
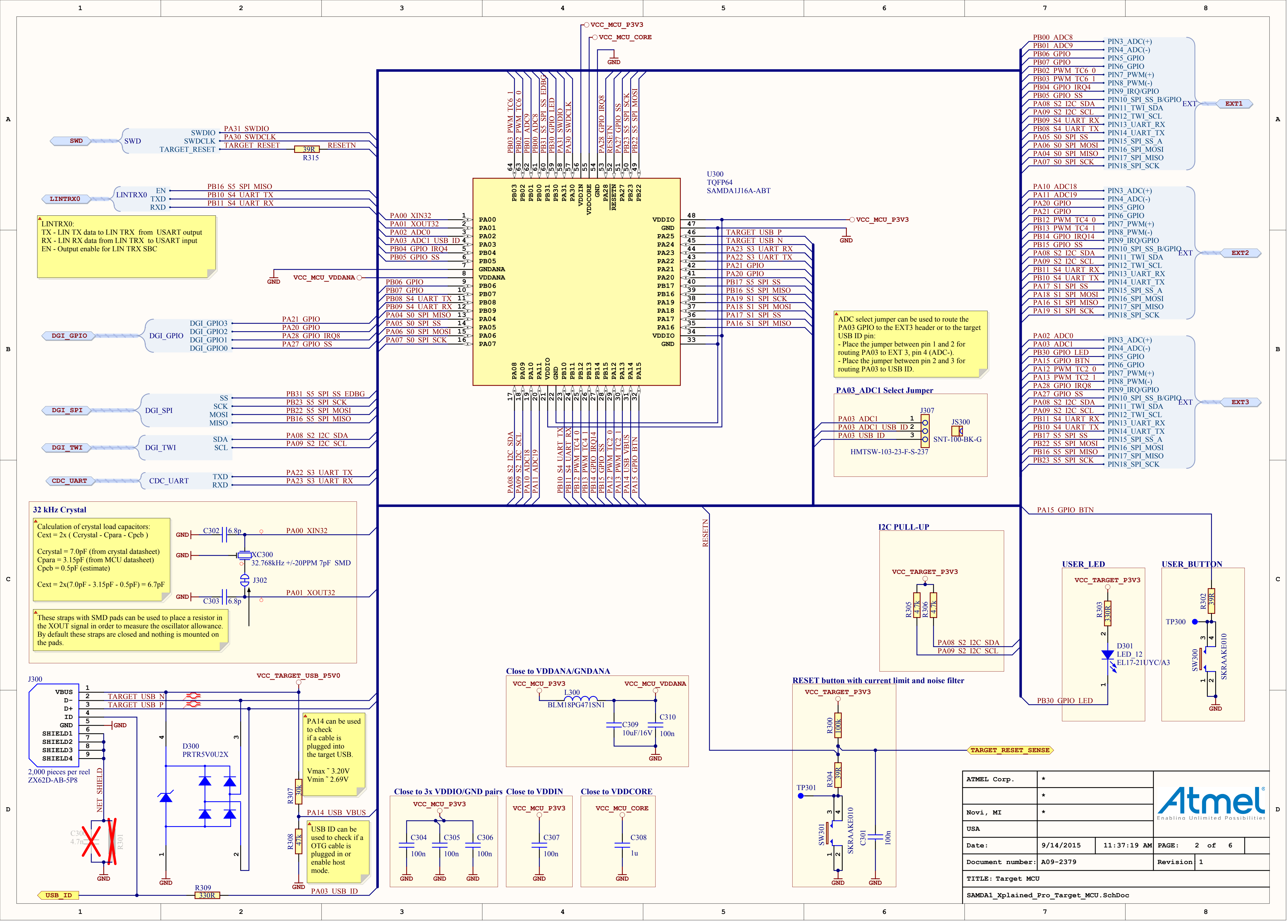
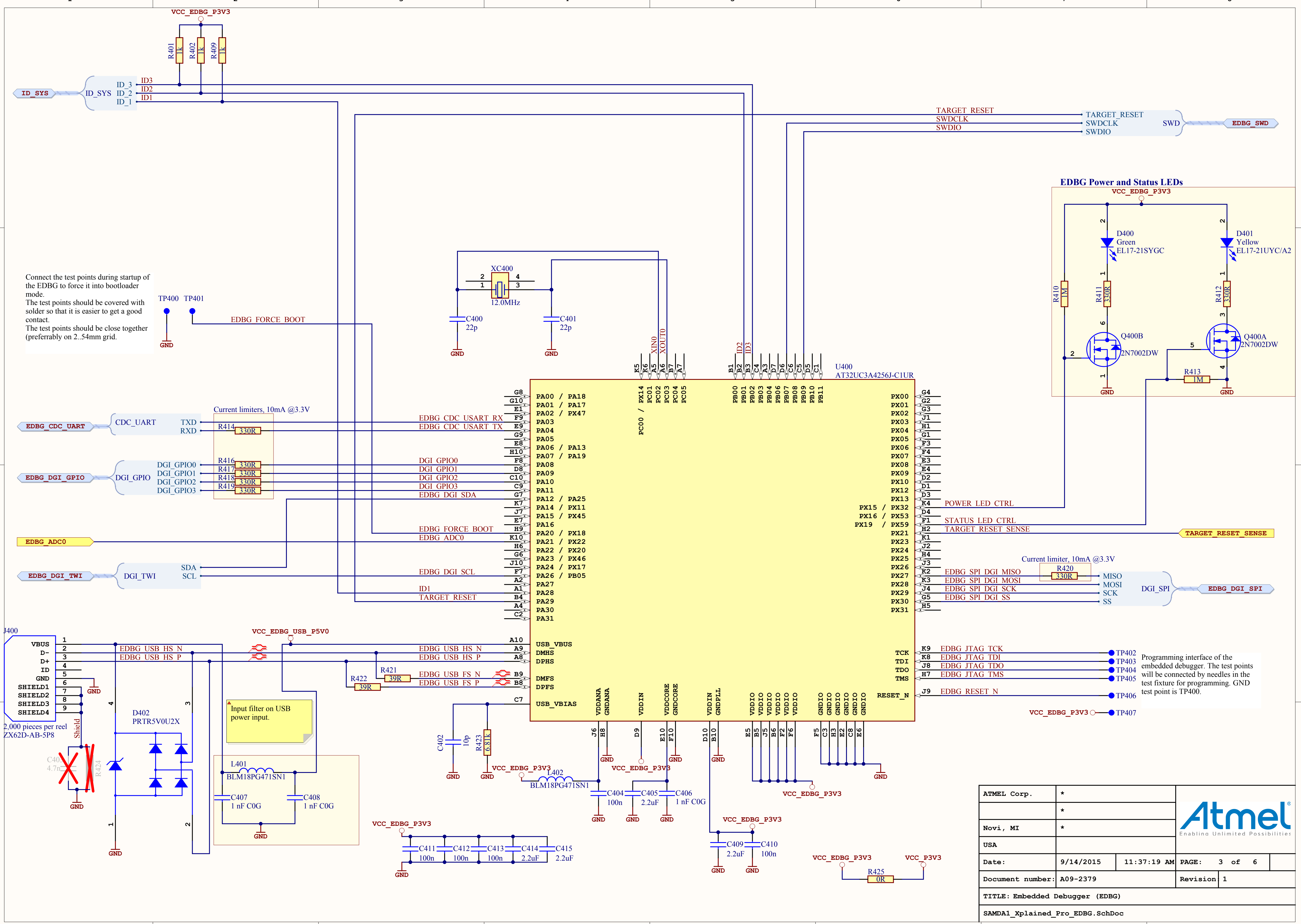
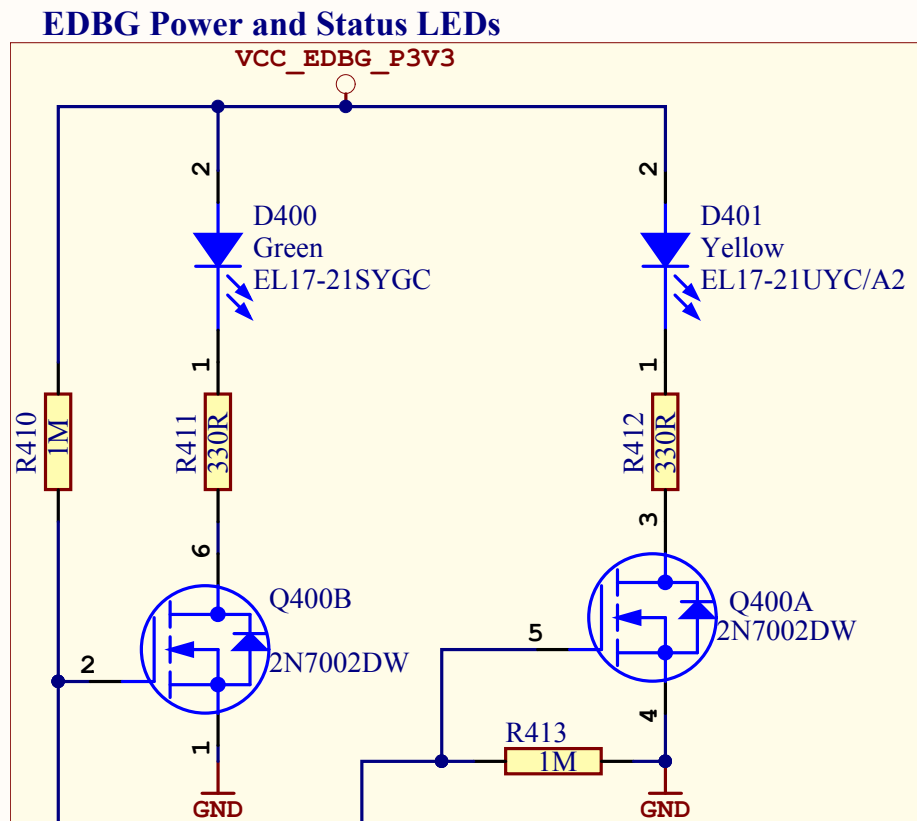


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Novi, MI	*			
USA				
Date:	9/14/2015	11:37:19 AM	PAGE: 1 of 6	
Document number:	A09-2379		Revision	1
TITLE: Top Level Schematics				
SAMD A1 Xplained Pro_TopLevel.SchDoc				



