

SIMPlugIN-VIDEO User Manual

... a SIMPlugIN board® family member

Revision: see file name on page header
Date: AUGUST 26th 2011

WARNING:

This board can only work with 1.8 volt power supply. See below for details.



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0) Introduction and references

This manual describes how to operate SIMPlugIN-VIDEO board.

SIMPlugIN family boards are intended for engineers (engineering students too) that want to enjoy an easy to use and easy to expand FPGA development system.

SIMPlugIN-VIDEO is an add-on board that provides a high speed, 10 bit, triple DAC. Its main use is to implement a complete VGA port (including serial link to communicate with plug and play monitors) but can be used to generate composite video (reaching to HD frequencies) or as a general purpose triple DAC.

WARNING:

This board can only work with 1.8 volt power supply. See bellow for details.

0.1) References

Note: from time to time companies modify their web pages. So, some of the detailed web link may be obsolete when you read the present document.

- SIMPlugIN- 6XL45 user manual and schematics
- In <http://focus.ti.com/docs/prod/folders/print/th8135.html> there is plenty of information of THS8135 video DAC chip.

1) General description

The chip THS8135 implements a triple video DAC. All data and control signal provided by this chip are available to the FPGA in the base board. This chip has many possibilities ranging from pure triple DAC operation to complex (HD style) composite video. As input data the chip allows from simply digital red, green blue to more complex video formats (like luma-chroma Y, Pr, Pb codifications).

WARNING: THS8135 works only with 1.8 volt. So it is mandatory to configure the base board properly so as to get 1.8 volt in VCCO power supply pins.

SIMPlugIN-VIDEO board provides some degree of protection against improper VCCO configuration. If VCCO voltage goes above 2 volt then a comparator turns off a mosfet transistor that cuts out the internal +1.8 power supply. Also LD1 green led is turned off to warn the user.

NOTICE: even with internal power turned off by the protection circuit, if there are many pins (e.g. the 30 R, G, B data input pins) at an improper voltage level (e.g. 3.3 volt due to the base board configured at such power voltage) **some damage to the SIMPlugIN-VIDEO and/or the base board could happen.**

Termination resistors

In order to cope with the, possibly, high frequencies of the signals that enter THS8135 chip, all and each of these signals are provided with 50 ohm termination resistors. The resistors are reference to 0.9 volt (50% of +1.8 internal power supply). So, in any case (even with low frequency operation) **all** FPGA pins that interface with THS8135 must be properly configured to cope with the current required by these termination resistors.

Additionally there are level translator and buffers to generate digital horizontal and vertical sync signals.

VGA standard provides an I2C like communication with the video monitor (for identification and plug and play purposes). The board provides an I2C level translator to generate those signals.

All FPGA control pins have test points. Additionally the 3 analog signals (RED, GREEN, BLUE) are provided with hook style test points pairs (signal and ground).

2) Connectors

VGA: female high density, 15 pin, SubD connector

1	RED
2	GREEN
3	BLUE
4	
5	GND
6	GND
7	GND
8	GND
9	
10	GND
11	
12	SDA-BUF
13	HSYNC- BUF
14	VSYNC- BUF
15	SCL-BUF

Add-on connectors**CON1**

1	+3.3
2	+5.0
3	GND
4	VCCO
5	B9
6	M1
7	B8
8	M2
9	GND
10	VCCO
11	B7
12	B6
13	B5
14	B4
15	GND
16	VCCO
17	B3
18	B2
19	B1
20	B0
21	GND
22	VCCO
23	R0
24	R1
25	R2
26	R3
27	GND
28	VCCO
29	R4
30	R5
31	R6
32	R7
33	GND
34	VCCO

CON3

1	+3.3
2	+5.0
3	GND
4	VCCO
5	R8
6	BLANK#
7	R9
8	SYNC#
9	GND
10	VCCO
11	SYNC-T
12	SDA
13	SCL
14	CLOCK
15	GND
16	VCCO
17	G9
18	G8
19	G7
20	G6
21	GND
22	VCCO
23	G5
24	G4
25	G3
26	G2
27	GND
28	VCCO
29	G1
30	HSYNC
31	G0
32	VSYNC
33	GND
34	VCCO

WARNING: in the base board VCCO must be configured for 1.8 volt operation

3) Configuration jumpers, LED

There are no configuration jumpers.

