OpenCellular LTE Front End Board
Band 3
1800MHz

RefDes	Description	Value	Part Number	MRP
PCB1	Facebook - OC-LTE Front End - Band 3, 1800		690-488-E	690-488-E

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Title:
OC-LTE Front-End Band 3 1800MHz

Reference number: 690-488-E	Rev.: E	Project: FBKD1702-3P3	Paper size: B (11X17)
Drawn by: David Lacasse Ing. M.Ing.	Sheet Name: OpenCellular_FrontEnd	1 of 16	Total Pages:
Approved by:	Filename:		Printing date: 19/06/2018:07:27

Fix ATT +
SKY12343-364LF

MMG20241H

A2I20D040N

Insert fixed 0dB ATT

TX1 section

BB: -20 to -30dBm
EVM < 2%
ACLR < -55dBc

TX 1

LP0805A1842AS

MMG20241H

TQQ0303

SC2200

RFIN : -1 to +5dBm: Peak
-11dBm to -5dBm: RMS

-10dBm @
BB OUT = -26.5dBm

PA Subsystem
G=45dB @ Var ATT:0dB

35.25dBm

X3C19F1-20S

SKYFR-001387

YAT-10+

5.25dBm

YAT-20+
Low VSWR
50Ohm load

SKY12343-364LF

BFCN-1860 +

YAT-20+
Low VSWR
50Ohm load

RFFB: -8 to -2dBm : Peak
-18 to -12dBm: RMS
-15dBm @ var ATT=18.25dB

RFPAL

SKYFR-001387

LFCN-2250

Provision for
TX connector

34.4dBm

YAT-20+
Low VSWR
50Ohm load

30.5dBm

TX

RX

BH3000CU

ADRF5130
w/ BYPASS

X3C19F1-20S

FWR

REV

YAT-10+

TRX 1

RX1 section

I2C interface

AD7995

AD8364

Input A

Input B

Features and Power Supply

Power
Supply

Current/Volt
age sensors
monitoring

EEPROM

Temp
Sensors

TQQ7303

SKY12343-364LF

TQP3M9037

RX 1

FWR

REV

Provision for
RX connector

RX main

RX Sniffer

HMC8038

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Reference number: 690-488-E	Rev.: E	Project: FBKD1702-3P3	Paper size: B (11X17)
Drawn by: David Lacasse Ing. M.Ing.	Sheet Name: Diagram Block	2	Total Pages: of 16
Approved by:	Filename:		Printing date: 19/06/2018:07:27

I2C Table

			BB Board	LED board	FE Board								
I2C BUS	BB_I2C0	Addr Range			Board	TX1_att	TX1	VSWR1	RX1	TX2_att	TX2	VSWR2	RX2
TCA9535PWR	IC I/O EXPANDER I2C	0x20 to 0x27			0x24					0x25	0x26		0x27
LM75ADP	Temp sensor	0x48 to 0x4F								0x4A			
AT24C64D-SSHM-B	EEPROM CALIBRATION	0x50 to 0x57			0x51								
AD7995-0	ADC VSWR	0x28										0x28	
AD7995-1	ADC VSWR	0x29											
AT24C64D-XHM-B	BB EEPROM **not in revA or B**		0x52 (revC)										
I2C BUS	BB_I2C1												
TCA9535PWR	IC I/O EXPANDER I2C	0x20 to 0x27				0x25	0x26		0x27				
LM75ADP	Temp sensor	0x48 to 0x4F				0x4A							
TCA6416	GPIO Exp		0x21										
DAC8571	DAC for XO CTRL		0x4E										
AD7995-0	ADC VSWR	0x28						0x28					
I2C BUS	GBC_TIVA_I2C4 Merge with BB_I2C1 in standalone R248 R39 Pop												
TCA9535PWR	IC I/O EXPANDER I2C	0x20 to 0x27			0x20								
CAT24C256WI-GT3	EEPROM ID	0x50 to 0x57			0x50								
LM75ADP	Temp sensor	0x48 to 0x4F			0x49								
INA226	Current sensor PA1	0x40 to 0x4F			0x40								
INA226	Current sensor PA2	0x40 to 0x4F			0x41								
SX1509BIULTRT	I2C GPIO EXPANDER			0x3E									
SX1509BIULTRT	I2C GPIO EXPANDER			0x3F									
LM75ADP	Temp sensor	0x48 to 0x4F		0x4F (LEDv2)									
SE98ATP,547	Temp sensor			0x1A (LEDv1)									
I2C BUS	GBC_TIVA_I2C3 Merge with BB_I2C0 in standalone With Jumper on BB J22-J23												
INA226AIDGST	I2C I/O EXPANDER	0x20 to 0x27	0x44										
CAT24C256WI-GT3	EEPROM ID	0x50 to 0x57	0x50										
LM75AIMM	Temp sensor	0x48 to 0x4F	0x48										
SX1509	IC GPIO EXPANDER I2C		0x71										

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Title: OC-LTE Front-End Band 3 1800MHz

Reference number:	Rev.:	Project:	Paper size:
690-488-E	E	FBKD1702-3P3	B (11X17)

Drawn by:	Sheet Name	Total Pages:
David Lacasse Ing. M.Ing.	Tables 3	of 16

Approved by:	Filename:	Printing date:
		19/06/2018:07:27

RX2
128-0711-201
UMC
RX2
0734151692
MCX
RX2
MCX-J-P-H-RA-TH1
MCX
Place direct on pad
RX2
128-0711-201
UMC
RX2
128-0711-201
UMC
RX2
MCX-J-P-H-ST-MT1
MCX
RX2
ANT2
Dualfootprint
Sniffer
TRX_Antenna
TRX
Antenna_Sw_3V3
Sniffer_Sw_3V3
Sniffer_Sw_EN_3V3
Sniffer_Sw_BB_CTRL_3V3
Antenna_Switch_3V3
Sniffer_Switch_3V3
Sniffer_Switch_EN_3V3
Sniffer_Sw_BB_CTRL_3V3
28K50A-40ML5
QMA
RX2in
0734151692
MCX
Duplexer BYPASS
TX2out
0734151692
MCX
Duplexer BYPASS
Crowfeet
RX2
5V
3V3
RX_OUT
RX_IN
IO_EXP_I2C_AD2_3V3
I2C_SCL_3V3 IO_EXP_I2C_AD1_3V3
I2C_SDA_3V3 IO_EXP_I2C_AD0_3V3
RX2_IO_EXP_I2C_AD2_3V3
RX2_IO_EXP_I2C_AD1_3V3_
RX2_IO_EXP_I2C_AD0_3V3_
BB_I2C0_SCL_3V3
BB_I2C0_SDA_3V3
TQQ7303
863-1966-1-ND
LFCN-2250+
USD003C
X3C19F1-20S
TX2
28V_PA_VDD
28V_PA_VDD2
To_RFPAL_IN
From_RFPAL_OUT
To_RFPAL_feedback
5V
3V3
TX_OUT
RFPAL_Feedback_Att_IN
TX_IN
HighGainPA_EN_3V3
TempSensor_I2C_AD2_3V3
TempSensor_I2C_AD1_3V3
TempSensor_I2C_AD0_3V3
IO_EXP_I2C_AD2_3V3
IO_EXP_I2C_AD1_3V3
IO_EXP_I2C_AD0_3V3
IO_EXP2_I2C_AD2_3V3
I2C_SCL_3V3 IO_EXP2_I2C_AD1_3V3
I2C_SDA_3V3 IO_EXP2_I2C_AD0_3V3
OS_Temp_sensor_alert_3V3
TX_HighGainPA2_EN_3V3
TX1_OS_Temp_sensor_alert_3V3
TX2_OS_Temp_sensor_alert_3V3
28V_PA2_sw
5V_TX2
3V3_TX2
TX2_TempSensor_I2C_AD2_3V3
TX2_TempSensor_I2C_AD1_3V3
TX2_TempSensor_I2C_AD0_3V3
TX2_IO_EXP_I2C_AD2_3V3
TX2_IO_EXP_I2C_AD1_3V3
TX2_IO_EXP_I2C_AD0_3V3
TX2_IO_EXP2_I2C_AD2_3V3
TX2_IO_EXP2_I2C_AD1_3V3
TX2_IO_EXP2_I2C_AD0_3V3
D10AA2024
10W, VSWR=1.25:1
20dB
VSWR2
RMS_FWD_IN
RMS_REV_IN
I2C_SCL_3V3
I2C_SDA_3V3
DualRFPAL
1V8
Reset_N_1V8
MS0_1V8
MS1_1V8
RFPAL_IN_A
RFPAL_OUT_A
RFPAL_feedback_A
RFPAL_IN_B
RFPAL_OUT_B
RFPAL_feedback_B
SPI_CLK_1V8
SPI_DATA_IN_1V8
SPI_DATA_OUT_1V8
SPI_CS_1V8
**Reset should be toggled after powerup
TX1
TX1
128-0711-201
UMC
TX1
MCX-J-P-H-RA-TH1
MCX
TX1
128-0711-201
UMC
TX1
128-0711-201
UMC
TX1out
0734151692
MCX
ANT1
MCX-J-P-H-ST-MT1
MCX
28K50A-40ML5
QMA
VSWR1
RX1
0734151692
MCX
RX1
128-0711-201
UMC
RX1
MCX-J-P-H-RA-TH1
MCX
RX1
128-0711-201
UMC
RX1
128-0711-201
UMC
RX1in
0734151692
MCX
BYPASS
Place connector direct on pad
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Reference number: 690-488-E
Rev.: E
Project: FBKD1702-3P3
Paper size: B (11X17)
Drawn by: David Lacasse Ing. M.Ing.
Sheet Name: MAIN
Total Pages: 4 of 16
Approved by:
Filename:
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DIGITAL BOARD CONNECTOR

For standalone use

GBC_I2C4_SCL_3V3 — R299 0R0 — BB_I2C1_SCL_3V3 (P17)

GBC_I2C4_SDA_3V3 — R300 0R0 — BB_I2C1_SDA_3V3 (P16)

