A DIVISION OF CIRRUS LOGIC

CRD7615-7/8

Analog/Digital Evaluation CCD Cameras

Features

- CCD Camera Processor Board
- Includes CS7615 Analog Processor
- Includes CS7665 Digital Processor
- 4:2:2 Component Digital Video
- ITU-R BT.656 Compliant Transport
- NTSC/PAL Composite Video Output
- S-Video Output
- I^2C Control Interface
- Programmable Image Adjustment
- 12 mm and C-Mount Lens Options

Description

The CRD7615-7/8 is a family of CCD cameras that provide simple to use evaluation and demonstration platforms using the CS7615 which performs CDS and analog-to-digital conversion of the CCD signal and the CS7665 which converts the digitized CCD output data into the international standard 4:2:2 digital video conforming to H.656 transport protocol.

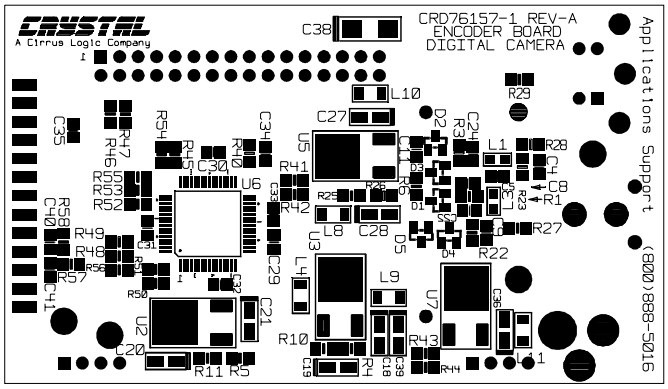
The CRD7615-7A is an analog CCD camera with 640x480 analog output delivering either Composite or S-Video output. Analog output requires standard video monitor. Control software is included to adjust camera settings and operational features. The CRD7615-7D is a digital CCD Camera with 4:2:2 component digital video output. The CRD7615-7C is an analog and digital camera in one unit.

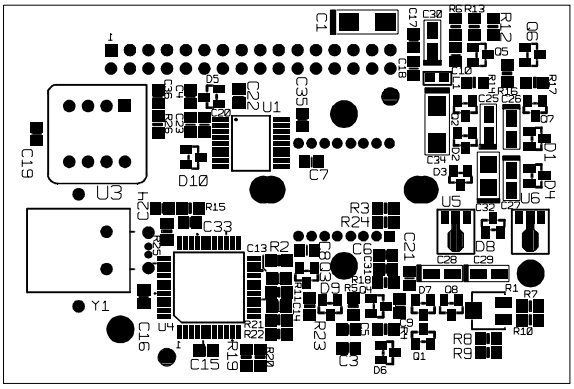
The CRD7615-8G includes a CRD7615-7D with a complete Cirrus Logic Graphics Adapter Display System (currently shipping with CL-GD5465 graphics adapter card). TVTap software is included to display video images.

All cameras include external power module, parallel port I^2C controller and control software to adjust camera settings and operational features. Digital output is provided via a 26-pin connector and the NTSC/PAL output is via standard RCA and S-Video connectors.

ORDERING INFORMATION

CRD7615-7A, analog camera
CRD7615-7C, combination camera
CRD7615-7D, digital camera
CRD7615-8G, digital camera with graphics cards





Crystal Semiconductor Products Division
P.O. Box 17847, Austin, Texas 78760
(512) 445 7222 FAX: (512) 445 7581
http://www.crystal.com

OPERATION

The CRD7615-7/8 includes the CS7615 Analog Video Signal Processor which performs analog processing and converts the analog CCD output to a digital format. Also included on the CRD7615-7/8 processor board is the CS7665 Digital Video Color-Space Processor, which decodes the MYCG (magenta, yellow, cyan, and green) CCD imager data and converts it to the industry standard 4:2:2 component digital video in YCrCb format. The component digital video can be used directly or after processing by the video encoder, the composite output formats can be used. The CRD7615-7/8 uses a +12 V or +9 V supply in the form of a wall plug-in unit.

Power Requirements

The CRD7615-7/8 requires a reasonably filtered (less than 200 mV ripple) +5 V power supply feed, which is used by the processor board and most camera heads. This +5 V supply is generated on-board the camera by regulating the raw +12 V input power feed. A charge pump is used to generate both +15 V and –8 V required by the CCD imager.

Analog Processor

The CRD7615-7/8 is based on the CS7615 analog processor chip (see Figure 3). The CS7615 performs all necessary analog processing, including Correlated-Double-Sampler (CDS), Automatic-Gain-Control (AGC), Black level adjust, and appropriate output data formatting to allow the mosaic (MYCG) CCD imager data to be processed by the CS7665 digital processor. The CS7615 control registers are accessible via the I^2C control bus.

Digital Processor and Encoder Board

The CS7665 digital processor is included in the CRD7615-7/8 (see Figure 5). The CS7665 converts the digital mosaic data from the CS7615, into 4:2:2 component digital video that adheres to the ITU H.656 transport protocol. The Automatic-White-Balance and other control registers are accessible via the CRD6715-7/8's main I^2C interface.