LD1 is a green led that will be lit only if the VCOO voltage is configured to 1.8 volt

WARNING: if the system is powered and LD1 is not lit then turn off power immediately and check the configuration of VCCO voltage in the base board.

4) Test points

Test point for THS8135 control signals

TPM5	SYNC#
TPM6	BLANK#
TPM7	R9
TPM8	R8
TPM9	R7
TPM10	R6
TPM11	R5
TPM12	R4
TPM13	R3
TPM14	R2
TPM15	R1
TPM16	R0
TPM17	SYNC-T
TPM18	CLOCK
TPM19	B0
TPM20	B1
TPM23	G9
TPM24	G7
TPM25	G8
TPM26	G6
TPM27	B2
TPM28	B4
TPM29	B3
TPM30	B5
TPM31	G5
TPM32	G3
TPM33	G4
TPM34	G2
TPM35	B6
TPM36	B8
TPM37	B7
TPM38	B9
TPM41	G1
TPM42	G0
TPM43	M1
TPM44	M2

Test point for non THS8135control signals

TPM1	GND
TPM2	GND
TPM3	GND
TPM4	GND
TPM21	HSYNC
TPM22	VSYNC
TPM47	SDA
TPM48	SCL

Test point for digital output signals

TPM39	VSYNC-BUF
TPM40	HSYNC-BUF
TPM45	SCL-BUF
TPM46	SDA-BUF

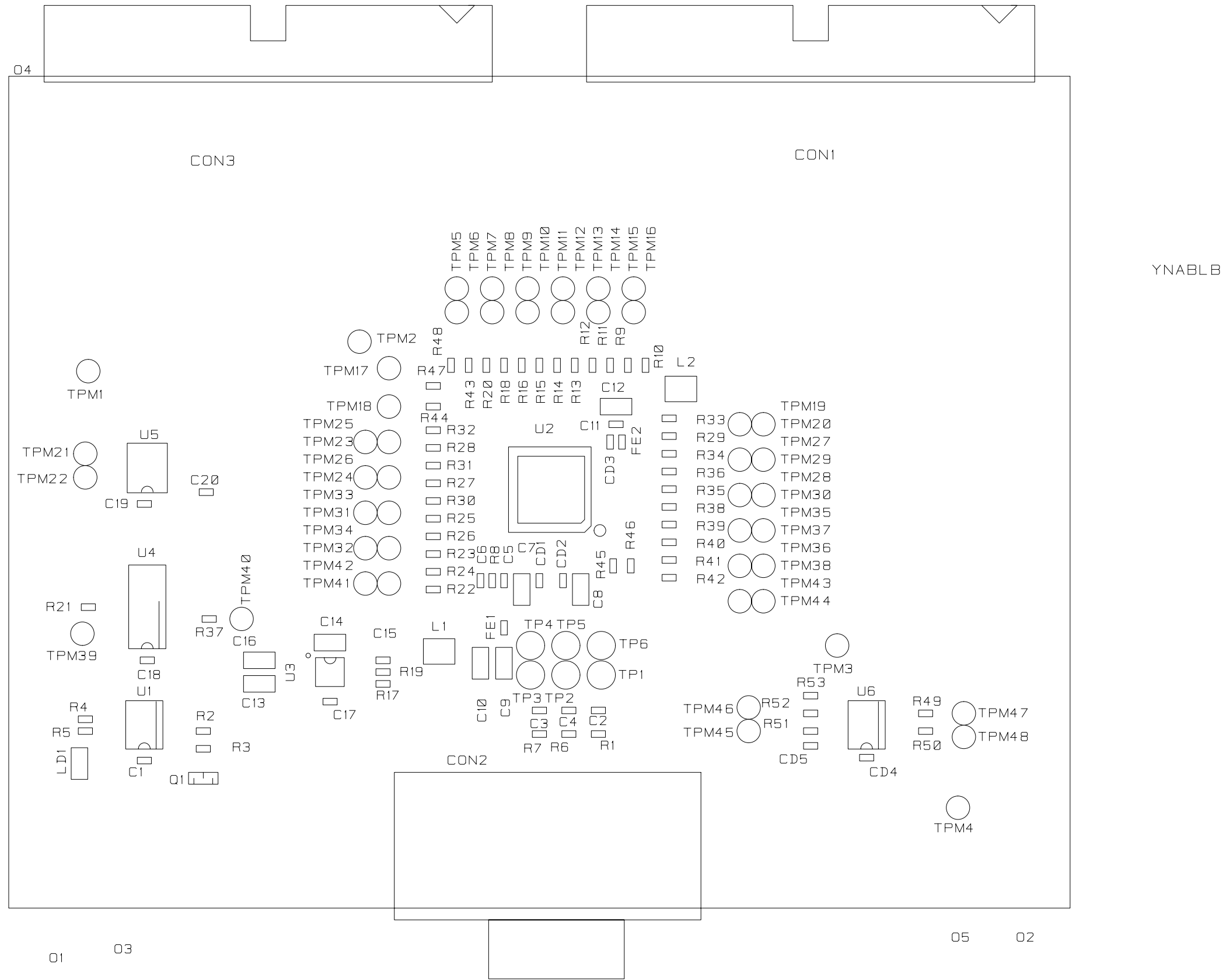
Test point (hook style) for analog output signals

