SB5

PT8 Video Encoder

Evaluation Board

User Manual

Revision 0.2
17th June 2015

Revisions

Date	Revisions	Version
10-05-2015	First draft	0.1
14-06-2015	Revisions to analogue front end schematics.	0.2

Contents

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Introduction

SB5 is an evaluation platform for the SingMai PT8 video encoder IP core.

The video source can be SDI video (SMPTE-259M) or one of the internal video patterns. The selected source is then encoded in the PT8 IP core to a digital composite output, which is fed to a digital to analogue converter (DAC), the resulting analogue output being filtered and buffered.

Simple switch controls allow the selection of the SDI or pattern video source, video pattern selection, and selection of NTSC or PAL encoded outputs.

SB5 requires 5VDC which is provided via the supplied AC-DC converter.

Warning

The SB5 is protected from copying of the FPGA design by a proprietary anti-copying device.

Whilst it is possible to clone the PCB (we provide the schematic diagrams in Appendix B to save you the trouble), and the bit map of the FPGA (we provide no assistance in this matter), without the custom anti-copying device the IP core will not run.

Quick start guide

A plan view of the SB5 board is shown in Figure 1.

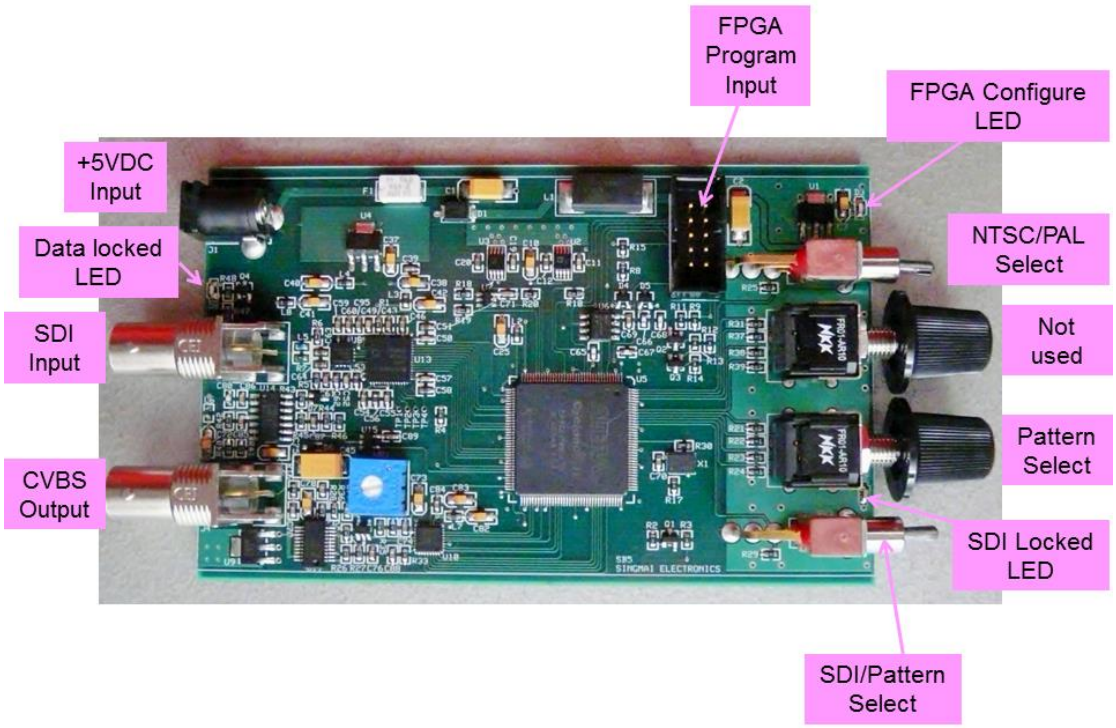

Figure 1 SB5 evaluation board overview.

SB5 requires a 5VDC supply which is provided via the supplied AC-DC adaptor. The adaptor accepts AC between 100 and 240VAC – the full specification is provided in Appendix A.

Connect the 5VDC jack from the adaptor to the +5VDC socket on the SB5. The yellow 'FPGA Configured' LED should light showing the FPGA has been configured successfully.

Select patterns (by switching the SDI/Pattern switch down) and connect the CVBS output to a monitor. You should be able to see a 75% colour bar pattern. There are ten patterns available, depending on the colour standard selected: They are shown in Table 1.

Switch position[1]	NTSC-M	PAL
0	75% colour bars	75% colour bars
1	100% colour bars	100% colour bars
2	SMPTE colour bars	75% bars + red
3	N7CMPF	CCIR17
4	N7CMBF	CCIR18
5	FCCMB	CCIR330
6	Frequency sweep	CCIR331
7	Limit ramp	Ramp
8	7.75MHz sweep (960H)	7.75MHz sweep (960H)
9	12.0MHz sweep (1280H)	12.0MHz sweep (1280H)

Table 1 SB5 evaluation board patterns.

[1] When the white bar on the switch points downward, 75% colour bars is selected.

The VITS signals are also added to the CVBS output (NTSC/PAL only).

To change the output standard between PAL and NTSC switch the standard select toggle switch.

Switch positions 8 and 9 select 960H (36MHz sampling) or 1280H (54MHz sampling) standards. NTSC/PAL standards are 27MHz sampling.

To use the SDI input, switch the SDI/Pattern switch up. Connect up a valid SDI input (note the colour standard selected must match the SDI input line standard and the pattern select should be set to any NTSC/PAL standard – i.e. not 960H or 1280H mode). If the SDI input is valid and the SDI decoder PLL is able to lock, the green 'SDI locked' LED will light.