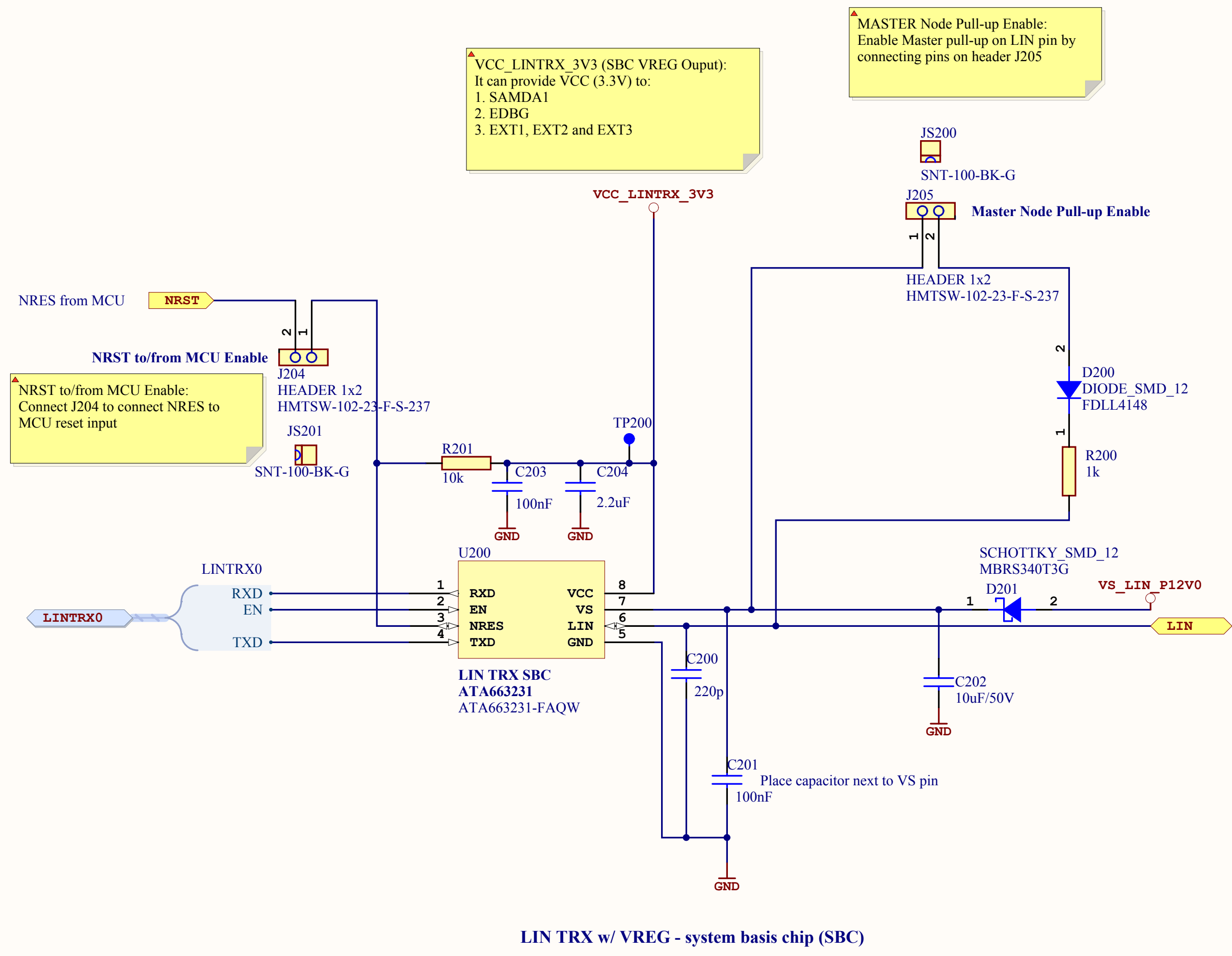



Connect the test points during startup of the EDBG to force it into bootloader mode. The test points should be covered with solder so that it is easier to get a good contact. The test points should be close together (preferably on 2.54mm grid).

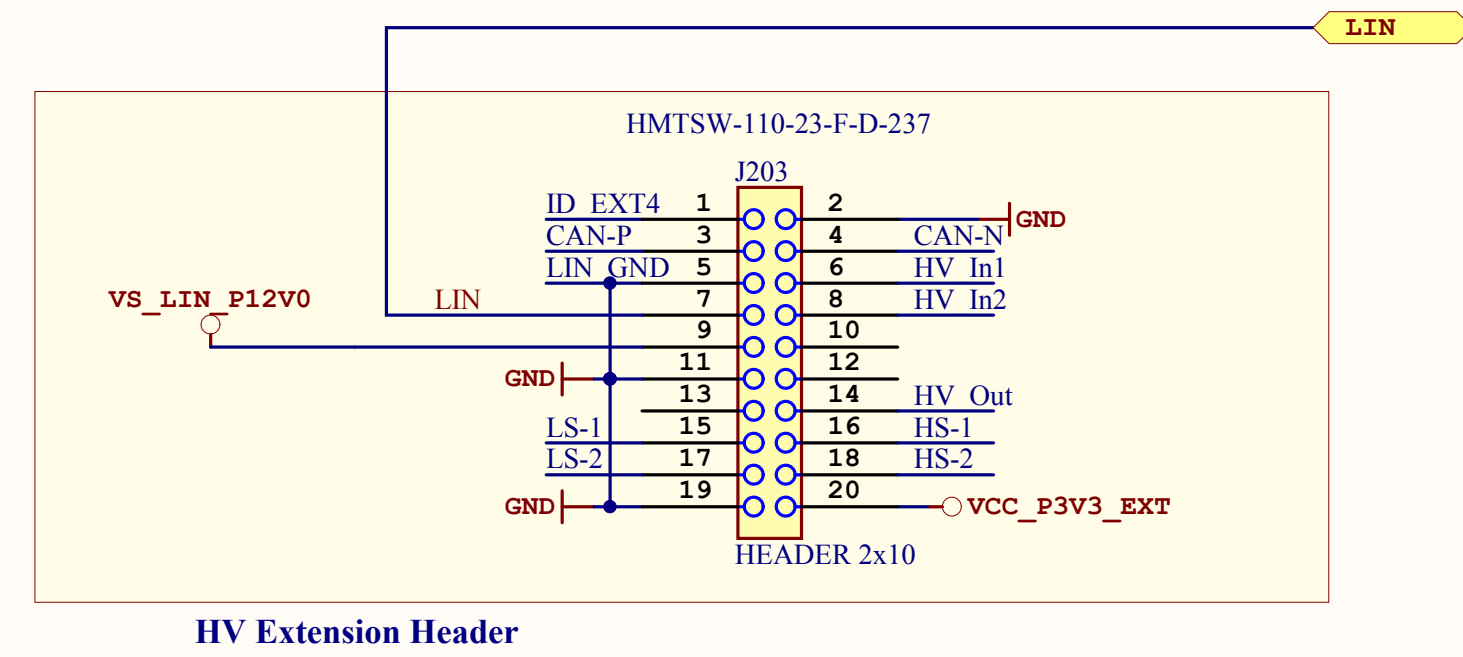
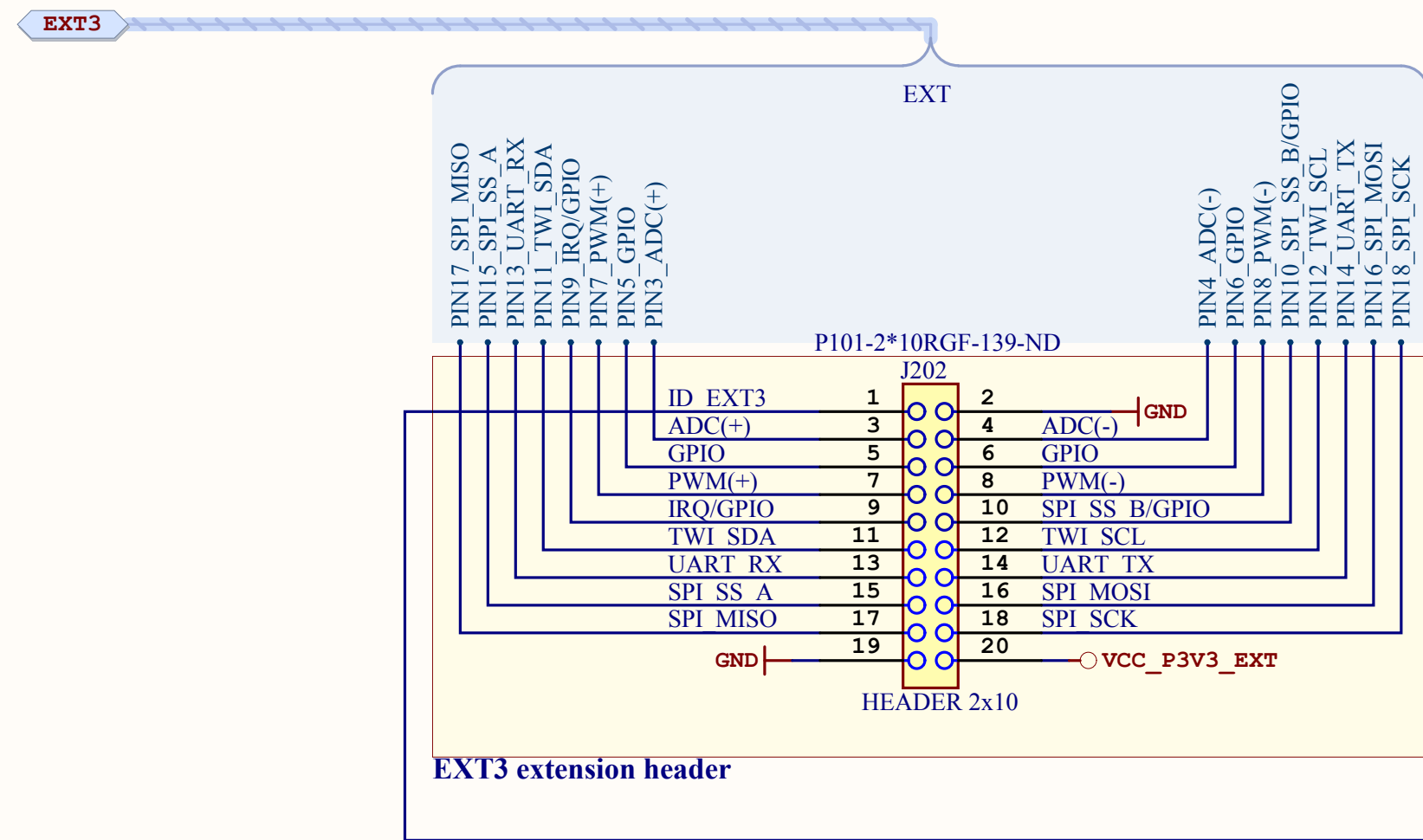
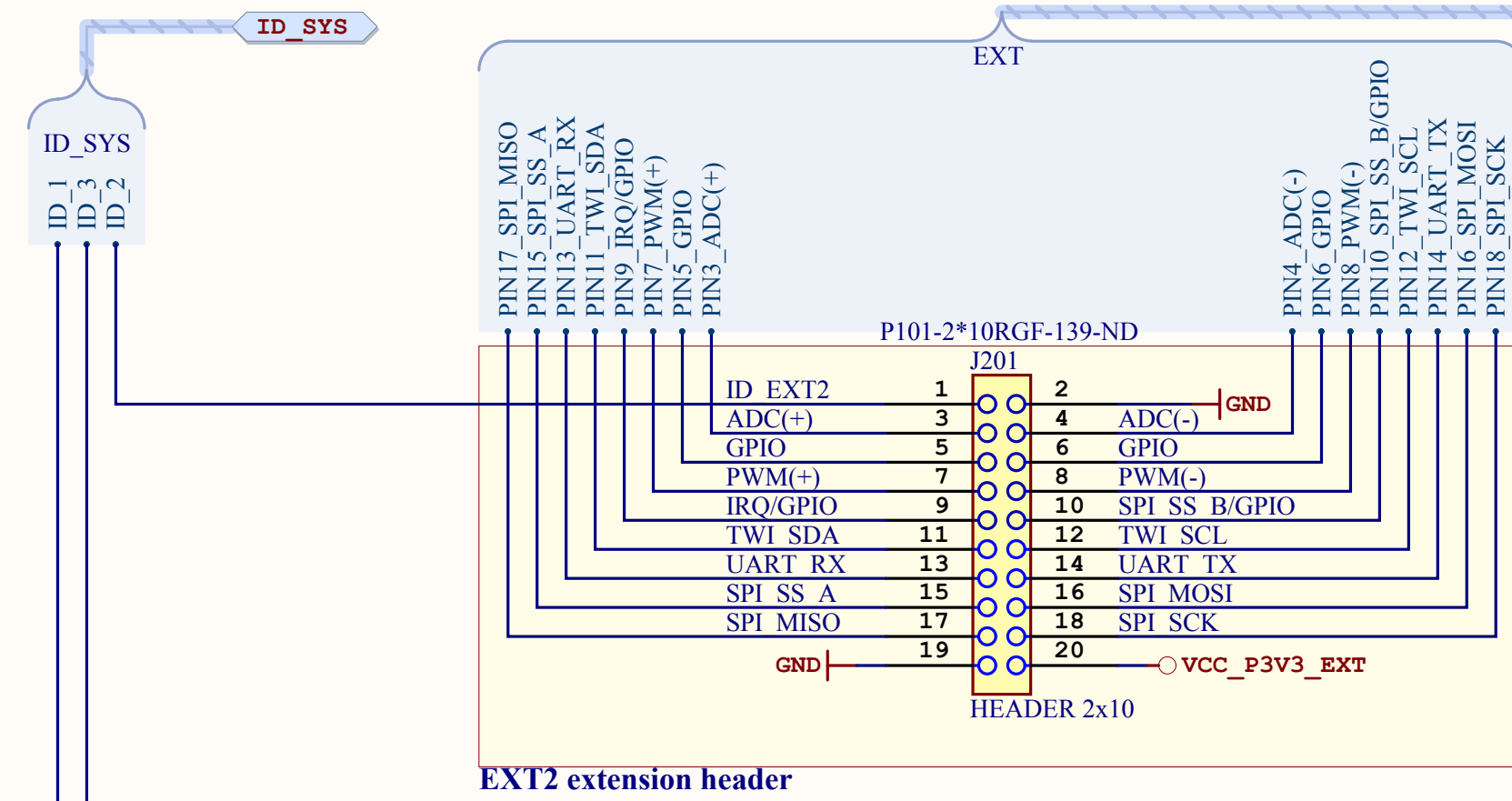
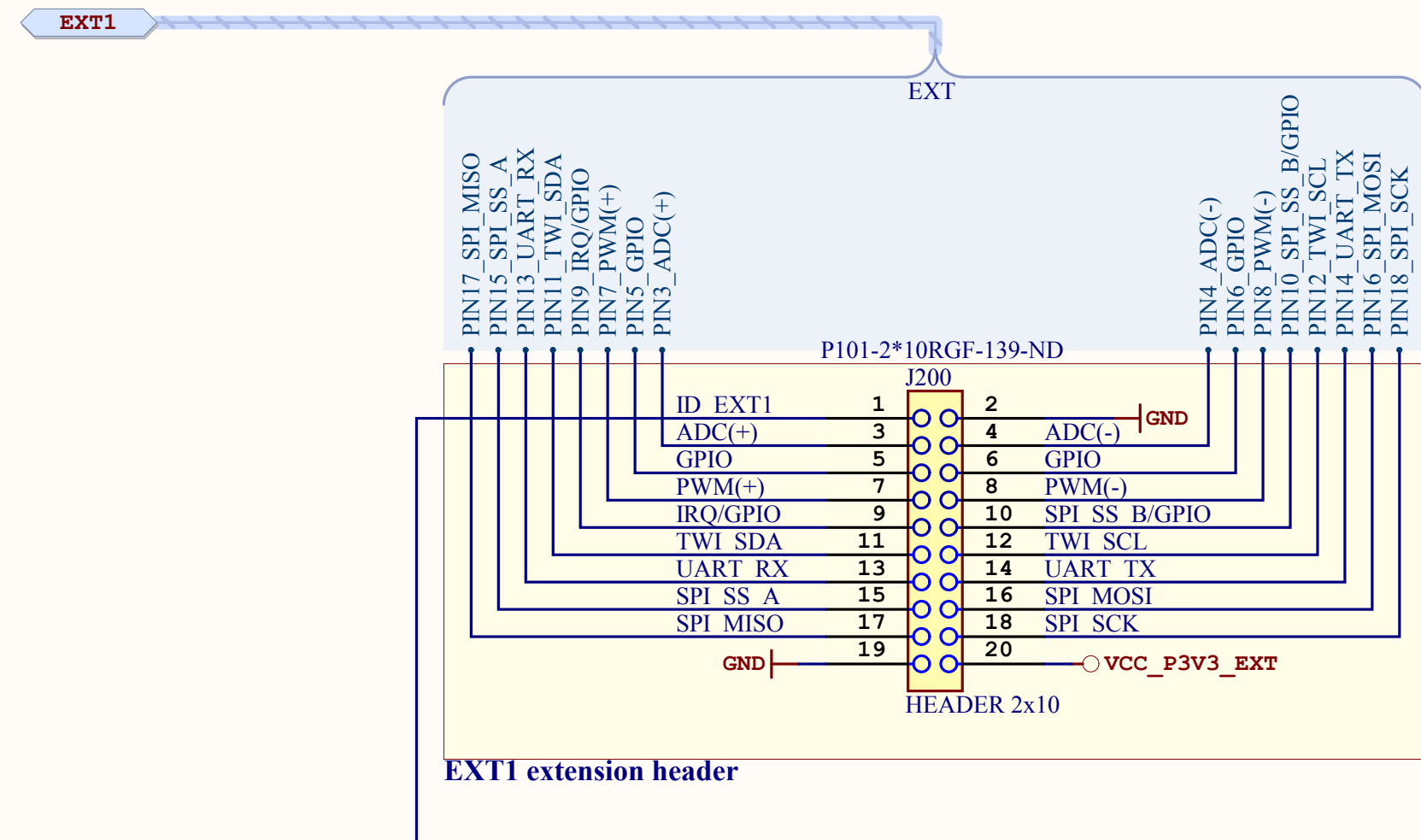


