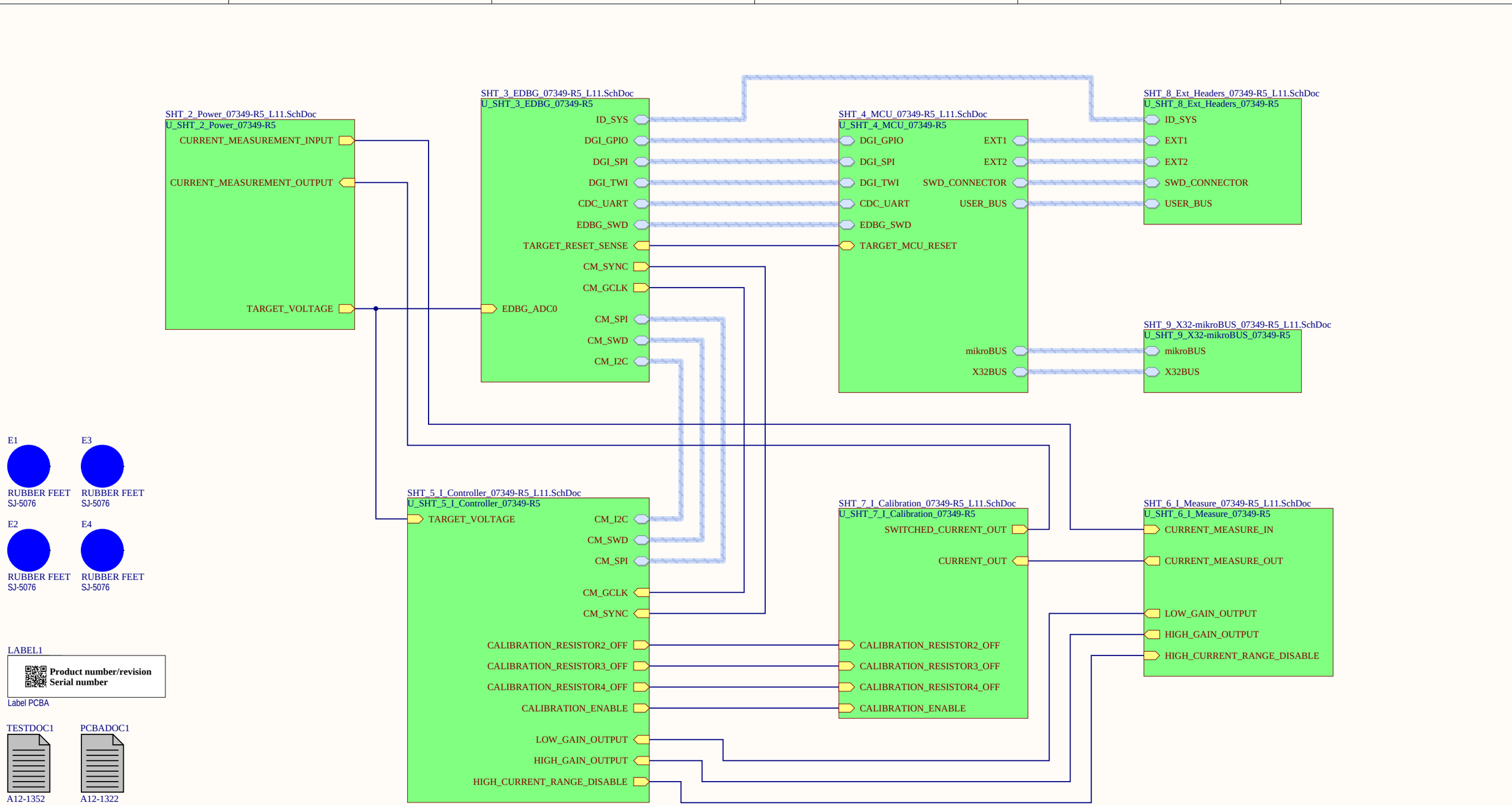
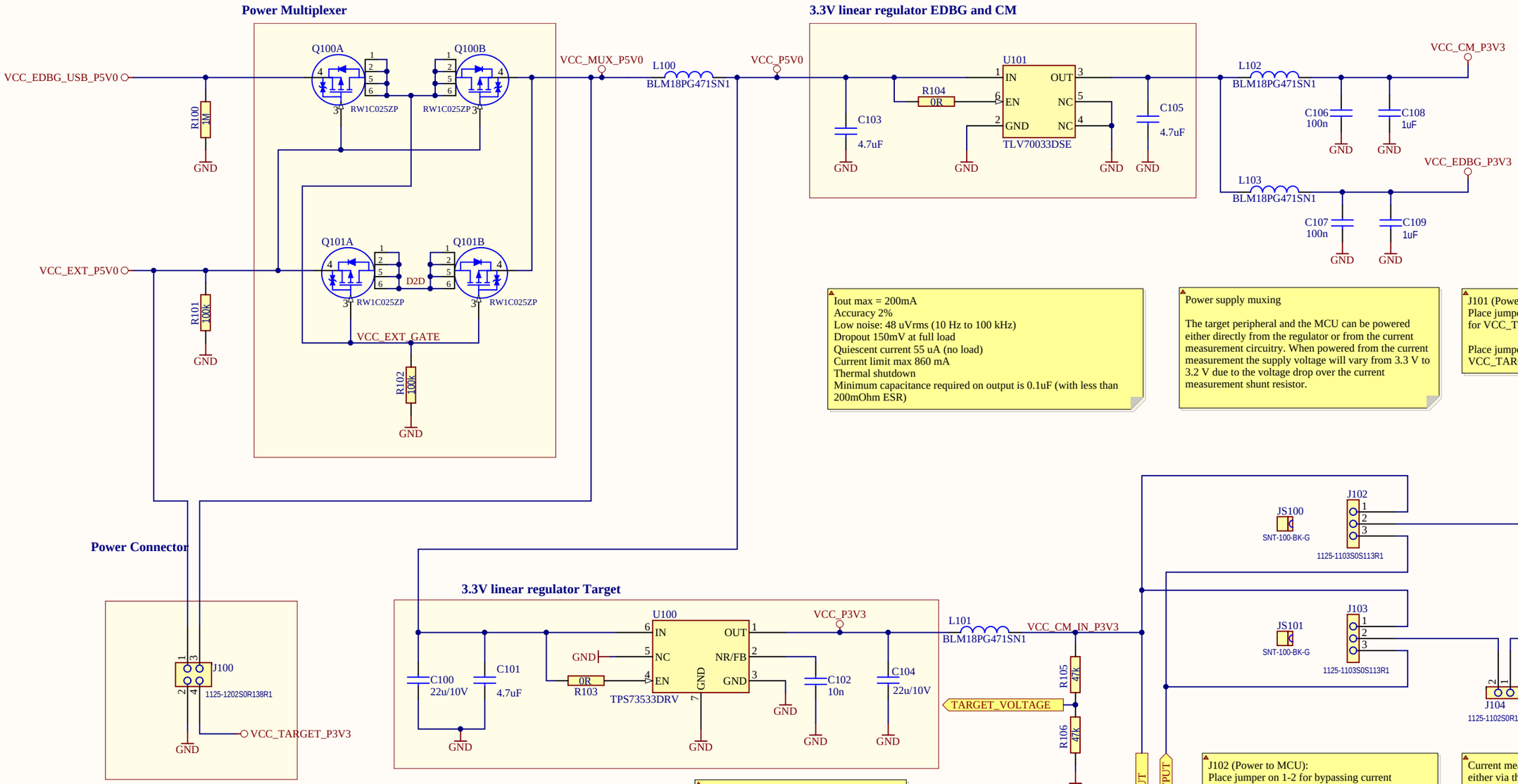


