Sheet: RF_ch0
- RX_TX_SW
- RX_TX_SW_INV
- 1ST_NYQ_2ND_NYQ_SW
- 1ST_NYQ_2ND_NYQ_SW_INV
- I2C_SCL_ATTN
- I2C_SDA_ATTN
- +5V_REG
File: RF_channel.sch

Sheet: RF_ch1
- RX_TX_SW
- RX_TX_SW_INV
- 1ST_NYQ_2ND_NYQ_SW
- 1ST_NYQ_2ND_NYQ_SW_INV
- I2C_SCL_ATTN
- I2C_SDA_ATTN
- +5V_REG
File: RF_channel.sch

Sheet: RF_ch2
- RX_TX_SW
- RX_TX_SW_INV
- 1ST_NYQ_2ND_NYQ_SW
- 1ST_NYQ_2ND_NYQ_SW_INV
- I2C_SCL_ATTN
- I2C_SDA_ATTN
- +5V_REG
File: RF_channel.sch

Sheet: RF_ch3
- RX_TX_SW
- RX_TX_SW_INV
- 1ST_NYQ_2ND_NYQ_SW
- 1ST_NYQ_2ND_NYQ_SW_INV
- I2C_SCL_ATTN
- I2C_SDA_ATTN
- +5V_REG
File: RF_channel.sch

Sheet: Digitial I/O via PMOD
- RX_TX_SW0
- RX_TX_SW0_INV
- RF_CH0_ATTN_SCL
- RF_CH0_ATTN_SDA
- RX_TX_SW1
- RX_TX_SW1_INV
- RF_CH1_ATTN_SCL
- RF_CH1_ATTN_SDA
- RX_TX_SW2
- RX_TX_SW2_INV
- RF_CH2_ATTN_SCL
- RF_CH2_ATTN_SDA
- RX_TX_SW3
- RX_TX_SW3_INV
- RF_CH3_ATTN_SCL
- RF_CH3_ATTN_SDA
- 1ST_2ND_NYQ_BPF_SEL
- 1ST_2ND_NYQ_BPF_SEL_INV
- INA219_PWR_MON_SDA
- INA219_PWR_MON_SCL
File: PMOD_DIO.sch

Sheet: Power Input & Regulation
- INA_I2C_SCL
- INA_I2C_SDA
- +5V_CH3
- +5V_CH2
- +5V_CH1
- +5V_CH0
File: power_input.sch

Mechanical

FID1 Fiducial
FID2 Fiducial
FID3 Fiducial

H1 MountingHole_Pad
GND
H2 MountingHole_Pad
GND
H3 MountingHole_Pad
GND
H4 MountingHole_Pad
GND

DC Power Input

J1
PJ1-021-SMT-TR

F1
ERB-RE5R00V
5A 32VDC 0603

PWR_IN — PWR_IN_FUSED — PWR_IN_CMC

ACP3225
L1
CMC 500 Ohms @ 100MHz 2A DCR 40 mOhm

C3 1µF
0.1µF C4
C5 1µF
C11 10µF
R4 100k

R5
RES 0.002 OHM 1% 1W 1206
Vin_unreg
sense12V_N
sense12V_P

GND

PWR_RETURN

C1 0.1µF
C2 DNP
R1 DNP

GND

+3V3
C12 0.1µF
GND

sense12V_P
R2 10
R3 10
C6 1µF

sense12V_N

INA_I2C_SCL
INA_I2C_SDA

U5
INA219AIDCNR

Pin	
4	VS
1	IN+
2	IN−
5	SCL
6	SDA
7	A0
8	A1
3	GND

Addr: 0x40

GND

9V-12V Input -> 5.5V SMPS Regulated

Vin_unreg

C25 10µF

GND

R30 10k

IC REG BUCK ADJ 2A TSOT23-6
TPS562208DDCT

Pin	
3	VIN
5	EN
2	SW
6	VBST
4	VFB
1	GND

U6

GND

V_SW_NODE
C26 0.1µF

SRR6038-3R3Y
L2
3.3 uH 20 mOhm DCR
3.5A Rated

V_FB

5V5_SW

R7 61.9k
R8 10k

C27 22µF

GND

GND

Vout: 5.5 V
Vripple: 39.5 mV (pk-pk)
Iout : 2 A (max)
Efficiency: 93% (typ)