Programming interface of the embedded debugger. The test points will be connected by needles in the test fixture for programming. GND test point is TP400.


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Date:	9/14/2015	11:37:19 AM	PAGE: 3 of 6	
Document number:	A09-2379		Revision	1
TITLE: Embedded Debugger (EDBG)				
SAMDA1_Xplained_Pro_EDBG.SchDoc				

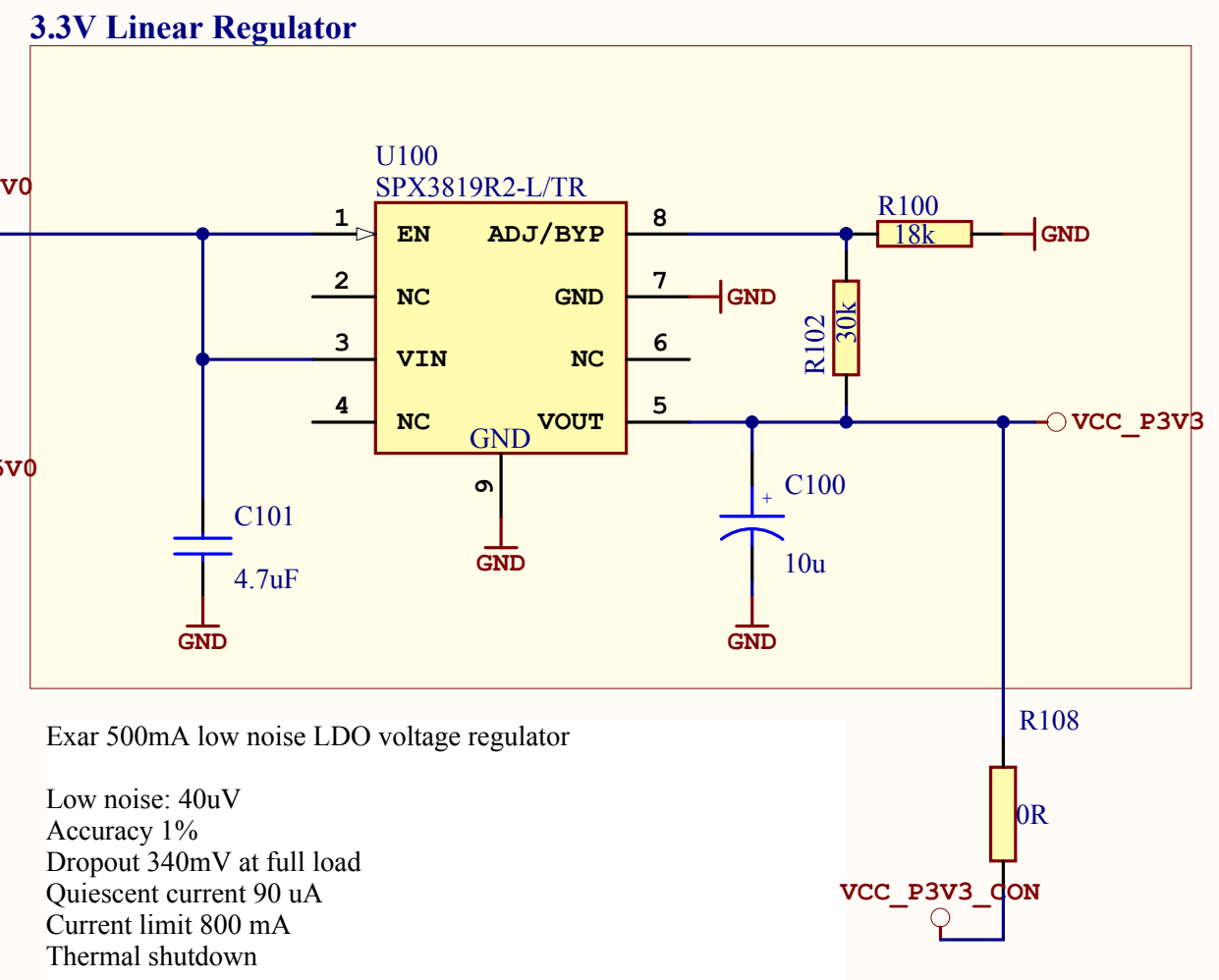
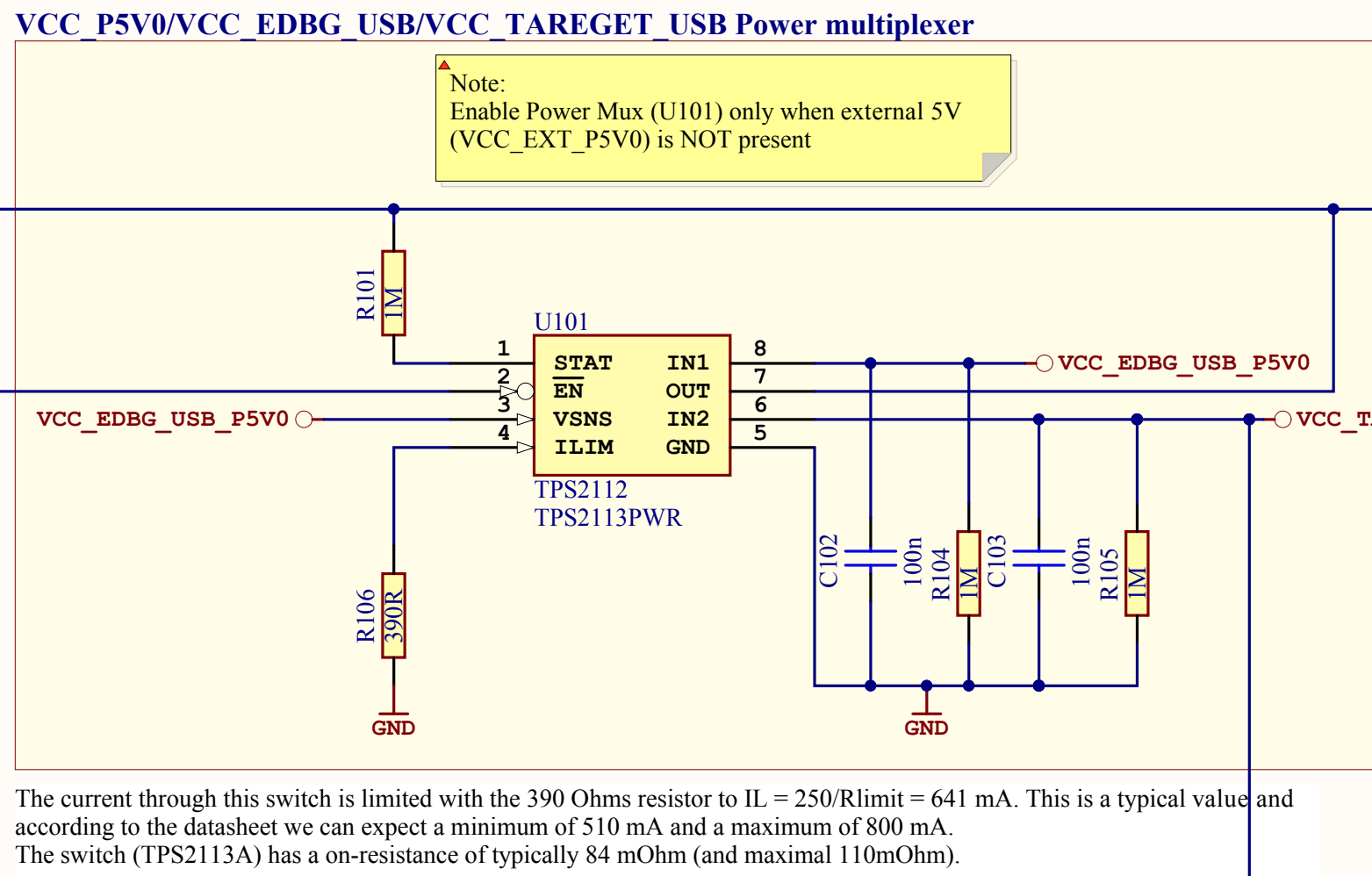
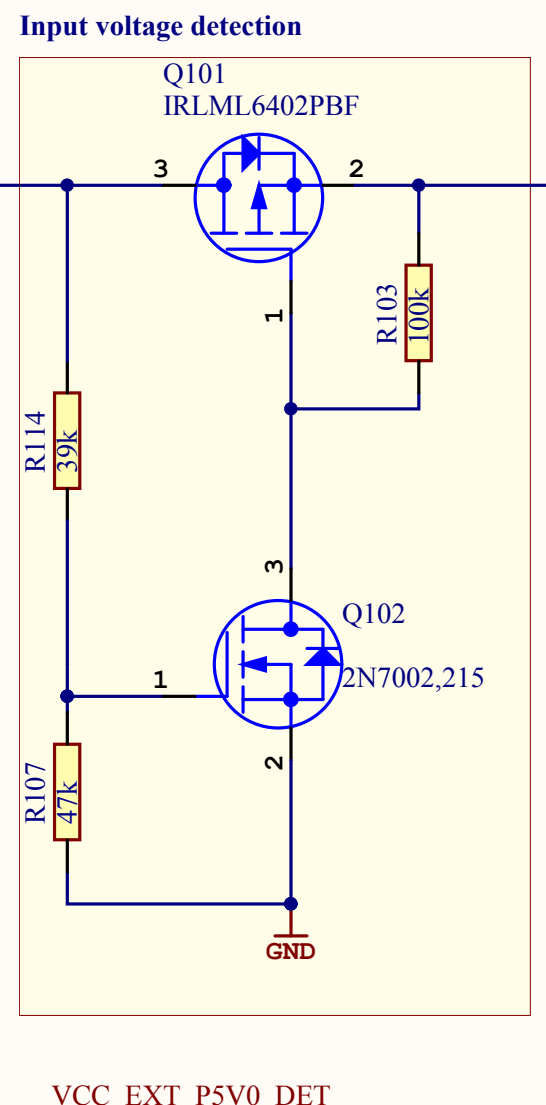
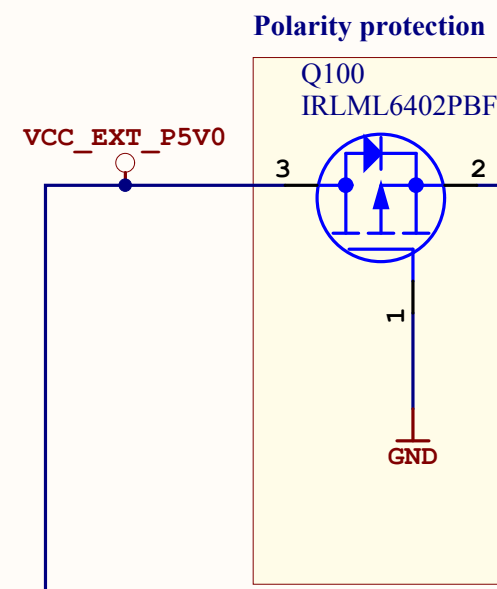


