ISL59481EVAL1 Evaluation Board User's Guide

Application Note | February 2, 2006 | AN1235.0

Introduction

The ISL59481EVAL1 evaluation board contains the ISL59481 Dual 4:1 RGB MUX amp and associated components needed to implement an 8:1 RGB+H/V sync video multiplexer. The 8 video input ports, and single output port are accessed using standard 15 pin VGA female connectors. The I/O connectors are compatible with most VGA, SVGA and XGA video sources and video monitors with VGA cable interfaces. A typical application would use the ISL59481EVAL1 board to multiplex anywhere from 2 to 8 PC's or laptops to a single video monitor or projector.

Evaluation Board Description and Key Features

The multiplexing of the RGB video is performed by the ISL59481. Multiplexing the H and V sync signals is accomplished using two ISL84051 8:1 analog switches. The ISL59481 Video MUX and the analog H and V sync multiplexers have the same input channel select logic coding, and are parallel-connected to form a single 3 input binary coded interface (S0, S1, S2). The evaluation board contains three different channel select options via jumpers on the board. Switches on the board enable direct logic control in binary format. The on-board oscillator and 4-bit counter can be connected to provide a continuous channel-by-channel scan of as few as 2 input channels up to all 8. An added option allows the user to disconnect the auto-scan oscillator and use the on-board momentary-contact switch to manually scan through the selected channels.

Reference Documents

- ISL59481 Data Sheet, FN7456

Getting Started

The evaluation board should have the same appearance as the silk screen shown in Figure 1. Prior to applying power, connect the source input VGA cables and the evaluation board output VGA cable to the respective video components. The evaluation board, as supplied, is designed for 75Ω source impedances and requires a 75Ω termination impedance in the output display device.

Applying Power to the Evaluation Board

The following safeguards will ensure correct power-up.

1. Limit the current on ±5V supplies to 250mA.
2. Turn on the power supplies after the power cables are attached to the evaluation board.

Power supply protection Schottky diodes are included on the ±5V supplies to prevent damage due to reverse polarity.

Evaluation Board Jumper, Cable Header, and Switch Descriptions

COMPONENT	DESCRIPTION
JUMPERS	
J1	Selects channel select via single-step momentary contact switch S4, or auto mode using on-board oscillator
J-S0	Selects S0 logic input to manual control via switch S0 or through external control ribbon cable header
J-S1	Selects S1 logic input to manual control via switch S1 or through external control ribbon cable header
J-S2	Selects S2 logic input to manual control via switch S2 or through external control ribbon cable header
HEADERS	
EN	External MUX enable: Internal pull-down (logic 0) enables RGB+H/V output, logic high disables RGB and H/V sync output
S0	External S0 channel select logic input
S1	External S1 channel select logic input
S2	External S2 channel select logic input
SWITCHES	
S0	Manual channel select logic input S0
S1	Manual channel select logic input S1
S2	Manual channel select logic input S2
S3	Momentary contact channel select step control

