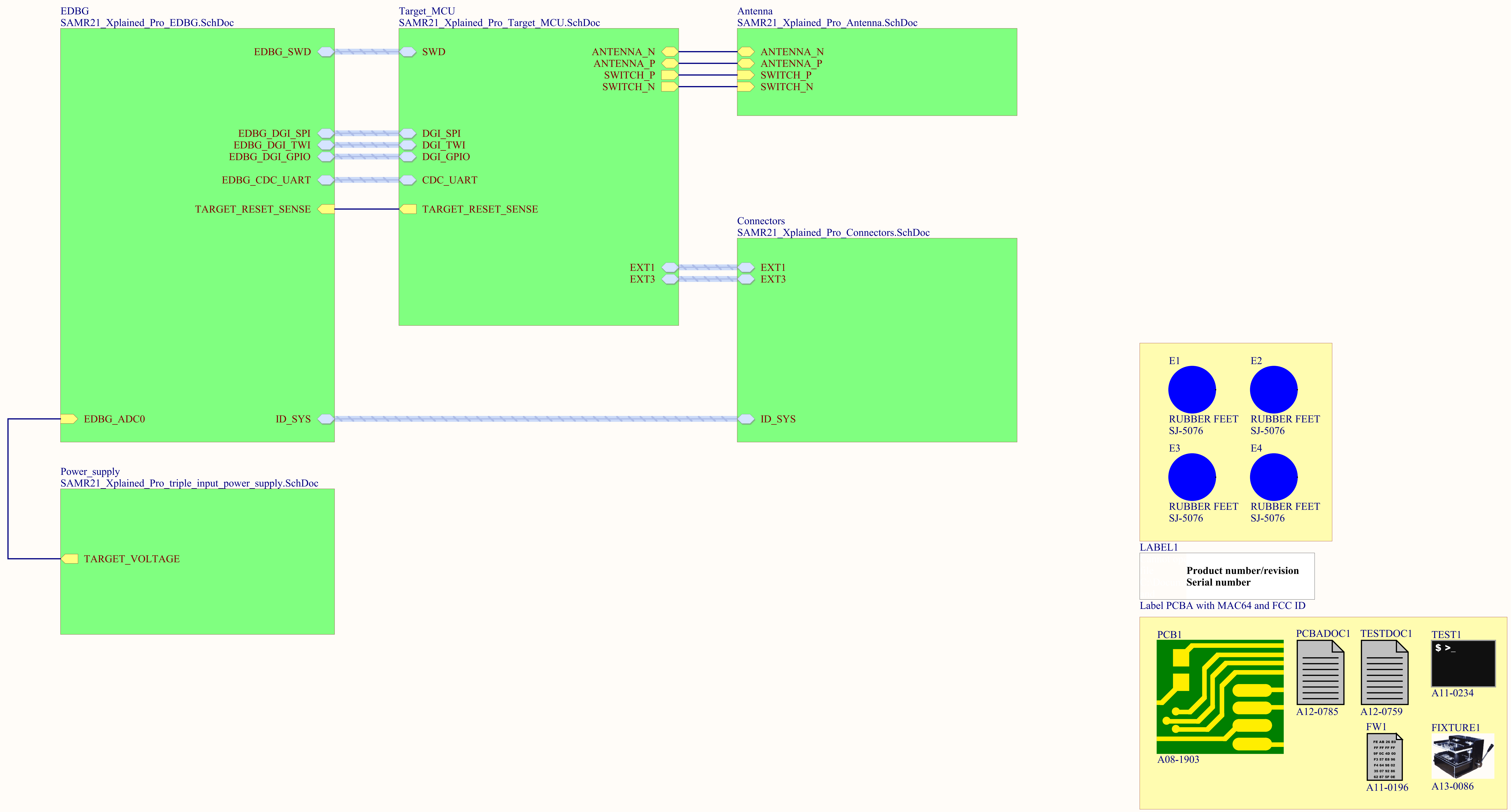
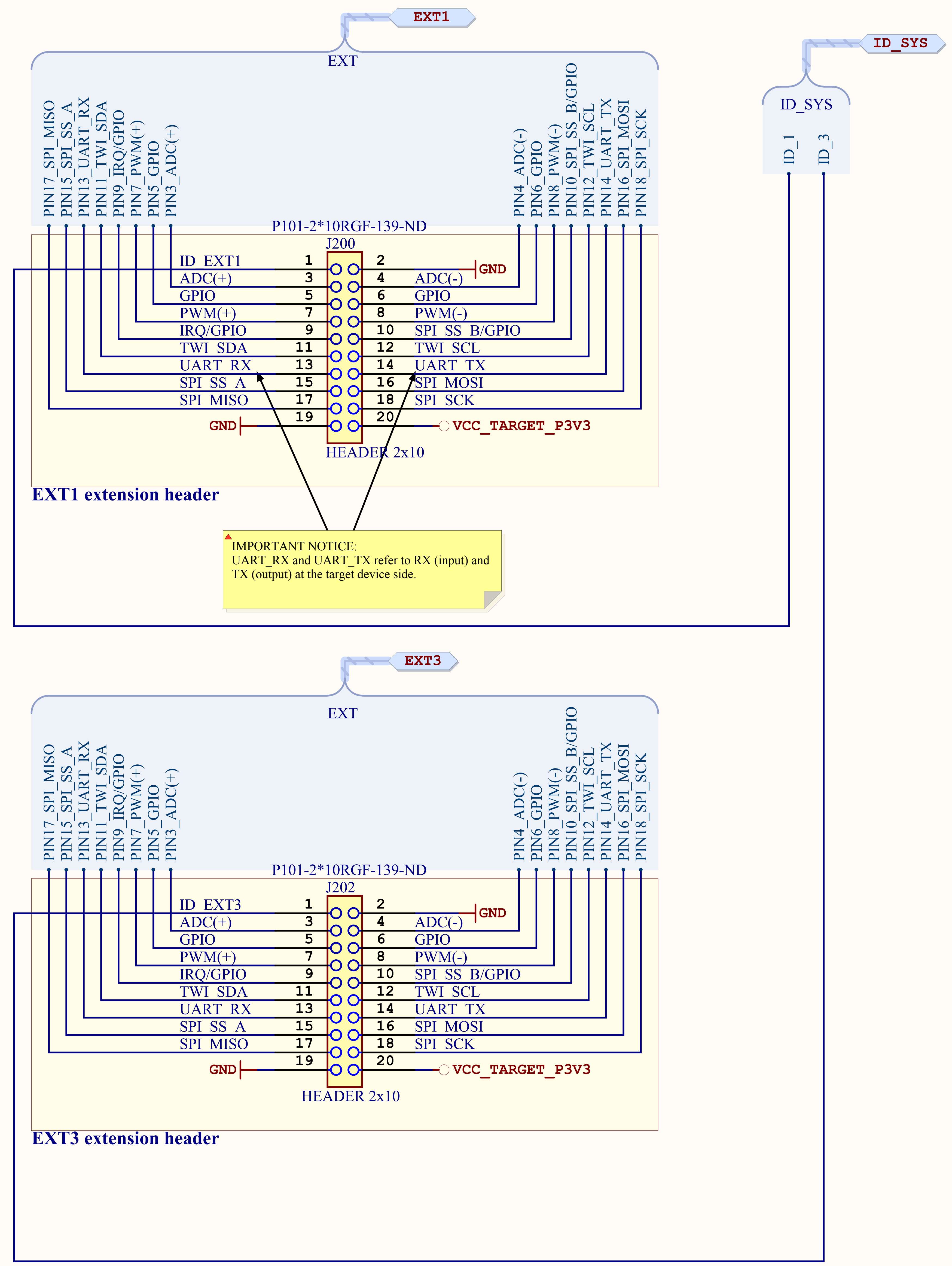
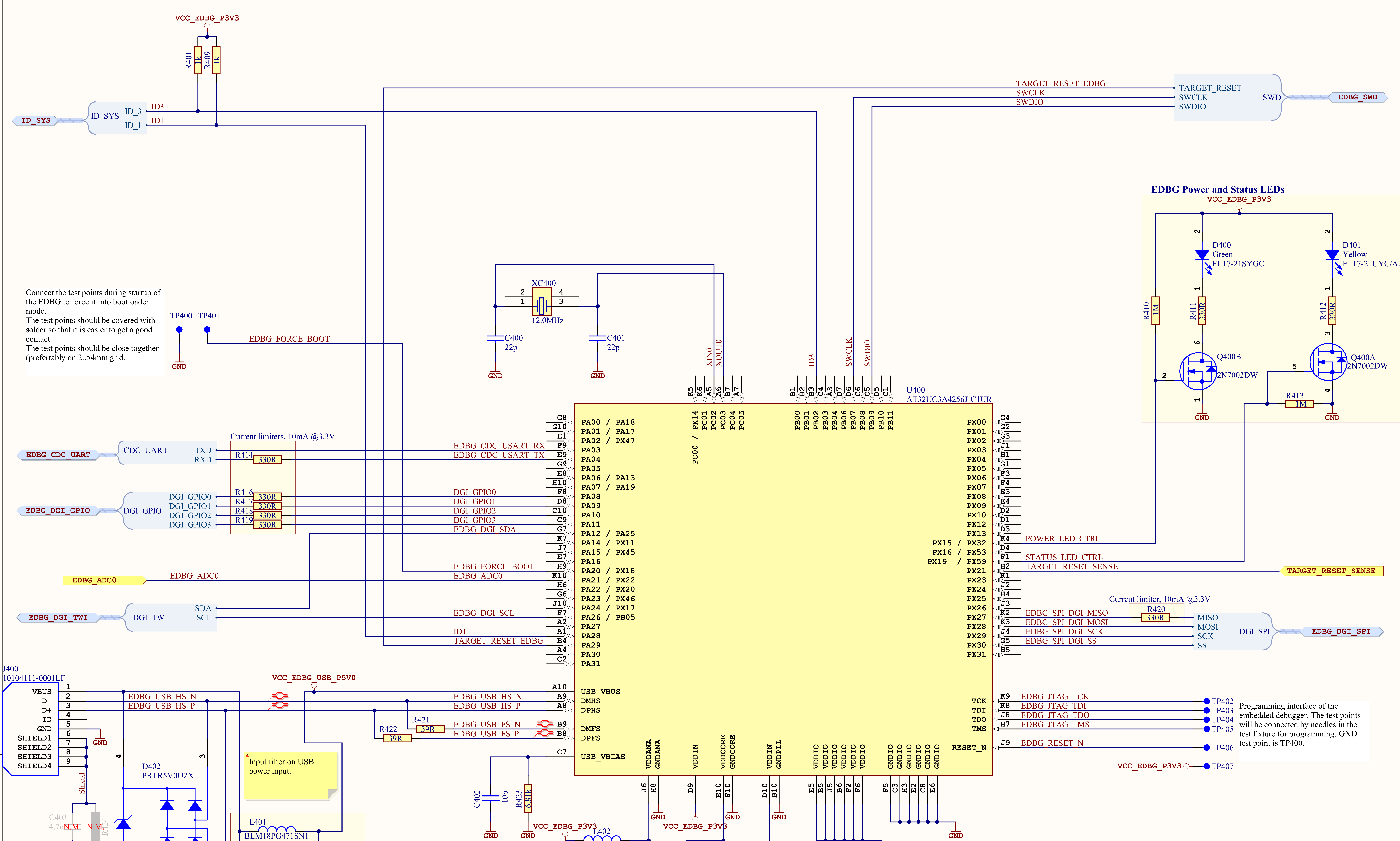