Drawn By: Roger Hathaway	MICROCHIP
Engineer: Roger Hathaway	
PartNumber: 07-07349_L11	Project Title: *SAM L11 Xplained Pro*
Sheet Title: Top Level Block Diagram	Designed with Altium — Altium.com
Size: B — Sch #:03-07349_L11 — Date: 5/14/2018 1:19:06 PM	
Revision: 5 — Sheet 1 of 9	
File: SHT_1_Top Level_07349-R5_L11.SchDoc	

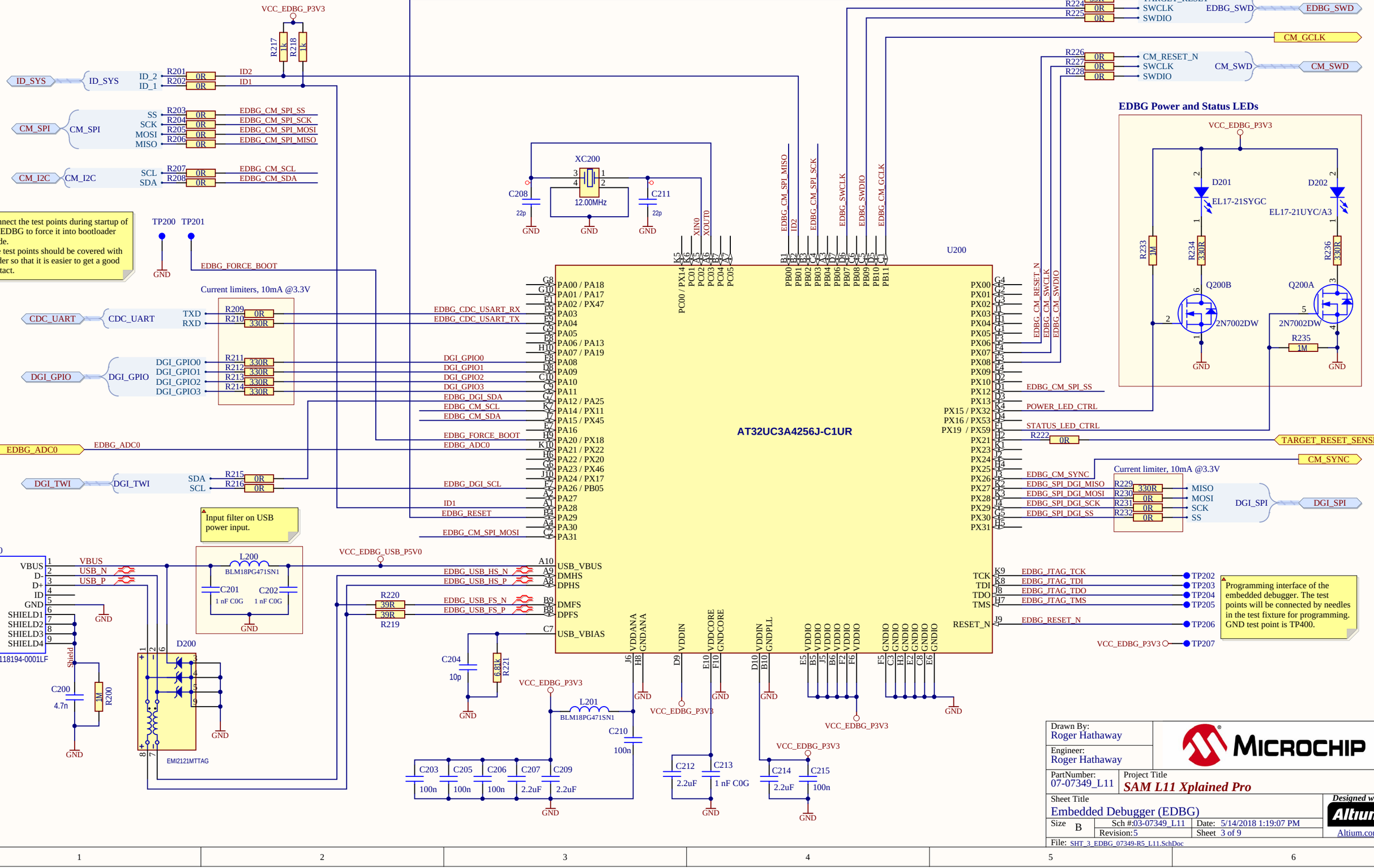


Drawn By:	Roger Hathaway
Engineer:	Roger Hathaway
PartNumber:	07-07349_L11
Project Title	*SAM L11 Xplained Pro*
Sheet Title	Input Source Select and Power Supplies
Size	B
Sch #:	03-07349_L11
Date:	5/14/2018 1:19:06 PM
Revision:	5
Sheet	2 of 9
File:	SHT_2_Power_07349-R5_L11.SchDoc