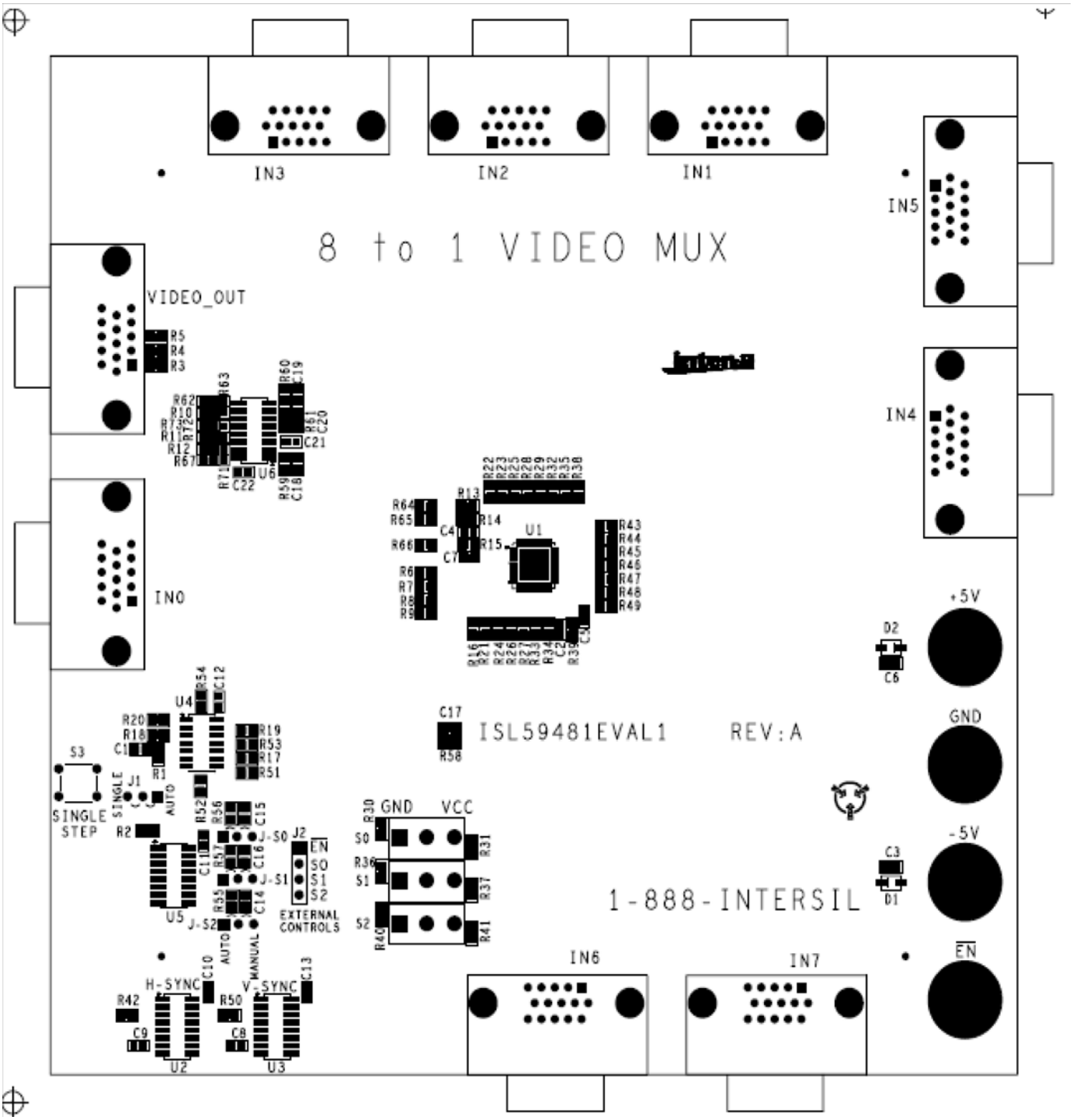


FIGURE 1. ISL59481EVAL1 TOP VIEW

Testing the Evaluation Board

Testing the video and sync signal paths is accomplished using 1 or more RGB+H/V test video sources and a video monitor as the measurement device. Before powering the board, connect the jumpers as follows:

1. Connect jumpers J-S0, J-S1 and J-S2 to the MANUAL position (center to right post).
2. Connect jumper J1 to the single-step position (center to left post).

The following tests should be performed in the order shown.

Power Supply Tests

1. Connect an ammeter in series with the +5V and -5V supply.
2. Connect power supplies to the respective +5V, -5V and ground banana jacks.
3. Set supplies to +5V; ±50mV and -5V; ±50mV. Supply power to the board.
4. Measure +5V supply current = +110mA ±20mA
5. Measure -5V supply current = -100mA ±20mA

Channel Select Logic and Video Performance Test

1. Calibrate the video test source with the video monitor by connecting the source(s) to the video monitor and selecting a display suitable for verifying correct luminance, display resolution and H/V sync lock. The test display in the following evaluation board tests should be identical to the test display.
2. Re-connect the video monitor to the VIDEO_OUT VGA connector on the evaluation board.
3. Connect the video test source to IN0. Additional video sources can speed up the verification process. If more than 1 test source is available connect each in sequential fashion to IN1, IN2 etc.
4. Set switches S0, S1 and S2 to the GND position and apply power.
5. After ~3s the test display supplied to IN0 should appear on the test monitor exactly as it appeared in step 1.

NOTE: The ~3s delay is a built in delay common in many display devices to lock onto the H/V sync signals and adjust the picture prior to enabling the display screen.

6. Perform the display test on the remaining video inputs by moving the video input source to the appropriate input according to the truth table in Table 1.