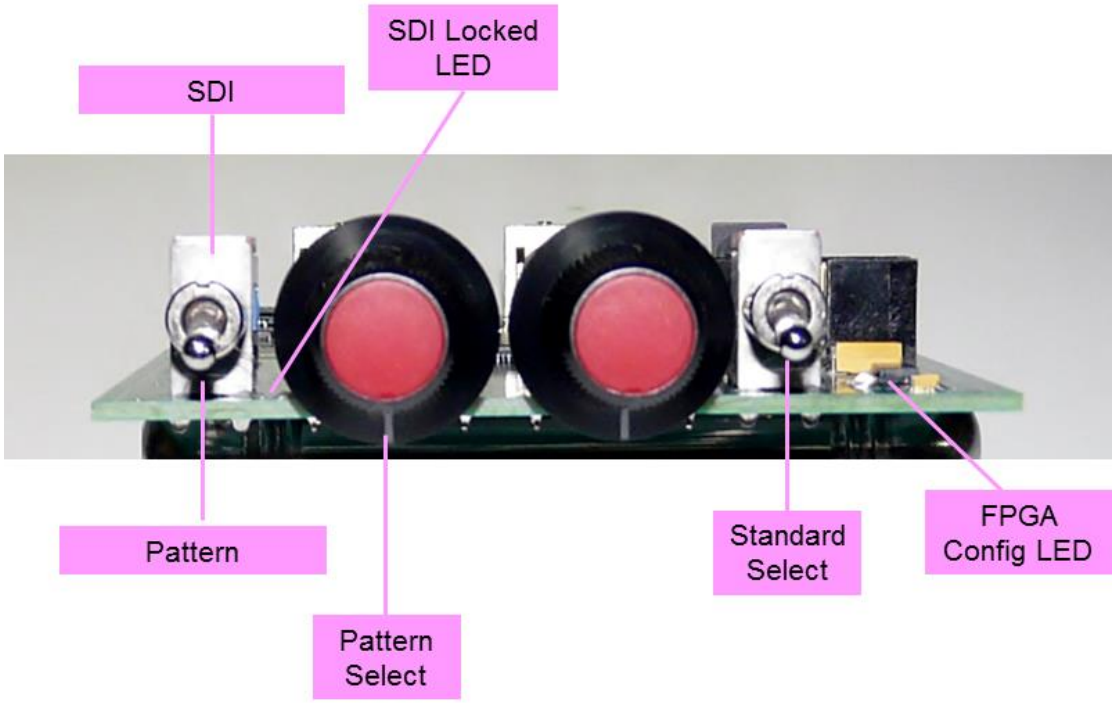

Figure 2 Evaluation board switch functions.

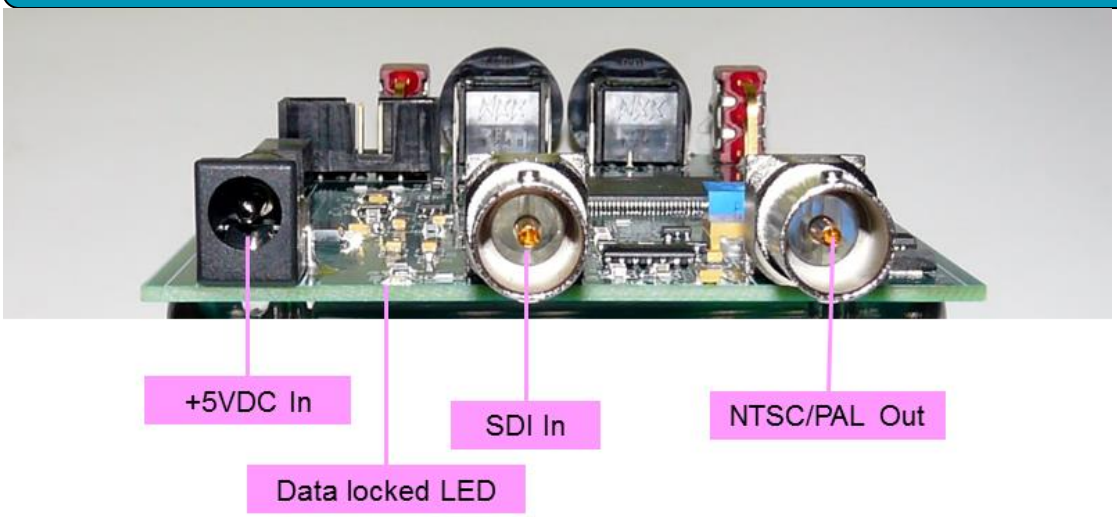

Figure 3 Evaluation board connectors.

Re-programming the FPGA

It may be necessary to reprogram the FPGA to demonstrate any customization to the PT8 IP core. As the SB5 uses an Altera FPGA it is necessary to download the Quartus programmer software (free from the Altera website: https://wl.altera.com/download/software/prog-software/12.1).

Also it is necessary to use the USB-Blaster module, also from Altera (or similar from other companies): http://www.buyaltera.com/scripts/partsearch.dll?Detail&name=544-1775-ND.

The USB-Blaster 10-way header plugs into J3, the 10W header on the SB5. The header is polarized to ensure the cable cannot be inserted the wrong way (see Figure 4).

Figure 4 Re-programming the SB5.

Install and open the Quartus programmer. The screen should look similar to Figure 5.

The new FPGA image will be sent as a file called SB5.pof. Set the programming mode to 'Active Serial Programming'. If everything is OK the programmer should recognize the serial EEPROM (shown as EPCS4). Click the 'Add File' button and point to the SB5.pof file. Click the check box 'Program/Configure' and click the 'Start' button. You should see the progress bar move as the device is programmed. If successful the bar will show 100% (Successful) after programming is complete.

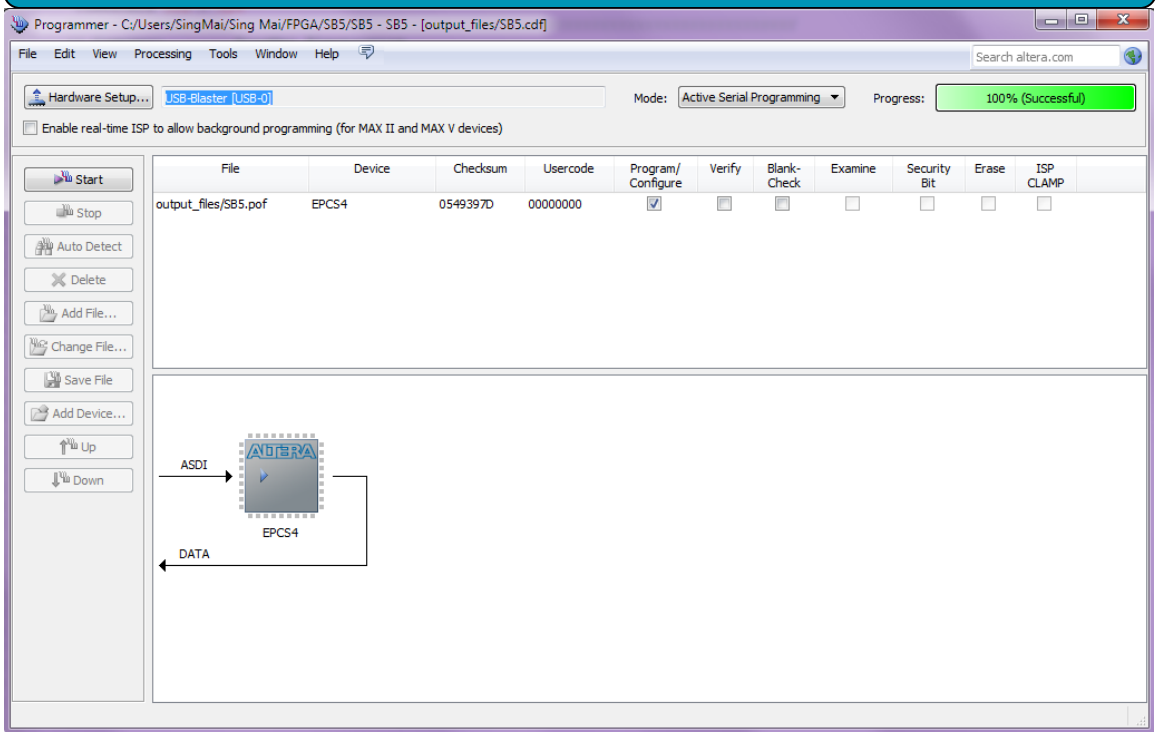

Figure 5 Quartus FPGA programmer.