test point	signal	test point color
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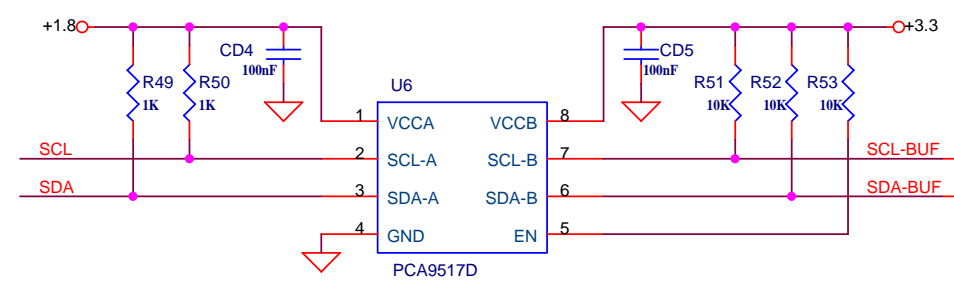
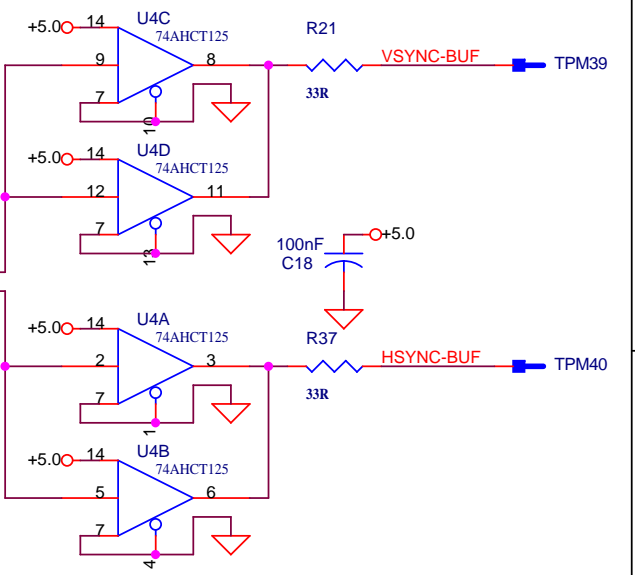