MICROCHIP

Designed with Altium

Altium.com


VCC_EDBG_P3V3
R217 1k
R218 1k
ID_SYS
ID_SYS
ID_2
ID_1
R201 0R
R202 0R
ID2
ID1
CM_SPI
CM_SPI
SS
SCK
MOSI
MISO
R203 0R
R204 0R
R205 0R
R206 0R
EDBG_CM_SPI_SS
EDBG_CM_SPI_SCK
EDBG_CM_SPI_MOSI
EDBG_CM_SPI_MISO
CM_I2C
CM_I2C
SCL
SDA
R207 0R
R208 0R
EDBG_CM_SCL
EDBG_CM_SDA
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.
TP200
TP201
GND
EDBG_FORCE_BOOT
Current limiters, 10mA @3.3V
CDC_UART
CDC_UART
TXD
RXD
R209 0R
R210 330R
EDBG_CDC_USART_RX
EDBG_CDC_USART_TX
DGI_GPIO
DGI_GPIO
DGI_GPIO0
DGI_GPIO1
DGI_GPIO2
DGI_GPIO3
R211 330R
R212 330R
R213 330R
R214 330R
DGI_GPIO0
DGI_GPIO1
DGI_GPIO2
DGI_GPIO3
EDBG_DGI_SDA
EDBG_CM_SCL
EDBG_CM_SDA
EDBG_FORCE_BOOT
EDBG_ADC0
EDBG_ADC0
EDBG_ADC0
DGI_TWI
DGI_TWI
SDA
SCL
R215 0R
R216 0R
EDBG_DGI_SCL
ID1
EDBG_RESET
EDBG_CM_SPI_MOSI
Input filter on USB power input.
J200
VBUS
D-
D+
ID
GND
SHIELD1
SHIELD2
SHIELD3
SHIELD4
10118194-0001LF
VBUS
USB_N
USB_P
Shield
C200 4.7n
R200 1M
L200
BLM18PG471SN1
C201 1 nF C0G
C202 1 nF C0G
VCC_EDBG_USB_P5V0
D200
EMI2121MTTAG
R220 39R
R219 39R
EDBG_USB_HS_N
EDBG_USB_HS_P
EDBG_USB_FS_N
EDBG_USB_FS_P
XC200
12.00MHz
C208 22p
C211 22p
XIN0
XOUT0
C204 10p
R221 6.81k
VCC_EDBG_P3V3
L201
BLM18PG471SN1
C210 100n
C203 100n
C205 100n
C206 100n
C207 2.2uF
C209 2.2uF
C212 2.2uF
C213 1 nF C0G
C214 2.2uF
C215 100n
U200
AT32UC3A4256J-C1UR
PA00 / PA18
PA01 / PA17
PA02 / PX47
PA03
PA04
PA05
PA06 / PA13
PA07 / PA19
PA08
PA09
PA10
PA11
PA12 / PA25
PA14 / PX11
PA15 / PX45
PA16
PA20 / PX18
PA21 / PX22
PA22 / PX20
PA23 / PX46
PA24 / PX17
PA26 / PB05
PA27
PA28
PA29
PA30
PA31
PC00 / PX14
PC01
PC02
PC03
PC04
PC05
PB00
PB01
PB02
PB03
PB04
PB05
PB06
PB07
PB08
PB09
PB10
PB11
PX00
PX01
PX02
PX03
PX04
PX05
PX06
PX07
PX08
PX09
PX10
PX12
PX13
PX15 / PX32
PX16 / PX53
PX19 / PX59
PX21
PX23
PX24
PX25
PX26
PX27
PX28
PX29
PX30
PX31
USB_VBUS
DMHS
DPHS
DMFS
DPFS
USB_VBIAS
TCK
TDI
TDO
TMS
RESET_N
VDDANA
GNDANA
VDDIN
VDDCORE
GNDCORE
VDDIO
GNDIO
GNDPLL
EDBG_CM_SPI_MISO
EDBG_CM_SPI_SCK
EDBG_SWCLK
EDBG_SWDIO
EDBG_CM_GCLK
EDBG_CM_RESET_N
EDBG_CM_SWCLK
EDBG_CM_SWDIO
EDBG_CM_SPI_SS
POWER_LED_CTRL
STATUS_LED_CTRL
EDBG_CM_SYNC
EDBG_SPI_DGI_MISO
EDBG_SPI_DGI_MOSI
EDBG_SPI_DGI_SCK
EDBG_SPI_DGI_SS
EDBG_JTAG_TCK
EDBG_JTAG_TDI
EDBG_JTAG_TDO
EDBG_JTAG_TMS
EDBG_RESET_N
R223 39R
R224 0R
R225 0R
TARGET_RESET
SWCLK
SWDIO
EDBG_SWD
EDBG_SWD
CM_GCLK
R226 0R
R227 0R
R228 0R
CM_RESET_N
SWCLK
SWDIO
CM_SWD
CM_SWD
R222 0R
TARGET_RESET_SENSE
CM_SYNC
Current limiter, 10mA @3.3V
R229 330R
R230 0R
R231 0R
R232 0R
MISO
MOSI
SCK
SS
DGI_SPI
DGI_SPI
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.
TP202
TP203
TP204
TP205
TP206
TP207
VCC_EDBG_P3V3
EDBG Power and Status LEDs
D201
EL17-21SYGC
D202
EL17-21UYC/A3
R233 1M
R234 330R
R236 330R
Q200B
2N7002DW
Q200A
2N7002DW
R235 1M
GND
Drawn By: Roger Hathaway
Engineer: Roger Hathaway
PartNumber: 07-07349_L11
Project Title: SAM L11 Xplained Pro
Sheet Title: Embedded Debugger (EDBG)
Size B
Sch #:03-07349_L11
Revision:5
Date: 5/14/2018 1:19:07 PM
Sheet 3 of 9
File: SHT_3_EDBG_07349-R5_L11.SchDoc
Designed with Altium
Altium.com

EDBG_SWD
TARGET_RESET
EDBG_SWD
SWCLK
SWDIO
TARGET_MCU_RESET
SWCLK
SWDIO

DGI_GPIO
DGI_GPIO
DGI_GPIO0
DGI_GPIO1
DGI_GPIO2
DGI_GPIO3
PA10_GPIO1_S2_USART_RTS
PA11_GPIO2_S2_USART_CTS
PA23_GPIO_SS
PA27_GPIO_SS

DGI_TWI
DGI_TWI
SDA
SCL
PA16_S1_I2C_SDA
PA17_S1_I2C_SCL

CDC_UART
CDC_UART
RXD
TXD
PA25_UART_RX
PA24_UART_TX

DGI_SPI
DGI_SPI
SS
MOSI
MISO
SCK
PA07_LED_PWM_TC0
PA14_S0_SPI_MOSI
PA04_S0_SPI_MISO
PA15_S0_SPI_SCK

TARGET_MCU_RESET
TARGET_MCU_RESET

Option
VCC_TARGET_P3V3
R331 DNP
R332 DNP

Close to VDDCORE
C308 100n
C309 1u
GND
J300
JS300
SNT-100-BK-G
1125-1102S0S113R1

I2C PULL-UP
VCC_TARGET_P3V3
R329 4.7k
R330 4.7k
PA16_S1_I2C_SDA
PA17_S1_I2C_SCL

Close to VDDIO/GND pair
VCC_MCU_P3V3
L302
BLM18PG471SN1
VDDIO
C304 100n
C306 10uF/16V
GND GND

L301
10uH
GND
VDDCORE
TARGET_MCU_RESET
PA27_GPIO_SS
SWDIO
SWCLK

U301
ATSAML11E16A-AU

32	31	30	29	28	27	26	25																
PA31 / SWDIO	PA30 / SWCLK	VDDIO	VDDOUT	GND	VDDCORE	RESET	PA27																

XIN32 — R302 0R — PA00 1 — PA00 / XIN32
XOUT32 — R303 0R — PA01 2 — PA01/ XOUT32
PA02_ADC0 3 PA02
PA03_ADC1_VREF 4 PA03
PA04_S0_SPI_MISO 5 PA04
PA05_S0_SPI_SS 6 PA05
PA06_SPI_SS 7 PA06
PA07_LED_PWM_TC0 8 PA07

PA25 24 PA25_UART_RX
PA24 23 PA24_UART_TX
I2C / PA23 22 PA23_GPIO_SS
I2C / PA22 21 PA22_GPIO_IRQ_1
PA19 20 PA19_PWM_TC2_1
PA18 19 PA18_PWM_TC2_0
I2C / PA17 18 PA17_S1_I2C_SCL
I2C / PA16 17 PA16_S1_I2C_SDA

