SLA-1500 Interface Control Documentation

DATE: January 19, 2016

PN: ICD-SLA-1500-OEM

Hood River, OR 97031

USA

Table of Contents

Index of Tables

Illustration Index

Revision History

Date	Comments
2016-JAN-19	Added section on Thermal Management
2015-OCT-19	Added SLA-1500-mAB section
2015-OCT-16	Added KNOWN ISSUES:section
2015-SEPT-17	Updated SLA-1500-AB Connectors, Added SLA-1500-SONY table captions, added illustrations for SLA-1500-SONY J3 Pin 1
2015-SEPT-15	Updated hardware overview, Added IO block diagram, added accessories summary section, updated connector details for SLA-1500-SONY, corrected copyright
2015-MAY-11	Formatting, Minor Text and Table Edits, Fix SLA-1500-AB J3 table, Copyright dates, Added Revision History, Image & Table Indexes

Safe Device Handling

It is required that all equipment be handled in an ESD safe way and use best practices for setting up and handling **ALL** equipment. These procedures are not outlined here.

Table 1: Safe ESD Device Handling

Thermal Management

Since the SLA-1500-OEM / SLA-1500-SOM uses package on package (PoP) technology, the physical processor is not directly accessible because of the memory components stacked on top. This limits the effectiveness of reducing junction temperatures via a thermal path to the top of the DM3730 processor. Attaching a heatsink to the top of the PoP package or providing a thermal path to the end-product case reduces the processor junction temperature.

Heatsink

SightLine recommends that all hardware use some form of mechanical heatsink (example).

Gap Filler (Thermal Grease)

When possible use some form of thermally conductive liquid gap filling material such as Arctic Silver rather than an adhesive.

Gap Pads

When possible use some form of thermally conductive material for filling air gaps such as the Bergquist VO Ultra Soft pads.

Mechanical

See Board Dimensions below for size and placement.

Junction-to-Case Thermal Resistance (Theta-JC)

Not available. See Operating Temperature below.

Overview

Document describes the SLA-1500-OEM product line hardware and some accessories. The SLA-1500 from SightLine Applications is a very small, low power, single-channel on-board video processor for unmanned airborne or ground vehicles in ISR applications. The system is capable of processing and streaming HD video outputs to 720P. This product is designed to add advanced capabilities to camera systems. It operates on video right at the source, which is key for low latency performance and best video quality.

SLA-1500-OEM

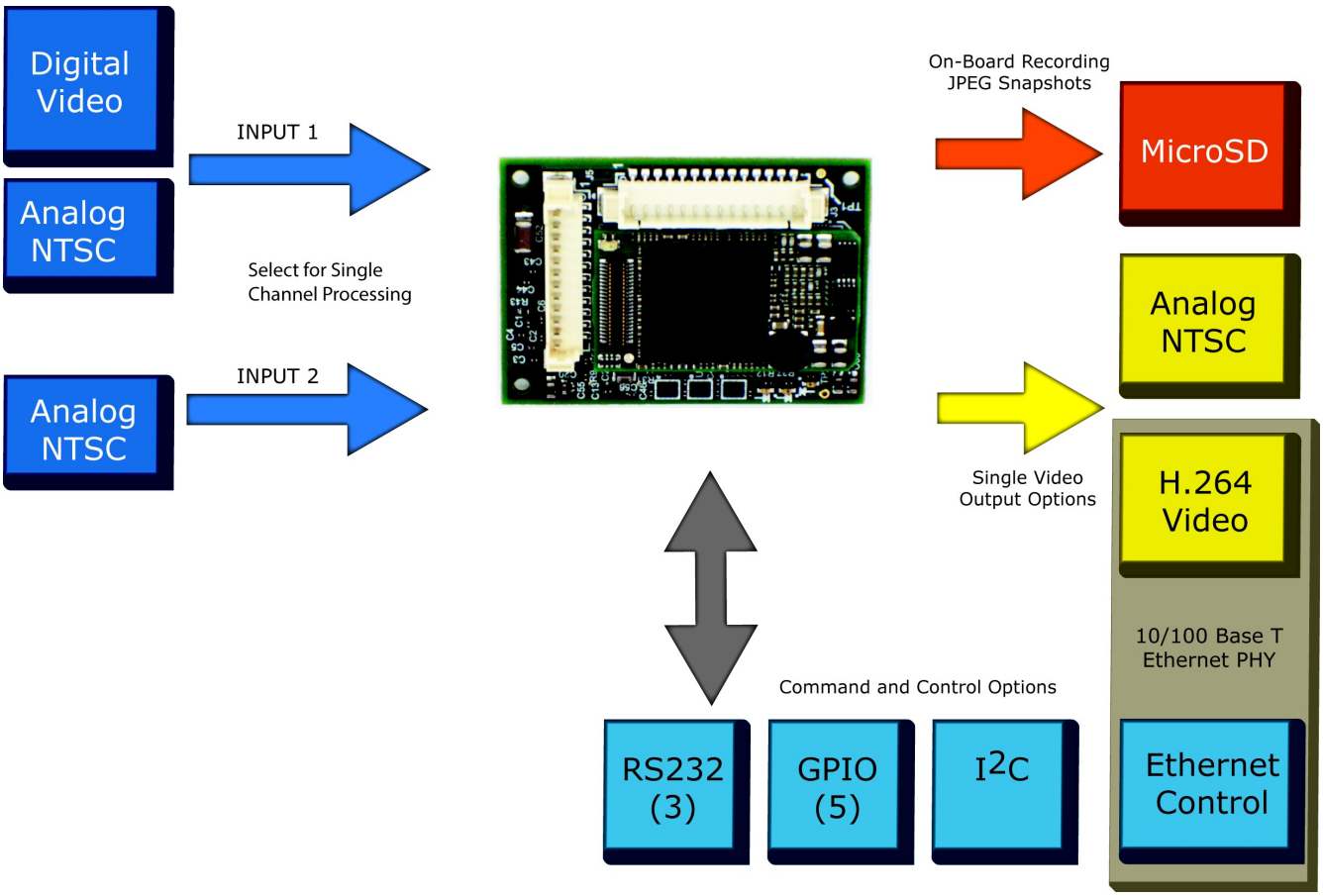


Illustration 1: SLA-1500-OEM IO Block Diagram

Board Summary

Dimensions	37.74mm x 26.54mm x 10.14mm
Weight	7.6 grams
Power	5 VDC @ 330 mA
Component Temp Range	-40°C to 85°C[1]
Operating Temperature	-40°C to 55°C
Current Revision	**C**

Table 2: SLA-1500-OEM Physical Characteristics

Primary Input / Output:

• 4.5V – 6V DC Input	• Digital Video Input (16-bits + clocks)
• Analog Video In (x2)	• 3.3V TTL Serial Ports (x3)
• Analog Video Out (Composite TV Out)	• I^2C
• 10/100Base-T Ethernet	• On-board FPGA for advanced video signal processing
• 4 GPIO	• MicroSD Card

Table 3: SLA-1500-OEM Primary IO

Accessories

Camera Interfaces

Adaptor boards for EO Cameras: • Sony (FCB-EH6xxx, EV7xxx, EH31xx) • Hitachi DI-SC120R • HDMI • CameraLink	**Adaptor boards for IR Cameras**: • FLIR Tau (direct connect) • FLIR Neutrino • FLIR Quark • DRS Tamarisk

Table 4: SLA-1500-OEM Common Camera Interfaces

1 Available in most configurations.

System Interfaces

- Round-wire and Board to Board interfaces supported
- Support boards provide easy connection for system use and laboratory, with standard RJ45, serial, and coaxial video connectors
- Small enclosed solution option

Connector Summary

Label	MFG Part Number	Function	Mates with...
J3	Molex 53398-1471	Analog Video In/Out, Power, Serial, Ethernet	Molex 51021-1400
J4	Hirose DF12B(5.0)-50DP-0.5V(86)	Digital Camera, Serial, I2C, Power, etc.	Hirose DF12B-50DS-0.5V(86)
J5	Molex 53398-1271	JTAG, USB	Molex 51021-1200
S1	JEA ST9S008V4AR1500	Micro SD socket	Any Micro SD card

Table 5: SLA-1500-OEM Connectors

Board Dimensions

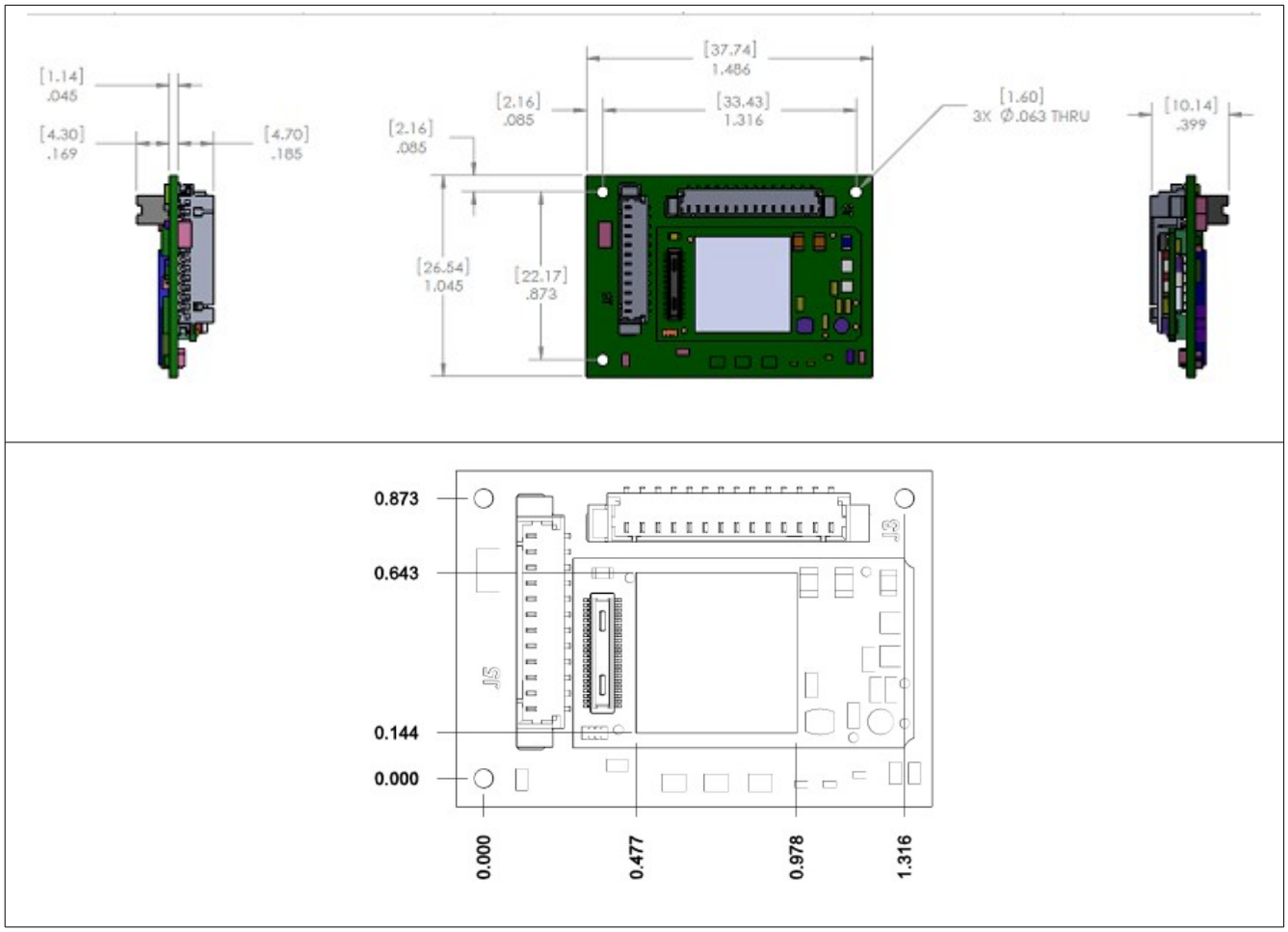


Table 6: SLA-1500-OEM Layout/Dimensions

Mounting Holes

All mounting holes shall support M1.6 screws. See also the **ICD-SLA-1500-ENC.PDF** for more options.

SLA-1500-SOM

The following image shows orientation of SLA-1500-SOM relative to SLA-1500-OEM.

