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DALSA CA-D1 Cameras

High frame rates, large pixels, and easy-to-interface single outputs make these progressive scan area cameras adaptable to a wide range of applications.



Features

- 128x128, and 256x256 resolution,
- 16µm x 16µm pixels, 100% fill factor
- Frame transfer architecture—no shutter required
- Single output
- Up to 15MHz data rate
- 8-bit or 12-bit digital data in RS422 format
- Vertical and horizontal binning options
- Multi-camera synchronization

Description

The CA-D1 series cameras feature the IA-D1 sensors in single output cameras providing data at up to 15MHz. This allows maximum frame rates of 736 frames per sec (CA-D1-0128A) or 203 frames/sec (CA-D1-0256A).

The CA-D1 cameras use DALSA's patented modular architecture. This system of connecting circuit modules through standardized busses allows DALSA to build a high performance modular camera using the reliability, flexibility, and cost-effectiveness of high-volume interchangeable parts. Within the camera, a driver board provides bias voltages and clocks to the CCD image sensor, a timing board generates all internal timing, and A/D boards process the video and digitize it for output. Contact DALSA for further information.

Applications

The CA-D1 cameras are ideally suited for use in:

- Motion tracking
- Instrumentation
- High frame rate imaging

Sensor

The CA-D1 cameras use the IA-D1 area scan image sensors for high speed, high resolution performance. The sensors use a frame transfer architecture. The pixel size is 16µm x 16µm with a 100% fill factor (all of the image area is photosensitive) to achieve maximum quantum efficiency within the pixel. Figure 1 shows the block diagram of the sensor.

Table 1. Camera Configurations

Specification	A Model	T Model
Pixel Pitch	16µm	16µm
Aperture, 0128	2.1 x 2.1mm	2.1 x 2.1mm
0256	4.1 x 4.1mm	4.1 x 4.1mm
Lens Mount	C-mount	C-mount
Data Bits	8	12
Max. Data Rate	15MHz	10MHz
Max. Frame Rate, 0128	736fps	490fps
0256	203fps	136fps
Data Format	RS422	RS422
Data Channels	1	1

Example Configuration: CA-D1-0256A

resolution — model

Analog output models also available. Contact DALSA

Operation

Power Supplies

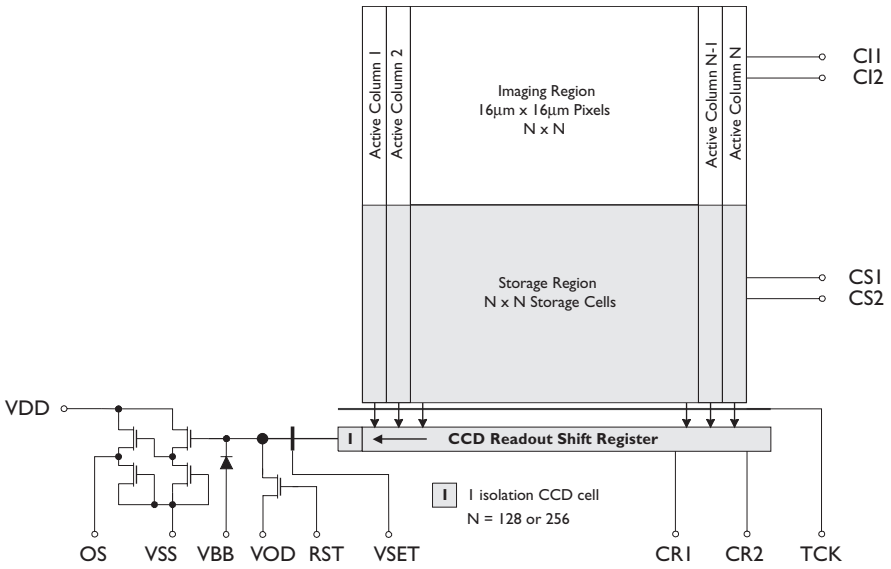
Cameras provide optimum performance using well-regulated linear supplies. The power supply requirements indicated below are adequately overrated to accommodate all models and operating conditions.

Voltage	Current Draw	Notes
+15V	300mA	Specified at 40°C ambient.
+5V	1500mA	Tolerance for all supplies:
-5V	200mA	■ ± 50mV
-15V	100mA	■ <5mV ripple.