I^2C Control and Settings

The CRD7615-7/8 incorporates an I^2C EEPROM, which provides all necessary register settings for the camera on power-up. This EEPROM can be programmed using either the digital video connector HDR1 (Figure 6), HDR4 (Figure 5) or the I^2C external connector HDR2 (Figure 1). Only one of these approaches should be used at a time. The CRD7615-7/8 must be re-powered, or the CS7665 must be reset, for these new EEPROM settings to take effect. Additionally, all registers are accessible using the I^2C control channel, and the Crystal software is compatible with both connection schemes.

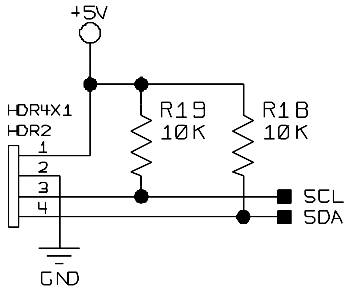


Figure 1. External I^2C Connector.

Digital Output Options

The CRD7615-7C and -7D support a 26-pin 0.1" spacing stake header option (Figure 6). The 26-pin connector is compatible with the existing Crystal reference designs, and provides a simple means of integrating the camera's digital output into an existing system. The CRD7615-8G uses the CRD7615-7D as a base and includes all necessary hardware and EPPROM changes.

Composite Output Options

The CRD7615-7A and -7C provide two analog output mode connectors for composite and S-Video. The Composite output is available in connector J1 (Figure 8), while the S-Video is available in connector P1 (Figure 8).

Schematics and Gerber Files

The CRD7615-7A, -7C and -7D schematics and PCB layout files are available upon request in Zuken-Radac file format. The PCB Gerber files are also available upon request.

SPECIAL NOTES

1) The crystal oscillator U3 schematic implementation is optional. Only the simple crystal Y1 is used.

2) The CRD7615-7/8 power supply can be configured to receive power from an external power module or from the digital video connector. The CRD7615-7/8 is configured for external power as indicated in the "Analog Output Mode" section of the bill of materials. The CRD7615-7D and 8G are not shipped with the external power supply module and is configured for a power feed from the digital video connector as indicated in the "Digital Output Mode" section of the bill of materials.

BILL OF MATERIALS AND BUILD OPTIONS

CRD76157-1 Rev.C							
#	QTY	REF	DEVICE	VALUE	MANUFACTURER	MFG PART NO.	PACKAGE
CRD 76157-1 Rev.C Digital Processor and Encoder Board, Installed Components							
1	3	C1-3	CAPES108M6	1000UF	NIC		CSP_NIC_8X10P
2	6	C4-9	CAPGS561J50_0805	560PF	KEMET	C0805C561J5GAC	C0805
3	16	C10-17,C29-35,C42,	CAPXS104K25	.1UF	NIC	NMC0805X7R104K2	C0805
4	8	C18-21,C27-28,C36, C39	CAPTS105K16	1UF	KEMET	T491A105K016AS	3216
5	3	C22-24	CAPGS220J100_0805	22PF	AVX	0805_1_A_220_J_	C0805
6	2	C25-26	CAPXS104J25_0805	.1UF	AVX	0805_3_C_104_J_	C0805
7	2	C37-38	CAPTS106K16	10UF	AVX	TAJ_C_106_K_016	6032
8	2	C40-41	CAPGS221J100_0805	220PF	AVX	0805_1_A_101_J_	C0805
9	6	D1-6	MMBD914LT1	1N914	MOTOROLA	MMBD914LT1	
10		D7	1N4001	1N4001	MANY	1N4001	D041
11		HDR1	HDR13X2EDGE	HDR13X2	3-M	2526-5002UB	
12		HDR2 or HDR4	HDR4X1	HDR4X1	Amp	640455-4	
13	1		Goes Between Boards		Samtec	ZW-16-07-T-D-200-115	
14	1	HDR3	HDR16X2	HDR16X2	Samtec	SLW-116-01-T-D	
15		J1	CON_RCA_RA	CON_RCA_RA	?	16PKJ097:RCA	J_RCA_RA_PCB
16	3	L1-3	IND0805_2R7_10	2.7UH	VENKEL	MLF0805_2R7KT	IND0805
17	2	L8-9	IND_FB1206_26	FERRITE_BEAD	DALE	ILB-1206-26-25%	IND1206
18		P1	CON_AMP_749263_1	AMP_749263_1	AMP	749263_1	AMP_749263_1
19		P2	CON_POWER_CUI		CUI STACK	PJ-002A	RAPC722
20	3	R1-3	RES_S0805_22R0_5	22	MANY		RES0805
21	2	R4-5	RES_S0805_3601_5	3.6K	MANY		RES0805
22	2	R6-7	RES_S0805_1502_1	15K	MANY		RES0805
23	1	R8	RES_S0805_1004_1	1M	MANY		RES0805
24	1	R40	RES_S0805_1003_5	100K	MANY		RES0805
25	4	R9, R22-24	RES_S0805_1001_1	1K	MANY		RES0805
26	2	R10-11	RES_S0805_1201_5	1.2K	MANY		RES0805
27	18	R12-17, R27-31, R45-46, R48, R50, R52,R54,R55-56	RES_S0805_0000_1	0	MANY		RES0805