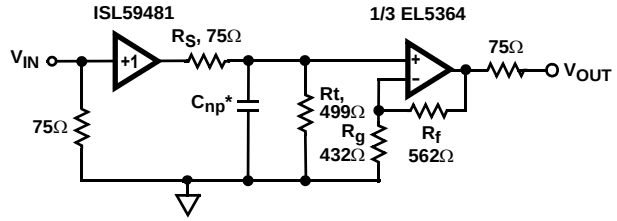
Auto-Scan Test

1. Connect scope probe to the J1 AUTO pin and observe a logic level (0 to +5V) square wave with ~3s period.
2. Connect jumpers J-S0, J-S1, and J-S2 to the AUTO position (center to left post).
3. Connect jumper J1 to the AUTO position and observe that the display scans all the test sources connected to the input channels (center to right post).
4. Connect jumper J1 to the single-step position and use the momentary contact switch S4 to manually all the test sources.

Test completed.

RGB Video Signal Path

The video inputs are terminated with 75Ω resulting in an overall RGB video path gain of 1 when using 75Ω video source impedance and load terminations (Figure 2). The RGB outputs contain series-connected 75Ω back-termination resistors for cable driving. The ISL59481 operates in unity gain, and the EL5364 triple op amp gain is set to 2.3 to compensate for the interstage and output impedance matching loss. Two methods of gain adjustment are provided. Increasing gain to compensate for cable attenuation can be accomplished using the EL5364 R_f and R_g gain resistors. Gain reduction is best achieved using the divider network R_s and Rt. Capacitor pads (C_{np}) are provided to adjust the frequency response of the amplifier.



* Cnp is not populated and is provided for frequency response adjustment

FIGURE 2. VIDEO SIGNAL PATH

Channel Select Logic

The ISL59481 RGB MUX and the H/V sync MUX share the same 1 of 8 input channel select logic inputs (S0, S1, S2). The channel select logic is shown in Table 1. Three methods of channel select logic control are provided using jumpers.

TABLE 1. CHANNEL SELECT TRUTH TABLE

S2	S1	S0	VIDEO OUT
0	0	0	IN0
0	0	1	IN1
0	1	0	IN2
0	1	1	IN3
1	0	0	IN4
1	0	1	IN5
1	1	0	IN6
1	1	1	IN7

Auto Sequencing Using the On-Board Oscillator

An on-board 0.3Hz R-C oscillator (Figure 3) drives the master clock of the 4-bit binary counter, which generates the channel select logic inputs S0, S1 and S2. The default 6s channel scan rate provides the time needed by the display to sync-lock and adjust the picture prior to enabling the display. The 2.2MΩ (R1) resistor value can be reduced to speed up the channel scan time. Jumper J1 is provided to select either the 6s auto-step timer, or the momentary contact switch for manual stepping.

