

# CCD42-40 AIMO Back Illuminated

## 2048 x 2048 Pixel Scientific CCD Sensor

### Features

- ! 2048 x 2048 pixel image area
- ! Back Illuminated Operation
- ! Advance Inverted Mode (MPP) Operation
- ! 13.5  $\mu\text{m}$  Square Pixels
- ! Low Noise, high responsivity output amplifiers
- ! Gated dump drain on output register
- ! 42 pin PGA Package

### Introduction

This version of the CCD42 family of CCD Sensors has full frame architecture. Back illumination technology in combination with an extremely low noise amplifier make the device well suited for use in general scientific imaging. To further improve the sensitivity the CCD is manufactured without anti-blooming structures. This variant of the CCD42-40 operates in inverted mode (AIMO) for use at Peltier temperatures. Marconi's AIMO structures give a 100 times reduction in dark current with minimum reduction in full well capacity.

The output amplifier is designed to give excellent noise levels at low pixel rates and can match the noise performance of most conventional science CCDs at pixel rates as high as 1 MHz.

The readout register has a gate controlled dump drain to allow fast dumping of unwanted data. The register is designed to accommodate 4 image pixels of charge and a summing well is provided capable of holding 6 image pixels. The output amplifier has a feature to enable the responsivity to be reduced to allow the reading of such large charge packets. The devices may be operated through either or both outputs by making the appropriate Rf connections.

The device is supplied in a 42 pin PGA package designed for ease of use. The design of the package permits easy interfacing to cold shoes or supports.

### General Data

#### Format

Image Area	(mm)	27.6 x 27.6
Active Pixels	(H)	2048
	(V)	2048 + 3
Pixel Size	( $\mu\text{m}$ )	13.5 x 13.5

50 additional pixels are provided at each end of the output register for output settling purposes.

Number of Output Amplifiers 2

The device has a 100% fill factor for maximum sensitivity.

#### Package

Format	Metal/ceramic 42 pin PGA Package
Size	50.0 x 48.0 mm

#### Typical Performance

O/P Amp Responsivity	( $\mu\text{V}/\text{e}^-$ )	5
Peak Signal	( $\text{e}^-/\text{pixel}$ )	100,000
Register charge capacity	(V)	4 pixels
Summing well charge capacity		6 pixels
Charge Transfer Efficiency	(%)	
Parallel		99.9999
Serial		99.9993

Quantum Efficiency	350nm	50%
	500nm	85%
	650nm	70%
	900nm	25%

Minimum Spectral Range	(nm)	200 - 1100
Readout Noise (140-253K)	( $\text{e}^- \text{ rms}$ )	3
Dark Signal ( $\text{e}^-/\text{Pixel}/\text{sec}$ at 20°C)		250

Note: All values quoted using typical operating conditions at a readout frequency of 20 kHz and at a temperature of 253K (approx).

## Typical Operating Conditions

(See Note 4)

Ref:	Pin No.	Reference	Typ. Voltage
Vss	1,8,13,28,35,40	Substrate	9.5V
If 1	6,39	Image Clock	12V
If 2	7,34	Image Clock	12V
If 3	5,38	Image Clock	12V
Rf 1(L)	20	Register Clock	11V
Rf 2(L)	19	Register Clock	11V
Rf 1(R)	23	Register Clock	11V
Rf 2(R)	22	Register Clock	11V
Rf 3	24	Register Clock	11V
f R(L)	18	Reset Pulse	12V
f R(R)	27	Reset Pulse	12V
f SW(L)	16	Summing Well	11V
f SW(R)	25	Summing Well	11V
DG (Note 3)	26,17	Register Dump Gate	0V
OG1(L)	15	Output Gate	3V
OG1(R)	30	Output Gate	3V
DD	32,11	Dump Drain	24V
OG2(L)	14	Output Gate (1)	See Note 1
OG2(R)	29	Output Gate (2)	See Note 1
OD(L)	10	Output Drain	29V
OD(R)	31	Output Drain	29V
OS(L)	9	Output Source	See Note 2
OS(R)	36	Output Source	See Note 2
RD(R)	33	Reset Drain	17V
RD(L)	12	Reset Drain	17V
NC	2,3,4,21,37,41,42		
f SW	-	Summing Well	
DG	-	Register Dump Gate	

### **Note 1**

OG2 = OG1 + 1 volt - normal low noise mode.  
 or = 20v - Low responsivity  
 / increased charge Handling mode.