Technical Overview

The 5VDC input is filtered and linear regulators generate the required local supplies.

The PT8 video encoder IP core is run on an Altera 4CE15 FPGA. The FPGA is configured using a pre-programmed EEPROM.

The input to the PT8 may be either an internal video pattern generator or the BT656 output from the Gennum GS9090B SDI de-serialiser IC.

A 27MHz MEMS oscillator provides a 27MHz clock source for the FPGA. The FPGA PLL multiplies this to 36MHz or 54MHz for 960H/1280H operation respectively.

The PT13 IP core (compact microprocessor) provides the control for the board, reading the switch status and controlling the PLLs, PT8 and video pattern generator.

The output from the PT8 is digital composite video and this is converted to analogue using an ADI AD9705 10-bit DAC. The analogue output is filtered and buffered.

Appendix A: AC-DC adaptor

The specification for the supplied AC-DC adaptor is shown in Figures 6 and 7.

MENB1010

Universal 10 Watt Series

Medical Switch-Mode Power Supply ***3 Year Warranty***

- *100-240Vac Universal Input Range*
- *Meets EISA2007, CEC Efficiency Level V, EU (EC) No 278/2009 Phase II*
- *Desktop & Wall Plug Styles*
- *5V to 24V Single Output Models, up to 12W*
- *Modified and Custom Designs Available*
- *Regulated Output with Low Ripple*
- *Impact-Resistant Polycarbonate Enclosure*
- *No load Power Consumption <0.3W*
- *Limited Power Source*
- *Certified to UL/EN/IEC60601-1, 3rd Edition, 2xMOPP Isolation*

Specifications *All Specifications are typical at nominal input, full load at 25°C unless otherwise stated.*

AC Input	100-240Vac, -/-10%, 47-63 Hz, 1Ø	**MTBF**	>100,000 hours (calculated)
Input Current	100Vac: 0.27A	**Hold-up Time**	18 mS min. @ 115Vac, 60 mS min. @ 230 Vac
Inrush Current	60 A peak max at 264 Vac	**Overload Protection**	Hiccup Mode
Input Fuse	Internal Primary Current Fuse provided (1A, 250Vac rated)	**Short Circuit Protection**	Hiccup Mode
Efficiency	Meets EISA2007, CEC Efficiency Level V, EU (EC) No 278/2009 Phase II	**Topology**	Switching – Fixed Frequency Flyback
Output Voltage	See chart	**Safety Standards**	EN/IEC/CSA/UL60601-1, 3rd Edition
Output Power	See chart	**EMC, Radiated & Conducted**	See Chart below
Ripple and Noise	1% pk-pk max., 20MHz BW	**Dielectric Withstand**	Input-Output: 2 MOPP, Input-Ground: 1 MOPP, Output-Ground: 500Vac
Line & Load Voltage Regulation	Line: +/- 1%, Load: +/-5%	**Operating Temperature**	0° to 40°C, no derating
Minimum Load	Not required	**Storage Temperature**	-30 to +85°C
Case Material	Black 94V-0 Polycarbonate	**Relative Humidity**	5% to 95%, non-condensing
Case Dimensions	84 x 47 x 32mm. See outline drawing	**Operating Altitude**	-500 to 10,000 ft
Weight	110g	**Non-operating Altitude**	-500 to 40,000 ft
Output Cable	#20AWG (UL2468), 1500mm, 2 conductor	**Output Connector**	2.5mm barrel type (Ault #3), center contact (+) Other options available, contact the factory for details

EMC Specifications

Conducted Emissions	EN55011 Class B, FCC Part 15, Class B.
Radiated Emissions	EN55011 Class B, FCC Part 15, Class B.
Line Frequency Harmonics	EN61000-3-2, Class A
Voltage Fluctuations/Flicker	EN61000-3-3
Static Discharge Immunity	EN61000-4-2, 6kV Contact Discharge, 8kV air discharge
Radiated RF Immunity	EN61000-4-3, 3V/m.
EFT/Burst Immunity	EN61000-4-4, 2kV/5kHz.
Line Surge Immunity	EN61000-4-5, 1kV differential, 2kV common-mode
Conducted RF Immunity	EN61000-4-6, 3Vrms
Power Frequency Magnetic Field Immunity	EN61000-4-8, 3A/m
Voltage Dip Immunity	EN61000-4-11, Criteria A

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Figure 6 AC-DC adaptor specification- Page 1.

MENB1010

Universal 10 Watt Series

Medical Switch-Mode Power Supply — **3 Year Warranty**

Model Number	Volts (V)	Output Current (max)	Max Watts	Ripple (Vp-p max)
MENB1010A0503F01	5 V	2.00 A	10.0 W	50 mV
MENB1010A0603F01	6 V	2.00 A	12.0 W	60 mV
MENB1010A0703F01	7.5 V	1.60 A	12.0 W	75 mV
MENB1010A0903F01	9 V	1.10 A	10.0 W	90 mV
MENB1010A1203F01	12 V	1.00 A	12.0 W	120 mV
MENB1010A1503F01	15 V	0.80 A	12.0 W	150 mV
MENB1010A1603F01	16 V	0.75 A	12.0 W	160 mV
MENB1010A1803F01	18 V	0.67 A	12.0 W	180 mV
MENB1010A2403F01	24 V	0.50 A	12.0 W	240 mV
MENB1010A4803F01	48 V	0.25 A	12.0 W	480 mV

Notes: Part numbers above include #3 output connector and IEC320 C14 grounded input receptacle. See below for other options.