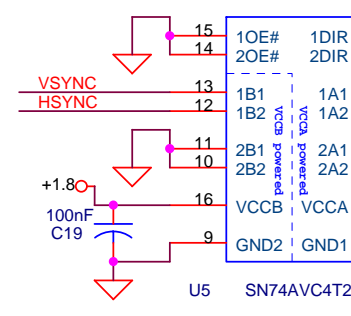
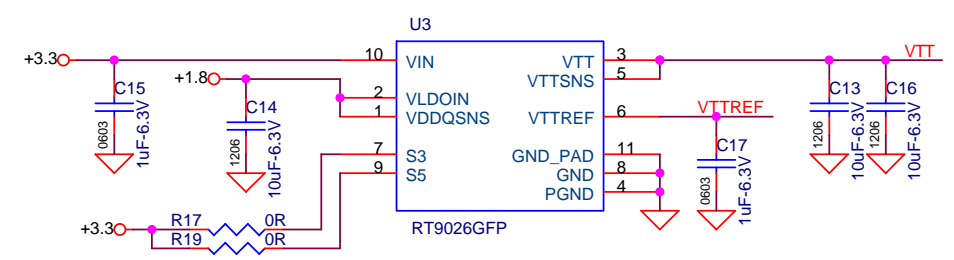
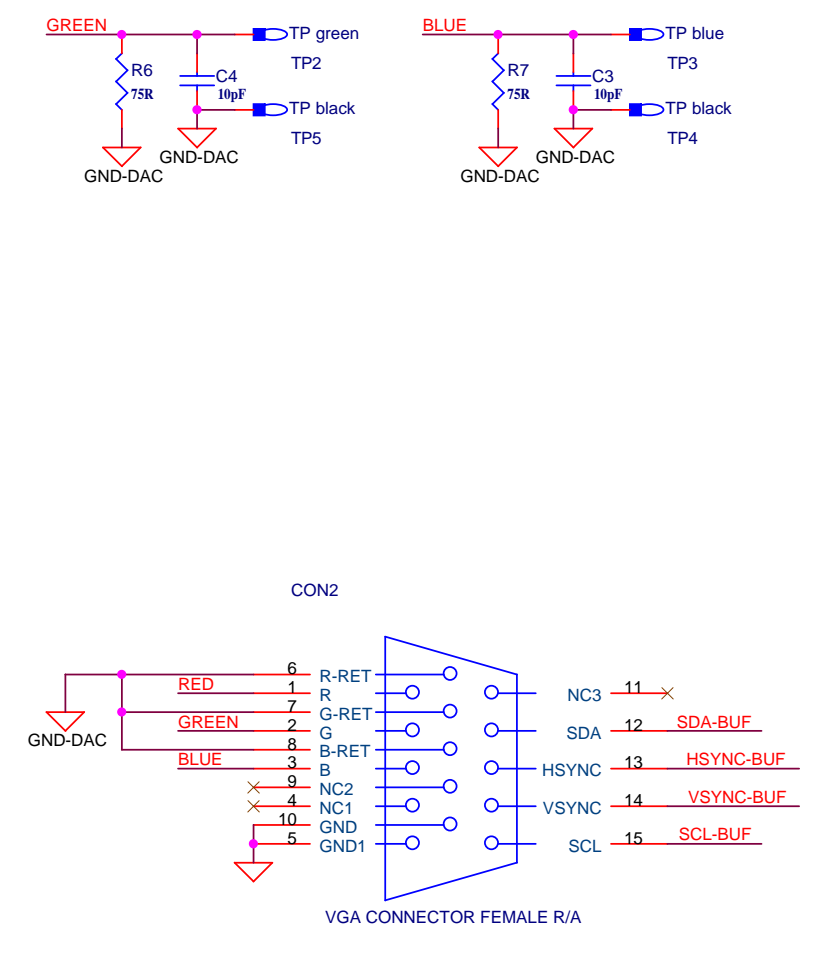
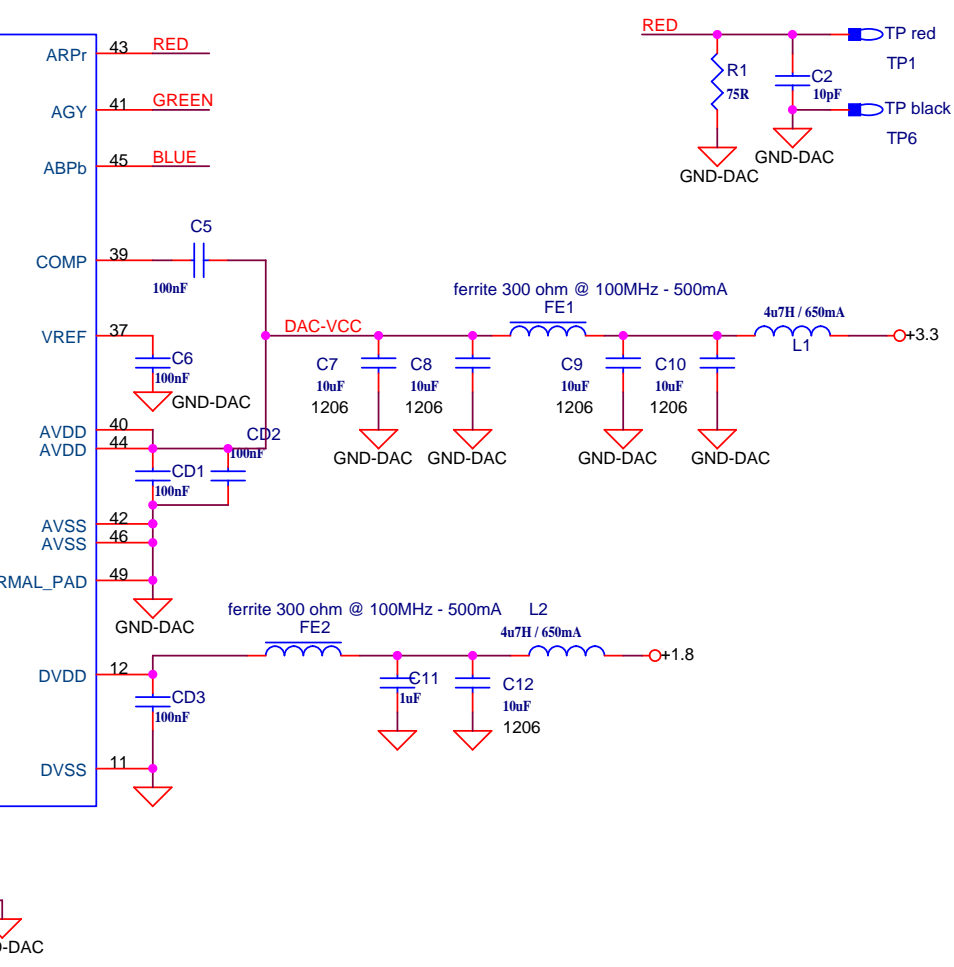