### **Note 2**

OS = 3 - 5 volts below OD typically.

### **Note 3**

Non-charge dumping level shown. For charge dumping DG should be pulsed to  $12 \pm 2$  V

### **Note 4**

Readout register clock pulse low levels +1V; other clock low levels  $0 \pm 0.5$ V.

**Note 5**

With the Rf connections shown this device will operate through both outputs. In order to operate from the left hand output only Rf 1(R) and Rf 2(R) should be reversed.

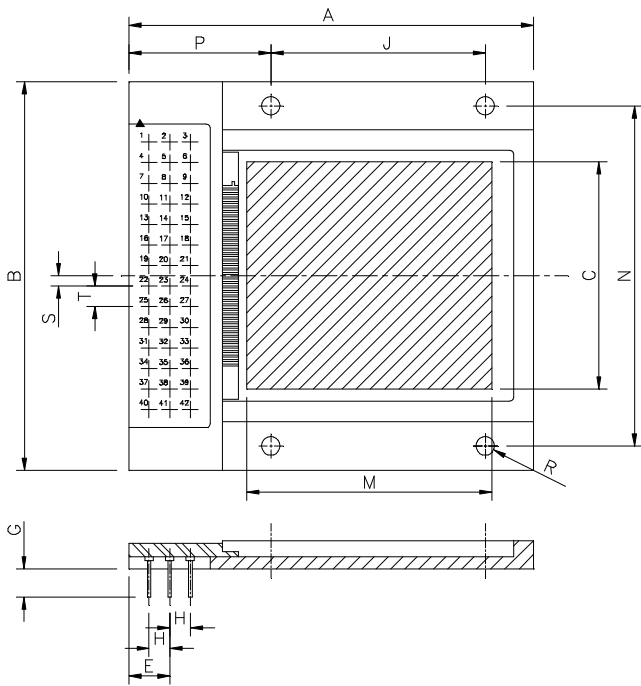
**Note 6**

Pins 8 & 35 are a local substrate (LS) connection for the output nodes. This should be connected to Vss for normal operation.

**Blemish Specification**

<b>Grade</b>	<b>0</b>	<b>1</b>	<b>2</b>
Column Defects	0	3	6
Black Defects	100	150	250
Traps > 200e <sup>-</sup>	10	20	30
White Defects	100	150	200

Minimum separation between adjacent column defects is 50 pixels.



PIN CONNECTIONS

1	SS	2	(FT2)	3	(FT1)
4	(FT3)	5	IØ3	6	IØ1
7	IØ2	8	LS	9	OSL
10	ODL	11	DD	12	RDL
13	SS	14	OG2L	15	OG1L
16	ØSWL	17	DG	18	ØRL
19	RØ2L	20	RØ1L	21	-
22	RØ2R	23	RØ1R	24	RØ3
25	ØSWR	26	DG	27	ØRR
28	SS	29	OG2R	30	OG1R
31	ODR	32	DD	33	RDR
34	IØ2	35	LS	36	OSR
37	(FT3)	38	IØ3	39	IØ1
40	SS	41	(FT2)	42	(FT1)

REF	MILLIMETERS
A	50.00 ±0.20
B	48.00 ±0.20
C	28.10 ±0.20
D	3.50 ±0.20
E	5.00 ±0.38
F	Ø0.45 ±0.10
G	3.50 ±0.20
H	2.54 ±0.13
J	26.50 ±0.20
K	33.02 ±0.20
L	1.30 ±0.20
M	30.30 ±0.20
N	42.00 ±0.20
P	17.50 ±0.20
R	Ø2.30 ±0.20
S	1.27 ±0.13
T	2.54 ±0.13
U	6.00 ±0.20

Notes.

The Frame Transfer (FT) connections are not used on this version of the CCD42-40.

The CCD42-40 is also available in front illuminated format and supplied on a metal package designed for close butting.