1/4.5-Inch, 1.6Mp CMOS Digital Image Sensor Die

MT9M012

For the product data sheet, refer to Aptina's Web site: www.Aptina.com

Features

- DigitalClarity® CMOS imaging technology
- High frame rate (1280H x 720V/50 fps)
- Superior low-light performance
- Low dark current
- Global reset release (GRR) for simultaneous exposure of all rows
- Simple two-wire serial interface
- Programmable controls: gain, frame rate, frame size, exposure
- Horizontal and vertical mirror image
- Automatic black level calibration
- On-die phase-locked loop (PLL) oscillator
- Bulb exposure mode for arbitrary exposure times
- Snapshot mode to take frames on demand
- Parallel data output
- Electronic rolling shutter (ERS), progressive scan
- Arbitrary image decimation with anti-aliasing
- Programmable power-down mode (mode A or mode B)
- Xenon and LED flash support with fast exposure adaptation
- Flexible support for external auto focus, optical zoom, and mechanical shutter

General Physical Specifications

- Die thickness: 200µm ±12µm
  (Consult factory for other thickness)
- Backside wafer surface of bare silicon
- Typical metal 1 thickness: 3.1kÅ
- Typical metal 2 thickness: 3.1kÅ
- Typical metal 3 thickness: 6.1kÅ
- Metallization composition: 99.5 percent Al and 0.5 percent Cu over Ti
- Typical topside passivation: 2.2kÅ nitride over 6.0kÅ of undoped oxide
- Passivation openings (MIN): 75µm x 90µm

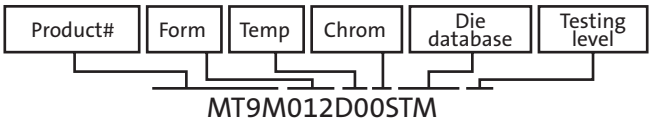
Order Information

MT9M012D00STM

Die Database

- Die outline, see Figure 2 on page 11
- Singulated die size
  – 6,748µm ±25µm x 6,351µm ±25µm
- Bond Pad Identification Tables, see pages 5–10

Options	Designator
• Form	
– Die	D
• Testing	
– Standard (level 1) probe	C1



Notes: 1. Consult die distributor or factory before ordering to verify long-term availability of these die products.

Key Performance Parameters

- Optical format: 1/4.5-inch (4:3)
- Active imager size: 3.24mm(H) x 2.41mm(V), 4.04mm diagonal
- Active pixels: 1472H x 1096V
- Pixel size: 2.2µm x 2.2µm
- Color filter array: monochrome
- Shutter type
  – Global reset release (GRR), snapshot only
  – Electronic rolling shutter (ERS)
- Maximum data rate: 82 Mp/s
- Master clock: 41 MHz
- Frame rate
  – 1440H x 1080V, programmable up to 30 fps
  – 1280H x 720V, programmable up to 50 fps
- ADC resolution: 12-bit, on-die
- Responsivity: 1.4 V/lux-sec (550nm)
- Dynamic range: 70.1dB
- SNR MAX: 38.1dB

Key Performance Parameters (continued)

- Supply voltage
  - Digital: 1.7–1.9V
  - I/O: 2.6–3.1V
  - PLL: 2.6–3.1V
  - Analog: 2.6–3.1V
- Power consumption: 364.6mW at 2.8V (parallel)
- Operating temperature: –30°C to +70°C

General Description

The Aptina™ MT9M012 is a 1/4.5-inch format CMOS active-pixel digital image sensor die with a pixel array of 1472H x 1096V. The default active imaging array size is 1440H x 1080V. It incorporates sophisticated on-die camera functions such as windowing, mirroring, and snapshot mode. It is programmable through a simple two-wire serial interface and has very low power consumption.

The MT9M012 digital image sensor die features DigitalClarity—the breakthrough low-noise CMOS imaging technology that achieves near-CCD image quality (based on signal-to-noise ratio and low-light sensitivity) while maintaining the inherent size, cost, and integration advantages of CMOS.

Die Testing Procedures

Aptina imager die products are tested with a standard probe (C1) test level. Wafer probe is performed at an elevated temperature to ensure product functionality in Aptina's standard package. Because the package environment is not within Aptina's control, the user must determine the necessary heat sink requirements to ensure that the die junction temperature remains within specified limits.

Image quality is verified through various imaging tests. The probe functional test flow provides test coverage for the on-die ADC, logic, serial interface bus, and pixel array. Test conditions, margins, limits, and test sequence are determined by individual product yields and reliability data.

Aptina retains a wafer map of each wafer as part of the probe records, along with a lot summary of wafer yields for each lot probed. Aptina reserves the right to change the probe program at any time to improve the reliability, packaged device yield, or performance of the product.

Die users may experience differences in performance relative to Aptina's data sheets. This is due to differences in package capacitance, inductance, resistance, and trace length.

Functional Specifications

These specifications are provided for reference only. For target functional and parametric specifications, refer to the product data sheet found on Aptina's Web site.

