

# VIDEOLOGY<sup>®</sup>

IMAGING SOLUTIONS INC.

## Application Note

### 20/21D35X High Resolution B&W Board Camera Preliminary

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# 1. Introduction

The 2xD35x is a 1/3" high-resolution monochrome camera within our Blue Sky Series of camera boards. The use of state of the art components in the 2xD35x series provides superb image quality, multiple functionality and excellent near infrared sensitivity. Along with these features, its small board design (32 x 32 mm) allows it to be used in current and future applications.

## 1.1. List of Models

*See a sales representative for complete model selections.*

### 1.1.1. B&W Cameras

#### High Resolution 32mm Board

20/ 21D35X

20/ 21D35XB

20/ 21D35XO

20/ 21D35XOB

Composite 1Vp-p CVBS (75 ohms) output

Balanced video output

Aerospace grade, composite 1Vp-p (75 ohms) output

Aerospace grade, balanced video output @ 10 ohms

### 1.1.2. Color Cameras

#### High Resolution 38mm Board

20/ 21D20X

20/ 21D20XB

20/ 21D20XS

Composite 1Vp-p CVBS (75 ohms) output

Balanced video output

Sony Ex-View<sup>®</sup>, composite 1Vp-p CVBS (75 ohms) output

#### High Resolution 32mm Board

20/ 21D10X

20/ 21D10XS

20/ 21D10XB

20/ 21D10XA\*

Composite 1Vp-p CVBS (75 ohms) output

Sony Ex-view<sup>®</sup> CCD, composite 1Vp-p CVBS (75 ohms) output

Balanced video output

Audio version, composite 1Vp-p CVBS (75 ohms) output

#### Standard Resolution 38mm Board

20/ 21D11X

Composite 1Vp-p CVBS (75 ohms) output

#### \* Audio Option:

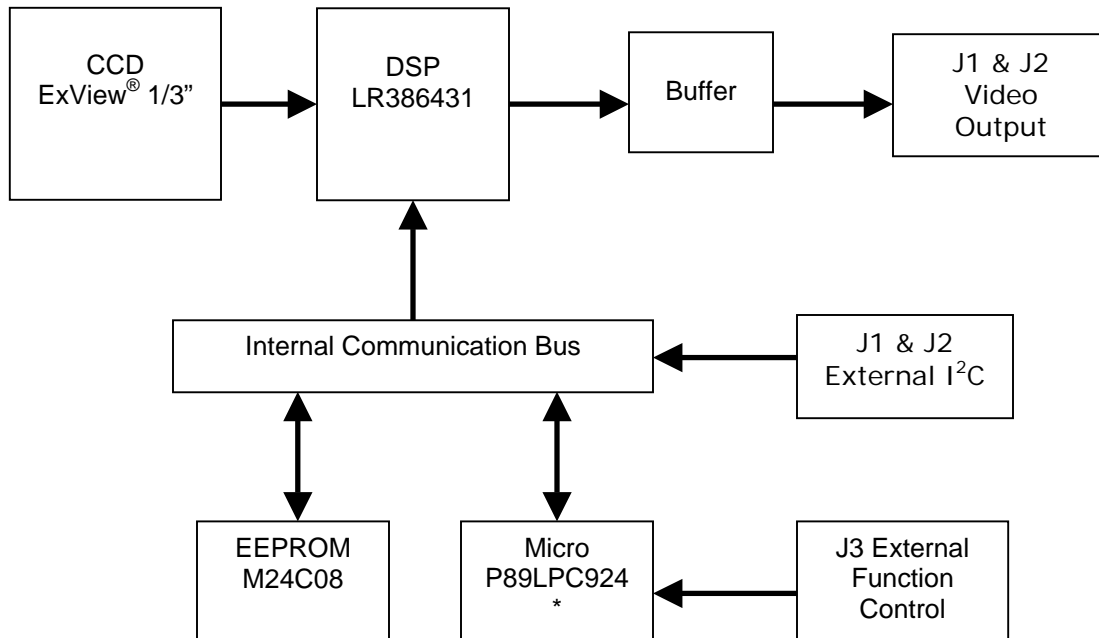
Equipment with audio recording capabilities is intended to be used only for legal and proper purposes. The customer assumes all liability related to legal and proper use per VIS waiver FOR-03-021.

