Standard 640×512 Mid-wave Cooled Infrared Imaging Module

TECHNICAL DATA

V2.0



CONTENT

1.	Bi	rief Introduction
2.	D	eclarations2
3.	Fe	eatures
	3.1.	Image Output Gating 3
	3.2.	Internal-sync and External-sync Output
	3.3.	NUC and Dead Pixels Replacement
	3.4.	Spatial Filtering
	3.5.	Display Modification on Image Output
	3.6.	Image Orientation
	3.7.	Brightness and Contrast Adjustment
	3.8.	Digital Detail Enhancement (DDE)
	3.9.	Image Contrast Enhancement
4.	E	ectrical Interfaces
	4.1.	Connector Definition
	4.2.	Camera Link Output Protocol
	4.3.	RS422 Protocol
	4.4.	Analog Video Output
	4.5.	External Sync Interface
5.	C	ommand Words 10
6.	Di	mensions

1. Brief Introduction

This standard type of Cooled Infrared Imaging Module is based on the 640×512 MW Cooled Infrared Detector and compatible with most similar types of IR detectors. It can transform the infrared radiation into visualized image. Rich functionalities and interfaces, compact size and low power consumption make it easy to use for the system integration and secondary development. It is utilized in various applications on the security & surveillance, border patrol, UAV load and R&D.

The Module Includes,

	Cooled MW Infrared Detector	1 each
	Cooler Driving Board	1 pc
	AD Board	1 pc
	DB Board	1 pc
	Power Supply Board	1 pc
\triangleright	Internal Connection Cables	1 set

The main features and specifications are as below,

- ➢ Image Resolution: 640×512
- Spectral Range: 3~5 um
- Pitch Size: 15um
- ➢ F number: 2, 3 or 4
- > NETD: ≤ 25 mK or Detector Typical NETD+5mK
- Max Frame Rate of Image Output: 100 Hz
- Video Output Interfaces: Camera Link (digital) and Analog video, others can be customized
- Image Output Type: 8-bit, 14-bit and 16-bit selectable
- ➢ Power Consumption: ≤20W (steady-state), ≤30W (during cooling down)
- > Cooling Down Time: $\leq 8 \min$ (room temperature)
- ► Image Polarity: White Hot/ Black Hot

- Digital Detail Enhancement
- Image Contrast Enhancement
- Image Filtering and De-noising
- Image Integration: Auto/manual Modification on the integration time
- Internal Sync or External Sync
- Single and Two-point NUC, the correction parameters can be fixed
- > Auto/Manual Dead pixels replacement
- > Provides test images, such as gray level gradient, stripe target and checkerboard
- > Analog image rollover, mirroring, freeze and digital zooming
- Crosshair overlay/remove
- > Operating Temperature: -40~+60°C
- Storage Temperature: -55~+70°C
- ➢ Humidity: 0%∼80%RH

Interfaces and Power Supply

- Digital Video Output: CameraLink@14bit (16bit), CameraLink@8bit
- > Analog Video Output: PAL (NTSC), upon the frame rate
- Communication Interface: RS422
- External Sync: Differential LVDS
- > Power Supply: 28V DC (nominal), 18~36V DC

2. Declarations

- > The module cannot be used with the power supply out of the defined voltage range.
- Any disassembly on the electronic boards without permission breaks the maintenance terms and conditions.
- > Except the analog output, any hot-plugging on another connectors is prohibited.
- This documents is only related to the electronic boards and the imaging module. For further detailed information of the cooler, please refers to the cooler operation manual or contact the cooler manufacture.

3. Features

3.1. Image Output Gating

The module provides the feature of online gating on the real-time IR image and test images. Users can select the image output among 14-bit, 16-bit, 8-bit gray scale, and test images. The analog and digital video interfaces are changed synchronously with the image output gating. This feature is also customizable.

There are 9 types of test images, including row gray level and its dynamic map, column gray level and its dynamic map, row 5-square target and its dynamic map, column 5-square target and its dynamic map, and also checkerboard.





Column gray level



Checkerboard



3.2. Internal-sync and External-sync Output

The module provides the feature of internal-sync and external-sync output, which can be switched automatically or manually. When the module is working under the externalsync mode, the image will be output at the corresponding frame rate if the external-sync signal is detected. If not, the module will switch to internal-sync mode automatically. The frame rate of the external-sync signal is less than the maximum frame rate of the image output.

3.3. NUC and Dead Pixels Replacement

The module provides the feature of single and two-point Non-uniformity correction and dead pixels replacement. The default image is output after NUC and dead pixels replacement. If users change the infrared lens, the NUC should be executed again on the module together with the new lens. The correction parameters should also be saved accordingly.

3.4. Image Spatial Filtering

The module provides the feature of image spatial filtering. Users can open or close that filtering and modify the filtering coefficient. The smaller coefficient, the stronger filtering effect. This feature is default enabled. Generally, the module works properly under the default mode and relative parameters.

3.5. Display Modification on Image Output

The module provides the feature of display modification on image output. The image can be displayed at White hot or Black hot mode.

3.6. Image Orientation

The module provides the feature of image orientation adjustment. The image can be output with Mirror Horizontally or Mirror Vertically.

3.7. Brightness and Contrast Adjustment

The brightness and contrast of the image can be adjusted online.

3.8. Digital Detail Enhancement (DDE)

The module provides DDE feature. Users can adjust the image through the DDE level. The higher DDE level, the stronger enhancement effect.