Model Number Key

MENB 1 010 A VV 03 F 01

Model	"01" = Standard. "02" and higher indicates a modified model.
Input Connector:	"F" = IEC320 C14 grounded, Other options available, see below
Output Connector:	"03" = 2.5mm Barrel Type Connector. Other options available, contact factory.
Output Voltage:	"05" = 5Vdc, "12" = 12Vdc, "24" = 24Vdc, etc.
Model	"A" = Original Configuration
Output Power:	"010" = 10 Watts
# of Outputs	"1" = Single Output
Product Family:	"M" = Medical, "E" = External, "NB" = Model Series Designator

AC Input Receptacle Options

Desktop

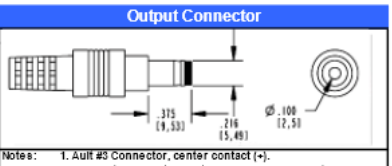
IEC320 - C14 Class I Grounded (F) | IEC320 - C18 Class II Ungrounded (Q) | IEC320 - C8 Class II "Shaver" (N)

Wall-Plug

N. America Japan Interchangable (B) | N. America Japan Fixed (C) | Europe Fixed (M) | United Kingdom Fixed (G) | Australia Fixed (H)

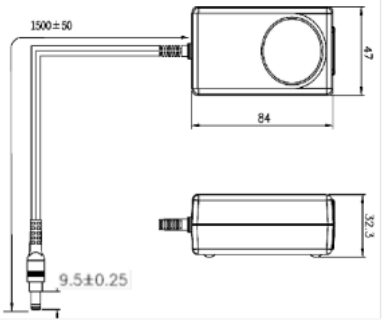
Notes:
1. For desktop options, choose applicable letter above.
2. For Wall-Plug options, choose the applicable letter above and the unit will be fitted with the receptacle chosen. The N. A. blade version (B) will be an interchangeable blade. The other options (C), (M), (G), and (H) will be fixed blades molded in the case.
3. Blade Kit is available which will include one each of a EU, UK, and Australian blade. Kit part # is KT1027K. These can be used with the (B) version, to allow blades to be changed.

Output Connector

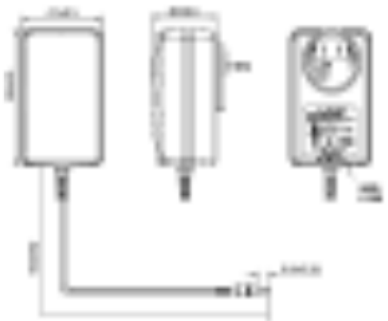


Notes:
1. Ault #3 Connector, center contact (+).
2. Connector is Switchcraft 760 plug or equivalent. Mating connector is Switchcraft 712A or equivalent.
3. Other connector options are available. Contact your local SL Power Representative for details.

Outline Drawings



Desktop Style



Wall-Plug Style (Option "B" Shown)

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Figure 7 AC-DC adaptor specification- Page 2.

Appendix B: SB5 Schematics

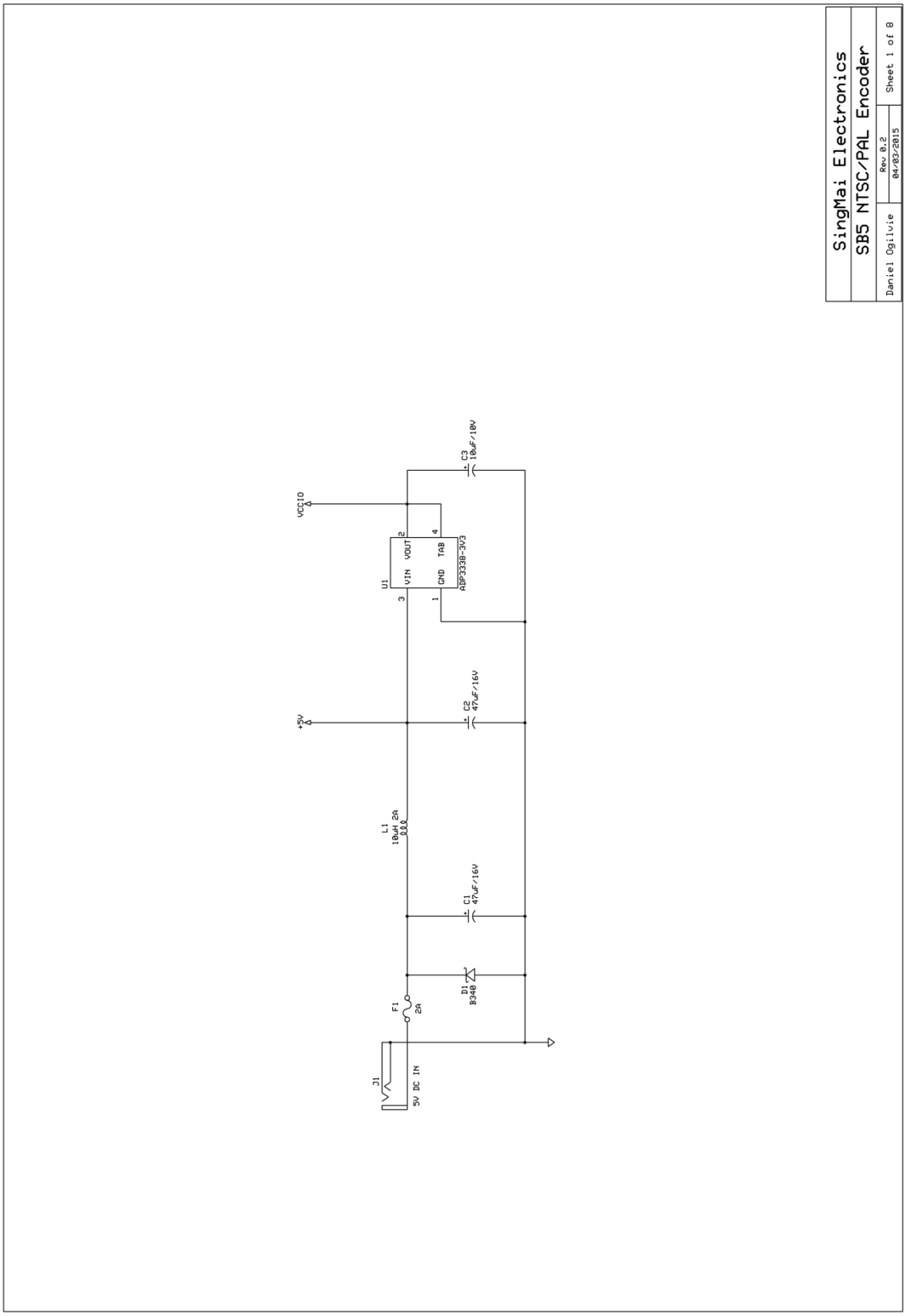

Figure 8 SB5 schematics - sheet 1.

