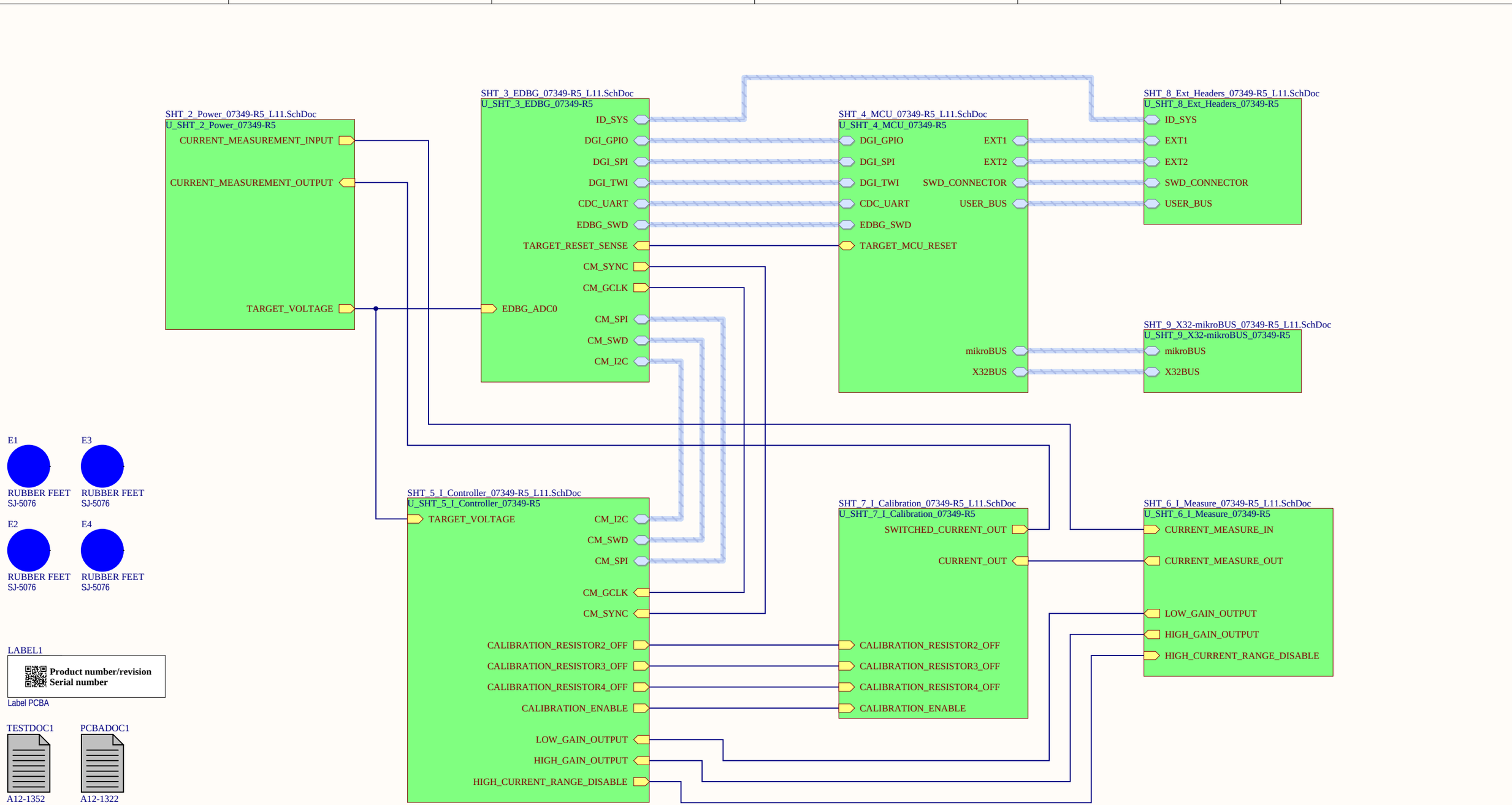