Bonding Instructions

The MT9M012 imager die has 124 bond pads. Refer to Table 1 and Table 2 on pages 5–10 for a complete list of bond pads and coordinates.

The MT9M012 imager die does not require the user to determine bond option features.

The die also has several pads defined as "do not use." These pads are reserved for engineering purposes and should not be used. Bonding these pads could result in a nonfunctional die.

Figure 1 on page 4 shows the MT9M012 typical die connections. For low-noise operation, the MT9M012 die requires separate supplies for analog and digital power. Power supply rails should be decoupled to ground using capacitors. The use of inductance filters is not recommended.

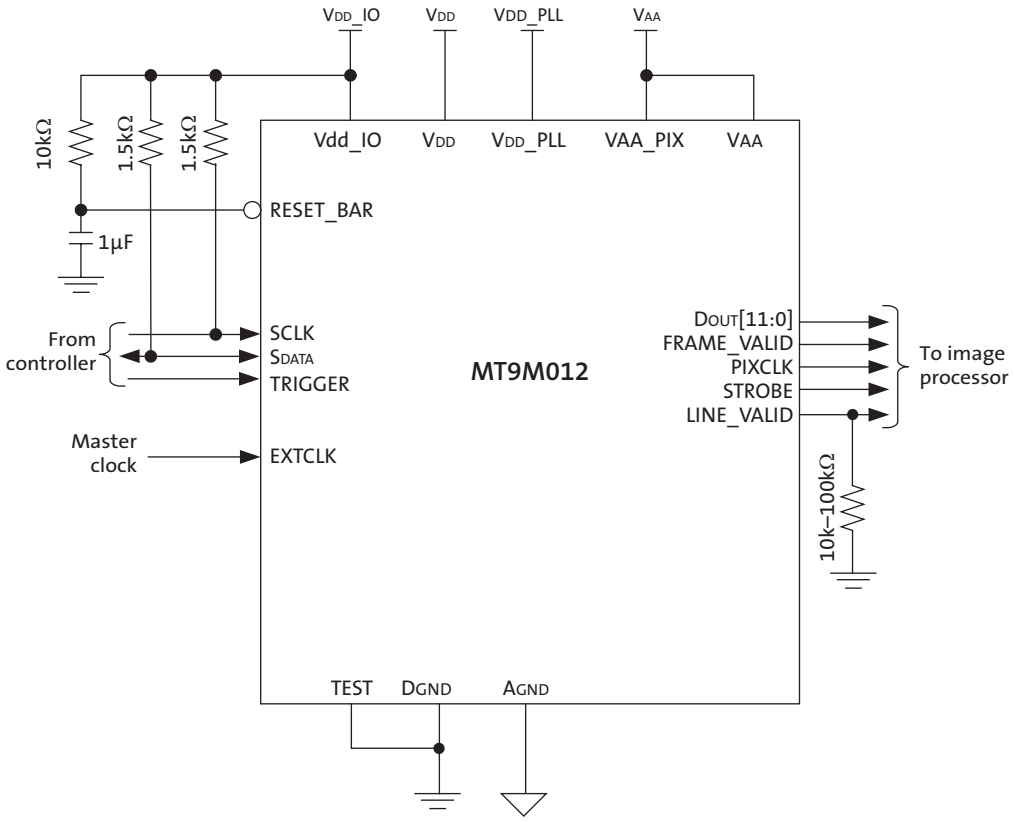
All DGND pads must be tied together, as must all AGND pads, all VDD_IO pads, and all VDD pads. Doing so will minimize risk of damage to the sensor in an ESD event.

Storage Requirements

Aptina die products are packaged in for shipping a cleanroom environment. Upon receipt, the customer should transfer the die to a similar environment for storage. Aptina recommends the die be maintained in a filtered nitrogen atmosphere until removed for assembly. The moisture content of the storage facility should be maintained at 30 percent relative humidity ±10 percent. ESD damage precautions are necessary during handling. The die must be in an ESD-protected environment at all times for inspection and assembly.

Typical Configuration

Figure 1: Typical Configuration (Connection) Parallel Mode



Notes:
1. Typical connection shows only one scenario out of multiple possible variations for this sensor.
2. All inputs must be configured with VDD_IO.
3. VAA and VAA_PIX must be tied together.
4. All power supplies should be adequately decoupled.
5. All DGND pads must be tied together, as must all AGND pads, all VAA, all VAA_PIX, all VDD_IO pads, and all VDD pads.

