


LDOs


CONNECTORS / SWITCHES

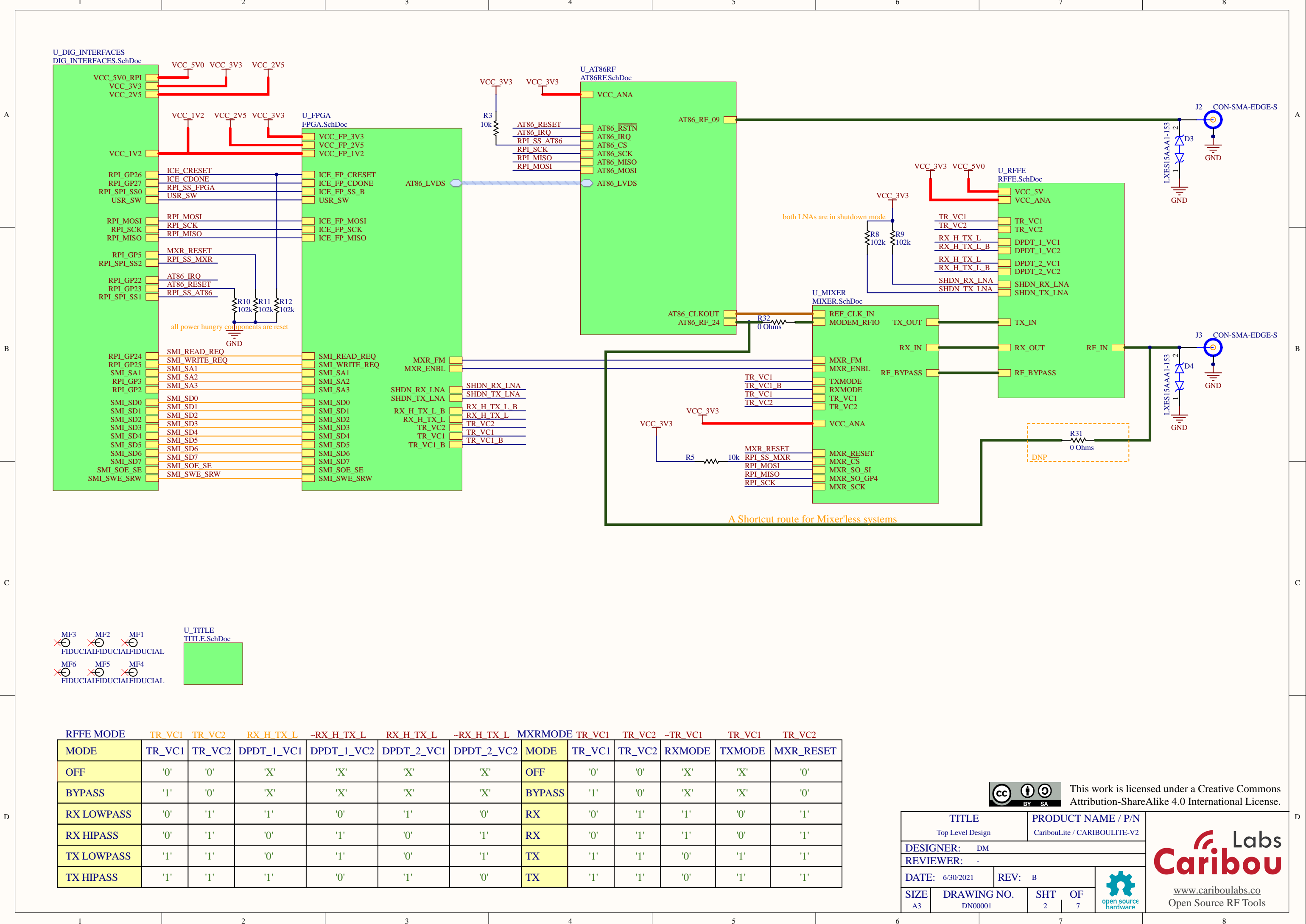
DIGITAL IC

ANALOG / MIXED IC

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TITLE Block Diagrams		PRODUCT NAME / P/N CaribouLite / CARIBOULITE-V2		<div> www.cariboulabs.co Open Source RF Tools</div>
DESIGNER: DM				
REVIEWER: -				
DATE: 6/27/2021		REV: B		
SIZE A3	DRAWING NO. DN00001	SHT 1	OF 7	