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## 2. Features

- Sony HR ExView® CCD
  - ICX258AL (1/3" B&W HR CCD EIA)
  - ICX259AL (1/3" B&W HR CCD CCIR)
- CVBS or 100-OHM differential video outputs
- Horizontal resolution of greater than 560 TVL
- Back light compensation selection pin on connector
- Factory customizable microprocessor with 6 I/O's
- I<sup>2</sup>C camera control with the following adjustments:
  - Automatic or manual gain control
  - Interlaced or non-interlaced output
  - Gamma 1 or 0.45
  - Contour (edge) enhancement
  - Electronic iris or 10 fixed shutter speeds
- Mirror and non-mirror modes

### 2.1. Block Diagram



\*The micro programmer is factory re-programmable for up to 6 I/O controls accessible at J3.

## 2.2. Differential (Balanced) Video Output

One option for this camera is to have differential (balanced) video output. The model then becomes 2XD35XB. This means that instead of a conventional CVBS output (where there is the video signal and ground), there are positive and negative video signal outputs.

The advantage of this form of transmission is that the signal can be transmitted over longer lengths with less expensive wire. On the receiver side of the video transmission, there is a video device called a balun. A balun converts the differential video signals back to the standard CVBS signal to be displayed or recorded in a standard monitor or video recorder. The balun should be active for all wire runs greater than 250 feet.

Many applications can accept a passive balance for shorter runs.

## 2.3. Electronic Iris and Fixed Shutter Speeds

The default operation of this camera is the electronic iris mode. The output of the CCD, which is dependent on the light intensity, is controlled by the electronics of the camera and not the mechanics of the lens. The amount of signal out of the CCD is dependent on the light intensity and the time that the charge can build up (the period during which no OFD pulse is present). By measuring the output of the CCD and comparing it with an internal reference it is possible to control the level of the signal out of the CCD.

Sometimes it is preferred that the shutter is fixed. One example would be if there is a very fast moving object in the scene. The longer the integration time (the period that no OFD pulse occurs, max 1/50 sec for CCIR and max 1/60 sec for EIA) the less sharp the image will be due to movement of the object during the integration period. To prevent this the camera has 10 fixed shutter speeds that can be selected for the application. They are 1/60 (1/50 CCIR), 1/100 (1/120 CCIR), 1/250, 1/500, 1/1000, 1/2000, 1/10000, 1/20000, 1/50000 and 1/100000. Use the I2C camera control software to select electronic Iris or any of the 10 fixed shutter speeds.

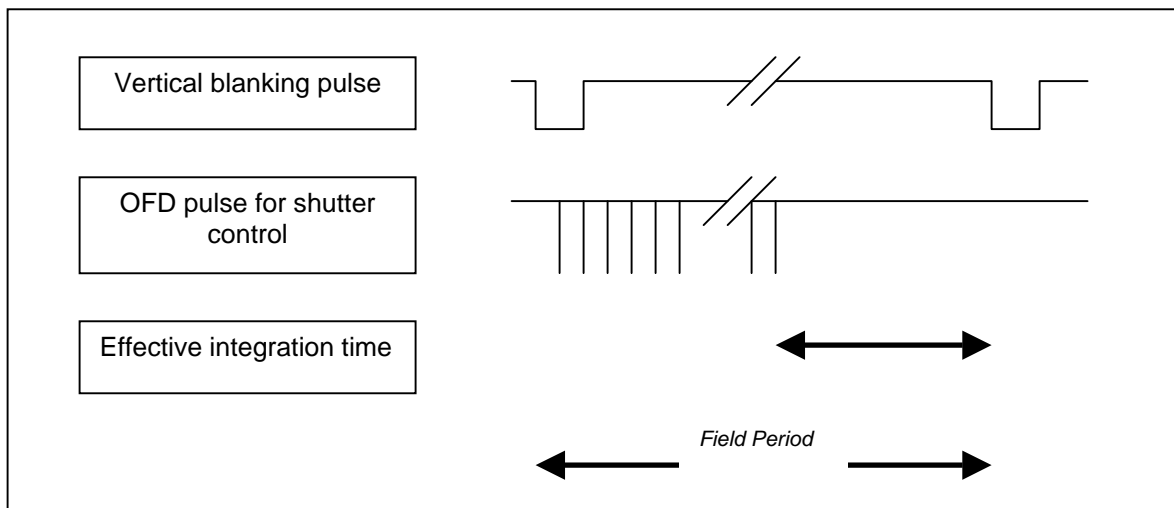


Figure 1. Shutter control

## 2.4. Automatic Gain Control (AGC)

This function is responsible for the output signal remaining constant at a certain level. If the camera is pointed to a gamma reflection chart 0.45 the output should be 1 Vp-p. This control circuit works with an integrator, which is generated from the video, and corresponds with the average value of the video signal. This average is then compared with an internal reference and depending on the outcome will increase or decrease the gain. This camera is in the automatic gain control as a default.

