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Find the *Teledyne Dalsa / Coreco Imaging SP-11-02K30* at our website: *Click HERE*

SP-11-xxx30 Compact Line Scan Camera

DALSA's newest, smallest camera sets new standards in performance and value. Once more DALSA raises the bar by bundling an unmatched feature set into a compact package.



Features

- Small form factor (50mm x 50mm x 88mm, <300g)
- 512, 1024, or 2048 x 1 resolution, 14µm square pixels
- 8-bit output from 10-bit digitizer
- 30MHz data rate, LVDS, CE-compliant
- Exposure control and antiblooming
- External clock detection powers down internal clock source when external clock is detected
- Test pattern generation to aid in system debug
- Free run mode—camera will operate without any external control signals
- User-selectable features:
  - 1x2 horizontal binning
  - four gain settings
  - data rate (clock divide by 1 or 2)
- Single 12V input model (SP-12) also available

Description

The SP-11 cameras use DALSA's newest compact modular architecture. Within the SP-11 camera, driver circuits provide bias voltages and clocks to the CCD image sensor, timing circuits generate internal timing, and A/D circuits process the video and digitize it for output.

Sensor

The SP-11 cameras use DALSA's IL-CC line scan sensors. The sensors' photoelements have a photosensitive area of 14µm x 14µm and a center to center spacing of 14µm. Figure 3 shows a block diagram of the IL-CC sensor. See the IL-CC datasheet (document number 03-36-00125) for more details.

Table 1. SP-11 Configurations

Specification	0512	1024	2048
Pixel Pitch	14µm x 14µm		
Aperture 14µm x	7.2mm	14.4mm	28.8mm
Lens Mount	C-mount	C-mount	F-mount
Max. Line Rate:	52.8kHz	27.6kHz	14.1kHz
Data Format	1x8 bits, EIA-644 (LVDS)		
Data Rate	30MHz		
CE Compliance	Yes		

Example Configuration: SP-11-01K30

model — data rate

resolution

Operation

Power Supplies

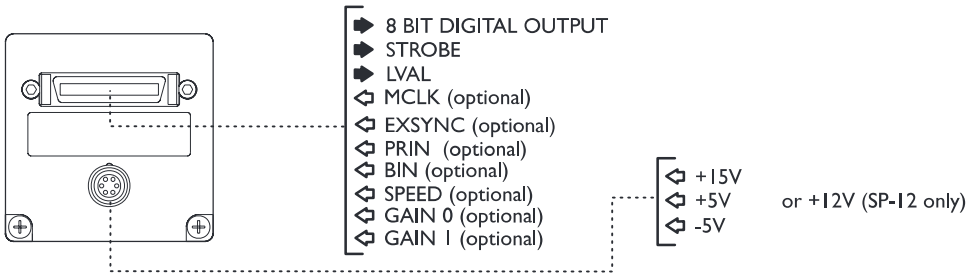
Cameras meet all performance specifications using standard switching supplies, although well-regulated linear supplies provide optimum performance. The standard SP-11 requires three input voltages (±5V, +15V), but a single supply model (SP-12, 12V input) is also available.

Optical Interface

The SP-11 cameras provide an adapter for C-mount or F-mount (35mm Nikon-compatible) lenses, depending on sensor resolution. The mount threads into an opening in the camera's front plate, and is optically aligned to provide the proper distance between lens and sensor.

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Figure 1. Camera Interface



Electrical Interface

All connectors are on the camera rear plate. The standard SP-11 uses Hirose HR10A series 6-pin circular connector for power and a MDR36 (mini D-shell) for data and control signals. Data, clocking, and control signals use the EIA-644 (LVDS) standard for data transmission.

Input Control Signals

Control signals are differential, requiring complements denoted with a "B" suffix (e.g. BIN, BINB). **All inputs are optional and default to logic high.**

Most applications will use an EXSYNC input to control line rate, but the SP-11 can operate in "free-run mode" in which it outputs data without requiring any inputs.

Table 2. EXSYNC and PRIN

EXSYNC and PRIN are used together, as outlined below.

