1/1.7-Inch 8 MP CMOS Digital Image Sensor

AR0821

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

Non−NDA Data Sheet

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Request Full Data Sheet

General Description

onsemi AR0821 is a 1/1.7−inch CMOS digital image sensor with a 3848 H x 2168 V active−pixel array. This advanced sensor captures images in either linear or high dynamic range, with rolling−shutter readout. AR0821 is optimized to deliver high−quality performance in both low−light and challenging lighting conditions. It is supported by a 2.1 μm Dual Conversion Gain Pixel Technology (DR−Pix™) BSI pixel from **onsemi** and embedded HDR (eHDR) technology that delivers greater than 140 dB. The sensor includes advanced functions such as in−pixel binning, windowing, and both video and single frame modes to provide flexible Region of Interest (ROI) or specific resolution providing enhanced performance in extreme low light conditions. The device is programmable through a simple two−wire serial interface, and supports MIPI output interface.

Table 1. KEY PARAMETERS

Parameter		Typical Value
Optical format		1/1.7 inch (9.25 mm)
Active pixels		3848 x 2168 = 8.3M
Pixel size		2.1 μm
Color filter array		RGB Bayer
CRA		18°
Shutter type		Electronic rolling shutter
Input clock range		6 – 50 MHz
Pixel Clock Range		150 ~ 156 MHz
Output	Serial	MIPI CSI−2 12−, 16−, 20−, or 24−bit
Frame rate	Full resolution	60FPS – Linear
Responsivity RGB (Green)		17.5 ke−/lux*sec
SNR_{MAX}		41 dB
Maximum dynamic range		≥140 dB (eHDR 4−exp)
Supply voltage	I/O	1.8 V
	Digital	1.2 V
	Analog	2.8 V
	MIPI	1.2 V
Power consumption (typical)		520 mW (Full Resolution, Linear 60FPS)
Operating temperature		(−30°C < T_J < +85°C)
Optimal Performance Temperature Range		(0°C < T_J < +60°C)
Package options		11 x 8 mm iBGA

Features

- 4K Resolution
- High Performance 2.1 μm Automotive Grade Backside Illuminated (BSI) Pixel with DR−Pix Technology from **onsemi**
- Advanced eHDR Reconstruct with Flexible Exposure Ratio Control
- Multiple HDR Modes: 3−exp eHDR, 4−exp eHDR and 2−exp line interleaved output (LI−HDR)
- Readout Modes: 2x2 Scaling, 2x2 Mono Summing for Linear/ 4−exp eHDR, 2x2 Binning
- Data Interface: 1.7 Gbps/Lane, 4−lane MIPI CSI−2
- Built−In Temperature Sensor
- Selectable Automatic or User Controlled Black Level Control
- Frame to Frame Switching Among up to Four Contexts to Enable Multi−Function Systems
- Multi−Camera Synchronization Support
- This is a Pb−Free Device

Applications

- AGV/AMR
- Machine Vision Cameras
- ID Document Readers
- Surveillance/Security Cameras
- Video Conferencing

Table 2. ORDERING INFORMATION

Part number	Description	Orderable Product Attribute Description	Package
AR0821CSSC18SMEA0−DPBR	RGB, 18°CRA	Dry Pack with Protective Film	iBGA
AR0821CSSC18SMEA0−DPBR1	RGB, 18°CRA	Dry Pack with Protective Film, Small MOQ	
AR0821CSSC18SMEA2−DPBR	RGB, 18°CRA	Dry Pack with Protective Film	
AR0821CSSC18SMEA0−DRBR	RGB, 18°CRA	Dry Pack without Protective Film	
AR0821CSSC18SMEA0−DRBR1	RGB, 18°CRA	Dry Pack without Protective Film, Small MOQ	
AR0821CSSC18SMEAH3−GEVB	RGB, 18°CRA	Demo3 Headboard	

Table 3. FRAME RATE FOR AR0821 MODES OF OPERATION

Mode	Resolution	# of Exposures	Bit Depth	Data Rate	Frame Rate (FPS)
Full Resolution, Linear	3840 x 2160	1	12	1.68 Gbps	60
Full Resolution, eHDR	3841 x 2160	3	12	1.25 Gbps	40
Full Resolution, eHDR	3842 x 2160	4	12	1.25 Gbps	30
Full Resolution, LI−HDR	3843 x 2160	2	10	1.56 Gbps	30
Mono−Summing, Linear	1920 x 1080	1	12	1.40 Mbps	190
Mono−Summing, eHDR	1920 x 1080	4	12	1.25 Gbps	60
Scaling, 2x2	1920 x 1080	1	12	1.68 Gbps	110
Binning, 2x2	1920 x 1080	1	12	1.40 Mbps	190

