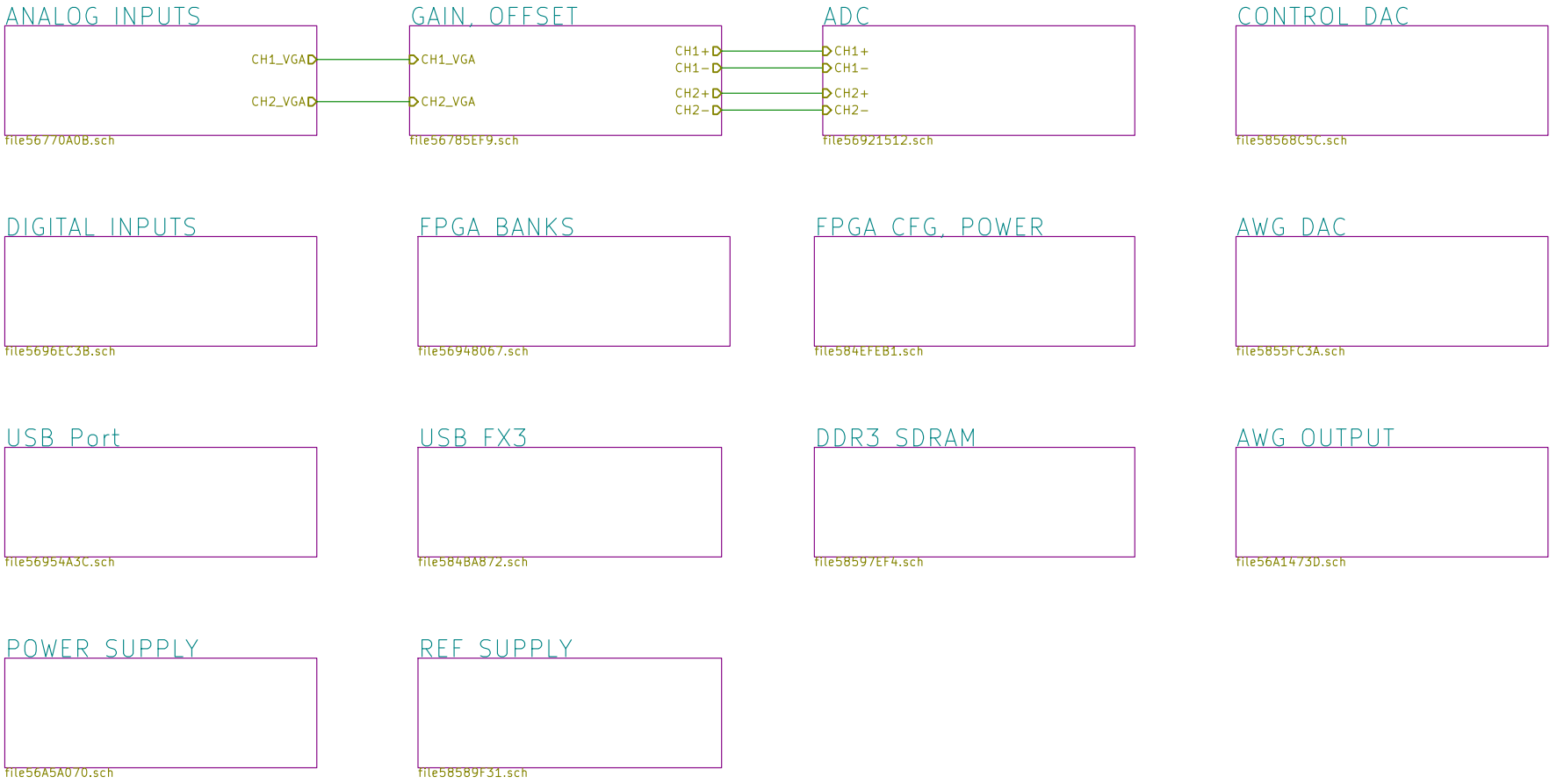
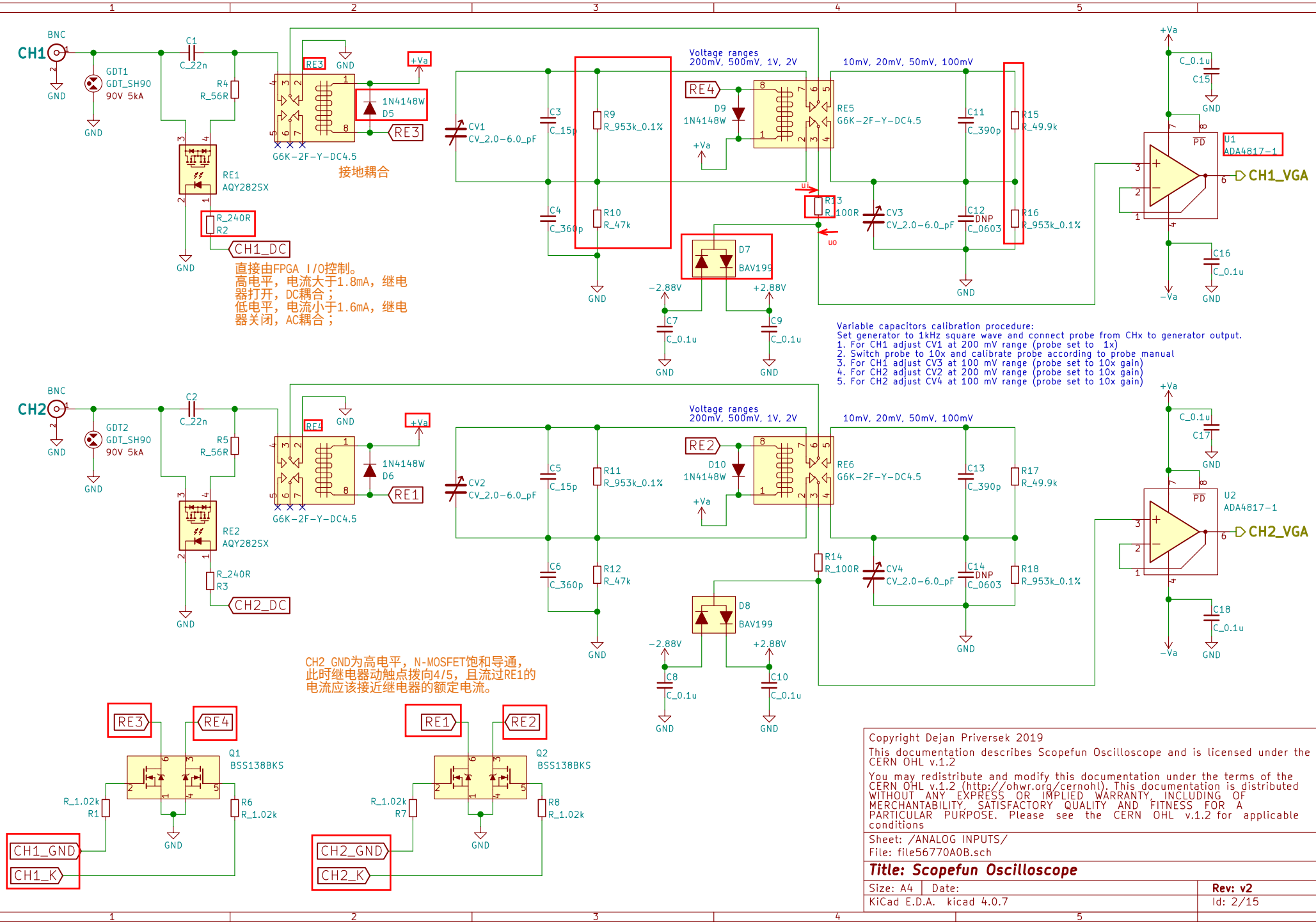