open source
hardware

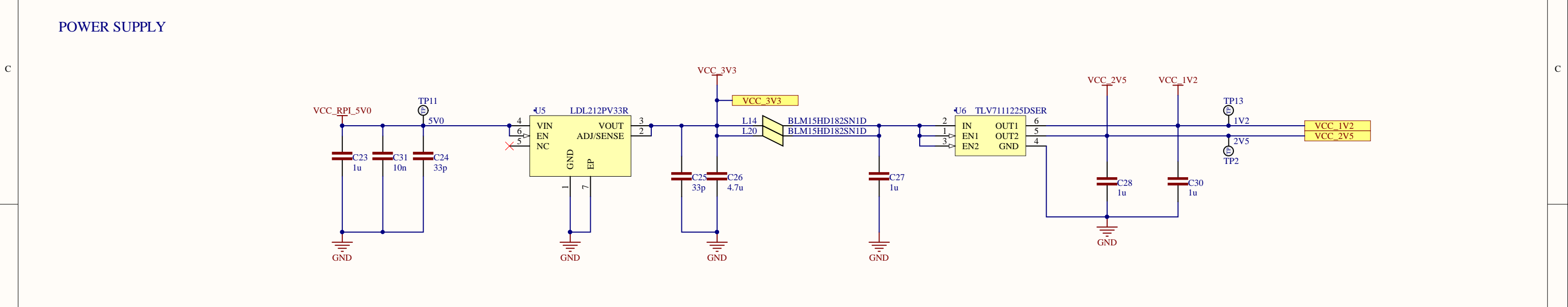
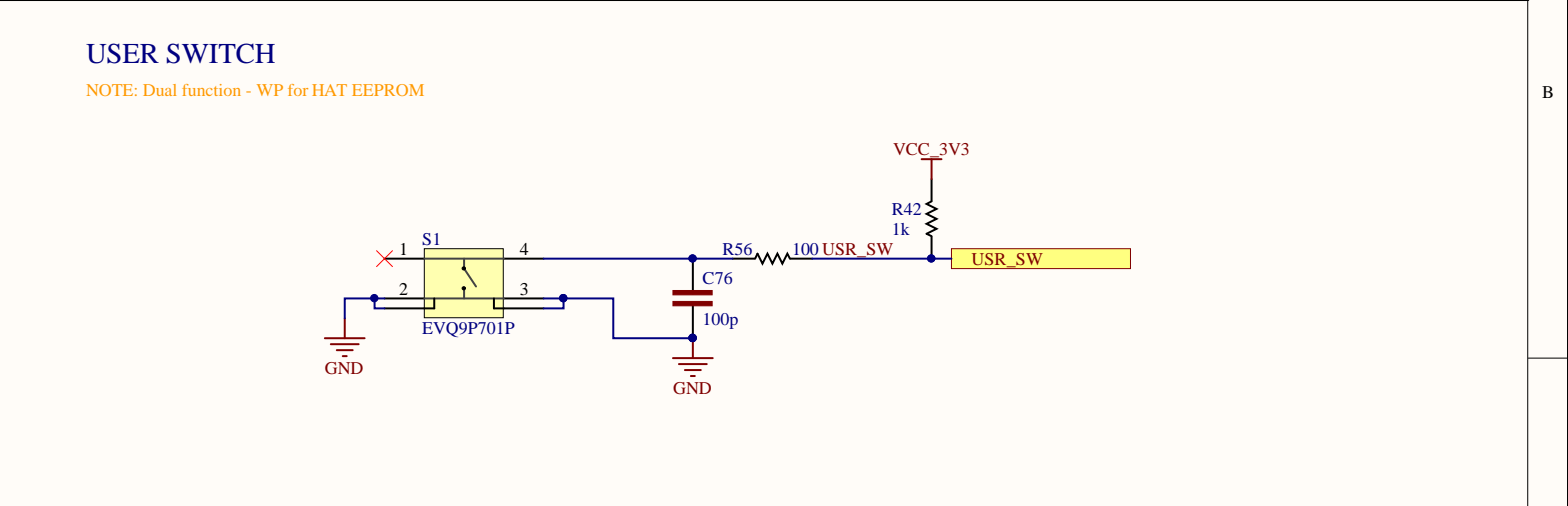
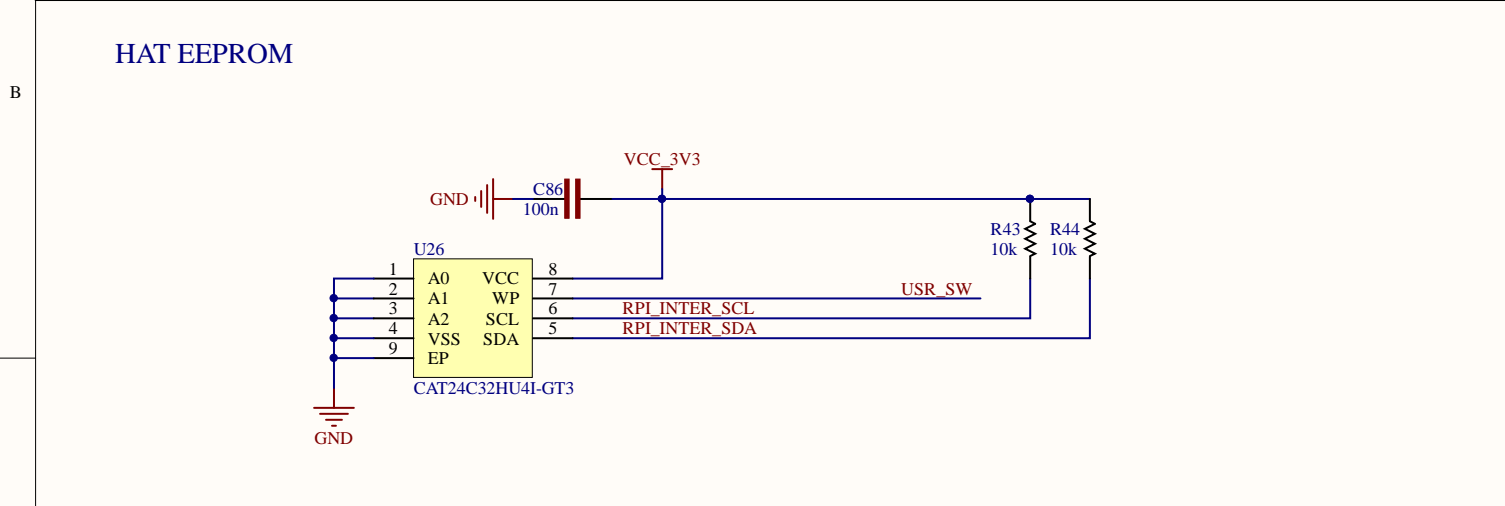
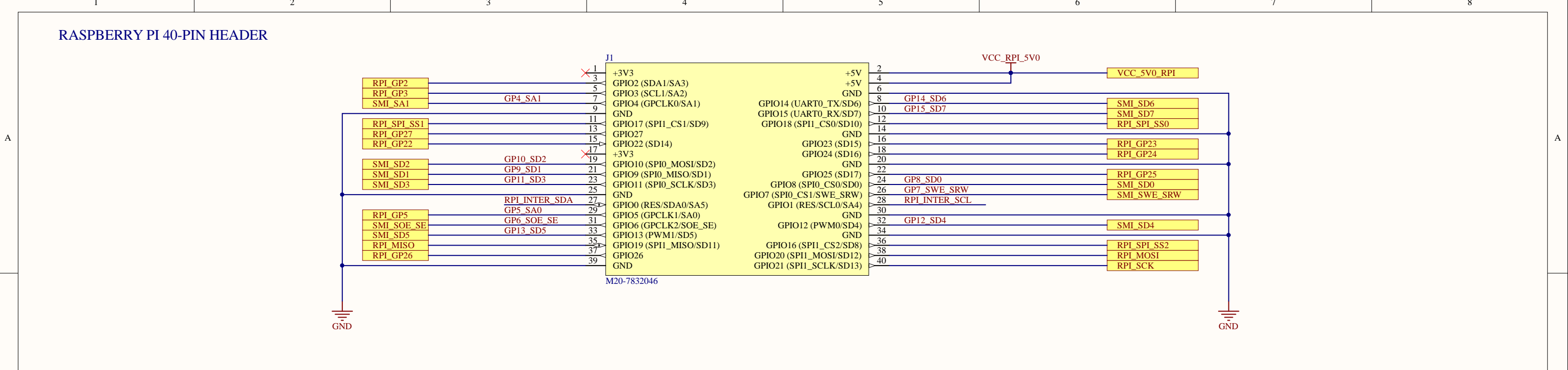