OS_PA_Temp_sensor_alert_3V3 — R347 0R0 — TX1_OS_Temp_sensor_alert_3V3

R346 0R0 — TX2_OS_Temp_sensor_alert_3V3

3V3_Tiva — E21 BLM15PX471SN1D 1A — +3V3 (P1) — TP39 — TP40

3V3_Tiva (P5): GBC_LED_Board_Reset_N_3V3, GBC_I2C4_SDA_3V3, GBC_I2C4_SCL_3V3 — GND

+28V — TP34 — GND

+3V3 — TP82 — GND

+5V — TP38 — GND

+1V8 — TP37 — GND

BB_I2C1_SCL_3V3 — R49 0R0 — BB_I2C0_SCL_3V3

BB_I2C1_SDA_3V3 — R70 0R0 — BB_I2C0_SDA_3V3

For debug
I2C adresses should be modified

P18 (I2C0): TP84, R155 4K75, R154 4K75 (+3V3) — BB_I2C0_SCL_3V3, BB_I2C0_SDA_3V3 — TP83 — GND

P20 (I2C1): TP79, R152 4K75, R151 4K75 (+3V3) — BB_I2C1_SCL_3V3, BB_I2C1_SDA_3V3 — TP78 — GND

P11: 1722992108 — +28V, +5V, GND — +3V3, +1V8

Current Max : 1750mA 950mA 820mA 277mA

+1V8 (P12), +5V (P9), +28V (P8), +3V3 3V3_Tiva (P10)

J5

BB_I2C1_SDA_3V3 — R48 0R0
BB_I2C1_SCL_3V3 — R50 0R0
TP36 — BB_SPI_CS1_3V3 — R52 0R0
BB_SPI_DATA_IN_3V3
BB_SPI_DATA_OUT_3V3 — R55 100R
BB_SPI_CLK_3V3 — R58 100R

TP7 — RFIC_GPO_0_3V3 — R62 0R0
TP9 — RFIC_GPO_1_3V3 — R68 0R0
BB_I2C0_SCL_3V3 — R67 0R0
BB_I2C0_SDA_3V3 — R72 0R0

R66 0R0, R65 0R0, R51 0R0 — GND

R40 0R0 — 7130_EXP_GPIO3 — TP1
R42 0R0 — 7130_EXP_GPIO1 — TP2
R44 0R0 — BB_RF_GPO0 — TP3
R45 0R0 — BB_RF_GPO1 — TP4
OS_FE_Temp_sensor_alert_3V3
OS_PA_Temp_sensor_alert_3V3
R53 0R0 — BB_RF_GPO2 — TP5
CS_Current_sensor_alert_3V3
R56 0R0 — BB_RF_GPO3 — TP6
R59 100R — BB_SPI_CS0_3V3

R60 100R — RFIC_GPO_2_3V3 — Sniffer_Sw_BB_CTRL_3V3
R64 0R0 — RFIC_GPO_3_3V3 — TP8
R69 0R0 — GBC_I2C4_SCL_3V3
R71 0R0 — GBC_I2C4_SDA_3V3
R73 0R0 — 7130_EXP_GPIO2 — TP10
R76 0R0 — 7130_EXP_GPIO0 — TP11

R41 0R0, R42 0R0, R45 0R0, R47 0R0, R54 0R0, R57 0R0, R63 0R0, R74 0R0, R75 0R0 — GND

U53 (1V8_RFPAL)

BB_SPI_CLK_3V3 — BB_SPI_CLK_1V8
BB_SPI_DATA_OUT_3V3 — BB_SPI_DATA_OUT_1V8
SN74LVC2T45DCUR

DIR
0 = B to A
1 = A to B
Alim=1.65 à 5.5V

U55

BB_SPI_CS0_3V3 — BB_SPI_CS0_1V8
RFPAL_Reset_N_3V3 — RFPAL_Reset_N_1V8
SN74LVC2T45DCUR

DIR
0 = B to A
1 = A to B
Alim=1.65 à 5.5V

U54

BB_SPI_DATA_IN_1V8 — BB_SPI_DATA_IN_3V3 — TP96
TP77 — R352 0R0
SN74LVC2T45DCUR

DIR
0 = B to A
1 = A to B
Alim=1.65 à 5.5V

U61

RFPAL_MS0_3V3 — RFPAL_MS0_1V8
RFPAL_MS1_3V3 — RFPAL_MS1_1V8
SN74LVC2T45DCUR

DIR
0 = B to A
1 = A to B
Alim=1.65 à 5.5V

U3 — AT24C64D-SSHM

BB_I2C0_SCL_3V3, BB_I2C0_SDA_3V3 — C3 100nF — 0x51

WP Active high — R38 10K0 — EEPROM_Calibration_WP_3V3

R34 0R0, R33 0R0, R32 0R0 — Crowfeet all

R37 0R0, R36 0R0, R35 0R0 — GND

U14 — LM75ADP,118

OS_FE_Temp_sensor_alert_3V3 — R140 10K0 — 0x49

GBC_I2C4_SCL_3V3, GBC_I2C4_SDA_3V3 — C12 100nF

R146 0R0, R144 0R0, R142 0R0 — Crowfeet all

R145 0R0, R143 0R0, R141 0R0 — GND

U12 — CAT24C256WI-GT3

GBC_I2C4_SCL_3V3, GBC_I2C4_SDA_3V3 — C10 100nF — 0x50

WP Active high — R109 10K0 — GBC_EEPROM_ID_WP_3V3

R137 0R0, R138 0R0, R139 0R0 — Crowfeet all

R134 0R0, R135 0R0, R136 0R0 — GND

Alim=1.8 à 5.5V

U30

GBC_LED_Red_3V3 — R296 0R0 — Crowfeet
GBC_LED_Green_3V3 — R294 0R0 — Crowfeet
R295 0R0, R293 0R0 — GND

C122 100nF, C123 100nF

R297 100R, R298 100R — P13 — LEDs

DIR
0 = B to A
1 = A to B

Alim=1.65 à 5.5V

	Bits 3:0
PCB RevA	0000
PCB RevD	0001
PCB RevE	0010

Bits 7:4 Unused

U13 — TCA9535RTWR

GBC_I2C4_SCL_3V3, GBC_I2C4_SDA_3V3 — TP65 — 0x20

C11 100nF

R133 0R0 — GBC_EEPROM_ID_WP_3V3

P00 — TP66
P01 — TP64
P02 — TP63
P03 — TP62
P04
P05 — R293 0R0 — GBC_LED_Red_3V3
P06 — R292 0R0 — GBC_LED_Green_3V3
P07 — R131 0R0 — GBC_LED_Board_Reset_N_3V3

R122 0R0, R121 0R0, R120 0R0 — GND

R129 0R0, R128 0R0, R127 0R0, R126 0R0, R125 0R0, R124 0R0, R123 0R0, R132 0R0 — Crowfeet all

R119 0R0, R118 0R0, R117 0R0, R116 0R0, R115 0R0, R114 0R0, R113 0R0, R130 0R0 — GND

U62 — TCA9535RTWR

BB_I2C0_SCL_3V3, BB_I2C0_SDA_3V3 — TP124 — 0x24

C65 100nF

R436 0R0, R435 0R0, R442 0R0 — Crowfeet all

R449 0R0, R448 0R0, R455 0R0 — GND

P00 — R459 0R0 — Antenna_Switch_3V3
P01 — R460 0R0 — Sniffer_Switch_3V3
P02 — R461 0R0 — TP120
P03 — R462 0R0 — Sniffer_Switch_EN_3V3
P04 — R463 0R0 — RFPAL_MS0_3V3
P05 — R464 0R0 — RFPAL_MS1_3V3
P06 — R474 0R0 — EEPROM_Calibration_WP_3V3
P07 — R473 0R0 — RFPAL_Reset_N_3V3
P10 — R472 0R0 — TP119
P11 — R471 0R0 — TP118
P12 — R470 0R0 — TP117
P13 — R469 0R0 — TP116
P14 — R468 0R0 — TP114
P15 — R467 0R0 — TP115
P16 — R446 0R0 — TP122
P17 — R447 0R0 — TP121