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## 2.5. Manual gain control

The manual gain control is an option where the AGC is turned off and the user selects the amount of gain for the image or to turn the gain off all together. This would be used when the lighting for the scene is constant or controlled. To turn the AGC off un-check the AGC box in the I<sup>2</sup>C camera control software and the slider bar will become active. Adjust the slider up or down a fixed gain can be selected.

## 2.6. Gamma

A camera has a gamma function to correct for the non-linear behavior of the monitor. The gamma curve of the camera is 0.45. With this gamma setting the monitor is able to display the scene as we see it with our eyes. However, if the camera video signal is processed for pattern recognition this gamma function may not be wanted. To make this possible the 20/21D35x has a gamma 1 option. The gamma settings is selected via the I<sup>2</sup>C camera control software.

## 2.7. Contour (edge) enhancement

Contour (edge) enhancement is an image-processing filter that improves the apparent sharpness of the video. It is accomplished by creating bright and dark highlights on the edges of lines in the image therefore enhancing the image and making it look sharper. The default setting for this camera is contour enhancement "on" but by un-checking the select box in the control software you can turn it off. There is also a slide bar that allows for the intensity or gain level of the enhancement to be selected. The default value is set to 15.

## 2.8. Back Light compensation

BLC is when the electronic iris circuit only uses the main part of the scene to determine the level of the CCD output (see figure 2). When fixed shutter speeds are used, this function has no effect. The camera has a default setting of back light compensation (BLC) "on". To switch the BLC off you ground pin 8 of connector J1 or optional connector J2

The Back Light Compensation is fully programmable through the I<sup>2</sup>C camera control software. The size and position of the window can be programmed along with the weighting factor (the relation between the BLC window and rest of the image).