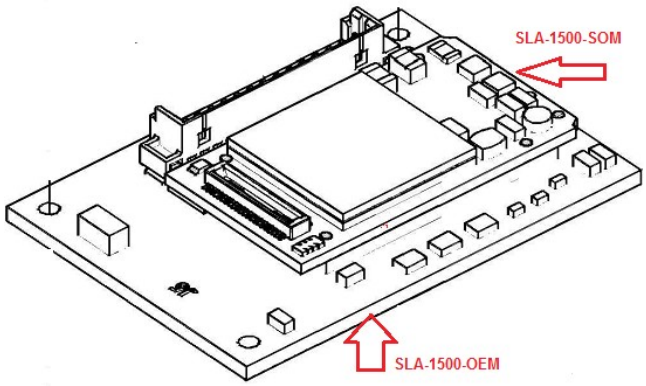


Illustration 2: SLA-1500-SOM Orientation

NOT SHOWN: J5 connector on SLA-15000-OEM

NOTE: Do not remove the SLA-1500-SOM from the SLA-1500-OEM

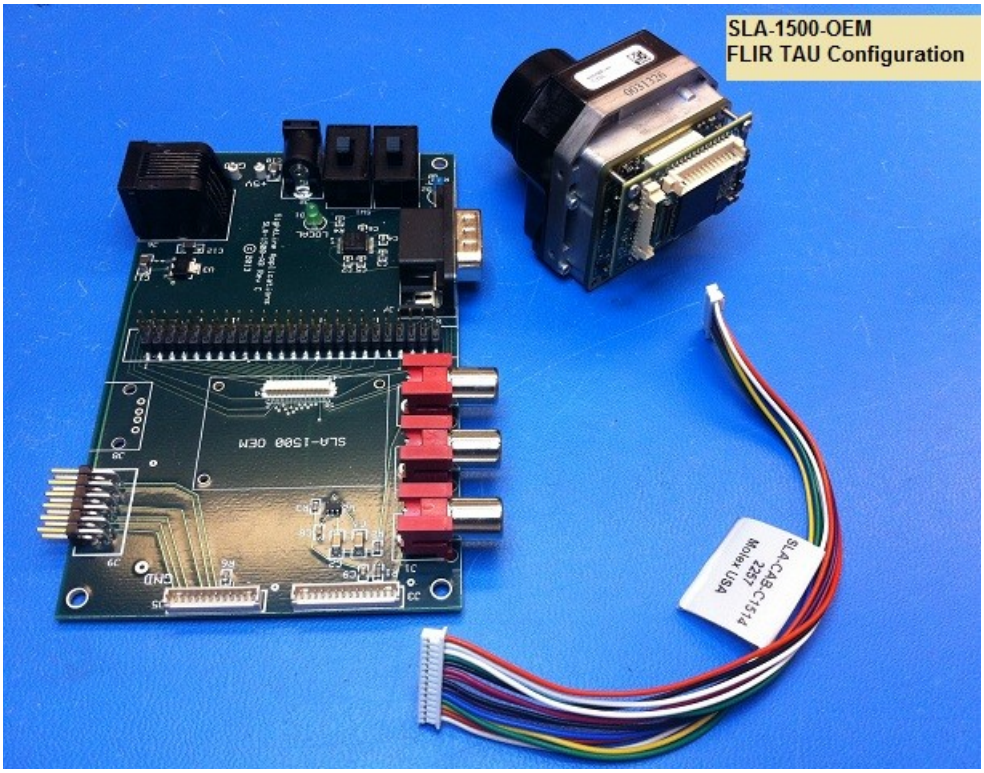


Illustration 3: SLA-1500-OEM connected to FLIR TAU 640 with SLA-1500-AB (REV C)

Connector J3: Analog Video, Power, Serial, Ethernet

Pin	Signal	Description		Pin	Signal	Description
1	Video In 0	Analog Video Input		8	Vin	Power Input (4.5 – 6V: 5V nominal)
2	AGND			9	Vin	
3	Video Out	Analog Video Output		10	DGND	
4	AGND			11	RX-	10/100BaseT Ethernet
5	TXA	3.3V Serial		12	RX+	
6	RXA			13	TX+	
07	DGND			14	TX-	

Table 7: SLA-1500-OEM J3 Pinout

Analog Video Out (Composite TV Out)

Support composite DC coupled output full-scale voltage output: minimum 1.2 Vpp with a 75-Ω load. The following video standards are supported:

- NTSC-J, M
- PAL-B, D, G, H, I
- PAL-M

NOTE: A 75 Ohm resistor load is required on the TV Out for proper signal quality.

Connector J4: Digital Camera, Serial, Power (DEFAULT)

This connector is design to allow the SLA-1500-OEM to mate with the FLIR TAU 640 or other SLA accessory boards. This is a generic camera input supporting up to 12-bits video data.

Signal Level	Name	Pin	Pin	Name	Signal Level
VIOSEL	RXB	1	2	TXB	VIOSEL
VIOSEL	CAMD15 / CAMXCLKA	3	4	CAMD14 / CAMCLKB	VIOSEL
	DGND	5	6	DGND	
VIOSEL	I2C SCL	7	8	I2C SDA	VIOSEL
VIOSEL	GPIO175	9	10	CAMFLD	VIOSEL
VIOSEL	CAMVS	11	12	CAMHS	VIOSEL
VIOSEL	GPIO174	13	14	CPIO173	VIOSEL
VIOSEL	RXC	15	16	TXC	VIOSEL
	DGND	17	18	TAUDET	
3.3V	GPIO178	19	20	CAMD13	VIOSEL
VIOSEL	EXTSYNC (NYI)	21	22	CAMD12	VIOSEL
VIOSEL	CAMD11	23	24	CAMD10	VIOSEL
VIOSEL	CAMD09	25	26	CAMD08	VIOSEL
	DGND	27	28	DGND	
VIOSEL	CAMD07	29	30	CAMD06	VIOSEL
VIOSEL	CAMD05	31	32	CAMD04	VIOSEL
VIOSEL	CAMD03	33	34	CAMD02	VIOSEL
VIOSEL	CAMD01	35	36	CAMD00	VIOSEL
	DGND	37	38	DGND	
VIOSEL	CAMPCLK	39	40	GPIO172	VIOSEL
	DGND	41	42	DGND	
	Analog Video In 1	43	44	Analog Ground	
	DGND	45	46	VIOSEL	below
	Power Return	47	48	Alternate Power In/Out	5V
	Power Return	49	50	Alternate Power In/Out	5V

POWER	ANALOG VIDEO	DIGITAL VIDEO	I2C	Serial	GPIO	GROUND

Internal Pullup

The pullup drive strength is equal to: minimum = 50µA, typical = 100 µA, maximum = 250 µA (unless otherwise specified).

Connector J5: FPGA JTAG

Use with SLA-CAB-1512 and SLA-1500-AB board.

Pin	Signal	Description	Pin	Signal	Description
1	+5V	Vin	7	TMS	
2	Reserved		8	TDI	
3	Reserved		9	VJTAG	
4	Reserved		10	TRST	
5	DGND		11	TDO	
6	TCK		12	VPUMP	

Table 8: SLA-1500-OEM J5 Pinout

Socket S1: MicroSD

- Push In, Push Out
- 3.3mm card eject length
- 10,000 Mating Cycles
- Works with most Micro SD cards

Power

Connector/Pin	Name	Range	Tolerance
J4 Pin 46	VIOSEL	1.8, 2.5V, 3.3V	± 0.1V
J4 Pin 48 & 50	P5V	4.5 – 5.5V	
J3 Pin 8 & 9	P5V	4.5 – 5.5V	

Table 9: SLA-1500-OEM Power Supply Pins

NOTE: Apply 5V to either J3 (Pin 8 & 9) or J4 (Pin 48 & 50). Do not apply power to both.