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Reference number: 690-488-E	Rev.: E	Project: FBKD1702-3P3	Paper size: B (11X17)
Drawn by: David Lacasse Ing. M.Ing.	Sheet Name: CONNECTOR		Total Pages: 5 of 16
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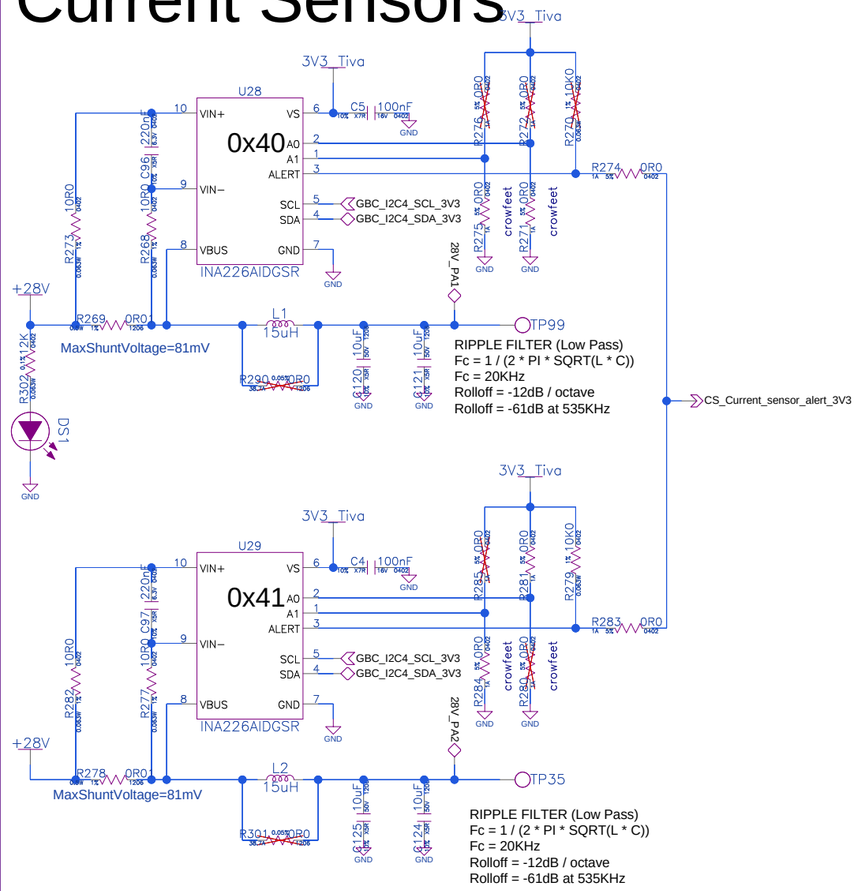
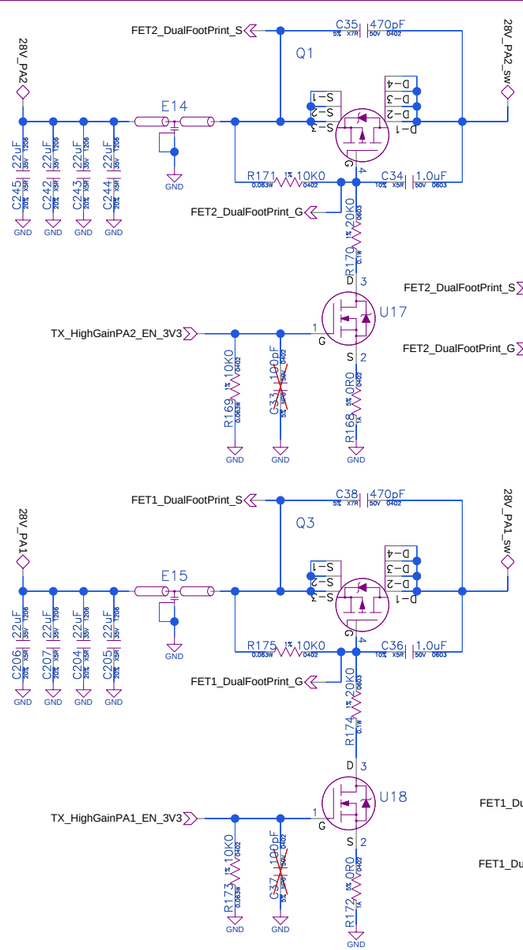
Current Sensors

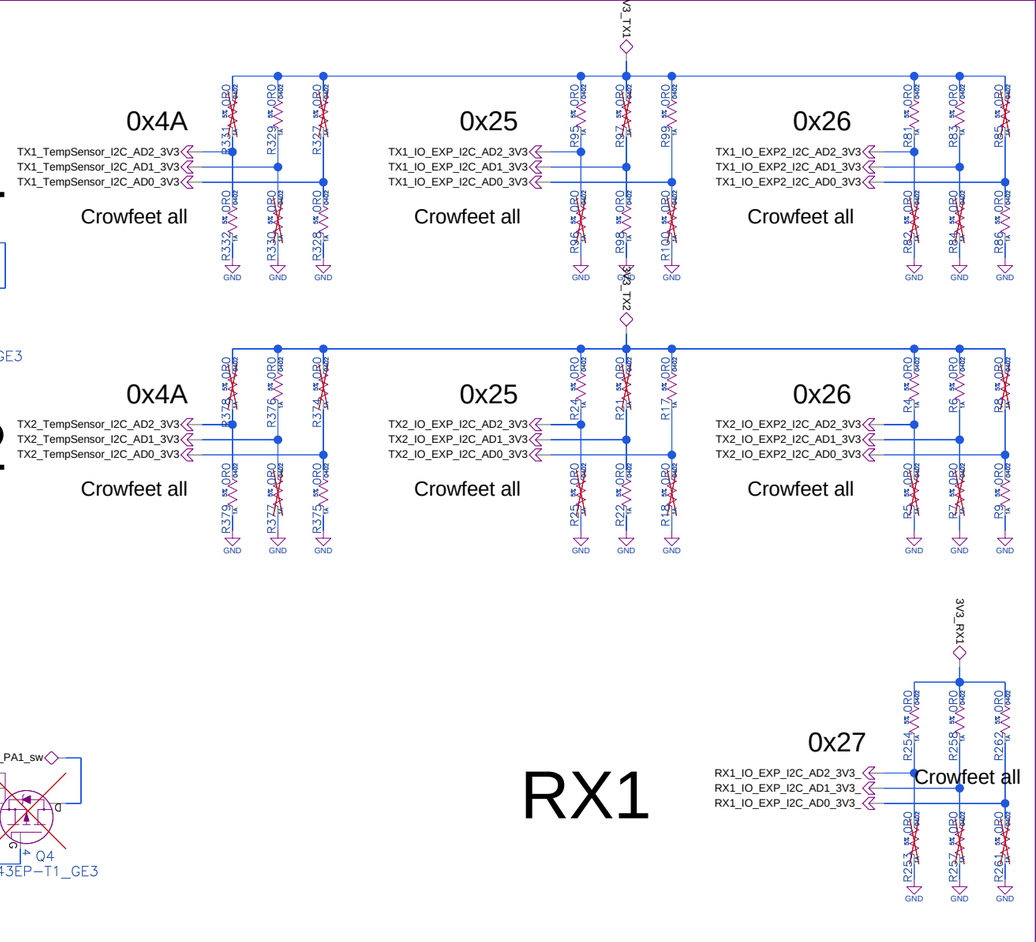


RIPPLE FILTER (Low Pass)
Fc = 1 / (2 * PI * SQRT(L * C))
Fc = 20KHz
Rolloff = -12dB / octave
Rolloff = -61dB at 535KHz

RIPPLE FILTER (Low Pass)
Fc = 1 / (2 * PI * SQRT(L * C))
Fc = 20KHz
Rolloff = -12dB / octave
Rolloff = -61dB at 535KHz



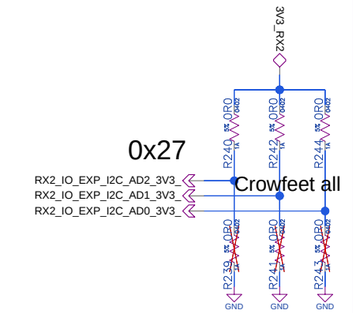
TX1

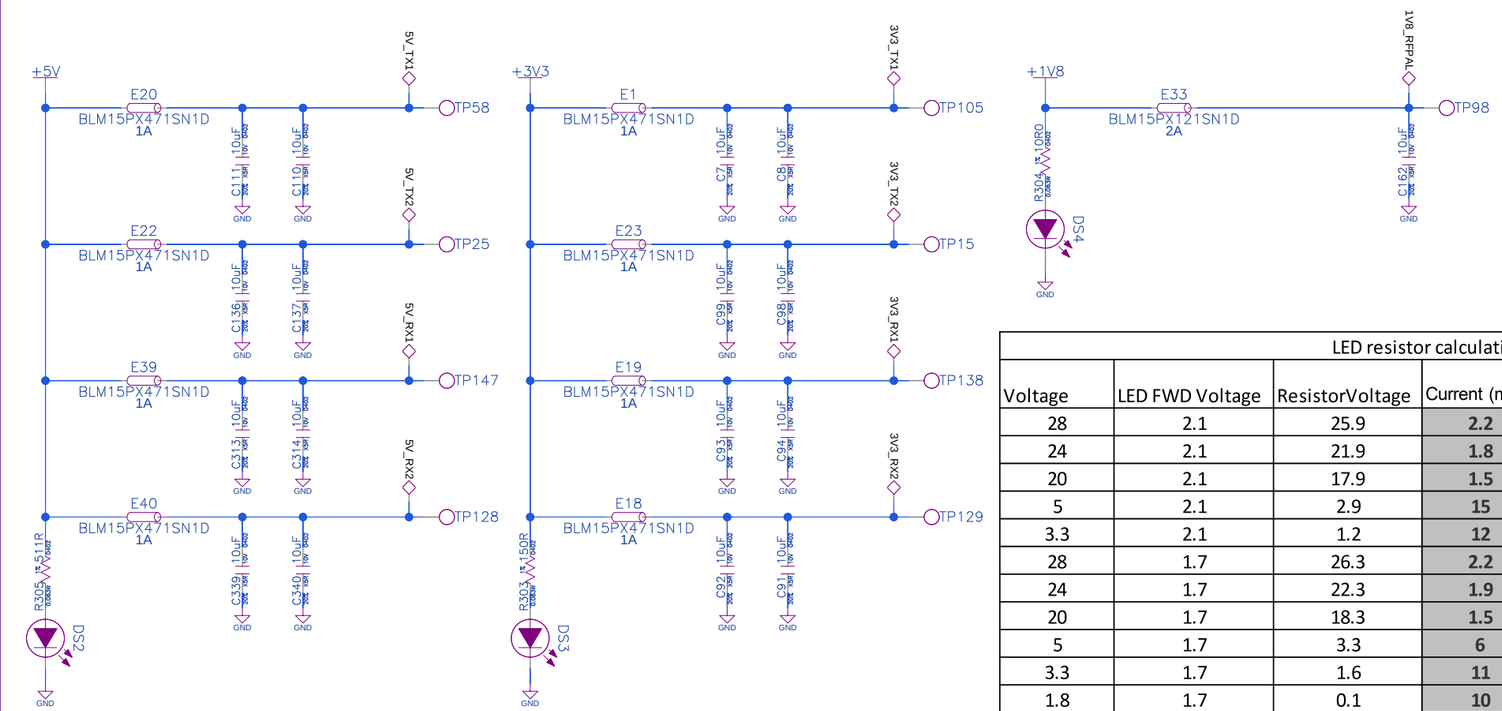


TX2

RX1

RX2





LED resistor calculation					
Voltage	LED FWD Voltage	ResistorVoltage	Current (mA)	ResistorValue	Power in resistor (mW) Should be below 63mW
28	2.1	25.9	2.2	12000	56
24	2.1	21.9	1.8	12000	40
20	2.1	17.9	1.5	12000	27
5	2.1	2.9	15	200	42
3.3	2.1	1.2	12	100	14
28	1.7	26.3	2.2	12000	58
24	1.7	22.3	1.9	12000	41
20	1.7	18.3	1.5	12000	28
5	1.7	3.3	6	511	21
3.3	1.7	1.6	11	150	17
1.8	1.7	0.1	10	10	1