Bond Pad Identification Tables

Table 1: Bond Pad Location and Identification from Center of Pad 1

Pad Name	Pad Number	"X"[1] Microns	"Y"[1] Microns	"X"[1] Inches	"Y"[1] Inches
1	VDD_IO1	0.00	0.00	0.0000000	0.0000000
2	VDD_IO2	141.84	0.00	0.0055843	0.0000000
3	VDD_IO9	283.68	0.00	0.0111685	0.0000000
4	DGND10	414.72	0.00	0.0163276	0.0000000
5	TRIGGER	568.14	0.00	0.0223675	0.0000000
6	VDD_IO10	726.48	0.00	0.0286016	0.0000000
7	DGND11	857.52	0.00	0.0337606	0.0000000
8	DOUT0	1050.32	0.00	0.0413512	0.0000000
9	VDD_IO11	1232.64	0.00	0.0485291	0.0000000
10	DGND12	1363.68	0.00	0.0536882	0.0000000
11	FRAME_VALID	1556.48	0.00	0.0612787	0.0000000
12	VDD_IO12	1738.80	0.00	0.0684567	0.0000000
13	DGND13	1869.84	0.00	0.0736157	0.0000000
14	LINE_VALID[4]	2062.64	0.00	0.0812063	0.0000000
15	VDD_IO13	2244.96	0.00	0.0883843	0.0000000
16	DGND14	2376.00	0.00	0.0935433	0.0000000
17	STROBE	2568.80	0.00	0.1011339	0.0000000
18	VDD_IO14	2751.12	0.00	0.1083118	0.0000000
19	DGND15	2882.16	0.00	0.1134709	0.0000000
20	DOUT1	3074.96	0.00	0.1210614	0.0000000
21	VDD_IO15	3257.28	0.00	0.1282394	0.0000000
22	DGND16	3388.32	0.00	0.1333984	0.0000000
23	PIXCLK	3581.12	0.00	0.1409890	0.0000000
24	VDD_IO16	3763.44	0.00	0.1481669	0.0000000
25	DGND17	3894.48	0.00	0.1533260	0.0000000
26	DOUT2	4087.28	0.00	0.1609165	0.0000000
27	VDD_IO17	4269.60	0.00	0.1680945	0.0000000
28	DGND18	4400.64	0.00	0.1732535	0.0000000
29	DGND1	4531.68	0.00	0.1784126	0.0000000
30	DGND2	4662.72	0.00	0.1835717	0.0000000
31	TEST[3]	4816.14	0.00	0.1896116	0.0000000
32	VDD_IO18	4974.48	0.00	0.1958457	0.0000000
33	DGND19	5105.52	0.00	0.2010047	0.0000000
34	VDD1	5247.36	0.00	0.2065890	0.0000000
35	VDD2	5389.20	0.00	0.2121732	0.0000000
36	DGND3	5520.24	0.00	0.2173323	0.0000000
37	DGND4	5651.28	0.00	0.2224913	0.0000000
38	DOUT11	6098.87	–309.39	0.2401128	–0.0121805
39	DOUT10	6098.87	–542.67	0.2401128	–0.0213648
40	DOUT9	6098.87	–775.95	0.2401128	–0.0305490
41	VDD_IO8	6098.87	–958.27	0.2401128	–0.0377270
42	VDD_IO7	6098.87	–1100.11	0.2401128	–0.0433112

Table 1: Bond Pad Location and Identification from Center of Pad 1 (continued)

Pad Name	Pad Number	"X"[1] Microns	"Y"[1] Microns	"X"[1] Inches	"Y"[1] Inches
43	DGND9	6098.87	–1995.02	0.2401128	–0.0785439
44	DNU[2]	6098.87	–2126.86	0.2401128	–0.0837344
45	DNU	6098.87	–2382.79	0.2401128	–0.0938104
46	TEST[3]	6098.87	–2514.63	0.2401128	–0.0990010
47	DNU	6098.87	–2646.47	0.2401128	–0.1041915
48	DNU	6098.87	–2902.40	0.2401128	–0.1142675
49	TEST	6098.87	–3034.24	0.2401128	–0.1194581
50	DNU	6098.87	–3166.08	0.2401128	–0.1246486
51	DNU	6098.87	–3422.01	0.2401128	–0.1347246
52	EXTCLK	6098.87	–3796.54	0.2401128	–0.1494701
53	VDD_PLL	6098.87	–3944.09	0.2401128	–0.1552789
54	DGND30	6098.87	–4075.13	0.2401128	–0.1604380
55	VDD_IO6	6098.87	–4980.87	0.2401128	–0.1960970
56	VDD_IO5	6098.87	–5122.71	0.2401128	–0.2016813
57	DOUT6	6098.87	–5315.51	0.2401128	–0.2092719
58	DOUT7	6098.87	–5548.79	0.2401128	–0.2184561
59	DOUT8	6098.87	–5782.07	0.2401128	–0.2276404
60	DGND8	5651.28	–6070.13	0.2224913	–0.2389815
61	DGND7	5520.24	–6070.13	0.2173323	–0.2389815
62	VDD4	5378.40	–6070.13	0.2117480	–0.2389815
63	VDD3	5236.56	–6070.13	0.2061638	–0.2389815
64	DGND29	5105.52	–6070.13	0.2010047	–0.2389815
65	VDD_IO28	4963.68	–6070.13	0.1954205	–0.2389815
66	TEST	4810.27	–6070.13	0.1893805	–0.2389815
67	DGND6	4662.72	–6070.13	0.1835717	–0.2389815
68	DGND5	4531.68	–6070.13	0.1784126	–0.2389815
69	DGND28	4400.64	–6070.13	0.1732535	–0.2389815
70	VDD_IO27	4258.80	–6070.13	0.1676693	–0.2389815
71	SDATA	4066.00	–6070.13	0.1600787	–0.2389815
72	DGND27	3894.48	–6070.13	0.1533260	–0.2389815
73	VDD_IO26	3752.64	–6070.13	0.1477417	–0.2389815
74	SCLK	3599.23	–6070.13	0.1417018	–0.2389815
75	DGND26	3451.68	–6070.13	0.1358929	–0.2389815
76	VDD_IO25	3309.84	–6070.13	0.1303087	–0.2389815
77	TEST	3156.43	–6070.13	0.1242687	–0.2389815
78	DGND25	3008.88	–6070.13	0.1184598	–0.2389815
79	VDD_IO24	2867.04	–6070.13	0.1128756	–0.2389815
80	DOUT5	2674.24	–6070.13	0.1052850	–0.2389815
81	DGND24	2502.72	–6070.13	0.0985323	–0.2389815
82	VDD_IO23	2360.88	–6070.13	0.0929480	–0.2389815
83	TEST	2207.47	–6070.13	0.0869081	–0.2389815
84	DGND23	2059.92	–6070.13	0.0810992	–0.2389815
85	VDD_IO22	1918.08	–6070.13	0.0755150	–0.2389815
86	DOUT4	1725.28	–6070.13	0.0679244	–0.2389815