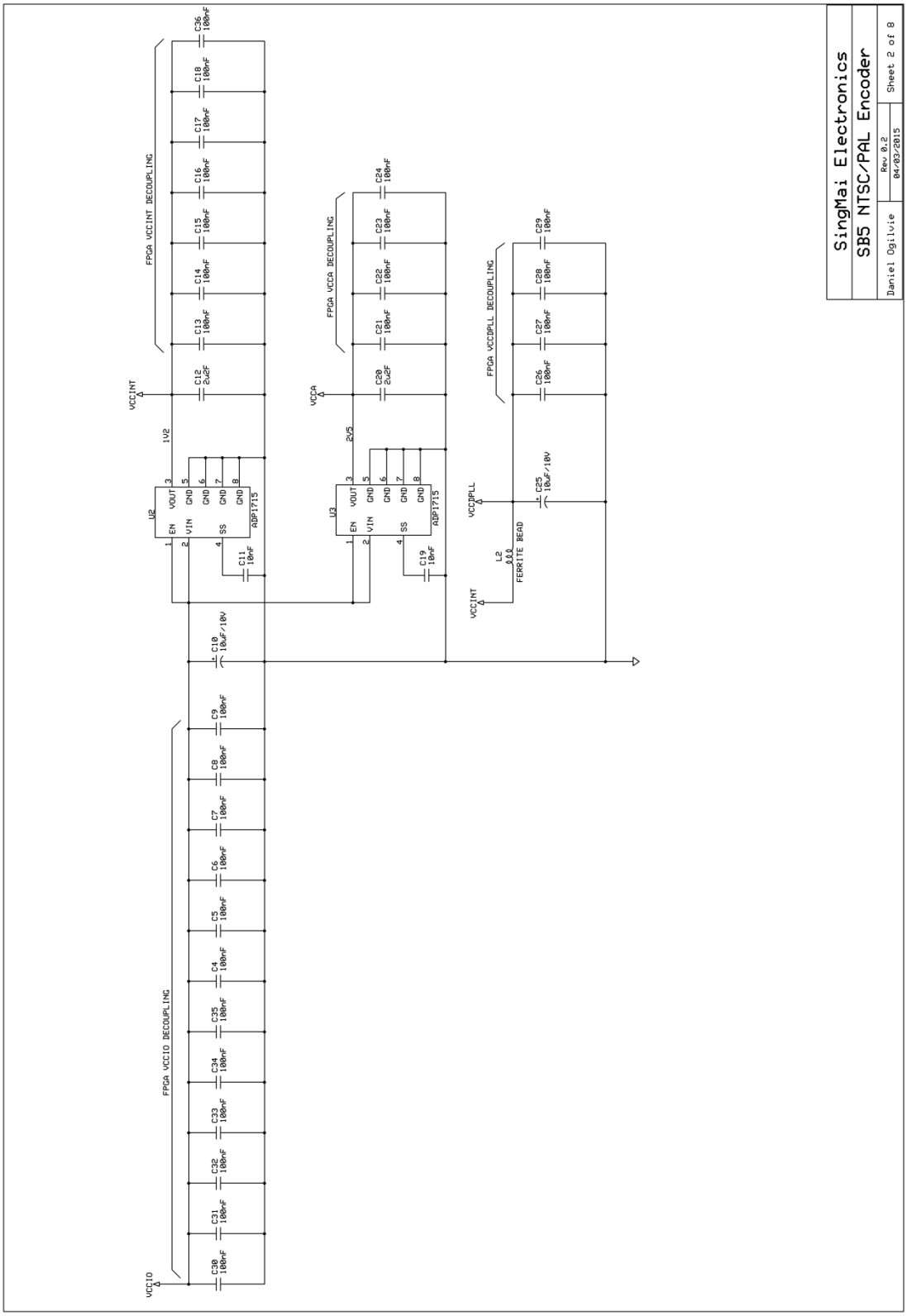

Figure 9 SB5 schematics - sheet 2.

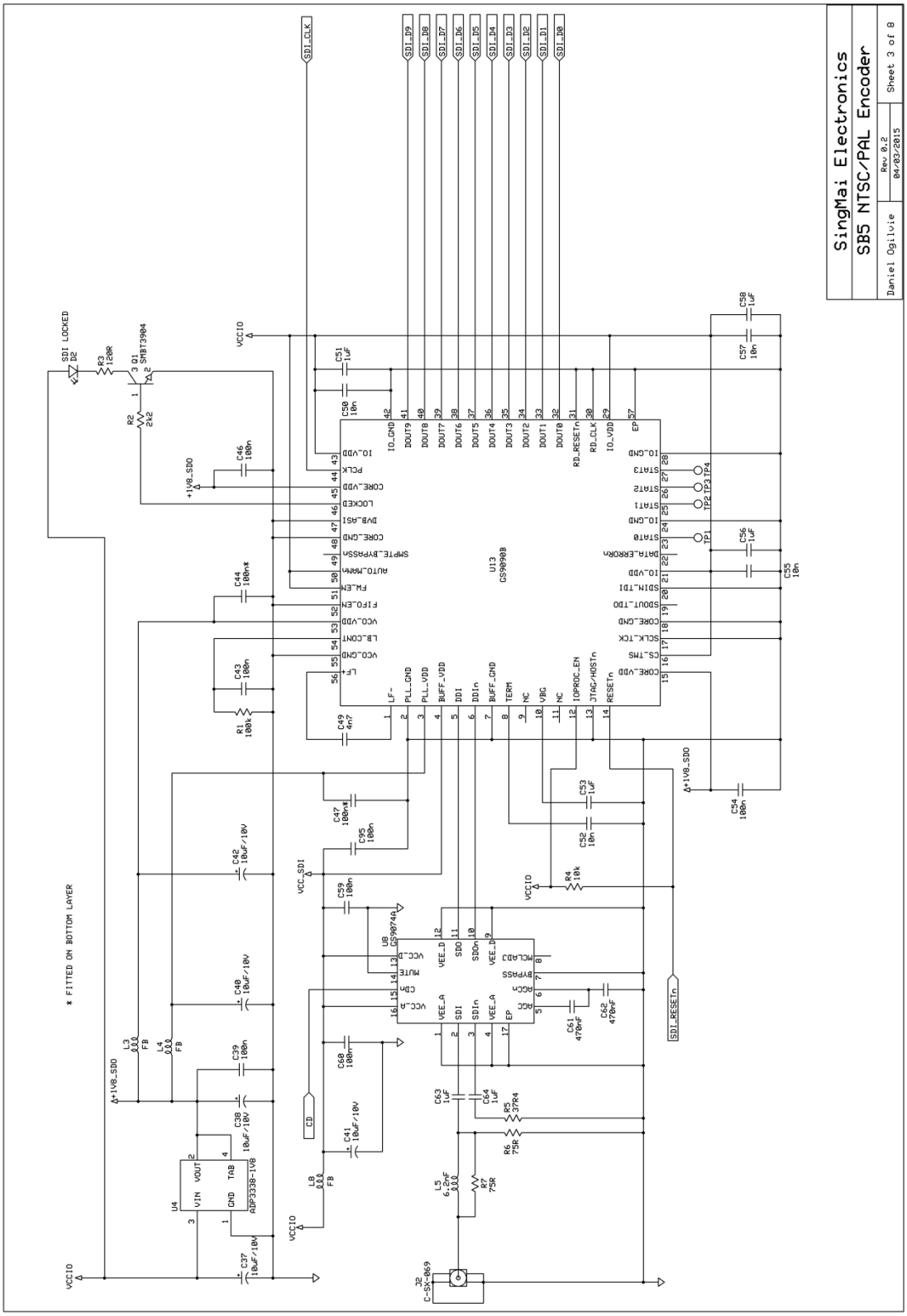

Figure 10 SB5 schematics - sheet 3.