Optical Interface

The CA-D1 cameras provide a mount for a C-mount lens. The image sensor's frame transfer architecture means the camera does not require a shutter for most applications.

Figure 1. IA-D1 Sensor Block Diagram



Electrical Interface

All of the CA-D1's connectors are on its rear plate. The camera uses a DB25 connector, 20- or 40-pin IDC connectors, and one BNC connector. The power and control signals are input to and output from the DB25 connector. Digital data and data clocking signals are provided on IDC connectors using the RS422 standard for data transmission. The BNC connector provides an analog video reference for the A and T models.

Input Control Signals

The CA-D1 cameras require only one input signal. The transfer clock EXSYNC is required to trigger frame readout. Note that for optimum performance, the cameras use an internal oscillator to control all internal timing, including pixel rate. **These cameras do not normally accept an external MCLK signal.** Contact DALSA if you want to supply an external MCLK.

Control signals are differential, requiring complements denoted with a "B" suffix (e.g. EXSYNC, EXSYNCB).

Signal	Controls
EXSYNC	Start of frame readout, Frame rate, Integration/Exposure time
BIN	Pixel Binning

EXSYNC

EXSYNC is a user-supplied RS422 input signal used to trigger frame readout and integration time. The camera integrates from falling edge of EXSYNC to the next falling edge of EXSYNC.

EXSYNC State	Camera Mode
High	Integration
Falling Edge	Frame readout begins
Held low	Maximum frame rate

BIN

BIN is an optional RS422 input signal located on pins 14 and 1 of the DB25 connector. This signal is valid only on cameras ordered with a binning option. BIN high causes the camera to bin its pixels, increasing sensitivity while reducing resolution. The camera is available in 1x2 and 2x2 binning options. If you do not use BIN, tie BIN low and BINB high.

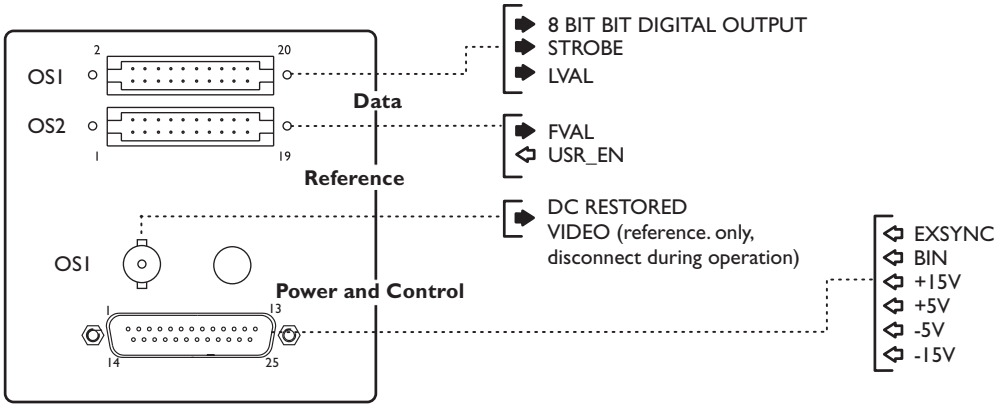
USR_EN

USR_EN is an optional input signal located on the OS2 connector (A model only). It can be used in special operating modes to select a camera from multiple cameras multiplexed onto a common data bus.

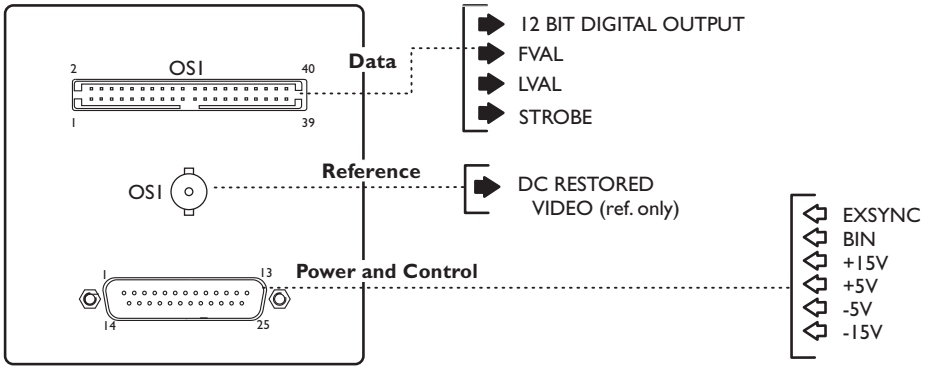
USR_EN State	Camera Mode
Low	Camera outputs tri-stated
High	Camera outputs active
Unconnected	Camera outputs active