Sheet: /

File: Scopefun_v2.sch

Title: Scopefun Oscilloscope

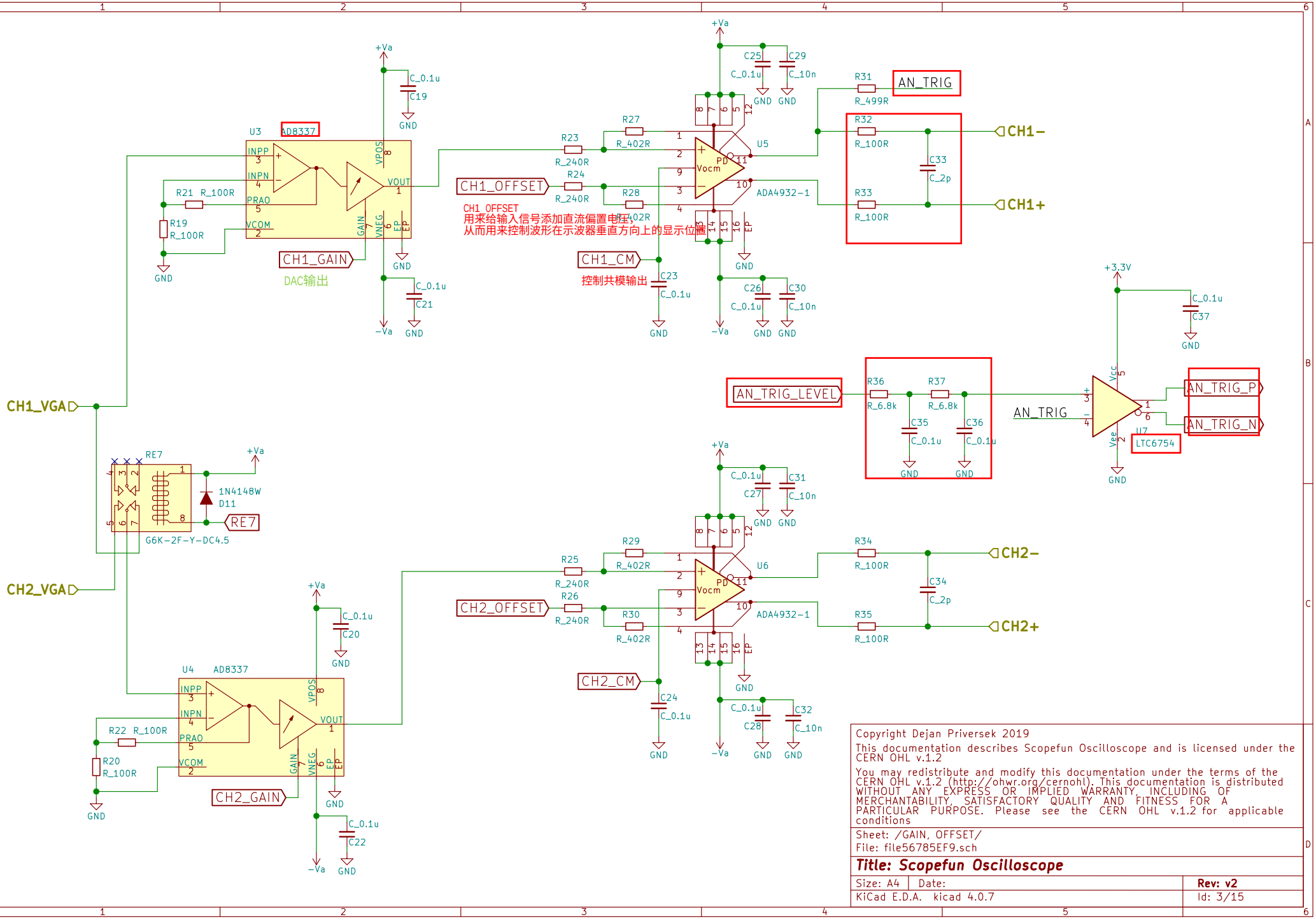
Size: A4	Date:	**Rev: v2**
KiCad E.D.A. kicad 4.0.7		Id: 1/15



Sheet: /ANALOG INPUTS/
File: file56770A0B.sch

Title: Scopefun Oscilloscope

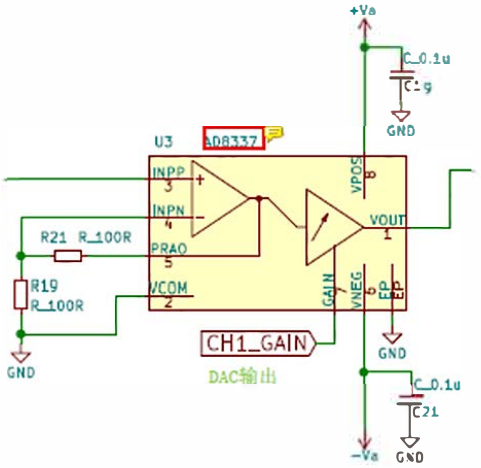
Size: A4	Date:	Rev: v2
KiCad E.D.A. kicad 4.0.7		Id: 2/15



Sheet: /GAIN, OFFSET/
File: file56785EF9.sch

Title: Scopefun Oscilloscope

Size: A4	Date:	Rev: v2
KiCad E.D.A. kicad 4.0.7		Id: 3/15

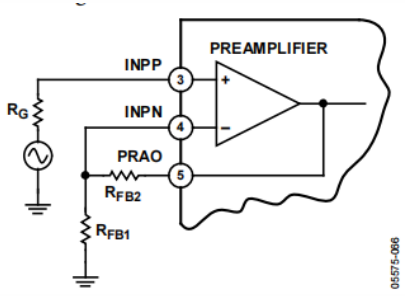


当前置放大器的增益设置为6dB(2V/V)时，总体增益计算如下：

$$Gain(\text{dB}) = \left[19.7\frac{\text{dB}}{\text{V}} \times V_{GAIN}\right] + ICPT(\text{dB})$$

where the nominal intercept ($ICPT$) = 12.65 dB.

前置放大器同相输入，增益为2V/V时，推荐以下电路连接：



推荐RFB2大于等于100欧姆。这会使得前置放大器性能稳定

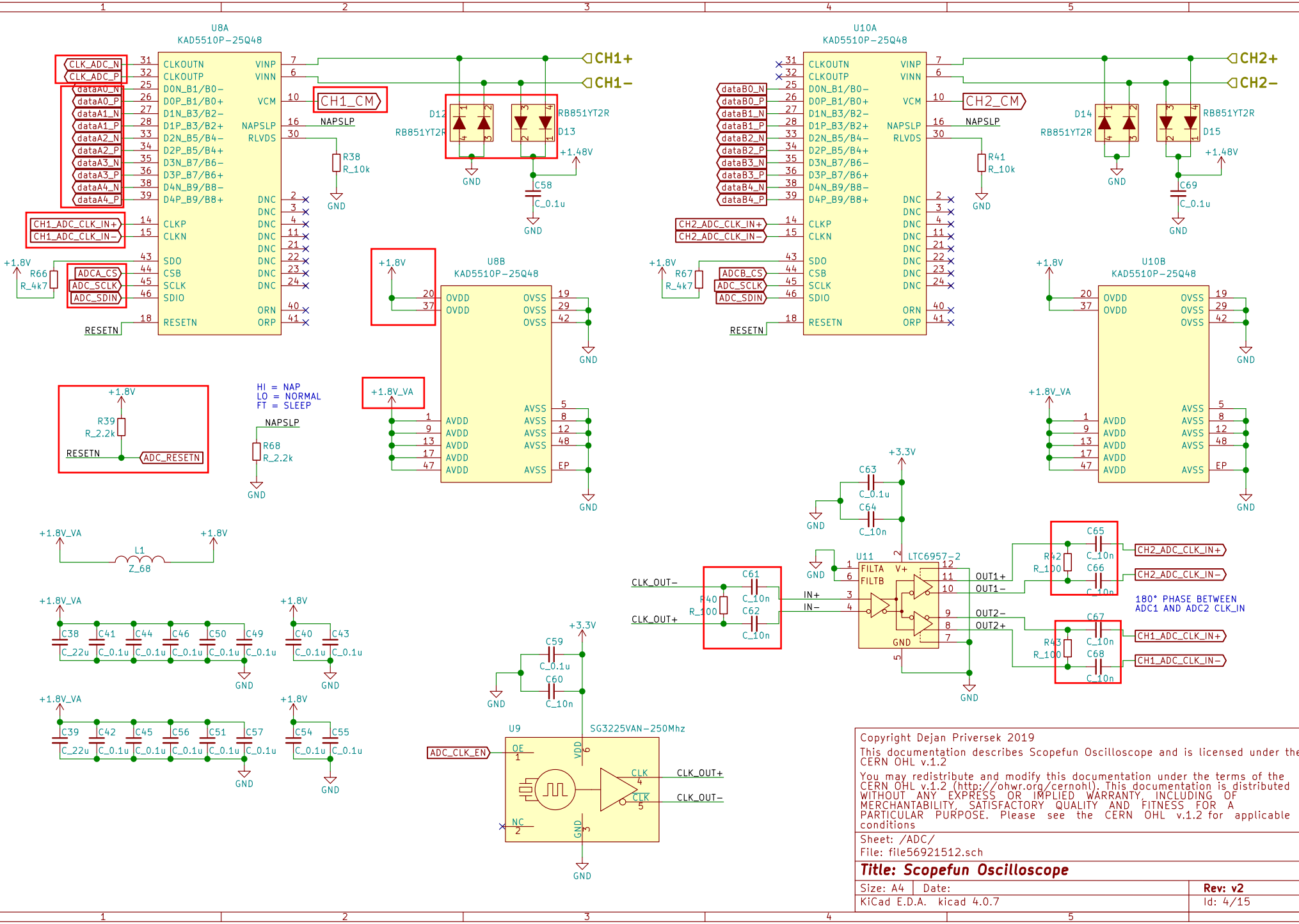
绝对最大额定值		
Supply Voltage		±6 V
Input Voltage (INPx)		VPOS, VNEG
GAIN Voltage		VPOS, VNEG
引脚定义		
引脚号	引脚名	引脚描述
1	VOUT	
2	VCOM	当使用双电源供电时为电源的供地；当使用单电源时，在 VPOS 引脚上为 VCOM 引脚提供一半的正电源电压。
3	INPP	前置放大器正极输入
4	INPN	前置放大器负极输入
5	PRAO	前置放大器输出
6	VNEG	负向电源；双电源供电连接负电源，单电源供电接地
7	GAIN	增益控制电压输入引脚
8	VPOS	正向电源
EP	Exposed Pad	