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Reference number: 690-488-E	Rev.: E	Project: FBKD1702-3P3	Paper size: B (11X17)
Drawn by: David Lacasse Ing. M.Ing.	Sheet Name: POWER		Total Pages: 6 of 16
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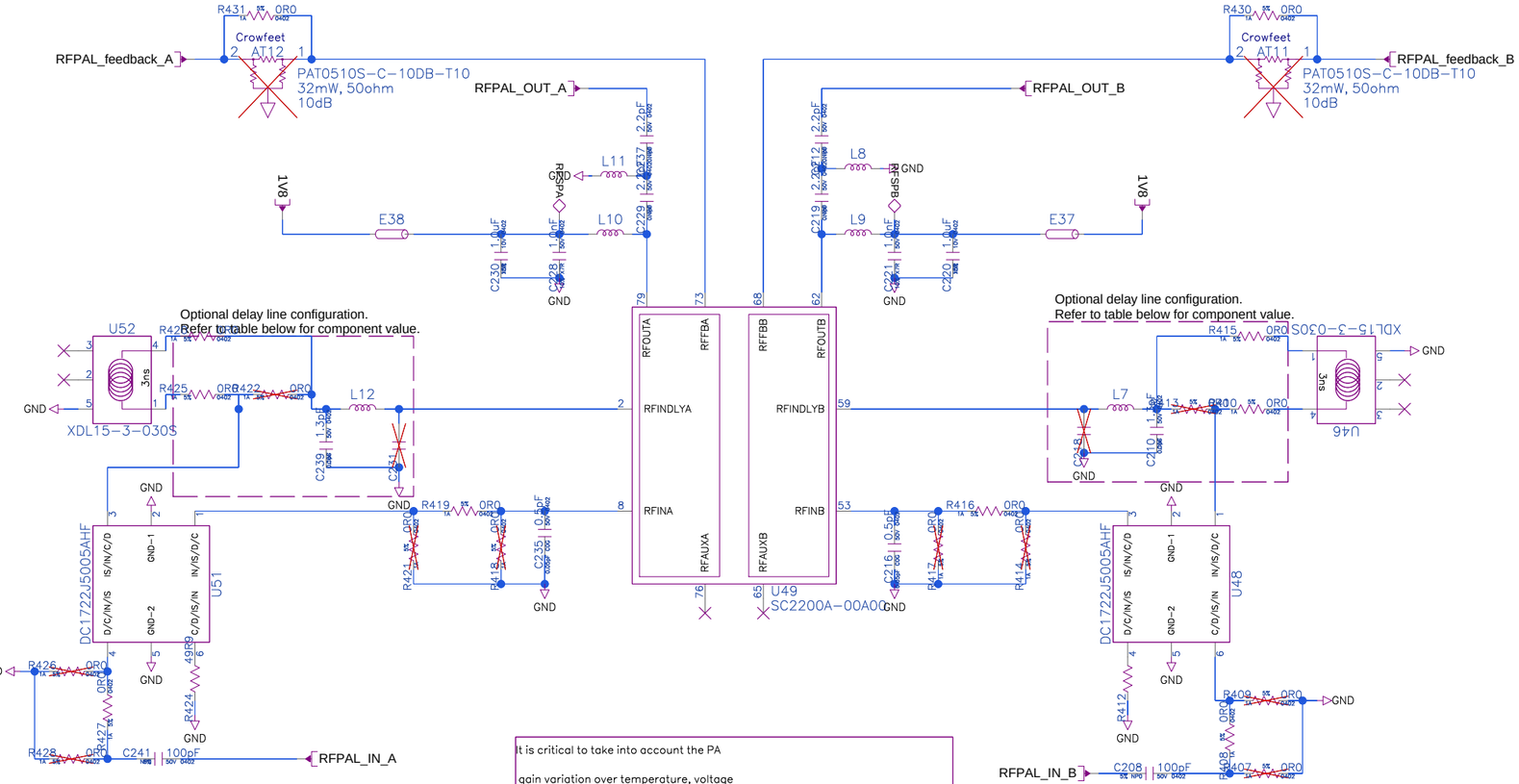
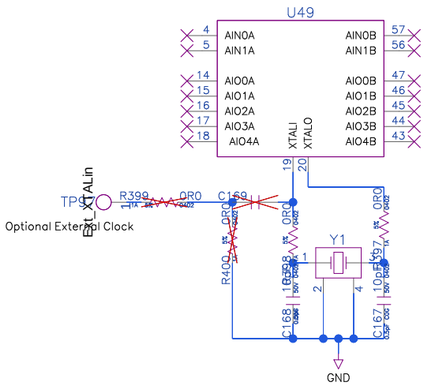
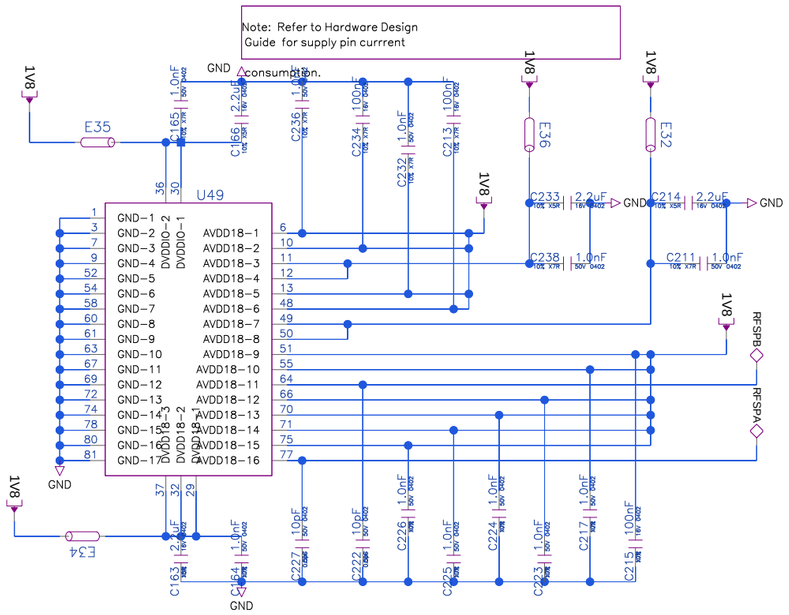
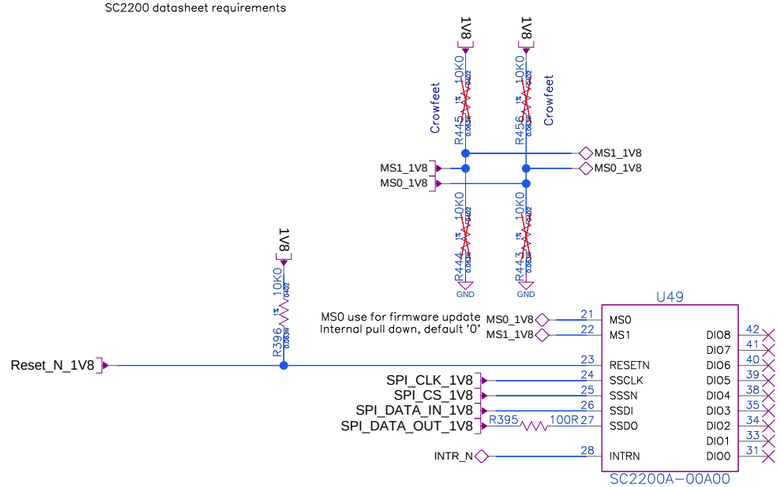
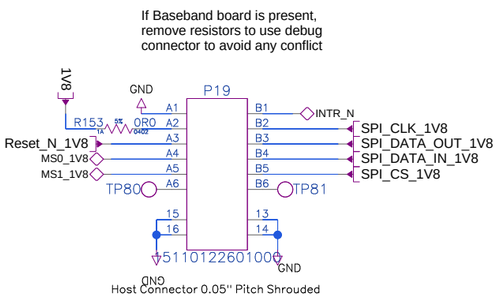
DualRFPAL











It is critical to take into account the PA

gain variation over temperature, voltage
and process variations to make sure the

RFIN and RFFB levels always meet the

SC2200 datasheet requirements

Design info
AVDD18: 30mVPKPK
DVDD18: 50mVPKPK
DVDDIO: 50mVPKPK

Power Sequencing
The SC2200 contains a power−on−reset (POR) circuit connected to the DVDD18 power supply (which triggers between 1 and 1.3V).
IMPORTANT:
a. The DVDDIO power supply must be within 90% of its final value at least 100?s before the DVDD18 power supply is turned on.
b. If this sequence cannot be implemented or DVDDIO and DVDD18 are connected together, then the RESETN pin must be asserted low for at least 1ms after the last supply is established.

IMPORTANT: If the host processor does not perform max power calibration , this connector is needed for production line calibration. Refer to Hardware Design Guide for detail.

