IMX678-AAQR1
Diagonal 8.86 mm (Type 1/1.8) CMOS Solid-state Image Sensor with Square Pixel for Color Cameras

Description

The IMX678-AAQR/AAQR1 is a diagonal 8.86 mm (Type 1/1.8) CMOS active pixel type solid-state image sensor with a square pixel array and 8.40 M effective pixels. This chip operates with analog 3.3 V, digital 1.1 V, and interface 1.8 V triple power supply, and has low power consumption. High sensitivity, low dark current and no smear are achieved through the adoption of R, G and B primary color mosaic filters. This chip features an electronic shutter with variable charge-integration time.
(Applications: Security cameras)

Features

◆ CMOS active pixel type dots
◆ Built-in timing adjustment circuit, H/V driver and serial communication circuit
◆ Input frequency: 13.5MHz / 18MHz / 24MHz / 27MHz / 36MHz / 37.125 MHz / 72 MHz / 74.25 MHz
◆ Number of recommended recording pixels: 3840 (H) × 2160 (V) approx. 8.29M pixel
◆ Readout mode
  All-pixel scan mode
  Horizontal / Vertical 2/2-line binning mode
  Window cropping mode
  Horizontal / Vertical direction - Normal / Inverted readout mode
◆ Readout rate
  Maximum frame rate in All-pixel scan mode: 12 bit: 60 frame/s, 10 bit: 72 frame/s
◆ High dynamic range (HDR) function
  Digital overlap HDR
  Clear HDR
◆ Synchronizing sensors function
◆ Variable-speed shutter function (resolution 1H units)
◆ CDS / PGA function
  0 dB to 30 dB: Analog Gain 30 dB (step pitch 0.3 dB)
  30.3 dB to 72 dB: Analog Gain 30 dB + Digital Gain 0.3 dB to 42 dB (step pitch 0.3 dB)
◆ Supports I/O
  CSI-2 serial data output (2 Lane / 4 Lane / 8Lane / 4Lane × 2ch)
  RAW10 / RAW12 output
◆ Anti-reflective coating glass on both sides (IMX678-AAQR1)
  Non anti-reflective coating glass (IMX678-AAQR)

* STARVIS 2 and its logo are registered trademarks or trademarks of Sony Group Corporation or its affiliates. The STARVIS 2 is back-illuminated pixel technology used in CMOS image sensors for security camera applications. It features a sensitivity of 2000 mV or more per 1 μm² (color product, when imaging with a 706 cd/m² light source, F5.6 in 1 s accumulation equivalent). It also has a wide dynamic range (AD 12 bit) of more than 8 dB compared to STARVIS for the same pixel size in a single exposure, and achieves high picture quality in the visible-light and near infrared light regions.

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Device Structure

◆ CMOS image sensor
◆ Image size: Diagonal 8.86 mm (Type 1/1.8) approx. 8.40 M pixels, All pixels
◆ Total number of pixels: 3856 (H) × 2200 (V) approx. 8.48 M pixels
◆ Number of effective pixels: 3856 (H) × 2180 (V) approx. 8.40 M pixels
◆ Number of active pixels: 3856 (H) × 2176 (V) approx. 8.39 M pixels
◆ Number of recommended recording pixels: 3840 (H) × 2160 (V) approx. 8.29 M pixels
◆ Unit cell size: 2.0 μm (H) × 2.0 μm (V)
◆ Optical black: Horizontal (H) direction: Front 0 pixels, rear 0 pixels

Vertical (V) direction: Front 20 pixels, rear 0 pixels
◆ Package: 132 pin LGA

Image Sensor Characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity Typ.</td>
<td>14815 Digit/lx/s (IMX678-AAQR)</td>
<td>12 bit converted value</td>
</tr>
<tr>
<td></td>
<td>16309 Digit/lx/s (IMX678-AAQR1)</td>
<td></td>
</tr>
<tr>
<td>Saturation signal Min.</td>
<td>3895 Digit</td>
<td>12 bit converted value</td>
</tr>
</tbody>
</table>

Basic Drive Mode

<table>
<thead>
<tr>
<th>Drive mode</th>
<th>Recommended number of recording pixels</th>
<th>Maximum frame rate [frame/s]</th>
<th>Output interface</th>
<th>ADC [bit]</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-pixel</td>
<td>3840 (H) × 2160 (V) approx. 8.29 M pixels</td>
<td>72</td>
<td>CSI-2</td>
<td>10</td>
</tr>
<tr>
<td>Horizontal/Vertical 2/2-line binning</td>
<td>1920 (H) × 1080 (V) approx. 2.07 M pixels</td>
<td>72</td>
<td>CSI-2</td>
<td>10</td>
</tr>
</tbody>
</table>
Comparison Image under 0.2 lux

Gain setting of IMX334 is 4 times of IMX678, however they can get same output brightness.

<table>
<thead>
<tr>
<th>IMX334</th>
<th>IMX678-AAQR1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition: F1.6, exposure time 33.3 ms, gain 60 dB</td>
<td>Condition: F1.6, exposure time 33.3 ms, gain 48 dB</td>
</tr>
</tbody>
</table>

Comparison Image under NIR at 850 nm

<table>
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<th>IMX334</th>
<th>IMX678-AAQR1</th>
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<tbody>
<tr>
<td>Condition: F1.6, exposure time 33.3 ms, gain 0 dB</td>
<td>Condition: F1.6, exposure time 33.3 ms, gain 0 dB</td>
</tr>
</tbody>
</table>

Image Sensors for Security Cameras: https://www.sony.net/cis-security/