SPECIFICATIONS

V_S = ±2.5 V, T_A = 25°C, preamplifier gain = +2, V_{COM} = GND, f = 10 MHz, C_L = 5 pF, R_L = 500 Ω, including a 20 Ω snubbing resistor, unless otherwise specified.

Table 1.

Parameter	Test Conditions/Comments	Min	Typ	Max	Unit
GENERAL PARAMETERS					
−3 dB Small Signal Bandwidth −3db小信号带宽	V_{OUT} = 10 mV p-p		280		MHz
−3 dB Large Signal Bandwidth	V_{OUT} = 1 V p-p		100		MHz
Slew Rate 压摆率	V_{OUT} = 2 V p-p		625		V/µs
	V_{OUT} = 1 V p-p		490		V/µs
Output Signal Range 输出信号范围	R_L ≥ 500 Ω, V_S = ±2.5 V, +5 V		V_{COM} ± 1.3		V
	R_L ≥ 500 Ω, V_S = ±5 V		V_{COM} ± 2.4		V
GAIN CONTROL INTERFACE 增益控制接口					
Gain Scaling Factor 增益比例系数	−0.6 V < V_{GAIN} < +0.6 V		19.7		dB/V
Gain Range 增益范围			24		dB
Intercept 截止	V_{GAIN} = 0 V		12.65		dB
Input Voltage (V_{GAIN}) Range	No foldover	−V_S		+V_S	V
POWER SUPPLY					
Supply Voltage 电源电压	V_{POS} to V_{NEG} (dual- or single-supply operation)	4.5	5	10	V
V_S = ±2.5 V					
Quiescent Current 静态电流	Each supply (VPOS and VNEG)	10.5	15.5	23.5	mA
Power Dissipation	No signal, VPOS to VNEG = 5 V		78		mW
PSRR 电源纹波抑制比	V_{GAIN} = 0.7 V, f = 1 MHz		−40		dB
V_S = ±5 V					
Quiescent Current	Each supply (VPOS and VNEG)	13.5	18.5	25.5	mA
Power Dissipation	No signal, VPOS to VNEG = 10 V		185		mW
PSRR	V_{GAIN} = 0.7 V, f = 1 MHz		−40		dB