EXSYNC	PRIN	Camera Operation
Supplied from external source (Min 300Hz)	Disabled or unconnected (high)	Edge Mode: EXSYNC falling edge triggers line readout. Camera integrates incident light from the falling edge of EXSYNC to the next falling edge of EXSYNC.
Supplied from external source (Min 300Hz)	Enabled (low)	Level Mode: EXSYNC falling edge triggers line readout. Camera integrates incident light while EXSYNC is high (from **rising** edge of EXSYNC to **falling** edge of EXSYNC). While EXSYNC is low, the camera does not integrate incident light.
Unconnected*	Disabled or unconnected (high)	Free Run Mode: Camera operates at maximum line rate until it receives an EXSYNC edge. No exposure control.
Unconnected*	Enabled (low)	Free Run Mode: Camera operates at maximum line rate until it receives an EXSYNC edge. Each line is only exposed for ~400ns.

* Free run is disabled when the camera receives an EXSYNC edge. The camera will not free run again until it is powered off and on again.

Table 3. Control Signals

These control inputs can be used independently of each other.

MCLK	Unconnected	Internal MCLK controls pixel rate (30MHz)	
	Supplied externally	MCLK controls pixel rate (maximum 30MHz)	
SPEED	Unconnected or High	Pixel rate = MCLK rate	
	Low	Pixel rate = MCLK/2	
BIN	Unconnected or High	No binning	
	Low	Camera combines the charge collected by two horizontally adjacent pixels.	
GAIN		GAIN1 High or Unconnected	GAIN1 Low
	GAIN0 High or Unconnected	8x (default)	4x
	GAIN0 Low	2x	1x

Output Signals

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

Clocking Signal	Indicates
LVAL (high)	Outputting valid line
STROBE (rising edge)	Valid data

Digital Data

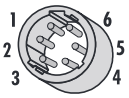
The SP-11 digitizes to 10 bits and outputs the most significant 8 bits in LVDS format on a MDR36 connector.

After the end of each valid line, the camera outputs two isolation pixels and four test pattern pixels. These pixels alternate between 10101010 and 01010101 (eg. 170, 85, 170, 85).

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Figure 2. SP-11 Connector Pinouts

Power Connector



Mating Part: HIROSE HR10A-7P-6S

Pin	Signal	Current
1	+5V	600mA
2	+5V	
3	+15	80mA
4	-5V	80mA
5	GND	
6	GND	

Camera meets all performance specifications using standard switching power supplies.

Voltage Input Tolerance: ±250mV on all supplies.

Control & Data Connector



All data and control signals use EIA-644 (LVDS) format.