1. All frame rates listed are for MIPI 4−lane operation.
2. When MIPI bitrate is over 1.4 Gbps, every time when streaming Deskew Pattern needs to be enabled by setting R0x31C6 = 0x4000 (R0x31C6[14] =1) and R0x31C8 = 0x0CF0. Boost also needs to be enabled by setting 0x31DE[2] = 1.

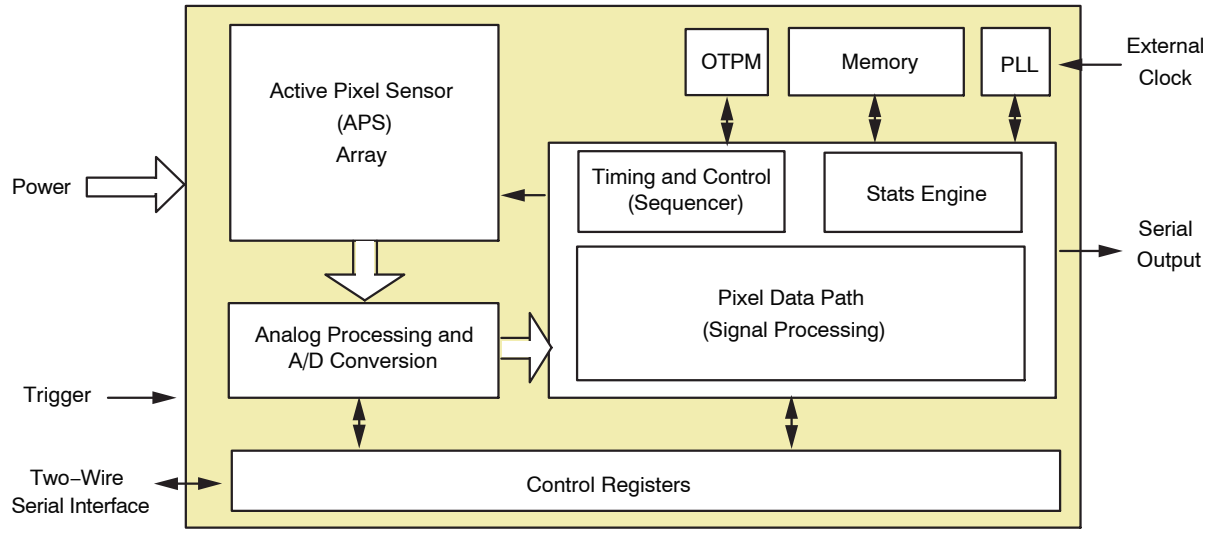
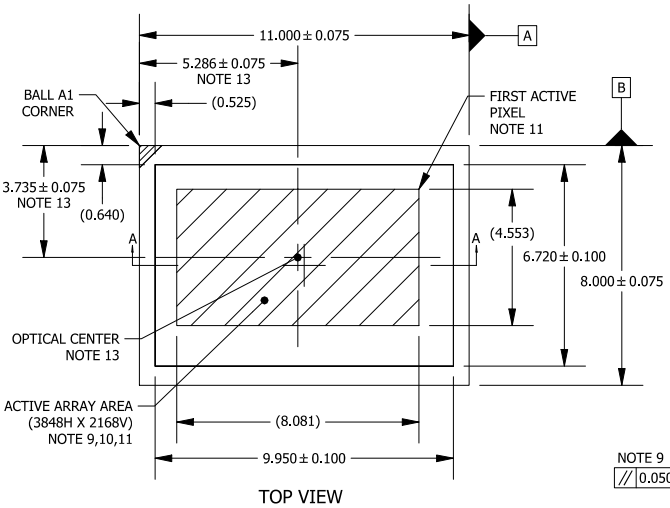