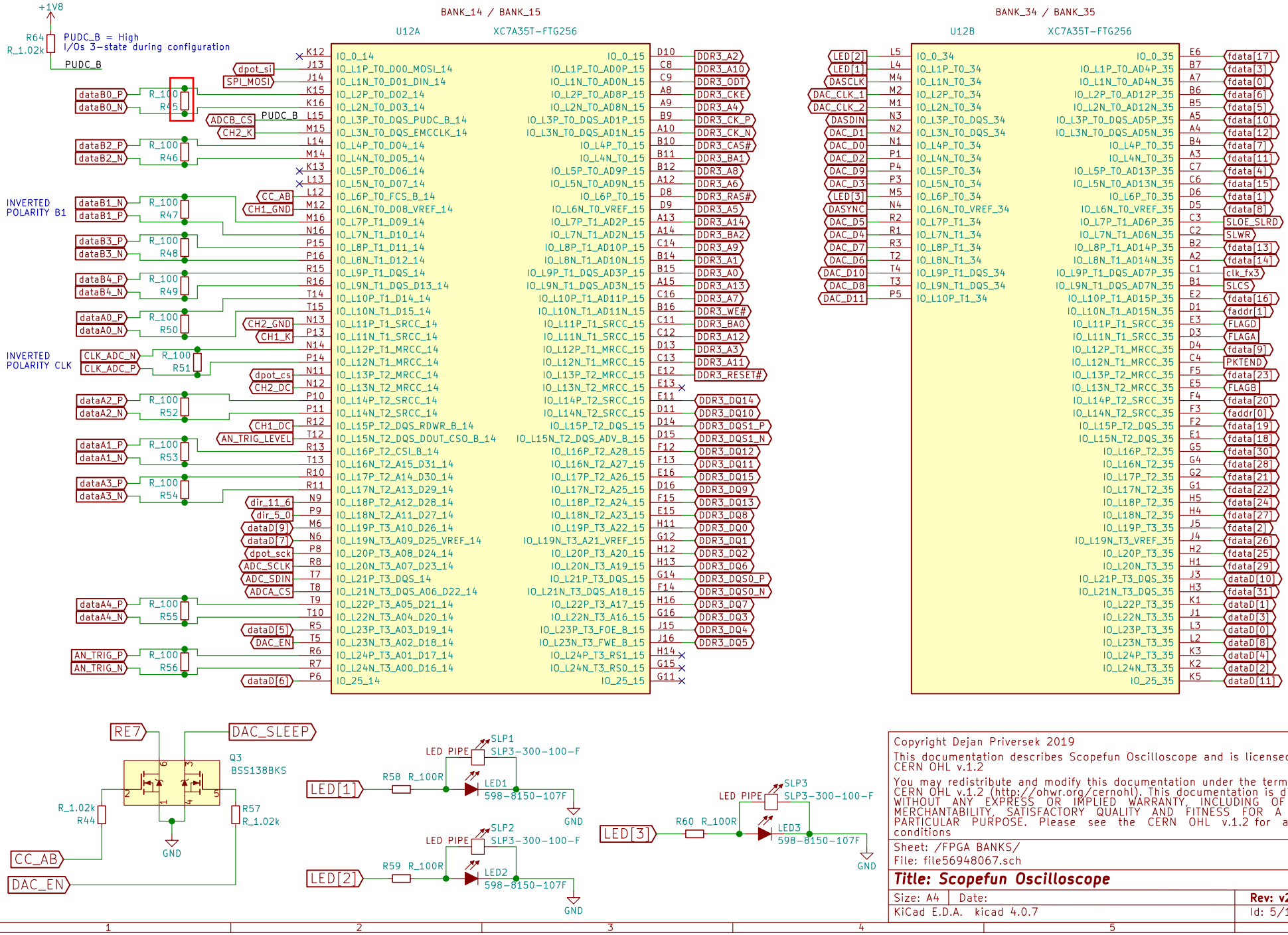


Sheet: /ADC/

File: file56921512.sch

Title: Scopefun Oscilloscope

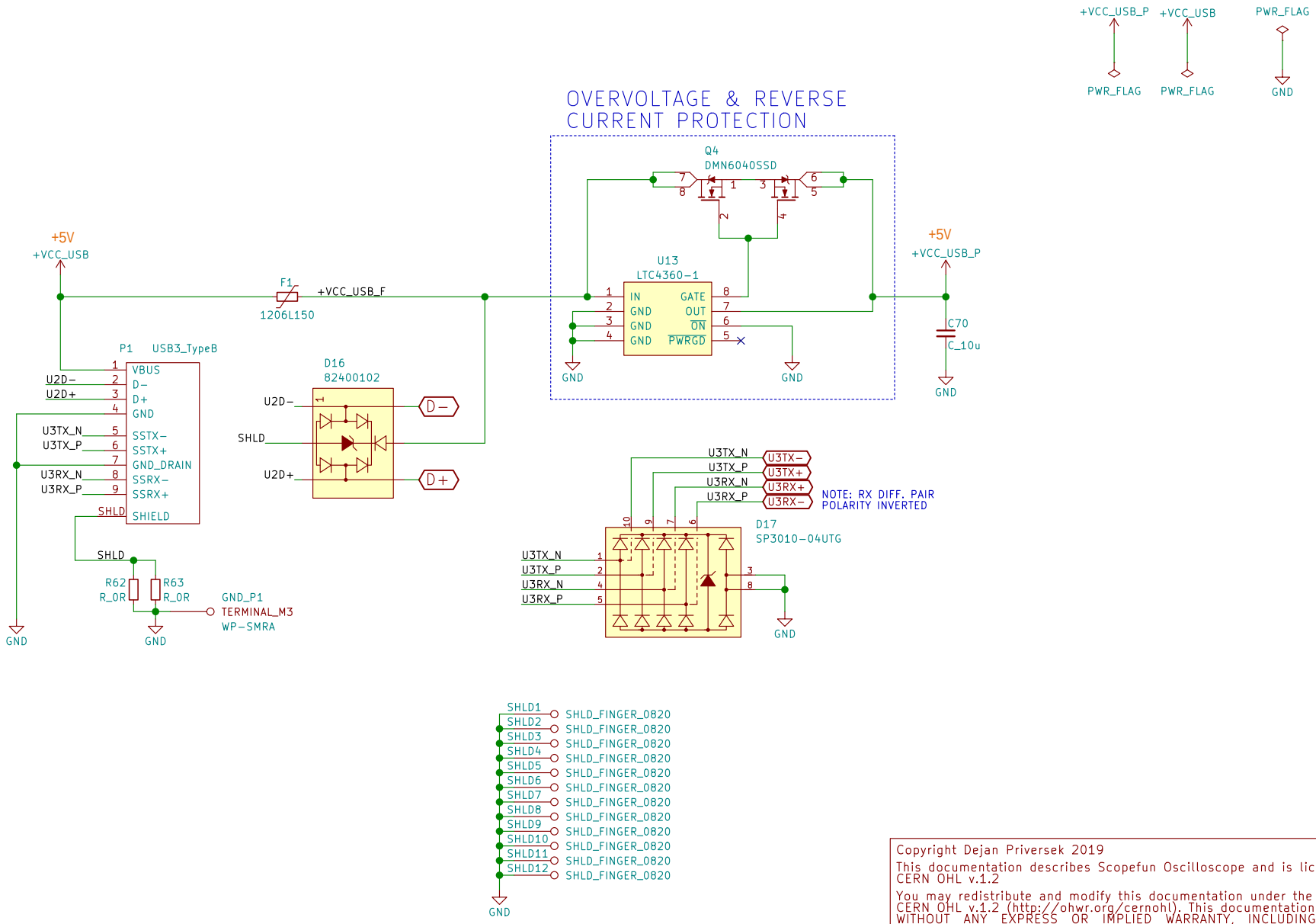
Size: A4	Date:	Rev: v2
KiCad E.D.A. kicad 4.0.7		Id: 4/15



