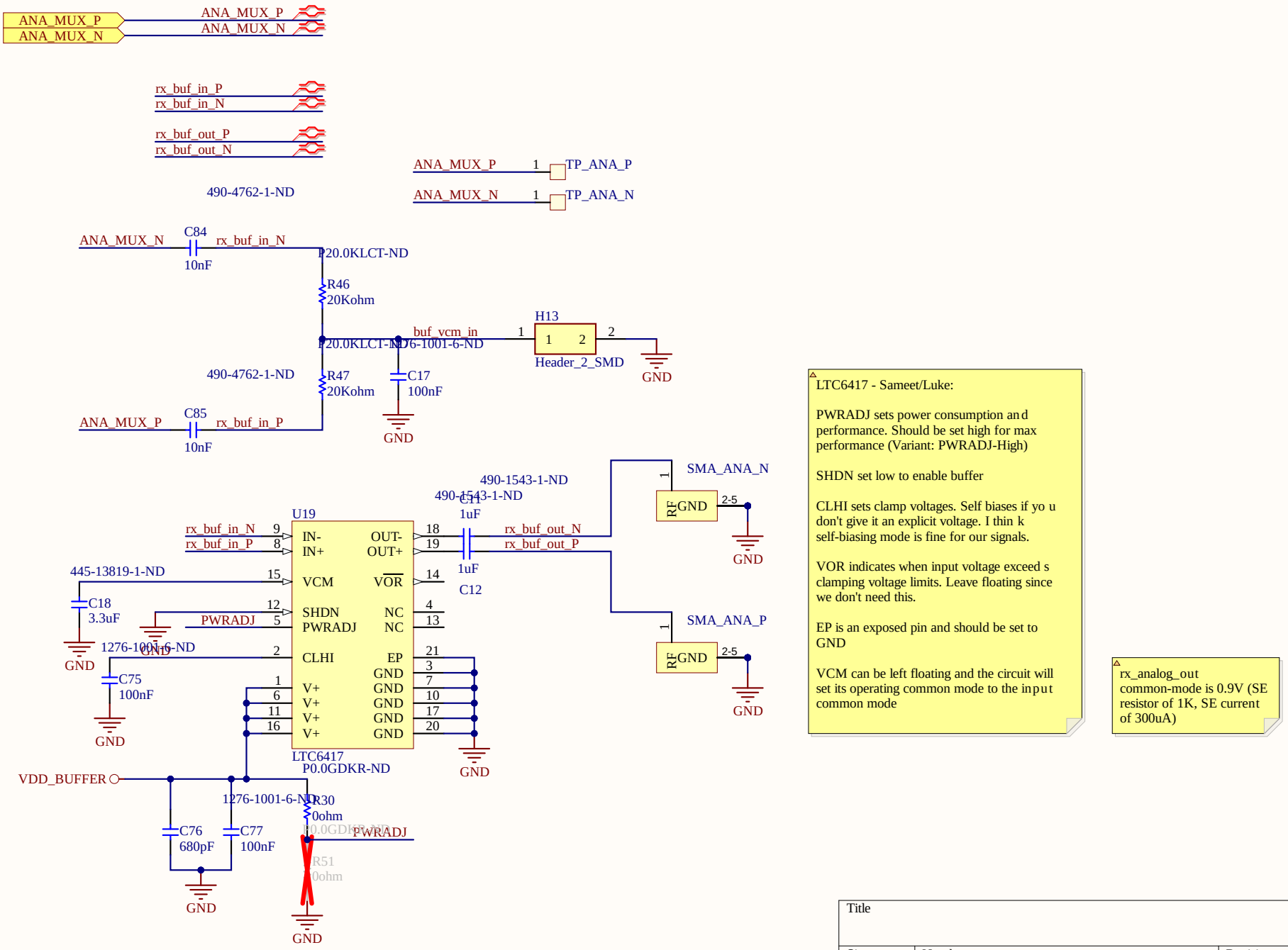


LTC6417 - Sameet/Luke:

PWRADJ sets power consumption and performance. Should be set high for max performance (Variant: PWRADJ-High)

SHDN set low to enable buffer

CLHI sets clamp voltages. Self biases if you don't give it an explicit voltage. I think self-biasing mode is fine for our signals.

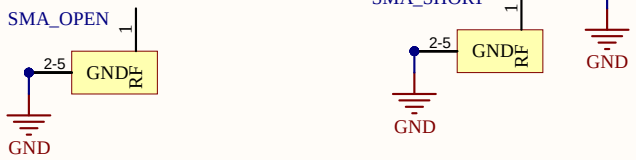
VOR indicates when input voltage exceeds clamping voltage limits. Leave floating since we don't need this.

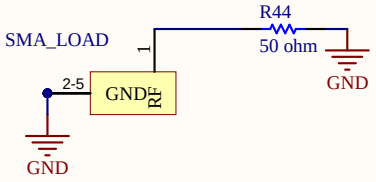
EP is an exposed pin and should be set to GND

VCM can be left floating and the circuit will set its operating common mode to the input common mode

rx_analog_out common-mode is 0.9V (SE resistor of 1K, SE current of 300uA)

Title		
Size: A	Number	Revision
Date: 6/12/2020		Sheet of
File: C:\Users\..\BB_analog.SchDoc		Drawn By:





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Size A	Number	Revision
Date: 6/12/2020		Sheet of
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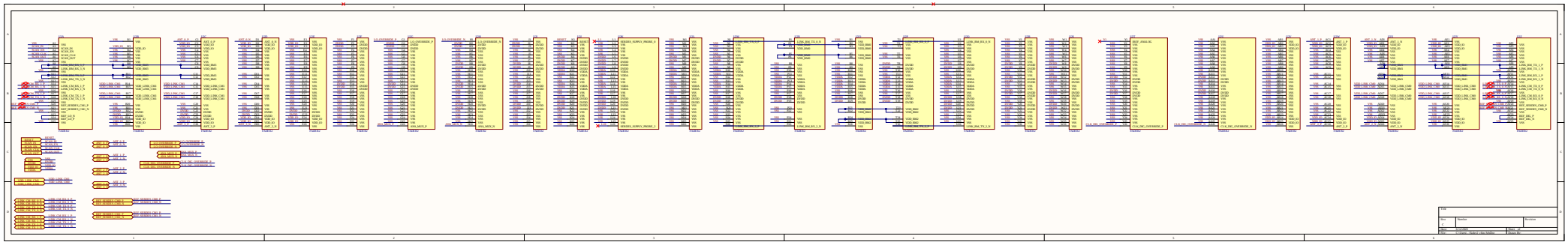
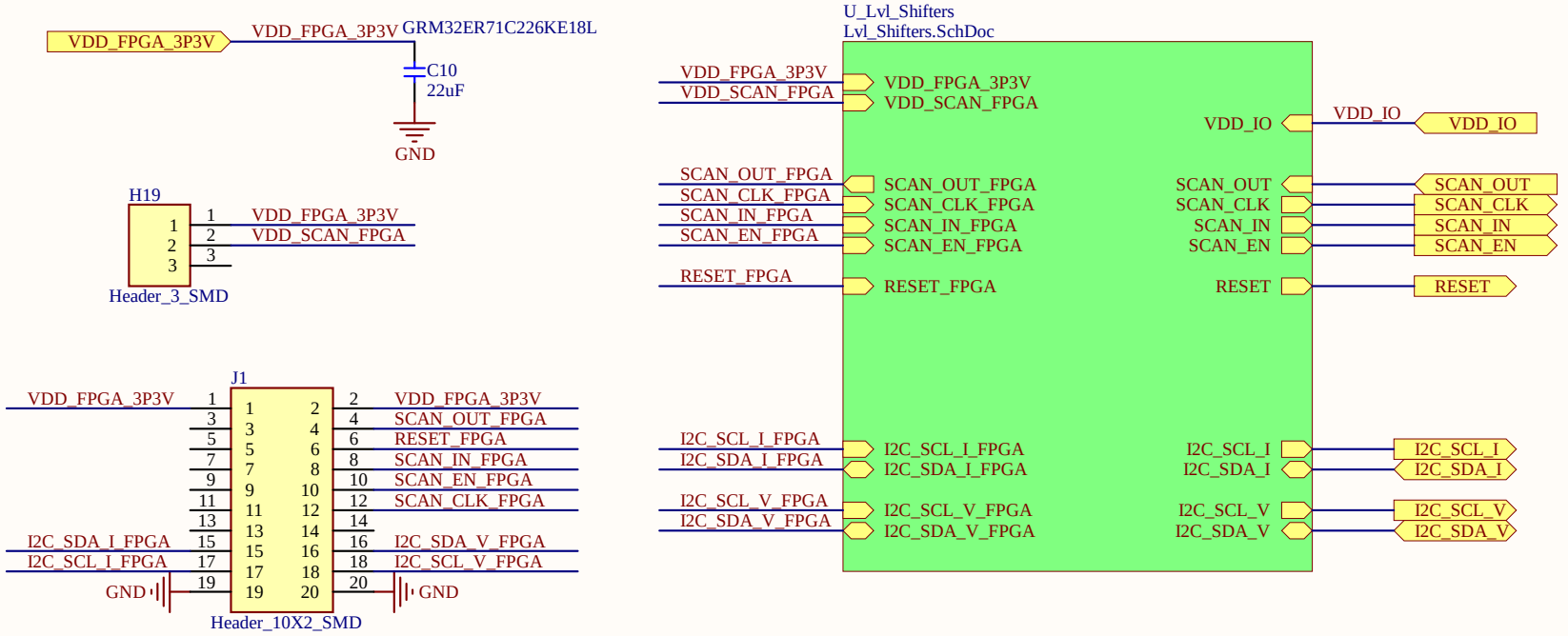
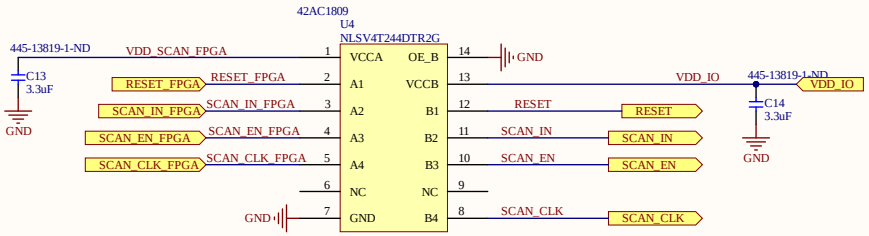




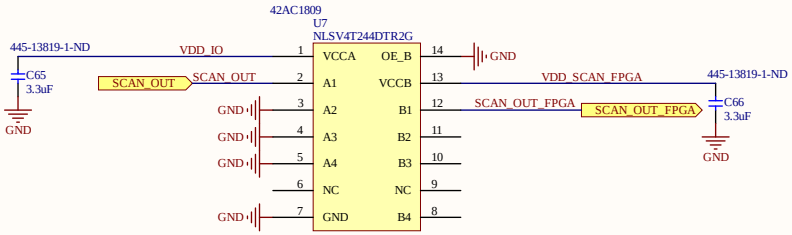
Connects to JP1 on XEM6001 Opal Kelly board

Title		
Size: A	Number	Revision
Date: 6/12/2020		Sheet of
File: C:\Users\..\FPGA_interface.SchDoc		Drawn By:

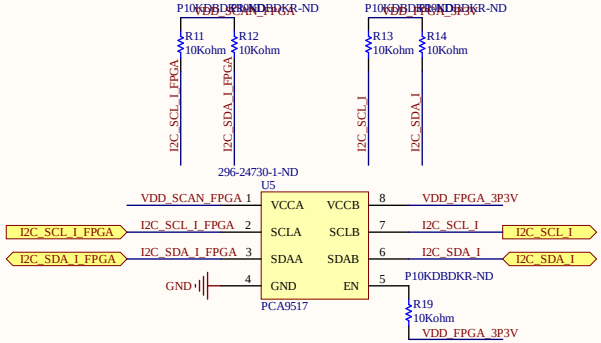
VDD from FPGA -> VDD_IO (chip)

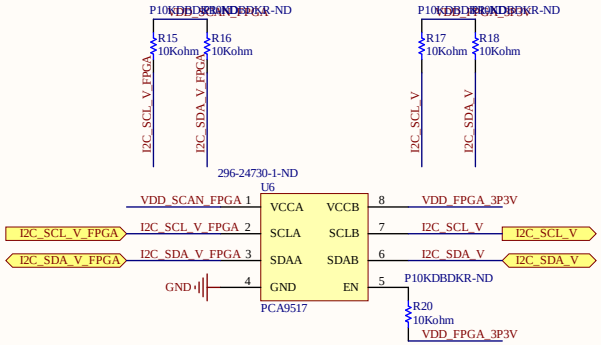


VDD_IO (chip) -> VDD from FPGA



VDD from FPGA -> 3.3V (pot, isense)