Figure 2. Camera Interface

A Model



T Model



Output Signals

These signals indicate when data is valid, allowing you to clock the data from the CA-D1 to your acquisition system:

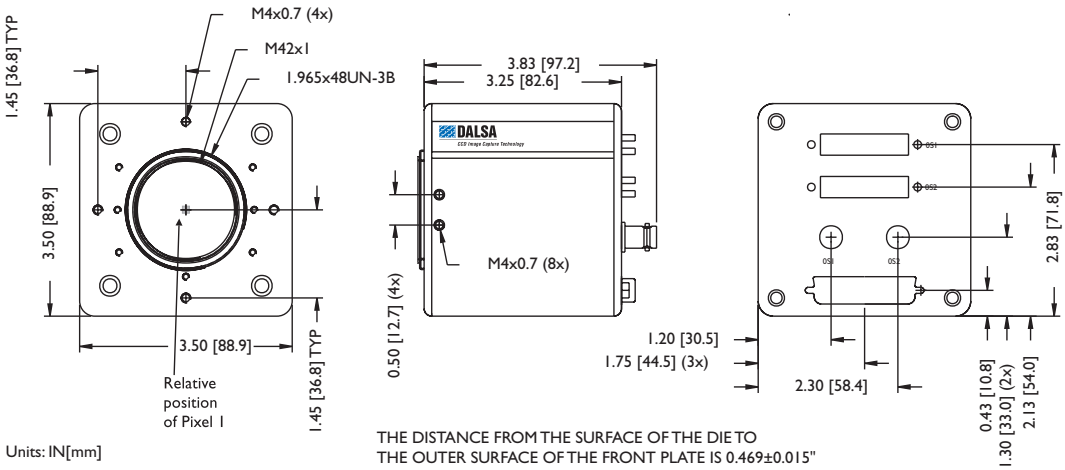
Clocking Signal	Indicates
FVAL (high)	Valid frame
LVAL (high)	Valid line
STROBE (falling edge)	Valid pixel

Digital Data

A models use 20-pin IDC connectors to output data. T models use a 40-pin IDC connector. See Figure 4.

Figure 3. Mechanical Dimensions

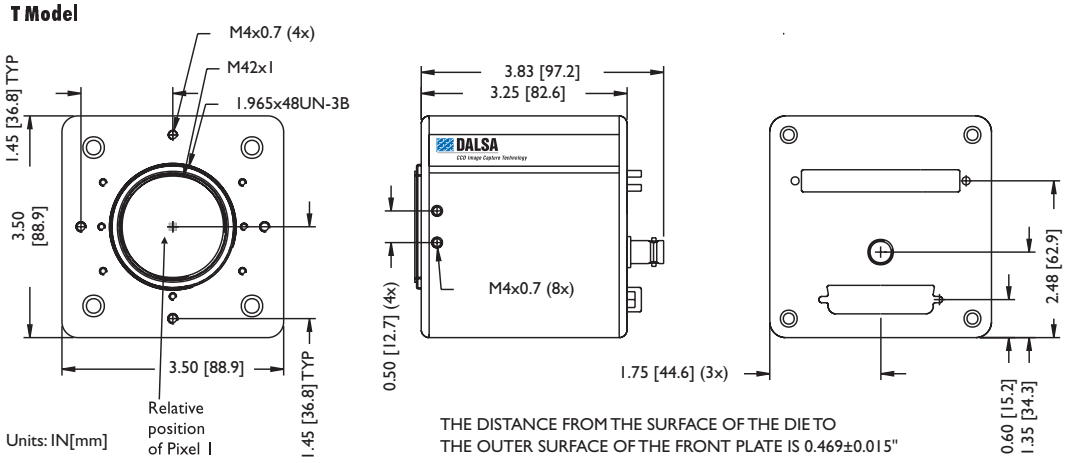
A Model



Units: IN[mm]