9	10	11	12	13	14	15	16																
VDDANA	GND	PA08	PA09	PA10	PA11	PA14 / XIN	PA15 / XOUT																

PA08_S2_UART_TX
PA09_S2_UART_RX
PA10_GPIO1_S2_USART_RTS
PA11_GPIO2_S2_USART_CTS
PA14_S0_SPI_MOSI
PA15_S0_SPI_SCK
R304 0R
R305 0R

Close to VDDANA/GNDANA
VCC_MCU_P3V3
L300
BLM18PG471SN1
VCC_MCU_VDDANA
C305 4.7uF
C307 100n
GND

SWDIO
SWCLK
SWD
SWD_CONNECTOR
TARGET_MCU_RESET
TARGET_RESET

PA02_ADC0
PA03_ADC1_VREF
PA10_GPIO1_S2_USART_RTS
PA11_GPIO2_S2_USART_CTS
PA18_PWM_TC2_0
PA19_PWM_TC2_1
PA22_GPIO_IRQ_1
PA23_GPIO_SS
PA16_S1_I2C_SDA
PA17_S1_I2C_SCL
PA09_S2_UART_RX
PA08_S2_UART_TX
PA05_S0_SPI_SS
PA14_S0_SPI_MOSI
PA04_S0_SPI_MISO
PA15_S0_SPI_SCK
PIN3_ADC(+)
PIN4_ADC(-)
PIN5_GPIO
PIN6_GPIO
PIN7_PWM(+)
PIN8_PWM(-)
PIN9_IRQ/GPIO
PIN10_SPI_SS_B/GPIO
PIN11_TWI_SDA
PIN12_TWI_SCL
PIN13_UART_RX
PIN14_UART_TX
PIN15_SPI_SS_A
PIN16_SPI_MOSI
PIN17_SPI_MISO
PIN18_SPI_SCK
EXT
EXT1

PA27_GPIO_SS
PA16_S1_I2C_SDA
PA17_S1_I2C_SCL
PA25_UART_RX
PA24_UART_TX
PA06_SPI_SS
PA14_S0_SPI_MOSI
PA04_S0_SPI_MISO
PA15_S0_SPI_SCK
EXT
EXT2

PA02_ADC0
TARGET_MCU_RESET
PA05_S0_SPI_SS
PA15_S0_SPI_SCK
PA04_S0_SPI_MISO
PA14_S0_SPI_MOSI
PA16_S1_I2C_SDA
PA17_S1_I2C_SCL
PA08_S2_UART_TX
PA09_S2_UART_RX
PA22_GPIO_IRQ_1
PA18_PWM_TC2_0
PIN1_ADC(+)
PIN2_RESET_B
PIN3_SPI_SS_A
PIN4_SPI_SCK
PIN5_SPI_MISO
PIN6_SPI_MOSI
PIN11_TWI_SDA
PIN12_TWI_SCL
PIN13_UART_TX
PIN14_UART_RX
PIN15_IRQ/GPIO
PIN16_PWM(+)
mikroBUS
mikroBUS

PA09_S2_UART_RX
PA11_GPIO2_S2_USART_CTS
PA08_S2_UART_TX
PA10_GPIO1_S2_USART_RTS
PA17_S1_I2C_SCL
TARGET_MCU_RESET
PA16_S1_I2C_SDA
PA05_S0_SPI_SS
PA14_S0_SPI_MOSI
PA15_S0_SPI_SCK
PA04_S0_SPI_MISO
PA22_GPIO_IRQ_1
PA02_ADC0
PIN3_USART_RX
PIN4_USART_CTS
PIN5_USART_TX
PIN6_USART_RTS
PIN7_I2C_SCL
PIN8_STBY/RST_B
PIN9_I2C_SDA
PIN10_DMM/I2S_WS
PIN11_I2S_DIN
PIN12_I2S_CK
PIN13_I2S_DOUT
PIN14A_CLK_AUDIO
PIN14B_I2S_MCK
PIN2_ANALOG_POT
X32BUS
X32BUS

TARGET_MCU_RESET
PA07_LED_PWM_TC0
PA27_GPIO_SS
PA06_SPI_SS
TARGET_MCU_RESET
USER_LED
USER_BUTTON
USER_QTOUCH
USER_BUS
USER_BUS

32 kHz CRYSTAL

Crystal datasheet:
Ccrystal = 9pF
max ESR (limit) = 70kOhm
Accuracy ±20ppm

Datasheet:
Cpara = 2.5pF (Typical)
max ESR =70 kOhm

PCB capacitance: Cpcb = 0.5pF (estimated)

Estimated load:
C = 2x(Ccrystal- Cpara - Cpcb)
C = 2x(9pF - 2.15pF(estimated) - 0.5pF)
C = 12.7pF

Selected in design: C= 13pF
Verification showed: 13pF
Accuracy: less than ±11.8ppm
Startup time: 172ms to reach output
with a 9.5pF probe connected to the crystal.
Safety factor: Above 6

XIN32 XOUT32
XC300 * 32.768kHz
R300 0R
C300 13pF
C301 13pF
GND

Ext 12 MHz CRYSTAL

An external crystal and load capacitors can be soldered to these footprints.

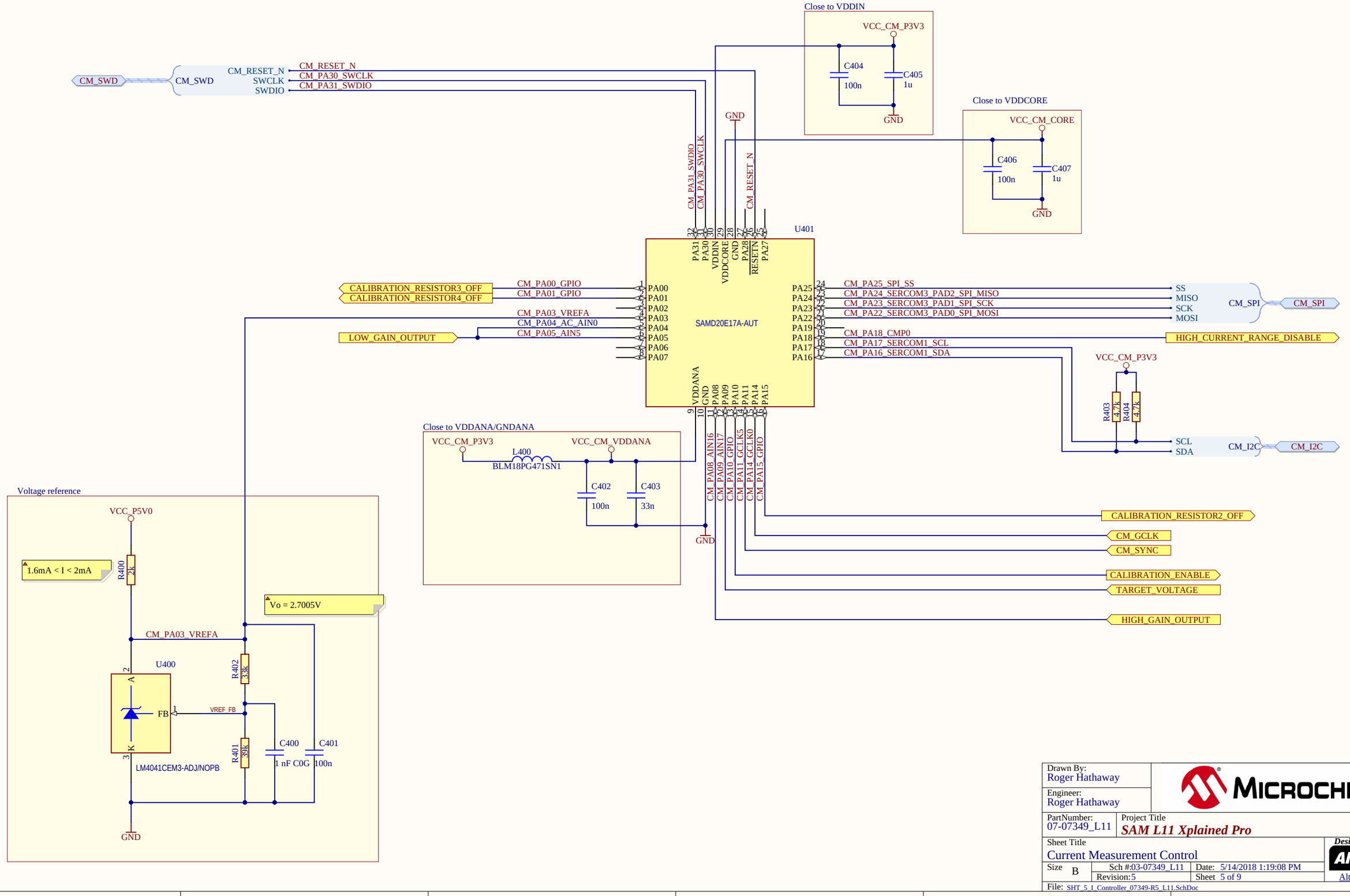
Select a crystal and capacitors for your application based on information from the SAM L11 datasheet.