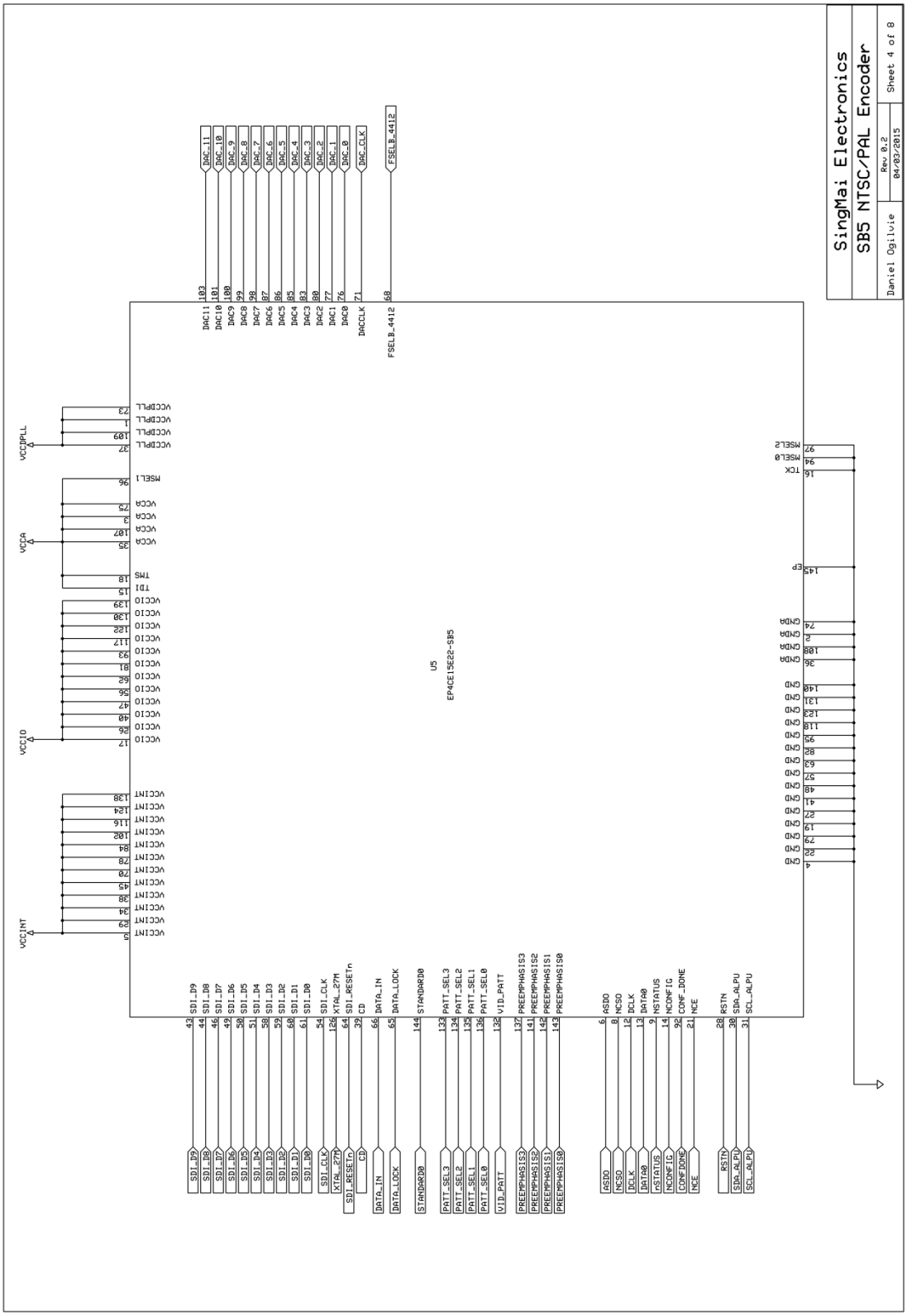

Figure 11 SB5 schematics - sheet 4.