CRD76157-1 Rev.C							
#	**QTY**	**REF**	**DEVICE**	**VALUE**	**MANUFACTURER**	**MFG PART NO.**	**PACKAGE**
28	7	R18-19, R41-42, R59-61	RES_S0805_1002_1	10K	MANY		RES0805
29	2	“R25, R43”	RES_S0805_2400_5	240	MANY		RES0805
30	2	“R26, R44”	RES_S0805_1301_1	1.3K	MANY		RES0805
31	2	R57-58	RES_S0805_3300_5	33	MANY		RES0805
32	1	U1	PLCC68	PLCC68			PLCC68
33	1	U1	PLCC68 SOCKET		AMP	822280-1	68 Pin
34	4	“U2-3, U5, U7”	LM317MDT	LM317MDT	MOTOROLA	LM317MDT	DPAC
35	1	U4	X24C04_SO8	X24C04_SO8	XICOR	X24C04_SO8	SO8
36	1	U6	QFP64_10X10	QFP64_10X10			QFP64_10X10
37	1	U8	74ACT74S	74ACT74S	NATIONAL S.	74ACT74S	SO14
CRD 76157-1 Rev.C Digital Processor and Encoder Board,... Do not... Install Components							
1	3	C1-3	CAPES108M6	1000UF	NIC		CSP_NIC_8X10P
25	14	R20-21,R32-39,R47, R49,R51,R53	RES_S0805_0000_1	0	MANY		RES0805
CRD 76157-1 Rev.C Digital Processor and Encoder Board, Analog Output Mode,Install Components (CRD7615-7A)							
10	1	D7	1N4001	1N4001	MANY	1N4001	D041
12	1	HDR2 or HDR4	HDR4X1	HDR4X1	Amp	640455-4	
15	1	J1	CON_RCA_RA	CON_RCA_RA	?	16PKJ097:RCA	J_RCA_RA_PCB
17	4	L4-5, L10-11	IND_FB1206_26	FERRITE_BEAD	DALE	ILB-1206-26-25%	IND1206
18	1	P1	CON_AMP_749263_1	AMP_749263_1	AMP	749263_1	AMP_749263_1
19	1	P2	CON_POWER_CUI		CUI STACK	PJ-002A	RAPC722
CRD 76157-1 Rev.C Digital Processor and Encoder Board, Digital Output Mode,Install Components (CRD7615-7D)							
11	1	HDR1	HDR13X2EDGE	HDR13X2	3-M	2526-5002UB	
17	4	L6-7	IND_FB1206_26	FERRITE_BEAD	DALE	ILB-1206-26-25%	IND1206

CRD76157-2 Rev.A							
#	**QTY**	**REF**	**DEVICE**	**VALUE**	**MANUFACTURER**	**MFG PART NO.**	**PACKAGE**
CRD67157-2 Rev A, CCD Analog Processor Board, Installed Components							
1	1	C1	CAPTS106K16	10UF	AVX	TAJ_C_106_K_016	6032
2	23	C3-23, C35	CAPXS104J25_0805	.1UF	AVX	0805_3_C_104_J_	C0805
4	6	C25-30	CAPTS105K20_3216	1UF	AVX	TAJ_A_105_K_020	3216
5	1	C31	CAPXS222K50	.0022UF	KEMET	C0805C222K5RAC	C0805
6	1	C32	CAPTS105K25	1UF	KEMET	T491B105K025AS	3528