NOTE: Do not exceed 3.3V on VIOSEL

VIOSEL

Pin 46 VIOSEL powers and sets the voltage level of the signals with names starting with CAM, as well as RXC and TXC. The SLA-1500-OEM uses a voltage level converter (TI TXB0104YZTR) on board. VIOSEL can be set to **1.8V, 2.5V, or 3.3V.** Do Not exceed 3.3V.

LEDS

Label	Description
D1	Power Indicator
D2	GPIO179
D3	Network Status

Table 10: SLA-1500-OEM LED Status

UARTS

RXn/TXn	Reference Voltage	Connector	Linux	Common Use
A	3.3V	J3:P5/6	/dev/ttyO0	Command and Control, DEBUG
B	VIOSEL (J4:P46)	J4:P1/2	/dev/ttyO2	Camera Control Pass-Through
C	VIOSEL (J4:P46)	J4:P15/16	/dev/ttyO1	Generic Pass-Through

Table 11: SLA-1500-OEM Serial Ports

Test Points

Label	Description	Label	Description
TP1	Ground	TP3	FPGA Pin B9
TP2	3.3V	TP4	FPGA Pin C8

Table 12: SLA-1500-OEM Test Points

General Purpose Input / Output (GPIO)

Label	Reference Voltage	Description/ Location	Label	Reference Voltage	Description/ Location
GPIO127	GROUND		GPIO174	VIOSEL	J4 Pin 13 (CAMSYSEN)
GPIO129		LAN9221 Pin 43 (IRQ)	GPIO175	VIOSEL	J4 Pin 9 (CAMIRQ)
GPIO171		FPGA A9	GPIO178	3.3V	J4 Pin 19 (DISC0)
GPIO172	VIOSEL	J4 Pin 40 (CAMEN)	GPIO179	3.3V	LED D2
GPIO173	VIOSEL	J4 Pin 14 (CAMSTROBE)			

Table 13: SLA-1500-OEM Generic (Optional) GPIO

KNOWN ISSUES:

- Some REV C boards shipped with no U7 component will not have I2C capability on J4. This was done to allow to direct connection to the back of a FLIR Tau 640. See application notes for alternative solutions.

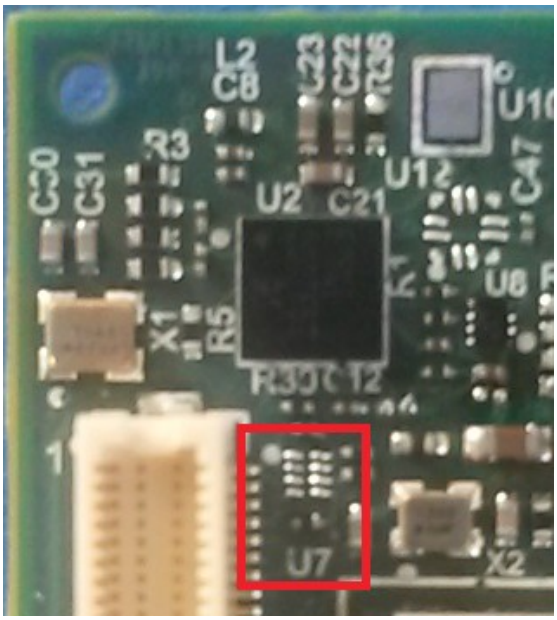


Illustration 4: SLA-1500-OEM missing U7

- A anti-alias filter should be added to each analog video input to help improve video quality

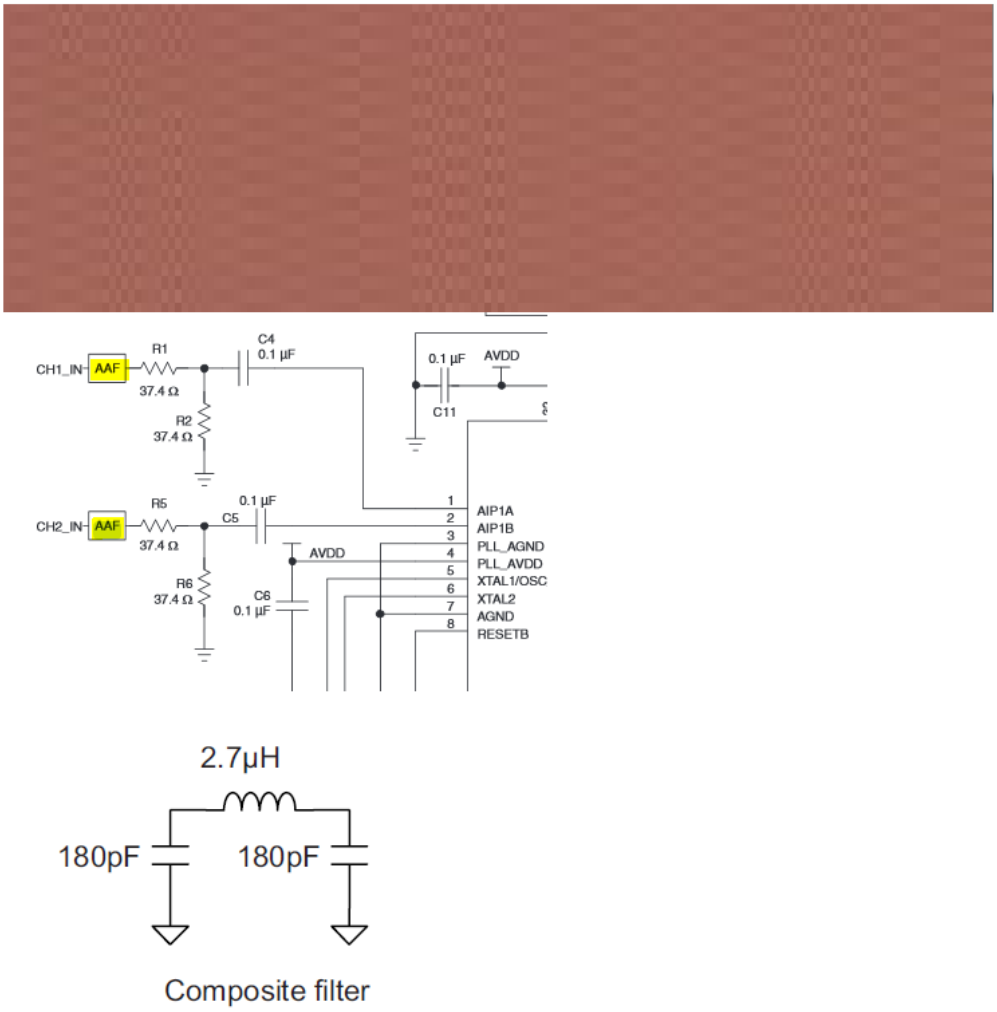


Illustration 5: KNOWN ISSUE: SLA-1500-OEM Analog Video Anti-alias filter

SLA-1500-AB

Board Summary

Dimensions	Board Rev Specific
Weight	Board Rev Specific
Power	5 VDC
Revision	A, B, C, D, mAB

Table 14: SLA-1500-AB Physical Characteristics

NOTE: Different revisions for the SLA-1500-AB board exist. Please contact your Sales Engineer to ask what variant might be right for your application.