ATMEL Norway	*		
Vestre Rosten 79	*		
N-7075 TILLER	*		
NORWAY			
Date:	26.09.2013	10:43:26	PAGE: 1 of 7
Document number:	A09-2127		Revision 1
TITLE: Top Level Schematics			
SAMR21_Xplained_Pro_TopLevel.SchDoc			



ATMEL Norway	*		
Vestre Rosten 79	*		
N-7075 TILLER	*		
NORWAY			
Date:	26.09.2013	10:43:26	PAGE: 2 of 7
Document number:	A09-2127		Revision 1
TITLE: Extension connectors			
SAMR21_Xplained_Pro_Connectors.SchDoc			

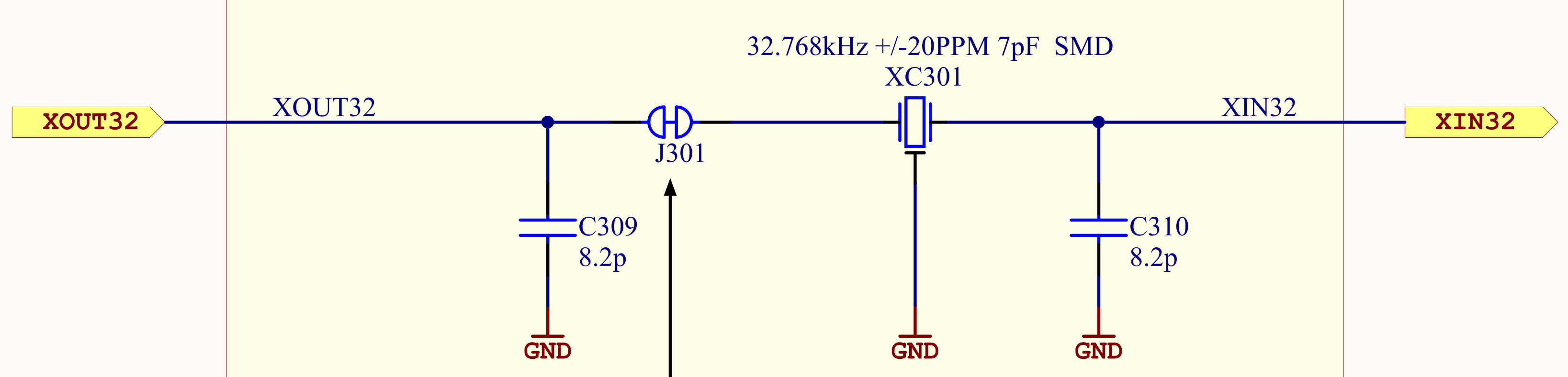
Atmel
Enabling Unlimited Possibilities



ATMEL Norway	*		
Vestre Rosten 79	*		
N-7075 TILLER	*		
NORWAY			
Date:	26.09.2013 10:43:27	PAGE:	3 of 7
Document number:	A09-2127	Revision	1
TITLE: Embedded Debugger (EDBG)			
SAMR21_Xplained_Pro_EDBG.SchDoc			

Atmel
Enabling Unlimited Possibilities

32 kHz Crystal



These straps with SMD pads can be used to place a resistor in the XOUT signal in order to measure the oscillator allowance.
By default these straps are closed and nothing is mounted on the pads.

Crystal datasheet:
Ccrystal = 7pF
max ESR = 60kOhm
Accuracy +-20ppm

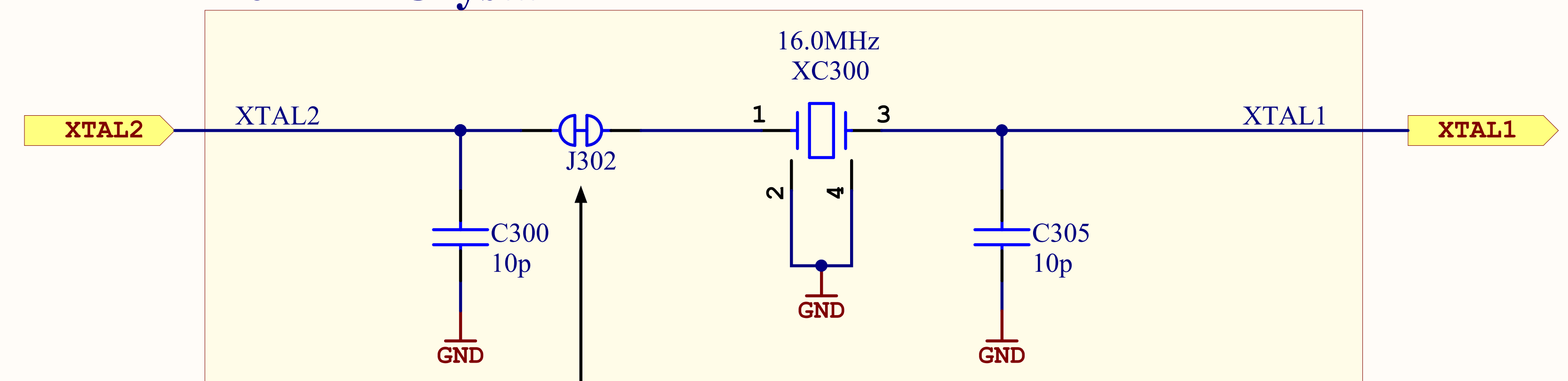
SAM R21 datasheet:
Cpara = ? (Typical)
max ESR = ?k Ohm
PCB capacitance: Cpcb = 2pF (estimated)

Estimated load
C = 2 (Ccrystal- Cpara - Cpcb)
C = 2 (7pF - ? pF - 2pF) = ? pF

Selected in design
C= 8.2 pF

Verification showed: TBD
Accuracy: xxx ppm
Startup time: x.xx seconds to reach full swing (first clock after xxxms)
Safety factor: Above x

16 MHz Crystal



These straps with SMD pads can be used to place a resistor in the XOUT signal in order to measure the oscillator allowance.
By default these straps are closed and nothing is mounted on the pads.