Table 1: Bond Pad Location and Identification from Center of Pad 1 (continued)

Pad Name	Pad Number	"X"[1] Microns	"Y"[1] Microns	"X"[1] Inches	"Y"[1] Inches
87	DGND22	1553.76	–6070.13	0.0611717	–0.2389815
88	VDD_IO21	1411.92	–6070.13	0.0555874	–0.2389815
89	RESET_BAR	1258.51	–6070.13	0.0495474	–0.2389815
90	DGND21	1110.96	–6070.13	0.0437386	–0.2389815
91	VDD_IO20	969.12	–6070.13	0.0381543	–0.2389815
92	DOUT3	776.32	–6070.13	0.0305638	–0.2389815
93	DGND20	604.80	–6070.13	0.0238110	–0.2389815
94	VDD_IO19	462.96	–6070.13	0.0182268	–0.2389815
95	VDD_IO4	321.12	–6070.13	0.0126425	–0.2389815
96	VDD_IO3	179.28	–6070.13	0.0070583	–0.2389815
97	VAA1	–368.71	–5445.27	–0.0145159	–0.2143805
98	VAA2	–368.71	–5303.43	–0.0145159	–0.2087963
99	VAA3	–368.71	–5161.59	–0.0145159	–0.2032120
100	AGND1	–368.71	–5019.75	–0.0145159	–0.1976278
101	AGND2	–368.71	–4888.71	–0.0145159	–0.1924687
102	AGND3	–368.71	–4757.67	–0.0145159	–0.1873096
103	DNU	–368.71	–4221.27	–0.0145159	–0.1661915
104	DNU	–368.71	–4090.23	–0.0145159	–0.1610325
105	DNU	–368.71	–3959.19	–0.0145159	–0.1558734
106	VAA4	–368.71	–3383.91	–0.0145159	–0.1332246
107	VAA5	–368.71	–3242.07	–0.0145159	–0.1276404
108	VAA6	–368.71	–3100.23	–0.0145159	–0.1220561
109	AGND4	–368.71	–2969.19	–0.0145159	–0.1168970
110	AGND5	–368.71	–2838.15	–0.0145159	–0.1117380
111	AGND6	–368.71	–2707.11	–0.0145159	–0.1065789
112	VAA_PIX1	–368.71	–2374.47	–0.0145159	–0.0934829
113	VAA_PIX2	–368.71	–2243.43	–0.0145159	–0.0883238
114	VAA_PIX3	–368.71	–2112.39	–0.0145159	–0.0831648
115	VAA_PIX4	–368.71	–1981.35	–0.0145159	–0.0780057
116	VAA_PIX5	–368.71	–1850.31	–0.0145159	–0.0728467
117	VAA_PIX6	–368.71	–1719.27	–0.0145159	–0.0676876
118	DNU	–368.71	–1501.83	–0.0145159	–0.0591270
119	AGND7	–368.71	–1284.39	–0.0145159	–0.0505663
120	AGND8	–368.71	–1153.35	–0.0145159	–0.0454073
121	AGND9	–368.71	–1022.31	–0.0145159	–0.0402482
122	VAA7	–368.71	–880.47	–0.0145159	–0.0346640
123	VAA8	–368.71	–738.63	–0.0145159	–0.0290797
124	VAA9	–368.71	–596.79	–0.0145159	–0.0234955

Notes:
1. Reference to center of each bond pad from center of bond pad 1.
2. DNU = do not use. See "Bonding Instructions" on page 3.
3. All TEST bond pads must be tied to DGND for normal device operation.
4. LINE_VALID requires an external pull-down resistor (typically 10k–100kΩ) to DGND for normal device operation.