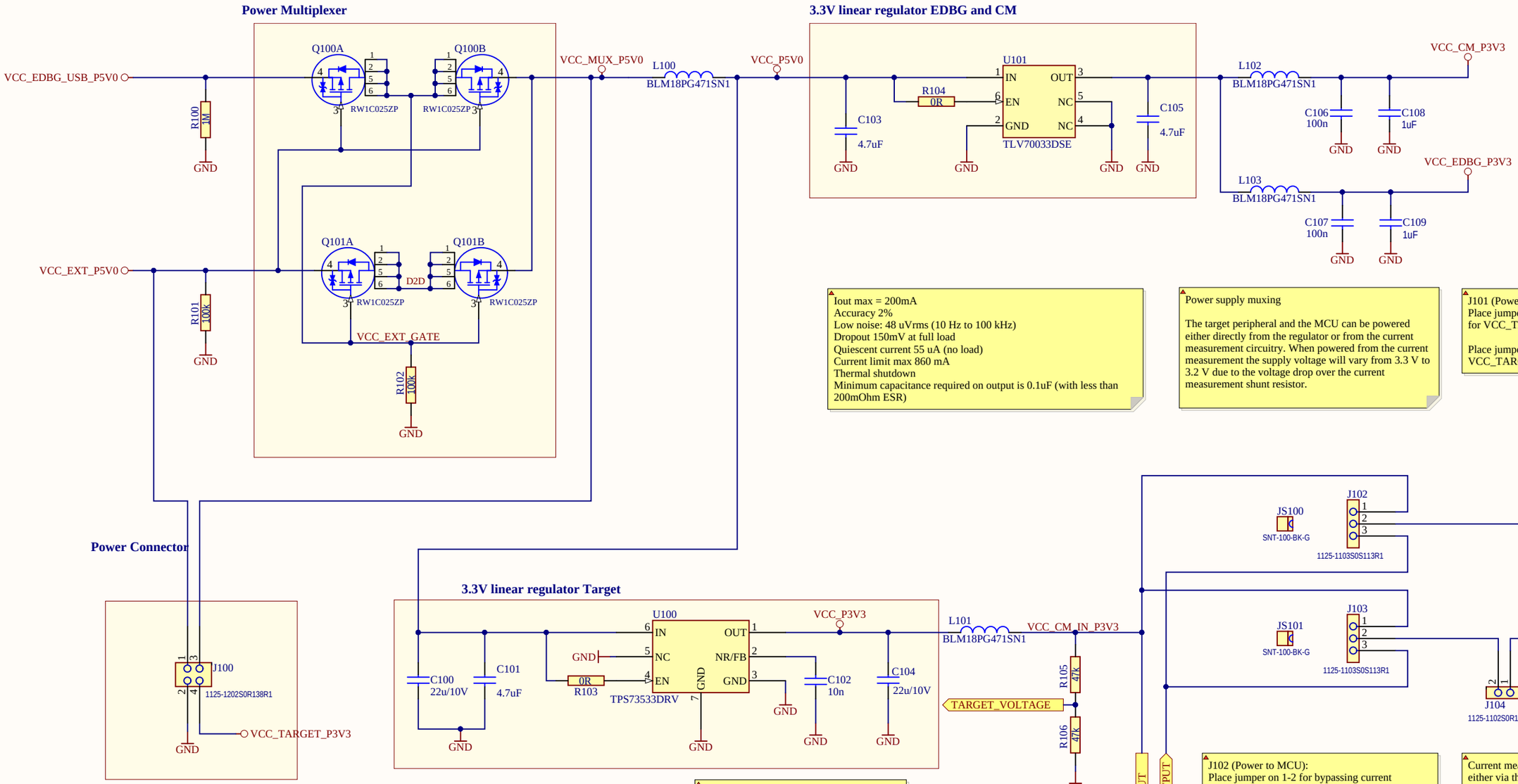