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USA				
Date:	9/14/2015	11:37:19 AM	PAGE:	4 of 6
Document number:	A09-2379		Revision	1
TITLE: LIN SBC TRX				
SAMDA1_Xplained_Pro_LIN_TRX.SchDoc				



▲ HV Connector (plain vertical header):
 - LIN: LIN signal I/O
 - VS_LIN: External Voltage Supply VS_LIN = 5V-28V
 - VCC_TARGET_P3V3: External voltage
 - VCC_P3V3: External 3.3V OR on-board Vreg output @3.3V
 - VCC_SBC_VREG3V3: On-board LIN TRX SBC Vreg output (3.3V)

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Date:	9/14/2015	11:37:20 AM	PAGE:	5 of 6
Document number:	A09-2379		Revision	1
TITLE: Extension connectors				
SAMDA1_Xplained_Pro_Connectors.SchDoc				



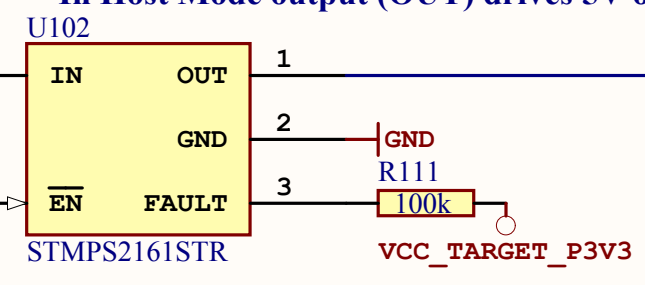
Each FET in the power path has a $R_{DS(on)}$ of $<50m\Omega$ at $V_{GS} = -5V$ with a current of up to 20A. That means we can expect a maximum voltage drop across the FETs of $50mV @ 500mA$, $100mV @ 1A$ and $200mV @ 2A$. For USB host mode we need a voltage between 4.4V to 5.25V so the drop that we have is ok and leaves some room for an OTG switch on-resistance.

Note: Host Mode is enabled when $VBUS_HOST_EN = 0V$. It is enabled by having USB_ID pin = 0V. The USB micro-A plug has the USB OTG functionality.

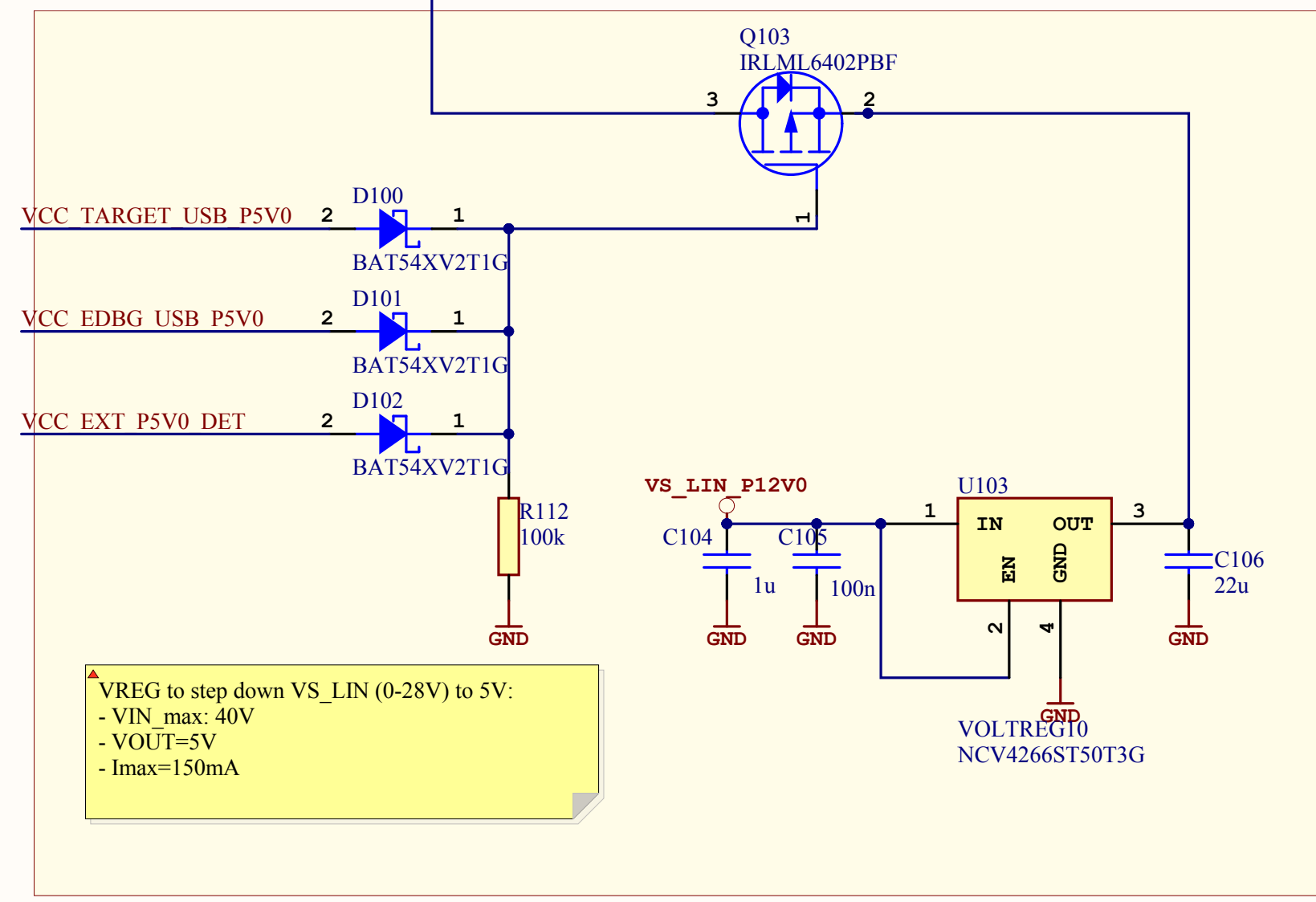
The current through this switch is limited with the 390 Ohms resistor to $I_L = 250/R_{limit} = 641$ mA. This is a typical value and according to the datasheet we can expect a minimum of 510 mA and a maximum of 800 mA. The switch (TPS2113A) has a on-resistance of typically 84 mOhm (and maximal 110mOhm).