CRD76157-2 Rev.A							
#	QTY	REF	DEVICE	VALUE	MANUFACTURER	MFG PART NO.	PACKAGE
8	1	C34	CAPTS106K20	10UF	KEMET	T491C106K020AS	6032
9	4	D1-4	BAT54C	BAT54C		BAT54C	SOT23
10	6	D5-10	1N4454_SOT23	1N4544	MANY	1N4544	
11	1	HDR1	HDR16X2	HDR16X2			
12	2	L1-2	IND_FB0805_600	FERRITE_BEAD	MURATA	BLM21A10	IND0805
13	2	Q1-2	MMBT2907ALT1	MMBT2907ALT1	MOTOROLA	MMBT2907ALT1	SOT23
14	6	Q3-8	MMBT2222AL	MMBT2222AL	MOTOROLA	MMBT2222AL	SOT23
15	1	R1	POT_PANA_ST4A_103	10K	PANASONIC	ST4A_103	POT_ST4A
16	7	R2-6, R10	RES_S0805_3901_5	3.9K	MANY		RES0805
17	3	R7, R16-17	RES_S0805_1002_1	10K	MANY		RES0805
19	1	R11	RES_S0805_1004_1	1M	MANY		RES0805
20	4	R12-14	RES_S0805_1001_1	1K	MANY		RES0805
21	1	R18	RES_S0805_1003_1	100K	MANY		RES0805
22	5	“R19,R21”	RES_S0805_0000_1	0	MANY		RES0805
23	1	R23	RES_S0805_1000_1	100	MANY		RES0805
24	1	R24	RES_S0805_1502_1	15K	MANY		RES0805
25	1	R25	RES_S0805_2000_1	200	MANY		RES0805
26	1	U1	LR36683N	LR36683N	SHARP	LR36683N	MFP18
27	1	U2	LZ2313H5	LZ2313H5	SHARP	LZ2313H5	SDIP16
29	1	U4	QFP44_10X10	QFP44_10X10			QFP44_10X10
30	1	U5	NJM78L15A	NJM78L15A	NEW JAPAN RADIO	NJM78L15A	SOT89
31	1	U6	NJM79L08A	NJM79L08A	NEW JAPAN RADIO	NJM79L08A	SOT89
32	1	Y1	XTL_HC49U_12P2727	12.2727MHZ	Cal Crystal	CCL-11-12.2727B15F	CCL-11
CRD67157-2 Rev A, CCD Analog Processor Board,…Do Not Install... Components							
2	1	C36	CAPXS104J25_0805	.1UF	AVX	0805_3_C_104_J_	C0805
3	1	C24	CAPGS150J50	15PF	KEMET	C0805C150J5GAC	C0805
7	1	C33	CAPGS330J50	33PF	KEMET	C0805C330J5GAC	C0805
16	1	R9	RES_S0805_3901_5	3.9K	MANY		RES0805
18	1	R8	RES_S0805_4701_5	4.7K	MANY		RES0805
20	1	R15	RES_S0805_1001_1	1K	MANY		RES0805
22	3	R20,R22,R26	RES_S0805_0000_1	0	MANY		RES0805
28	1	U3	CLKOSC_12P2727_TS	12.2727MHZ	FOX	F3020_12P2727MH	HALFSIZE

CCD ANALOG PROCESSOR BOARD

The CCD imager and analog processor (CRD76157-2) half of the camera includes a Sharp LM2313H5 CCD imager and LM36683N vertical drive chip (Figure 4). Additionally, the CS7615 Analog Processor (Figure 3), and a charge pump dc-dc converter (Figure 4) are also included. A connector (Figure 2) between the analog processor board and the associated digital processor board carries all necessary signals. The supported camera mounts are available from Marshall and can be used for both simple 12mmx0.5 lenses as well as standard C-Mount lenses.

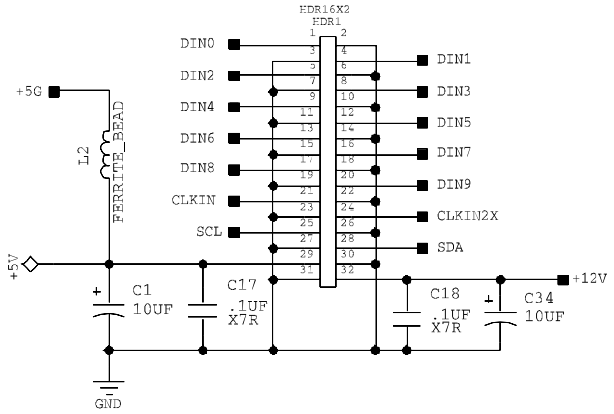


Figure 2. Analog Board to Digital Board Connector.