Mating Part: 3M 10136-6000EC series
Cable: 26AWG 100W shielded twisted pair

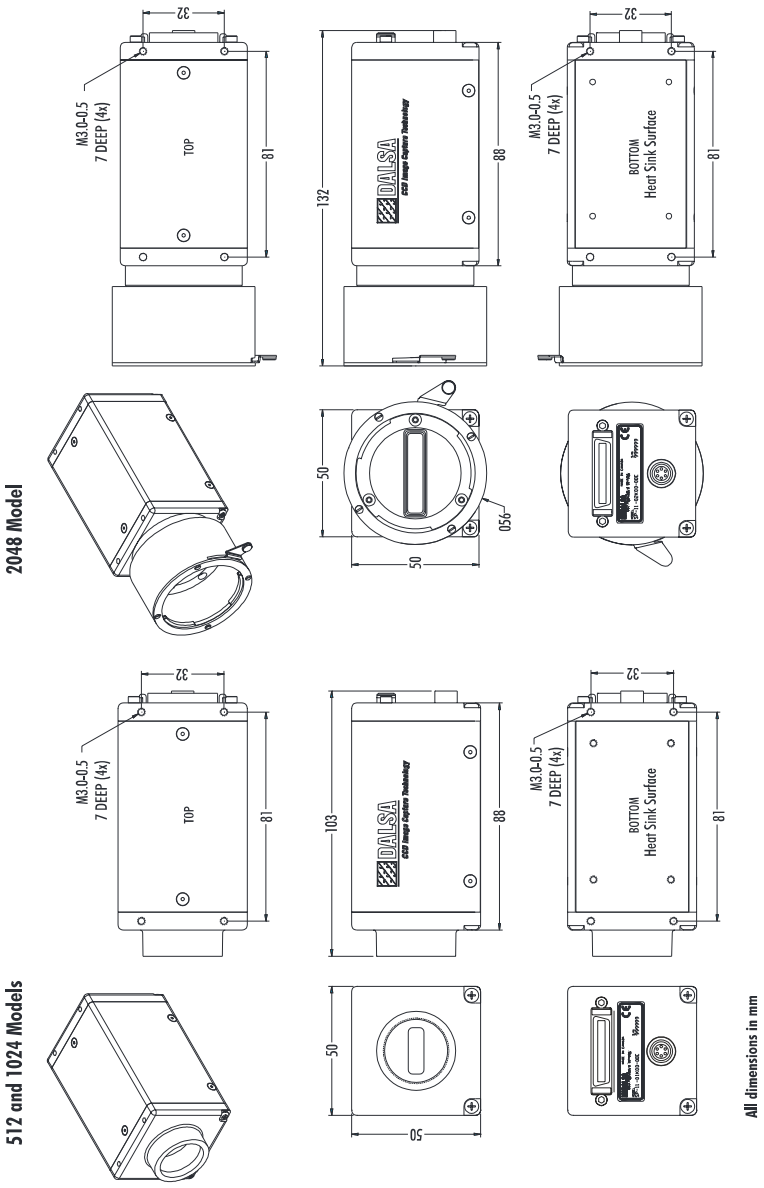
Pin	Signal	Pin	Signal	Description	Default
1	SPEED	19	SPEEDB	Controls data rate	30MHz
2	GAIN0	20	GAIN0B	Controls gain	High
3	Future use	21	Future use	Not used: Do not connect	
4	GAIN1	22	GAIN1B	Controls gain	High
5	MCLK	23	MCLKB	Controls master clock frequency	30MHz
6	PRIN	24	PRINB	Exposure control	Disabled
7	EXSYNC	25	EXSYNCB	Controls line rate/exposure time	Free run
8	BIN	26	BINB	Controls pixel binning (summing)	Disabled
9	D7	27	D7B	Data bits	
10	D6	28	D6B		
11	D5	29	D5B		
12	D4	30	D4B		
13	D3	31	D3B		
14	D2	32	D2B		
15	D1	33	D1B		
16	D0	34	D0B		
17	STROBE	35	STROBEB	Pixel clock; data valid on rising edge	Outputs
18	LVAL	36	LVALB	Pixel data valid during logic high state	

Notes on Operation (for full detail, see the Camera User's Manual)

1. All control signals are OPTIONAL and default to logic high state when unconnected.
2. Long unterminated cables can act as antennae, causing spurious inputs. DALSA recommends tying unused inputs to known states using using differential drivers or resisitive networks.
3. Max. operating temperature is 50°C ambient.
4. Free run is disabled when the camera receives an EXSYNC edge. The camera will not free run again until it is powered off and on again.

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Figure 3. Mechanical Dimensions



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Table 4. SP-11 Performance Specifications

Calibration Conditions	Units	Setting	Range Min.	Range Max.	Notes
Data Rate	MHz	30	30	30	
Line Rate	kHz	3.5	3.5	3.5	
Saturation Output Amplitude	DN	246	240	254	
Saturation Light Intensity	µW/cm^2	21			2
Responsivity	DN/(nJ/cm^2)	40	39	41	
+15 Input Voltage	Volts	15.0	14.9	15.1	
+5 Input Voltage	Volts	5.0	4.9	5.1	
-5 Input Voltage	Volts	-5.0	-5.1	-4.9	
Ambient Temperature	°C	25	22	28	
Calibration Mode		Default			4