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
 $V_{OUT} = 1.235V * (1 + R1/R2) = 1.235V * (1 + 30k/18k) = 3.293V$

In Host Mode output (OUT) drives 5V on VBUS



VS_LIN Power Multiplexer

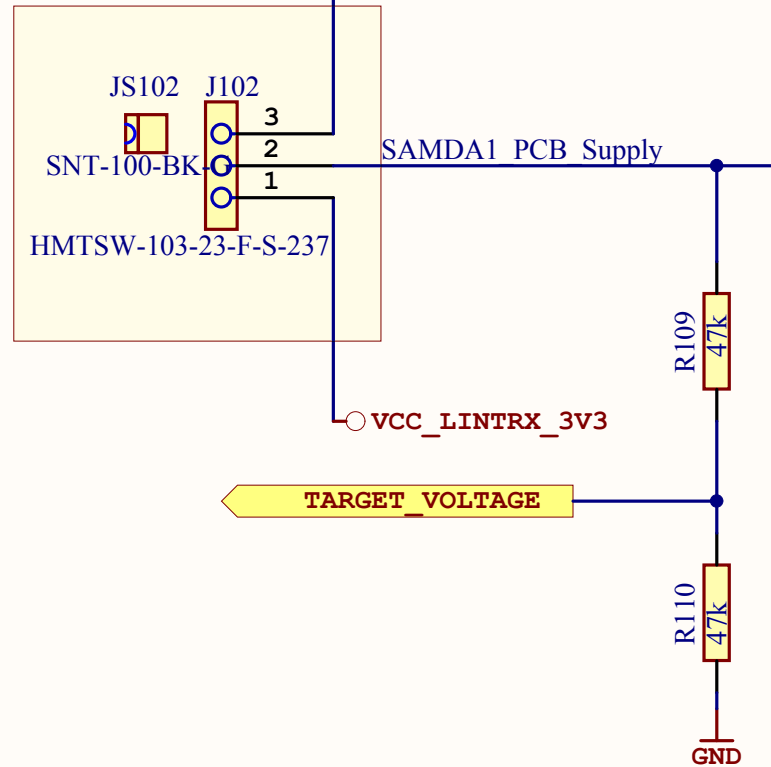


VREG to step down VS_LIN (0-28V) to 5V:
 - $V_{IN_max} = 40V$
 - $V_{OUT} = 5V$
 - $I_{max} = 150mA$

Connecting SAMDA1 PCB voltage supply:
 1. Provide VCC(5V) on PWR header pin 1 (overrides any USB VBUS).
 NOTE: Keep VCC within 2% for USB host functionality.
 2. Or, connect EDBG USB plug to use VC_USB_EDBG to use it as the main source of power (VCC_EXT_P5V0 must be disconnected)
 3. Or, connect Target USB plug to use VC_USB_TARGET=5V as the main source of power.
 4. Or, apply VC=3.3V on pin 4

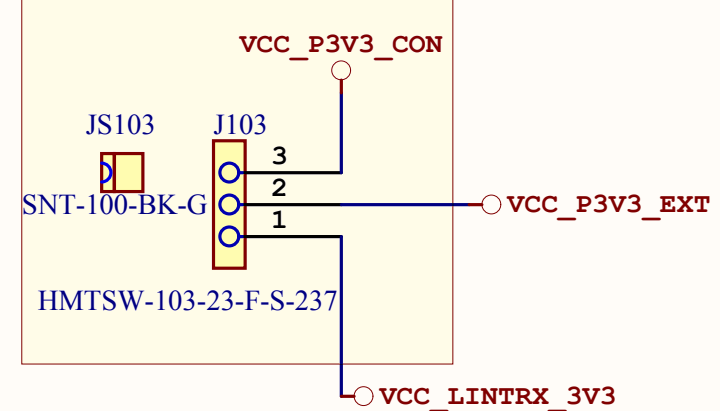
Host Mode-VBUS (Provide USB/VBUS in Host Mode):
 State of ID pin (USB connector port) controls if VBUS is enabled for HOST mode.
 - Host mode enabled - ID=0 set VBUS enabled (Host Mode Enabled).
 - Host Mode disabled - ID= RID_A/B/C or FLOATING (Host Mode Disabled i.e. the VBUS can be provided by the connected peripheral/host and the switch will be open.
 This can be overridden by driving the pin low.
 The logic state of the ID pin can be read directly for use with either GROUNDED or FLOATING ID pin, but for the other 3 states (RID_A/B/C) reading with an ADC is recommended.

MCU VCC Select



HEADER 1x2
 Pin header 1x2 right angle
 For current measurements of the target MCU remove this jumper and connect a measurement instrument.

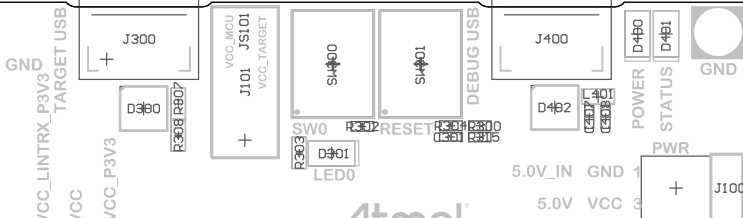
EXTENSION HEADER VCC Select



VBUS_HOST_EN (On-The-Go)	Power Input (Source)	Deser.	Power Mode	
			Source of VCC_P3V3 Output	VBUS pin on USB TARGET plug
3.3V - Host Mode Disabled	VCC_EXT_P5V0=5V	5V Ext. VCC is regulated U101 Pwr. Mux is disabled	VCC_EXT_P5V0	VBUS=5V (Supplied by USB)
3.3V - Host Mode Disabled	VCC_EDBG_USB_P5V0=5V	USB EDBG VBUS is regulated U101 Pwr. Mux is enabled (IN1)	VCC_EDBG_USB_P5V0	VBUS=5V (Supplied by USB)
3.3V - Host Mode Disabled	VCC_TARGET_USB_P5V0=5V	USB TARGET VBUS is regulated U101 Pwr. Mux is enabled (IN2)	VCC_TARGET_USB_P5V0	VBUS=5V (Supplied by USB)
0V - Host Mode Enabled	VCC_EXT_P5V0 (5V on J100-1)	5V Ext. VCC is regulated ID pin on USB cable=0V	VCC_EXT_P5V0	VBUS=VCC_TARGET_USB_P5V0
0V	VCC_EXT_P5V0=0 VCC_EDBG_USB_P5V0=5V	U101 Pwr. Mux is disabled No voltage is detected on input Incorrect input setting	No input	VBUS=0V

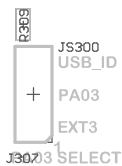
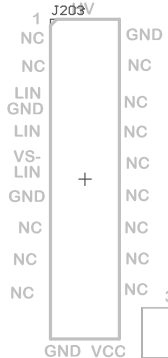
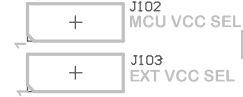
MCU VCC (3.3V) Select:
 1. J102/Pin1-2 supply from VCC_LINTRX_3V3
 2. J102/Pin2-3 supply from VCC_P3V3_CON (VREG from USB)
 Extension Header VCC(3.3V) Select:
 1. J103/Pin1-2 supply from VCC_LINTRX_3V3
 2. J103/Pin2-3 supply from VCC_P3V3_CON (VREG from USB)

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Date:	9/14/2015	11:37:20 AM	PAGE: 6 of 6
Document number:	A09-2379		Revision 1
TITLE: Power supply			
SAMD11_Xplained_Pro_Quad_input_power_supply.SchDoc			

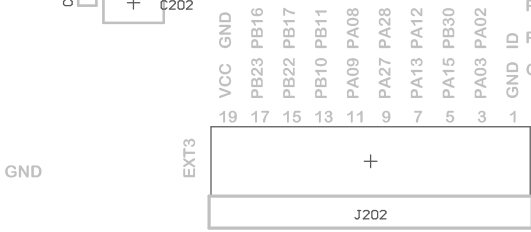
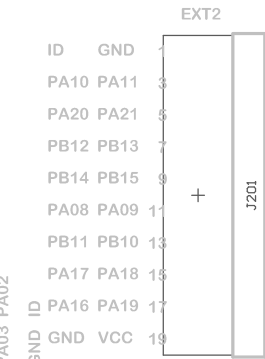
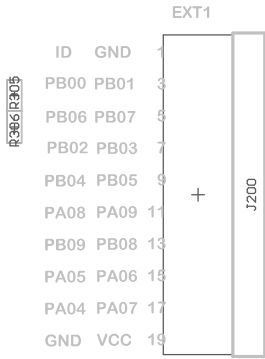
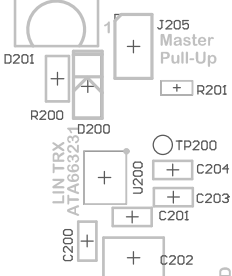
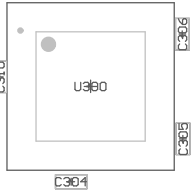


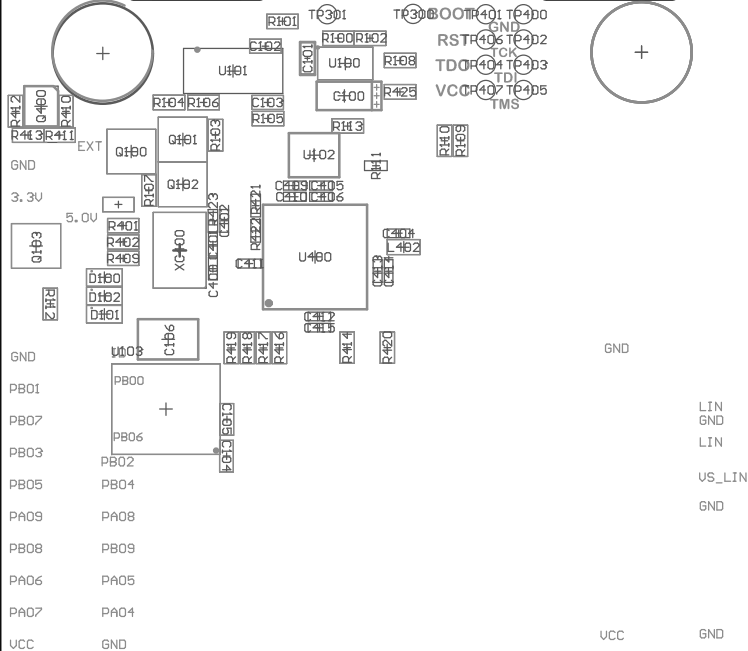
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SAMDA1 X PLAINED PRO