| | |
|---|---|
| Drawn By: Roger Hathaway | MICROCHIP |
| Engineer: Roger Hathaway | |
| PartNumber: 07-07349_L11 | Project Title: *SAM L11 Xplained Pro* |
| Sheet Title: Top Level Block Diagram | Designed with Altium — Altium.com |
| Size B \| Sch #:03-07349_L11 \| Date: 5/14/2018 1:14:57 PM | |
| Revision:5 \| Sheet 1 of 9 | |
| File: SHT_1_Top Level_07349-R5_L11.SchDoc | |

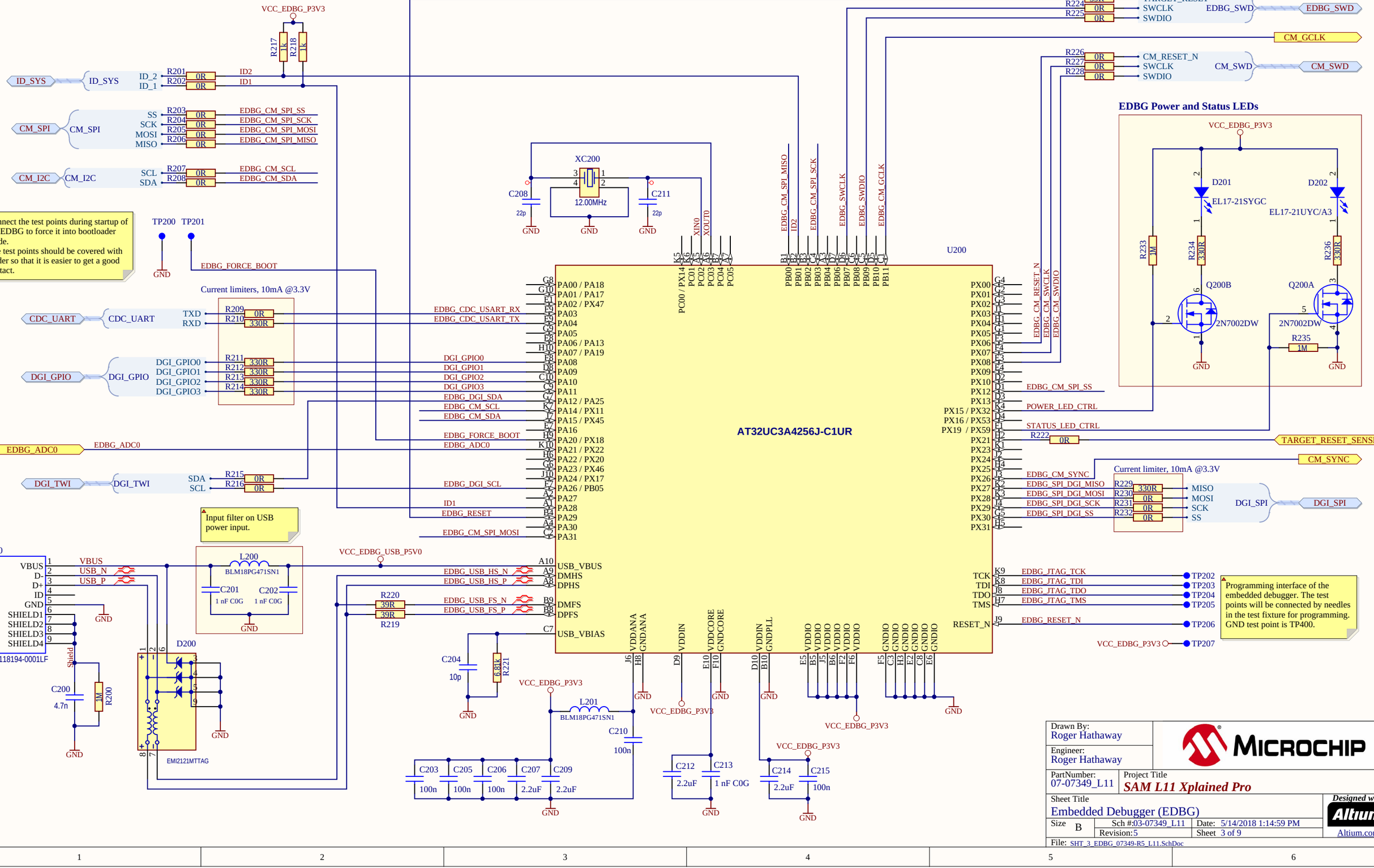



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|---|---|
| Drawn By: | Roger Hathaway |
| Engineer: | Roger Hathaway |
| PartNumber: | 07-07349_L11 |
| Project Title | *SAM L11 Xplained Pro* |
| Sheet Title | Input Source Select and Power Supplies |
| Size | B |
| Sch #: | 03-07349_L11 |
| Date: | 5/14/2018 1:14:58 PM |
| Revision: | 5 |
| Sheet | 2 of 9 |
| File: | SHT_2_Power_07349-R5_L11.SchDoc |

MICROCHIP

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| | |
|---|---|
| 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 |
| Date: | 5/14/2018 1:14:59 PM |
| Revision: | 5 |
| Sheet | 3 of 9 |
| File: | SHT_3_EDBG_07349-R5_L11.SchDoc |

MICROCHIP

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
C309
100n
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
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
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
R300 0R
32.768kHz
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.