Table 2: Bond Pad Location and Identification from Center of Die

Pad Number	Pad Name	"X"[1] Microns	"Y"[1] Microns	"X"[1] Inches	"Y"[1] Inches
1	VDD_IO1	–2865.08	3035.07	–0.1127984	0.1194907
2	VDD_IO2	–2723.24	3035.07	–0.1072142	0.1194907
3	VDD_IO9	–2581.40	3035.07	–0.1016299	0.1194907
4	DGND10	–2450.36	3035.07	–0.0964709	0.1194907
5	TRIGGER	–2296.95	3035.07	–0.0904309	0.1194907
6	VDD_IO10	–2138.60	3035.07	–0.0841969	0.1194907
7	DGND11	–2007.56	3035.07	–0.0790378	0.1194907
8	DOUT0	–1814.76	3035.07	–0.0714472	0.1194907
9	VDD_IO11	–1632.44	3035.07	–0.0642693	0.1194907
10	DGND12	–1501.40	3035.07	–0.0591102	0.1194907
11	FRAME_VALID	–1308.60	3035.07	–0.0515197	0.1194907
12	VDD_IO12	–1126.28	3035.07	–0.0443417	0.1194907
13	DGND13	–995.24	3035.07	–0.0391827	0.1194907
14	LINE_VALID[4]	–802.44	3035.07	–0.0315921	0.1194907
15	VDD_IO13	–620.12	3035.07	–0.0244142	0.1194907
16	DGND14	–489.08	3035.07	–0.0192551	0.1194907
17	STROBE	–296.28	3035.07	–0.0116646	0.1194907
18	VDD_IO14	–113.96	3035.07	–0.0044866	0.1194907
19	DGND15	17.08	3035.07	0.0006724	0.1194907
20	DOUT1	209.88	3035.07	0.0082630	0.1194907
21	VDD_IO15	392.20	3035.07	0.0154409	0.1194907
22	DGND16	523.24	3035.07	0.0206000	0.1194907
23	PIXCLK	716.04	3035.07	0.0281906	0.1194907
24	VDD_IO16	898.36	3035.07	0.0353685	0.1194907
25	DGND17	1029.40	3035.07	0.0405276	0.1194907
26	DOUT2	1222.20	3035.07	0.0481181	0.1194907
27	VDD_IO17	1404.52	3035.07	0.0552961	0.1194907
28	DGND18	1535.56	3035.07	0.0604551	0.1194907
29	DGND1	1666.60	3035.07	0.0656142	0.1194907
30	DGND2	1797.64	3035.07	0.0707732	0.1194907
31	TEST[3]	1951.06	3035.07	0.0768132	0.1194907
32	VDD_IO18	2109.40	3035.07	0.0830472	0.1194907
33	DGND19	2240.44	3035.07	0.0882063	0.1194907
34	VDD1	2382.28	3035.07	0.0937906	0.1194907
35	VDD2	2524.12	3035.07	0.0993748	0.1194907
36	DGND3	2655.16	3035.07	0.1045339	0.1194907
37	DGND4	2786.20	3035.07	0.1096929	0.1194907
38	DOUT11	3233.79	2725.68	0.1273144	0.1073102
39	DOUT10	3233.79	2492.40	0.1273144	0.0981260
40	DOUT9	3233.79	2259.12	0.1273144	0.0889417
41	VDD_IO8	3233.79	2076.80	0.1273144	0.0817638
42	VDD_IO7	3233.79	1934.96	0.1273144	0.0761795
43	DGND9	3233.79	1040.05	0.1273144	0.0409469
44	DNU[2]	3233.79	908.21	0.1273144	0.0357563

Table 2: Bond Pad Location and Identification from Center of Die (continued)