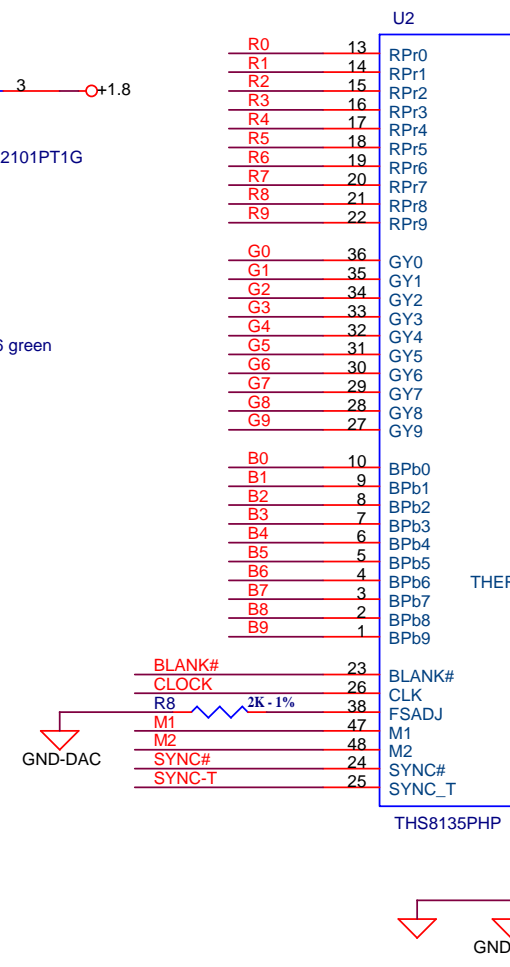
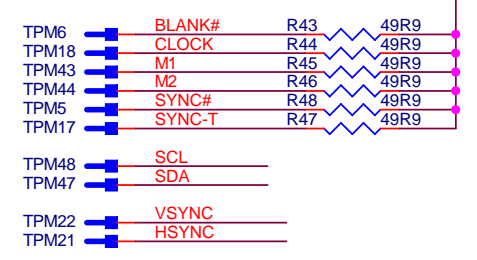
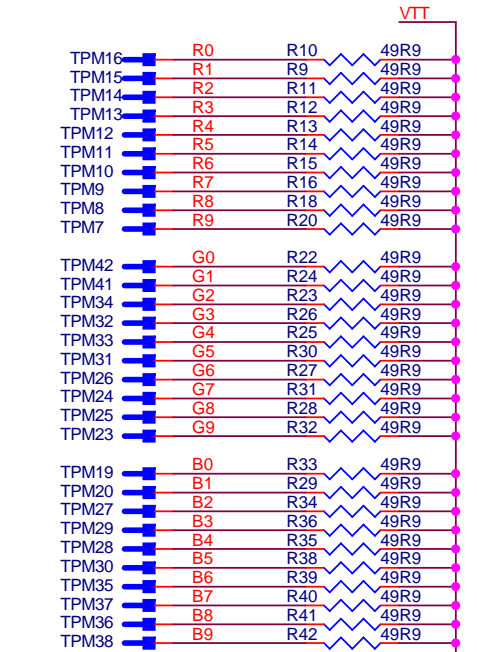
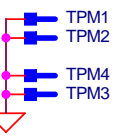