DS1
LED GREEN CLEAR CHIP SMD

5V5_SW

R6 180

PWR Good LED
Vf: 1.9V - 2.4V
IF: 20 mA

GND

5.5V -> 5V, Per Channel LDO

U1
MCP1755ST-5002E_DB
IC REG LINEAR 5V 300MA SOT223-3

5V5_SW — VIN / VOUT — +5V_CH0

C7 10µF
C13 10µF
C17 10µF
C21 10µF

GND   GND

U2
MCP1755ST-5002E_DB
IC REG LINEAR 5V 300MA SOT223-3

5V5_SW — VIN / VOUT — +5V_CH1

C8 10µF
C14 10µF
C18 10µF
C22 10µF

GND   GND

U3
MCP1755ST-5002E_DB
IC REG LINEAR 5V 300MA SOT223-3

5V5_SW — VIN / VOUT — +5V_CH2

C9 10µF
C15 10µF
C19 10µF
C23 10µF

GND   GND

U4
MCP1755ST-5002E_DB
IC REG LINEAR 5V 300MA SOT223-3

5V5_SW — VIN / VOUT — +5V_CH3

C10 10µF
C16 10µF
C20 10µF
C24 10µF

GND   GND

Per LDO:
Iout_max = 250 mA (per RF Channel)
P_LDO_max => (Vin − Vout)*Iout_max = 125 mW
R_JA = 62.0 degC/W (typ, SOT-223-3)
TJ_rise_max => P_LDO_max*R_JA = 7.75 degC

PSRR = 80 dB
Line Regulation = +/− 0.01% (typ)

PMOD DIO & +3.3V

+3V3

R9 DNP R12 10k R14 10k

J2
PPTC062LJBN-RC
CONN HDR 12POS 0.1 TIN PCB R/A

RN5 DNP

I2C_SDA_PMOD
I2C_SCL_PMOD
1ST_2ND_NYQ_BAND_SEL

R11 10k R13 DNP R15 DNP

GND

RX_TX_SW0_PMOD
RX_TX_SW1_PMOD
RX_TX_SW2_PMOD
RX_TX_SW3_PMOD

3V3_IN

RN4
EXB-28V103JX
4x 10K +/- 5%

GND

PWR_FLAG

GND

FB1
BLM18HE152SN1D
FERRITE BEAD 1.5 KOHM 0603 1LN

1   2

DCR = 0.5 Ohm (Max)
Rated Current = 0.5 A

+3V3

C29 0.1µF

C30 10µF

GND   GND

DIO Buffer & Inversion for RF SPDTs

IC BUF NON-INVERT 3.6V 14TSSOP
SN74LVC125APWR

+3V3

C32 0.1µF

GND

RX_TX_SW0   33   RX_TX_SW0_PMOD
               R18   RX_TX_SW0_BUF
RX_TX_SW1   33   RX_TX_SW1_BUF
               R16

1 1OE   VCC 14
2 1A   4OE 13
3 1Y   4A   12
4 2OE   4Y   11
5 2A   3OE 10
6 2Y   3A   9
7 GND   3Y   8

U9

GND   GND

RX_TX_SW3_PMOD   33   RX_TX_SW3
RX_TX_SW3_BUF   R22
RX_TX_SW2_PMOD   33   RX_TX_SW2
RX_TX_SW2_BUF   R24

IC INVERTER 6CH 6-INP 14TSSOP
SN74HCU04PWR

+3V3

C33 0.1µF

GND

RX_TX_SW0_INV   33   RX_TX_SW0_PMOD
                 R19   RX_TX_SW0_INV_BUF
RX_TX_SW1_INV   33   RX_TX_SW1_PMOD
                 R17   RX_TX_SW1_INV_BUF
RX_TX_SW2_INV   33   RX_TX_SW2_PMOD
                 R20   RX_TX_SW2_INV_BUF