Title		
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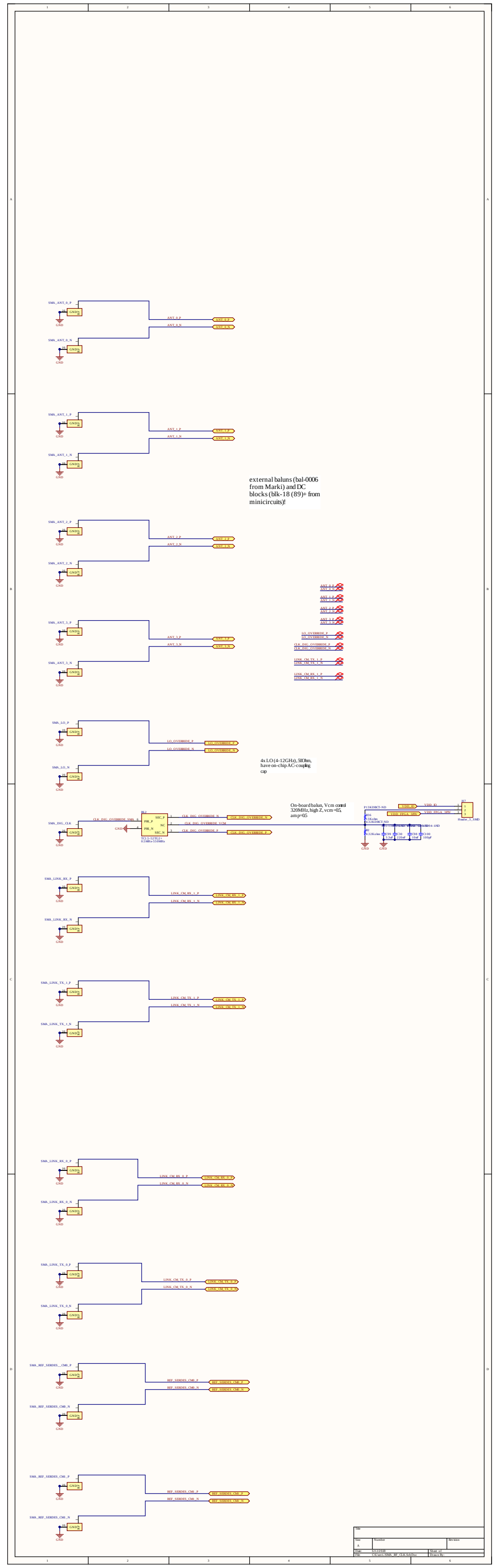
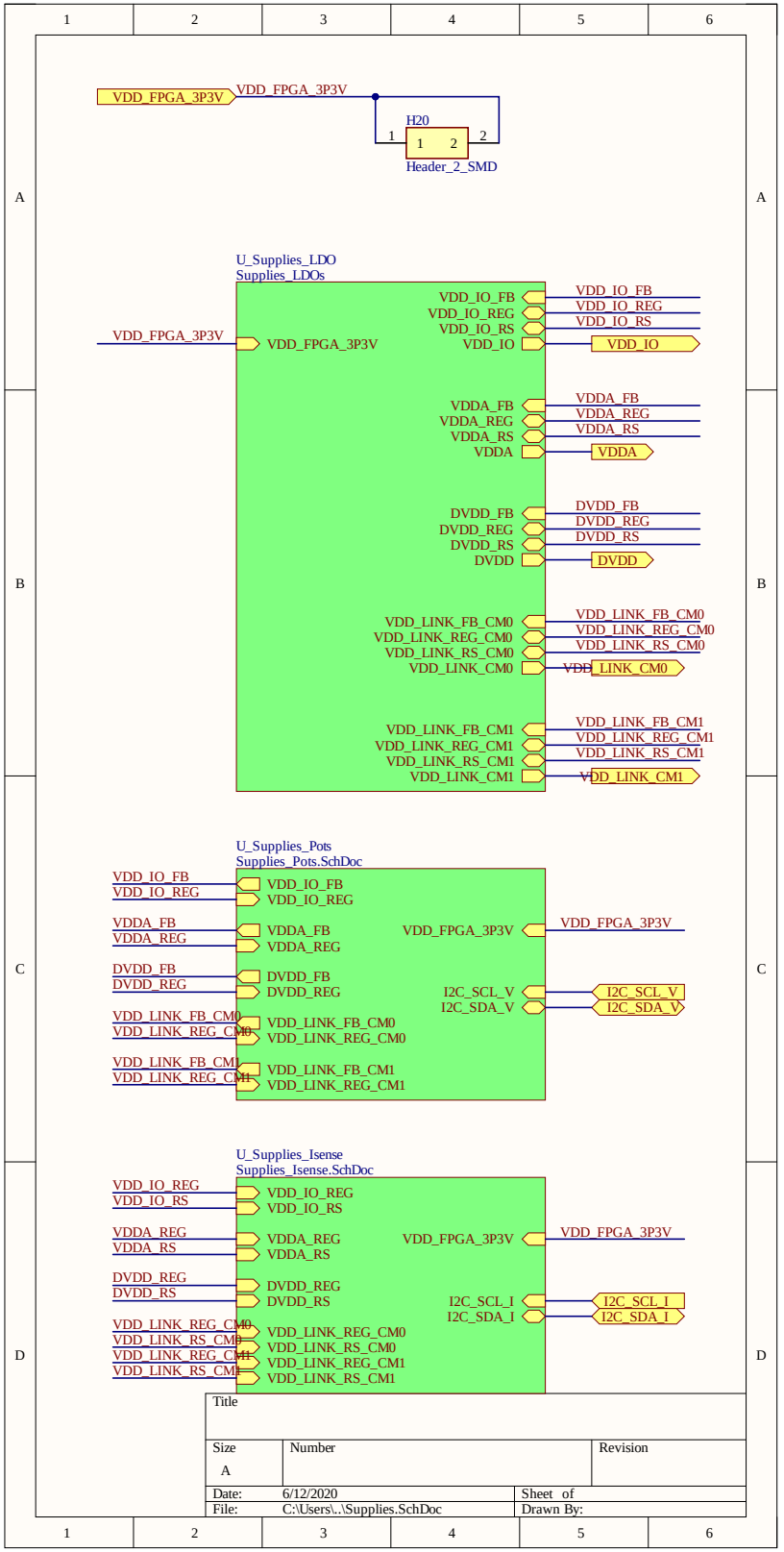
Date: 6/12/2020		Sheet of
File: C:\Users\..\Lvl_Shifters.SchDoc		Drawn By:



ANT_1_P
ANT_1_N
ANT_2_P
ANT_2_N
external baluns (bal-0006 from Marki) and DC blocks (blk-18 (89)+ from minicircuits)!
LINK_CM_RX_1_P
LINK_CM_RX_1_N
LO_OVERRIDE_P
LO_OVERRIDE_N
4x LO (4-12GHz), 50Ohm, have on-chip AC-coupling cap
On-board balun, Vcm control 320MHz, high Z, vcm=0.5, amp=0.5
CLK_DIG_OVERRIDE_N
CLK_DIG_OVERRIDE_P
R36
13Kohm
R2
4.32Kohm
GND


