

FEATURES

- 2048 x 2048 x 13.5 μm pixels
- Back Thinned for High Quantum Efficiency
- Advanced Inverted Mode Operation (AIMO)
- Low Noise Output Amplifiers
- Full-frame Architecture
- Gated Dump Drain on Output Register
- 42-pin PGA Package

GENERAL DATA

Format

Image area	27.6 x 27.6 mm
Active pixels: horizontal	2048
vertical	2048 + 4
serial overscan pixels	50 at each end
Pixel size:	13.5 x 13.5 μm
Number of output amplifiers	2

The device has a 100% fill factor for maximum sensitivity

PERFORMANCE LIMITS

Parameter	Min	Typical	Max	Units	Notes
Peak charge storage	80k	100k	-	e^-/pixel	1
Peak output voltage (normal mode unbinned)	-	450	-	mV	
Dark signal at 293 K	-	250	500	$\text{e}^-/\text{pixel/s}$	2
Charge transfer efficiency:					
parallel	99.999	99.9999	-	%	3
serial	99.999	99.9993	-	%	
Output amplifier responsivity (normal mode) (high signal mode)	3.0 -	4.5 1.5	6 -	$\mu\text{V}/\text{e}^-$	
Readout noise at 253 K	-	3.0	4.5	rms e^-	4
Readout frequency	-	20	3000	kHz	5
Line transfer period	TBA	100	-	μs	
Output node capacity	-	1,000,000	-	e^-	6

Spectral Response (at 253 K)

Wavelength (nm)	Basic process Midband AR coating		Basic process Broadband AR coating		Photo response non-uniformity	
	Minimum QE	Typical QE	Minimum QE	Typical QE	Maximum (1s)	Units
300	Not specified	Not specified	Not specified	Not specified	-	%
350	15	20	25	40	5	%
400	40	52	55	75	3	%
500	85	90	75	84	3	%
650	85	90	75	77	3	%
900	30	42	30	38	5	%

A basic process CCD with no coating is also available for soft X-ray and EUV applications.

NOTES

1. Signal level at which resolution begins to degrade.
2. The typical average (background) dark signal at any temperature T (kelvin) between 253 K and 300 K is given by: $Q_d/Q_{d0} = 1.14 \times 10^6 T^3 e^{-9080/T}$ where Q_{d0} is the dark current at 293 K. Note that this is typical performance and some variation may be seen between devices.
3. CTE is measured for a complete 3-phase clock triplet.
4. Measured using correlated double sampling. Noise specification applies at 20 kHz.
5. Readout above 1000 kHz can be achieved but performance to the parameters given cannot be guaranteed.
6. With output circuit configured in normal/low-noise mode (OG2 low).

TYPICAL OPERATING CONDITIONS

Ref	Pin No.	Typ. Voltage
SS, LS	1, 8, 13, 28, 35, 40	9.5 V
IN1	6, 39	15 V
IN2	7, 34	15 V
IN3	5, 38	15 V
RN1(L)	20	11 V
RN2(L)	19	11 V
RN1(R)	23	11 V
RN2(R)	22	11 V
RN3	24	11 V
NR(L)	18	12 V
NR(R)	27	12 V
NSW (L)	20	11 V
NSW (R)	25	11 V
DG (Note 9)	26, 17	0V
OG1(L)	15	3 V
OG1(R)	30	3 V
DD	32, 11	24 V
OG2(L)	14	See note 7
OG2(R)	29	See note 7
OD(L)	10	29 V
OD(R)	31	29 V
OS(L)	9	See note 8
OS(R)	36	See note 8
RD(L)	33	17 V
RD(R)	12	17 V
NC	2, 3, 4, 21, 37, 41, 42	

NOTES

7. OG2 = OG1 + 1 V - normal low noise mode or OG2 = 20 V - low responsivity / increased charge handling mode.
8. OS = 3 to 5 V below OD typically. Use 3 – 5 mA current source or 5 – 10 kΩ load.
9. Non-charge dumping level is shown. For charge dumping DG should be pulsed to 12 ± 2 V
10. Readout register clock pulse low levels + 1 V; other clock low levels 0 ± 0.5 V.
11. With the RN connections shown this device will operate through both outputs. In order to operate from the left-hand output only RN1(R) and RN2(R) should be reversed.

Nomenclature

SS	-	Substrate
LS	-	Local substrate (connect to SS)
IN 1/2/3	-	Image area clocks
RN 1/2/3	-	Serial register clocks
NR	-	Reset clock
N SW	-	Summing well
DG	-	Register dump gate
OG1, OG2	-	Output gates
DD	-	Dump drain
OD	-	Output drain
OS	-	Output source
RD	-	Reset drain
NC	-	Not connected

BLEMISH SPECIFICATION

Grade	0	1	2
Column defects	0	3	6
Black spots	100	150	250
Traps > 200e-	10	20	30
White Spots	100	150	250

Black spots are counted when they have a signal level of less than 80% of the local mean at a signal level of approximately half full-well.