PA14 PA15
DNP XC301
DNP R333
12.00MHz
GND GND
DNP GND DNP GND

CryptoAuthentication Device

U300
VCC_TARGET_P3V3
PA16_S1_I2C_SDA
PA17_S1_I2C_SCL
R313 0R
R314 0R
1 NC
2 NC
3 NC
4 SDA
5 SCL
6 NC
8 VCC
9 PAD
4 GND
C310 100n
ATECC508A I2C UDFN
GND

Drawn By: Roger Hathaway	MICROCHIP
Engineer: Roger Hathaway	
PartNumber: 07-07349_L11	Project Title: *SAM L11 Xplained Pro*
Sheet Title: Target MCU	Designed with Altium
Size: B	Sch #:03-07349_L11 Date: 5/14/2018 1:19:08 PM
	Revision:5 Sheet 4 of 9
File: SHT_4_MCU_07349-R5_L11.SchDoc	Altium.com



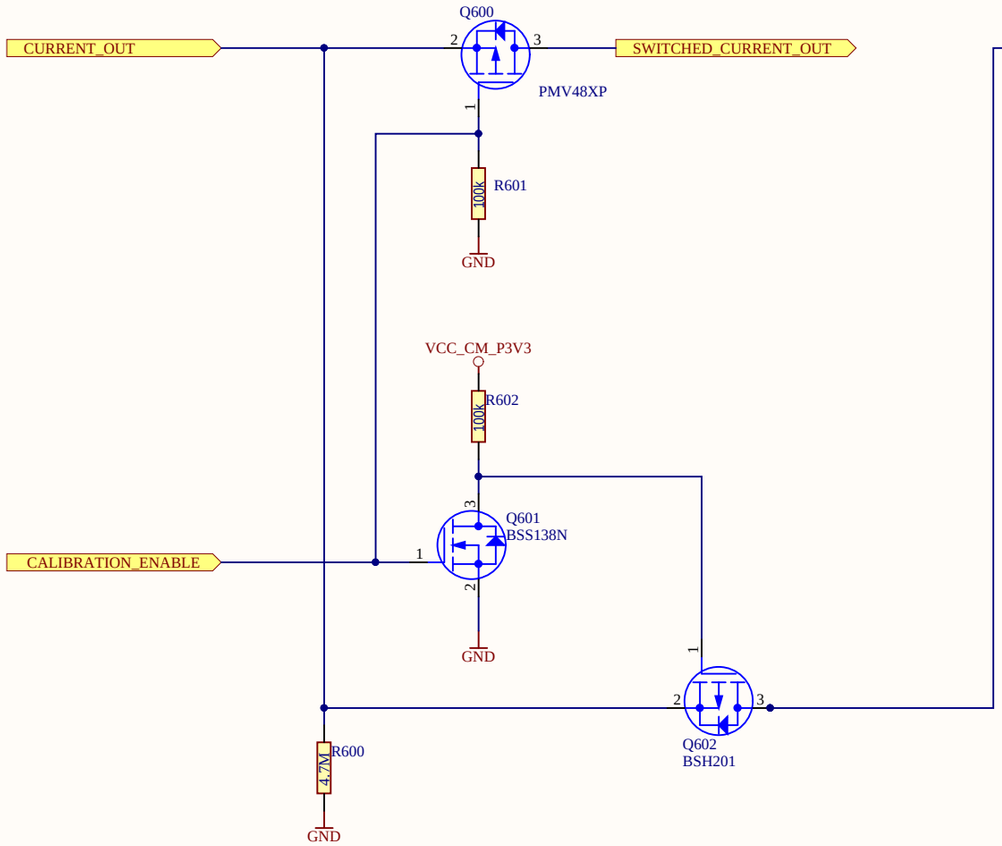
Drawn By:	Roger Hathaway
Engineer:	Roger Hathaway
PartNumber:	07-07349_L11
Project Title	*SAM L11 Xplained Pro*
Sheet Title	Current Measurement Control
Size	B
Sch #:	03-07349_L11
Date:	5/14/2018 1:19:08 PM
Revision:	5
Sheet	5 of 9
File:	SHT_5_I_Controller_07349-R5_L11.SchDoc