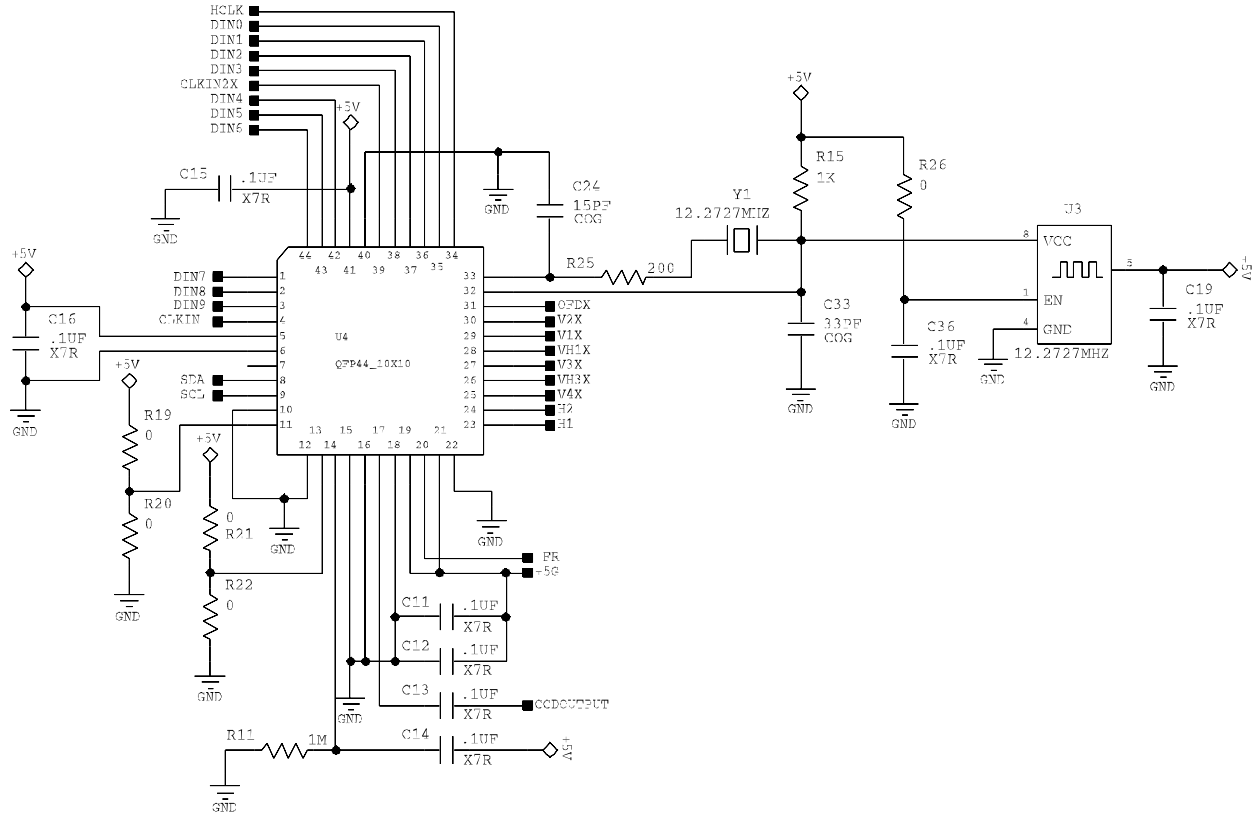


Figure 3. CS7615 Analog Processor Schematic.

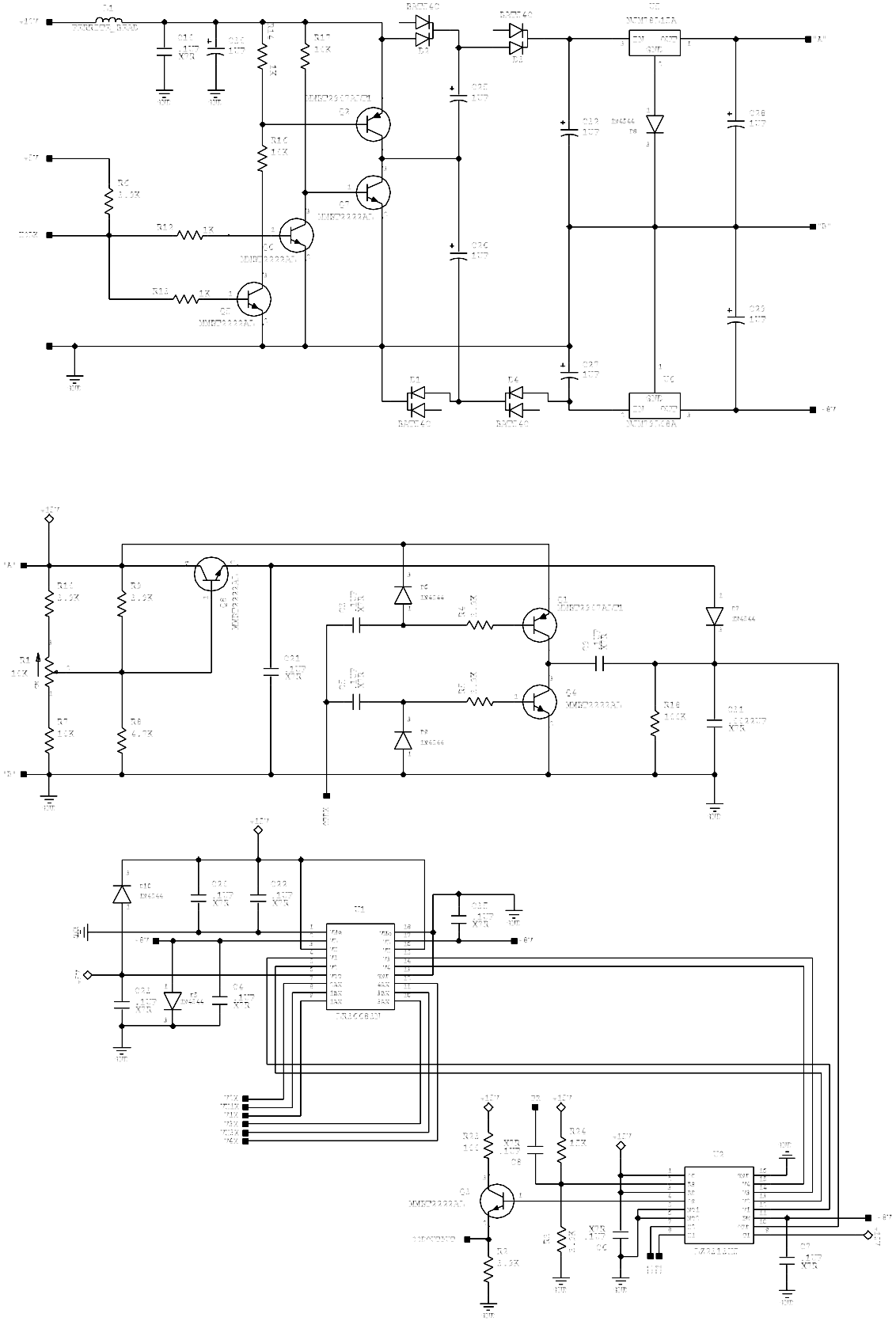


Figure 4. CCD Imager and Power Supply Circuit.