Operating Ranges	Units	Min.	Max.	Notes
Data Rate	MHz	15	30	
Line Rate 2048 resolution	kHz	0.3	14.1	
Line Rate 1024 resolution	kHz	0.3	27.6	
Line Rate 0512 resolution	kHz	0.3	52.8	
Temperature	°C	0	50	
+15 Input Voltage	Volts	14.5	15.5	
+5 Input Voltage	Volts	4.75	5.25	
-5 Input Voltage	Volts	-5.25	-4.75	
Responsivity	DN/(nJ/cm^2)	5	40	5
Nominal Gain Range		1x	8x	5

Specification	Units	Min Gain Min.	Min Gain Typ.	Min Gain Max.	Max Gain Min.	Max Gain Typ.	Max Gain Max.	Notes
Saturation Output Amplitude	DN			255			255	
Photoresponse Non Uniformity (PRNU)								
PRNU, Exposure Control Disabled, Global	DN		6	14		7	16	1
PRNU, Exposure Control Enabled, Global	DN		9	18		16	28	1,6
PRNU, Exposure Control Disabled, Local	DN		4	9		5	10	1
PRNU, Exposure Control Enabled, Local	DN		7	14		12	20	1,6
Fixed Pattern Noise (FPN)								
FPN, Exposure Control Disabled, Global	DN		0.6	2		3	7	
FPN, Exposure Control Enabled, Global	DN		5	10		11	18	6
DC Offset, Exposure Control Disabled	DN		4			6		
DC Offset, Exposure Control Enabled	DN		12			24		
Random Noise, pk-pk	DN		2	3		7	12	7
Random Noise, rms	DN		0.5	0.6		1.3	2	7
Dynamic Range	Ratio		480			180		7
Noise Equivalent Exposure (NEE)	pJ/cm^2		100			32.5		7
Sauturation Equivalent Exposure (SEE)	nJ/cm^2		48.4			6		7
Supply current +15V	mA		65	80		65	80	
Supply current +5V	mA		520	600		520	600	3
Supply current –5V	mA		65	80		65	80	

Notes: see next page.

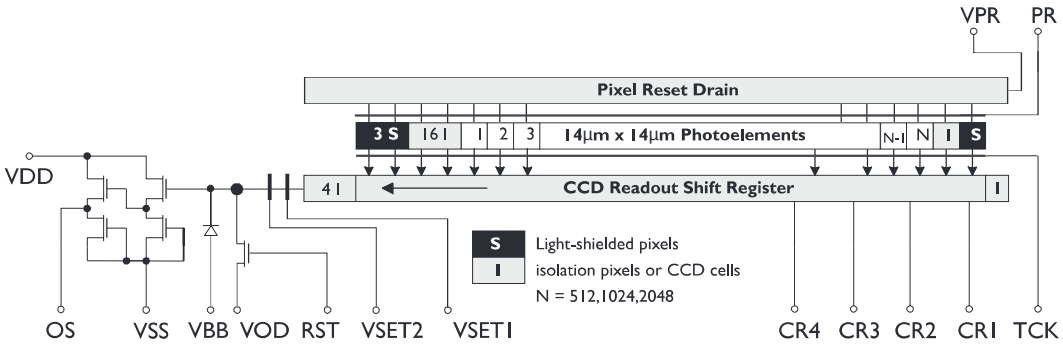
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Notes to Table 4: SP-11 Performance Specifications:

- Performance specification values achieved under calibration conditions. Performance values also achieved over specified temperature range.
- All measurements exclude first and last pixel.
- No performance measurements performed for External Clock, Minimum speed with internal clock, or binning modes. Functional operation verified only.

1. Measured at 50% of Saturation Output Amplitude.
2. Tungsten halogen light source, black body color temperature 3200K, with 750nm cutoff filter.
3. LVDS output signals terminated.
4. Default operating mode: Max. Speed (40MHz), High gain (8x), Exposure Control Disabled, Binning Off, Internal MCLK.
5. Intermediate Responsivity settings available of 10 DN/(nJ/cm^2) at 2x gain and 20 DN/(nJ/cm^2) at 4x gain selectable through user control but not tested.
6. ECE performance results for maximum values are taken at 10 DN/(nJ/cm^2) or 2x gain setting.
7. Exposure Control disabled (ECD).

Figure 4. IL-CC Sensor Block Diagram



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

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