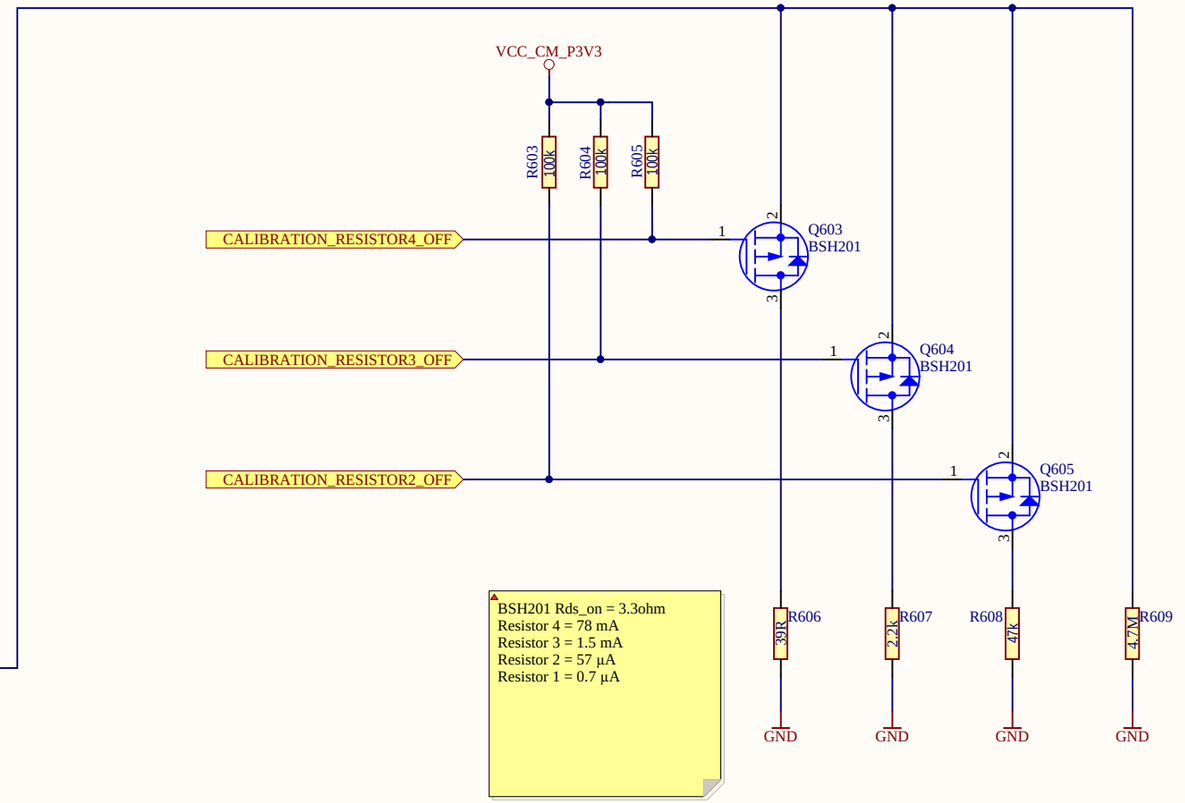
MICROCHIP

Designed with Altium

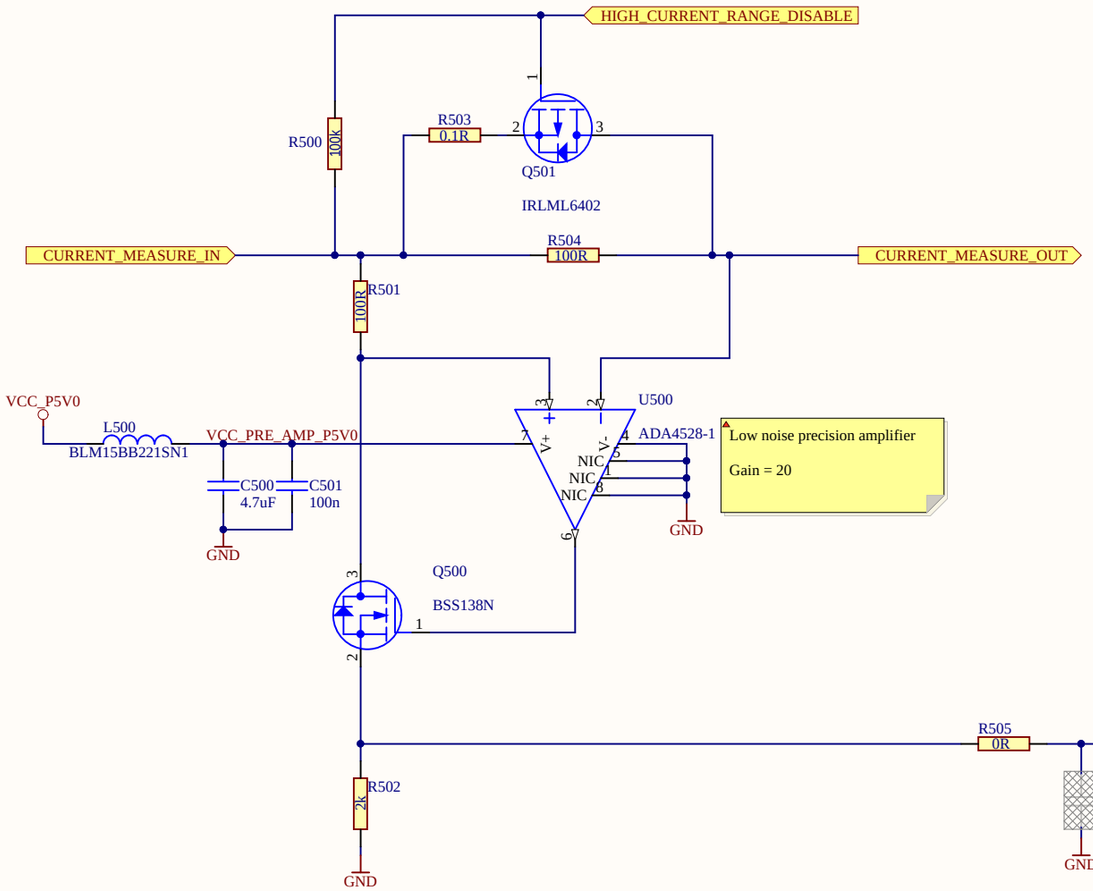
Altium.com

Target disconnect for calibration

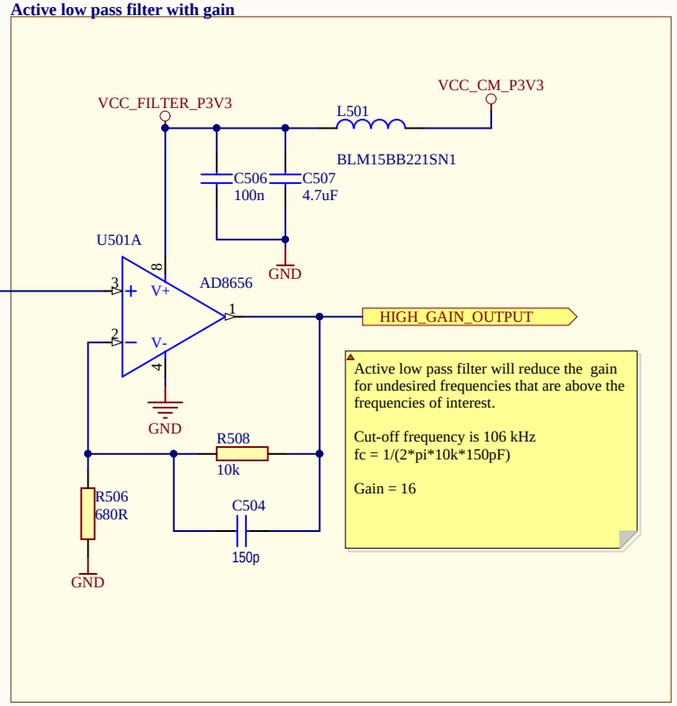




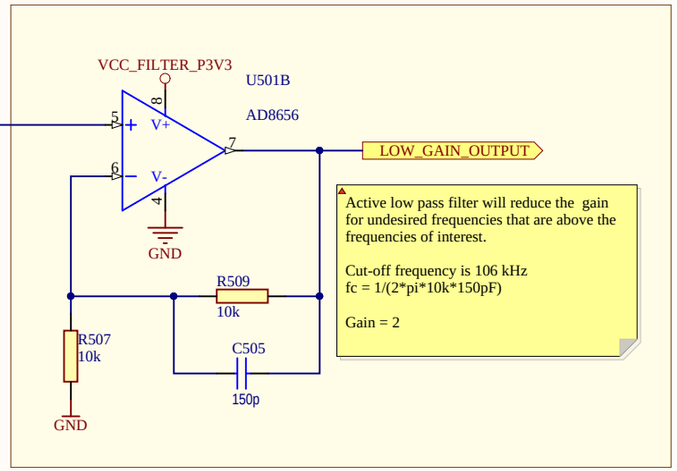
Drawn By: Roger Hathaway	MICROCHIP
Engineer: Roger Hathaway	
PartNumber: 07-07349_L11	Project Title: *SAM L11 Xplained Pro*
Sheet Title: Current Measurement Calibration	Designed with Altium (Altium.com)
Size: B	Sch #:03-07349_L11 · Date: 5/14/2018 1:19:09 PM
	Revision:5 · Sheet 6 of 9