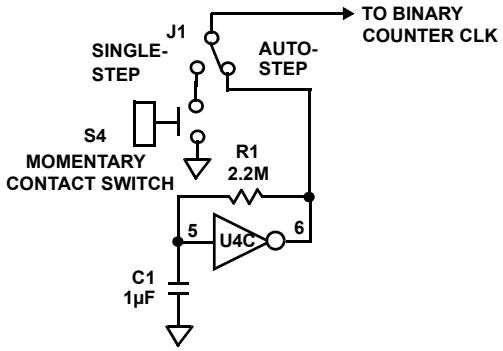


FIGURE 3. CHANNEL SCAN OSCILLATOR

Internal and External Channel Select Logic

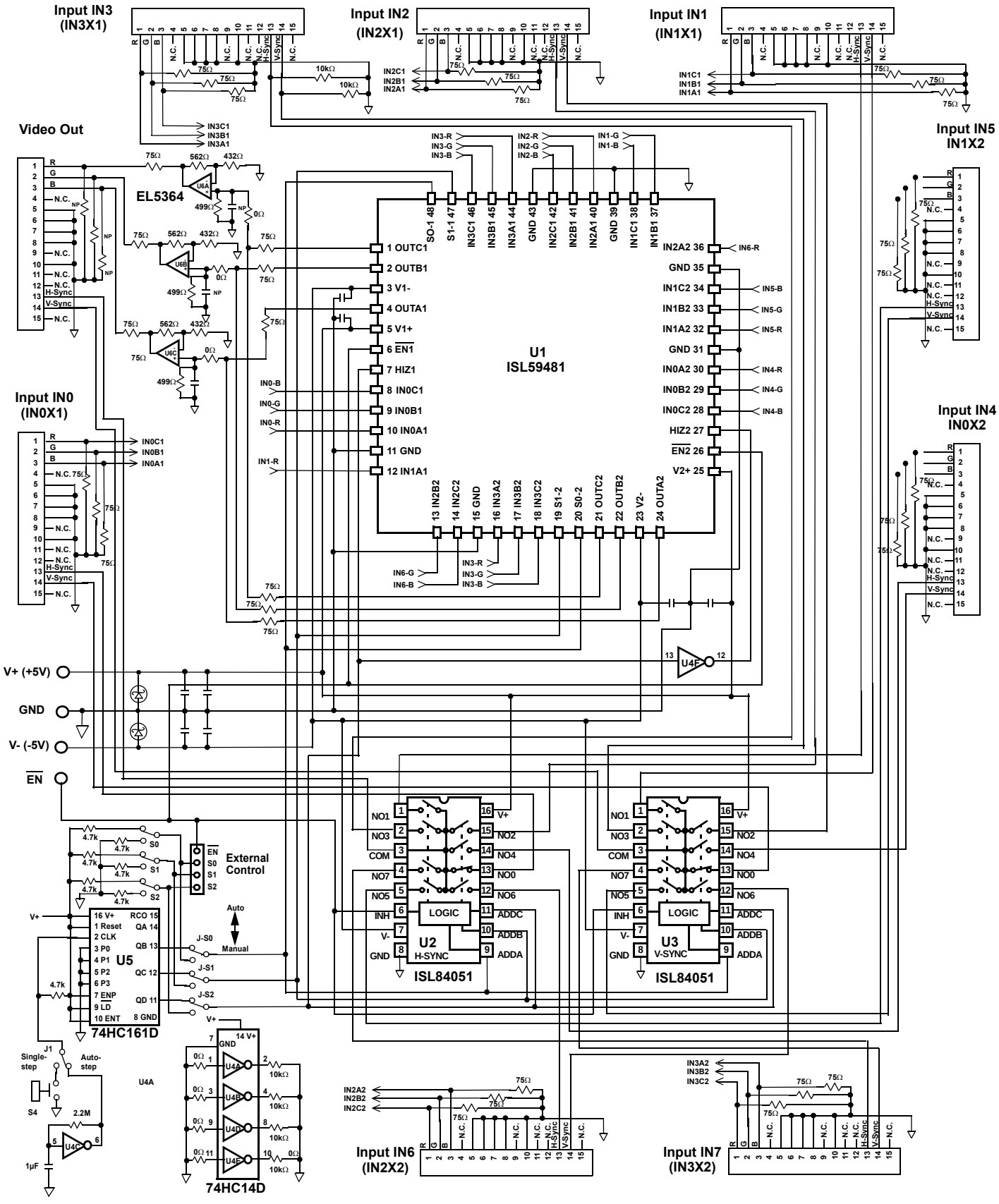
J-S0, J-S1 and J-S2 are two-position jumpers that control the method of channel selection. In the AUTO position, the internal channel scan is enabled. The MANUAL position connects the on-board SPDT switches (S0, S1, and S2) for manual selection. A parallel-connected EXTERNAL CONTROL ribbon cable header is provided for external channel select control.

A wide range of auto-scan options can be selected by connecting only 1 or 2 of the 3 jumpers to the internal logic, with the remainder connected to the switch. For example, connecting jumper J-S0 to the AUTO position and connecting jumpers J-S1 and J-S2 to the MANUAL position with the switches S1 and S2 to the logic 0 state limits the channel scan to only 2 of the 8 channels (IN0 and IN1). Moving a second jumper from the MANUAL position to the AUTO position, increases the number of channels scanned from 2 to 4. The complete list of channel scan jumper options are shown in Table 2.