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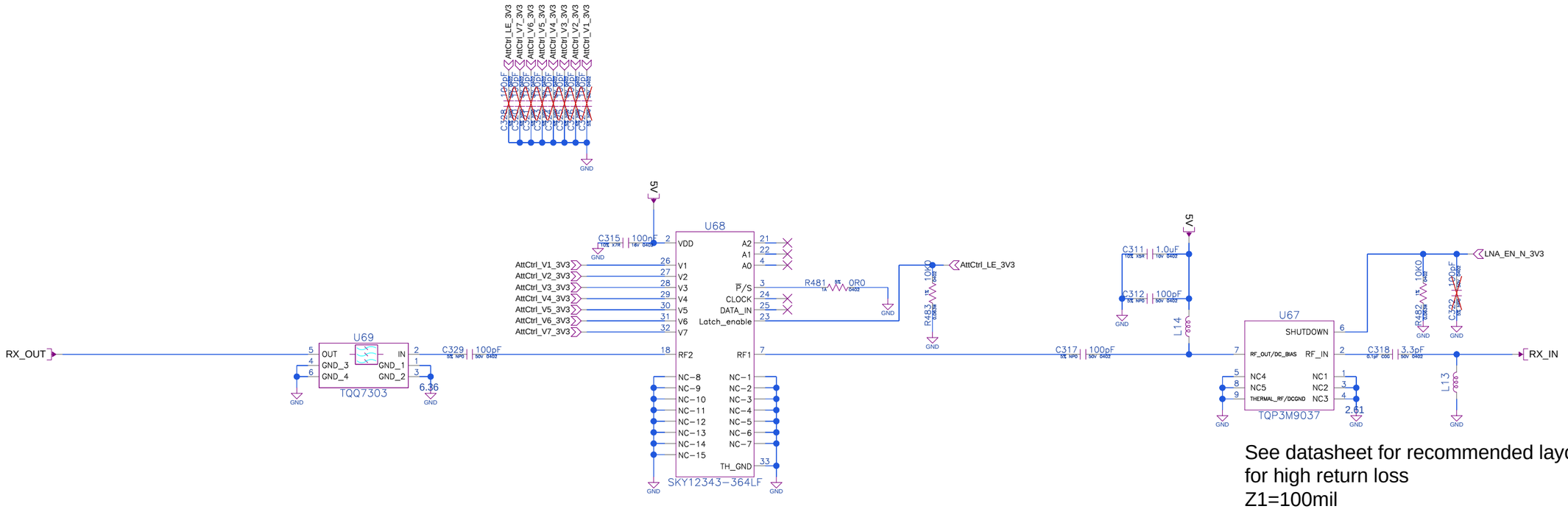
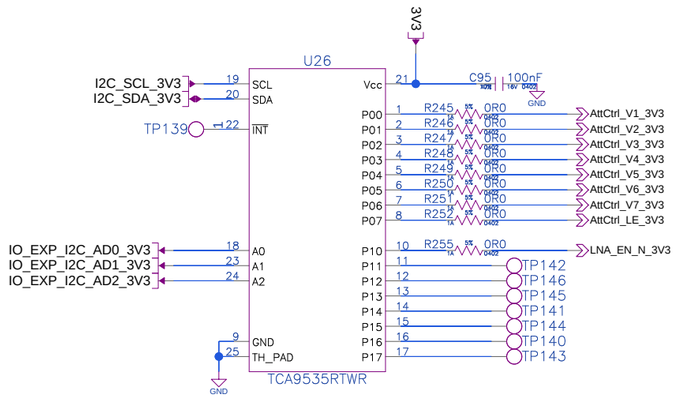
Drawn by: David Lacasse Ing. M.Ing.	Sheet Name 1		Total Pages: 7 of 16
Approved by:	Filename:		Printing date: 03/08/2018:14:35

RX1



RF input Power = 25dBm AbsMax
Insertion Loss : 1.5GHz to 3GHz = 1.9dB typ 3dB max
ViH = 3V to 3.3V (VCC=3V3)
ViH = 3V to 5V (VCC=5V)
ViL = 0V to 1.3V (VCC=3V3)
ViL = 0V to 1.9V (VCC=5V)
LatchEN need to be low at power-up

See datasheet for recommended layout
for high return loss
Z1=100mil



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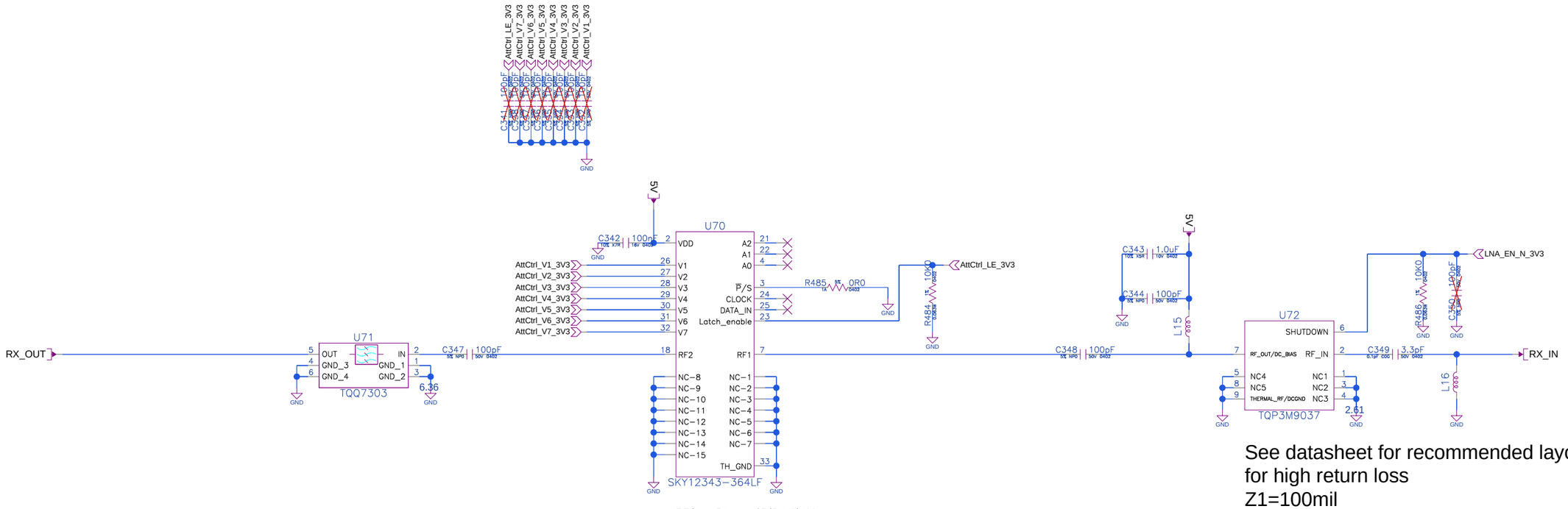
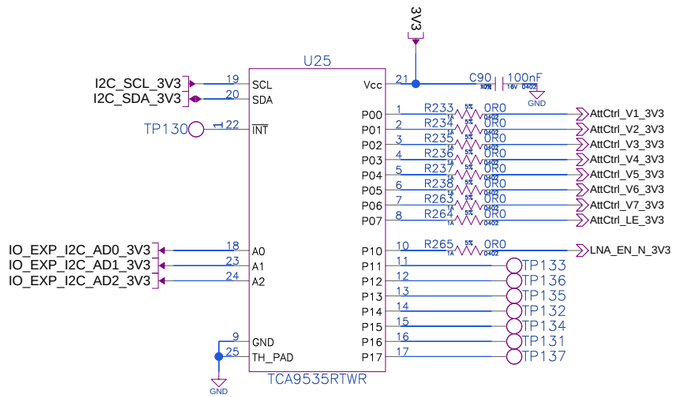
Approved by:	Filename:		Printing date: 03/08/2018:14:35

RX2



RF input Power = 25dBm AbsMax
Insertion Loss : 1.5GHz to 3GHz = 1.9dB typ 3dB max
ViH = 3V to 3.3V (VCC=3V3)
ViH = 3V to 5V (VCC=5V)
ViL = 0V to 1.3V (VCC=3V3)
ViL = 0V to 1.9V (VCC=5V)
LatchEN need to be low at power-up

See datasheet for recommended layout
for high return loss
Z1=100mil



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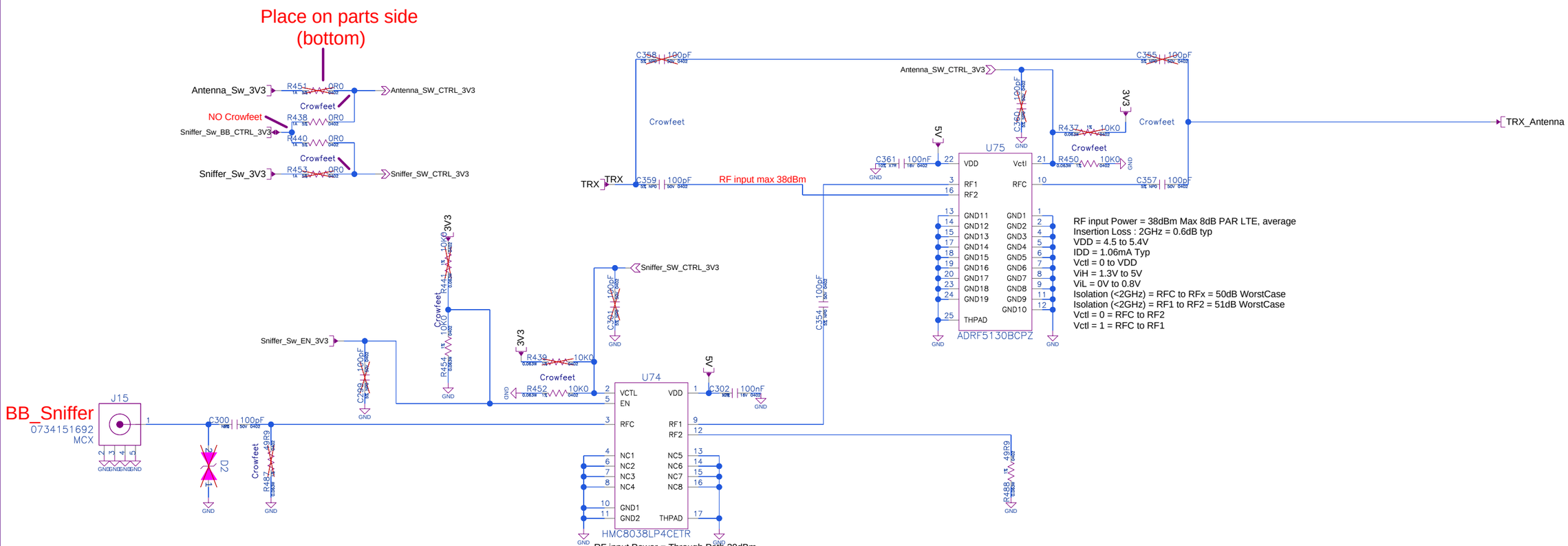
Drawn by: David Lacasse Ing. M.Ing.	Sheet Name 1	9	Total Pages: of 16
Approved by:	Filename:		Printing date: 03/08/2018:14:35