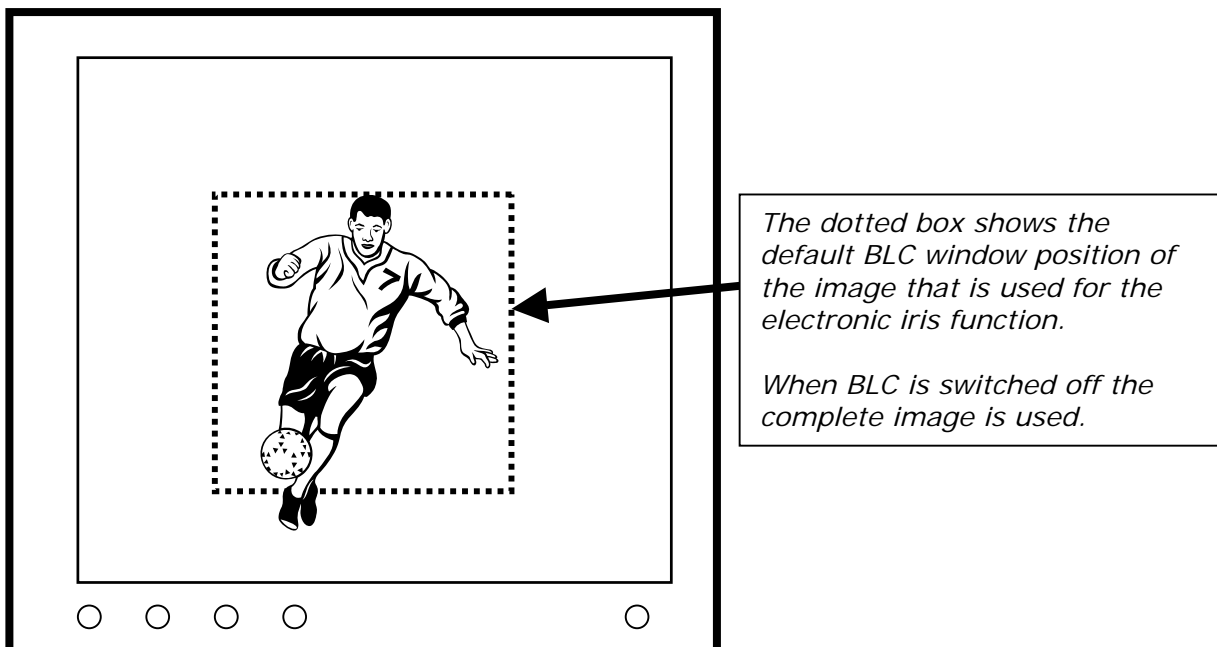


Figure 2. BLC

### 2.9. Spectral response

The CCD is the eye of the camera. It converts light into an electrical signal that will be turned into a video signal by the processing of the camera. However, the camera is not sensitive for all types of light and has a sensitivity peak at 550 nm.

The spectral curve of the 20/21D35x ranges from the visual part of light to the near infrared area (1100 nm). Due to the use of Sony Exview<sup>®</sup> CCD the IR sensitivity is improved drastically. Only filters may change the response. The complete curve is shown in figure 3:

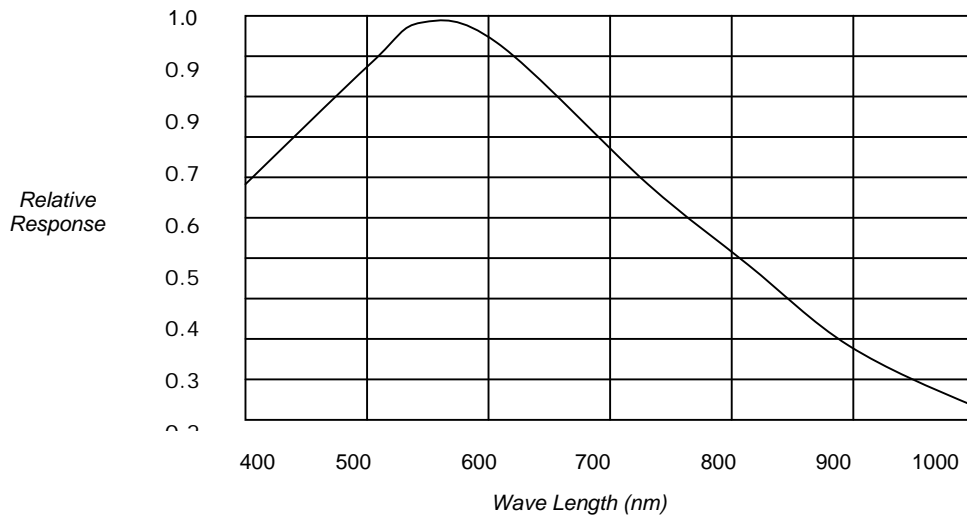


Figure 3. Spectral Response

### 2.10. Interlaced / Non-Interlaced

The camera runs normally in the interlaced mode according to the CCIR or EIA standard. This means that a full picture (frame) is built up out of two half pictures (fields) that are shifted half a line compared to each other. (See figure 4.) Every 40 ms (CCIR) or 33.3mS (EIA) the camera generates a complete picture.

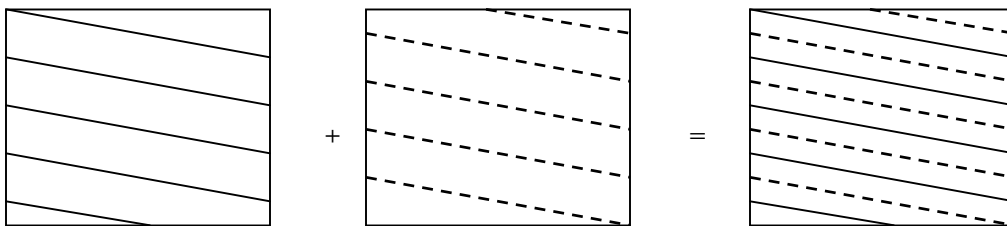


Figure 4. Interlaced Picture

However sometimes the application does not require the high vertical resolution, but requires having the same information in each field (without the half line shift between the fields). In this case the two fields are identical or non-interlaced. (See figure 5.)