Pad Number	Pad Name	"X"[1] Microns	"Y"[1] Microns	"X"[1] Inches	"Y"[1] Inches
45	DNU	3233.79	652.28	0.1273144	0.0256803
46	TEST[3]	3233.79	520.44	0.1273144	0.0204898
47	DNU[2]	3233.79	388.60	0.1273144	0.0152992
48	DNU	3233.79	132.67	0.1273144	0.0052232
49	TEST	3233.79	0.83	0.1273144	0.0000327
50	DNU	3233.79	–131.01	0.1273144	–0.0051579
51	DNU	3233.79	–386.94	0.1273144	–0.0152339
52	EXTCLK	3233.79	–761.48	0.1273144	–0.0299793
53	VDD_PLL	3233.79	–909.02	0.1273144	–0.0357882
54	DGND30	3233.79	–1040.06	0.1273144	–0.0409472
55	VDD_IO6	3233.79	–1945.80	0.1273144	–0.0766063
56	VDD_IO5	3233.79	–2087.64	0.1273144	–0.0821906
57	DOUT6	3233.79	–2280.44	0.1273144	–0.0897811
58	DOUT7	3233.79	–2513.72	0.1273144	–0.0989654
59	DOUT8	3233.79	–2747.00	0.1273144	–0.1081496
60	DGND8	2786.20	–3035.07	0.1096929	–0.1194907
61	DGND7	2655.16	–3035.07	0.1045339	–0.1194907
62	VDD4	2513.32	–3035.07	0.0989496	–0.1194907
63	VDD3	2371.48	–3035.07	0.0933654	–0.1194907
64	DGND29	2240.44	–3035.07	0.0882063	–0.1194907
65	VDD_IO28	2098.60	–3035.07	0.0826220	–0.1194907
66	TEST	1945.19	–3035.07	0.0765821	–0.1194907
67	DGND6	1797.64	–3035.07	0.0707732	–0.1194907
68	DGND5	1666.60	–3035.07	0.0656142	–0.1194907
69	DGND28	1535.56	–3035.07	0.0604551	–0.1194907
70	VDD_IO27	1393.72	–3035.07	0.0548709	–0.1194907
71	SDATA	1200.92	–3035.07	0.0472803	–0.1194907
72	DGND27	1029.40	–3035.07	0.0405276	–0.1194907
73	VDD_IO26	887.56	–3035.07	0.0349433	–0.1194907
74	SCLK	734.15	–3035.07	0.0289033	–0.1194907
75	DGND26	586.60	–3035.07	0.0230945	–0.1194907
76	VDD_IO25	444.76	–3035.07	0.0175102	–0.1194907
77	TEST	291.35	–3035.07	0.0114703	–0.1194907
78	DGND25	143.80	–3035.07	0.0056614	–0.1194907
79	VDD_IO24	1.96	–3035.07	0.0000772	–0.1194907
80	DOUT5	–190.84	–3035.07	–0.0075134	–0.1194907
81	DGND24	–362.36	–3035.07	–0.0142661	–0.1194907
82	VDD_IO23	–504.20	–3035.07	–0.0198504	–0.1194907
83	TEST	–657.62	–3035.07	–0.0258904	–0.1194907
84	DGND23	–805.16	–3035.07	–0.0316992	–0.1194907
85	VDD_IO22	–947.00	–3035.07	–0.0372835	–0.1194907
86	DOUT4	–1139.80	–3035.07	–0.0448740	–0.1194907
87	DGND22	–1311.32	–3035.07	–0.0516268	–0.1194907
88	VDD_IO21	–1453.16	–3035.07	–0.0572110	–0.1194907

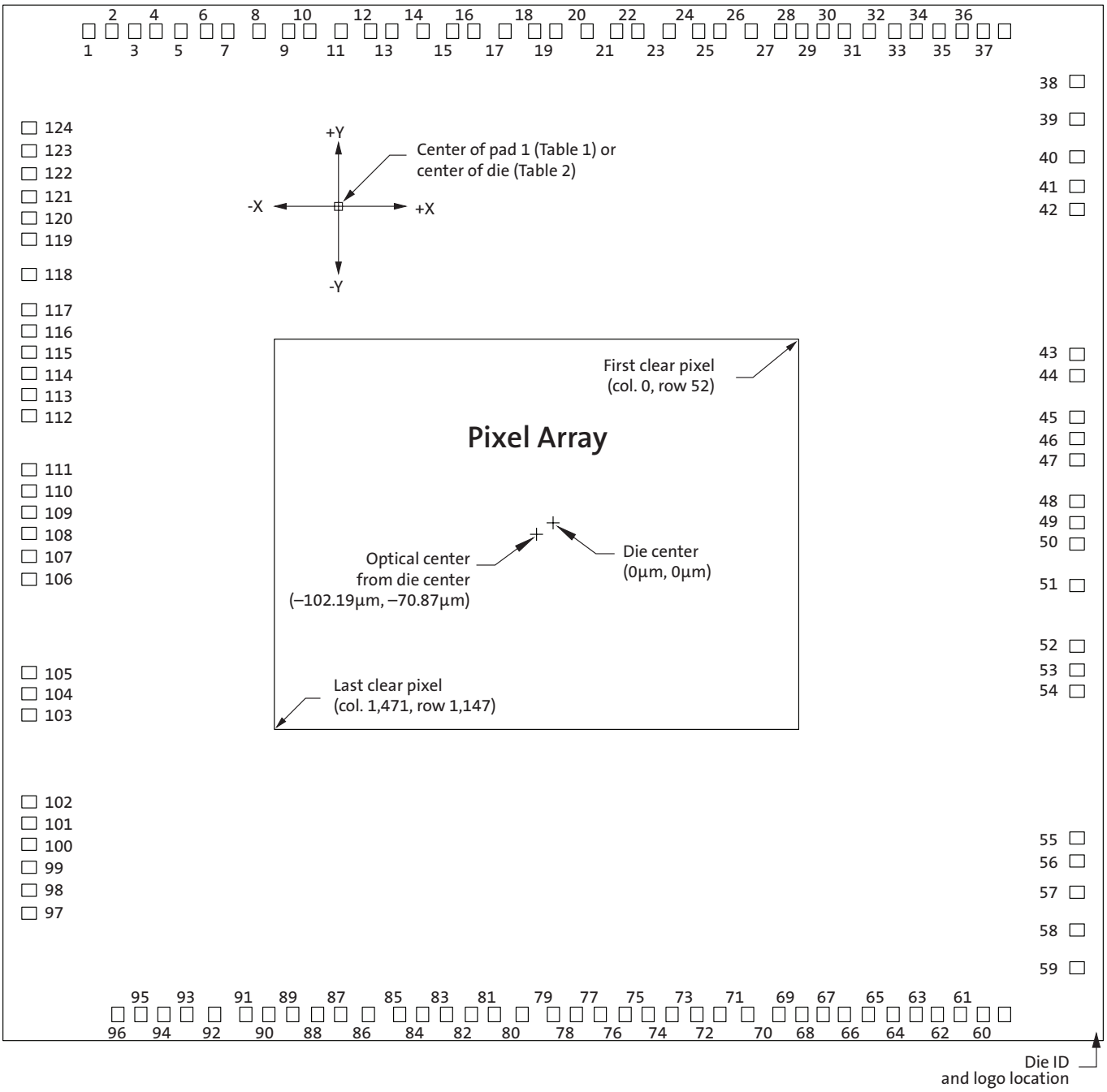
Table 2: Bond Pad Location and Identification from Center of Die (continued)