Crystal datasheet:
Ccrystal = 9pF
max ESR = 80 Ohm
Accuracy +-15ppm

SAM R21 datasheet:
Cpara = 3 pF (typical) (RF233 datasheet)
Ctrim = 0 - 4.5 pF (programmable in 0.3 pF steps)
Maximum load ? pF
Maximum ESR = ? Ohm
Estimated Cpcb = 0pF

C = 2 (Ccrystal - Cpara - Ctrim - Cpcb)

If Ctrim = 0 pF:
C = 2 (9F - 3pF) = 12pF

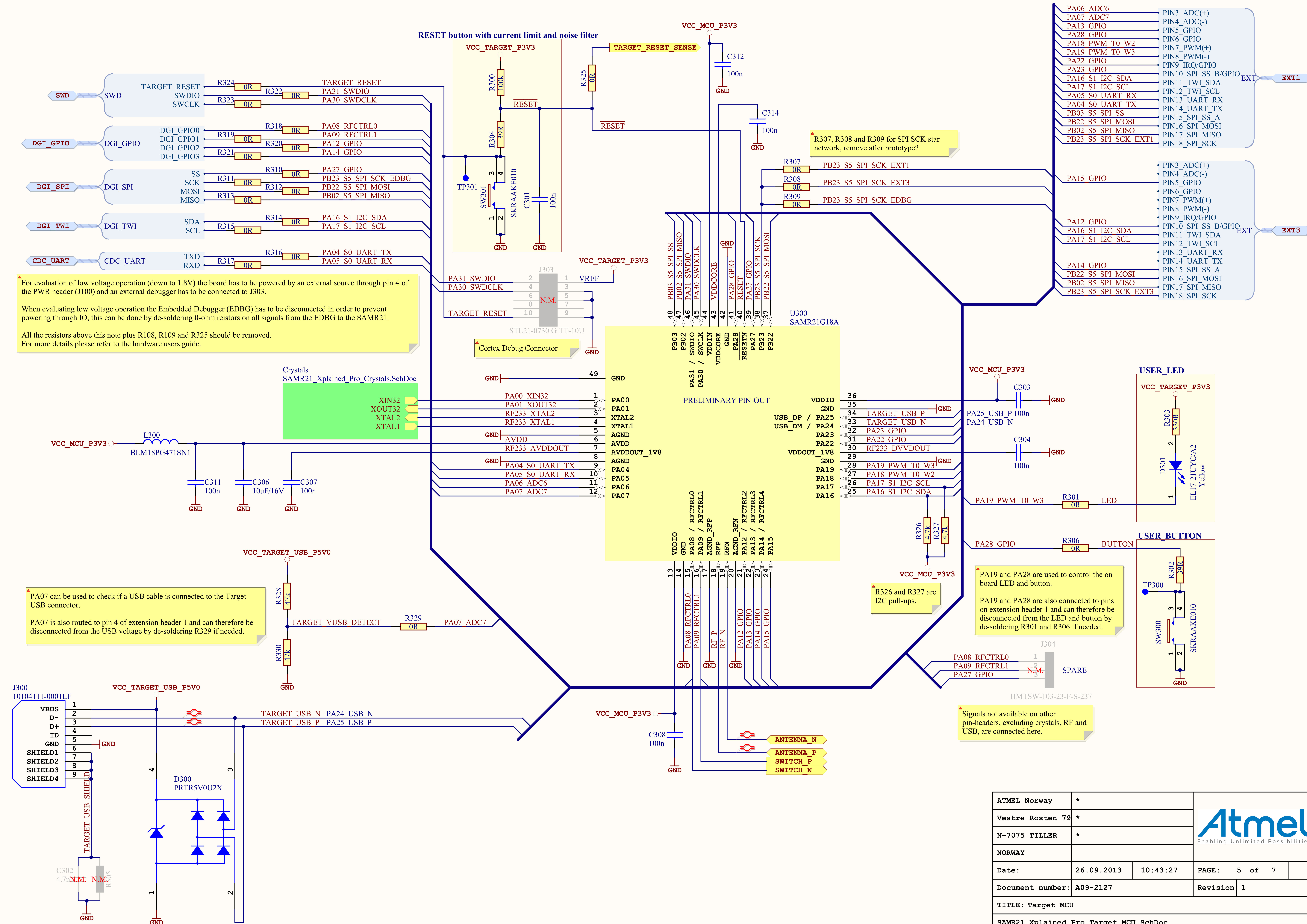
As Ctrim can only add capacitance a lower value is selected for external load capacitors, this example assumes that Ctrim = 1pF:

C = 2 (9pF- 3pF - 1pF) = 10pF

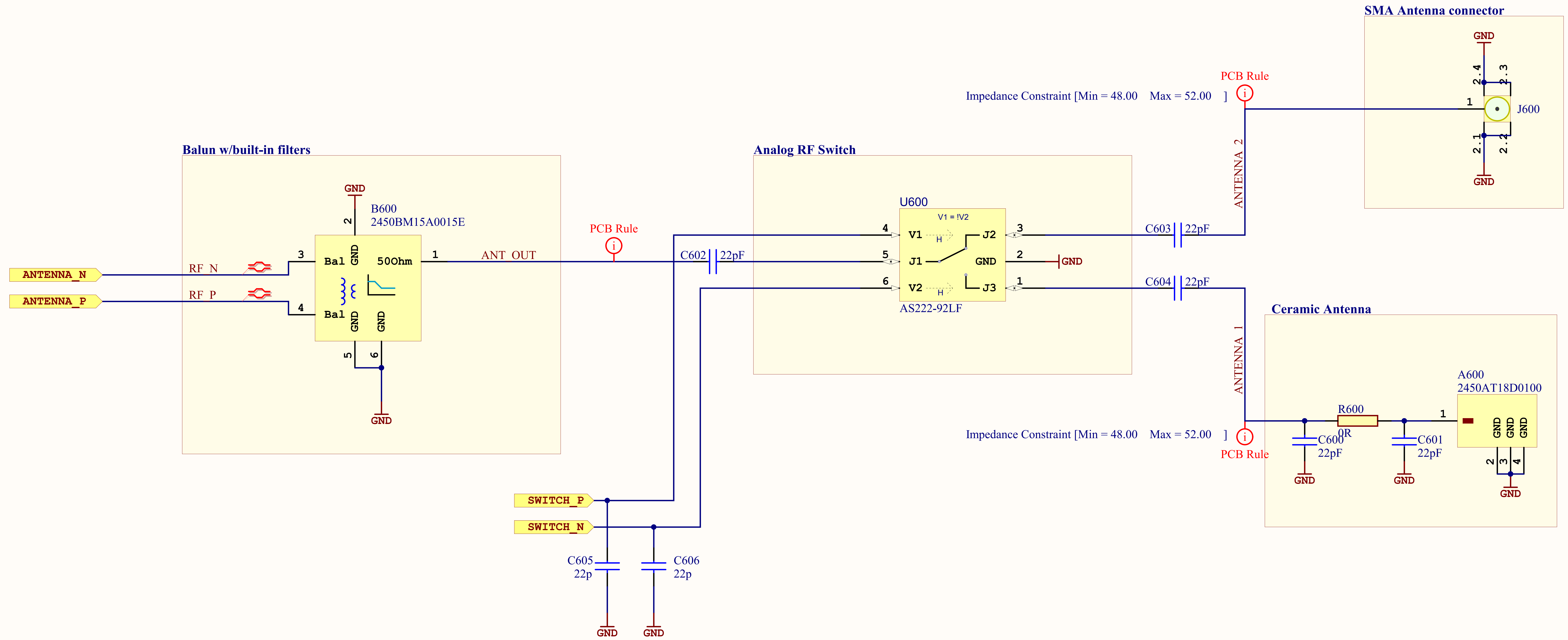
Selected in design
C= 10.0pF

Verification showed: TBD
Accuracy xxx ppm
Startup: full swing after x.xx ms (first clock after xxx us)
Safety factor: Above x