Figure 1. Block Diagram

IBGA95 11x8
CASE 503BW
ISSUE C

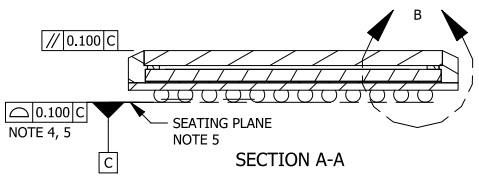
DATE 24 MAR 2021



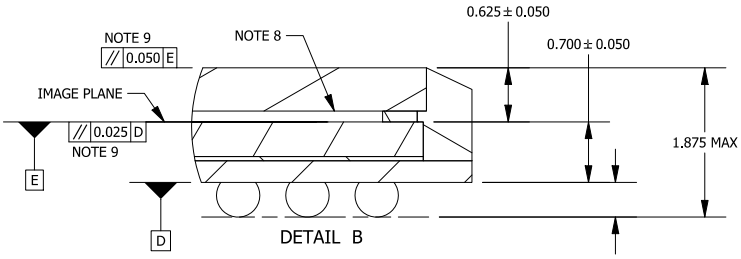
TOP VIEW

NOTES:

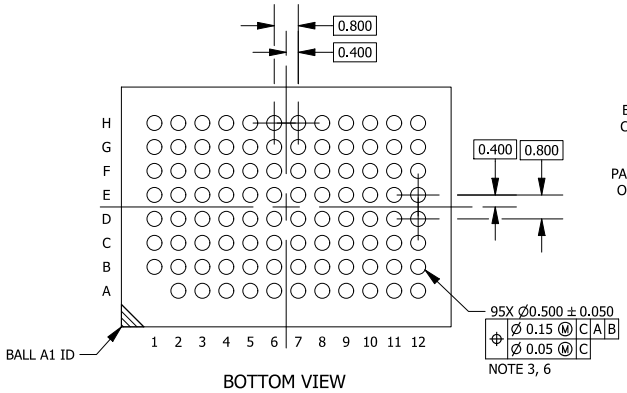
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS [mm].
3. SOLDER BALL DIAMETER IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER PARALLEL TO DATUM C.
4. COPLANARITY APPLIES TO THE SPHERICAL CROWNS OF THE SOLDER BALLS.
5. DATUM C, THE SEATING PLANE IS DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.
6. SOLDER BALL MATERIAL: SAC305 (96.5% Sn, 3% Ag, 0.5% Cu).
7. GLASS: 0.500 THICKNESS; REFRACTIVE INDEX = 1.52; AR COATING R<1% 420-850nm (EACH SIDE).
8. AIR GAP BETWEEN GLASS AND PIXEL ARRAY: 0.125 THICKNESS.
9. PARALLELISM APPLIES ONLY TO THE ACTIVE ARRAY.
10. MAXIMUM ROTATION OF ACTIVE ARRAY RELATIVE TO DATUMS A AND B IS ± 0.7°.
11. REFER TO THE DEVICE DATA SHEET FOR TOTAL PIXEL ARRAY DEFINITIONS.
12. PACKAGE CENTER (X, Y) = (0.000, 0.000).
13. OPTICAL CENTER RELATIVE TO PACKAGE CENTER (X, Y) = (-0.214, 0.265).



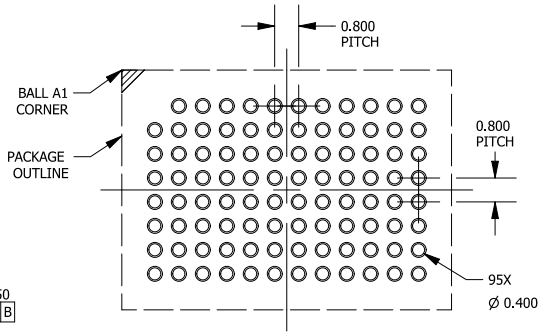
SECTION A-A



DETAIL B



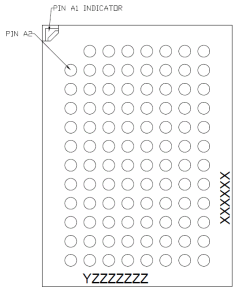
BOTTOM VIEW



RECOMMENDED MOUNTING FOOTPRINT*

*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
Y = Year
ZZZ = Lot Traceability

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	**IBGA95 11X8**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

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Technical Library: www.onsemi.com/design/resources/technical−documentation
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