Pad Number	Pad Name	"X"[1] Microns	"Y"[1] Microns	"X"[1] Inches	"Y"[1] Inches
89	RESET_BAR	–1606.58	–3035.07	–0.0632510	–0.1194907
90	DGND21	–1754.12	–3035.07	–0.0690598	–0.1194907
91	VDD_IO20	–1895.96	–3035.07	–0.0746441	–0.1194907
92	DOUT3	–2088.76	–3035.07	–0.0822346	–0.1194907
93	DGND20	–2260.28	–3035.07	–0.0889874	–0.1194907
94	VDD_IO19	–2402.12	–3035.07	–0.0945717	–0.1194907
95	VDD_IO4	–2543.96	–3035.07	–0.1001559	–0.1194907
96	VDD_IO3	–2685.80	–3035.07	–0.1057402	–0.1194907
97	VAA1	–3233.79	–2410.20	–0.1273144	–0.0948898
98	VAA2	–3233.79	–2268.36	–0.1273144	–0.0893055
99	VAA3	–3233.79	–2126.52	–0.1273144	–0.0837213
100	AGND1	–3233.79	–1984.68	–0.1273144	–0.0781370
101	AGND2	–3233.79	–1853.64	–0.1273144	–0.0729780
102	AGND3	–3233.79	–1722.60	–0.1273144	–0.0678189
103	DNU	–3233.79	–1186.20	–0.1273144	–0.0467008
104	DNU	–3233.79	–1055.16	–0.1273144	–0.0415417
105	DNU	–3233.79	–924.12	–0.1273144	–0.0363827
106	VAA4	–3233.79	–348.84	–0.1273144	–0.0137339
107	VAA5	–3233.79	–207.00	–0.1273144	–0.0081496
108	VAA6	–3233.79	–65.16	–0.1273144	–0.0025654
109	AGND4	–3233.79	65.88	–0.1273144	0.0025937
110	AGND5	–3233.79	196.92	–0.1273144	0.0077528
111	AGND6	–3233.79	327.96	–0.1273144	0.0129118
112	VAA_PIX1	–3233.79	660.60	–0.1273144	0.0260079
113	VAA_PIX2	–3233.79	791.64	–0.1273144	0.0311669
114	VAA_PIX3	–3233.79	922.68	–0.1273144	0.0363260
115	VAA_PIX4	–3233.79	1053.72	–0.1273144	0.0414850
116	VAA_PIX5	–3233.79	1184.76	–0.1273144	0.0466441
117	VAA_PIX6	–3233.79	1315.80	–0.1273144	0.0518031
118	DNU	–3233.79	1533.24	–0.1273144	0.0603638
119	AGND7	–3233.79	1750.68	–0.1273144	0.0689244
120	AGND8	–3233.79	1881.72	–0.1273144	0.0740835
121	AGND9	–3233.79	2012.76	–0.1273144	0.0792425
122	VAA7	–3233.79	2154.60	–0.1273144	0.0848268
123	VAA8	–3233.79	2296.44	–0.1273144	0.0904110
124	VAA9	–3233.79	2438.28	–0.1273144	0.0959953

Notes:
1. Reference to center of each bond pad from center of die.
2. DNU = do not use. See "Bonding Instructions" on page 3.
3. All TEST bond pads must be tied to DGND for normal device operation.
4. LINE_VALID requires an external pull-down resistor (typically 10k–100kΩ) to DGND for normal device operation.