VDD_FPGA_3P3V
VDD_FPGA_3P3V
H20
1
1
2
2
Header_2_SMD
U_Supplies_LDO
Supplies_LDOs
VDD_FPGA_3P3V
VDD_FPGA_3P3V
VDD_IO_FB
VDD_IO_REG
VDD_IO_RS
VDD_IO
VDD_IO_FB
VDD_IO_REG
VDD_IO_RS
VDD_IO
VDDA_FB
VDDA_REG
VDDA_RS
VDDA
VDDA_FB
VDDA_REG
VDDA_RS
VDDA
DVDD_FB
DVDD_REG
DVDD_RS
DVDD
DVDD_FB
DVDD_REG
DVDD_RS
DVDD
VDD_LINK_FB_CM0
VDD_LINK_REG_CM0
VDD_LINK_RS_CM0
VDD_LINK_CM0
VDD_LINK_FB_CM0
VDD_LINK_REG_CM0
VDD_LINK_RS_CM0
VDD_LINK_CM0
VDD_LINK_FB_CM1
VDD_LINK_REG_CM1
VDD_LINK_RS_CM1
VDD_LINK_CM1
VDD_LINK_FB_CM1
VDD_LINK_REG_CM1
VDD_LINK_RS_CM1
VDD_LINK_CM1
U_Supplies_Pots
Supplies_Pots.SchDoc
VDD_IO_FB
VDD_IO_REG
VDDA_FB
VDDA_REG
DVDD_FB
DVDD_REG
VDD_LINK_FB_CM0
VDD_LINK_REG_CM0
VDD_LINK_FB_CM1
VDD_LINK_REG_CM1
VDD_IO_FB
VDD_IO_REG
VDDA_FB
VDDA_REG
DVDD_FB
DVDD_REG
VDD_LINK_FB_CM0
VDD_LINK_REG_CM0
VDD_LINK_FB_CM1
VDD_LINK_REG_CM1
VDD_FPGA_3P3V
I2C_SCL_V
I2C_SDA_V
VDD_FPGA_3P3V
I2C_SCL_V
I2C_SDA_V
U_Supplies_Isense
Supplies_Isense.SchDoc
VDD_IO_REG
VDD_IO_RS
VDDA_REG
VDDA_RS
DVDD_REG
DVDD_RS
VDD_LINK_REG_CM0
VDD_LINK_RS_CM0
VDD_LINK_REG_CM1
VDD_LINK_RS_CM1
VDD_IO_REG
VDD_IO_RS
VDDA_REG
VDDA_RS
DVDD_REG
DVDD_RS
VDD_LINK_REG_CM0
VDD_LINK_RS_CM0
VDD_LINK_REG_CM1
VDD_LINK_RS_CM1
VDD_FPGA_3P3V
I2C_SCL_I
I2C_SDA_I
VDD_FPGA_3P3V
I2C_SCL_I
I2C_SDA_I
Title
Size
A
Number
Revision
Date:
6/12/2020
Sheet of
File:
C:\Users\..\Supplies.SchDoc
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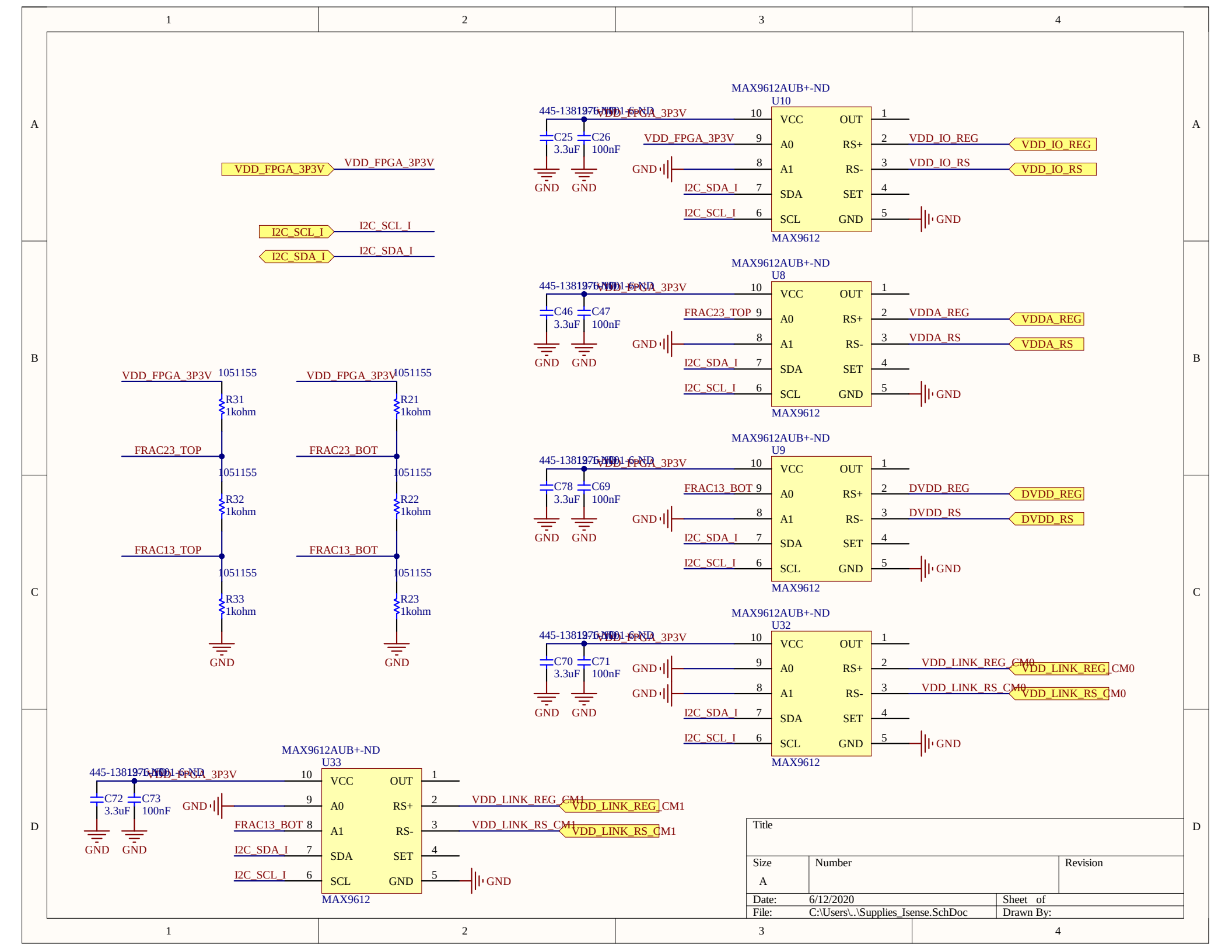
VDD_FPGA_3P3V
VDD_FPGA_3P3V
I2C_SCL_I
I2C_SCL_I
I2C_SDA_I
I2C_SDA_I
MAX9612AUB+-ND
U10
445-138127
VDD_FPGA_3P3V
C25
3.3uF
C26
100nF
GND
GND
GND
VDD_FPGA_3P3V
I2C_SDA_I
I2C_SCL_I
VCC
A0
A1
SDA
SCL
OUT
RS+
RS-
SET
GND
10
9
8
7
6
1
2
3
4
5
VDD_IO_REG
VDD_IO_RS
MAX9612
MAX9612AUB+-ND
U8
C46
3.3uF
C47
100nF
FRAC23_TOP
VDDA_REG
VDDA_RS
MAX9612
MAX9612AUB+-ND
U9
C78
3.3uF
C69
100nF
FRAC13_BOT
DVDD_REG
DVDD_RS
MAX9612
MAX9612AUB+-ND
U32
C70
3.3uF
C71
100nF
VDD_LINK_REG_CM0
VDD_LINK_RS_CM0
MAX9612
VDD_FPGA_3P3V
1051155
R31
1kohm
FRAC23_TOP
R32
1kohm
FRAC13_TOP
R33
1kohm
GND
R21
1kohm
FRAC23_BOT
R22
1kohm
FRAC13_BOT
R23
1kohm
GND
MAX9612AUB+-ND
U33
C72
3.3uF
C73
100nF
VDD_LINK_REG_CM1
VDD_LINK_RS_CM1
MAX9612
Title
Size
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Number
Revision
Date:
6/12/2020
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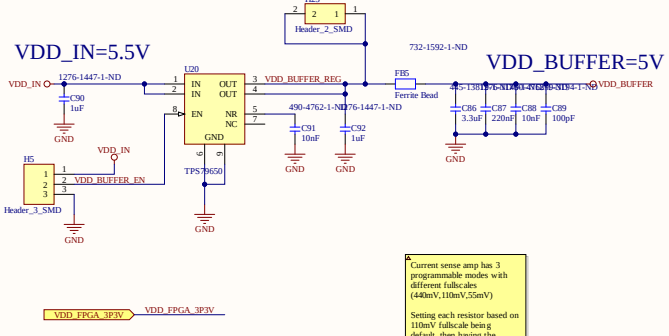
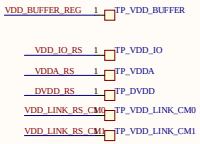
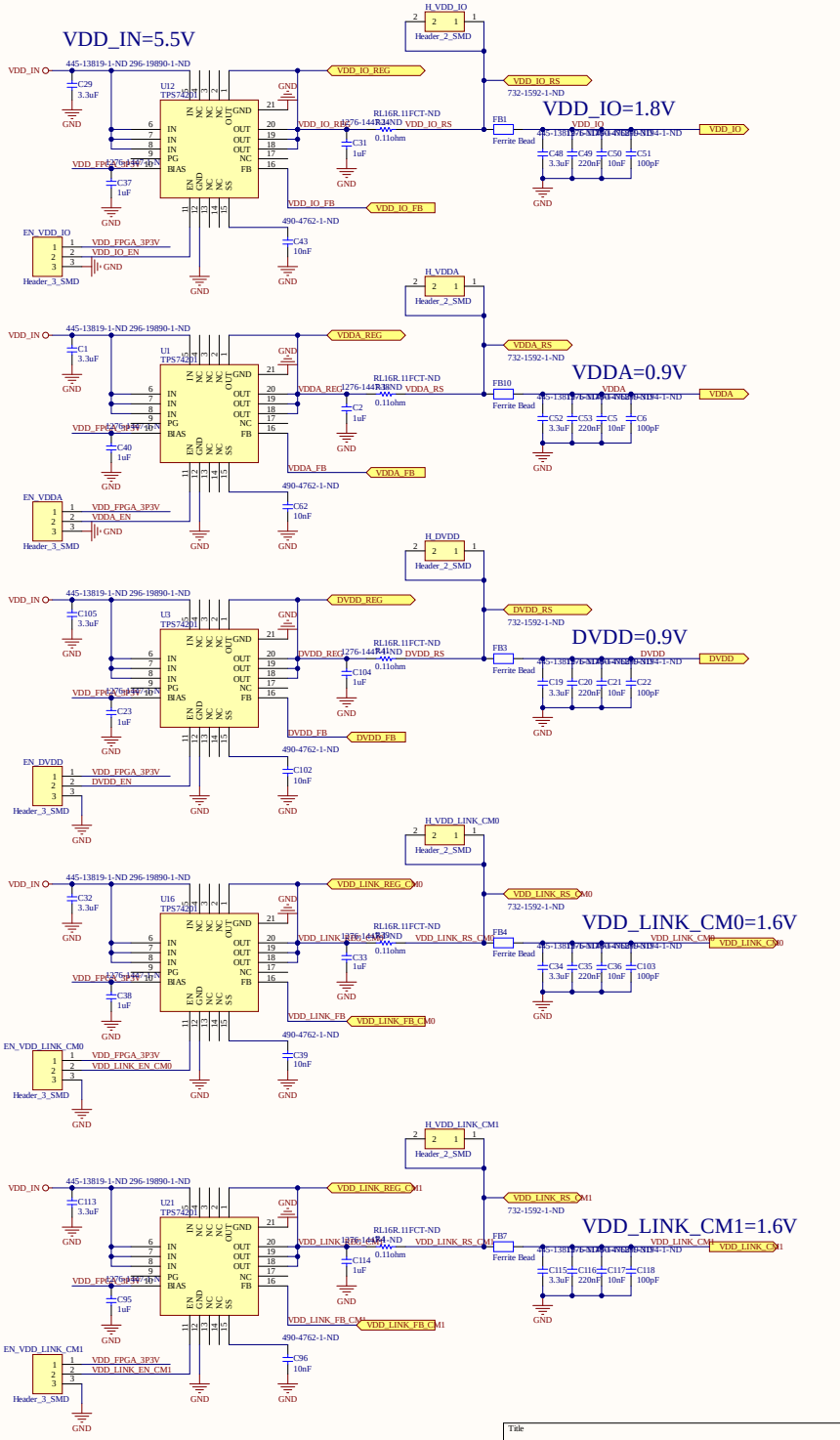
File:
C:\Users\..\Supplies_Isense.SchDoc
Drawn By:



Current sense amp has 3 programmable modes with different fullscales (440mV,110mV,55mV)

Setting each resistor based on 110mV fullscale being default, then having the ability to go to 55mV if needed for higher accuracy. VDD_PA spec'd for 1A/16=110mV, all others have 1A/1=110mV.





Title		
Size: A3	Number	Revision
Date: 6/12/2020		Sheet of
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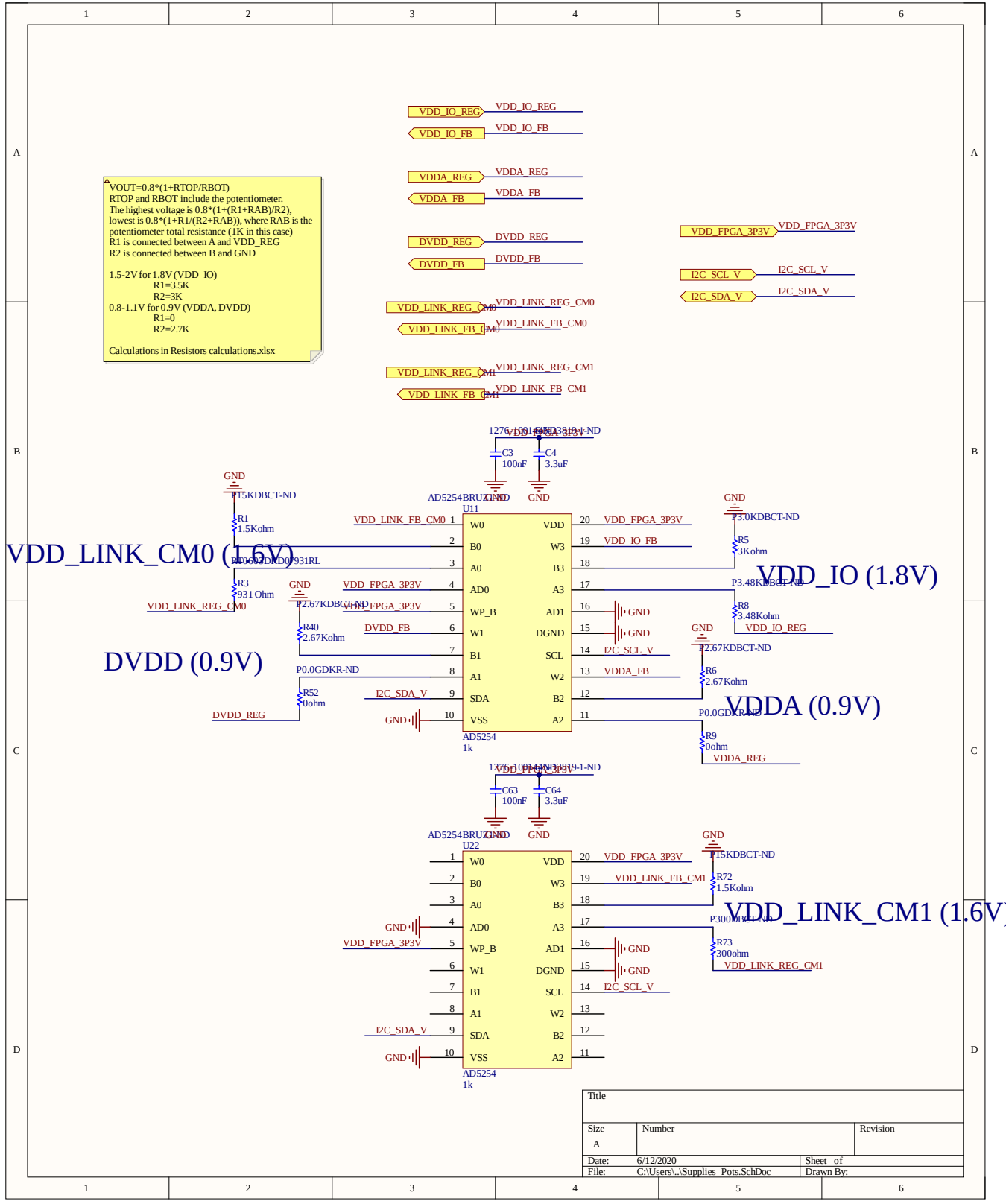
VOUT=0.8*(1+RTOP/RBOT)
RTOP and RBOT include the potentiometer.
The highest voltage is 0.8*(1+(R1+RAB)/R2),
lowest is 0.8*(1+R1/(R2+RAB)), where RAB is the potentiometer total resistance (1K in this case)
R1 is connected between A and VDD_REG
R2 is connected between B and GND
1.5-2V for 1.8V (VDD_IO)
R1=3.5K
R2=3K
0.8-1.1V for 0.9V (VDDA, DVDD)
R1=0
R2=2.7K
Calculations in Resistors calculations.xlsx
VDD_IO_REG
VDD_IO_FB
VDDA_REG
VDDA_FB
DVDD_REG
DVDD_FB
VDD_LINK_REG_CM0
VDD_LINK_FB_CM0
VDD_LINK_REG_CM1
VDD_LINK_FB_CM1
VDD_FPGA_3P3V
I2C_SCL_V
I2C_SDA_V
VDD_LINK_CM0 (1.6V)
VDD_IO (1.8V)
DVDD (0.9V)
VDDA (0.9V)
VDD_LINK_CM1 (1.6V)
AD5254BRUZ-1M
U11
U22
AD5254
1k
C3
100nF
C4
3.3uF
C63
C64
R1
1.5Kohm
R3
931 Ohm
R40
2.67Kohm
R52
0ohm
R5
3Kohm
R8
3.48Kohm
R6
2.67Kohm
R9
0ohm