1 1A   VCC 14
2 1Y   6A   13
3 2A   6Y   12
4 2Y   5A   11
5 3A   5Y   10
6 3Y   4A   9
7 GND   4Y   8

U10

GND

1ST_2ND_NYQ_BAND_SEL   100   1ST_2ND_NYQ_BPF_SEL_INV
                       R23
                       100   1ST_2ND_NYQ_BPF_SEL
                       R25
RX_TX_SW3_PMOD   33   RX_TX_SW3_INV
RX_TX_SW3_INV_BUF   R21

I2C Bus Switch

+3V3

C28 0.1µF

GND

EXB-28V103JX   EXB-28V103JX   EXB-28V103JX
4x 10K +/- 5%   4x 10K +/- 5%   4x 10K +/- 5%

RN1   RN2   RN3

I2C_SCL_PMOD   22 SCL   VCC
I2C_SDA_PMOD   23 SDA
                    SC0   5
                    SD0   4
                    SC1   7
+3V3   SD1   6
                    SC2   9
R10 10k   3 RESET SD2   8
                    SC3   11
                    SD3   10
                    SC4   14
                    SD4   13
                    SC5   16
PCA9548APW   SD5   15
                    SC6   18
            21 A2 SD6   17
            2   A1 SC7   20
            1   A0 SD7   19

GND

U7

ADDR: 0x70

GND   GND

RF_CH3_ATTN_SCL
RF_CH3_ATTN_SDA
RF_CH2_ATTN_SCL
RF_CH2_ATTN_SDA
RF_CH1_ATTN_SCL
RF_CH1_ATTN_SDA
RF_CH0_ATTN_SCL
RF_CH0_ATTN_SDA   ADDR: 0x20

INA219_PWR_MON_SCL
INA219_PWR_MON_SDA   ADDR: 0x40

EEPROM_SCL
EEPROM_SDA   ADDR: 0x50

+3V3

DS2
LED GREEN CLEAR CHIP SMD

2   1

PWR Good LED
Vf: 1.9V - 2.4V
IF: 20 mA

R31 75

GND

2 kb EEPROM

+3V3

C31 0.1µF

GND

M24C02-FDW

1 E0   VCC
2 E1   SDA   5   EEPROM_SDA
3 E2   SCL   6   EEPROM_SCL
4 VSS WC   7

U8

GND   GND   GND

ADDR: 0x50

Designer: John Gentile

Title: 4-Channel RF Front End
Size: B   Date: 2020-03-08   Rev: A
KiCad E.D.A. kicad 5.1.5-1.fc31   Id: 3/7

RX Path

+5V_REG

DC Bias Max Power Draw: 124 mA

C34
330pF

RX_IN

U11
ADL5611ARKZ-R7
IC AMP W-CDMA 30MHZ-6GHZ SOT89-3
RFIN 1
RFOUT 3
GND 2

Gain: 22.2 dB
BW: 30 - 6000 MHz
P1dB: 21.0 dBm @ 900 MHz
OIP3: 40.0 dBm @ 900 MHz

C37 68pF
C39 1.2nF
C42 1µF
GND

L3 43nH
C40 330pF
GND

+3V3
C44 0.1µF
GND

C0.25_RX
C0.5_RX
C1_RX
C2_RX
C4_RX
C8_RX
C16_RX

PE43711
U15
C0.25 24
C0.5 23
C1 22
C2 21
C4 20
C8 19
C16 18
SI 17 CLK
P/S 16 LE
GND 15
GND 14 RF2
GND 13 RF1
Vdd 2
GND 4
RF1 5
GND 6
GND 7 8 9 10 11 12

LE_RX

RF ATTENUATOR 31.5DB 500HM 24QFN
7-bit (0.25dB) DSA
Attn: 0 - 31.75 dB
BW: 9 kHz - 6 GHz

C48 330pF

1ST_NYQ_2ND_NYQ_SW

U16
HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
B 4
RFC 5
A 6
RF1 3
GND 2
RF2 1

RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

1ST_NYQ_2ND_NYQ_SW_INV

C49 330pF

1st Nyquist Zone Filter
LPF Passband (-1dB): 0 - 2.14 GHz

F4
LP0603A2140ANTR
RF_IN RF_OUT
GND 1 3
GND 2 4

GND

C50 330pF

F3
LPF04023600L
RF_IN RF_OUT
GND 1 3
GND 4

F5
DEA162300HT-8047A1
RF_IN RF_OUT
1 3
4

GND

2nd Nyquist Zone Filter
Composite Bandpass Filter: 2.3 - 3.6 GHz
LPF Passband (-1dB): 0 - 3.6 GHz
HPF Passband (-1dB): > 2.3 GHz

C53 330pF

RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

U17
HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
RF1 3
GND 2
RF2 1
B 4
RFC 5
A 6

1ST_NYQ_2ND_NYQ_SW_INV

C56 330pF
RX_FILTER_OUT

1ST_NYQ_2ND_NYQ_SW

C54 330pF
GND

T2
MABA-011082
1:1 Transformer Balun 5 - 8000 MHz
1 6
2 5
3 4

RX_FILTER_OUT

C57 330pF

J6
5-1814832-1
GND

RX Differential Output

C58 330pF

J7
5-1814832-1
GND

RX/TX SMA

RX_TX_SW_INV

J3
5-1814832-1
GND

C36 330pF

U13
HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
B 4
RFC 5
A 6
RF1 3
GND 2
RF2 1

RX_IN
GND
TX_OUT

RX_TX_SW

RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

TX Path

C0.25_TX
C0.5_TX
C1_TX
C2_TX
C4_TX
C8_TX
C16_TX

+3V3
C38 0.1µF
GND

PE43711
U12
C16 19
C8 20
C4 21
C2 22
C1 23
C0.5 24
C0.25 1
SI 18 CLK
LE 17
GND 16
GND 15
RF2 14
GND 13
Vdd 2
P/S 3
GND 4
RF1 5
GND 6
GND 12 11 10 9 8 7

LE_TX

GND

RF ATTENUATOR 31.5DB 500HM 24QFN
7-bit (0.25dB) DSA
Attn: 0 - 31.75 dB
BW: 9 kHz - 6 GHz

C35 330pF
TX_OUT
GND

C41 330pF

+5V_REG

DC Bias Max Power Draw: 124 mA

C43 68pF
C45 1.2nF
C46 1µF
GND

L4 43nH
GND

U14
ADL5611ARKZ-R7
IC AMP W-CDMA 30MHZ-6GHZ SOT89-3
RFOUT 3
RFIN 1
GND 2

Gain: 22.2 dB
BW: 30 - 6000 MHz
P1dB: 21.0 dBm @ 900 MHz
OIP3: 40.0 dBm @ 900 MHz

C47 330pF

F2
LPF04023600L
RF_OUT RF_IN
3 1
4

LPF Passband (-1dB): 0 - 3.6 GHz

T1
MABA-011082
1:1 Transformer Balun 5 - 8000 MHz
1 6
2 5
3 4

GND GND GND

C51 330pF

J4
5-1814832-1
GND

TX Differential Input

C52 330pF

J5
5-1814832-1
GND

I2C GPIO Expander

+3V3
C55 0.1µF
R26 10k
GND

PCAL6416APW
U18
INT 1
VDD_I2C 2
RESET 3
P0_0 4
P0_1 5
P0_2 6
P0_3 7
P0_4 8
P0_5 9
P0_6 10
P0_7 11
VSS 12
P1_0 13
P1_1 14
P1_2 15
P1_3 16
P1_4 17
P1_5 18
P1_6 19
P1_7 20
ADDR 21
SCL 22
SDA 23
VDD_P 24