Sheet: /FPGA BANKS/
File: file56948067.sch

Title: Scopefun Oscilloscope

Size: A4	Date:	Rev: v2
KiCad E.D.A. kicad 4.0.7		Id: 5/15

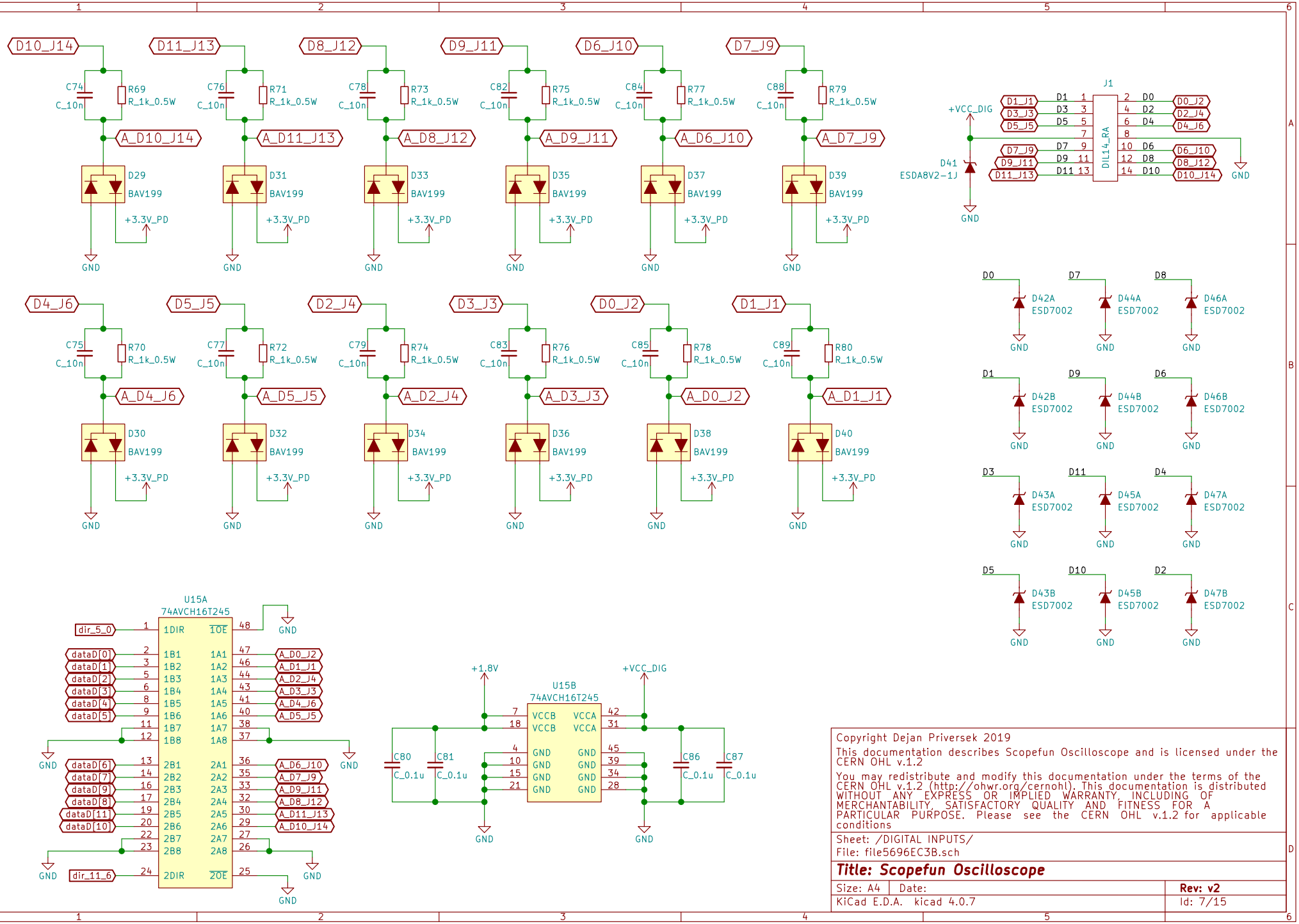


Sheet: /USB Port/

File: file56954A3C.sch

Title: Scopefun Oscilloscope

Size: A4	Date:	**Rev: v2**
KiCad E.D.A. kicad 4.0.7		Id: 6/15

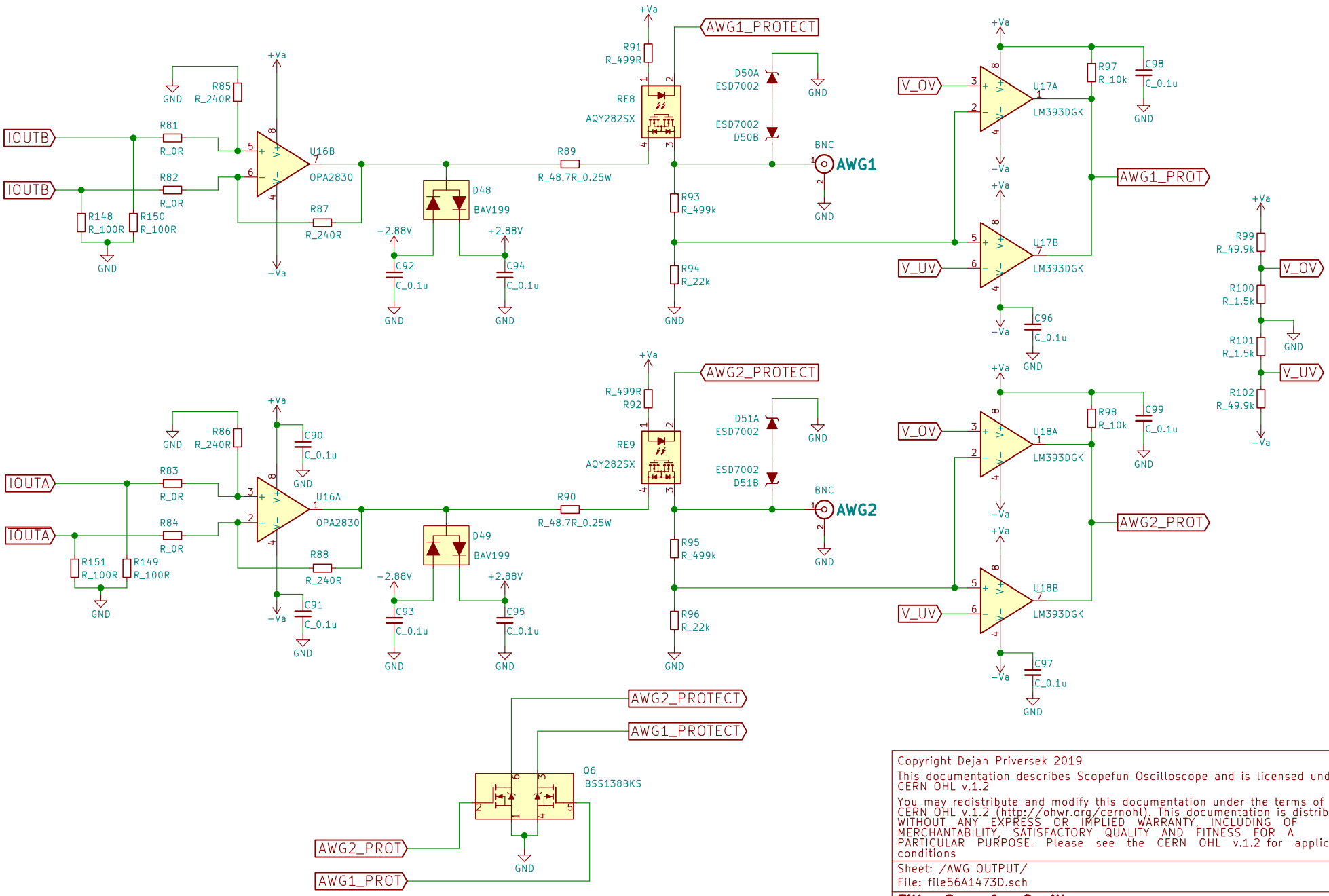


Sheet: /DIGITAL INPUTS/

File: file5696EC3B.sch

Title: Scopefun Oscilloscope

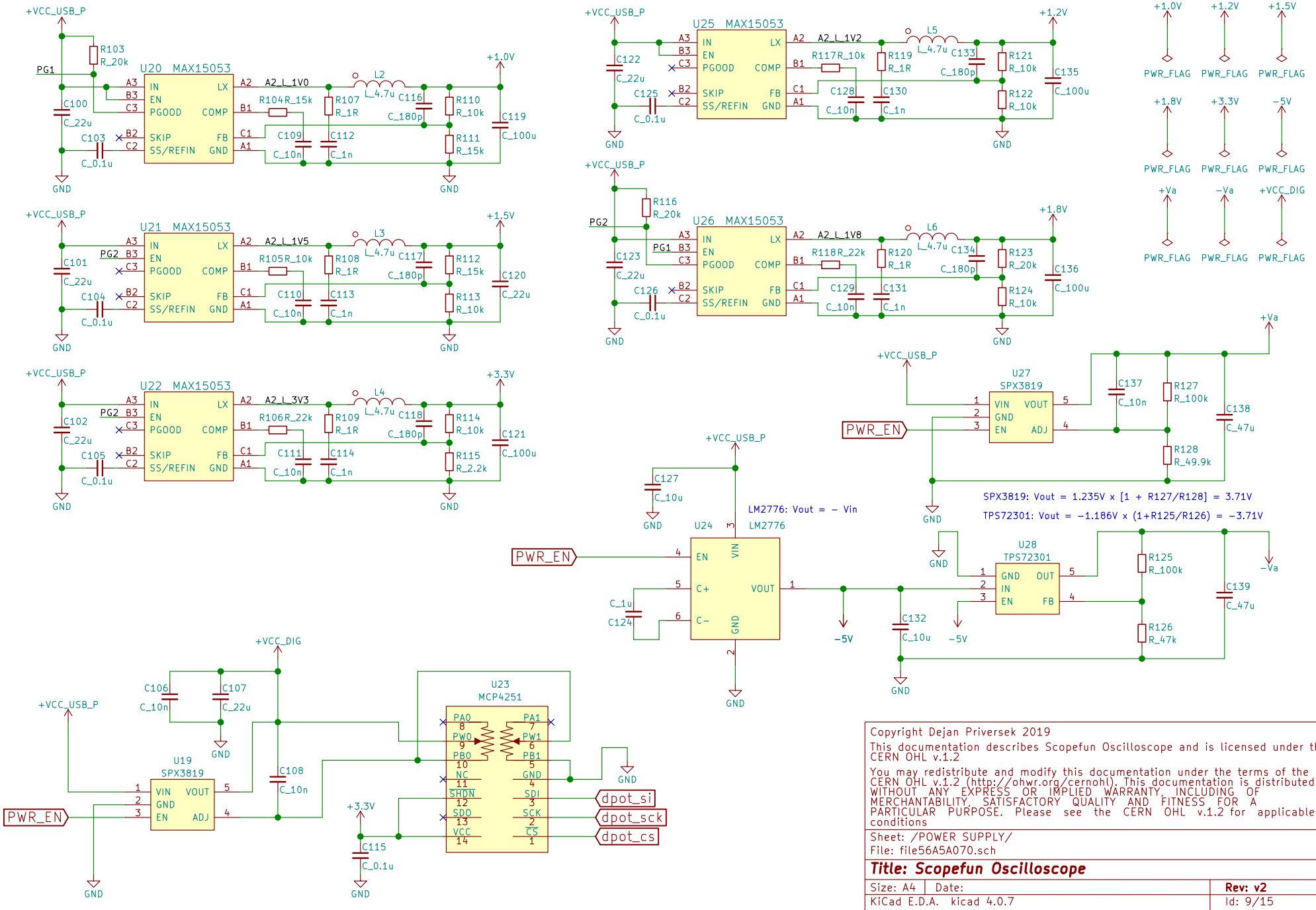
Size: A4	Date:	Rev: v2
KiCad E.D.A. kicad 4.0.7		Id: 7/15