RFFE MODE	TR_VC1	TR_VC2	RX_H_TX_L	~RX_H_TX_L	RX_H_TX_L	~RX_H_TX_L	MXRMODE	TR_VC1	TR_VC2	~TR_VC1	TR_VC1	TR_VC2
MODE	TR_VC1	TR_VC2	DPDT_1_VC1	DPDT_1_VC2	DPDT_2_VC1	DPDT_2_VC2	MODE	TR_VC1	TR_VC2	RXMODE	TXMODE	MXR_RESET
OFF	'0'	'0'	'X'	'X'	'X'	'X'	OFF	'0'	'0'	'X'	'X'	'0'
BYPASS	'1'	'0'	'X'	'X'	'X'	'X'	BYPASS	'1'	'0'	'X'	'X'	'0'
RX LOWPASS	'0'	'1'	'1'	'0'	'1'	'0'	RX	'0'	'1'	'1'	'0'	'1'
RX HIPASS	'0'	'1'	'0'	'1'	'0'	'1'	RX	'0'	'1'	'1'	'0'	'1'
TX LOWPASS	'1'	'1'	'0'	'1'	'0'	'1'	TX	'1'	'1'	'0'	'1'	'1'
TX HIPASS	'1'	'1'	'1'	'0'	'1'	'0'	TX	'1'	'1'	'0'	'1'	'1'



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TITLE		PRODUCT NAME / P/N	
Top Level Design		CaribouLite / CARIBOULITE-V2	
DESIGNER: DM		REVIEWER: -	
DATE: 6/30/2021		REV: B	
SIZE A3	DRAWING NO. DN00001	SHT 2	OF 7
		 Caribou Labs www.cariboulabs.co Open Source RF Tools	