Connectors (REV D)

Label	MFG Part Number	Function	Mates with...
J1	RCJ-044 (Yellow RCA Jack)	Analog Video Input 0	
J2	PJ-037A (2.0 x 6.5mm barrel jack)	5VDC Power	
J3	Molex 53398-1471 (14-pin) Mates with J3 on OEM	Analog Video, Power, Serial, Ethernet	Molex 51021-1400
J4	RCJ-044 (Yellow RCA Jack)	Analog Video Output	
J5	Molex 53398-1271 Mates with J5 on OEM	JTAG, USB	Molex 51021-1200
J6	5520251-4 Modular Jack	10/100 Base-T Ethernet	
J7	182-009-113R531 DB-9 Male	RS-232C Serial Port (PC Level)	
J8	1734035-2	Mini-USB (NYI)	
J9	CONN HEADER 12POS .100 R/A 15AU	JTAG	
J10	0.1” 50 pin header	Digital Connector Breakout (Rev C+)	
J11	RCJ-044 (Yellow RCA Jack)	Analog Video Input 1	
P4	Hirose DF12B-50DS-0.5V(86)	Digital Video Connector	SLA-1500-OEM J4

Table 15: SLA-1500-AB Connectors

Connector J1: Analog Video Input 0

NTSC analog video input 0.

Connector J2: 5VDC Power

Provides 5V power to SLA-1500-OEM.

Note: If the SLA-1500-SONY or SLA-1500- board is also connected, do not turn on switch SOM power switch, ok to turn on LOCAL power switch (for local board power).

Connector J3: Analog Video, Power, Serial, Ethernet

Passes through signals to the SLA-1500-OEM.

PIN	Function	PIN	Function
1	Video In0	8	+5V Input
2	Ground	9	+5V Input
3	Video Out	10	Ground
4	Ground	11	Ethernet RX -
5	TX A	12	Ethernet RX +
6	RX A	13	Ethernet TX +
7	Ground	14	Ethernet TX -

Table 16: SLA-1500-AB J3 Pinout

Connector J4: Analog Video Output

NTSC analog video output.

Connector J5: FPGA JTAG, USB

PIN	Function		PIN	Function
1	+5V	NYI	7	FPGA TMS
2	USB-		8	FPGA TDI
3	USB+		9	FPGA VJTAG
4	USBID		10	FPGA TRST
5	GND		11	FPGA TDO
6	FPGA TCK		12	FPGA VPUMP

Table 17: SLA-1500-AB J5 Pinout

Connector J6: 10/100 Base-T Ethernet

Provides 10/100Baste-T access using a standard Ethernet Modular Jack.

Connector J7:RS-232C Serial Port

Allows for serial port console to PC. Converts to 3.3V TTL needed by SLA-1500-OEM.

Connector J9: JTAG

Provides FPGA JTAG Access.

Connector J10: Digital Connector Breakout

Same pinout as: Connector J4: Digital Camera, Serial, Power (DEFAULT).

Connector J11: Analog Video Input 1

NTSC analog video input 1.

Connector P4: Digital Video Connector

Same pinout as: Connector J4: Digital Camera, Serial, Power (DEFAULT).

Schematics:

Schematics below are provided for **reference only**. Please contact your Sales Engineer for the latest files.