Sheet: /AWG OUTPUT/
File: file56A1473D.sch

Title: Scopefun Oscilloscope

Size: A4	Date:	Rev: v2
KiCad E.D.A. kicad 4.0.7		Id: 8/15



Sheet: /POWER SUPPLY/

File: file56A5A070.sch

Title: Scopefun Oscilloscope

Size: A4	Date:	Rev: v2
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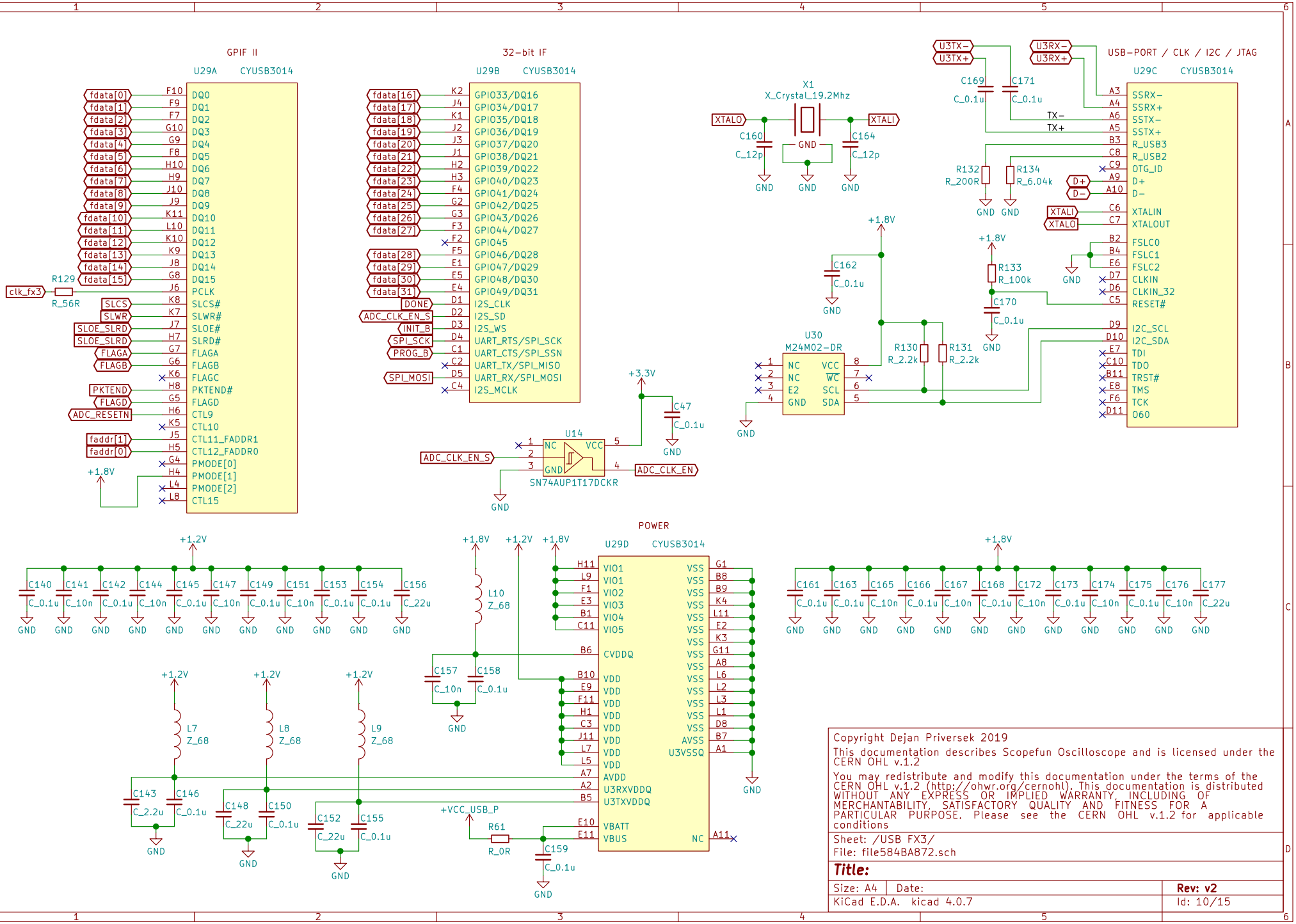

Sheet: /USB FX3/

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Size: A4	Date:	**Rev: v2**
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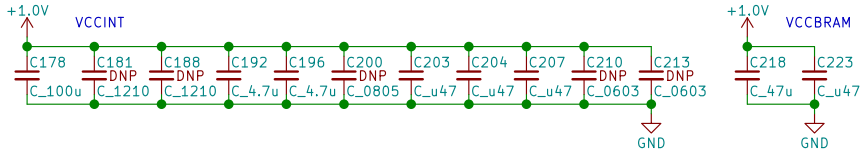