TP15 TP16 TP17

GND GND GND

VCC_3V3 R7 470 D1 LTST-C190KRKT

VCC_RPI_5V0 R6 470 D2 LTST-C190KRKT

CC BY SA

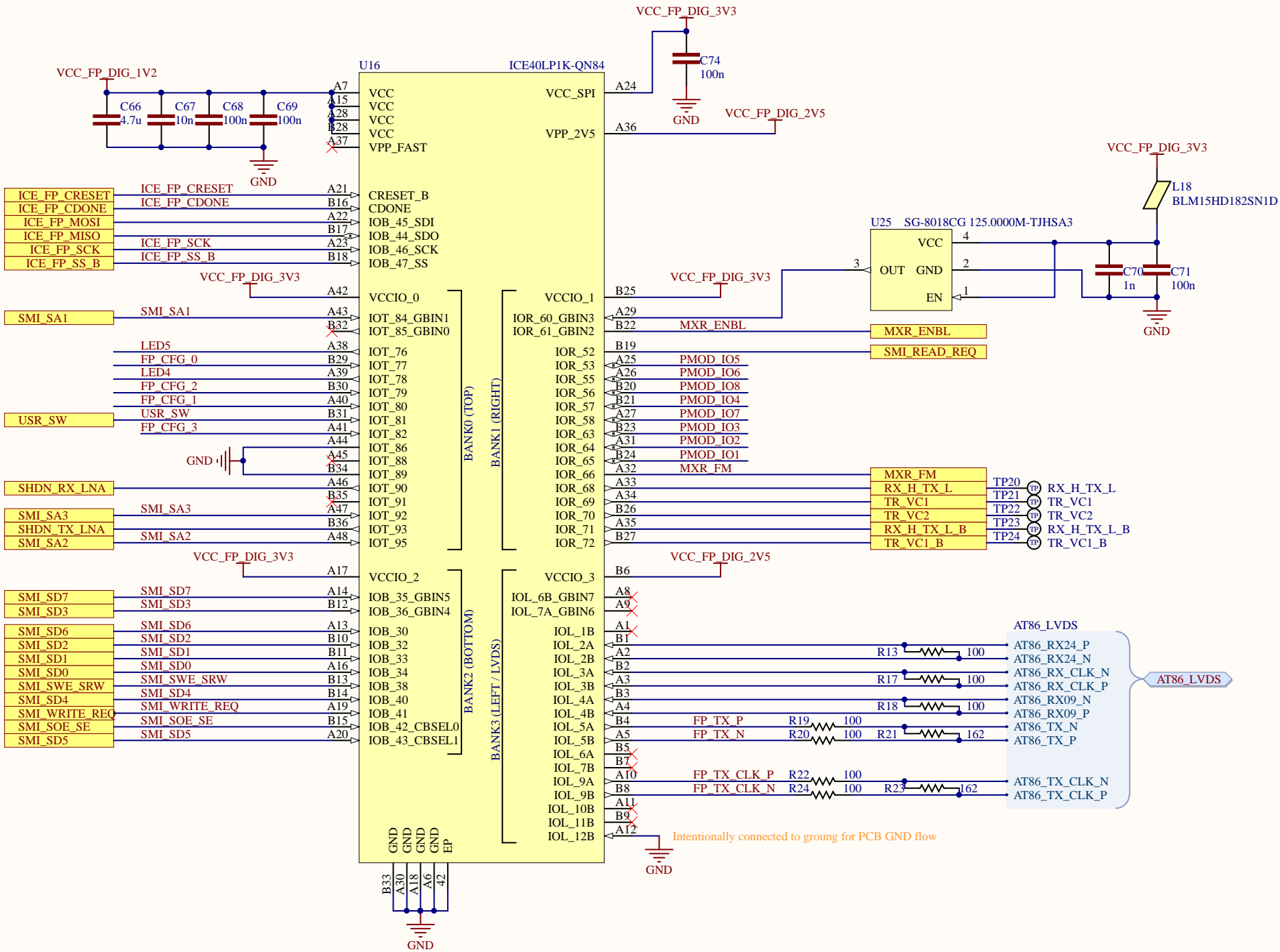
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TITLE		PRODUCT NAME / P/N	
Connectors and Power		CaribouLite / CARIBOULITE-V2	
DESIGNER: DM		REVIEWER: -	
DATE: 6/30/2021		REV: B	
SIZE A3	DRAWING NO. DN00001	SHT 3	OF 7

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Open Source RF Tools

FPGA



LVDS Negated Pairs

AT86_TX
AT86_RX09
AT86_TX_CLK

The other two are direct logic.

PROGRAMMING

POR=> Check SS
1. if SS='1' => if NVCM programmed, use NVCM, otherwise use external flash (SPI MASTER).
2. if SS='0', wait to be configured from external controller through SPI

RESET - restarts the configuration
CDONE - before configuration finished is '0', When done turns '1'

Calculation of differential lines

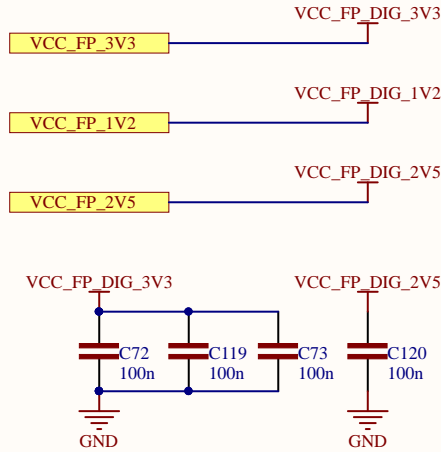
VCCIO = 2.5V
VOD = 0.5V (this is the differential swing nominal)
Rouput = 30 Ohms (given by ICE40 Specs)