32kHz CRYSTAL





XPLAINED PRO
EXTENSION HEADER

GND	ID
PA11	PA10
PA21	PA20
PB13	PB12
PB15	PB14
PA09	PA08
PB10	PB11
PA18	PA17
PA19	PA16
UCC	GND

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

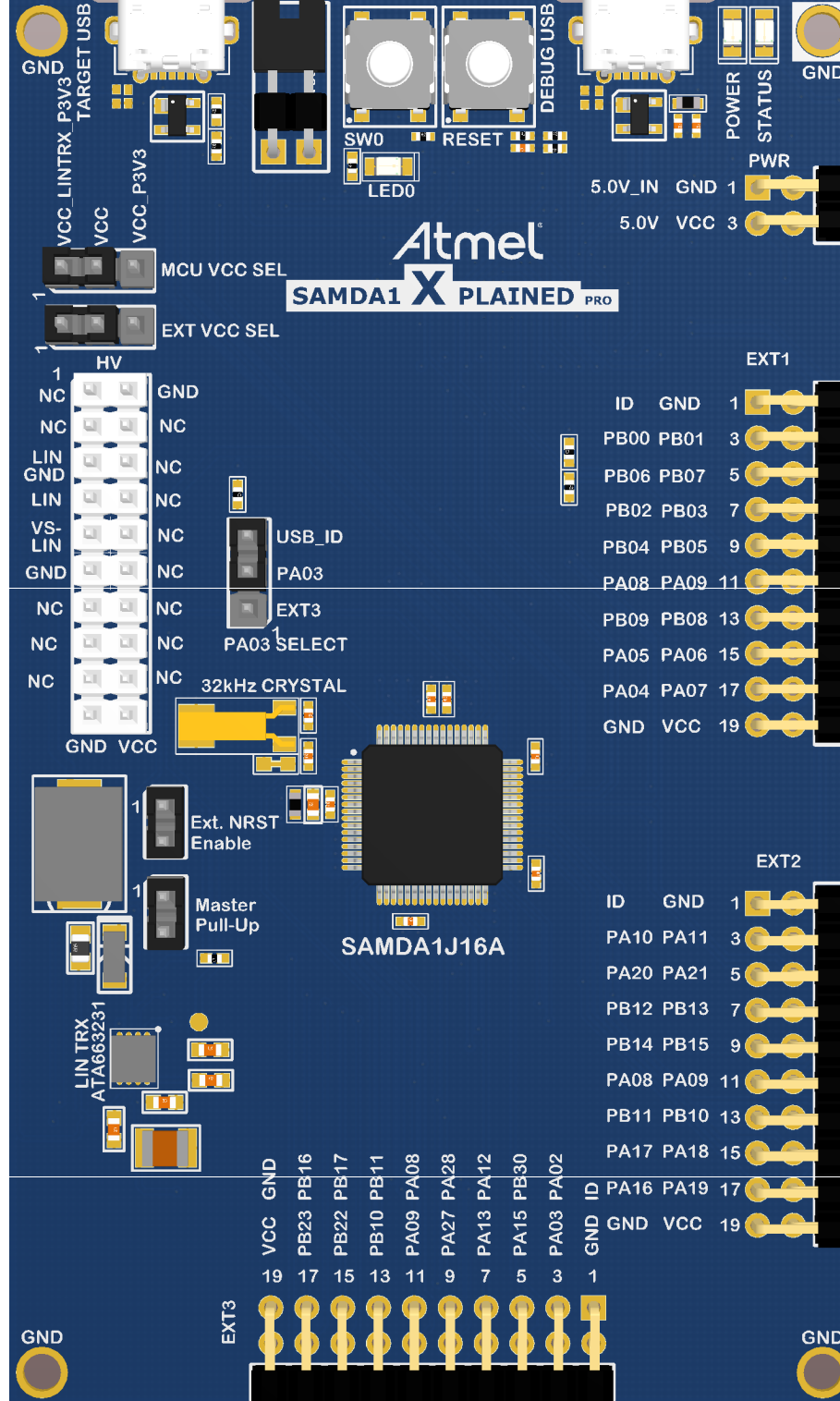
GND	ID
PA03	PA02
PA15	PB30
PA13	PA12
PA27	PA28
PA09	PA08
PB10	PB11
PB22	PB17
PB23	PB16
UCC	GND

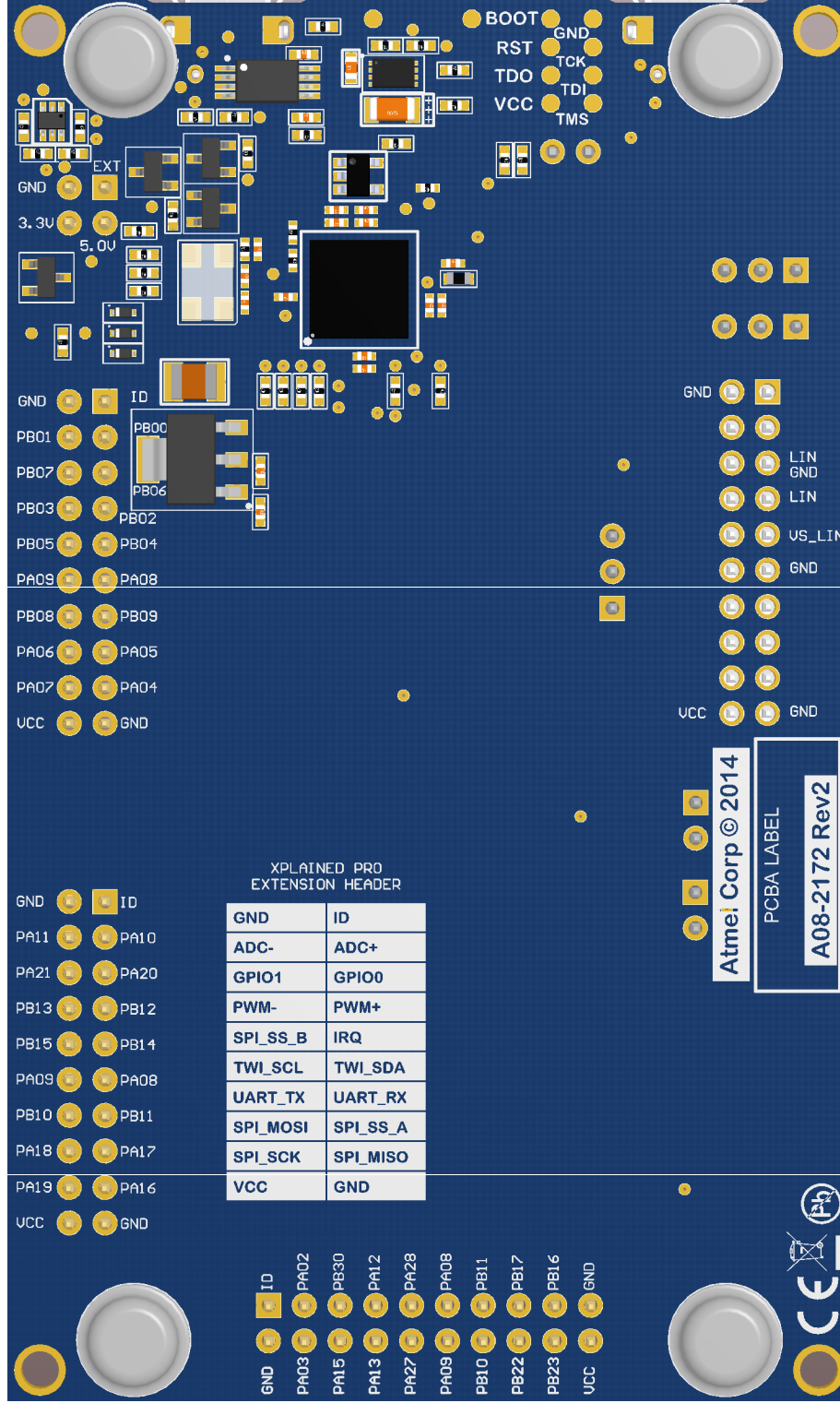
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PCBA LABEL
LABEL1

A08-2172 Rev2







BOOT
GND
RST
TCK
TDO
TDI
VCC
TMS

EXT
GND
3.3V
5.0V

GND ID
PB01
PB07
PB03
PB02
PB05
PB04
PA09
PA08

PB08
PB09
PA06
PA05
PA07
PA04
UCC
GND

GND ID
PA11
PA10
PA21
PA20
PB13
PB12
PB15
PB14
PA09
PA08
PB10
PB11
PA18
PA17
PA19
PA16
UCC
GND

XPLAINED PRO
EXTENSION HEADER

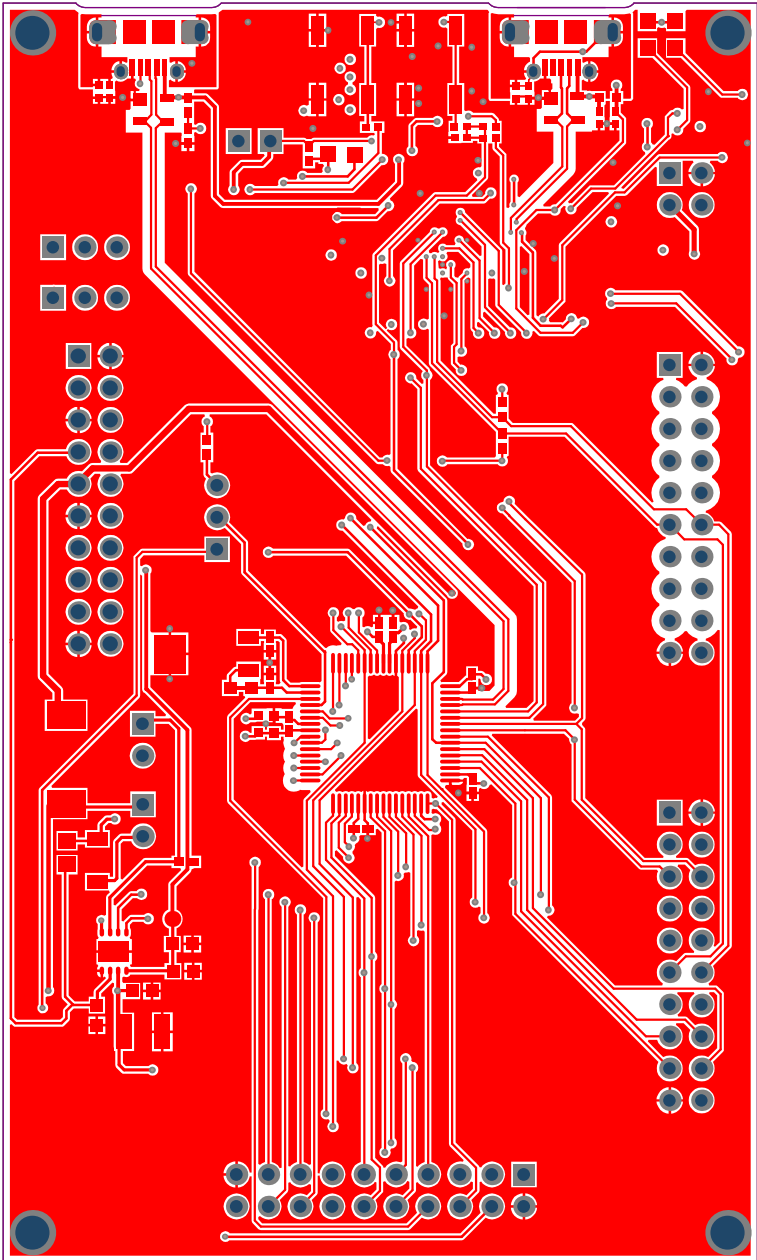
GND	ID
ADC-	ADC+
GPIO1	GPIO0
PWM-	PWM+
SPI_SS_B	IRQ
TWI_SCL	TWI_SDA
UART_TX	UART_RX
SPI_MOSI	SPI_SS_A
SPI_SCK	SPI_MISO
VCC	GND