THE DISTANCE FROM THE SURFACE OF THE DIE TO
THE OUTER SURFACE OF THE FRONT PLATE IS 0.469±0.015"

T Model

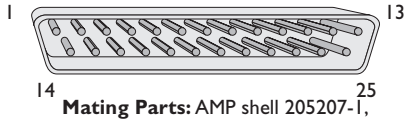


Units: IN[mm]

THE DISTANCE FROM THE SURFACE OF THE DIE TO
THE OUTER SURFACE OF THE FRONT PLATE IS 0.469±0.015"

Figure 4. CA-D1 Pinouts

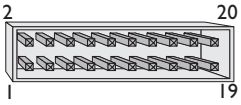
DB25—User Bus & Power



Mating Parts: AMP shell 205207-1, Amphenol hood 17-1657-25, AMP socket 745253-6
Control cable: Belden 9819 28AWG (or equivalents)
Power Cable: 22AWG

Pin	Signal	Pin	Signal
1	BINB (optional)	14	BIN (optional)
2	Factory use	15	Factory use
3	Factory use	16	Factory use
4	EXSYNCB	17	EXSYNC
5	Future use	18	Future use
6	Future use	19	Future use
7	Digital ground	20	Digital ground
8	+5 V Analog	21	+15 V Analog
9	+15 V Analog	22	-5 V Analog
10	Factory use	23	Factory use
11	Analog ground	24	Analog ground
12	-5 V Digital	25	-15 V Analog
13	+5 V Digital		

OS1—A Model Data and Clocking



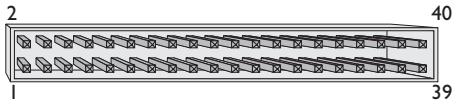
Mating Part: 3M 3421-6000 (or equiv.)
Cable: 26 AWG 100Ω shielded twisted pair

Pin	Signal	Pin	Signal
1	D7 (MSB)	2	D7B
3	D6	4	D6B
5	D5	6	D5B
7	D4	8	D4B
9	D3	10	D3B
11	D2	12	D2B
13	D1	14	D1B
15	D0 (LSB)	16	D0B
17	STROBE	18	STROBEB
19	LVAL	20	LVALB

OS2—A Model

1-15	No connect	2-16	No connect
17	FVAL	18	FVALB
19	USR_EN	20	USR_ENB

D1 (40-Pin)—T Model Digital Data and Clocking



Mating Part: 3M 3417-6000 (or equivalent)
Cable: 26 AWG 100 Ω shielded twisted pair

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	Future use	2	Future use	21	D7	22	D7B
3	Future use	4	Future use	23	D6	24	D6B
5	Future use	6	Future use	25	D5	26	D5B
7	Future use	8	Future use	27	D4	28	D4B
9	D11 (MSB)	10	D11B (MSB)	29	D3	30	D3B
11	D10	12	D10B	31	D2	32	D2B
13	D9	14	D9B	33	D1	34	D1B
15	D8	16	D8B	35	D0 (LSB)	36	D0B (LSB)
17	FVAL	18	FVALB	37	STROBE	38	STROBEB
19	No connect	20	No connect	39	LVAL	40	LVALB

Note: Do not connect to "Factory use," "Future use," or "No connect" pins.