DIGITAL PROCESSOR AND ENCODER BOARD

The CS7665 Digital Video Processor (CRD76157-1) forms the heart of the lower half of the camera (Figure 5). All color space processing as well as standard image processing is performed by the CS7665 (see CS7665 data sheet for further details). The main digital output connector (Figure 6) provides industry standard H.656 compliant component digital video output. The video encoder (Figure 8) provides both composite and S-Video output via connectors J1 and P1. The board-to-board connector (Figure 5) routes all necessary signals to the upper half of the camera..

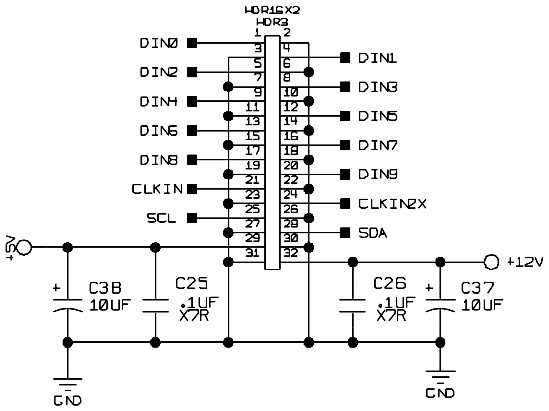


Figure 5. Digital Board to Analog Board Connector.

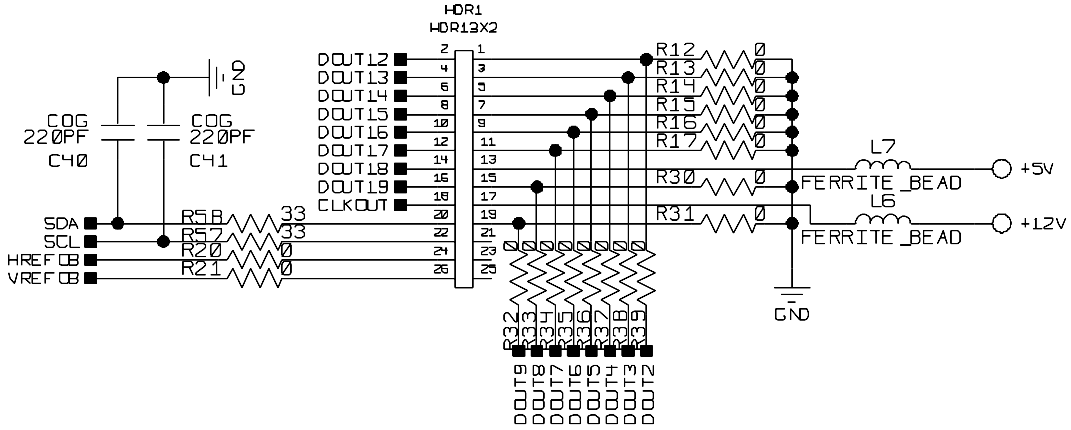


Figure 6. Main H.656 Component Digital Video Output.