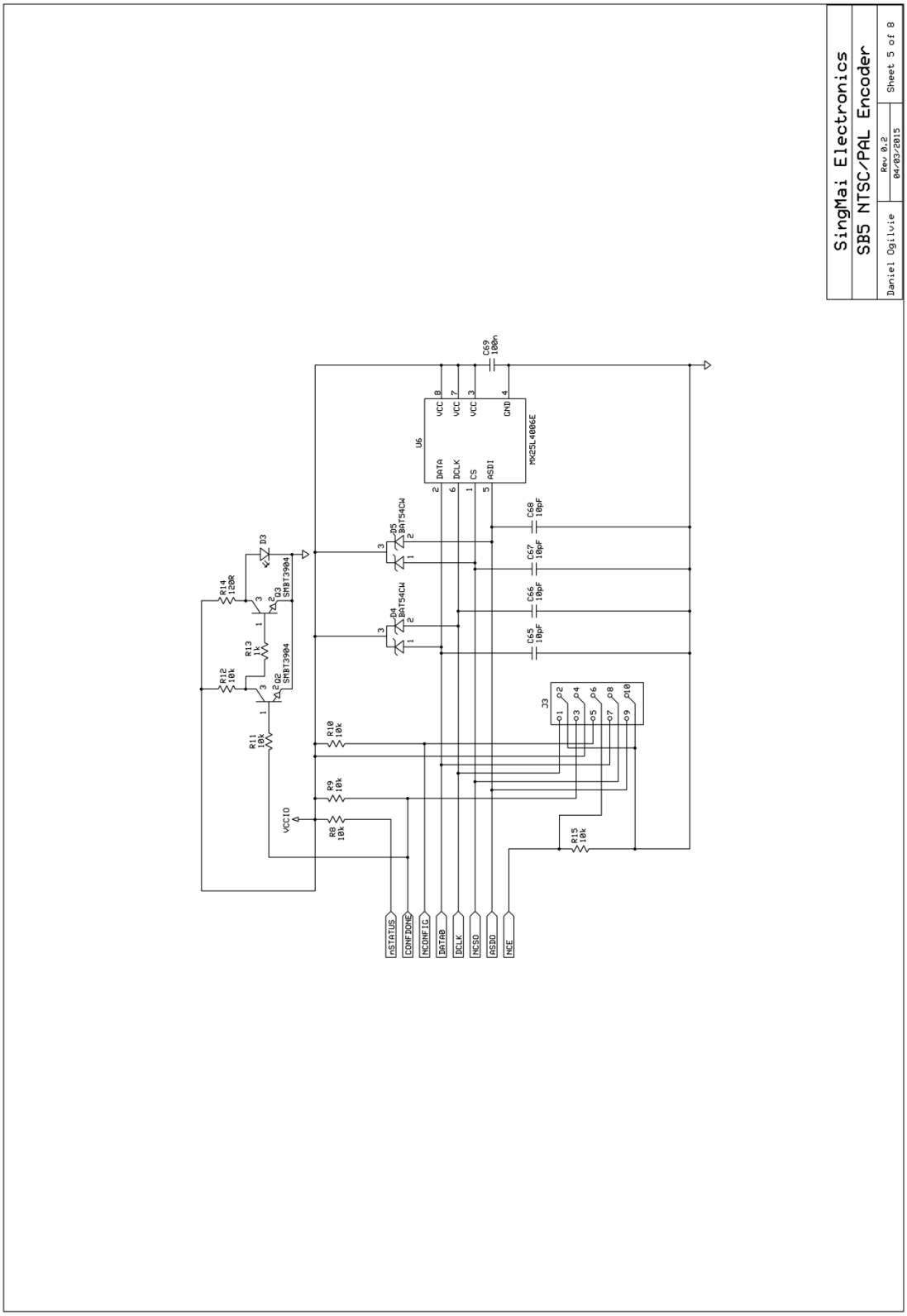

Figure 12 SB5 schematics - sheet 5.

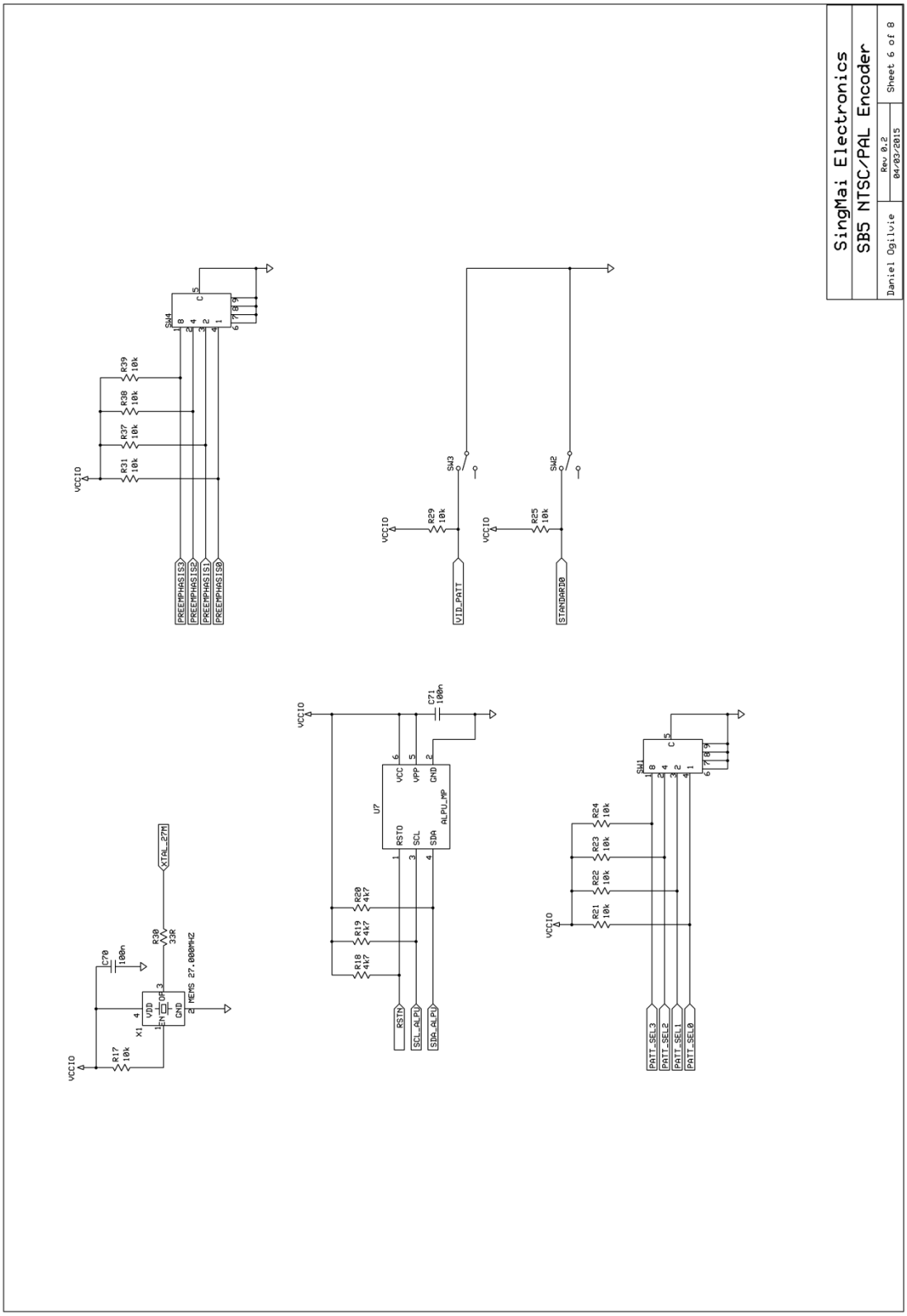

Figure 13 SB5 schematics - sheet 6.