Sniffer



	Sniffer_SW_BB_CTRL	
	Sniffer SW_CTRL	Antenna SW_CTRL
TRX2 - TRX Antenna	0	0
TRX Antenna - Sniffer Path	1	1

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Approved by:	Filename:		Printing date: 03/08/2018:14:35

TX1

Place close to destination

TX_RFPALin_AttCtrl_LE_3V3 … TX_RFPALin_AttCtrl_V1_3V3
TX_PA_AttCtrl_LE_3V3 … TX_PA_AttCtrl_V7_3V3

U34 — SKY12343-364LF

TX_PA_AttCtrl_LE_3V3
TP61 TP59 TP56
P/S CLOCK DATA_IN Latch_enable
TX_PA_AttCtrl_V1_3V3 … TX_PA_AttCtrl_V7_3V3

From_RFPAL_OUT
C106 100pF
R288 0R0
Crowfeet
AT7
PAT0510S-C-10DB-T10
32mW, 50ohm
10dB

+6dB RFPAL = 11dBm Peak
= 1dBm RMS

1dBm Peak
-9dBm RMS

-6dBm Peak
-16dBm RMS

-6dB min

U31 — TPS27081ADDCR 3A

TX_PreDriver2_EN_3V3
R320 10K0
R322 10K0
R321 10K0
C101 100nF
C102 56pF
L3 0.68uH

U32

C107 8.2pF
C149 10pF
R323 0R0
BYPASS
Place direct on PAD
20dB Gain

28V_PA_VDD2
28V_PA_VDD
PA_40W
VDD
VDD2
5V
Input
Output

4dBm 34dBm

TX_OUT

U45 — TPS27081ADDCR 3A

TX_PreDriver1_EN_3V3
R393 10K0
C154 100pF
R392 10K0
R394 10K0
C159 2.2uF
C158 100nF
C157 56pF
L4 0.68uH

U57

TX_RFPALin_AttCtrl_V1_3V3 … TX_RFPALin_AttCtrl_V7_3V3
TX_RFPAL_feedback
C270 100nF
TP109 TP107 TP126
P/S CLOCK DATA_IN Latch_enable
TP106 TP108
R433 0R0
TX_RFPALin_AttCtrl_LE_3V3
R429 10K0
R434 0R0
Crowfeet
AT13
10dB

Crowfeet
C273 100pF
U60 — BFCN-1860+
Crowfeet
C290 100pF
C291 100pF
AT17
D10AA10Z4
10W, VSWR=1.25:1
10dB
RFPAL_Feedback_Att_I

Place close to part
on the "right"

-15dB min

RFFB: -8 to -2dBm : Peak
-18 to -12dBm: RMS

RFIN : -1 to +5dBm: Peak
-11dBm to -5dBm: RMS

RF input Power = 25dBm AbsMax
Insertion Loss : 1.5GHz to 3GHz = 1.9dB typ 3dB max
ViH = 3V to 3.3V (VCC=3V3)
ViH = 3V to 5V (VCC=5V)
ViL = 0V to 1.3V (VCC=3V3)
ViL = 0V to 1.9V (VCC=5V)
LatchEN need to be low at power-up

TX_IN
R157 0R0
Crowfeet
AT2
PAT0510S-C-10DB
32mW, 50ohm
10dB
C25 100pF
U9 — LP0805A1842ASTR
C26 10pF
L2 3.6nH
U36 — MMG20241HT1
C161 10pF
L1 0.6nH
R345 0R0
BYPASS
Place direct on PAD
20dB Gain
U47 — TQQ0303
C209 100pF
R411 0R0
Crowfeet
AT9
To_RFPAL_IN
PAT0510S-C-10DB-T10
32mW, 50ohm
10dB

U8 — FI168D087018-T
R158 49R9
R159 49R9

U10 — TCA9535RTWR

I2C_SCL_3V3
I2C_SDA_3V3
TP47
IO_EXP2_I2C_AD0_3V3
IO_EXP2_I2C_AD1_3V3
IO_EXP2_I2C_AD2_3V3
P00 … P07 → TX_PreDriver1_EN_3V3, TX_PreDriver2_EN_3V3, HighGainPA_EN_3V3
P10 … P17 → TP41 … TP45, TP46, TP48, TP52, TP50, TP53, TP49, TP54, TP51

U11 — TCA9535RTWR

I2C_SCL_3V3
I2C_SDA_3V3
TP60
IO_EXP_I2C_AD0_3V3
IO_EXP_I2C_AD1_3V3
IO_EXP_I2C_AD2_3V3
P00 … P07 → TX_PA_AttCtrl_V1_3V3 … TX_PA_AttCtrl_V7_3V3, TX_PA_AttCtrl_LE_3V3
P10 … P17 → TX_RFPALin_AttCtrl_V1_3V3 … TX_RFPALin_AttCtrl_LE_3V3

U35

3V3
OS_Temp_sensor_alert_3V3
R326 10K0
I2C_SCL_3V3
I2C_SDA_3V3
TempSensor_I2C_AD0_3V3
TempSensor_I2C_AD1_3V3
TempSensor_I2C_AD2_3V3

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Approved by:	Filename:		Printing date: 03/08/2018:14:35

TX2

Place close to destination

TX_RFPALin_AttCtrl_LE_3V3 … TX_RFPALin_AttCtrl_V1_3V3 (8 lines) → 100pF C284 … C291 → GND

TX_PA_AttCtrl_LE_3V3 … TX_PA_AttCtrl_V1_3V3 (8 lines) → 100pF C135 … C142 → GND

5V

TP32 TP30 TP31 → A2 A1 A0

TX_PA_AttCtrl_LE_3V3 → R307 0R0 → P/S

TP29 TP28 → CLOCK DATA_IN

R372 10K0 → GND

R306 0R0 Crowfeet

From_RFPAL_OUT → C129 100pF → AT8 → PAT0510S-C-10DB-T10 32mW, 50ohm 10dB → RF1

+6dB RFPAL = 11dBm Peak
= 1dBm RMS

1dBm Peak
-9dBm RMS

U42 SKY12343-364LF

VDD: C134 100nF

Latch_enable

V1 … V7 → TX_PA_AttCtrl_V1_3V3 … TX_PA_AttCtrl_V7_3V3

NC-1 … NC-15, TH_GND → GND

RF2 → -6dBm Peak
-16dBm RMS

-6dB min

U39 TPS27081ADDCR 3A

TX_PreDriver2_EN_3V3 → R367 10K0 → VIN

VOUT-2 VOUT-1 R1/C1 R2 ON/OFF

C125 100pF, R369 10K0, R368 10K0 → GND

C128 100nF, C127 56pF → GND

L6 0.68uH

28V_PA_VDD2 28V_PA_VDD

5V

PA_40W: VDD VDD2 5V Input Output

4dBm 34dBm

U40

C130 2.4pF, C132 2.4pF, C131 2.4pF → GND

C133 8.2pF → C187 10pF → C186 0.68uH → GND

R370 0R0 BYPASS

Place direct on PAD

20dB Gain

TX_OUT

U37 TPS27081ADDCR 3A

TX_PreDriver1_EN_3V3 → R348 10K0 → VIN

VOUT-2 VOUT-1 R1/C1 R2 ON/OFF

C170 100pF, R349 10K0, R350 10K0 → GND

C173 2.2uF, C172 100nF, C171 56pF → GND

L5 0.68uH

RFFB: -8 to -2dBm : Peak
-18 to -12dBm: RMS

U58

TX_RFPALin_AttCtrl_V1_3V3 … TX_RFPALin_AttCtrl_V7_3V3 → V1 … V7

C285 100nF

A2 A1 A0 → TP101 TP103 TP111

P/S → R477 0R0

CLOCK DATA_IN → TP102 TP104

Latch_enable

TX_RFPALin_AttCtrl_LE_3V3

C287 100pF → TX_RFPAL_feedback

RF2 RF1

NC-8 … NC-15, TH_GND → GND

-15dB min

R432 10K0 → R478 0R0 Crowfeet → AT14 → 10dB

C286 100pF Crowfeet → U63 BFCN-1860+ → Crowfeet C294 100pF

C288 100pF, C295 100pF → GND

AT18 → D10AA10Z4 10W, VSWR=1.25:1 10dB → RFPAL_Feedback_Att_I

Place close to part on the "right"

RF input Power = 25dBm AbsMax
Insertion Loss : 1.5GHz to 3GHz = 1.9dB typ 3dB max
ViH = 3V to 3.3V (VCC=3V3)
ViH = 3V to 5V (VCC=5V)
ViL = 0V to 1.3V (VCC=3V3)
ViL = 0V to 1.9V (VCC=5V)
LatchEN need to be low at power-up

R149 0R0 Crowfeet → AT1 → PAT0510S-C-10DB 32mW, 50ohm 10dB

TX_IN → C20 100pF → U5 LP0805A1842ASTR → C19 10pF

U38 LMMS20241HT1

C174 10pF → C175 0.6pF → C180 0.6pF, C179 0.45pF, C178 0.6pF → GND

R351 0R0 BYPASS

Place direct on PAD

20dB Gain

U50 TQQ0303

B3_DL GND_3 GND_4 ANT GND_1 GND_2

C240 100pF → R423 0R0 Crowfeet → AT10 → PAT0510S-C-10DB-T10 32mW, 50ohm 10dB → To_RFPAL_IN

RFIN : -1 to +5dBm: Peak
-11dBm to -5dBm: RMS

U4 FI168D087018-T

INH OUTH INL OUTL GND-1 GND-2

R148 49R9, R147 49R9 → GND

U43

3V3 → C1 100nF → VCC

SCL SDA → I2C_SCL_3V3 I2C_SDA_3V3

A0 A1 A2 → TempSensor_I2C_AD0_3V3 TempSensor_I2C_AD1_3V3 TempSensor_I2C_AD2_3V3

OS_Temp_sensor_alert_3V3 → R373 10K0 → OS

GND

U1 TCA9535RTWR

I2C_SCL_3V3 I2C_SDA_3V3 → SCL SDA

TP22 → INT

C145 100nF

P00 P01 P02 → R1 R2 R3 0R0 → TX_PreDriver1_EN_3V3 TX_PreDriver2_EN_3V3 HighGainPA_EN_3V3