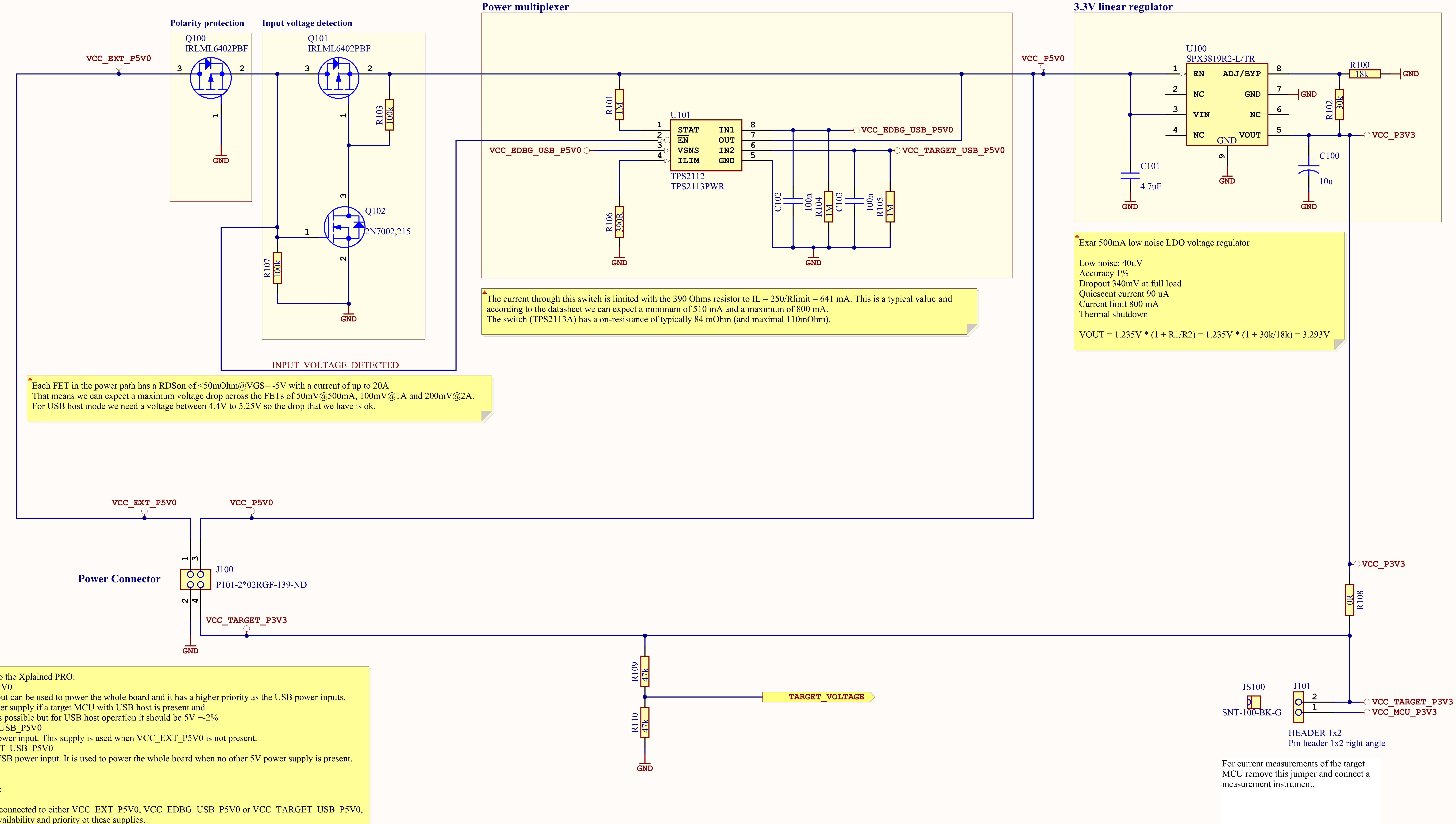
ATMEL Norway	*		Atmel Enabling Unlimited Possibilities	
Vestre Rosten 79	*			
N-7075 TILLER	*			
NORWAY				
Date:	26.09.2013	10:43:27	PAGE: 4 of 7	
Document number:	A09-2127		Revision	1
TITLE: Target Peripherals				
SAMR21_Xplained_Pro_Crystals.SchDoc				



ATMEL Norway	*		
Vestre Rosten 79	*		
N-7075 TILLER	*		
NORWAY			
Date:	26.09.2013	10:43:27	PAGE: 5 of 7
Document number:	A09-2127		Revision 1
TITLE: Target MCU			
SAMR21_Xplained_Pro_Target_MCU.SchDoc			



ATMEL Norway	*	
Vestre Rosten 79	*	
N-7075 TILLER	*	
NORWAY		
Date:	26.09.2013 10:43:27	PAGE: 6 of 7
Document number:	A09-2127	Revision 1
TITLE: Antenna		
SAMR21_Xplained_Pro_Antenna.SchDoc		



Exar 500mA low noise LDO voltage regulator

Low noise: 40uV
Accuracy 1%
Dropout 340mV at full load
Quiescent current 90 uA
Current limit 800 mA
Thermal shutdown

VOUT = 1.235V * (1 + R1/R2) = 1.235V * (1 + 30k/18k) = 3.293V

The current through this switch is limited with the 390 Ohms resistor to IL = 250/Rlimit = 641 mA. This is a typical value and according to the datasheet we can expect a minimum of 510 mA and a maximum of 800 mA.
The switch (TPS2113A) has a on-resistance of typically 84 mOhm (and maximal 110mOhm).

Each FET in the power path has a RDSon of <50mOhm@VGS= -5V with a current of up to 20A
That means we can expect a maximum voltage drop across the FETs of 50mV@500mA, 100mV@1A and 200mV@2A.
For USB host mode we need a voltage between 4.4V to 5.25V so the drop that we have is ok.

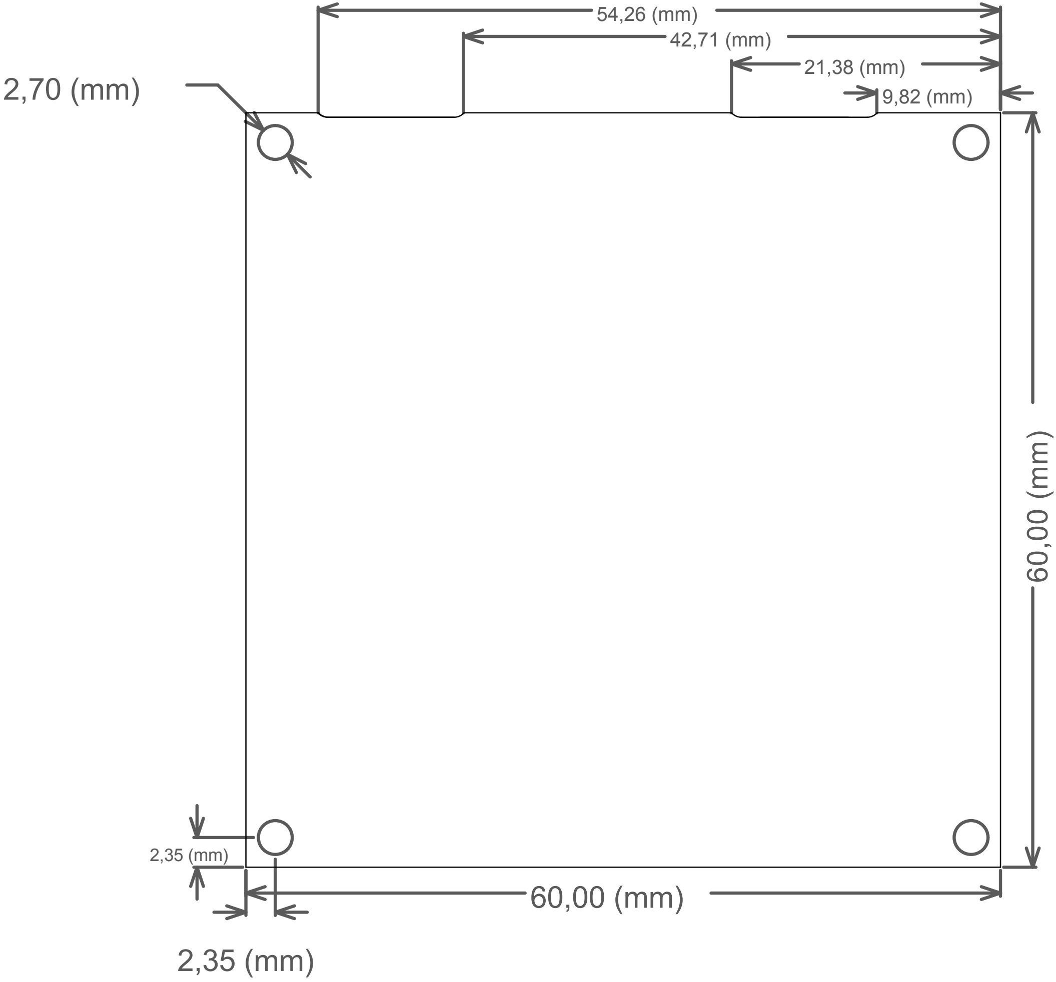
Power inputs to the Xplained PRO:
VCC_EXT_P5V0
This power input can be used to power the whole board and it has a higher priority as the USB power inputs.
Connect a power supply if a target MCU with USB host is present and
4.3V to 5.5V is possible but for USB host operation it should be 5V +-2%
VCC_EDBG_USB_P5V0
EDBG USB power input. This supply is used when VCC_EXT_P5V0 is not present.
VCC_TARGET_USB_P5V0
Target MCU USB power input. It is used to power the whole board when no other 5V power supply is present.