The parallel output resistor:
 $VCCIO = 2.5V \Rightarrow R_p = 2 * (50 * 2.5 / (2.5 - (2 * 0.5))) = 250 / 1.5 = 166 \text{ Ohms} \Rightarrow R_p / 2 = 83.3 \text{ Ohms}$
The series output resistors:
 $VCCIO = 2.5V \Rightarrow R_s = (50 * 83.3) / (83.3 - 50) - 30 = 4165 / 33.3 - 30 = 95 \text{ Ohms}$

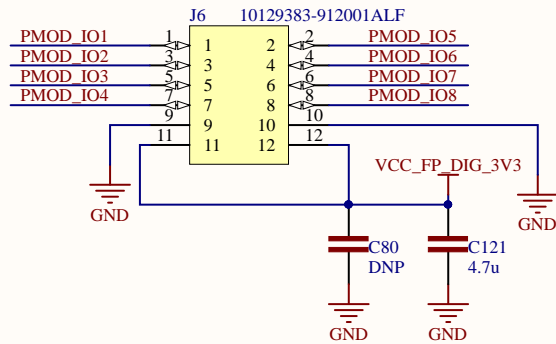
But, we want to make Rs a 100 Ohms to minimize BOM =>
 $R_s = 100 \Rightarrow R_p = 162.5 \text{ Ohms} \Rightarrow V_{od} = 0.48 \text{ Vdiff} \Rightarrow \text{Looks good enough!}$

Connect the positive or true polarity side of the differential pair to the DPxxA input and the negative or complementary side of the pair to the DPxxB input.
==== If it is easier to route the differential pair, the input pins can be swapped, which produces an inverted input value. =====
====The inverted input value can subsequently be inverted by logic within the FPGA. =====

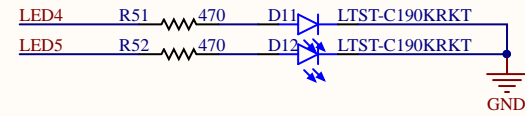
POWER TERMINALS



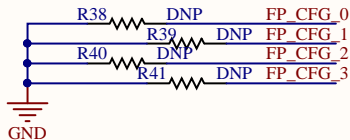
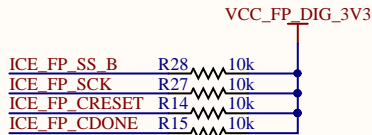
PMOD





LEDS



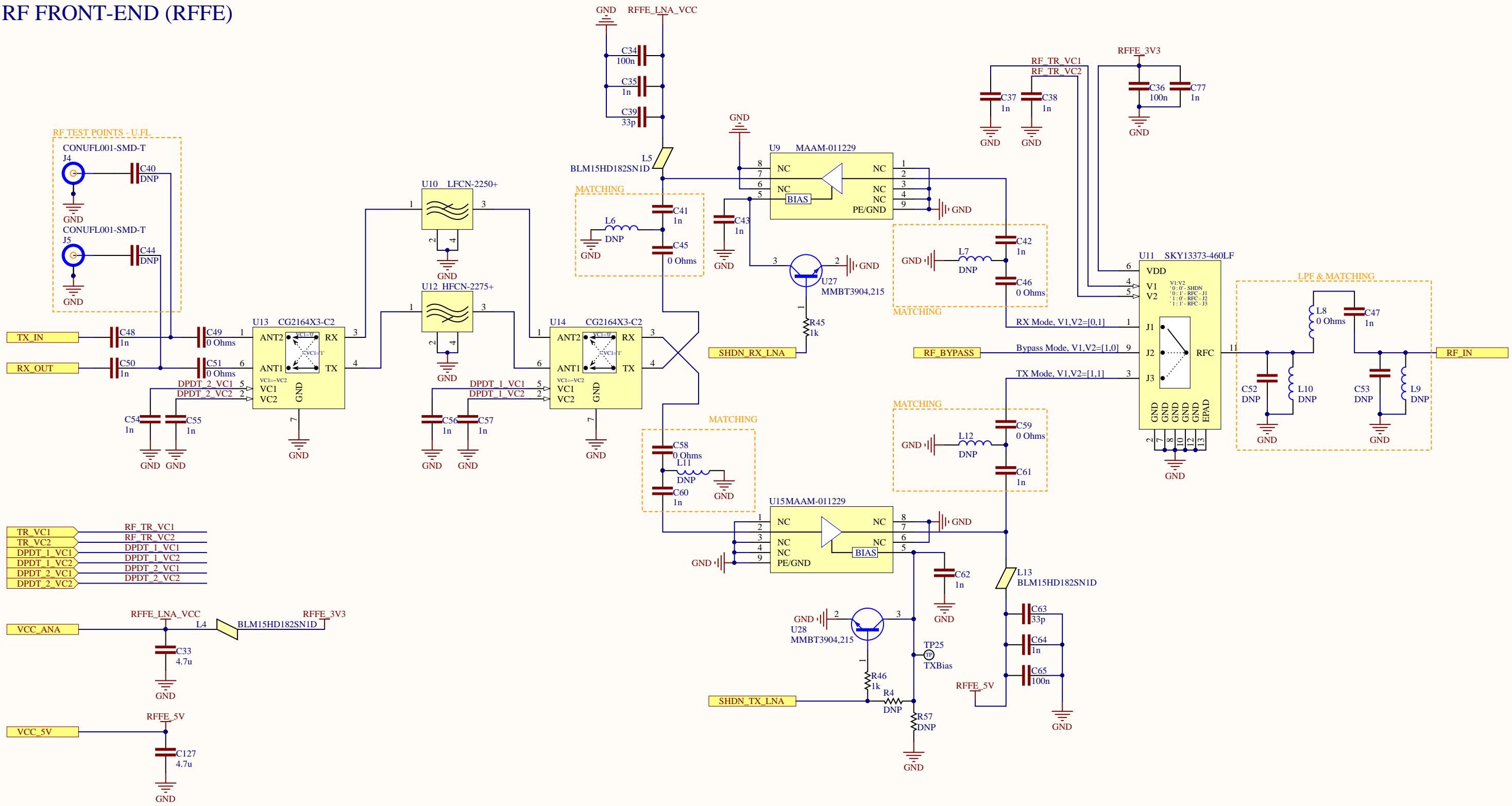
Configuration Resistors - Place 10k for pulldown as needed
Apply internal FPGA pullups on all config pins