Die Features

Figure 2: Die Outline (Top View)

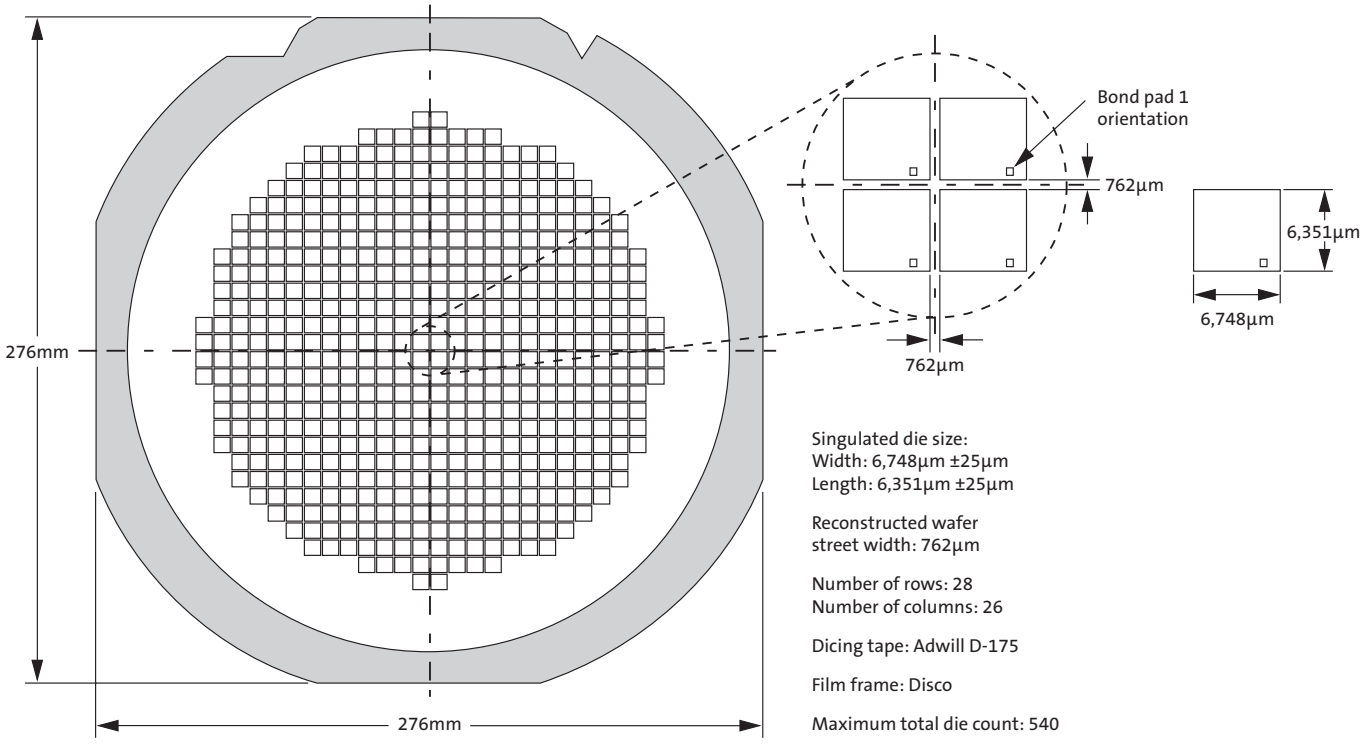


Physical Specifications

Table 3: Physical Dimensions

Feature	Dimensions
Die thickness	200µm ±12µm
Singulated die size (after wafer saw) Width (X dimension): Length (Y dimension):	 6,748 ±25µm 6,351 ±25µm
Bond pad size (MIN)	85µm x 100µm
Passivation openings (MIN)	75µm x 90µm
Minimum bond pad pitch	131µm
Optical array Optical center from die center: Optical center from center of pad 1:	 X = –102.19µm, Y = –70.87µm X = 2,762.90µm, Y = –3,105.93µm
First clear pixel (col. 0, row 52) From die center: From center of pad 1:	 X = 1,515.92µm, Y = 1,133.64µm X = 4,381.00µm, Y = –1,901.43µm
Last clear pixel (col. 1,471, row 1,147) From die center: From center of pad 1:	 X = –1,720.29µm, Y = –1,275.37µm X = 1,144.8µm, Y = –4,310.43µm

Figure 3: Die Orientation in Reconstructed Wafer



Revision History

Rev. C **5/10**

- Updated to non-confidential

Rev. B **5/10**

- Updated to Aptina template

Rev. A **7/08**

- Initial release

10 Eunos Road 8 13-40, Singapore Post Center, Singapore 408600 prodmktg@aptina.com www.aptina.com