
- Optical black level calibration
- Programmable Gain, Exposure & Clocks
- Auto Exposure and Gain Control (AEC/AGC)
- Auto White Balance Control (AWB)
- Color Bayer RGB Model
- 33 x 40mm x 22mm PCB Version
- USB Interface & Bus Powered
- C-Mount Precision Machined Housing
- Image Capture & Color Processing SDK

SI-5100 Data Sheet

SI-5100 Manual

**SI-5100 USB2.0 MegaCamera Specifications**

**Sensor:**

|                        |                          |
|------------------------|--------------------------|
| Optical Imaging Format | 1/1.8" (7.33mm x 5.44mm) |
| Active Pixels          | 2592H x 1944V            |
| Pixel Size (pitch)     | 2.775 µm x 2.775 µm      |
| Pixel Type             | CMOS                     |
| Aspect Ratio           | 1 : 1                    |
| Spectral Response      | 350 ~ 1100 nm            |

**USB2.0 High-Speed Interface & Control:**

|                      |  |
|----------------------|--|
| USB Speed            | 480Mb/sec (High-Speed)   |
| Serial Communication | Endpoint 0, Vendor Protocol  |
| Data Interface       | Endpoint 2, 2K FIFO  |
| Programmable Modes   | Exposure, Gain, Windowing, Zoom Mode & Window Subsampling, Clock rates |

|                     |  |
|---------------------|--|
| Readout Method      | Progressive Scan                                       |
| Black Level         | Auto Black Level Calibration                           |
| Shutter             | Rolling Shutter  |
| Shutter Speed       | Variable, 1 to 1998 row times                          |
| Windowing (ROI)     | Horizontal & Vertical, No Speed-up                     |
| Subsampling         | SXGA, VGA, HF Modes                                    |
| Subsampling & Zoom  | 1280 x 960 (SXGA)<br>640 x 480 (VGA)<br>320 x 200 (HF) |
| Dynamic range       | 60 dB (10-bit ADC Conversion)                          |
| Global Gain         | 1 to 8X, min step size 0.125                           |
| Red/Blue Gains      | 1/3-X to 3-X   |
| Horizontal Blanking | 408(QSXGA), 352(SXGA), 176(VGA)                        |
| Minimum Row Time    | 3000 Clocks (2592+ 408 Blanking)                       |
| Vertical Blanking   | 56 Rows  |
| Row/Frame Time      | 3000 clocks/row x 2000rows = 4fps                      |

### ADC & Digital Video Output

|                     |  |       |
|---------------------|--|-------|
| A/D Conversion      | Nominal 25Mhz (4fps @ 5.1MP)                           |       |
| Vertical Resolution | 10 Bit   |       |
| Readout Format      | 8-bit or 16bit (10-bit data)                           |       |
| Readout Rate        | 7 ~ 25Mhz ( 8-bit format)<br>7 ~ 20Mhz (16-bit format) |       |
| Max Transfer Rate   | ~ 40MB/sec (ICH4 or higher)                            |       |
| Max Frame Rate      | 25Mhz  | 15Mhz |
| 2592 x 1944         | 4  | 2.5   |
| 1280 x 960          | 15   | 9     |
| 640 x 480           | 30   | 20    |

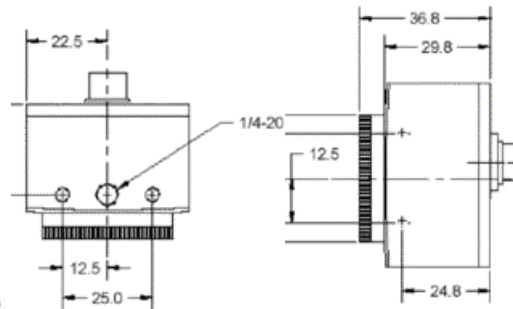
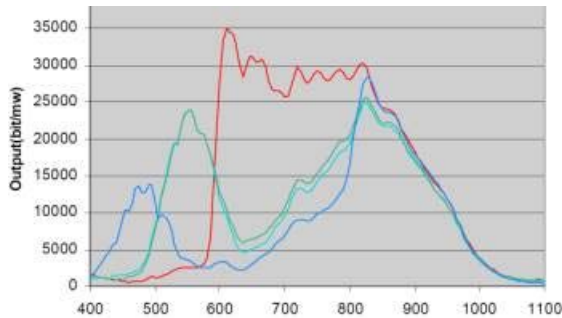
|                              |   |
|------------------------------|---|
| Region-of-Interest           | Programmable Horiz & Vertical                               |
| Auto Gain Controls (AGC)     | Manual / Automatic<br>Global & Red/Blue                     |
| Auto White Balance (AWB)     | Manual / Automatic<br>AWB Threshold, AWB Speed              |
| Auto Exposure Control (AEC)  | Manual / Automatic<br>AEC Target Min/Max<br>AEC Speed/Steps |
| Histogram Counters           | R/Gr/Gb/B Channel Average<br>Luminance Average              |
| Setting Timing               | Next top of Frame   |
| External Triggers (optional) | TTL Trigger-In / Strobe-Out<br>w/3-Pin connection (option)  |