LE_RX
C0.25_RX
C0.5_RX
C1_RX
C2_RX
C4_RX
C8_RX
C16_RX

LE_TX
C0.25_TX
C0.5_TX
C1_TX
C2_TX
C4_TX
C8_TX
C16_TX

I2C_SCL_ATTN
I2C_SDA_ATTN

+3V3
C59 0.1µF
GND

GND

ADDR: 0x20

Designer: John Gentile

JHU Embedded Systems Lab

Sheet: /RF_ch0/
File: RF_channel.sch

Title: 4-Channel RF Front End

Size: B   Date: 2020-03-08   Rev: A
KiCad E.D.A. kicad 5.1.5-1.fc31   Id: 4/7

RX Path

+5V_REG
DC Bias Max Power Draw: 124 mA

C63 68pF C65 1.2nF C68 1µF
GND

C60 330pF
RX_IN
U19 ADL5611ARKZ-R7
IC AMP W-CDMA 30MHZ-6GHZ SOT89-3
1 RFIN RFOUT 3
2 GND
Gain: 22.2 dB
BW: 30 - 6000 MHz
P1dB: 21.0 dBm @ 900 MHz
OIP3: 40.0 dBm @ 900 MHz

L5 43nH
C66 330pF
GND

+3V3
C70 0.1µF
GND

C0.25_RX
C0.5_RX
C1_RX
C2_RX
C4_RX
C8_RX
C16_RX

PE43711
U23
1 C0.25 24
2 Vdd 23
3 P/S 22
4 GND 21
5 RF1 20
6 GND 19
SI 18
CLK 17
LE 16
GND 15
GND 14
RF2 13
7 8 9 10 11 12
GND GND GND GND GND GND
LE_RX
GND
RF ATTENUATOR 31.5DB 500HM 24QFN
7-bit (0.25dB) DSA
Attn: 0 - 31.75 dB
BW: 9 kHz - 6 GHz

C74 330pF
GND

1ST_NYQ_2ND_NYQ_SW
1ST_NYQ_2ND_NYQ_SW_INV

U24 HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
4 B RF1 3
5 RFC GND 2
6 A RF2 1
RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

C75 330pF
C76 330pF
GND

1st Nyquist Zone Filter
LPF Passband (-1dB): 0 - 2.14 GHz
F8 LP0603A2140ANTR
2 GND RF_IN RF_OUT GND
GND

F7 LPF04023600L
1 RF_IN RF_OUT 3
GND

F9 DEA162300HT-8047A1
1 RF_IN RF_OUT 3
GND

2nd Nyquist Zone Filter
Composite Bandpass Filter: 2.3 - 3.6 GHz
LPF Passband (-1dB): 0 - 3.6 GHz
HPF Passband (-1dB): > 2.3 GHz

C79 330pF
C80 330pF

RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

U25 HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
3 RF1
2 GND RFC
1 RF2 A
GND
1ST_NYQ_2ND_NYQ_SW_INV
1ST_NYQ_2ND_NYQ_SW
C82 330pF
RX_FILTER_OUT

T4 MABA-011082
1:1 Transformer Balun 5 - 8000 MHz
RX_FILTER_OUT
GND
C83 330pF
J11 5-1814832-1
GND
RX Differential Output
C84 330pF
J12 5-1814832-1
GND

RX/TX SMA

RX_TX_SW_INV
J8 5-1814832-1
C62 330pF
U21 HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
4 B RF1 3
5 RFC GND 2
6 A RF2 1
GND
RX_TX_SW
RX_IN
GND
TX_OUT
RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

TX Path

C0.25_TX
C0.5_TX
C1_TX
C2_TX
C4_TX
C8_TX
C16_TX

GND
LE_TX
PE43711
U20
18 SI
17 CLK
16 LE
15 GND
14 GND
13 RF2
19 20 21 22 23 24
C16 C8 C4 C2 C1 C0.5
Vdd
P/S
GND
RF1
GND
C0.25
GND
+3V3
C64 0.1µF
GND

C61 330pF
TX_OUT
GND
12 11 10 9 8 7
GND GND GND GND GND GND
RF ATTENUATOR 31.5DB 500HM 24QFN
7-bit (0.25dB) DSA
Attn: 0 - 31.75 dB
BW: 9 kHz - 6 GHz