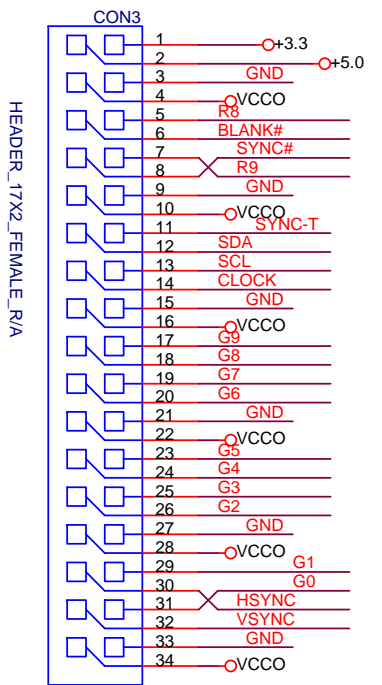
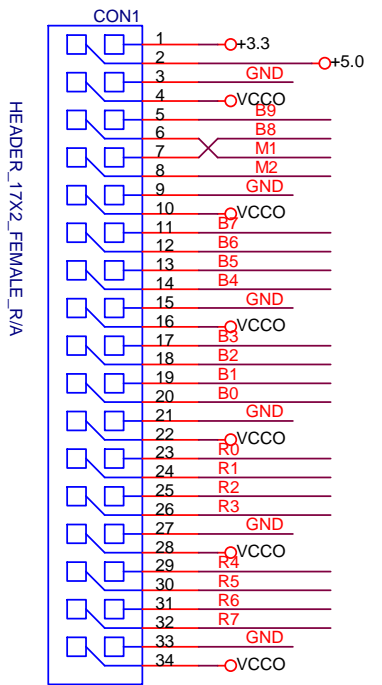
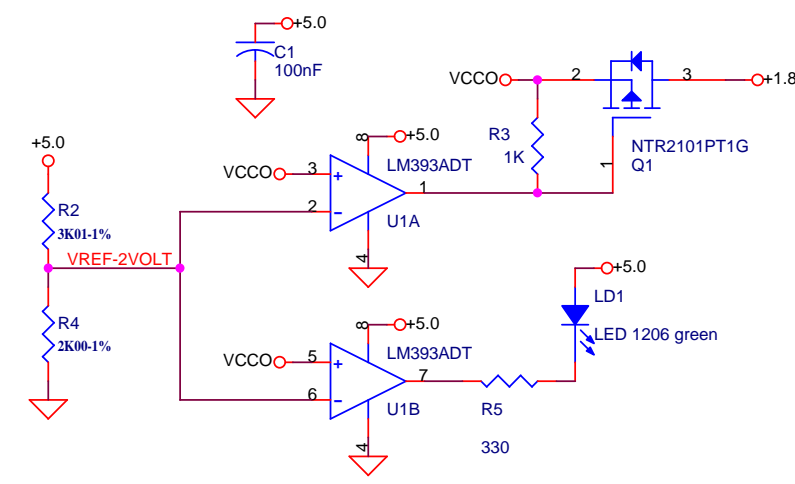
TP1	RED	red
TP6	GND	black