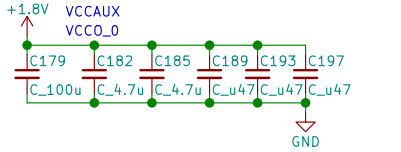

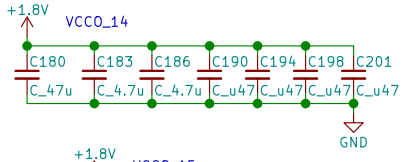

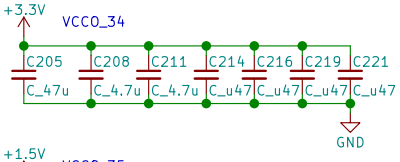

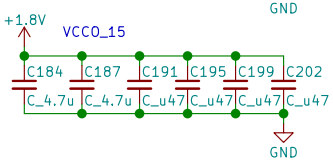

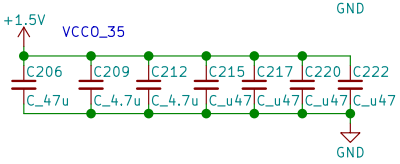

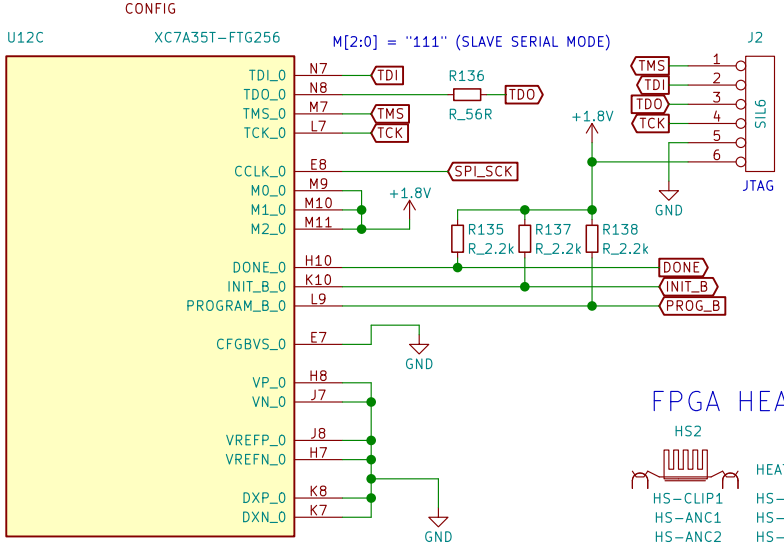

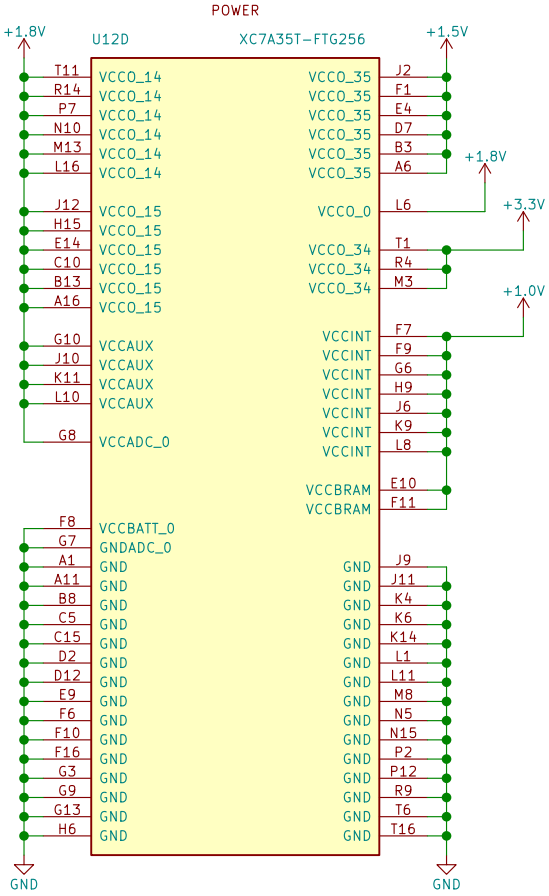

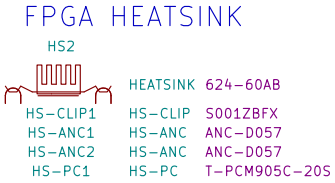

Sheet: /FPGA CFG, POWER/
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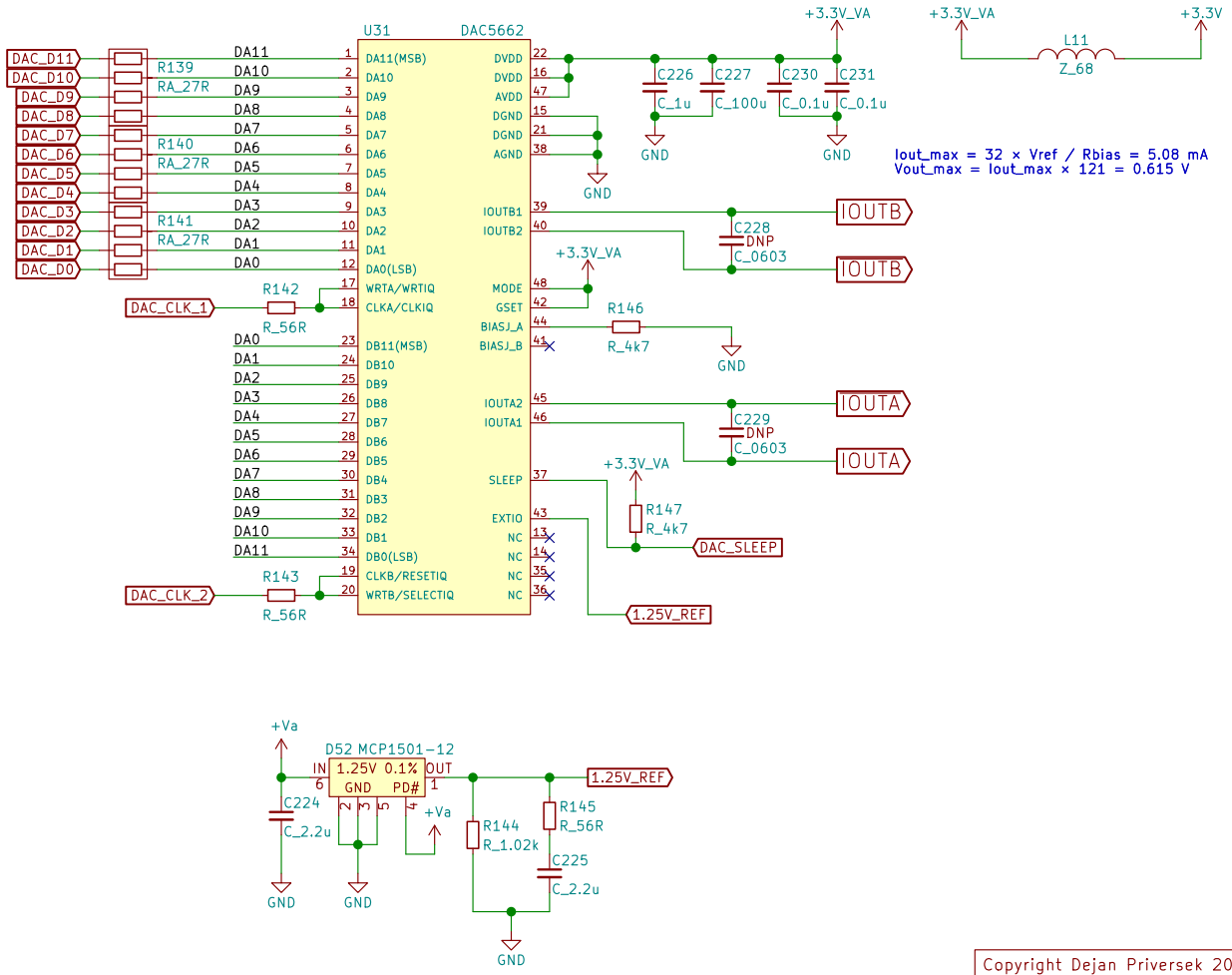
Size: A4	Date:	**Rev: v2**
KiCad E.D.A. kicad 4.0.7		Id: 11/15



Sheet: /AWG DAC/
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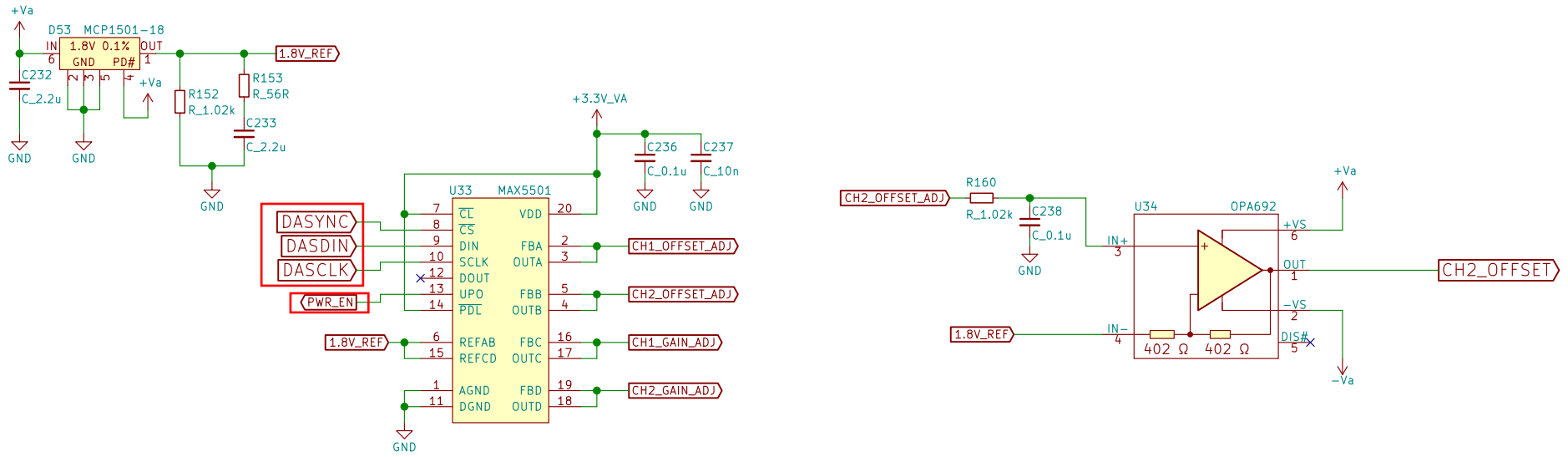
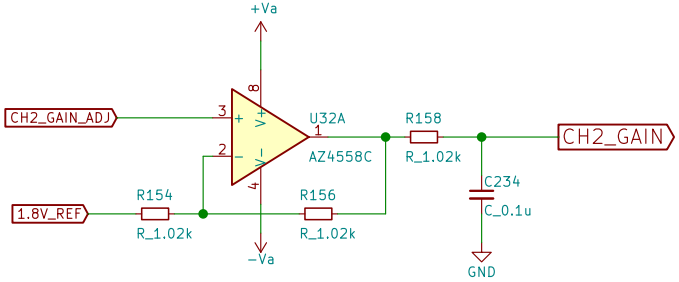
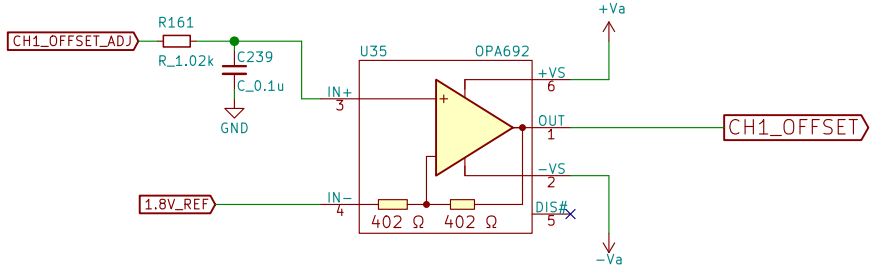
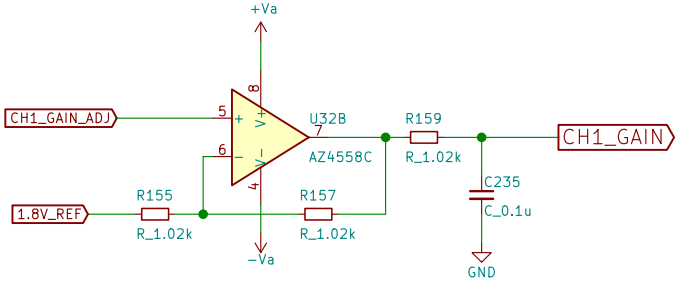
Size: A4	Date:	**Rev: v2**
KiCad E.D.A. kicad 4.0.7		Id: 12/15









Sheet: /CONTROL DAC/
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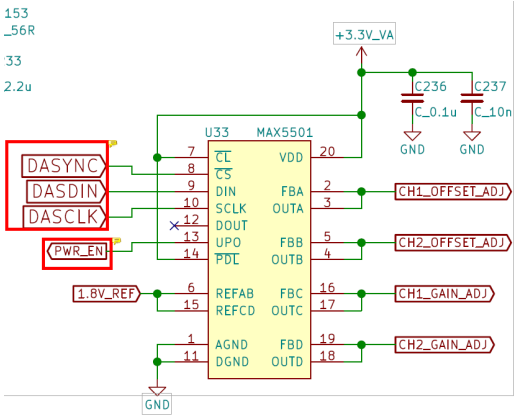
Size: A4	Date:	**Rev: v2**
KiCad E.D.A. kicad 4.0.7		Id: 13/15



DAC的输出Vout计算如下：
Vout=Vref*(NB/4096)*Gain
其中，NB为MAX5501输入数字码：0~4095、Vref为基准电压、Gain为外部设置的增益即内部输出缓冲运放的增益。以上是单极性输出的计算公式。跟多信息在DataSheet中。

ABSOLUTE MAXIMUM RATINGS

V_{DD} to AGND.....-0.3V to +6V
V_{DD} to DGND.....-0.3V to +6V
AGND to DGND.....-0.3V to +0.3V
REFAB, REFCD to AGND.....-0.3V to (V_{DD} + 0.3V)
OUT_, FB_ to AGND.....-0.3V to (V_{DD} + 0.3V)
Digital Inputs to DGND.....-0.3V to +6V
DOUT, UPO to DGND.....-0.3V to (V_{DD} + 0.3V)

ELECTRICAL CHARACTERISTICS

(V_{DD} = +5V ±10%, V_{REFAB} = V_{REFCD} = 2.5V), MAX5501 (V_{DD} = +3V to +3.6V, V_{REFAB} = V_{REFCD} = 1.25V), V_{AGND} = V_{DGND} = 0, R_L = 5kΩ, C_L = 100pF, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values at T_A = +25°C. Output buffer connected in unity-gain configuration (Figure 9).)