P03 … P07 → TP12 … TP17

P10 … P17 → TP18 … TP26 TP23

IO_EXP2_I2C_AD0_3V3 IO_EXP2_I2C_AD1_3V3 IO_EXP2_I2C_AD2_3V3 → A0 A1 A2

GND TH_PAD

U2 TCA9535RTWR

I2C_SCL_3V3 I2C_SDA_3V3 → SCL SDA

TP33 → INT

C2 100nF

P00 … P07 → R31 R30 R29 R28 R27 R26 R25 R24 0R0 → TX_PA_AttCtrl_V1_3V3 … TX_PA_AttCtrl_V7_3V3 TX_PA_AttCtrl_LE_3V3

P10 … P17 → R19 R16 R15 R13 R12 R11 R10 R14 0R0 → TX_RFPALin_AttCtrl_V1_3V3 … TX_RFPALin_AttCtrl_LE_3V3

IO_EXP_I2C_AD0_3V3 IO_EXP_I2C_AD1_3V3 IO_EXP_I2C_AD2_3V3 → A0 A1 A2

GND TH_PAD

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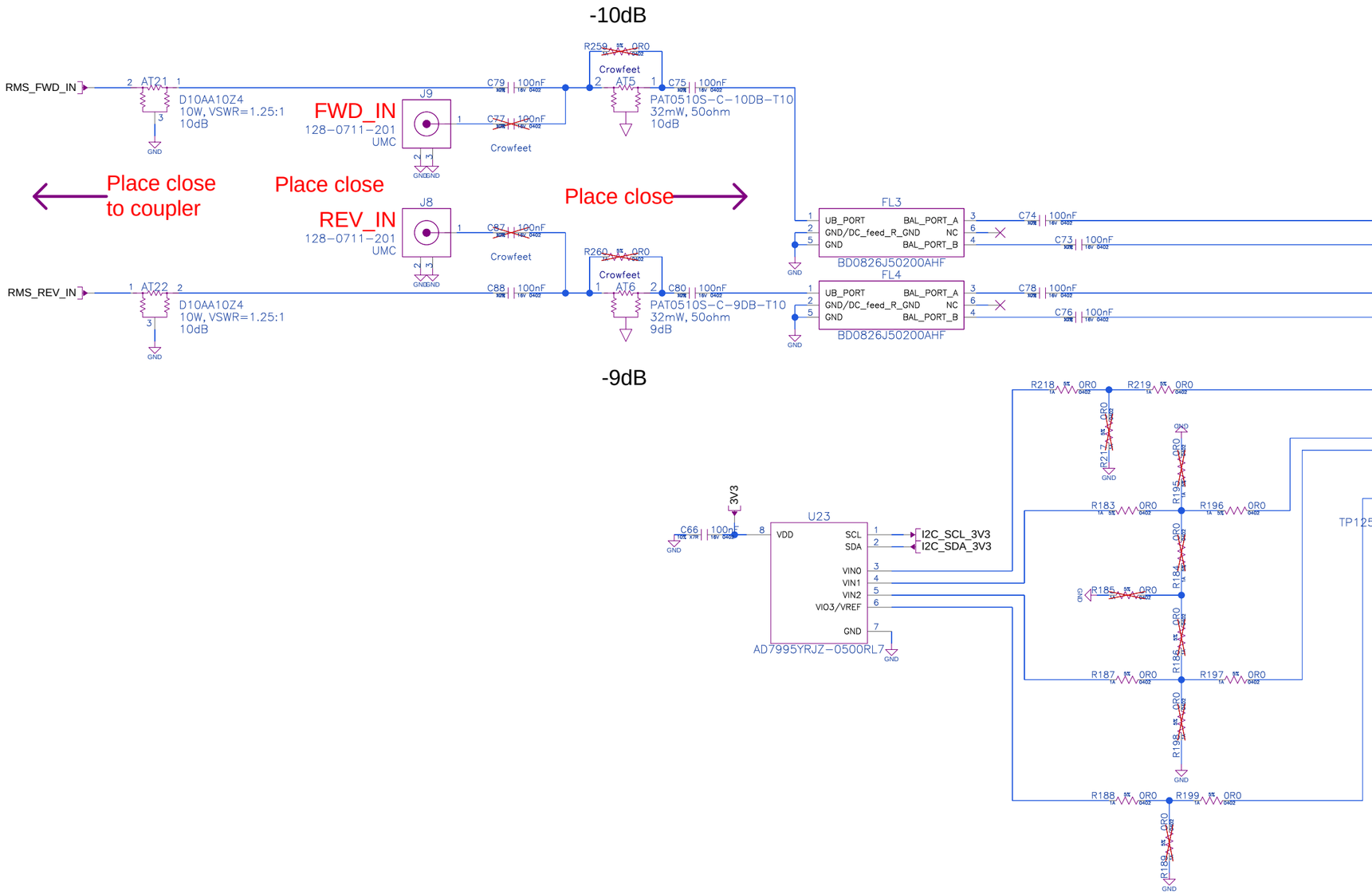
Approved by:	Filename:		Printing date: 03/08/2018:14:35

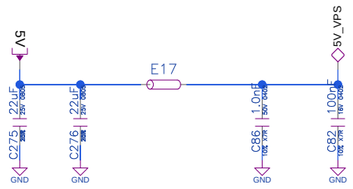
VSWR1



VREF	R1	R2	Pin	Voltage
2.5	6810	2430	ADJx	0.657
2.5	511	1000	VLVL*	1.655

*VLVL has an internal 1K0
*Voltage measured around 1.72V onboard

Recommended Voltages for ADJ(A,B)					
Frequency (MHz)	450	880	1880	2140	2500
ADJ (A,B) (V)	0	0.5	0.65	0.85	1.1



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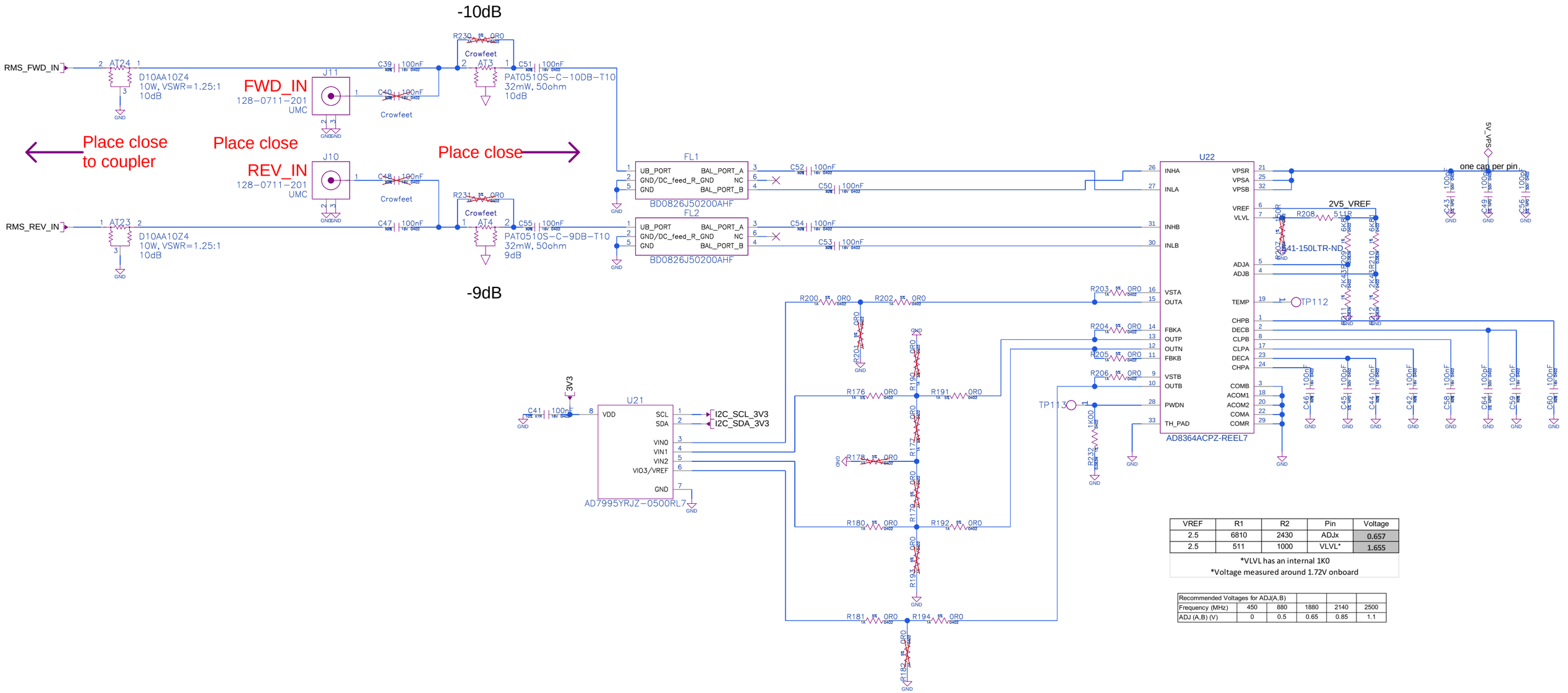
690-488-E	E	FBKD1702-3P3	B (11X17)

Drawn by:	Sheet Name	Total Pages:
David Lacasse Ing. M.Ing.	1	13 of 16

Approved by:	Filename:	Printing date:
		23/08/2018:16:52

VSWR2



VREF	R1	R2	Pin	Voltage
2.5	6810	2430	ADJx	0.657
2.5	511	1000	VLVL*	1.655

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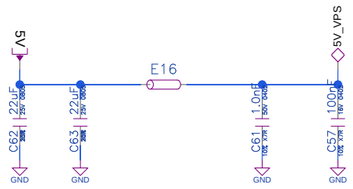
Frequency (MHz)	450	880	1880	2140	2500
ADJ (A,B) (V)	0	0.5	0.65	0.85	1.1