+5V_REG
DC Bias Max Power Draw: 124 mA
C69 68pF C71 1.2nF C72 1µF
GND

C67 330pF
L6 43nH
GND

U22 ADL5611ARKZ-R7
IC AMP W-CDMA 30MHZ-6GHZ SOT89-3
3 RFOUT RFIN 1
2 GND
GND
Gain: 22.2 dB
BW: 30 - 6000 MHz
P1dB: 21.0 dBm @ 900 MHz
OIP3: 40.0 dBm @ 900 MHz

C73 330pF
F6 LPF04023600L
3 RF_OUT RF_IN
4 GND
LPF Passband (-1dB): 0 - 3.6 GHz

T3 MABA-011082
1:1 Transformer Balun 5 - 8000 MHz
GND
C77 330pF
J9 5-1814832-1
GND
TX Differential Input
C78 330pF
J10 5-1814832-1
GND

I2C GPIO Expander

+3V3
C81 0.1µF
R27 10k
GND

PCAL6416APW
U26
1 INT P1_0 13
2 VDD_I2C P1_1 14
3 RESET P1_2 15
4 P0_0 P1_3 16
5 P0_1 P1_4 17
6 P0_2 P1_5 18
7 P0_3 P1_6 19
8 P0_4 P1_7 20
9 P0_5 ADDR 21
10 P0_6 SCL 22
11 P0_7 SDA 23
12 VSS VDD_P 24

LE_RX
C0.25_RX
C0.5_RX
C1_RX
C2_RX
C4_RX
C8_RX
C16_RX

LE_TX
C0.25_TX
C0.5_TX
C1_TX
C2_TX
C4_TX
C8_TX
C16_TX

I2C_SCL_ATTN
I2C_SDA_ATTN
+3V3
C85 0.1µF
GND
GND

ADDR: 0x20

RX Path

+5V_REG
DC Bias Max Power Draw: 124 mA

C89 68pF
C91 1.2nF
C94 1µF
GND

C86 330pF
RX_IN

U27
ADL5611ARKZ-R7
IC AMP W-CDMA 30MHZ-6GHZ SOT89-3
RFIN 1
RFOUT 3
GND 2

Gain: 22.2 dB
BW: 30 - 6000 MHz
P1dB: 21.0 dBm @ 900 MHz
OIP3: 40.0 dBm @ 900 MHz

L7 43nH
C92 330pF
GND

+3V3
C96 0.1µF
GND

C0.25_RX
C0.5_RX
C1_RX
C2_RX
C4_RX
C8_RX
C16_RX

PE43711
U31
C0.25 C0.5 C1 C2 C4 C8 C16
Vdd
P/S
GND
RF1
GND
SI
CLK
LE
GND
RF2
GND
GND GND GND GND GND GND
LE_RX

RF ATTENUATOR 31.5DB 500HM 24QFN
7-bit (0.25dB) DSA
Attn: 0 - 31.75 dB
BW: 9 kHz - 6 GHz

1ST_NYQ_2ND_NYQ_SW

C100 330pF

U32
HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
B RF1
RFC GND
A RF2

RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

1ST_NYQ_2ND_NYQ_SW_INV

C101 330pF
C102 330pF

1st Nyquist Zone Filter
LPF Passband (-1dB): 0 - 2.14 GHz
F12 LP0603A2140ANTR
RF_IN RF_OUT
GND

F11 LPF04023600L
RF_IN RF_OUT
GND

F13 DEA162300HT-8047A1
RF_IN RF_OUT
GND

2nd Nyquist Zone Filter
Composite Bandpass Filter: 2.3 - 3.6 GHz
LPF Passband (-1dB): 0 - 3.6 GHz
HPF Passband (-1dB): > 2.3 GHz

C105 330pF
C106 330pF

U33
HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
RF1 B
GND RFC
RF2 A

RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

1ST_NYQ_2ND_NYQ_SW_INV
1ST_NYQ_2ND_NYQ_SW

C108 330pF
RX_FILTER_OUT

T6 MABA-011082
1:1 Transformer Balun 5 - 8000 MHz
RX_FILTER_OUT
GND

C109 330pF
J16 5-1814832-1
GND

RX Differential Output

C110 330pF
J17 5-1814832-1
GND

RX/TX SMA

RX_TX_SW_INV

J13 5-1814832-1
C88 330pF
GND

U29
HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
B RF1
RFC GND
A RF2
RX_IN
GND
TX_OUT