TP2	GREEN	green
TP5	GND	black

TP3	BLUE	blue
TP4	GND	black



SIMPlugIN-VIDEOi





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Project: SIMPlugIN		Board: SIMPlugIN-VIDEO1	
Board description			
Add-on board with triple video DAC			
Size: A3	Page description:		Rev 1.0p
Last modified date: Wednesday, April 27, 2011			Page 1 of 1

Revised: Wednesday, April 27, 2011

Item	qty	Reference	Part	PCB Footprint
1	11	CD1,C1,CD2,CD3,CD4,CD5, C5,C6,C18,C19,C20	100nF	0603
2	2	CON3,CON1	HEADER_17X2_FEMALE_ R/A	
3	1	CON2	VGA CONNECTOR FEMALE R/A	VGA CONNECTOR FEMALE R/A
4	3	C2,C3,C4	10pF	0603
5	5	C7,C8,C9,C10,C12	10uF	1206
6	1	C11	1uF	0603
7	3	C13,C14,C16	10uF-6.3V	1206
8	2	C15,C17	1uF-6.3V	0603
9	2	FE1,FE2	ferrite 300 ohm @ 100MHz - 500mA	0603
10	1	LD1	LED 1206 green	1206
11	2	L1,L2	4u7H / 650mA	1210
12	1	Q1	NTR2101PT1G	NTR2101P
13	3	R1,R6,R7	75R	0603
14	1	R2	3K01-1%	0603
15	3	R3,R49,R50	1K	0603
16	1	R4	2K00-1%	0603
17	1	R5	330	0603
18	1	R8	2K - 1%	0603
19	36	R9,R10,R11,R12,R13,R14, R15,R16,R18,R20,R22,R23, R24,R25,R26,R27,R28,R29, R30,R31,R32,R33,R34,R35, R36,R38,R39,R40,R41,R42, R43,R44,R45,R46,R47,R48	49R9	0603
20	2	R17,R19	0R	0603
21	2	R37,R21	33R	0603
22	3	R51,R52,R53	10K	0603
23	48	TPM1,TPM2,TPM3,TPM4,TPM5, TPM6,TPM7,TPM8,TPM9, TPM10,TPM11,TPM12,TPM13, TPM14,TPM15,TPM16,TPM17, TPM18,TPM19,TPM20,TPM21, TPM22,TPM23,TPM24,TPM25, TPM26,TPM27,TPM28,TPM29, TPM30,TPM31,TPM32,TPM33, TPM34,TPM35,TPM36,TPM37, TPM38,TPM39,TPM40,TPM41,	DNP header 1x1	header 1x1

		TPM42,TPM43,TPM44,TPM45,		
		TPM46,TPM47,TPM48		
24	1	TP1	TP red	keystone tp mp 5011
25	1	TP2	TP green	keystone tp mp 5011
26	1	TP3	TP blue	keystone tp mp 5011
27	3	TP4,TP5,TP6	TP black	keystone tp mp 5011
28	1	U1	LM393ADT	SOIC8
29	1	U2	THS8135PHP	PQFP48 with ground pad
30	1	U3	RT9026GFP	RT9026GFP MSOP10 with pad
31	1	U4	74AHCT125	SO14
32	1	U5	SN74AVC4T245PWR	TSSOP16
33	1	U6	PCA9517D	SOIC8