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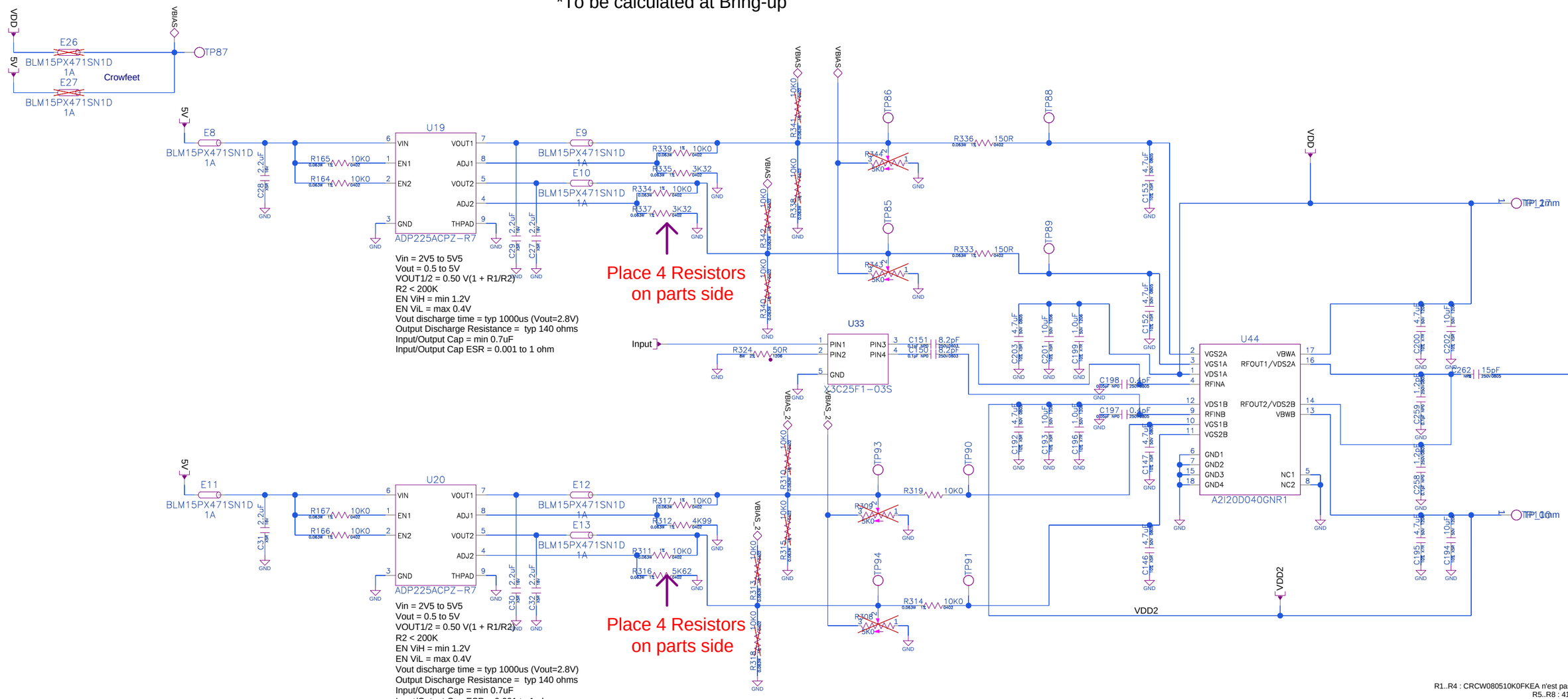
Approved by:	Filename:		Printing date: 23/08/2018:16:52

TX1\PA_40W

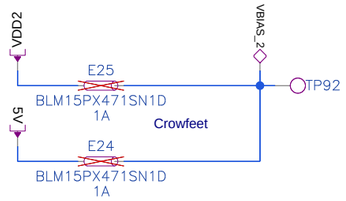
3 ways to set PA Bias Voltage
1 - Pot for Bring-up
2 - Resistors divider
3 - LDO (default)
*To be calculated at Bring-up

VGS1_A=1.88V VGS2_A=1.88V
VGS1_B=1.43V VGS2_B=1.36V
with VDD=28V



R1..R4 : CRCW080510K0FKEA n'est pas 1/4W mais 1/8W. On a le 420-047.
R5..R8 : 410-058.
R9 : 420-A314.
H1 : 200-975-IND.
C1, C2 : 400-811.
C3, C4 : 400-812.
C5..C8, C20, C21 : 400-813.
C9, C10, C15, C16 : 400-716. Existe déjà, c'est general purpose.
C13, C14 : 400-728. Existe déjà, c'est general purpose.
C11, C12 : 400-482. Existe déjà, c'est general purpose.
C17, C18 : 400-814.
C19 : 400-815.

Part Number	Vin (V)	R1	R2	Vout (V)	
ADP225ACPZ-R7	5	10000	6340	1.94	VGS1_A/VGS2_A
ADP225ACPZ-R7	5	10000	4220	1.48	VGS1_B
ADP225ACPZ-R7	5	10000	3830	1.38	VGS2_B



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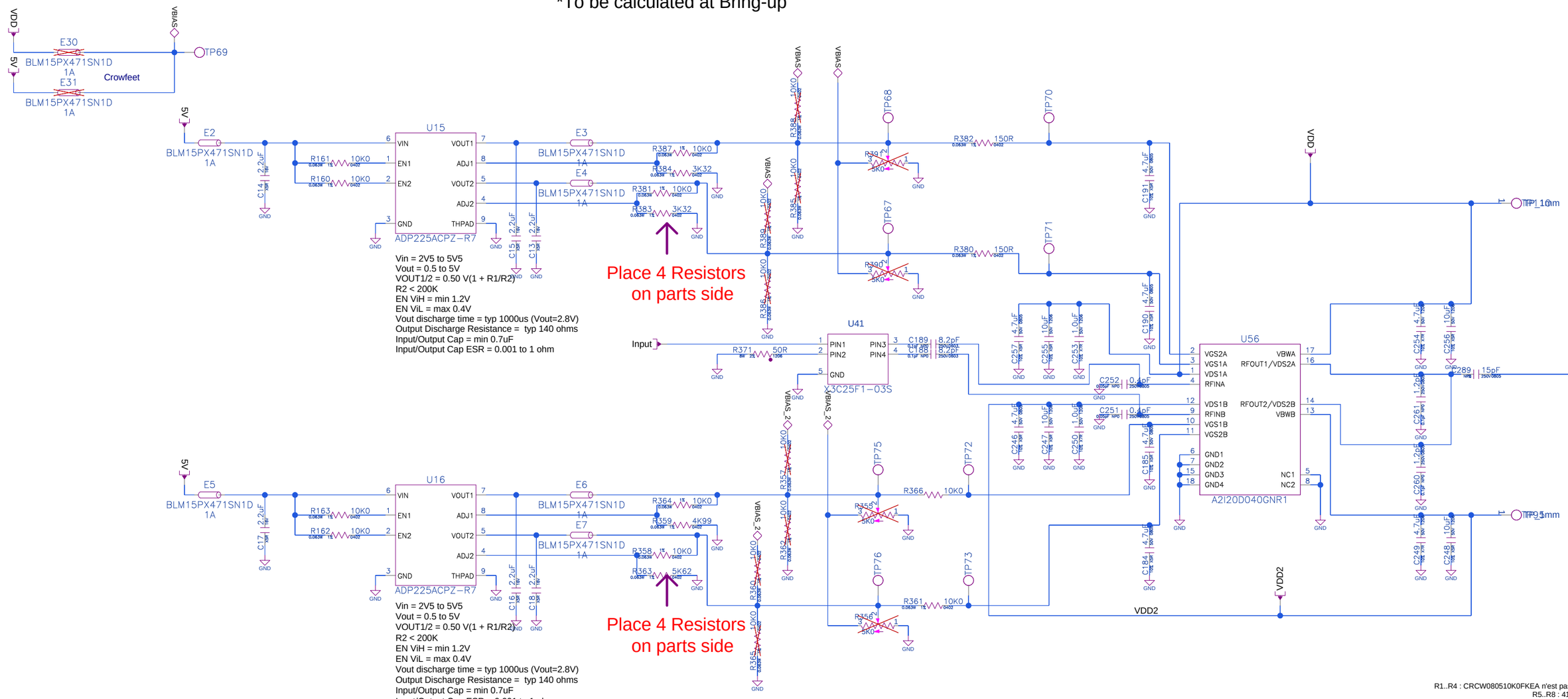
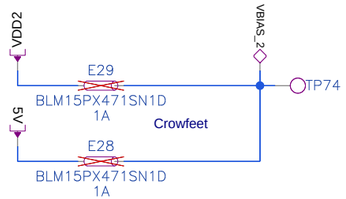
TX2\PA_40W

3 ways to set PA Bias Voltage
1 - Pot for Bring-up
2 - Resistors divider
3 - LDO (default)
*To be calculated at Bring-up

VGS1_A=1.88V VGS2_A=1.88V
VGS1_B=1.43V VGS2_B=1.36V
with VDD=28V



Part Number	Vin (V)	R1	R2	Vout (V)	
ADP225ACPZ-R7	5	10000	6340	1.94	VGS1_A/VGS2_A
ADP225ACPZ-R7	5	10000	4220	1.48	VGS1_B
ADP225ACPZ-R7	5	10000	3830	1.38	VGS2_B



R1..R4 : CRCW080510K0FKEA n'est pas 1/4W mais 1/8W. On a le 420-047.
R5..R8 : 410-058.
R9 : 420-A314.
H1 : 200-975-IND.
C1, C2 : 400-811.
C3, C4 : 400-812.
C5..C8, C20, C21 : 400-813.
C9, C10, C15, C16 : 400-716. Existe déjà, c'est general purpose.
C13, C14 : 400-728. Existe déjà, c'est general purpose.
C11, C12 : 400-482. Existe déjà, c'est general purpose.
C17, C18 : 400-814.
C19 : 400-815.

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Reference number: 690-488-E	Rev.: E	Project: FBKD1702-3P3	Paper size: B (11X17)
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