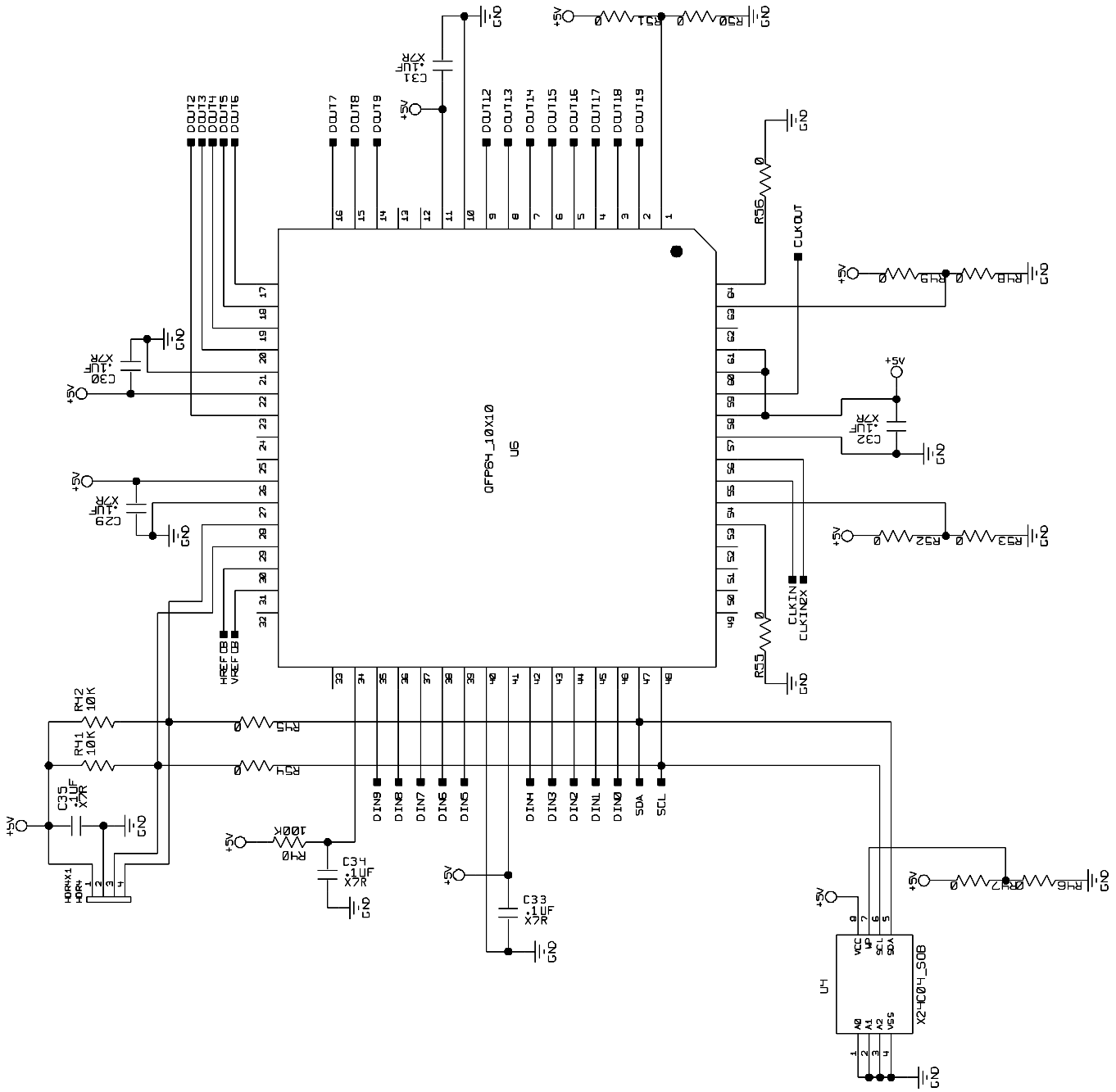


Figure 7. CS7665 Digital Processor Detail Schematic.