File: SHT_7_I_Calibration_07349-R5_L11.SchDoc	



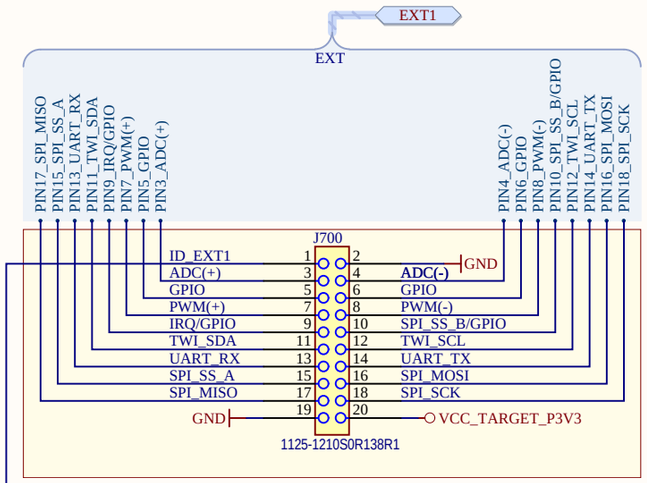
Active low pass filter with gain



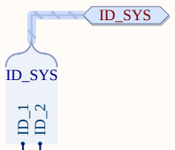
Active low pass filter with gain

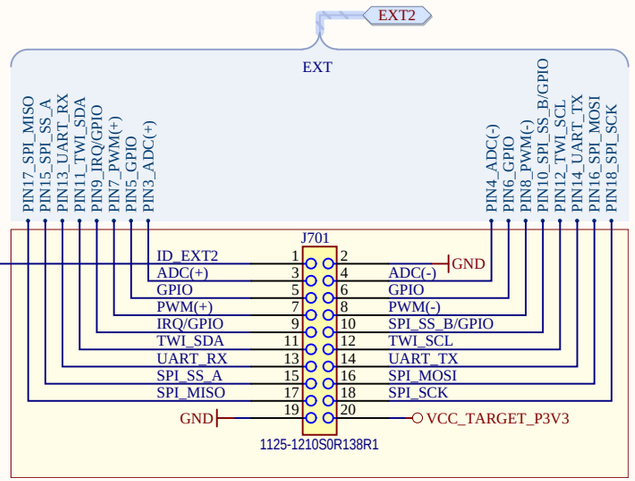


Drawn By: Roger Hathaway	MICROCHIP
Engineer: Roger Hathaway	
PartNumber: 07-07349_L11	Project Title: *SAM L11 Xplained Pro*
Sheet Title: Current Measurement Front End	Designed with Altium — Altium.com
Size: B	Sch #:03-07349_L11 · Date: 5/14/2018 1:19:09 PM · Revision:5 · Sheet 7 of 9
File: SHT_6_I_Measure_07349-R5_L11.SchDoc	