3.9. Image Contrast Enhancement (ICE)

The module provides the feature of image contrast enhancement. Users can adjust the image contrast through the ICE level. The higher ICE level, the stronger enhancement effect.

4. Electrical Interfaces

4.1. Connector Definition

The connector definition and wiring instruction are as below,

1) On-board output connector: PP1, type name: J63A-2F2-025-431-TH, matching connector: J63A-212-025-161-JC. The definition as below,

Pin	Signal	Connecting pin/signal	Remark
1	CMDCLKOUT+		Camera Link CLK
3	CMDCLKOUT-		
5	CMDOUT0+		Camera Link Channel 0
7	CMDOUT0-	Connecting	
9	CMDOUT1+		Camera Link Channel 1
11	CMDOUT1-	with system	
13	GND		
2	GND		
4	GND		

Pin	Signal	Connecting pin/signal	Remark
6	CMDOUT2+		Comerce Link Channel 2
8	CMDOUT2-		Camera Link Channel 2
10	CMDOUT3+		Camera Link Channel 3
12	CMDOUT3-		Callicia Link Chainer 5
15	DS_TXD2+		IR RS422 Output
17	DS_TXD2-		In no+22 Output
19	DS_RXD2+		IR RS422 Input
21	DS_RXD2-		in no+22 input
23	EXT_SYNC+		External-sync,
25	EXT_SYNC-		differential LVDS or RS422 differential level
14	NC		
16	NC		
18	NC		
20	NC		
22	AV_VIDEO		Analog video
24	AGND2		Analog video GND

2) On-board power supply connector: PP2, type name: J63A-2F2-015-431-TH, matching connector: J63A-212-015-161-JC. The definition as below,

Pin	Signal	Connecting Pin/signal	Remark
1	P_I_5V+		
3	P_I_5V+	Connecting PP3: pin4, pin5	
5	P_I_5V+	connecting 110. pm , pmc	
7	P_I_5V+		5V
2	P_I_5V-		power supply
4	P_I_5V-	Connecting PP3: pin6, pin7	
6	P_I_5V-		
8	P_I_5V-		

Pin	Signal	Connecting Pin/signal	Remark
10	P_I_7V+		
12	P_I_7V+	Connecting PP3: pin12	
14	P_I_7V+		7V
9	P_I_7V-		power supply
11	P_I_7V-	Connecting PP3: pin11	
13	P_I_7V-	1	
15	NC		

3) The connector on the power supply board: PP3, Type name: J30-15ZK, matching connector: J30-15TJL. The definition as below,

Pin	Signal	Connecting Pin/signal	Remark
1	+28VIN		Power supply+, voltage
9	+28VIN	Connecting with the	range 18V~36V
2	-28VIN	system power supply	Power supply -
10	-28VIN		rower suppry -
		Connecting with the	
		system power-on and	Power-on and control,
3	TTL+	control, can remain	5V high level power,
		unconnected, default	TTL-share with -28VIN
		power-on	
4	+5V	Connecting PP2: pin1,	
5	+5V	pin3, pin5, pin7	5V nower supply
6	5VGND	Connecting PP2: pin2,	5 v power suppry
7	5VGND	pin4, pin6, pin8	
8	24VGND	Connecting cooler	
15	24VGND	driving board power-	24V power supply
13	+24V	Connecting cooler	
14	+24V	driving board power+	
11	7VGND	Connecting PP2: pin9, pin11, pin13	7V power supply

Pin	Signal	Connecting Pin/signal	Remark
12	+7V	Connecting PP2: pin10,	
12		pin12, pin14	

4) Analog video connector: PP4, Type name: MCX_KWHD. The definition as below,

Pin	Signal	Connecting Pin/signal	Remark
1	AVIDEO		Analog video signal
2, 3, 4, 5	AGND		Analog video GND

4.2. Camera Link Output Protocol

Camera Link Output is developed with TI DS90CR285MTD/NOPB. The 14-bit or 16bit digital image is transferred according to the 16-bit×1 wiring definition of Base0 basic configuration refer to the Camera Link Standard 2.0. The wiring definition is as below. The data is from Camera_Data0 to Camera_Data15. Camera_LVAL is for effective row signal, Camera_FVAL is for effective frame signal, Camera_DVAL is for effective data signal and Camera_CLK is for pixel CLK signal.



Fig 4-1 Camera Link Wiring Definition

As below, CLK=Camera_CLK, FVAL=Camera_FVAL, LVAL=Camera_LVAL, DVAL=Camera_DVAL, DATA=Camera_Data[0-13]. N is for effective pixel value of 1 frame, CLK is for pixel CLK, DATA is 512 rows and the first row is in front. The data of each row has 640 pixels. The data aligns to the top edge of CLK.



Fig 4-2 Camera Link Timing

4.3. RS422 Protocol

The module can be controlled through RS422 interface. The RS422 is in accordance with below information. The default RS422 setup is,

Baud Rate 115200, 8bits data, 1 start bit, 1 stop bit, even parity bit.

4.4. Analog Video Output

The analog video is output with CVBS composite video. PAL is default, can also be changed to NTSC. The output resolution is 640×512.

4.5. External-sync Interface

The external-sync interface is LVDS differential level.

5. Command Words

The module is controlled through RS422 interface. It doesn't send out any information, but only receives the information from the outside host machine. When receiving the command words in accordance with the protocol, the module executes the command and feedbacks the results.

The communication command words are also customizable.

6. Dimensions



Fig 6-1 Dimensions of 640×512 detector



Fig 6-2 Dimensions of 640×512 IR imaging module