R72
1.5Kohm
R73
300ohm
P15KDBCT-ND
P3.0KDBCT-ND
P3.48KDBCT-ND
P2.67KDBCT-ND
P0.0GDKR-ND
P300DBCT-ND
GND
W0
B0
A0
AD0
WP_B
W1
B1
A1
SDA
VSS
VDD
W3
B3
A3
AD1
DGND
SCL
W2
B2
A2
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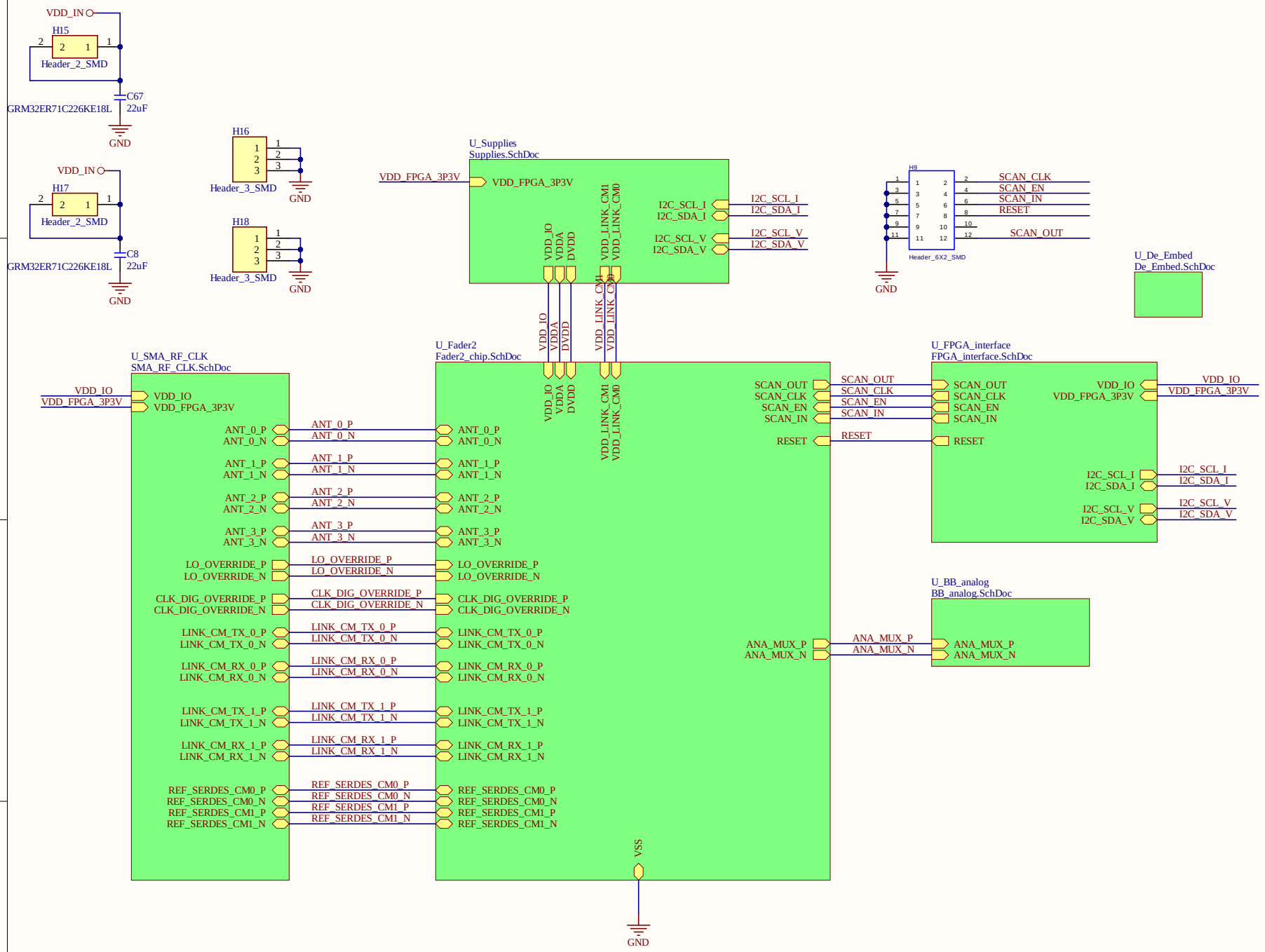
VDD_IN
H15
Header_2_SMD
C67
GRM32ER71C226KE18L
22uF
GND
H16
Header_3_SMD
H17
C8
H18
U_Supplies
Supplies.SchDoc
VDD_FPGA_3P3V
I2C_SCL_I
I2C_SDA_I
I2C_SCL_V
I2C_SDA_V
VDD_IO
VDDA
DVDD
VDD_LINK_CM1
VDD_LINK_CM0
H9
Header_6X2_SMD
SCAN_CLK
SCAN_EN
SCAN_IN
RESET
SCAN_OUT
U_De_Embed
De_Embed.SchDoc
U_SMA_RF_CLK
SMA_RF_CLK.SchDoc
U_Fader2
Fader2_chip.SchDoc
U_FPGA_interface
FPGA_interface.SchDoc
ANT_0_P
ANT_0_N
ANT_1_P
ANT_1_N
ANT_2_P
ANT_2_N
ANT_3_P
ANT_3_N
LO_OVERRIDE_P
LO_OVERRIDE_N
CLK_DIG_OVERRIDE_P
CLK_DIG_OVERRIDE_N
LINK_CM_TX_0_P
LINK_CM_TX_0_N
LINK_CM_RX_0_P
LINK_CM_RX_0_N
LINK_CM_TX_1_P
LINK_CM_TX_1_N
LINK_CM_RX_1_P
LINK_CM_RX_1_N
REF_SERDES_CM0_P
REF_SERDES_CM0_N
REF_SERDES_CM1_P
REF_SERDES_CM1_N
VSS
U_BB_analog
BB_analog.SchDoc
ANA_MUX_P
ANA_MUX_N
Title
Size
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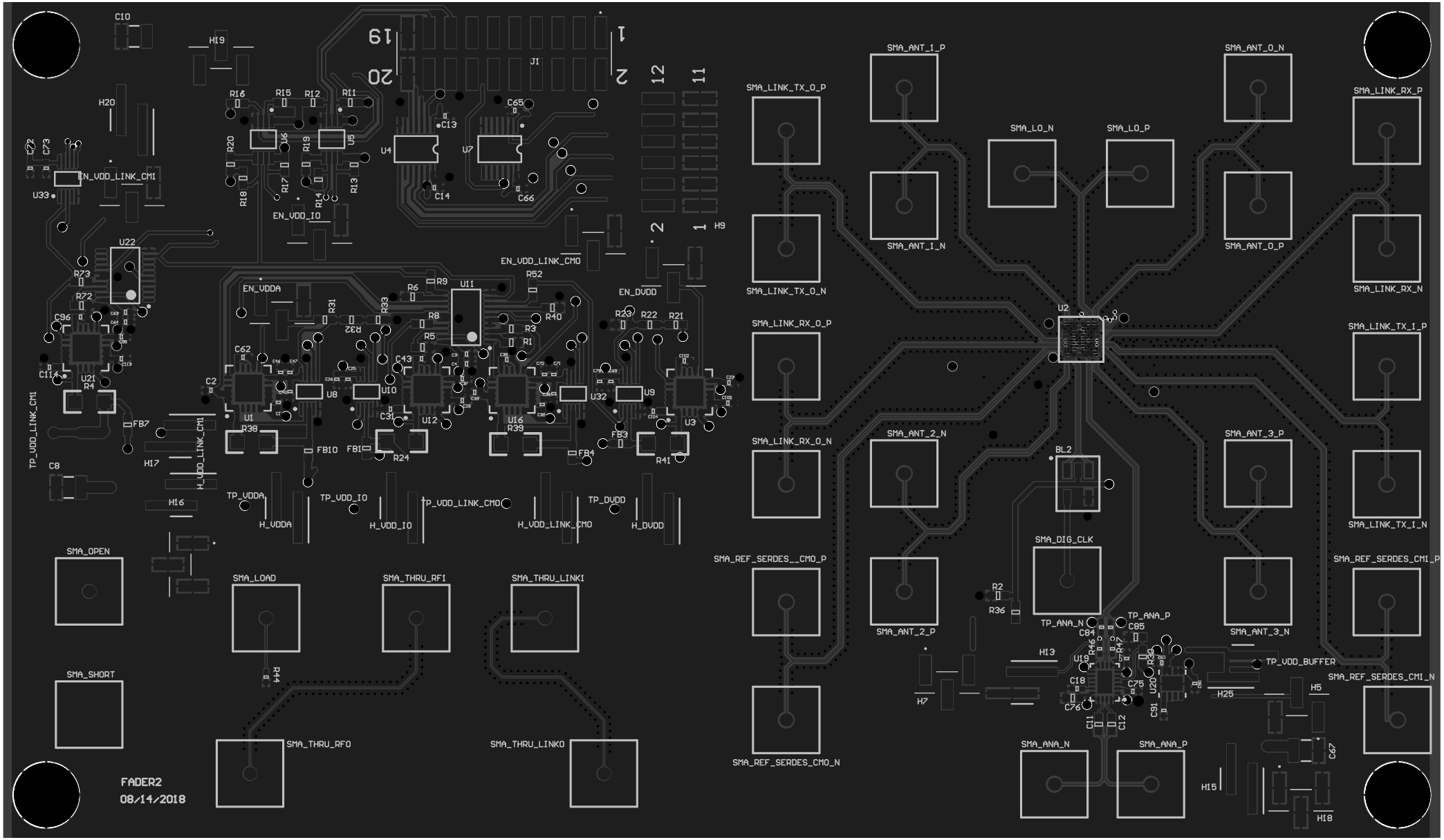
Number
Revision
Date:
6/12/2020
Sheet of
File:
C:\Users\..\Top.SchDoc
Drawn By:


FADER2
08/14/2018
EN_VDD_LINK_CM1
EN_VDD_IO
EN_VDD_LINK_CMO
EN_VDDA
EN_DVDD
TP_VDDA
TP_VDD_IO
TP_VDD_LINK_CMO
TP_DVDD
H_VDDA
H_VDD_IO
H_VDD_LINK_CMO
H_DVDD
TP_VDD_LINK_CM1
H_VDD_LINK_CM1
SMA_OPEN
SMA_SHORT
SMA_LOAD
SMA_THRU_RFI
SMA_THRU_LINKI
SMA_THRU_RFO
SMA_THRU_LINKO
SMA_LINK_TX_O_P
SMA_LINK_TX_O_N
SMA_LINK_RX_O_P
SMA_LINK_RX_O_N
SMA_REF_SERDES__CMO_P
SMA_REF_SERDES_CMO_N
SMA_ANT_1_P
SMA_ANT_1_N
SMA_ANT_2_P
SMA_ANT_2_N
SMA_LO_N
SMA_LO_P
SMA_ANT_0_N
SMA_ANT_0_P
SMA_ANT_3_P
SMA_ANT_3_N
SMA_LINK_RX_P
SMA_LINK_RX_N
SMA_LINK_TX_I_P
SMA_LINK_TX_I_N
SMA_DIG_CLK
SMA_REF_SERDES_CMI_P
SMA_REF_SERDES_CMI_N
SMA_ANA_N
SMA_ANA_P
TP_ANA_N
TP_ANA_P
TP_VDD_BUFFER

Component list

Bill of Materials for Variant [PWRADJ-High] of BOM Document [fader2_pcb.BomDoc]

Source Data From: fader2_pcb.BomDoc
Project: fader2_pcb.PrjPcb
Variant: PWRADJ-High