Other voltages:
VCC_P5V0
This supply is connected to either VCC_EXT_P5V0, VCC_EDBG_USB_P5V0 or VCC_TARGET_USB_P5V0, based on the availability and priority ot these supplies.
VCC_P3V3
Regulated 3.3V from VCC_P5V0
VCC_TARGET
Target supply voltage (target MCU and peripherals)

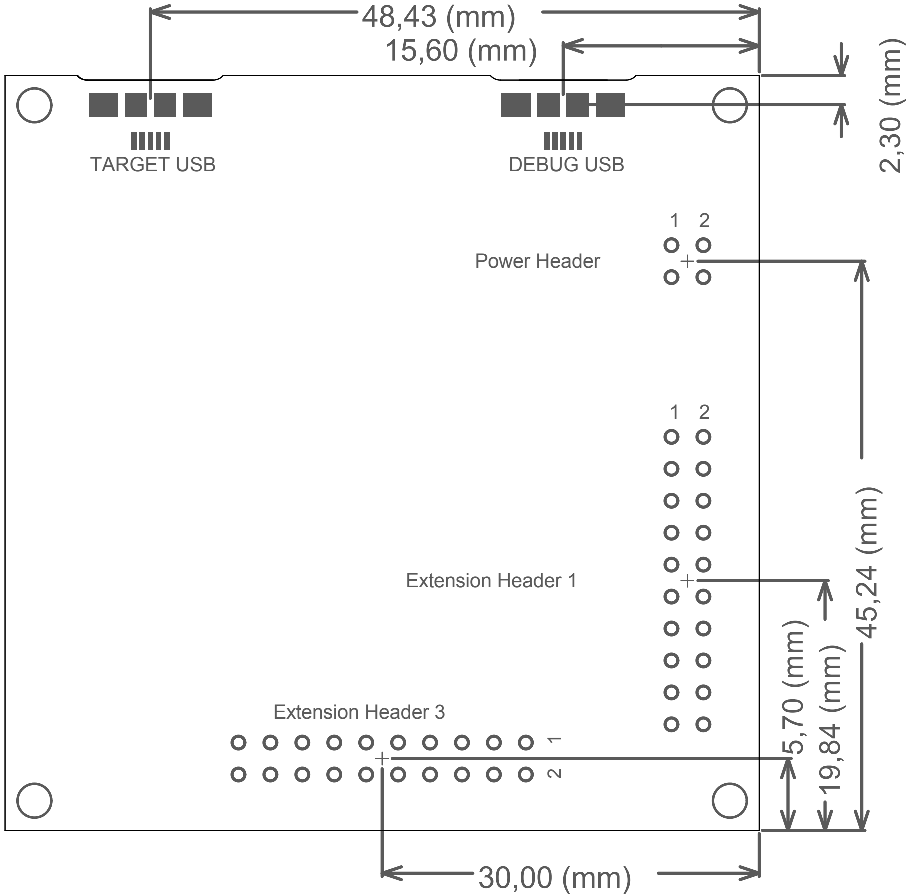
For current measurements of the target MCU remove this jumper and connect a measurement instrument.

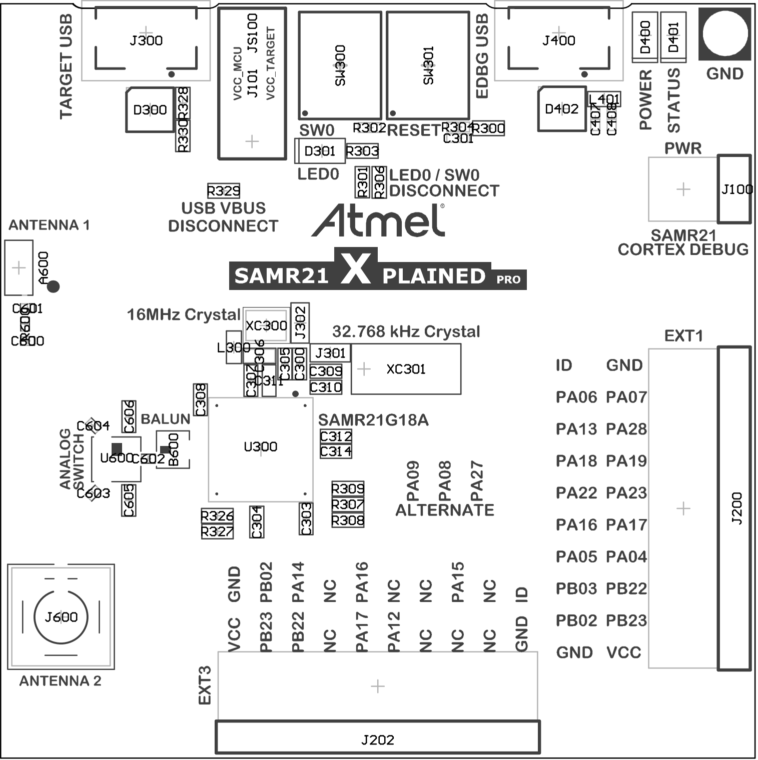
ATMEL Norway	*		
Vestre Rosten 79	*		
N-7075 TILLER	*		
NORWAY			
Date:	26.09.2013	10:43:27	PAGE: 7 of 7
Document number:	A09-2127		Revision 1
TITLE: Power supply			
SAMR21_Xplained_Pro_triple_input_power_supply.SchDoc			