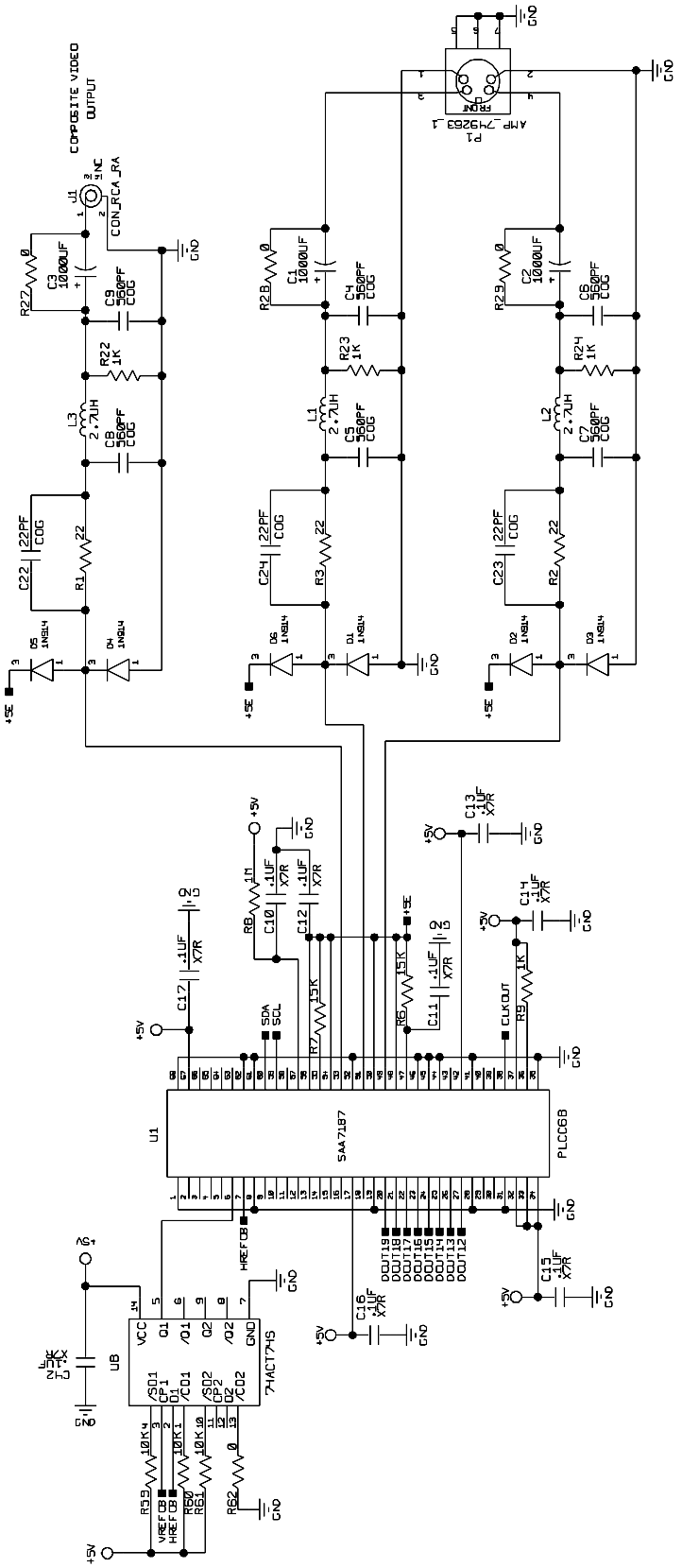


Figure 8. Video Encoder Details.

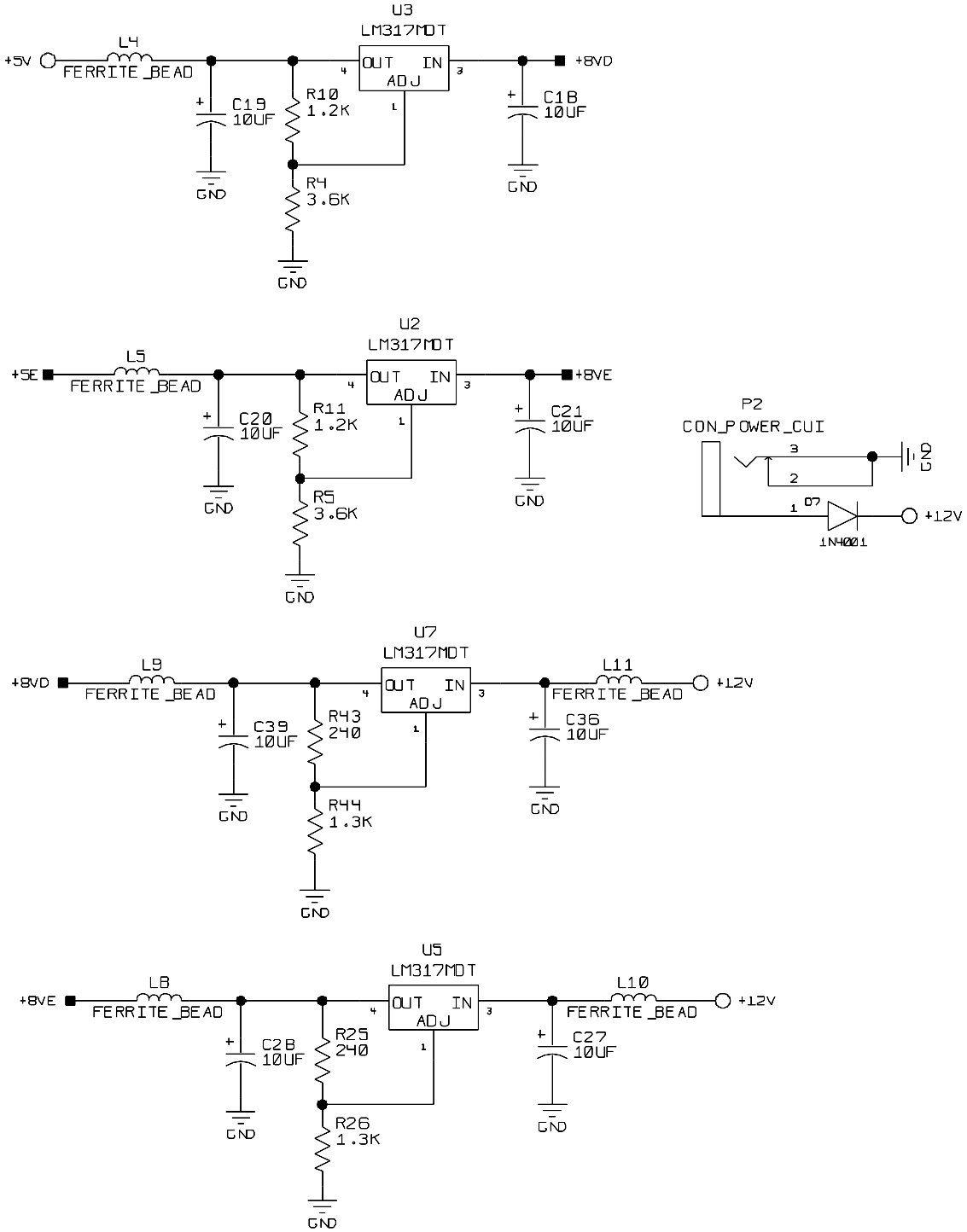


Figure 9. Power Supply Conditioning and Regulators.

• Notes •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