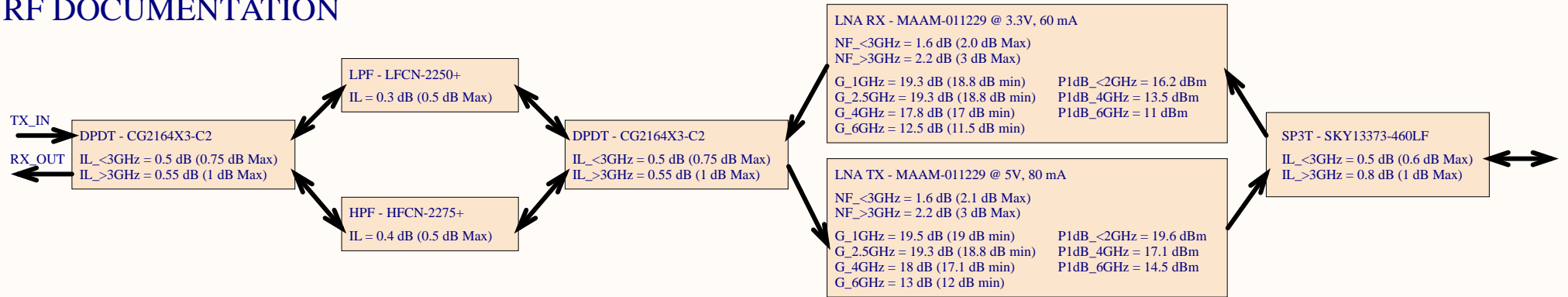
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TITLE FPGA ICE40LP		PRODUCT NAME / P/N CaribouLite / CARIBOULITE-V2		<div> www.cariboulabs.co Open Source RF Tools</div>
DESIGNER: DM				
REVIEWER: -				
DATE: 7/7/2021		REV: B		
SIZE A3	DRAWING NO. DN00001	SHT 4	OF 7	
<div> open source hardware</div>				

RF FRONT-END (RFFE)