Report Date: 6/12/2020 9:35 AM
Print Date: 12-Jun-20 9:35:16 AM

Description	Footprint	Quantity	Designator	Supplier Order Qty 1	Manufacturer 1	Manufacturer Part Number 1	Supplier Unit Price 1	Supplier Subtotal per Board 1	n Name Error: Supplier Ord	n Name Error: Manufa	Manufacturer Part Number 2	n Name Error: Supplier Unit	Supplier Currency 1	Total Price
Balun, 1:1.5 CORE & WIRE Transformer, 0.5 - 550 MHz, 50Ω	AT224-3	1	BL2	20	Mini-Circuits	TC1.5-52TG2+	2.95	2.95					USD	2.95
CAPCER 3.3uF 10% 10V X5R 0402	CAP_0402	24	C1, C4, C13, C14, C18, C19, C25, C29, C32, C34, C46, C48, C52, C64, C65, C66, C70, C72, C78, C86, C99, C105, C113, C115	24	TDK	C1005X5R1A335K050BC	0.342	8.21					USD	8.21
CAPCER 1uF 20% 16V X5R 0402	CAP_0402	12	C2, C23, C31, C33, C37, C38, C40, C90, C92, C95, C104, C114	12	Samsung	CL05A105MO5NNNC	0.049	0.588					USD	0.588
CAPCER 0.1uF 10% 16V X7R 0402	CAP_0402	10	C3, C17, C26, C47, C63, C69, C71, C73, C75, C77	10	Samsung	CL05B104KO5NNNC	0.029	0.29					USD	0.29
CAPCER 10nF 10% 50V X7R 0402	CAP_0402	15	C5, C21, C36, C39, C43, C50, C62, C84, C85, C88, C91, C96, C98, C102, C117	15	Murata	GCM155R71H103KA55D	0.044	0.66					USD	0.66
CAPCER 100pF 5% 50V C0G/NP0 0402	CAP_0402	7	C6, C22, C51, C89, C100, C103, C118	10	KEMET	C0402C101J5GACTU	0.039	0.273					USD	0.273
CAPCER 22uF 10% 16V X7R 1210	1210	3	C8, C10, C97	3	Murata	GRM32ER71C226KE18L	0.8507	2.55					USD	2.55
CAPCER 1uF 10% 10V X5R 0603	CAP_0603	2	C11, C12	2	Murata	GRM188R61A105KA61D	0.13	0.26					USD	0.26
CAPCER 0.22uF 10% 16V X7R 0402	CAP_0402	7	C20, C30, C35, C49, C53, C87, C116	10	Samsung	CL05B224KO5NNNC	0.054	0.378					USD	0.378
CAPCER 680pF 5% 25V C0G/NP0 0603	CAP_0603	1	C76	1	KEMET	C0603C681J3GACTU	0.33	0.33					USD	0.33
Connector Header Vertical, SMD, 3 position 0.100" (2.54mm)	HDR1X3_SMD	10	EN_DVDD, EN_VDD_IO, EN_VDD_LINK_CM0, EN_VDD_LINK_CM1, EN_VDDA, H5, H7, H16, H18, H19											0
Ferrite Bead 300 Ohms @ 100MHz 1 Signal Line 0603 (1608 Metric) 2A 150mOhm	FER_0603	6	FB1, FB3, FB4, FB5, FB7, FB10	6	Wurth Electronics	742792641	0.17	1.02					USD	1.02
Connector Header Vertical Dual Row , SMD, 12 position 0.100" (2.54mm)	HDR2X6_SMD	1	H9											0
Connector Header Vertical, SMD, 2 position 0.100" (2.54mm)	HDR1X2_SMD	10	H13, H15, H17, H20, H25, H_DVDD, H_VDD_IO, H_VDD_LINK_CM0, H_VDD_LINK_CM1, H_VDDA											0
Connector Header Vertical Dual Row , SMD, 20 position 0.100" (2.54mm)	HDR2X10_SMD	1	J1											0
RES SMD 1.5K OHM 0.1% 1/10W 0603	RES_0603	2	R1, R72	2	Panasonic	ERA-3AEB153V	0.34	0.68					USD	0.68
RES SMD 4.32kOHM 0.1% 1/10W 0603	RES_0603	1	R2	1	Panasonic	ERA-3AEB4321V	0.34	0.34					USD	0.34
RES SMD 931 OHM 0.5% 1/10W 0603	RES_0603	1	R3		Yageo	RT0603DRD079311RL								0
RES 0.11 OHM 1% 1/2W 1206	RES_1206	5	R4, R24, R38, R39, R41	5	Susumu	RL1632R-R110-F	0.68	3.4					USD	3.4
RES SMD 3k OHM 0.1% 1/10W 0603	RES_0603	1	R5	1	Panasonic	ERA-3AEB302V	0.34	0.34					USD	0.34
RES SMD 2.67kOHM 0.1% 1/10W 0603	RES_0603	2	R6, R40	2	Panasonic	ERA3AEB2671V	0.34	0.68					USD	0.68
RES SMD 3.48kOHM 0.1% 1/10W 0603	RES_0603	1	R8	1	Panasonic	ERA-3AEB3481V	0.34	0.34					USD	0.34
RES SMD 0 OHM JUMPER 1/10W 0603	RES_0603	3	R9, R30, R52	3	Panasonic	ERJ-3GEY0R00V	0.1	0.3					USD	0.3
RES SMD 10k OHM 0.1% 1/10W 0603	RES_0603	10	R11, R12, R13, R14, R15, R16, R17, R18, R19, R20	10	Panasonic	ERA-3AEB103V	0.3	3					USD	3
RES SMD 1K OHM 1% 1/10W 0603	RES_0603	6	R21, R22, R23, R31, R32, R33	5000	Panasonic	ERJ3EKF1001V	0.021	0.126					USD	0.126
RES SMD 13k OHM 0.1% 1/10W 0603	RES_0603	1	R36	1	Panasonic	ERA-3AEB133V	0.35	0.35					USD	0.35
RES SMD 50 OHM 0.1% 1/20W 0402	RES_0402	1	R44	1	Vishay Dale Thin Film	FC0402E50R0BST1	2.39	2.39					USD	2.39
RES SMD 20k OHM 1% 1/10W 0402	RES_0402	2	R46, R47	2	Panasonic	ERJ-2RKF2002X	0.1	0.2					USD	0.2
RES SMD 300 OHM 0.1% 1/10W 0603	RES_0603	1	R73	1	Panasonic	ERA-3AEB301V	0.34	0.34					USD	0.34
SMD SMA CONNECTOR	CON-SMA-SMD	32	SMA_ANA_N, SMA_ANA_P, SMA_ANT_0_N, SMA_ANT_0_P, SMA_ANT_1_N, SMA_ANT_1_P, SMA_ANT_2_N, SMA_ANT_2_P, SMA_ANT_3_N, SMA_ANT_3_P, SMA_DIG_CLK, SMA_LINK_RX_0_N, SMA_LINK_RX_0_P, SMA_LINK_RX_N, SMA_LINK_RX_P, SMA_LINK_TX_0_N, SMA_LINK_TX_0_P, SMA_LINK_TX_1_N, SMA_LINK_TX_1_P, SMA_LO_N, SMA_LO_P, SMA_LOAD, SMA_OPEN, SMA_REF_SERDES_CM0_P, SMA_REF_SERDES_CM0_N, SMA_REF_SERDES_CM1_N, SMA_REF_SERDES_CM1_P, SMA_SHORT, SMA_THRU_LINK0, SMA_THRU_LINK1, SMA_THRU_RF0, SMA_THRU_RF1	32	Linx	CONSMA001-SMD-G	2.89	92.48			CONSMA002-SMD		USD	92.48
Test Point, through-hole, 40mil pad diameter, 20mil hole diameter	Test_Point	8	TP_ANA_N, TP_ANA_P, TP_DVDD, TP_VDD_BUFFER, TP_VDD_IO, TP_VDD_LINK_CM0, TP_VDD_LINK_CM1, TP_VDDA											0
Linear Positive Voltage Regulator IC, Adjustable Voltage, 1 Output 1.5A 20-VQFN (5x5)	TPS74201	5	U1, U3, U12, U16, U21	5	Texas Instruments	TPS74201RGWR	5.3	26.5					USD	26.5
Flexible Array of Digital Efficient Radios (FADER2) chip, 26 x 26 BGA	FADER2	1	U2											0
Voltage Level Translator Unidirectional 1 Circuit 4 Channel 14-TSSOP	948G-01	2	U4, U7	2	ON Semiconductor	NLSV4T244DTR2G	1.94	3.88					USD	3.88
I2C Repeater, Buffer, ReDriver 2 Channel 400kHz 8-VSSOP	PCA9517	2	U5, U6	2	Texas Instruments	PCA9517DGKR	2.8	5.6					USD	5.6
OpAmp ADC	MAX9612	5	U8, U9, U10, U32, U33	5	Maxim	MAX9612AUB+	2.51	12.55					USD	12.55
Digital Potentiometer 1k Ohm 4 Circuit 256 Taps I²C Interface 20-TSSOP	AD5254	2	U11, U22		Analog Devices	AD5254BRUZ1								0
Single Channel, Low Noise, High Linearity Differential Buffer / 16-Bit ADC Driver with Fast Clamp, 1600 MHz Typical GBW, 10000 V/us Typical SR, 4.75 to 5.25 V, 20-Pin QFN (UDC20), Commercial, Pb-Free	LT-UDC-20_N	1	U19	1	Analog Devices / Linear Technology	LTC6417CUDC#PBF	9.71	9.71					USD	9.71
Single Output High PSRR LDO, 1 A, Fixed 5 V Output, 2.7 to 5.5 V Input, 8-pin SON (DRB), -40 to 125 degC, Green (RoHS & no Sb/Br)	TI-DRB8-2400X1650TP_V	1	U20	1	Texas Instruments	TPS79650DRBR	3	3					USD	3