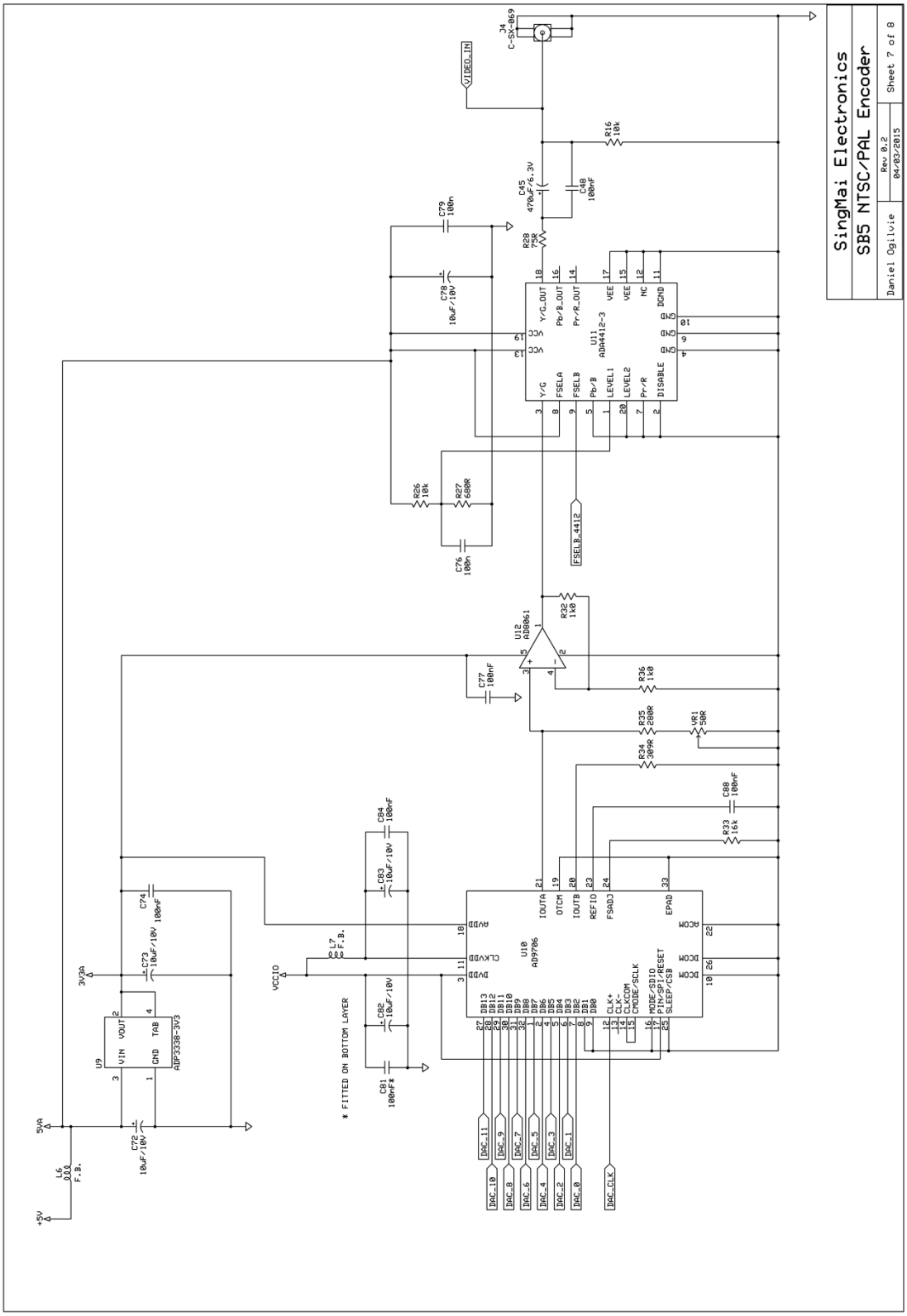

Figure 14 SB5 schematics - sheet 7.

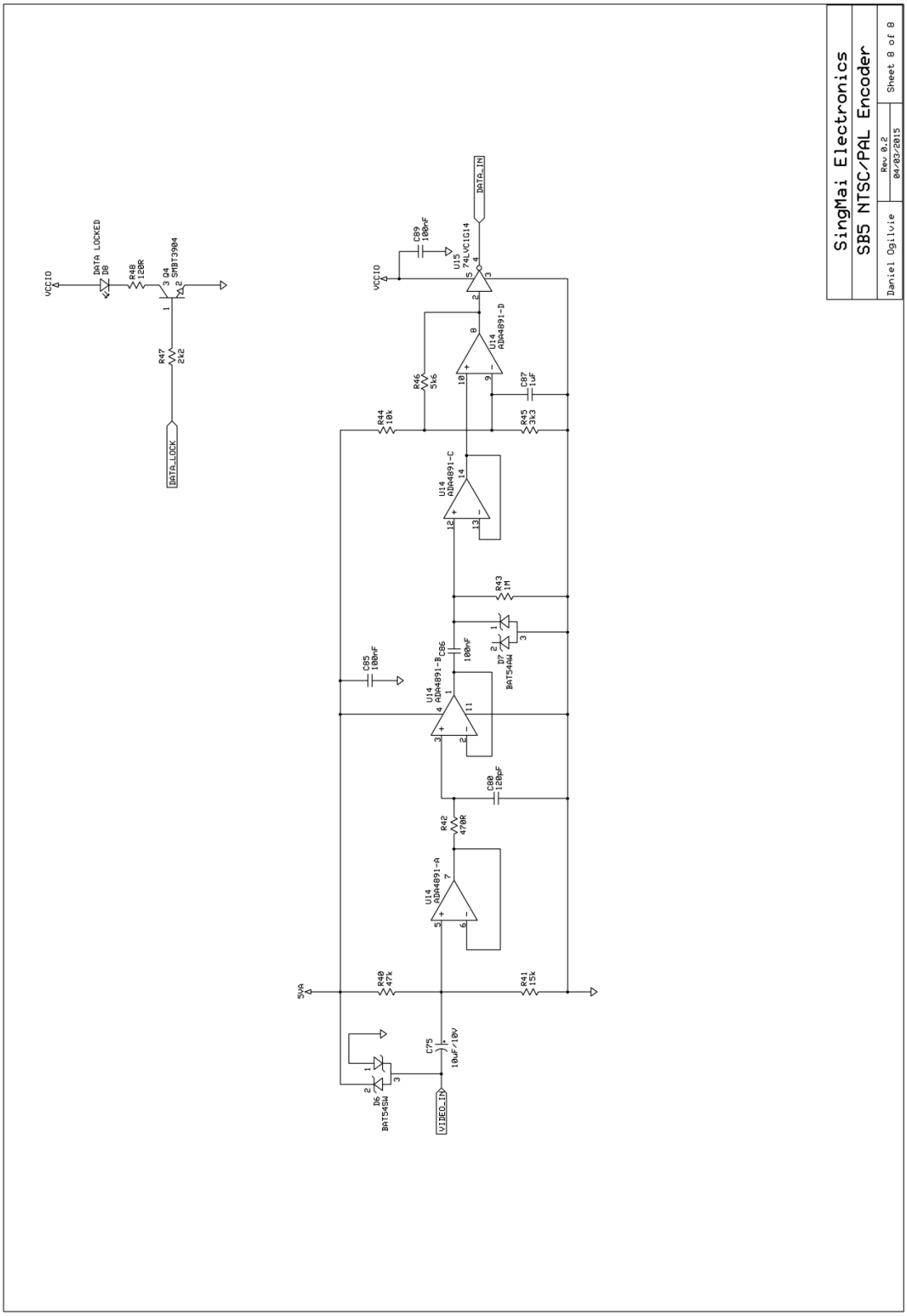

Figure 15 SB5 schematics - sheet 8.