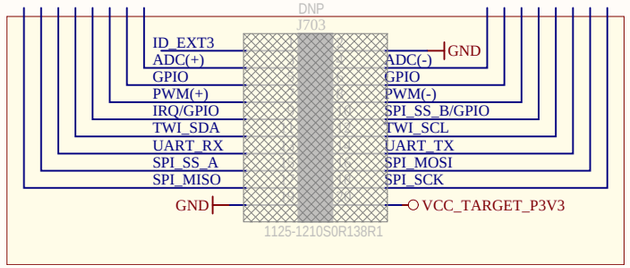


EXT1 extension header

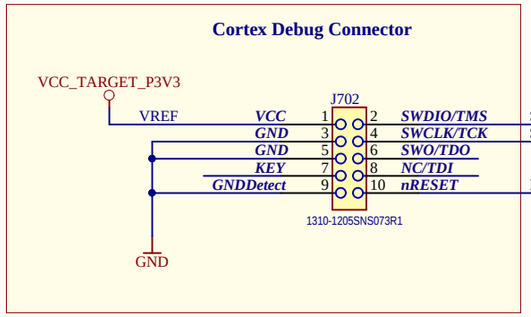




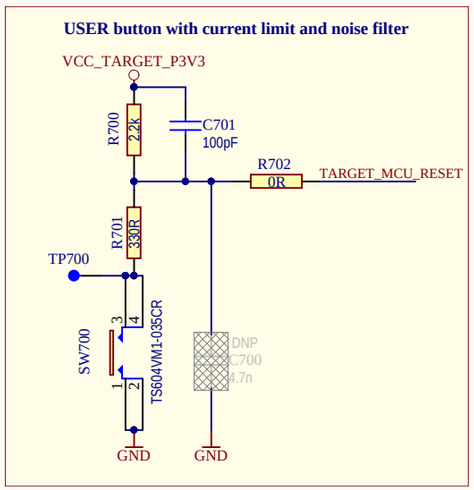
EXT2 extension header

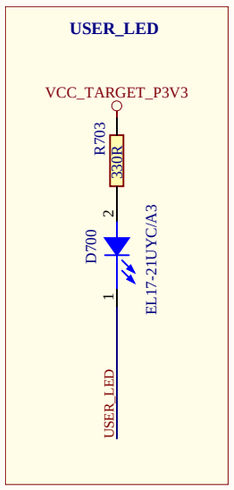


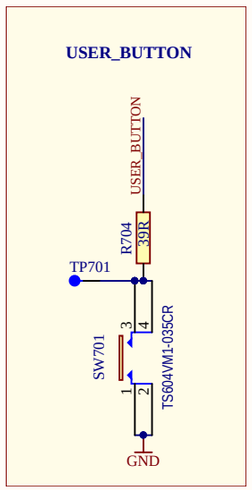
EXT3 extension header

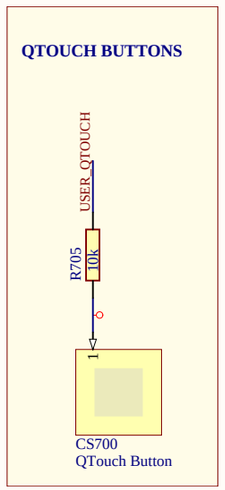




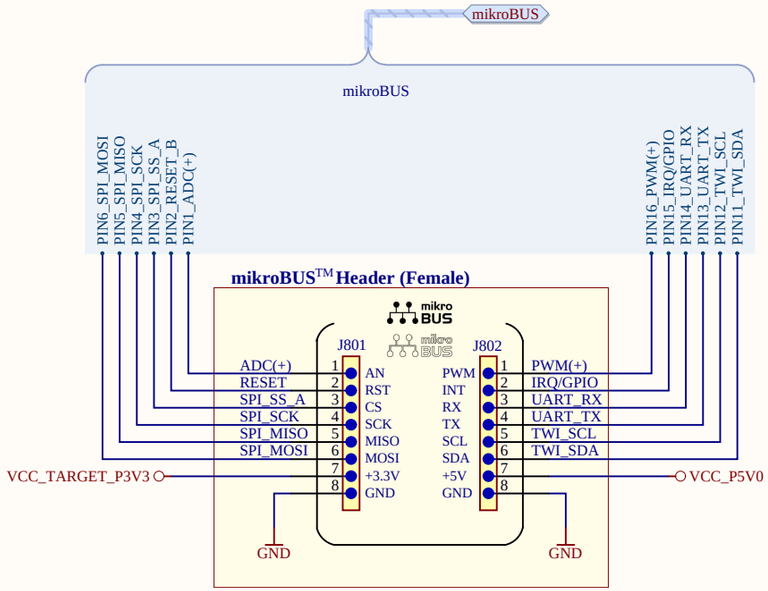


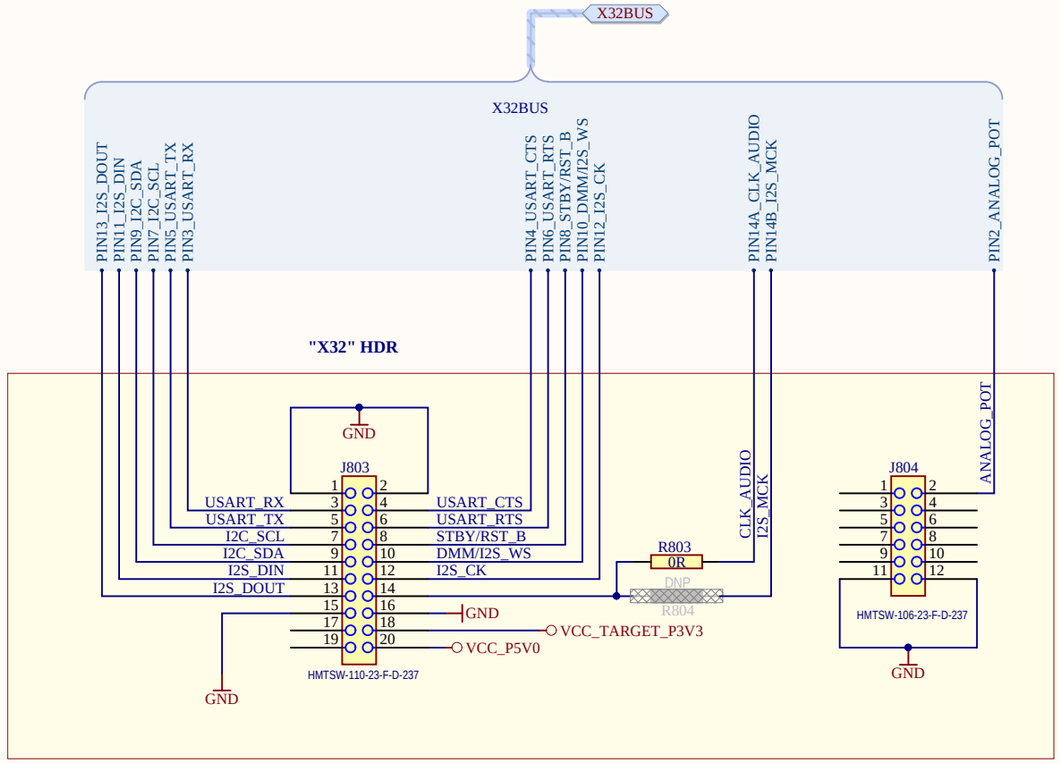


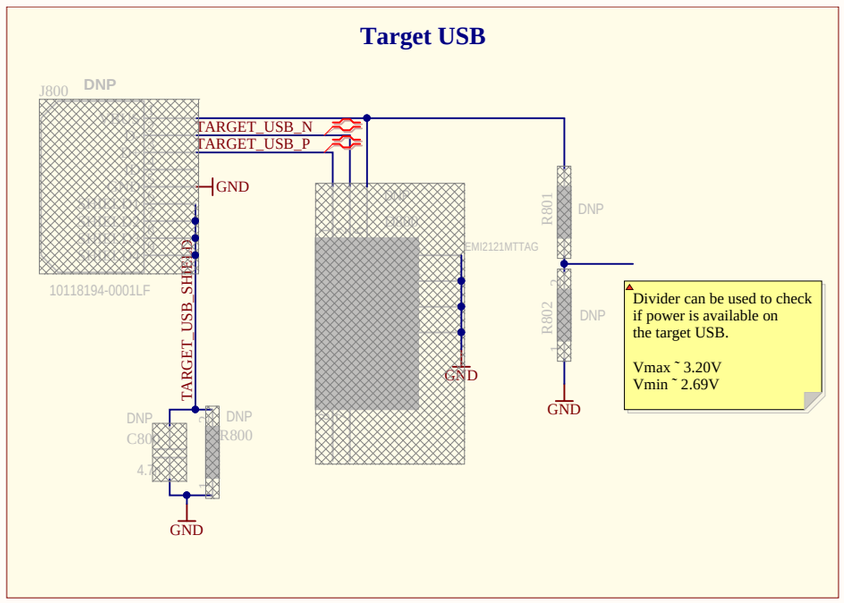




Drawn By: Roger Hathaway	MICROCHIP
Engineer: Roger Hathaway	
PartNumber: 07-07349_L11	Project Title: *SAM L11 Xplained Pro*
Sheet Title: Extension Connectors	Designed with Altium — Altium.com
Size: B	Sch #:03-07349_L11 · Revision:5 · Date: 5/14/2018 1:19:10 PM · Sheet 8 of 9
File: SHT_8_Ext_Headers_07349-R5_L11.SchDoc	







Drawn By: Roger Hathaway	MICROCHIP
Engineer: Roger Hathaway	
PartNumber: 07-07349_L11	Project Title: *SAM L11 Xplained Pro*
Sheet Title: X32 and mikroBUS Connectors	Designed with Altium
Size: B	Sch #:03-07349_L11 · Date: 5/14/2018 1:19:10 PM · Revision:5 · Sheet 9 of 9
File: SHT_9_X32-mikroBUS_07349-R5_L11.SchDoc	Altium.com