RF DOCUMENTATION



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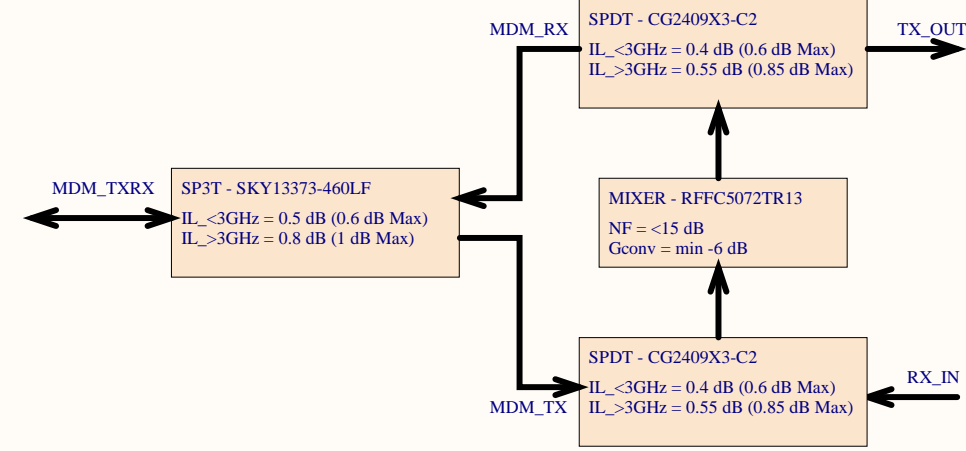
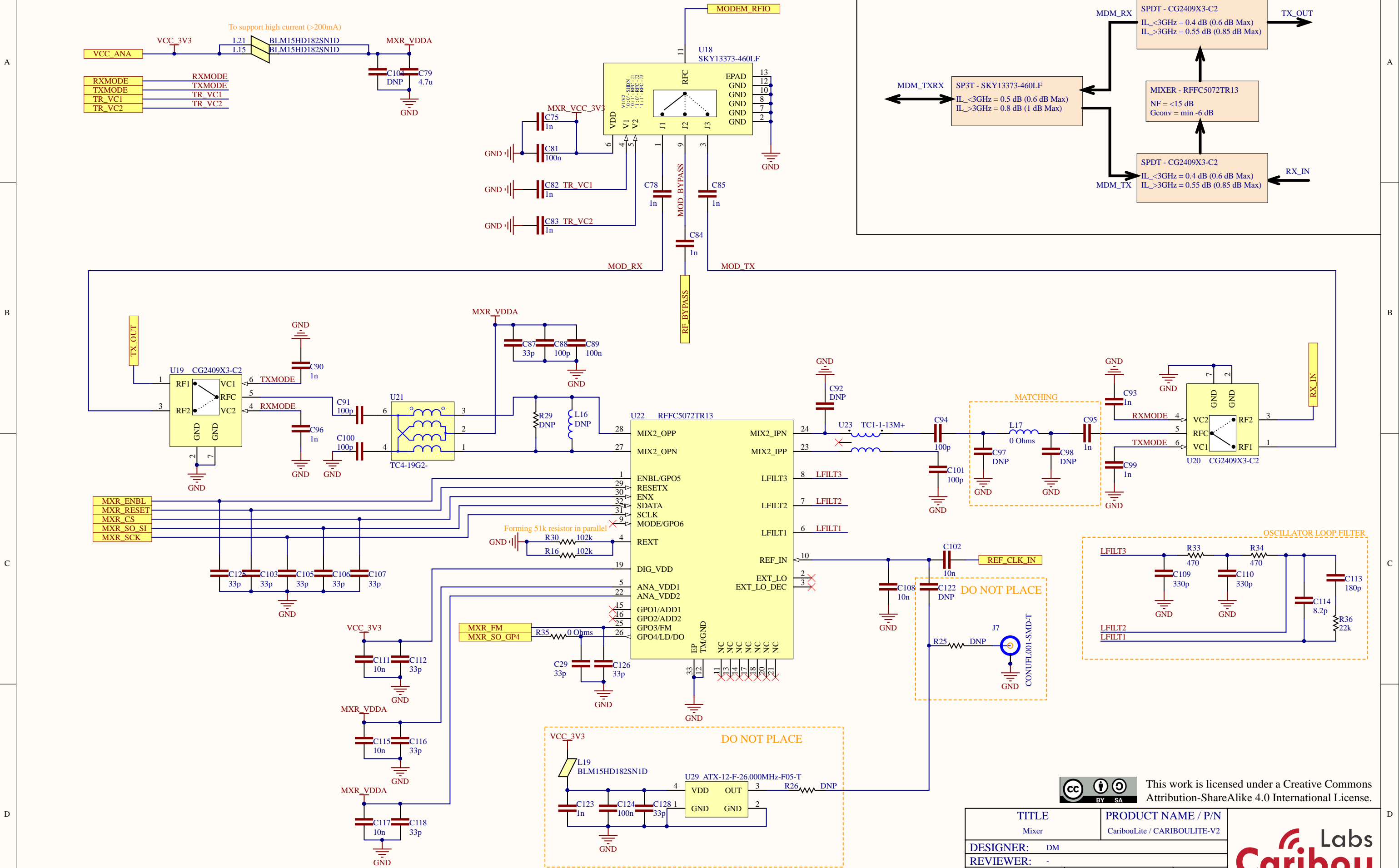
TITLE		PRODUCT NAME / P/N	
RF Front-End		CaribouLite / CARIBOULITE-V2	
DESIGNER:		DM	
REVIEWER:		-	
DATE:		6/27/2021	REV: B
SIZE	DRAWING NO.	SHT	OF
A3	DN00001	5	7