White spots are counted when they have a generation rate 125 times the specified maximum dark signal generation rate (measured between 253 and 293 K). The typical temperature dependence of white spot defects is the same as that of the average dark signal, i.e.:
 $Q_d/Q_{d0} = 122T^{-3}e^{-6400/T}$

Grade 5 are functional devices for set-up purposes only.

Traps Pixels where charge is temporarily held. Traps are counted if they have a capacity greater than 200 e⁻ at 253 K.

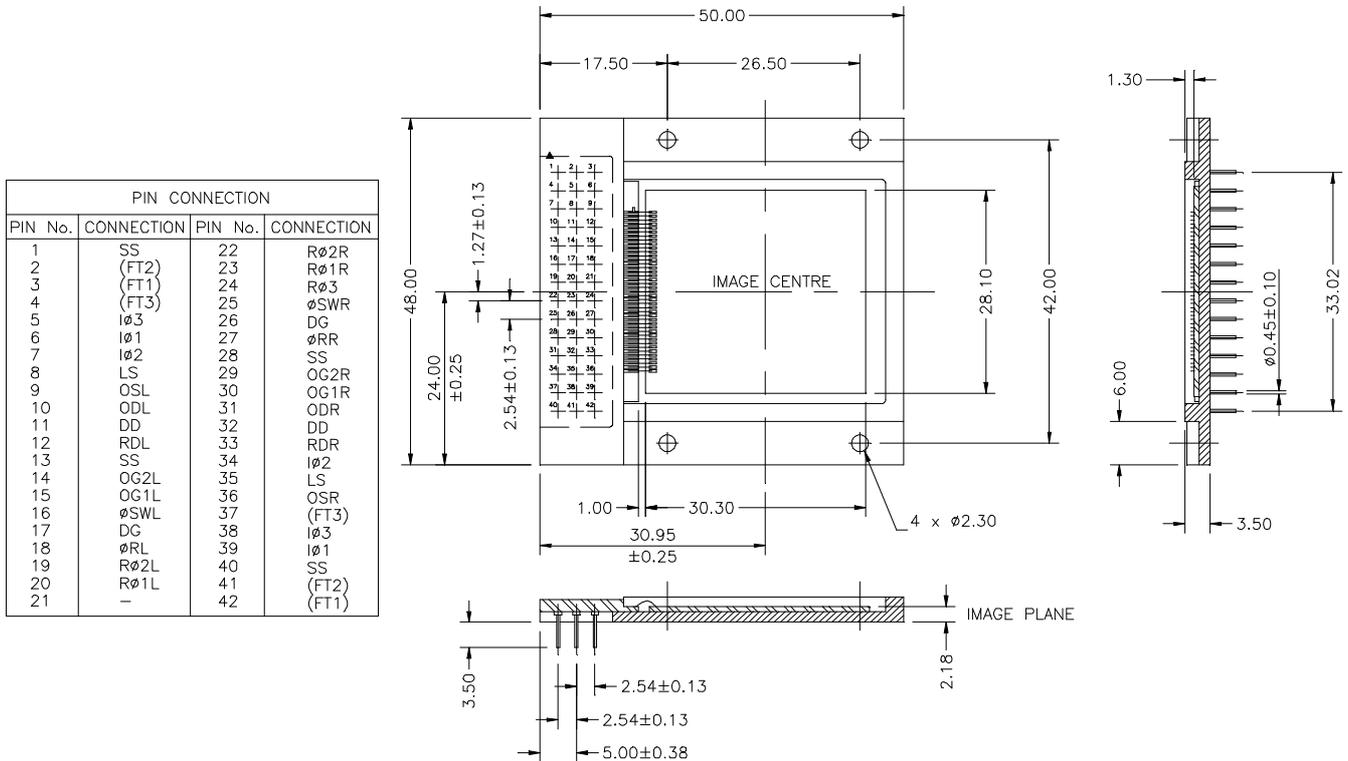
Column defects, a column that contains at least 50 white or 50 black defects.

Part Reference:

CCD42-40-*-343	*= grade,	AIMO, backside basic process midband AR, non-buttable PGA-metal package
CCD42-40-*-336	*= grade,	AIMO, backside basic process broadband AR, non-buttable PGA-metal package
CCD42-40-*-345	*= grade,	AIMO, backside basic process no AR, non-buttable PGA-metal package

Other variants of the CCD42-40 available are front illuminated format and non-inverted mode operation (NIMO). In common with all Marconi Applied Technologies CCD Sensors, the front illuminated CCD42-40 is available with a fibre-optic window or taper, or with a phosphor coating. Sensors are normally supplied with a temporary glass window. The CCD42-40 is also available in a compact ceramic pack or on a metal 3-side buttable package.

INTERFACE DETAILS



Note The Frame Transfer connections (FT) are not used in this version of the CCD42-40 (i.e. not connected).

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