

1/4.2-inch 5 MP CMOS Digital Image Sensor

AR0544

General Description

The **onsemi** AR0544 is a stacked 1/4.2–inch back side illuminated (BSI) CMOS active–pixel digital image sensor with a pixel array of 2592 x 1944 (2608H x 1960V including border pixels). The AR0544 has enhanced NIR response.

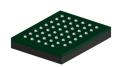
It incorporates sophisticated on-chip camera functions such as Wake on Motion (WOM), context switching and multiple subsampling modes. It is programmable through a simple I²C interface and has very low power consumption.

The AR0544 digital image sensor features **onsemi**'s breakthrough low-noise CMOS imaging technology.

The AR0544 sensor can generate full resolution image at up to 60 frames per second (fps) in 10-bit linear mode and 30 fps in line interleaved high dynamic range (LI-HDR) mode. AR0544 also supports enhanced Dynamic Range (eDR) mode.

Features

- 5 MP CMOS Sensor with Advanced 1.4 μm Pixel Stacked BSI Technology
- Enhanced NIR Response at 850 nm and 940 nm Wavelength
- LI-HDR: Supports Line Interleaved T1/T2 Readout to Enable HDR Processing in ISP Chip
- enhanced Dynamic Range (eDR)
- Super Low Power Mode
- Wake on Motion (WOM)/Motion Detection
- Subsampling Modes: Skipping, Binning, Summing
- Data Interfaces:
 - ◆ 2-lane MIPI D-PHY
- Bit-depth Compression Available for MIPI Interface
- Various Trigger Modes for Multi-sensor Synchronization
- Electronic Rolling Shutter (ERS) and Global Reset Release (GRR) Modes Supported
- 2360 bytes One–Time Programmable Memory (OTPM) for Storing Shading Correction Coefficients and Module Information
- Programmable Controls: Gain, Horizontal and Vertical Blanking, Frame Size/Rate, Exposure, Window Size
- On-chip Temperature Sensor
- Simple Two-wire Fast-mode+ Serial Interface
- On-chip Lens Shading Correction



ODCSP47 CASE 570DD

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

Non-NDA Data Sheet

Interested in what you see? If you would like more detailed information, please request the full version of our data sheet.

Request Full Data Sheet

Applications

- Videoconferencing Endpoints
- Webcams
- Machine Vision Cameras
- Video Doorbells
- Retail In-store Cameras, Bodycams, etc.
- 3D and Stereo Cameras

AR0544

Table 1. KEY PERFORMANCE PARAMETERS

Parameter		Value	
Optical format		1/4.2-inch 5 MP (4:3)	
Active pixels		2592 x 1944	
Pixel size		1.4 μm Back Side Illuminated (BSI)	
Chief ray angle (C	CRA)	11°	
Color Filter Array		RGB, Monochrome	
Input clock freque	ency	6-48 MHz	
Interface		2-lane MIPI using D-PHY @; Max data rate: 1.72 Gbps/lane	
ADC resolution		10-bits, on die	
Gain Control: Gain Table		Linear Mode: 0- 51.3 dB (Analog gain range: 0 ~ 27.3 dB, Digital gain range: 0 ~ 24 dB)	
Subsampling		Subsampling: Skipping (RGB, Mono), Binning (RGB), Summing (Mono)	
Temperature sens	sor	10-bit, controlled by two-wire serial I/F	
Frame Rate	Full Size, Linear Mode	60 fps	
Compression		DPCM: 10-8	
3D support		Frame rate and exposure synchronization	
Supply voltage	Analog, Pixel	2.8 V (2.7 V < V _{supply} < 2.9 V)	
	I/O	1.8 V (1.7 V < V _{supply} < 1.9 V)	
	PLL, MIPIphy	1.05 V (1 V < V _{supply} < 1.1 V)	
Power Consumpti	ion	158 mW at 5 MP 60 fps	
Responsivity		8.7 ke-/lux-sec (Green in RGB) 17.3 ke-/lux-sec (Clear in Mono)	
SNR _{MAX}		39.9 dB	
Dynamic Range		73 dB (eDR 1-exp) 100 dB (LI-HDR Mode)	
Operating Temperature Range (at junction) - T _J		-30°C to +85°C	
Optimal Performance Temperature Range (at junction) – T _J		0°C to +60°C	
Package Options:		CSP-47 (4.67 x 3.68) Bare Die	
θ_{JA}		46°C/W (Note 1)	
θ_{JB}		17°C/W	

^{1.} θJA is dependent on the customer module design and should not be used for calculating junction temperature.

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Table 2. 10-bit MODES OF OPERATION

Mode Name	Mode Description	Resolution	Frame Rate
Native	5 MP Linear Mode Full Resolution	2592 x 1944	60
LI Native	5 MP LI-HDR Mode	2592 x 1944	30
Crop	1080P Linear	1920 x 1080	110
SLP Native	5M Linear Mode Full Resolution, Lowest Power	2592 x 1944	1
Bin4	0.3 MP Linear, Lowest Power	648 x 486	1
WOM Bin4	Wake On Motion w/ Streaming	324 x 243	1

Table 3. 12-bit MODES OF OPERATION

Mode Name	lode Name Mode Description Resolution		Frame Rate
eDR Native	5M eDR Mode	2592 x 1944	30

Table 4. ORDERING INFORMATION

Part Number	Product Description	Orderable Product Attribute Description	
AR0544CSSC11SMKA1-CP	5 MP 1/4.2" CMOS Image sensor RGB 11° CRA	CSP with Protective Film	
AR0544CSSC11SMKA1-CP2	5 MP 1/4.2" CMOS Image sensor RGB 11° CRA	CSP with Protective Film Low MOQ	
AR0544CSSC11SMKA1-CR	5 MP 1/4.2" CMOS Image sensor RGB 11° CRA	CSP without Protective Film	
AR0544CSSC11SMKAH3-GEVB	5 MP 1/4.2" CMOS Image sensor RGB 11° CRA	Demo3 Headboard	