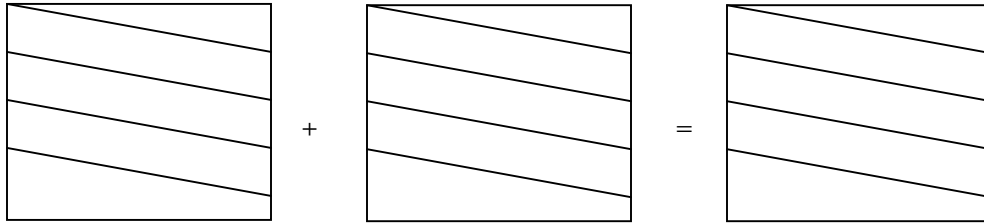


Figure 5. Non-Interlaced Picture

It can be seen that the vertical resolution is less (figure 5) compared with the interlaced mode (figure 4.). However, because the fields are identical the frame rate is increased (doubled).

To put the camera in the non-interlaced mode connect to the camera using the I2C camera control software and select non-interlaced in the drop down menu.

### 2.11. Software control

The camera has an I<sup>2</sup>C serial control interface via three wires; clock, data and ground found on connectors J1 & J2. By connecting these wires to the I<sup>2</sup>C interface (Videology part # 72V0012) and using the Camera Control Software (SFT-03001) you can access the functions described in this application note.

## 3. Connectors

**Table 1: J1 and optional connector J2 pin out configuration (JST-SM08-SRSS)**

Pin #	Standard CVBS output	Differential output
1	+12 V DC in	+12 V DC in
2	Ground	Ground
3	Video output	Differential (+) output
4	Iris output	Differential (-) output
5	I2C Clock	I2C Clock
6	I2C Data	I2C Data
7	Ground	Ground
8	BLC Off	BLC Off

**Table 2: Optional connector J4 pin out configuration (Hirose-DF3A-3P-2DSA)**

Pin #	
1	CVBS
2	Ground
3	+12 V DC in

**Table 3: Optional connector J5 pin out configuration (?)**

<b>Pin #</b>	
<b>1</b>	+ 12 V DC output
<b>2</b>	Ground

**Table 4: Optional connector J3 pin out configuration (JST-SM07-SRSS)**

<b>Pin #</b>	
<b>1</b>	I/O 1
<b>2</b>	I/O 2
<b>3</b>	I/O 3
<b>4</b>	I/O 4
<b>5</b>	I/O 5
<b>6</b>	I/O 6
<b>7</b>	Ground

## 4. Specifications

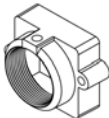
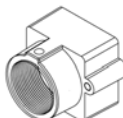

### Electrical

	20D35X NTSC	21D35X PAL
Image Sensor	1/3" Sony Ex-View® CCD	
Picture Elements	768 x 492	752 x 582
Resolution	570 TVL	
Sensitivity	< 0.005 Lux (50 IRE) f1.2, 3200°K	
Signal To Noise Ratio	>48 dB (AGC off)	
Gamma	0.45	
Gain Control	AGC 36dB	
Synchronization	Internal (crystal controlled)	
Scan Mode	Interlaced	
Backlight Compensation	On (off via jumper)	
Contour Enhancement	On	
Iris Controls	Electronic	
Video Output	Composite 1Vp-p CVBS @75 ohms Balanced video output option @ 100 ohms (20D35XB)	
Power Supply	+12VDC (+10% / -20%)	
Power Consumption	< 1.0W	

### Environmental

Operating Temperature	-15° C ~ 55° C (5° F ~ 131° F)
Storage Temperature	-30° C ~ 80° C (-22° F ~ 176° F)
Operating Humidity	20 to 93% RH
Storage Humidity	Up to 98% RH
Lifetime	MTBF >150000 hours
Packaging	Metallized, conductive bags
Warning: Avoid aiming the camera at the sun or other extremely bright lights. The CCD image sensor may be damaged if exposed to very bright objects.	