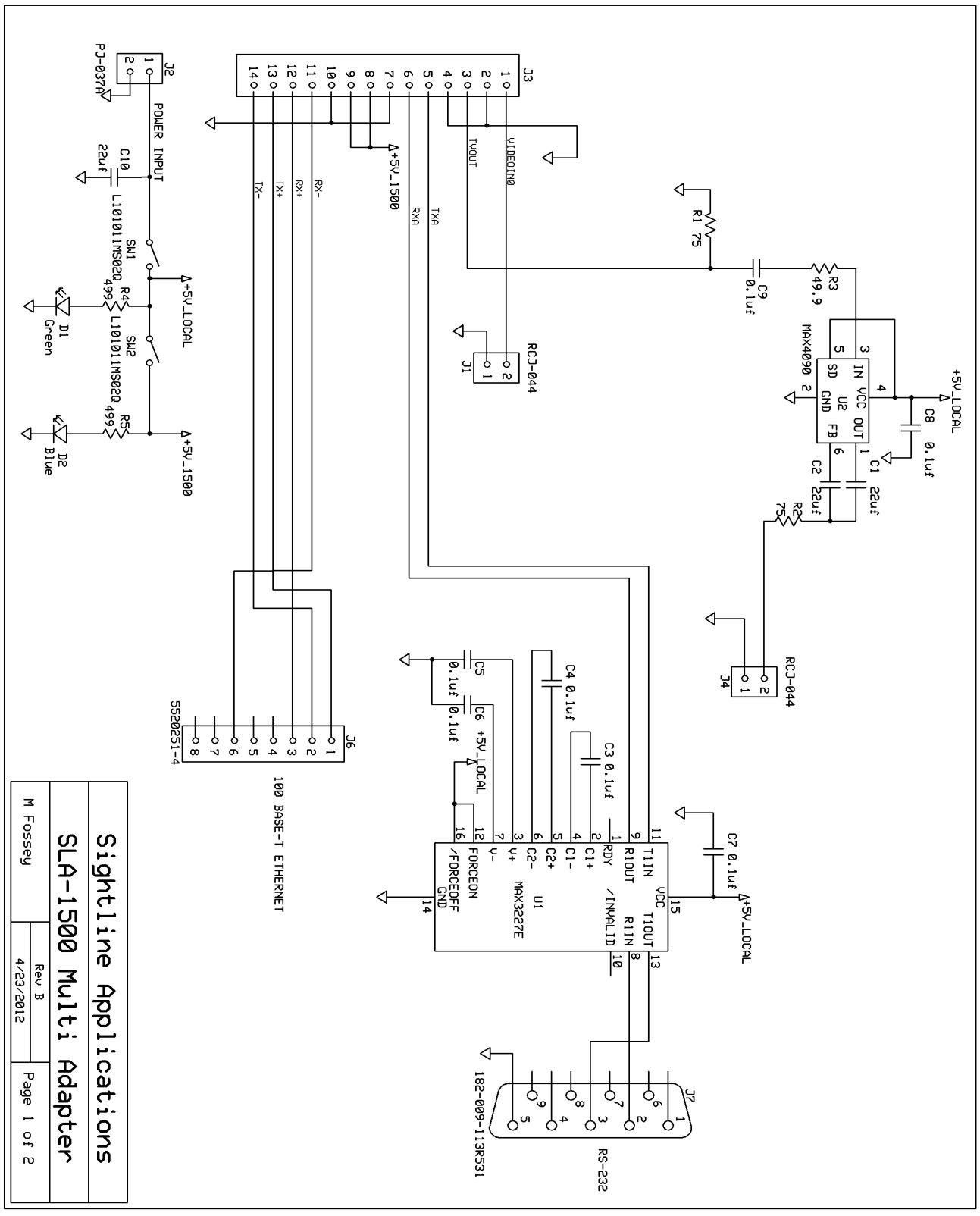


Illustration 6: SLA-1500-AB Sample Schematic

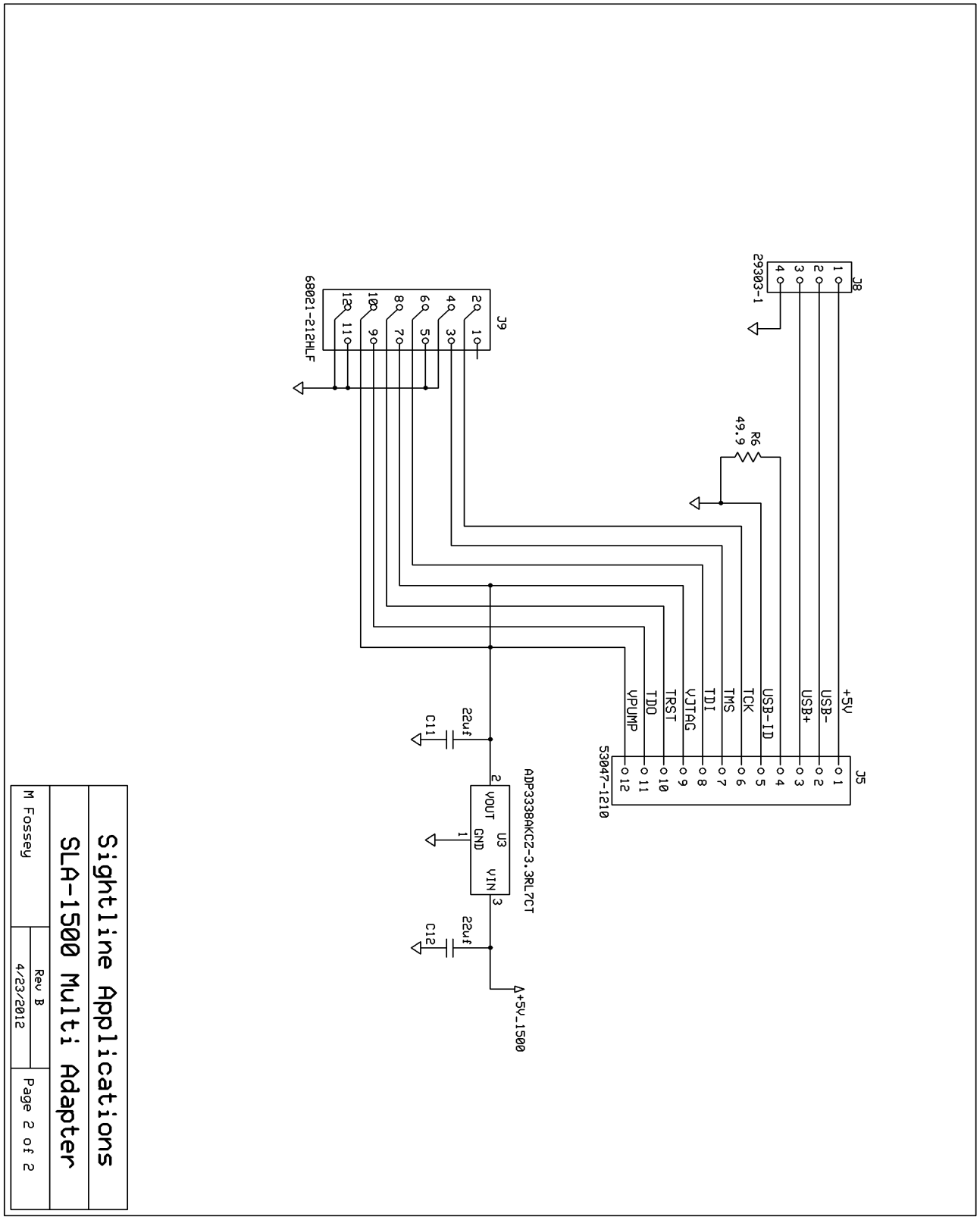


Illustration 7: SLA-1500-AB Sample Schematic

SLA-1500-DEV

Board Summary

This small adapter allows for easy JTAG debugging of the DM3730 ARM + DSP Processor of the SLA-1500-SOM. This board is to support advanced software development for either the ARM or the DSP.

Connectors

Label	MFG Part Number	Function
J1	Hirose DF40C(2.0)-40DS-0.4V(51)	JTAG to DSP
J2	CONN HEADER 14POS .100" R/A GOLD	To XDS510 USB Plus (or XDS100v2)