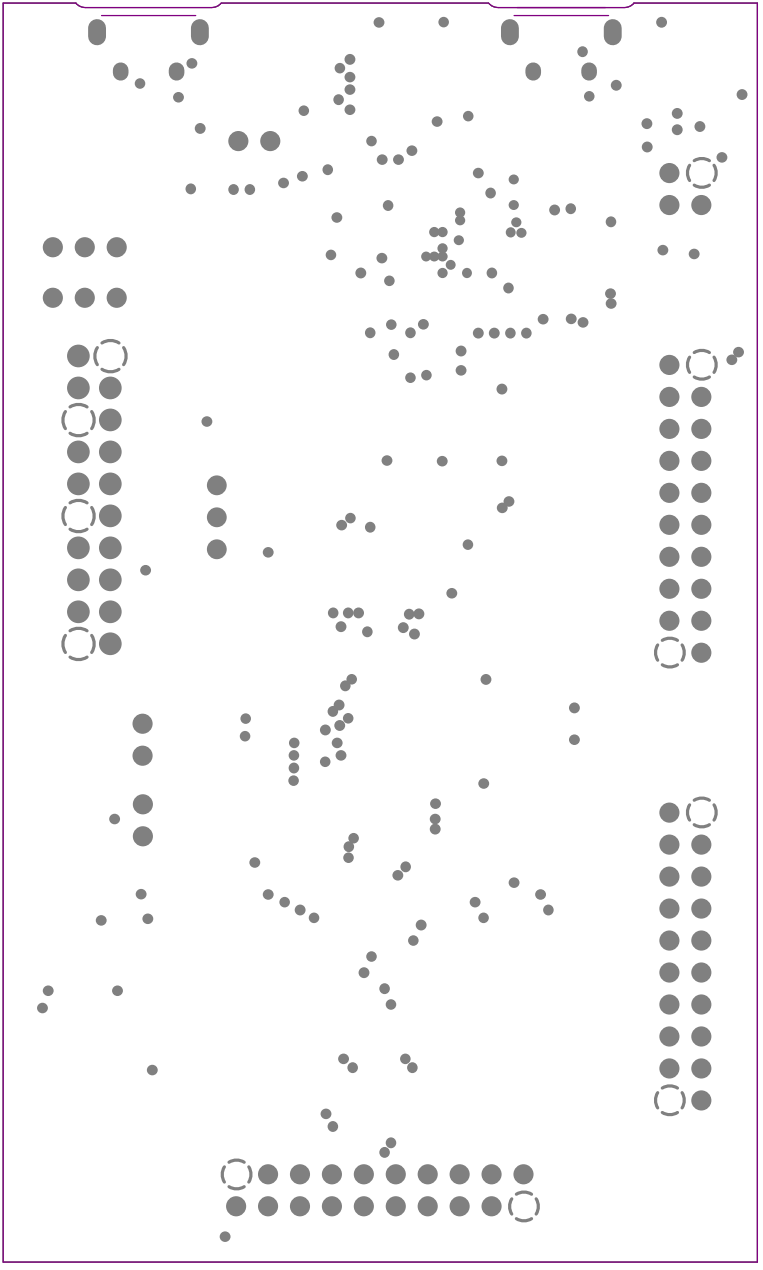
GND ID
PA03
PA02
PA15
PA10
PA13
PA12
PA27
PA28
PA09
PA08
PB10
PB11
PB22
PB17
PB23
PB16
UCC
GND

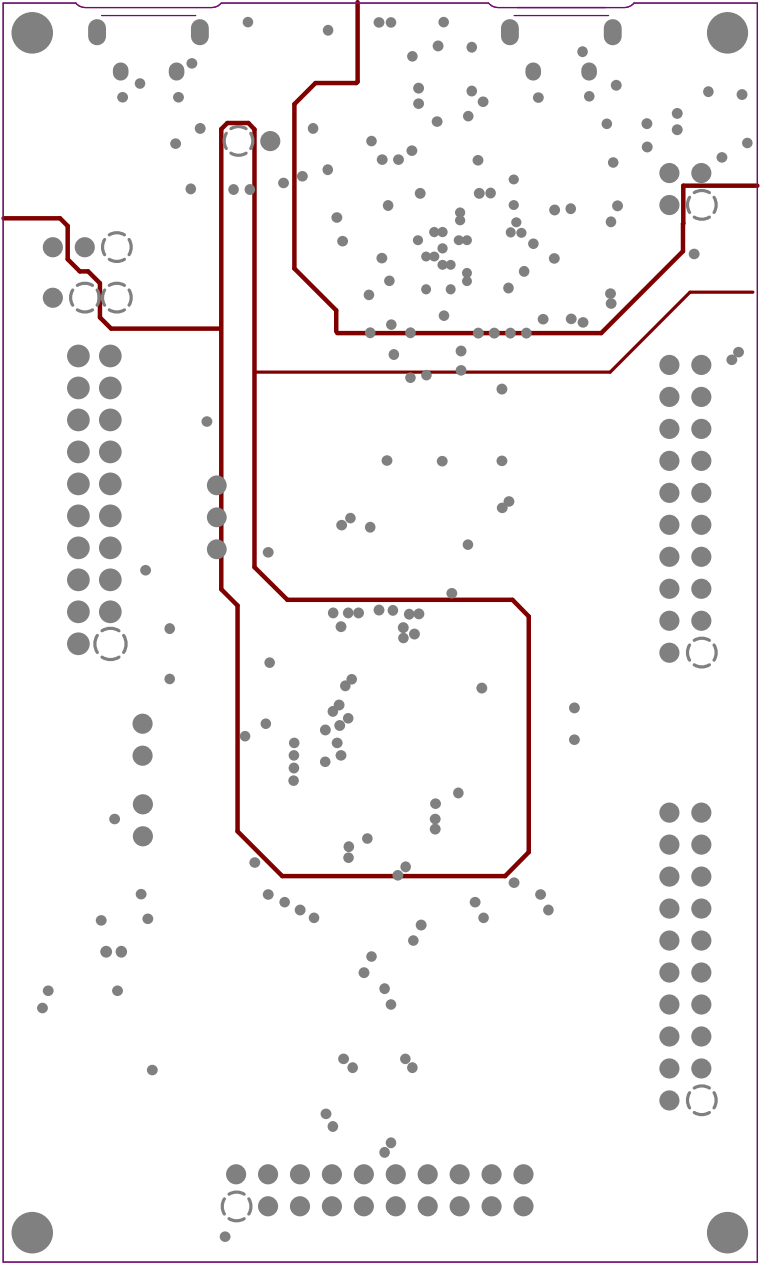
GND
LIN
GND
LIN
VS_LIN
GND
UCC
GND

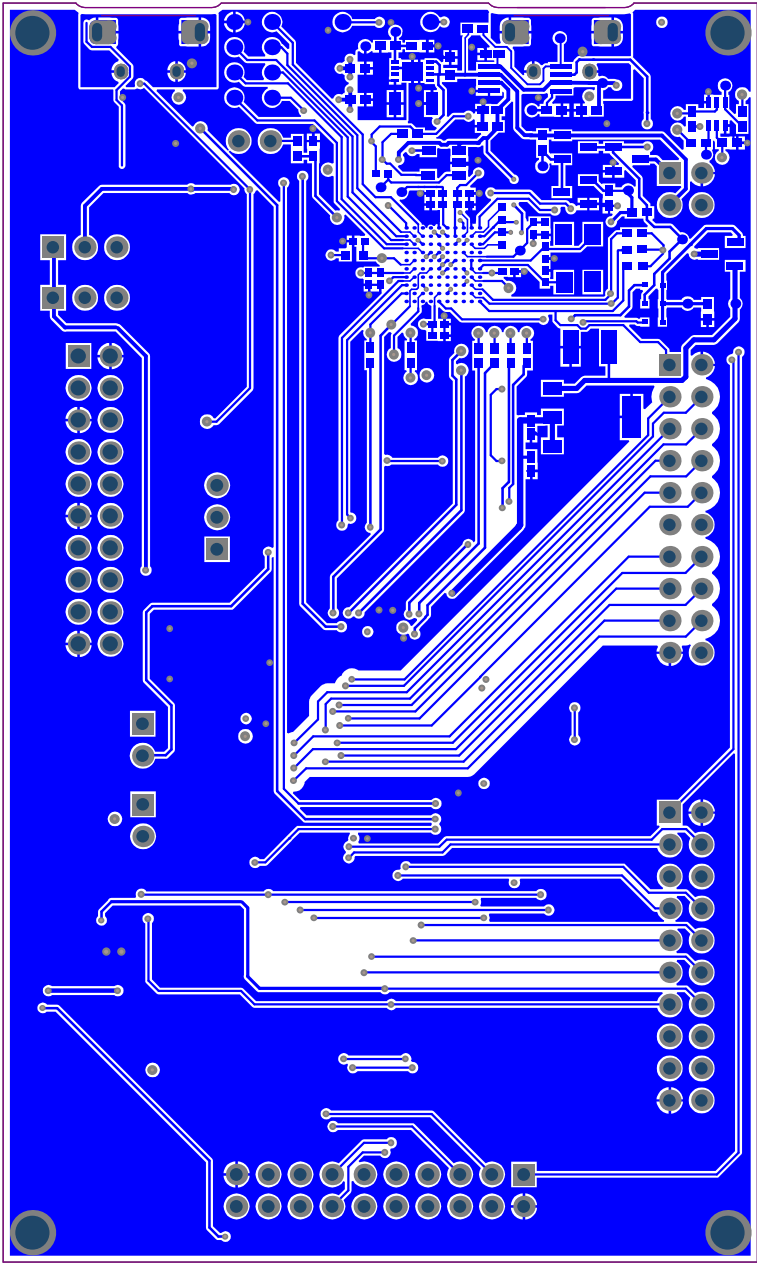
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PCBA LABEL
A08-2172 Rev2











Component list

Top Level Schematics



Source Data From: SAMDA1_Xplained_Pro.PrjPCB
 Project: SAMDA1_Xplained_Pro.PrjPCB
 Variant: Default_assembly