Figure 5. Camera Timing Overview

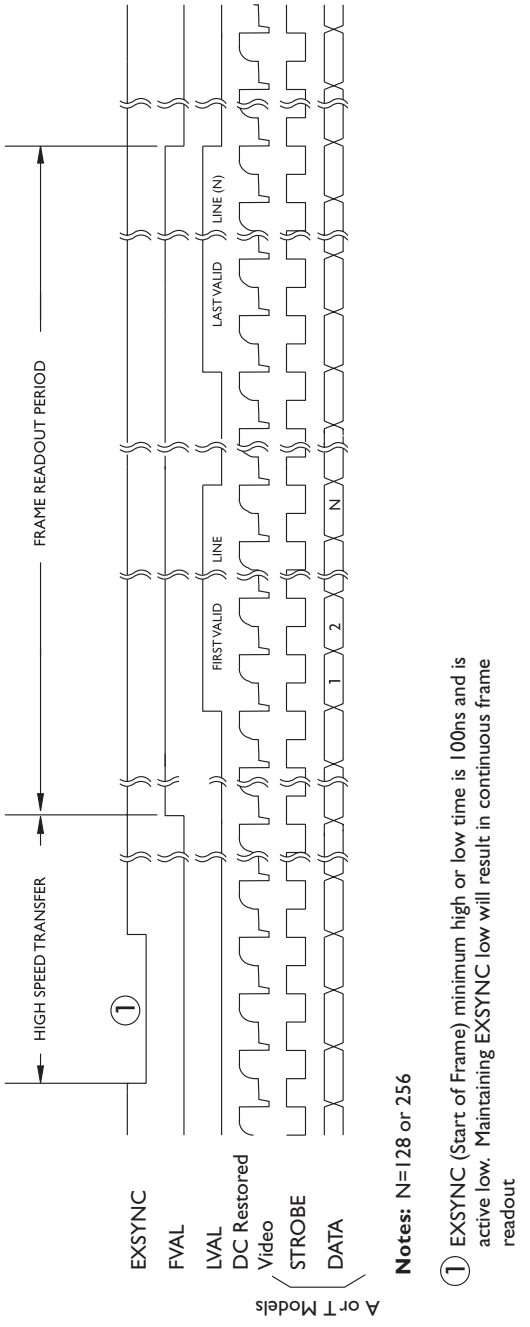


Table 2. CA-D1 Performance Specifications

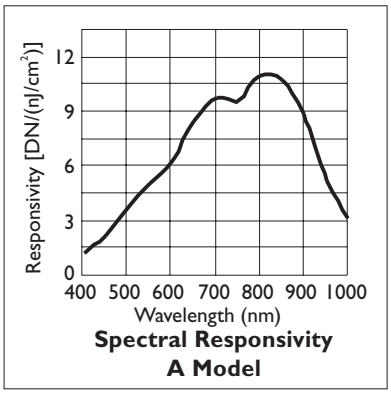
Specification		Units	A Model	T Model
Per Output Data Rate, max.		MHz	15	10
Frame Rate,	max., 128 x 128	Hz	736	490
	max., 256 x 256	Hz	203	136
Saturation Output Amplitude		DN	255	4095
Photoresponse Non Uniformity (PRNU) rms, max.		%	4	4
Fixed Pattern Noise, dark (FPN) rms, max.		DN	2	30
DC Offset, max.		DN	12.5	200
Random Noise	peak to peak, max.	DN	4.5	25
	rms, max.	DN	0.9	5
Noise Equiv. Exposure (NEE), max.		pJ/cm²	214	63
Saturation Equiv. Exposure (SEE). typ.		nJ/cm²	60	44
Responsivity, typ.		DN/(nJ/cm²)	4.2	80
Dynamic Range,	min.	ratio	270:1	760:1
	typ.	ratio	496:1	1320:1
Operating Temperature, max. ambient		°C	40	40

Notes

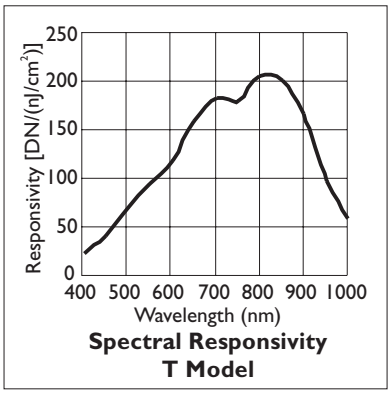
- DN = Digital Numbers (0-255 for 8-bit system).
- See Camera Measurement Definitions (doc# 03-36-00056) for specification definitions.

Test Conditions

- Excludes first four and last four pixels of each output.
- All measurements at 25°C ambient.
- Tungsten halogen light source, black body color temperature 3200K, filtered with 750nm IR cutoff filter.



Spectral Responsivity
A Model



Spectral Responsivity
T Model

ISO 9001 DALSA maintains a registered quality system meeting the ISO 9001 standard.

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