Small MCU Mechanical Dimensions

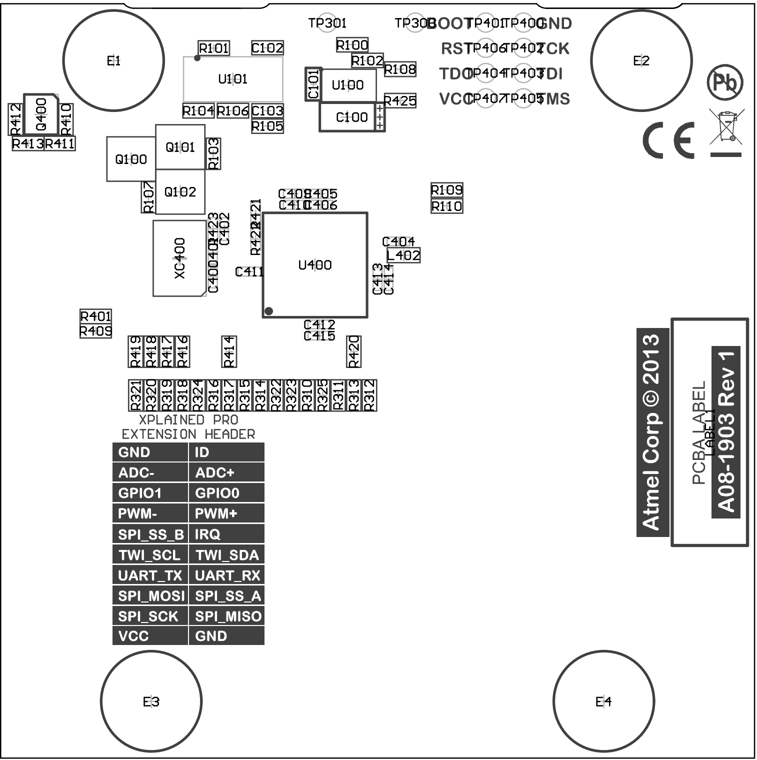


Small MCU Connector Placement

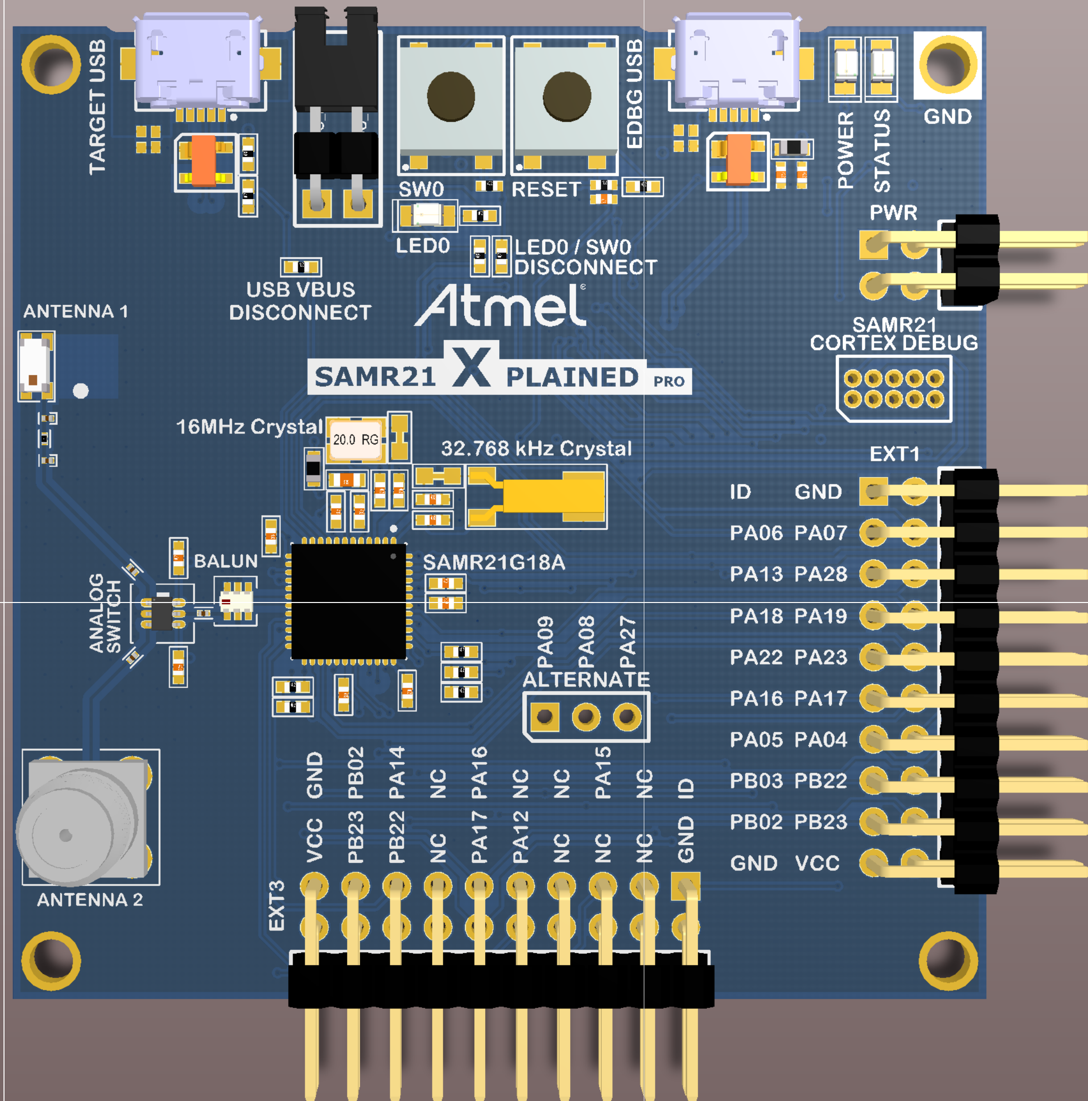


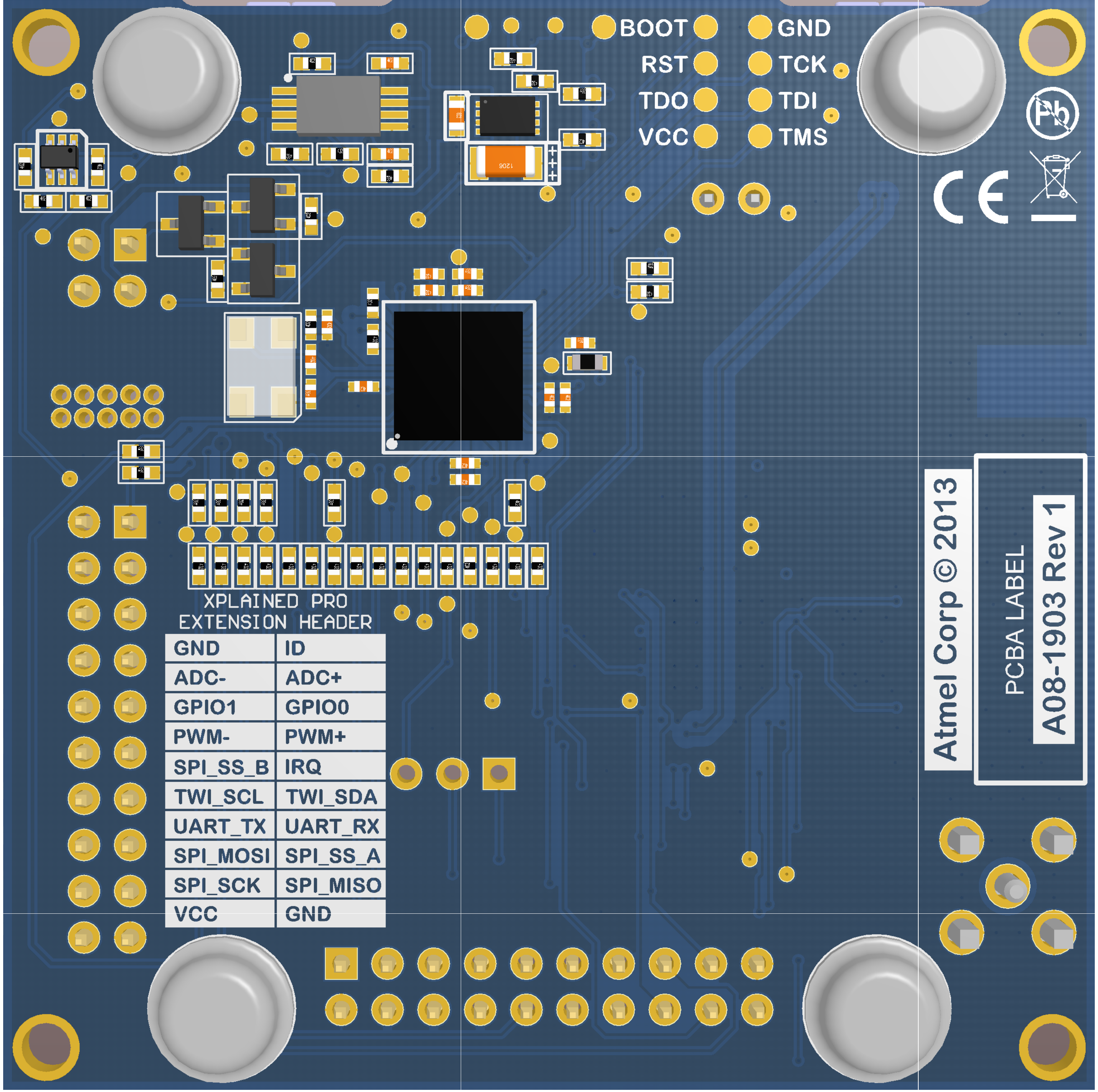


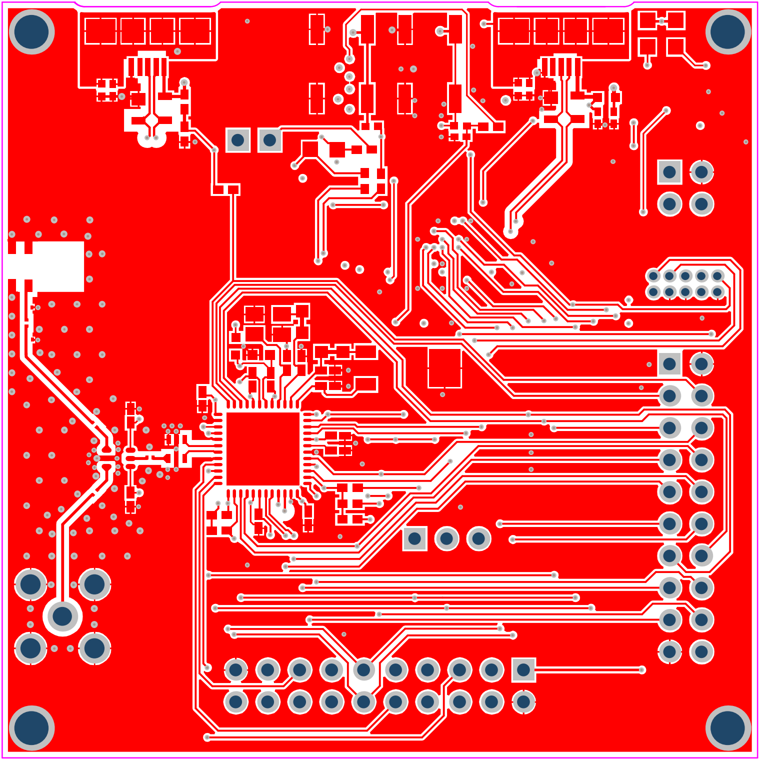
TARGET USB
J300
VCC_MCU
J101
JS100
VCC_TARGET
SW300
SW301
EDBG USB
J400
D400
D401
GND
D300
R328
R330
SW0
R302
RESET
R304
C301
R300
D402
L401
C407
C408
POWER
STATUS
D301
R303
LED0
R301
R306
LED0 / SW0
DISCONNECT
PWR
J100
R329
USB VBUS
DISCONNECT
Atmel
SAMR21
CORTEX DEBUG
ANTENNA 1
A600
SAMR21 X PLAINED PRO
C601
R600
C600
16MHz Crystal
XC300
J302
32.768 kHz Crystal
EXT1
L300
C306
J301
XC301
ID GND
C307
C311
C305
C300
C309
C310
PA06 PA07
C308
C606
BALUN
SAMR21G18A
C604
PA13 PA28
ANALOG SWITCH
U600
C602
B600
U300
C312
C314
PA18 PA19
PA09
PA08
PA27
C603
R309
R307
PA22 PA23
C605
ALTERNATE
R326
R327
C304
C303
R308
PA16 PA17
J200
PA05 PA04
GND PB02 PA14 NC PA16 NC NC PA15 NC ID
VCC PB23 PB22 NC PA17 PA12 NC NC NC GND
PB03 PB22
J600
PB02 PB23
GND VCC
ANTENNA 2
EXT3
J202