RX_TX_SW
RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

TX Path

C0.25_TX
C0.5_TX
C1_TX
C2_TX
C4_TX
C8_TX
C16_TX

+3V3
C90 0.1µF
GND

PE43711
U28
C16 C8 C4 C2 C1 C0.5 C0.25
SI
CLK
LE
GND
RF2
GND
Vdd
P/S
GND
GND
RF1
GND
GND GND GND GND GND GND
LE_TX

RF ATTENUATOR 31.5DB 500HM 24QFN
7-bit (0.25dB) DSA
Attn: 0 - 31.75 dB
BW: 9 kHz - 6 GHz

C87 330pF
TX_OUT
GND

+5V_REG
DC Bias Max Power Draw: 124 mA
C95 68pF
C97 1.2nF
C98 1µF
GND

C93 330pF
L8 43nH
GND

U30
ADL5611ARKZ-R7
IC AMP W-CDMA 30MHZ-6GHZ SOT89-3
RFOUT 3
RFIN 1
GND 2

Gain: 22.2 dB
BW: 30 - 6000 MHz
P1dB: 21.0 dBm @ 900 MHz
OIP3: 40.0 dBm @ 900 MHz

C99 330pF

F10 LPF04023600L
RF_OUT RF_IN
GND

LPF Passband (-1dB): 0 - 3.6 GHz

T5 MABA-011082
1:1 Transformer Balun 5 - 8000 MHz
GND

C103 330pF
J14 5-1814832-1
GND

TX Differential Input

C104 330pF
J15 5-1814832-1
GND

I2C GPIO Expander

+3V3
C107 0.1µF
R28 10k
GND

PCAL6416APW
INT 1
VDD_I2C 2
RESET 3
P0_0 4
P0_1 5
P0_2 6
P0_3 7
P0_4 8
P0_5 9
P0_6 10
P0_7 11
VSS 12
P1_0 13
P1_1 14
P1_2 15
P1_3 16
P1_4 17
P1_5 18
P1_6 19
P1_7 20
ADDR 21
SCL 22
SDA 23
VDD_P 24
U34

LE_RX
C0.25_RX
C0.5_RX
C1_RX
C2_RX
C4_RX
C8_RX
C16_RX

LE_TX
C0.25_TX
C0.5_TX
C1_TX
C2_TX
C4_TX
C8_TX
C16_TX

I2C_SCL_ATTN
I2C_SDA_ATTN

+3V3
C111 0.1µF
GND

ADDR: 0x20

GND

RX Path

C112 330pF
RX_IN

U35
ADL5611ARKZ-R7
IC AMP W-CDMA 30MHZ-6GHZ SOT89-3
1 RFIN RFOUT 3
2 GND
Gain: 22.2 dB
BW: 30 - 6000 MHz
P1dB: 21.0 dBm @ 900 MHz
OIP3: 40.0 dBm @ 900 MHz

+5V_REG
DC Bias Max Power Draw: 124 mA
C115 68pF   C117 1.2nF   C120 1µF
GND
L9 43nH
C118 330pF
GND

+3V3
C122 0.1µF
GND

C0.25_RX
C0.5_RX
C1_RX
C2_RX
C4_RX
C8_RX
C16_RX

PE43711
U39
24 C0.25
23 C1
22 C0.5
21 C2
20 C4
19 C8
18 C16
17
Vdd
P/S
GND
RF1
GND
SI
CLK
LE
GND
RF2
GND
LE_RX
RF ATTENUATOR 31.5DB 500HM 24QFN
7-bit (0.25dB) DSA
Attn: 0 - 31.75 dB
BW: 9 kHz - 6 GHz
GND

