onsemi

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.

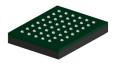
It incorporates sophisticated on-chip camera functions such as Wake on Motion (WOM), context switching and multiple subsampling modes. It is programmable through a simple I²C interface and has very low power consumption.

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

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	(CRA)	11°, 33°	
Color Filter Array		RGB, Monochrome, RGBIR	
Input Clock Frequ	iency	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: Gai	n Table	Linear Mode: 0-50.62 dB (Analog gain range: 0 ~ 27.37 dB, Digital gain range: 0 ~ 23.25 dB)	
Subsampling		Subsampling: Skipping (RGB, Mono), Binning (RGB), Summing (Mono)	
Temperature Sen	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 Consumpt	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) – TJ		-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. θ JA is dependent on the customer module design and should not be used for calculating junction temperature.



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	648 x 486	1
WoM Bin4Skip2 (Note 2)	Wake On Motion without Streaming 324 x 243		1

2. Sensor resolution is actually 648 x 486. GB columns are skipped which helps reduce power consumption. The stream output of the sensor cannot be used in this mode.

Table 3. 12-bit MODES OF OPERATION

Mode 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

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

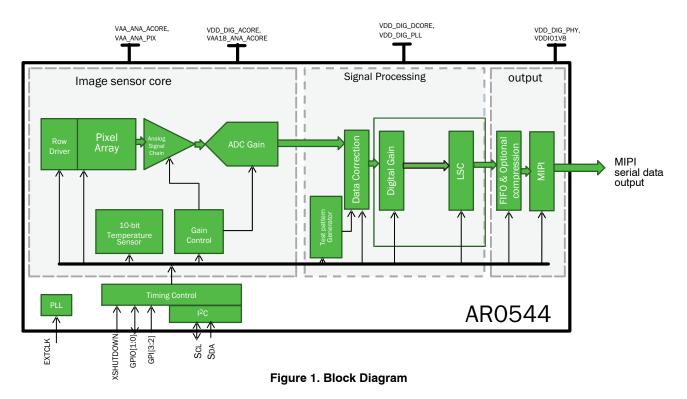
AR0544CSSC33SMKA1-CP	5 MP 1/4.2" CMOS Image sensor RGB 33° CRA	CSP with Protective Film
AR0544CSSC33SMKA1-CP2	5 MP 1/4.2" CMOS Image sensor RGB 33° CRA	CSP with Protective Film Low MOQ
AR0544CSSC33SMKA1-CR	5 MP 1/4.2" CMOS Image sensor RGB 33° CRA	CSP without Protective Film
AR0544CSSC33SMKAH3-GEVB	5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

AR0544CSSH33SMKA1-CP 5 MP 1/4.2" CMOS Image sensor RGBIR 33° CRA		CSP with Protective Film
AR0544CSSH33SMKA1-CP2	5 MP 1/4.2" CMOS Image sensor RGBIR 33° CRA	CSP with Protective Film Low MOQ
AR0544CSSH33SMKA1-CR	5 MP 1/4.2" CMOS Image sensor RGBIR 33° CRA	CSP without Protective Film
AR0544CSSH33SMKAH3-GEVB	5 MP 1/4.2" CMOS Image sensor RGBIR 33° CRA	Demo Headboard

3. Refer to AR0544 Die Data Sheet for Die Part Numbers & Ordering Information.



AR0544









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

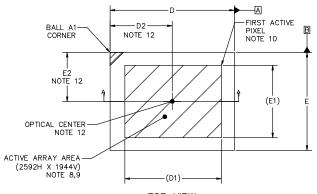
DATE 05 JUN 2025

NOTES:

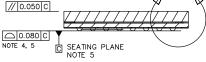
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018. 1.
- 2
- CONTROLLING DIMENSION: MILLIMETERS [mm]. SOLDER BALL DIAMETER IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER 3.
- PARALLEL TO DATUM C. COPLANARITY APPLIES TO THE SPHERICAL CROWNS OF THE SOLDER BALLS. DATUM C, THE SEATING PLANE IS DEFINED BY THE SPHERICAL CROWNS OF THE 4. 5. SOLDER BALLS.

- SOLDER 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.

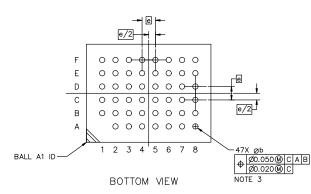
- 11. PACKAGE CENTER (X, Y) = (0.000, 0.000). 12. OPTICAL CENTER RELATIVE TO PACKAGE CENTER (X, Y) = (0.034, -0.005).
- 13. PLAIN COVER GLASS WITHOUT AR COATING.



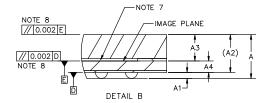


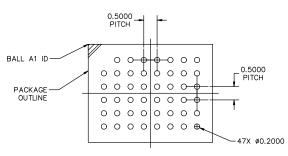






MILLIMETERS			
DIM	MIN	NOM	MAX
А			0.762
A1	0.081	0.101	0.121
A2		0.631 REF	
A3	0.426	0.440	0.454
A4	0.180	0.191	0.202
b	0.184	0.204	0.224
D	4.645	4.670	4.695
D1	3.629 REF		
D2	2.344	2.369	2.394
E	3.657	3.682	3.707
E1	2.722 REF		
E2	1.821	1.846	1.871
e	0.500 BSC		





RECOMMENDED MOUNTING FOOTPRINT * For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

DOCUMENT NUMBER:	98AON60539H Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	ODCSP47 4.67x3.68x0.63, 0.50P		PAGE 1 OF 1

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, ONSEMI, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi's product/patent coverage may be accessed at <u>www.onsemi.com/site/pdf/Patent_Marking.pdf</u>. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or indental damages. Buyer is responsible for its products and applications using onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by onsemi. "Typical" parameters which may be provided in onsemi data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification. Buyer shall indemnify and hold onsemi and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs,

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

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

ONLINE SUPPORT: <u>www.onsemi.com/support</u> For additional information, please contact your local Sales Representative at <u>www.onsemi.com/support/sales</u>