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MIXER - QORVO RFFC5072

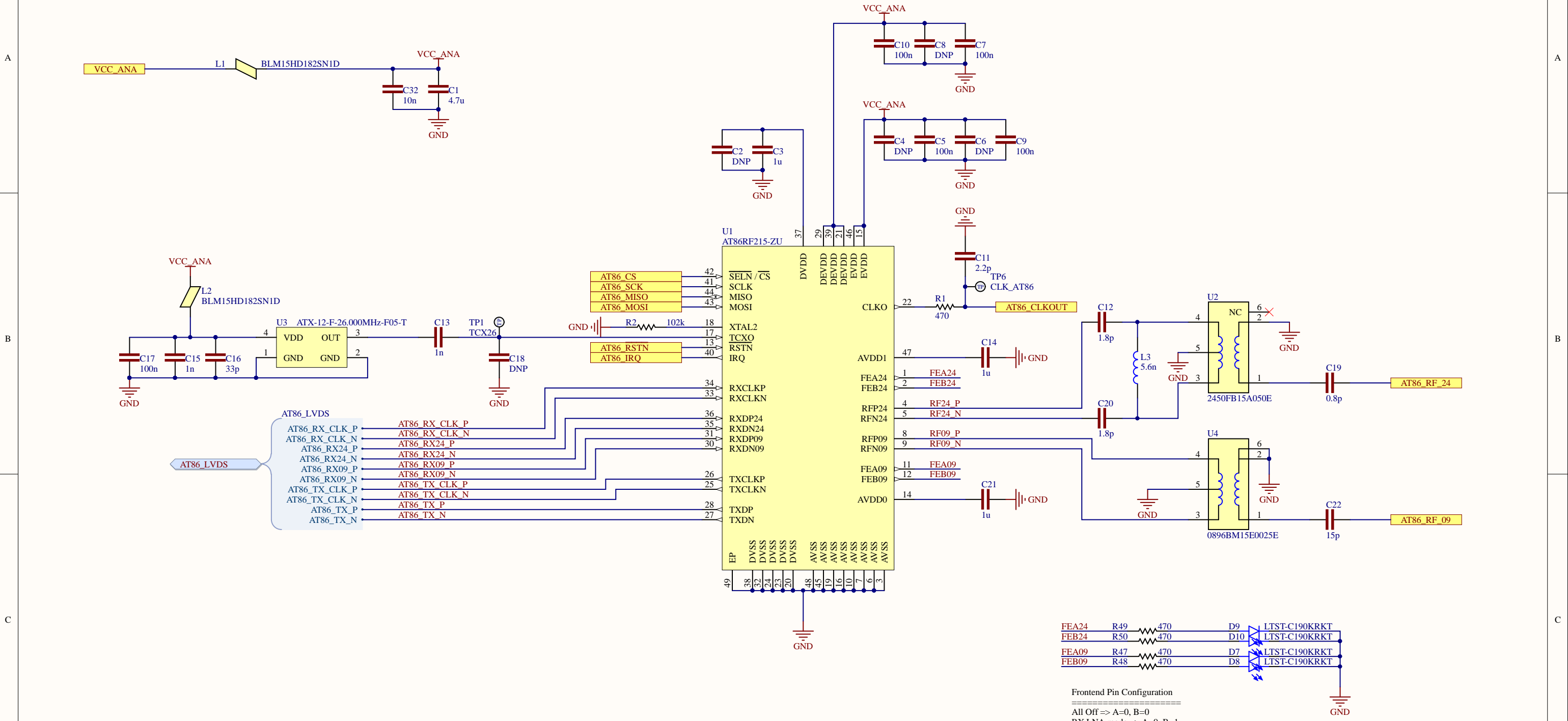
RF DOCUMENTATION



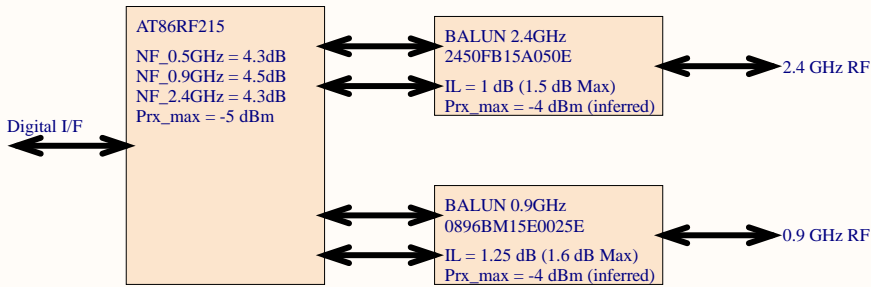
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TITLE Mixer		PRODUCT NAME / P/N CaribouLite / CARIBOULITE-V2		<div> www.cariboulabs.co Open Source RF Tools</div>
DESIGNER: DM				
REVIEWER: -				
DATE: 6/28/2021		REV: B		
SIZE A3	DRAWING NO. DN00001	SHT 6	OF 7	
				

MODEM - AT86RF215



RF DOCUMENTATION





FEA24 R49 470 D9 LTST-C190KRKT
FEB24 R50 470 D10 LTST-C190KRKT
FEA09 R47 470 D7 LTST-C190KRKT
FEB09 R48 470 D8 LTST-C190KRKT

Frontend Pin Configuration
=====

All Off => A=0, B=0
RX LNA mode => A=0, B=1
TX mode => A=1, B=0
RX Bypass => A=1, B=1

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TITLE Modem and TCXO		PRODUCT NAME / P/N CaribouLite / CARIBOULITE-V2		<div><p>www.cariboulabs.co Open Source RF Tools</p></div>
DESIGNER: DM				
REVIEWER: -				
DATE: 6/28/2021		REV: B		
SIZE A3	DRAWING NO. DN00001	SHT 7	OF 7	
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