C126 330pF

U40
HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
B   RF1
RFC GND
A   RF2
RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns
1ST_NYQ_2ND_NYQ_SW
1ST_NYQ_2ND_NYQ_SW_INV

1st Nyquist Zone Filter
LPF Passband (-1dB): 0 - 2.14 GHz
F16
LP0603A2140ANTR
GND RF_IN RF_OUT GND
C127 330pF
GND

F15
LPF04023600L
RF_IN RF_OUT
GND GND
C128 330pF

F17
DEA162300HT-8047A1
RF_IN RF_OUT
GND GND

2nd Nyquist Zone Filter
Composite Bandpass Filter: 2.3 - 3.6 GHz
LPF Passband (-1dB): 0 - 3.6 GHz
HPF Passband (-1dB): > 2.3 GHz

C131 330pF
C132 330pF

RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

U41
HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
RF1 GND RFC RF2 A
C134 330pF
1ST_NYQ_2ND_NYQ_SW_INV
RX_FILTER_OUT
1ST_NYQ_2ND_NYQ_SW

T8
MABA-011082
1:1 Transformer Balun 5 - 8000 MHz
RX_FILTER_OUT
C135 330pF
J21 5-1814832-1
GND
RX Differential Output
C136 330pF
J22 5-1814832-1
GND

RX/TX SMA

J18 5-1814832-1
GND
C114 330pF
RX_TX_SW_INV
U37
HMC544AETR
IC RF SWITCH SPDT 4GHZ SOT26
B   RF1
RFC GND
A   RF2
RX_IN
GND
TX_OUT
RX_TX_SW
RFC-RF1: A=0,B=1
RFC-RF2: A=1,B=0
P1dB = 39 dBm
t_switch = 30 ns

TX Path

C0.25_TX
C0.5_TX
C1_TX
C2_TX
C4_TX
C8_TX
C16_TX

PE43711
U36
SI
CLK
LE
GND
RF2
GND
C16
C8
C4
C2
C1
C0.5
C0.25
Vdd
P/S
GND
RF1
GND
LE_TX
+3V3
C116 0.1µF
GND

RF ATTENUATOR 31.5DB 500HM 24QFN
7-bit (0.25dB) DSA
Attn: 0 - 31.75 dB
BW: 9 kHz - 6 GHz

C113 330pF
TX_OUT

C119 330pF
L10 43nH
GND

DC Bias Max Power Draw: 124 mA
C121 68pF C123 1.2nF C124 1µF
+5V_REG
GND

U38
ADL5611ARKZ-R7
IC AMP W-CDMA 30MHZ-6GHZ SOT89-3
3 RFOUT RFIN 1
2 GND
Gain: 22.2 dB
BW: 30 - 6000 MHz
P1dB: 21.0 dBm @ 900 MHz
OIP3: 40.0 dBm @ 900 MHz

C125 330pF
F14
LPF04023600L
RF_OUT RF_IN
GND
LPF Passband (-1dB): 0 - 3.6 GHz

T7
MABA-011082
1:1 Transformer Balun 5 - 8000 MHz
GND GND
C129 330pF
J19 5-1814832-1
GND
TX Differential Input
C130 330pF
J20 5-1814832-1
GND

I2C GPIO Expander

+3V3
C133 0.1µF
R29 10k
GND

PCAL6416APW
1 INT   P1_0 13
2 VDD_I2C   P1_1 14
3 RESET   P1_2 15
4 P0_0   P1_3 16
5 P0_1   P1_4 17
6 P0_2   P1_5 18
7 P0_3   P1_6 19
8 P0_4   P1_7 20
9 P0_5   ADDR 21
10 P0_6   SCL 22
11 P0_7   SDA 23
12 VSS   VDD_P 24
U42

LE_RX
C0.25_RX
C0.5_RX
C1_RX
C2_RX
C4_RX
C8_RX
C16_RX

LE_TX
C0.25_TX
C0.5_TX
C1_TX
C2_TX
C4_TX
C8_TX
C16_TX

I2C_SCL_ATTN
I2C_SDA_ATTN

+3V3
C137 0.1µF
GND

ADDR: 0x20