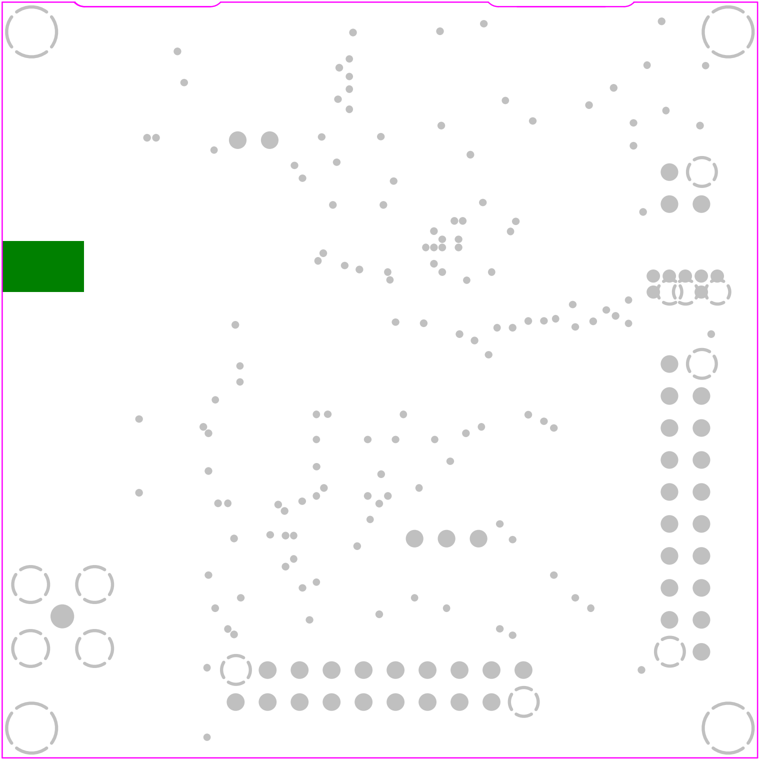


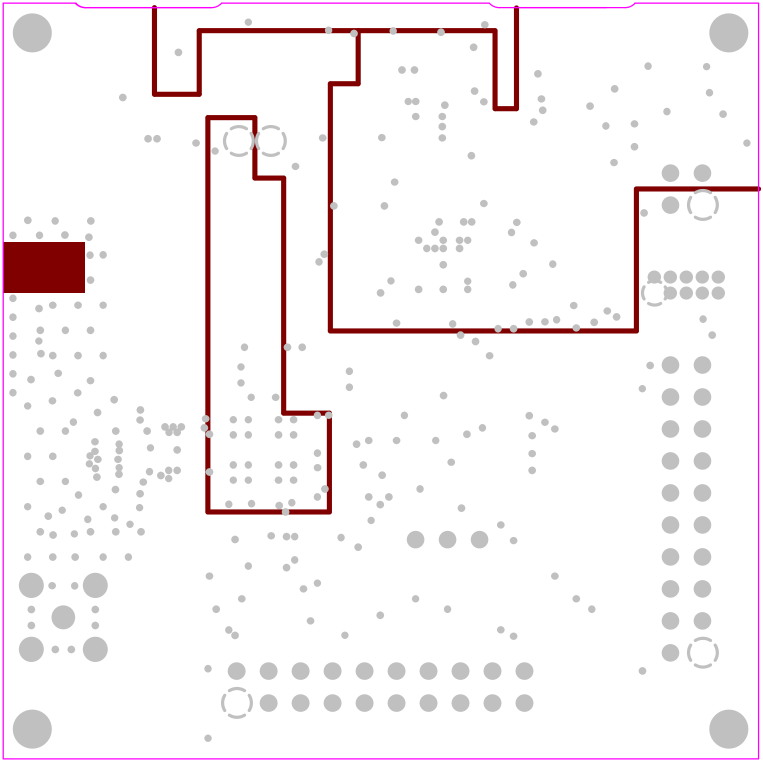
E1
E2
E3
E4
TP301
TP300
BOOT
TP401
TP400
GND
RST
TP406
TP402
TCK
TDO
TP404
TP403
TDI
VCC
TP407
TP405
TMS
R101
C102
U101
R100
R102
R108
C101
U100
R425
C100
R104
R106
C103
R105
R412
Q400
R410
R413
R411
Q100
Q101
R103
Q102
R107
C408
R405
C410
C406
R421
R422
R423
C402
XC400
C400
C401
C411
U400
C404
L402
C413
C414
R109
R110
R401
R409
C412
C415
R419
R418
R417
R416
R414
R420
R321
R320
R319
R318
R324
R316
R317
R315
R314
R322
R323
R310
R325
R311
R313
R312
XPLAINED PRO
EXTENSION HEADER
GND
ID
ADC-
ADC+
GPIO1
GPIO0
PWM-
PWM+
SPI_SS_B
IRQ
TWI_SCL
TWI_SDA
UART_TX
UART_RX
SPI_MOSI
SPI_SS_A
SPI_SCK
SPI_MISO
VCC
GND
Pb
CE
Atmel Corp © 2013
PCBA LABEL
LABEL1
A08-1903 Rev 1

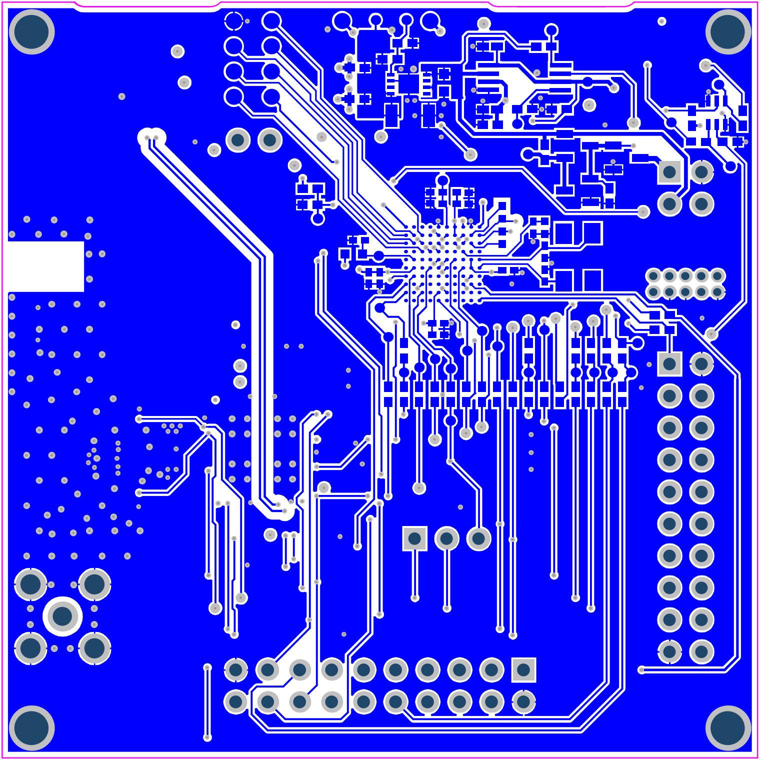

TARGET USB
EDBG USB
SW0
RESET
POWER
STATUS
GND
PWR
LED0
LED0 / SW0
DISCONNECT
USB VBUS
DISCONNECT
ANTENNA 1
Atmel
SAMR21 X PLAINED PRO
SAMR21
CORTEX DEBUG
16MHz Crystal
32.768 kHz Crystal
EXT1
ID GND
PA06 PA07
PA13 PA28
PA18 PA19
PA22 PA23
PA16 PA17
PA05 PA04
PB03 PB22
PB02 PB23
GND VCC
BALUN
SAMR21G18A
ANALOG SWITCH
PA09 PA08 PA27
ALTERNATE
GND PB02 PA14 NC PA16 NC NC PA15 NC ID
VCC PB23 PB22 NC PA17 PA12 NC NC NC GND
ANTENNA 2
EXT3


BOOT
GND
RST
TCK
TDO
TDI
VCC
TMS
XPLAINED PRO
EXTENSION HEADER
GND
ID
ADC-
ADC+
GPIO1
GPIO0
PWM-
PWM+
SPI_SS_B
IRQ
TWI_SCL
TWI_SDA
UART_TX
UART_RX
SPI_MOSI
SPI_SS_A
SPI_SCK
SPI_MISO
VCC
GND
Atmel Corp © 2013
PCBA LABEL
A08-1903 Rev 1









Component list

Top Level Schematics

Source Data From:	**SAMR21_Xplained_Pro.PrjPCB**
Project:	**SAMR21_Xplained_Pro.PrjPCB**
Variant:	**Default_assembly**