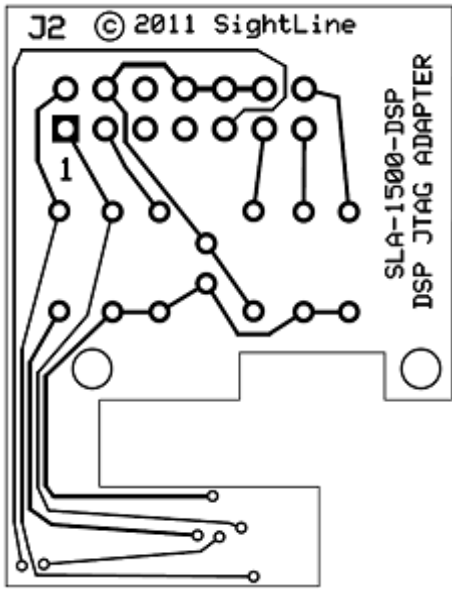


Illustration 8: SLA-1500-DBG TI DSP JTAG Adapter

Connector J1: Connection to DSP

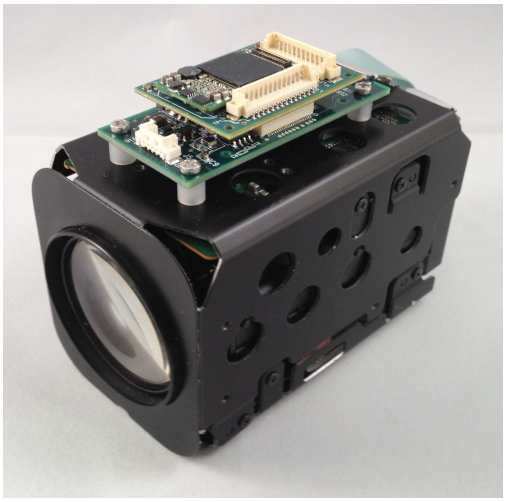
To be determined

Connector J2: 0.1” CONN HEADER 14POS

Allows for direct connection to XDS100v2 without use of other converters.

SLA-1500-SONY

Board Summary



Dimensions	57.15mm x 26.7mm x 8.5mm
Weight	6 grams
Power	7 - 12 VDC @ 500 mA (Sony 6300 + SLA-1500-OEM + SLA-1500-SONY)

Table 18: SLA-1500-SONY Physical Characteristics

Connectors

Label	MFG Part Number	Function	Mates with...
J1	KEL USL00-30L-A	Digital camera data to SONY	USL20-30SS-xxx-C
J2	4-pin Molex 53398-0471	Power	Molex 51021-0400 SLA-CAB-04xx
J4	Hirose DF12B-50DS-0.5V(86)	Mates to SLA-1500-OEM J4	DF12B-50DP-0.5V(86)
J3	3-pin Molex 53048-0310	3.3V TTL Serial direct to SONY	Molex 051021-0300 SLA-CAB-0302

Table 19: SLA-1500-SONY Connectors

TODO: Need new TOP & BOTTOM Assembly Drawing

Connector J1: Digital camera data to SONY

KEL USL00-30L-A. See SONY Technical Reference manuals for more details.

Connector J2: Power & Ground

Pin	Function	Description
1	Power 7 - 12VDC	Provides power to the camera and the SLA-1500-OEM
2		
3	Ground	
4		

Table 20: SLA-1500-SONY J2 Pinout

Connector J4: Mates to SLA-1500-OEM J4

Pin	Function	Pin	Function	Pin	Function
1	Serial RX B	19	Disc 0	37	Ground
2	Serial TX B	20	Cam D13	38	Ground
3	Cam Clock A	21	Ext Sync	39	Cam P Clk
4	Cam Clock B	22	Cam D12	40	Cam WEN
5	Ground	23	Cam D11	41	Ground
6	Ground	24	Cam D10	42	Ground
7	I2C SCL	25	Cam D09	43	Video In 1
8	I2C SDA	26	Cam D08	44	Analog Gnd
9	Cam IRQ	27	Ground	45	Ground
10	Cam FLD	28	Ground	46	VIO Select
11	Cam VS	29	Cam D07	47	Ground
12	Cam HS	30	Cam D06	48	+5V Out
13	Cam Sys En	31	Cam D05	49	Ground
14	Cam Strobe	32	Cam D04	50	+5V Out
15	Serial RX C	33	Cam D03		
16	Serial TX C	34	Cam D02		
17	Ground	35	Cam D01		
18	Tau Detect	36	Cam D00		

Table 21: SLA-1500-SONY J4 Pinout

Connector J3: Serial Port Bypass

Pin	Function	
1	TX	Note: When using this connector to talk directly to the SONY camera, it is recommend that you set **Serial Port 2** to "Port Not Used" in SLA-PANEL-PLUS.
2	RX	
3	Ground	

Table 22: SLA-1500-SONY J3 Pinout

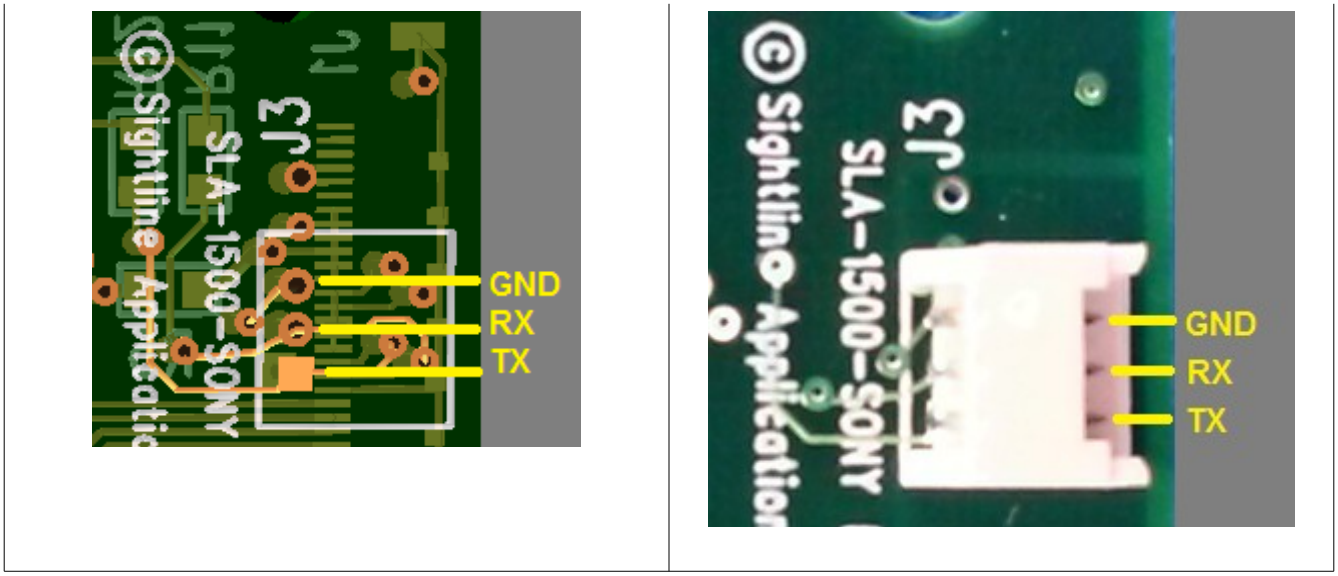
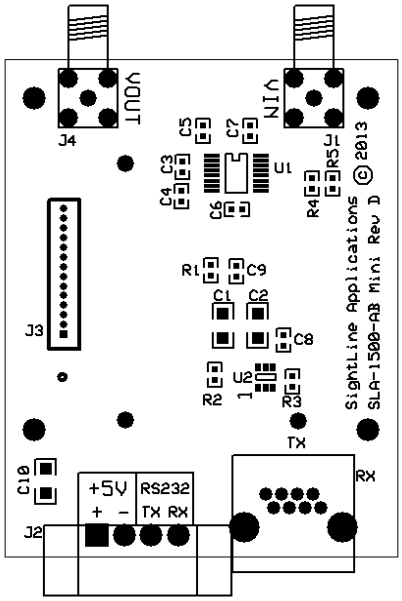