### Power

|                          |                                 |
|--------------------------|---------------------------------|
| Input Voltage            | +5 VDC +/- 10% < 500mA          |
| Power Consumption        | 2.0 Watts                       |
| Trigger Connection (opt) | Tajimi RO3-PB3M 3Pin (optional) |
| Connection               | USB Bus Powered                 |

### Mechanical

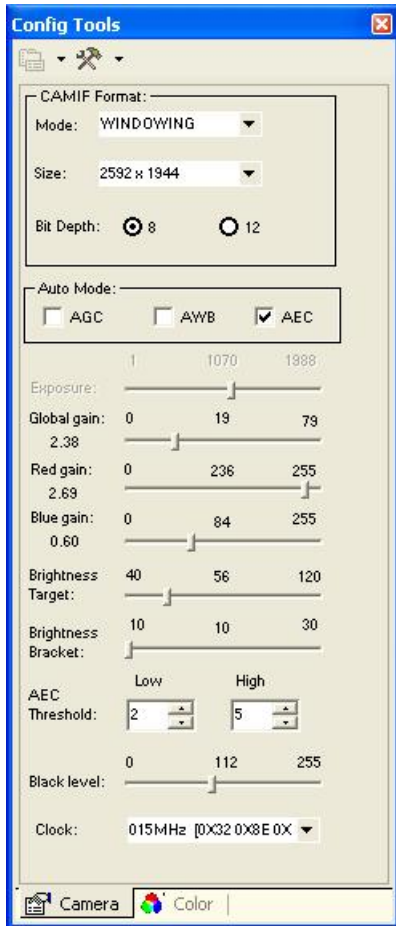
|                 |                               |
|-----------------|-------------------------------|
| Lens Mount      | C-Mount, 7mm Back focus Adj.  |
| Enclosure Size  | 45mm W x 52mm H x 50mm L      |
| Weight          | 8.5 oz. / 240g                |
| Camera Mount    | ¼" x 20 standard tripod mount |
| Cable Connector | USB-A Cable Integrated        |



|                     |   |
|---------------------|---|
| <b>SI-5100RGB-U</b> | 5.1 Megapixel USB2.0 Camera, RGB= Bayer Color   |
| <b>-PCB</b>         | PCB (33x40mm) Version of Camera. No housing included.                                       |
| <b>-T</b>           | External Trigger & strobe with 3-Pin Connection and Trigger/Strobe Breakout Cable           |
| <b>SDK</b>          | Software Development Kit (Microsoft .NETSample Code, IPP Color Processing API & USB Capture |

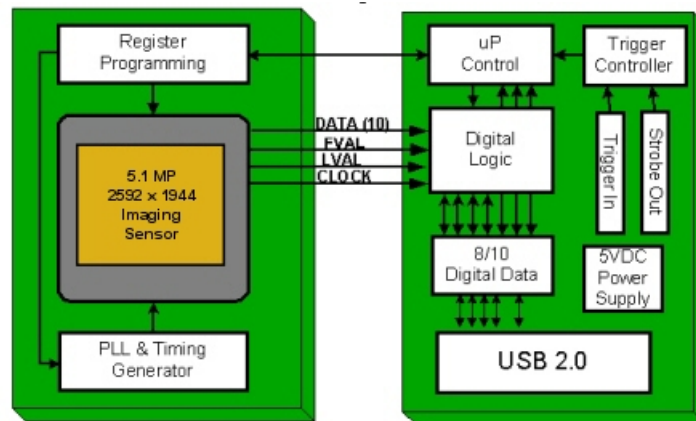
### SI-5100 Camera Control GUI

- Modes: Windowing, Subsampling, Zoom
- Image Capture: 2592 x 1944
- Sizes: QSXGA, XGA(1280x960), VGA (640x480)
- Bit Depth: 8 or 12 (10)
- Auto Modes: AEC, AWB, AGC
- Manual Controls:



Exposure  
Global Gain  
Blue/Red Gain

- Auto Exposure Controls (AEC):  
Brightness Target & Bracket  
Fast AEC Threshold: Low/high
- Black Level Offset
- Programmable Clock: 7~ 25MHz
- Auto Read-back of AEC/AGC/AWB Registers



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