### Mechanical

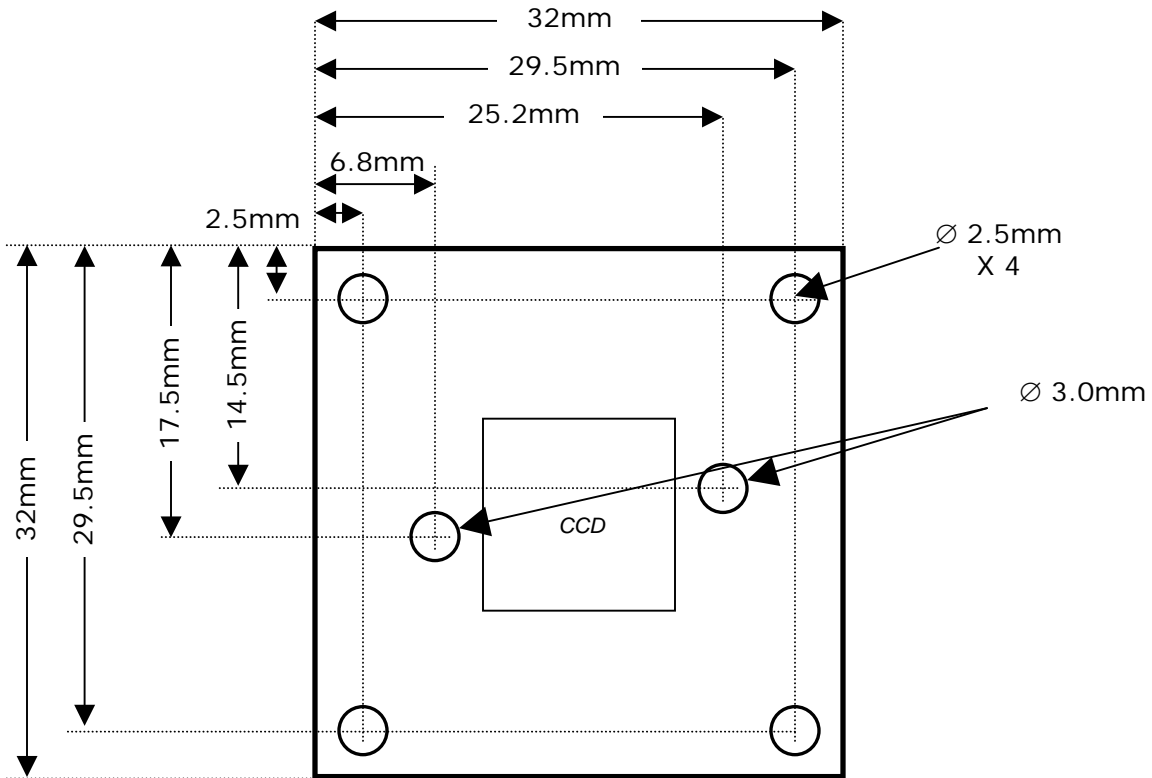
Dimensions W x H x D	32mm x 32mm x 18.14mm w/ pinhole mount (1.26" x 1.26" x 0.71")		
Weight	8.9g (0.020 lbs)		
Lens mount	Replace "X" in model number with desired lens mount option:		
Example: Change 20D35X to 20D355 to select an M-12 Board Mount.	<b>2</b> = Metal M-12 Pinhole	<b>5</b> = Metal M-12 Board	<b>8</b> = Metal CS
			

### Accessories

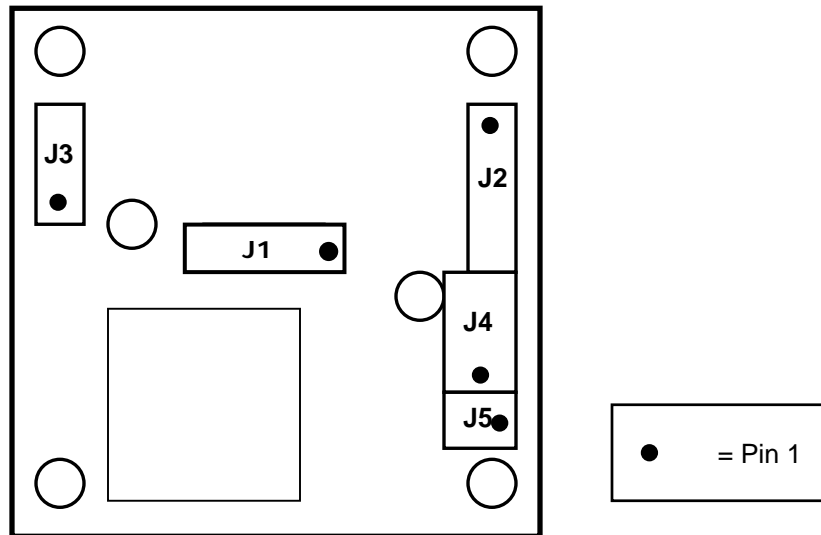
Cable (J4)	70V0213	3-pin AMP un-terminated
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## 5. Dimensions and Connector Placement

### 5.1. Top



### 5.2. Bottom



## 6. Contact

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