REFERENCE INPUT					
Reference Input Range	V_{REF}		0	V_{DD} - 1.4	V
DIGITAL INPUTS					
Input High Voltage	V_{IH}	MAX5500A/MAX5500B	2.4		V
		MAX5501A/MAX5501B	2.0		
Input Low Voltage	V_{IL}			0.8	V
DIGITAL OUTPUTS					
Output High Voltage	V_{OH}	I_{SOURCE} = 2mA	V_{DD} - 0.5		V
Output Low Voltage	V_{OL}	I_{SINK} = 2mA		0.13 0.4	V

Pin Description

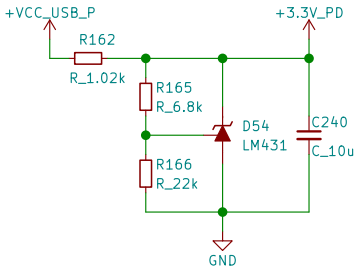
PIN	NAME	FUNCTION
1	AGND	Analog Ground
2	FBA	DAC A Output Amplifier Feedback
3	OUTA	DAC A Output Voltage
4	OUTB	DAC B Output Voltage
5	FBB	DAC B Output Amplifier Feedback
6	REFAB	DAC A/DAC B Reference Voltage Input
7	$\overline{CL}$	Active-Low Clear Input. $\overline{CL}$ clears all DACs and registers. $\overline{CL}$ resets all outputs (OUT_, UPO, and DOUT) to 0.
8	$\overline{CS}$	Active-Low Chip-Select Input
9	DIN	Serial Data Input
10	SCLK	Serial Clock Input
11	DGND	Digital Ground
12	DOUT	Serial Data Output
13	UPO	User-Programmable Logic Output
14	$\overline{PDL}$	Active-Low Power-Down Lockout. Drive $\overline{PDL}$ low to lock out software shutdown.
15	REFCD	DAC C/DAC D Reference Voltage Input
16	FBC	DAC C Output Amplifier Feedback
17	OUTC	DAC C Output Voltage
18	OUTD	DAC D Output Voltage
19	FBD	DAC D Output Amplifier Feedback
20	V_{DD}	Positive Power Supply

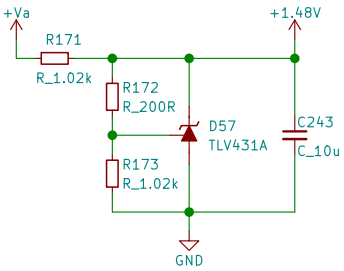
即拉低后，software shutdown被锁定，不能用。拉高后，software shutdown解锁，但是否要开启还需要通过寄存器配置。

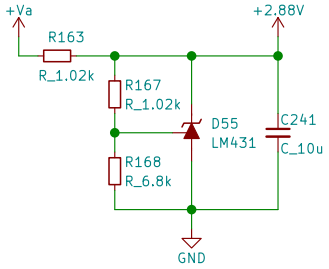
$$V_{CHx\_GAIN/OFFSET\_ADJ} = 1.8V \times \frac{NB}{4096},\ 0 \sim 1.8V$$

$$V_{CHx\_OFFET} = 2V_{CHx\_OFFSET\_ADI} - V_{ref} = V_{ref}(2 \times \frac{NB}{4096} - 1),\ -V_{ref} \sim V_{ref}$$

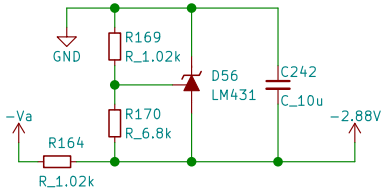
$$V_{CHx\_GAIN} = 2V_{CHx\_GAIN\_ADJ} - V_{ref} = V_{ref}(2 \times \frac{NB}{4096} - 1),\ -V_{ref} \sim V_{ref}$$







LM431: Vout=2.5V*(1+Ra/Rb)



Sheet: /REF SUPPLY/
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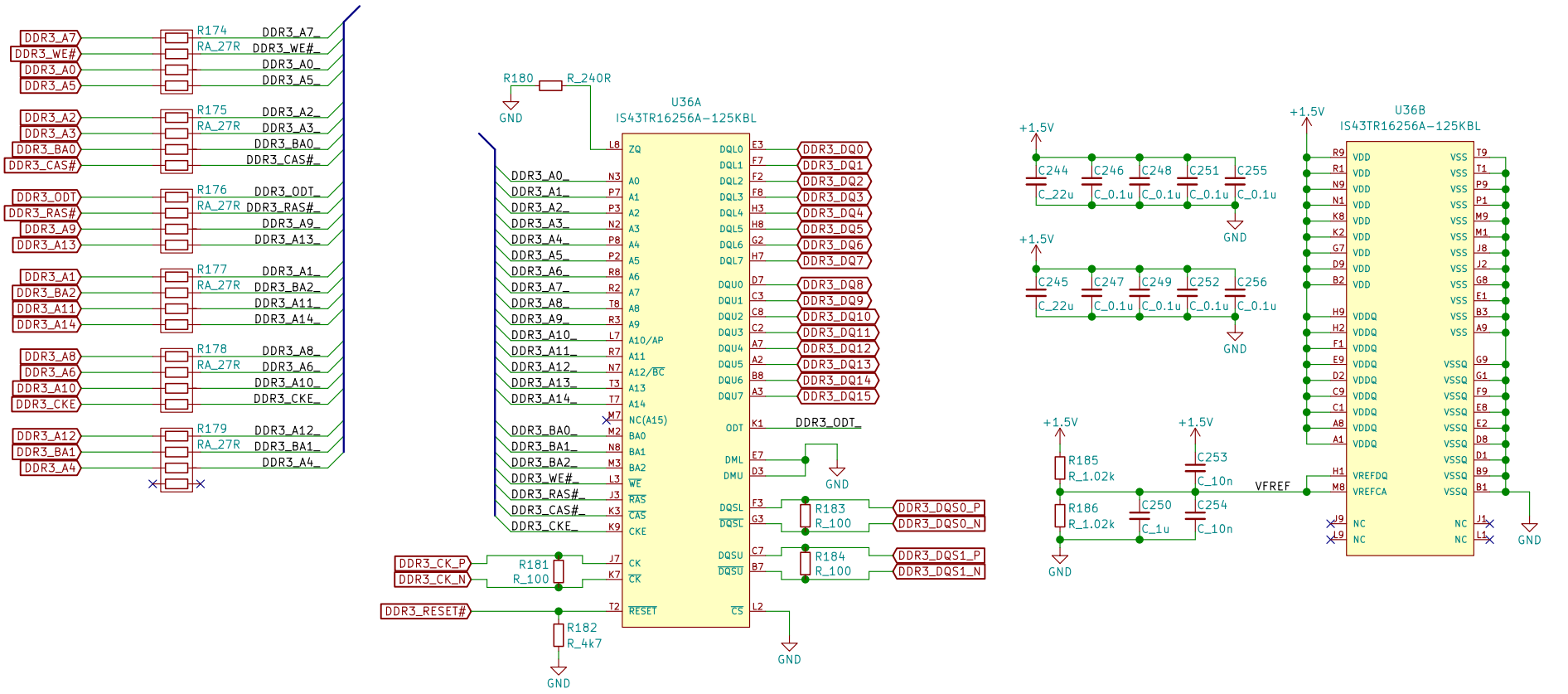
Title:

Size: A4	Date:	**Rev: v2**
KiCad E.D.A. kicad 4.0.7		Id: 14/15



Sheet: /DDR3 SDRAM/
File: file58597EF4.sch

Title:

Size: A4	Date:	**Rev: v2**
KiCad E.D.A. kicad 4.0.7		Id: 15/15