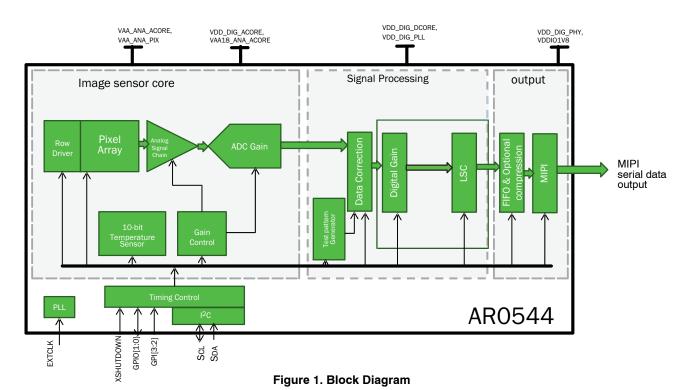
AR0544CSSM11SMKA1-CP	5 MP 1/4.2" CMOS Image sensor Mono 11° CRA	CSP with Protective Film
AR0544CSSM11SMKA1-CP2	5 MP 1/4.2" CMOS Image sensor Mono 11° CRA	CSP with Protective Film Low MOQ
AR0544CSSM11SMKA1-CR	5 MP 1/4.2" CMOS Image sensor Mono 11° CRA	CSP without Protective Film
AR0544CSSM11SMKAH3-GEVB	5 MP 1/4.2" CMOS Image sensor Mono 11° CRA	Demo3 Headboard

AR0544CSSC33SMKA1-CP	5 MP 1/4.2" CMOS Image sensor RGB 33° CRA	CSP with Protective Film
AR0544CSSC33SMKA1-CP2	5 MP 1/4.2" CMOS Image sensor RGB 33° CRA	CSP with Protective Film Low MOQ
AR0544CSSC33SMKA1-CR	5 MP 1/4.2" CMOS Image sensor RGB 33° CRA	CSP without Protective Film
AR0544CSSC33SMKAH3-GEVB	5 MP 1/4.2" CMOS Image sensor RGB 33° CRA	Demo3 Headboard

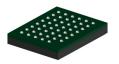
AR0544CSSH11SMKA1-CP	5 MP 1/4.2" CMOS Image sensor RGBIR 11° CRA	CSP with Protective Film
AR0544CSSH11SMKA1-CP2	5 MP 1/4.2" CMOS Image sensor RGBIR 11° CRA	CSP with Protective Film Low MOQ
AR0544CSSH11SMKA1-CR	5 MP 1/4.2" CMOS Image sensor RGBIR 11° CRA	CSP without Protective Film
AR0544CSSH11SMKAH3-GEVB	5 MP 1/4.2" CMOS Image sensor RGBIR 11° CRA	Demo Headboard

^{2.} Refer to AR0544 Die Data Sheet for Die Part Numbers & Ordering Information.

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ODCSP47 4.67x3.68x0.63, 0.50P CASE 570DD **ISSUE 0**

DATE 04 JAN 2024

NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
- CONTROLLING DIMENSION: MILLIMETERS [mm].
- SOLDER BALL DIAMETER IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER PARALLEL TO DATUM C.
- COPLANARITY APPLIES TO THE SPHERICAL CROWNS OF THE SOLDER BALLS.
- DATUM C, THE SEATING PLANE IS DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS

- SILIDER BALLS.
 GLASS: 0.400 THICKNESS; REFRACTIVE INDEX = 1.52.

 AIR GAP BETWEEN GLASS AND PIXEL ARRAY: 0.040 THICKNESS.

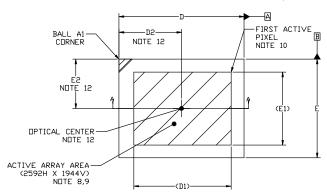
 PARALLELISM APPLIES ONLY TO THE ACTIVE ARRAY.

 MAXIMUM ROTATION OF ACTIVE ARRAY RELATIVE TO DATUMS A AND B IS ±0.1°.

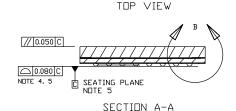
 REFER TO THE DEVICE DATA SHEET FOR TOTAL PIXEL ARRAY DEFINITIONS.

 PACKAGE CENTER (X, Y) = (0.000, 0.000).

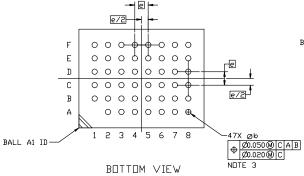
- 12. OPTICAL CENTER RELATIVE TO PACKAGE CENTER (X, Y) = (0.034, -0.005).

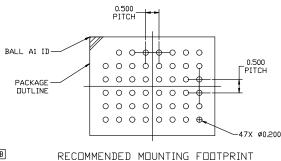


MILLIMETERS				
DIM	MIN	NDM	MAX	
Α			0.762	
A1	0.081	0.101	0.121	
A2	0.606	0,631	0.656	
АЗ	0.426	0.440	0.454	
Α4	0.180	0.191	0.202	
b	0.184	0.204	0.224	
D	4.645	4.670	4.695	
D1	3.629 (REF)			
D2	2.344	2.369	2.394	
Ε	3.657	3.682	3.707	
E1	2.722 (REF)			
E2	1.821	1.846	1.871	
е	0.500 BSC			



NOTE 7 NULL 8 IMAGE PLANE // 0.002 E // 0.002 D 由 DETAIL B





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