Report Date:	26.09.2013	10:43:52
Print Date:	26.09.2013	10:43:49

Fitted	Designator	Quantity	Value	Manufacturer	MPN	Description
Fitted	A600	1	2450AT18D0100	Johanson Technology	2450AT18D0100	2.45 GHz Ceramic Antenna
Fitted	B600	1	2450BM15A0015E	Johanson Technology	2450BM15A0015E	Filtered Balun to match AT86RF232/233 (35288)
Fitted	C100	1	10u	vishay	TR3A106K016C1700	SMD tantalum capacitor, ESR = 1.7, 3216-18 (EIA) 1206,
Fitted	C101	1	4.7uF	tdk	C1608X5R1A475K	Ceramic capacitor, SMD 0603, X5R, 10V, 10% (de31036)
Fitted	C102, C103, C303, C304, C307, C308, C311, C312, C314	9	100n	Kemet	C0402C104K4RACTU	Ceramic capacitor, SMD 0402, X7R, 16V, +/-10%
Fitted	C300, C305	2	10p			Ceramic capacitor, SMD 0402, NP0, 50V, +/-5%
Fitted	C301, C404, C410, C411, C412, C413	6	100n	Kemet	C0402C104K4RACTU	Ceramic capacitor, SMD 0402, X7R, 16V, +/-10%
Fitted	C306	1	10uF/16V	Taiyo Yuden	EMK107BBJ106MA-T	Ceramic capacitor, SMD 0603, X5R, 16V, 10UF ± 20% (High Density)
Fitted	C309, C310	2	8.2p			Ceramic capacitor, SMD 0402, NP0, 50V, +/-5%
Fitted	C400, C401	2	22p			Ceramic capacitor, SMD 0402, NP0, 50V, +/-5%
Fitted	C402	1	10p			Ceramic capacitor, SMD 0402, NP0, 50V, +/-5%
Fitted	C405, C409, C414, C415	4	2.2uF	Kemet	C0402C225M9PAC	Ceramic capacitor, SMD 0402, X5R, 6.3V, +/-20%
Fitted	C406, C407, C408	3	1 nF C0G	Murata	GRM1555C1H102JA01D	Ceramic capacitor, SMD 0402, C0G, 50V, +/-5%
Fitted	C600, C601, C602, C603, C604	5	22pF	Johanson Technology	250R05L220JV4T	Ceramic Capacitor, SMD 0201, 25V, NP0, 22PF
Fitted	C605, C606	2	22p			Ceramic capacitor, SMD 0402, NP0, 50V, +/-5%
Fitted	D300, D402	2	PRTR5V0U2X	Philips	PRTR5V0U2X	Double rail-to-rail USB ESD protection diode
Fitted	D301, D401	2	EL17-21UYC/A2	Everlight	17-21UYC/S530-A3/TR8	LED, Yellow, Wave length=591nm, SMD 0805, ±70°
Fitted	D400	1	EL17-21SYGC	Everlight	EL17-21SYGC	LED, Green, Wave length=575nm, SMD 0805, ±70°
Fitted	E1, E2, E3, E4	4	SJ-5076	3M	SJ-5076	2.8mm adhesive feet,diam 8.0mm
Fitted	FIXTURE1	1	Xplained PRO MCU board Jupiter Test Fixture	ESCATEC	Xplained PRO MCU board Jupiter Test Fixture	Xplained PRO MCU board Jupiter Test Fixture
Fitted	FW1	1	EDBG secured firmware	ATMEL		EDBG secured firmware
Fitted	J100	1	P101-2*02RGF-139-ND		P101-2*02RGF-139-ND	Pin header, 2x2, Right Angle, 2.54mm, THT, Pin In Paste
Fitted	J101	1	Pin header 1x2 right angle	Pro-data International Corp	2213R-2G	1x2 pin header, right angle, 2.54 mm pitch, through-hole
Fitted	J200, J202	2	P101-2*10RGF-139-ND		P101-2*10RGF-139-ND	Pin header, 2x10, Right Angle, 2.54mm, THM, Pin In Paste
Fitted	J300, J400	2	10104111-0001LF	FCI	10104111-0001LF	Micro USB AB Connector
Fitted	J600	1	19-46-1-TGG	Multicomp	19-46-1-TGG	SMA PCB mounted connector 50Ohm (de19205)
Fitted	JS100	1	SNT-100-BK-G	SAMTEC	SNT-100-BK-G	Jumper cap for 2.54mm pinheader
Fitted	L300	1	BLM18PG471SN1	Murata	BLM18PG471SN1	SMD RF inductor 0603. Z=470Ohm (@100MHz), Max R(dc)=0.65Ohm, Max current=1A
Fitted	L401, L402	2	BLM18PG471SN1	Murata	BLM18PG471SN1	SMD RF inductor 0603. Z=470Ohm (@100MHz), Max R(dc)=0.65Ohm, Max current=1A
Fitted	LABEL1	1	Label PCBA with MAC64 and FCC ID	ACT Logimark AS	505462	Label for use on wireless PCBA that needs 64 bit MAC and FCC ID
Fitted	PCB1	1	SAMR21 Xplained Pro PCB documentation	ATMEL		SAMR21 Xplained Pro PCBA documentation
Fitted	PCBADOC1	1	A09-2127 PCBA Files	ATMEL		SAMR21 Xplained Pro PCBA documentation
Fitted	Q100, Q101	2	IRLML6402PBF	International Rectifier	IRLML6402PBF	P-ch. MOSFET. -30V, -3.7A continuous,RDS(ON)=0.05Ohm@VGS=-4,5V, RDS(ON)=0.08Ohm@VGS=-2.5V
Fitted	Q102	1	2N7002,215	NXP	2N7002,215	N-Channel MOSFET. 60V, 0.300A continuous, 1.2A Peak. RDS(ON) = 3.8Ohm@VGS=4.5V, VGS(th)<2.5V
Fitted	Q400	1	2N7002DW	Fairchild	2N7002DW	Dual N-Channel MOSFET, 60V, 115mA cont,RDS(ON) < 7.5 Ohm @50mA@5V, SOT-363
Fitted	R100	1	18k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R101, R104, R105, R410, R413	5	1M			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R102	1	30k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R103, R107, R300	3	100k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R106	1	390R			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R108, R301, R306, R307, R308, R309, R310, R311, R312, R313, R314, R315, R316, R317, R318, R319, R320, R321, R322, R323, R324, R325, R329, R425	24	0R			Thick film resistor, SMD 0402, 1/16W, 1%, RES 0.0 OHM 1/16W 0402 SMD, Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R109, R110, R328, R330	4	47k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R302, R304, R421, R422	4	39R			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R303, R411, R412, R414, R416, R417, R418, R419, R420	9	330R			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R326, R327	2	4.7k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R401, R409	2	1k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R423	1	6.81k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R600	1	0R	ROHM	MCR006YZPJ000	Thick film resistor, SMD 0201, 1/20W, 5%
Fitted	SW300, SW301	2	SKRAAKE010	ALPS	SKRAAKE010	6.2x6.2 mm SMD tact switch, same as A08-0091 but less force is needed
Fitted	TEST1	1	SAMR21 Xplained Pro test	ATMEL		Fixture test for SAMR21 Xplained Pro
Fitted	TESTDOC1	1	SAMR21 Xplained Pro test Instructions	ATMEL		SAMR21 Xplained Pro test Instructions
Fitted	U100	1	SPX3819R2-L/TR	Exar	SPX3819R2-L/TR	500mA LDO, ADJ, low noise, 8-DFN package
Fitted	U101	1	TPS2113PWR	Texas Instruments	TPS2113PWR	Autoswitching 2:1 Power Mux
Fitted	U300	1	SAMR21G18A	ATMEL	SAMR21G18A-MUT	Atmel 32-bit Cortex M0 MCU with RF233 SIP.
Fitted	U400	1	AT32UC3A4256J-C1UR	ATMEL	AT32UC3A4256J-C1UR	AVR 32-bit RISC MCU
Fitted	U600	1	AS222-92LF	SKYWORKS SOLUTIONS	AS222-92LF	PHEMT SPDT Analog SWITCH, 0,1-3 GHz
Fitted	XC300	1	16.0MHz	Epson Toyocom	TSX-3225 16.0000MF09Z-AC3	16MHz uXtal, 3.2 x 2.5 mm SMD, CL=9pF, 15PPM, ESR=80ohm(Max.
Fitted	XC301	1	32.768kHz +/-20PPM 7pF SMD	Micro Crystal	MS1V-T1K 32.768kHz 7pF +/-20PPM TA	32k768 crystal, +-20ppm, CL=7pF, max ESR 60kOhm, SMD
Fitted	XC400	1	12.0MHz	Fox Electronics	FQ5032B-12-C-C-C-200-1	Fox FQ5032B 12.0MHz SMD crystal 738B-12
Not Fitted	C302, C403	0	4.7n			Ceramic capacitor, SMD 0402, X7R, 25V, +/-10%
Not Fitted	J303	0	PIN HEADER 2x5	Garry	STL21-0730 G TT-10U	2x5 pin header, 1.27mm pitch, THM
Not Fitted	J304	0	HMTSW-103-23-F-S-237			1x3 pin header, 2.54mm pitch, Pin-in-Paste THM, 1mm hole
Not Fitted	R305, R424	0	1M	KOA	RK73H1ETTP1004F	Thick film resistor, SMD 0402, 1/16W, 1%
		140				

Approved	**Notes**