Report Date: 9/14/2015 11:37:39 AM
 Print Date: 9/14/2015 11:37:35 AM

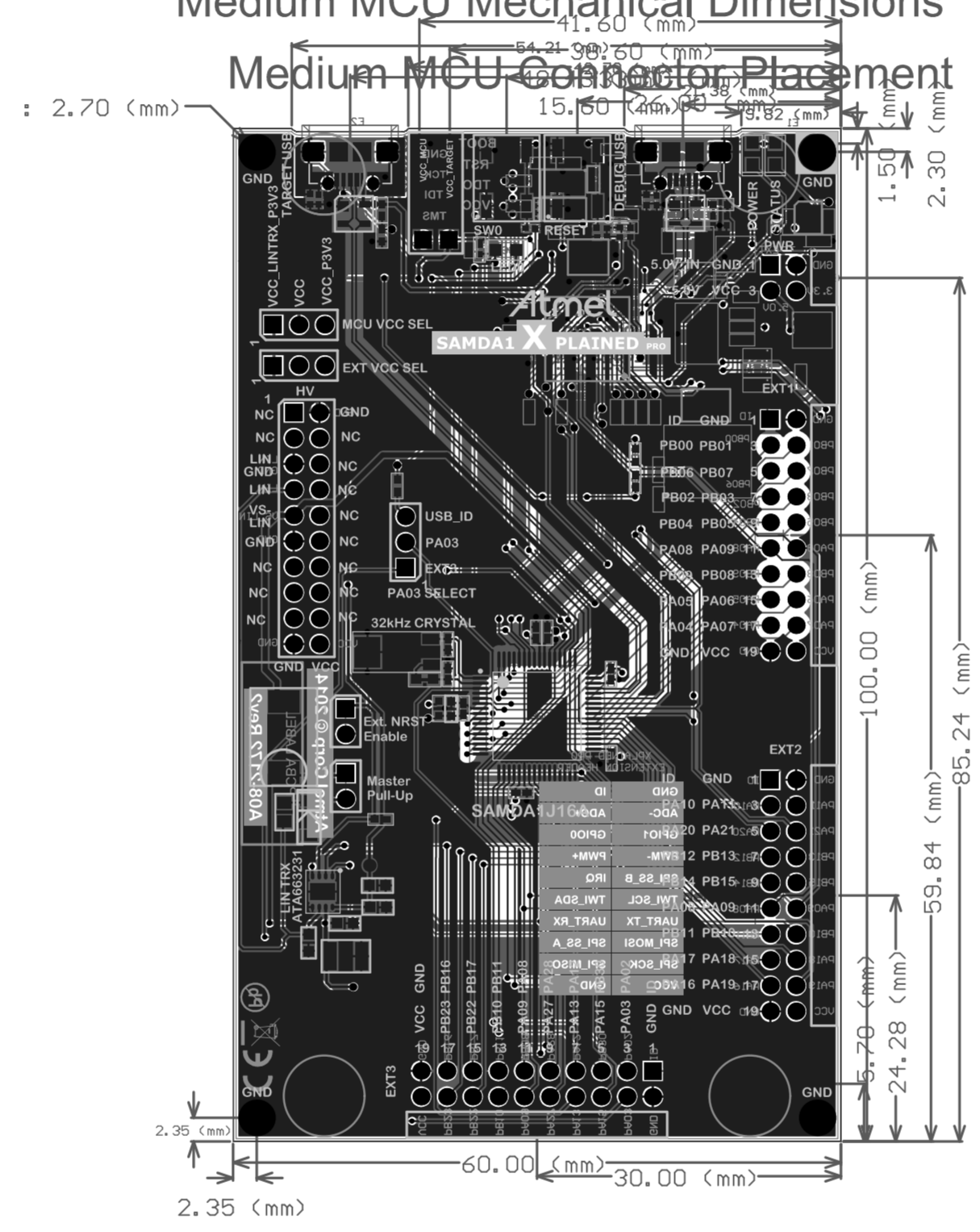
Fitted	Designator	Quantity	Value	Manufacturer	MPN	Description
Fitted	C100	1	10u	vishay	TR3A106K016C1700	SMD tantalum capacitor, ESR = 1.7, 3216-18 (EA) 1206.
Fitted	C101	1	4.7uF	tkk	C1608XR5R1A475K	Ceramic capacitor, SMD 0603, X5R, 10V, 10% (de31036)
Fitted	C102, C103, C106, C304, C305, C306, C307, C310	8	100n	Kemet	C0402C104K4RACTU	Ceramic capacitor, SMD 0402, X7R, 16V, +/-10%
Fitted	C104, C308	2	1u	Kemet	C0402C105K9PAC	Ceramic capacitor, SMD 0402, X5R, 6.3V, +/-10% (de26942)
Fitted	C106	1	22u	Murata	GRM32ER61C226KE20L	Ceramic capacitor, SMD 1210, X5R, 16V, +/-10%
Fitted	C200	1	220p			Ceramic capacitor, SMD 0603, X7R, 50V, +/-10%
Fitted	C201, C203	2	100nF	AVX	0603SC104KA72A	Ceramic capacitor, SMD 0603, X7R, 50V, +/-10%
Fitted	C202	1	100uF50V	tkk	CSA6P0X7S1H106K	Ceramic capacitor, SMD 1210, X7S, 50V, +/-10%
Fitted	C204	1	2.2uF	Murata	GRM1885C1H221UA01D	Ceramic capacitor, SMD 0603, X7R, 50V, +/-10%
Fitted	C301, C404, C410, C411, C412, C413	6	100n	Kemet	C0402C104K4RACTU	Ceramic capacitor, SMD 0402, X7R, 16V, +/-10%
Fitted	C302, C303	2	6.8p			Ceramic capacitor, SMD 0402, NPO, 50V, +/-5%
Fitted	C309	1	10uF16V	Taiyo Yuden	EMK107BBJ106MA-T	Ceramic capacitor, SMD 0603, X5R, 16V, 10UF +/- 20% (High Density)
Fitted	C400, C401	2	22p			Ceramic capacitor, SMD 0402, NPO, 50V, +/-5%
Fitted	C402	1	10p			Ceramic capacitor, SMD 0402, NPO, 50V, +/-5%
Fitted	C405, C409, C414, C415	4	2.2uF	Kemet	C0402C225M6PAC	Ceramic capacitor, SMD 0402, X5R, 6.3V, +/-20%
Fitted	C406, C407, C408	3	1nF COG	Murata	GRM1555C1H102JA01D	Ceramic capacitor, SMD 0402, C0G, 50V, +/-5%
Fitted	D100, D101, D102	3	BA154VZ2T1G	ON Semiconductor	BA154VZ2T1G	Schottky diode, If:200mA, Vf:0.35V, Vrrm:30V, SCD-523
Fitted	D200	1	FDL14148	Fairchild	FDL14148	SMD Diode, LL-34
Fitted	D201	1	MBR340T3G	ON Semiconductor	MBR340T3G	(0.5V max) 3A Schottky diode
Fitted	D300, D402	2	FR1RSV0L2X	Philips	FR1RSV0L2X	Double rail-to-rail USB ESD protection diode
Fitted	D301	1	EL17-21UYCA3	Everlight	17-21UYCS530-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	D401	1	EL17-21UYCA2	Everlight	17-21UYCS530-A3/TR8	LED, Yellow, Wave length=591nm, SMD 0805, +/-70°
Fitted	E1, E2, E3, E4	4	SJ-5076	3M	SJ-5076	2.8mm adhesive feet, diam 8.0mm
Fitted	FKTURE1	1	Xplained PRO MCU board Jupiter Test Fixture	ESCA/TEC	Xplained PRO MCU board Jupiter Test Fixture	Xplained PRO MCU board Jupiter Test Fixture
Fitted	FW1	1	ESBG secured firmw are			ESBG secured firmw are
Fitted	J100	1	PI01-2*10RGP-139-ND		PI01-2*10RGP-139-ND	Pin header, 2x12, Right Angle, 2.54mm, THM, Pin In Paste
Fitted	J101	1	Pin header 1x2 right angle	Pro-data International Corp	2213R-3G	1x2 pin header, right angle, 2.54 mm pitch, through-hole
Fitted	J102, J103	2	HMTSW-103-23-F-S-237	SAMTEC	HMTSW-103-23-F-S-237	1x3 pin header, 2.54mm pitch, Pin-in-Paste THM, 1mm hole
Fitted	J200, J201, J202	3	PI01-2*10RGP-139-ND		PI01-2*10RGP-139-ND	Pin header, 2x10, Right Angle, 2.54mm, THM, Pin In Paste
Fitted	J203	1	HMTSW-110-23-F-D-237	SAMTEC	HMTSW-110-23-F-D-237	2x10 pin header, 2.54mm pitch, Pin-in-Paste THM
Fitted	J204, J205	2	HMTSW-102-23-F-S-237	SAMTEC	HMTSW-102-23-F-S-237	1x2 pin header, 2.54mm pitch, Pin-in-Paste THM
Fitted	J300, J400	2	ZX62D-AB-5P8			Micro USB AB Connector, Standard SMT + DIP
Fitted	J307	1	HMTSW-103-23-F-S-237	SAMTEC	HMTSW-103-23-F-S-237	1x3 pin header, 2.54mm pitch, Pin-in-Paste THM, 1mm hole
Fitted	JS101, JS102, JS103, JS200, JS201, JS300	6	SNT-100-BK-G	SAMTEC	SNT-100-BK-G	Jumper cap for 2.54mm pinheader
Fitted	L300, L401, L402	3	BLM18PG471SN1	Murata	BLM18PG471SN1	SMD RF inductor 0603, Z=4700ohm (@100MHz), Max R(dc)=0.650hm, Max current=1A
Fitted	LABEL1	1	PCBA Label	ACT Logimark AS	505462	PCBA identification label PP Top White Gloss
Fitted	PCB1	1	SAM DA1 Xplained Pro PCB			SAM DA1 Xplained Pro PCB, 4 layer, 60mm x 100mm
Fitted	PCBADOC1	1	A09-2379 PCBA Files			SAMDA1 Xplained Pro PCBA documentation
Fitted	Q100, Q101, Q103	3	RLM6402PBF	International Rectifier	RLM6402PBF	P-ch. MOSFET, -30V, -3.7A continuous RDS(ON)=0.050hm@VGS=4.5V, RDS(ON)=0.080hm@VGS=2.5V
Fitted	Q102	1	2N7002.215	NXP	2N7002.215	N-Channel MOSFET, 60V, 0.300A continuous, 1.2A Peak, RDS(ON) = 3.80hm@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, R307	2	30k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R103, R112	2	100k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R106	1	39K			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R107, R109, R110, R113, R308	5	47k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R108, R425	2	0R			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R111, R300	2	100k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R114	1	39k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R200	1	1k	Panasonic		Thick film resistor, SMD 0805, 0.125W, 1%
Fitted	R201	1	10k	vishay		Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R302, R304, R315, R421, R422	5	39R			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R303, R309, R411, R412, R414, R416, R417, R418, R419, R420	10	330R			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R305, R306	2	4.7k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R401, R402, R409	3	1k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R423	1	6.81k			Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	SW300, SW301	2	SKRAAKB10	ALPS	SKRAAKB10	6.2x6.2 mm SMD tact sw/itch, same as A08-0091 but less force is needed
Fitted	TEST1	1	SAMDA1 Xplained Pro test software			Fixture egg Test for SAMDA1 Xplained Pro
Fitted	TESTDOC1	1	SAMDA1 Xplained Pro Test Instructions			SAMDA1 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	Autosw iching 2:1 Power Max
Fitted	U102	1	STM32F301S1R			Single channel power sw icht, TA, reverse block, active low enabled.
Fitted	U103	1	NCV4266S150T3G	ON Semiconductor	NCV4266S150T3G	150mA Low-Dropout Voltage Regulator with Enable, Vout=5V, VIn<0.5V, Vin=40V, SOT223-4
Fitted	L200	1	ATA683231-FAQW	ATMEL		LIN SBC TRX with VREG (3.3V/85mA) VDFN_3x3_8L
Fitted	L300	1	SAMDA1J16A-ABT			Atmel 32-bit RISC ARM/MCU
Fitted	U400	1	ATS232C34256J-CTUR	ATMEL	ATS232C34256J-CTUR	AVR 32-bit RISC/MCU
Fitted	XC300	1	32.768kHz +/-20PPM 7P SMD	Micro Crystal	MS1V-11K 32.768kHz 7P +/-20PPM 1A	32k768 crystal, +/-20ppm, CL=7pF, max ESR 60kOhm, SMD
Fitted	XC400	1	12.0MHz	Fox Electronics	FO5032B-12-C-C-C-200-1	Fox FO5032B 12.0MHz SMD crystal 7388-12
Not Fitted	C300, C403	0	4.7n			Ceramic capacitor, SMD 0402, X7R, 25V, +/-10%
Not Fitted	R301, R424	0	1M	KOA	RK73H1ETP1004F	Thick film resistor, SMD 0402, 1/16W, 1%


Approved

Notes

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Medium MCU Test Points Placement
 Medium MCU Mechanical Dimensions



 <p>ATMEL NORWAY Vestre Rosten 79 N-7075 Tiller</p>	ENGINEER:	TITLE:		
	PCB DESIGNER:			
DATE:	9/14/2015	PART NO.:	REV:	
FILE NAME:	SAMD11_xplained_Pro.PcbDoc	DWG NO.:	SCALE:	