Table 23: SLA-1500-SONY J3 Identifying Pin 1

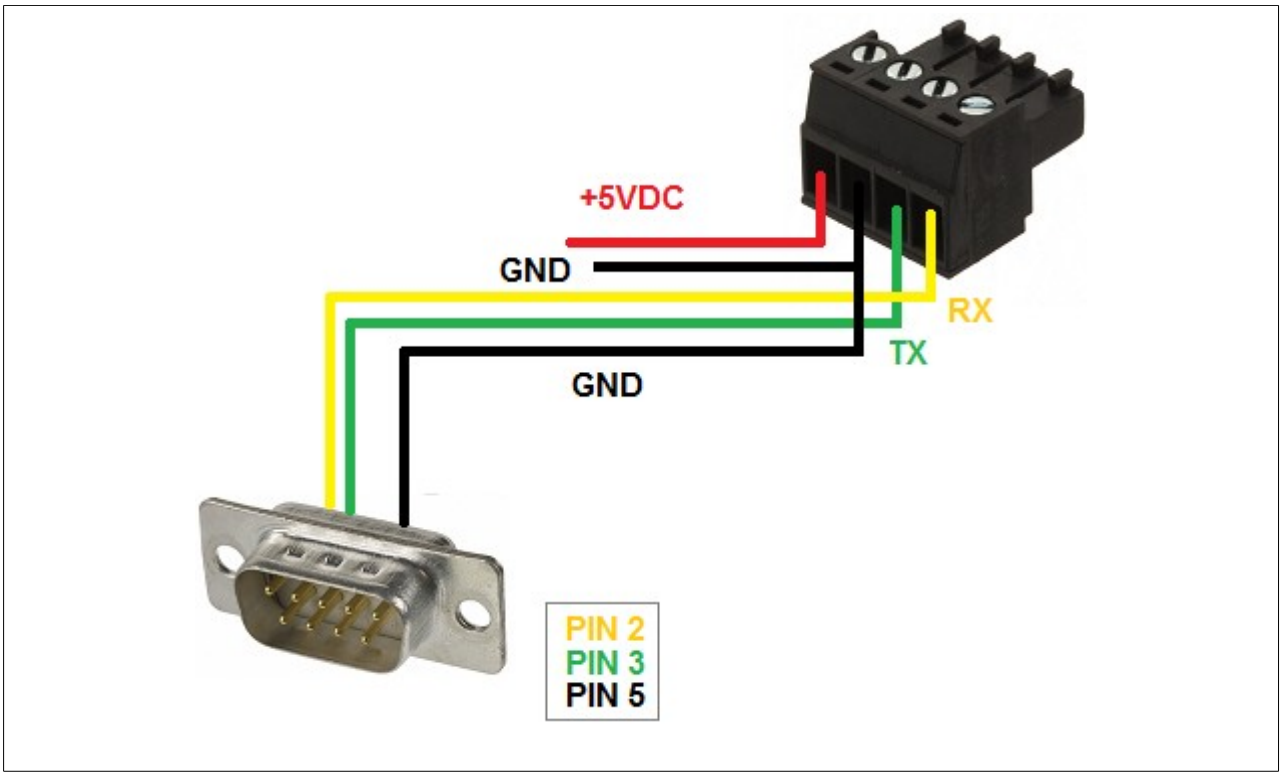
SLA-1500-mAB



REVISION D			
Label	**MFG Part Number**	**Function**	**Mates with...**
J1	CONSMA002	Analog Video Input	Standard SMA
J4	CONSMA002	Analog Video Output	Standard SMA
J6	1-406525-1	Ethernet	Standard CAT-5e cable
J2	39506-1004	Power, RS-232C	3.5MM TERM BLOCK PLUG STR 4POS MOLEX 039500-0004

Connector J2: Power + RS-232

Pin	Signal	Description
1	Power	4.5V – 5.5V DC
2	GND	Ground
3	TX	RS-232C level serial port. Share ground with PIN 2.
4	RX	



Connector J6: 10/100 Base-T Ethernet

Provides 10/100Base-T access using a standard Ethernet Modular Jack.

Pin	Signal	Description	Pin	Signal	Description
1	**TX+**	ORANGE + WHITE	5	NC	
2	**TX-**	ORANGE	6	**RX-**	GREEN
3	**RX+**	GREEN + WHITE	7	NC	
4	NC		8	NC	

Connector J4: Analog Video Output

NTSC analog video output.

Connector J1: Analog Video Input

NTSC analog video input.

KNOWN ISSUES

The SLA-1500-OEM (REV C) RS-232 receive pin (J3 Pin 6) should be driven to 3.3V when not in use.

This will prevent the SLA-1500-OEM from detecting an unintentional interrupt during power-up.

Additional References:

1. Texas Instruments Incorporated "AM/DM37x Multimedia Device Silicon Revision 1.x Version O Technical Reference Manual" SPRUGN4O–May 2010–Revised January 2012

SightLine Product Export Controls

Exports of SightLine products and technical data are governed by the US Export Administration Regulations (EAR) (15 CFR parts 730-774) administered by the US Department of Commerce. Classification of SightLine products has been defined as ECCN 4A994 for documentation and hardware/firmware, and 4D994 for licensed software. Customers acknowledge re-export responsibility and certify that their sale or distribution of SightLine products (whether incorporated into another system or otherwise) may constitute a new export and as such must be in accordance with the requirements of the EAR.

FILES

Additional files such as 3D models, Schematics, Gerbers, etc. may be available for some products.

Contact your Sales Engineer for more information.

ERRATA

Please contact your Sales Engineer often as new versions of the product (new schematics, etc.) may be available.

Appendix: Contacts

SightLine Applications, Inc.
1004 EUGENE STREET
HOOD RIVER, OR 97031

SightLine Applications, Inc.
524 N. Tillamook Street Suite 101
PORTLAND, OR 97227

Sales sales@sightlineapplications.com
General info@sightlineapplications.com

www.sightlineapplications.com