TABLE 2. CHANNEL SCAN SELECT LOGIC TABLE

CHANNELS SCANNED	JUMPER POSITION			SWITCH POSITION			CHANNELS SELECTED							
	J-S2	J-S1	J-S0	S2	S1	S0	IN0	IN1	IN2	IN3	IN4	IN5	IN6	IN7
8	Auto	Auto	Auto	-	-	-	X	X	X	X	X	X	X	X
4	Manual	Auto	Auto	0	-	-	X	X	X	X				
	Manual	Auto	Auto	1	-	-					X	X	X	X
	Auto	Manual	Auto	-	0	-	X	X			X	X		
	Auto	Manual	Auto	-	1	-			X	X			X	X
	Auto	Auto	Manual	-	-	0	X		X		X		X	
	Auto	Auto	Manual	-	-	1		X		X		X		X
2	Manual	Manual	Auto	0	0	-	X	X						
	Manual	Manual	Auto	0	1	-			X	X				
	Manual	Manual	Auto	1	0	-					X	X		
	Manual	Manual	Auto	1	1	-							X	X
	Auto	Manual	Manual	-	0	0	X				X			
	Auto	Manual	Manual	-	0	1		X				X		
	Auto	Manual	Manual	-	1	0			X				X	
	Auto	Manual	Manual	-	1	1				X				X
	Manual	Auto	Manual	0	-	0	X		X					
	Manual	Auto	Manual	0	-	1					X		X	
	Manual	Auto	Manual	1	-	0		X		X				
	Manual	Auto	Manual	1	-	1						X		X

ISL59481EVAL1 Schematic Diagram



ISL59481EVAL1 Components List

COMPONENT	VALUE	TOLERANCE	RATING	COMPONENT	VALUE	TOLERANCE	RATING
PWB	ISL59481EVAL1REVA PCB	Intersil Corp.	N/A	J-S0, J-S1, J-S2, J1	CONN-HEADER, 1x3, BRKAWY 1X36, 0.1	N/A	N/A
U_1 - 8:1 RGB Video MUX	ISL59481IRZA QFN48 Pb-Free	Intersil Corp.	N/A	D1, D2	DIODE-RECTIFIER, SMD SOD-123, 2PIN	N/A	N/A
U_2, U_3 - 8:1 Analog MUX	ISL84051IBZ SOIC16 Pb-Free	Intersil Corp.	N/A	R3-R5, R55-58, R64-R66	RESISTOR, SMD, 0805, DNP, DNP, DNP, TF	MBR0540T1-T	40V, 0.5A
U_4 - Hex Inverter	SN74HC14D SOIC14	N/A	N/A	R10-R12	RESISTOR, SMD, 0603, 75Ω	N/A	N/A
U_5 - 4-Bit Binary Counter	SN74HC161D SOIC16	N/A	N/A	R62, R67, R73	RESISTOR, SMD, 0603, 432Ω	1%	0.10W
U_6 - Triple 600MHz CFA Op Amp	EL5364ISZ SOIC16 Pb-Free	Intersil Corp.	N/A	R63, R71, R72	RESISTOR, SMD, 0603, 562Ω	1%	0.10W
C4, C7	CAP, SMD, 0603 1000pF	10%, X7R	25V	R6-R9, R16, R21-R29, R32, R35, R38, R43-R49	RESISTOR, SMD, 0805, 75Ω,	1%	1/10W
C2, C5, C8-C13, C21, C22	CAPACITOR, SMD, 0603, 0.1µF	N/A	25V	R13-R15, R17-R20, R33, R34, R39, R68-R70	RESISTOR, SMD, 0805, 0Ω,	N/A	1/10W
C3, C6	CAPACITOR, SMD, 0805, 10µF	10%, X5R	6.3V	R42, R50-R54.	RESISTOR, SMD, 0805, 10k	5%	1/10W
C1	CAPACITOR, SMD, 0805, 2.2µF	10%, X5R	16V	R1	RESISTOR, SMD, 0805, 2.2M	5%	1/8W
C14-C20	CAPACITOR, SMD, 0805, DNP-PLACE HOLDER	N/A	N/A	R2, R30, R31, R36, R37, R40, R41	RESISTOR, SMD, 0805, 4.7k	5%	1/10W
IN0-IN7, VIDEO_OUT	CONN-SUB MINI D, 15PIN, RECEPTACLE, RT ANGLE, FRONT METAL SHELL	N/A	N/A	R59, R60, R61	RESISTOR, SMD, 0805, 499	5%	1/10W
+5V, -5V, EN, GND	CONN-JACK, BANA-SS-SDRLESS, VERTIC	N/A	N/A	S0-S2	SWITCH-TOGGLE, THRU, SPDT, 5 P, ON-N	N/A	N/A
J2	CONN-HEADER, 4PIN, BRKAWY, 2.54mm, VERTICAL	J2		S3	SWITCH-PUSHBUTTON, TH, 6mm, 4P, ON/OFF,	N/A	12V, 0.05A