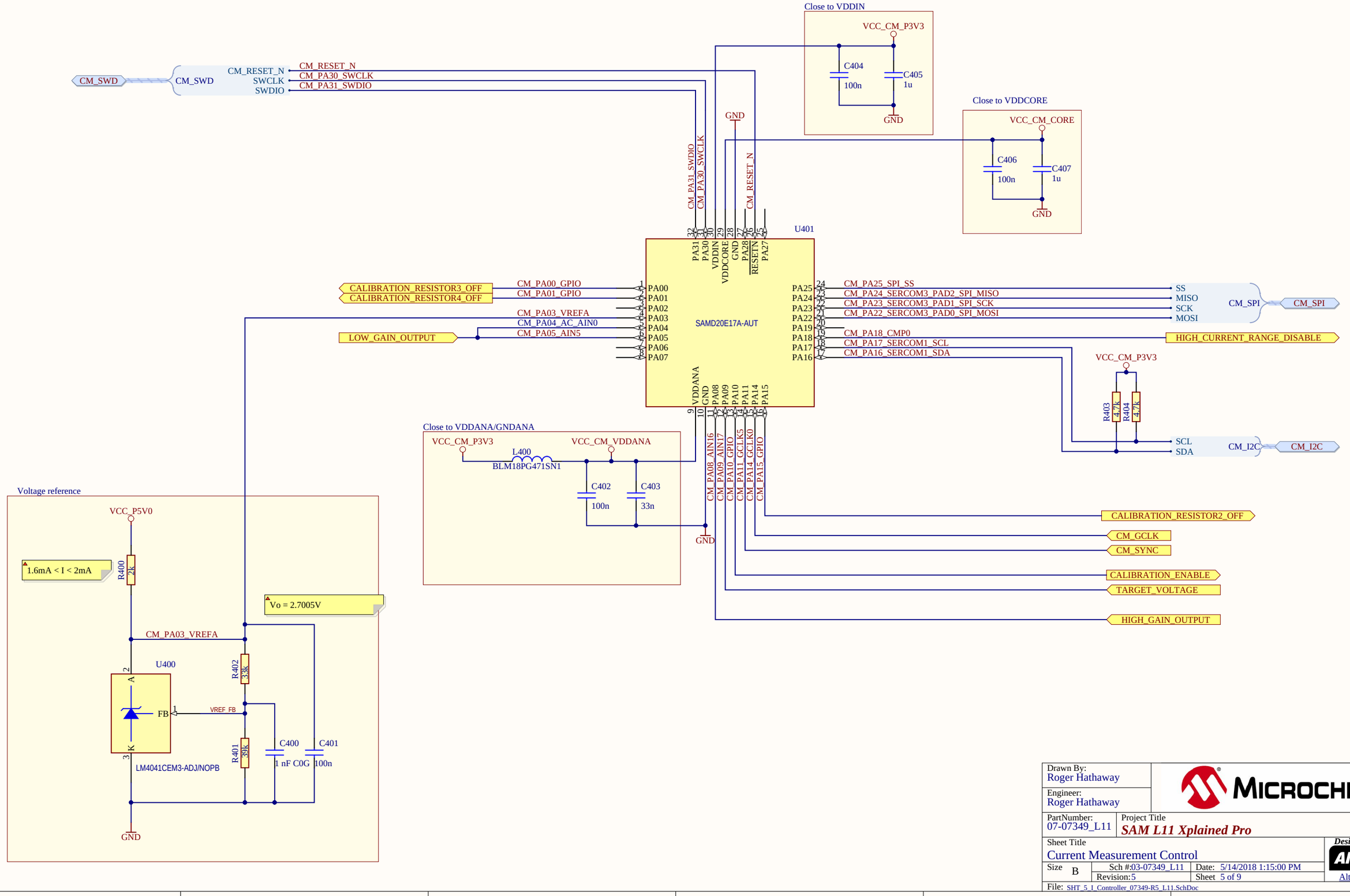
PA14
PA15
DNP XC301
DNP R333
12.00MHz
GND
DNP
GND

**CryptoAuthentication Device**

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

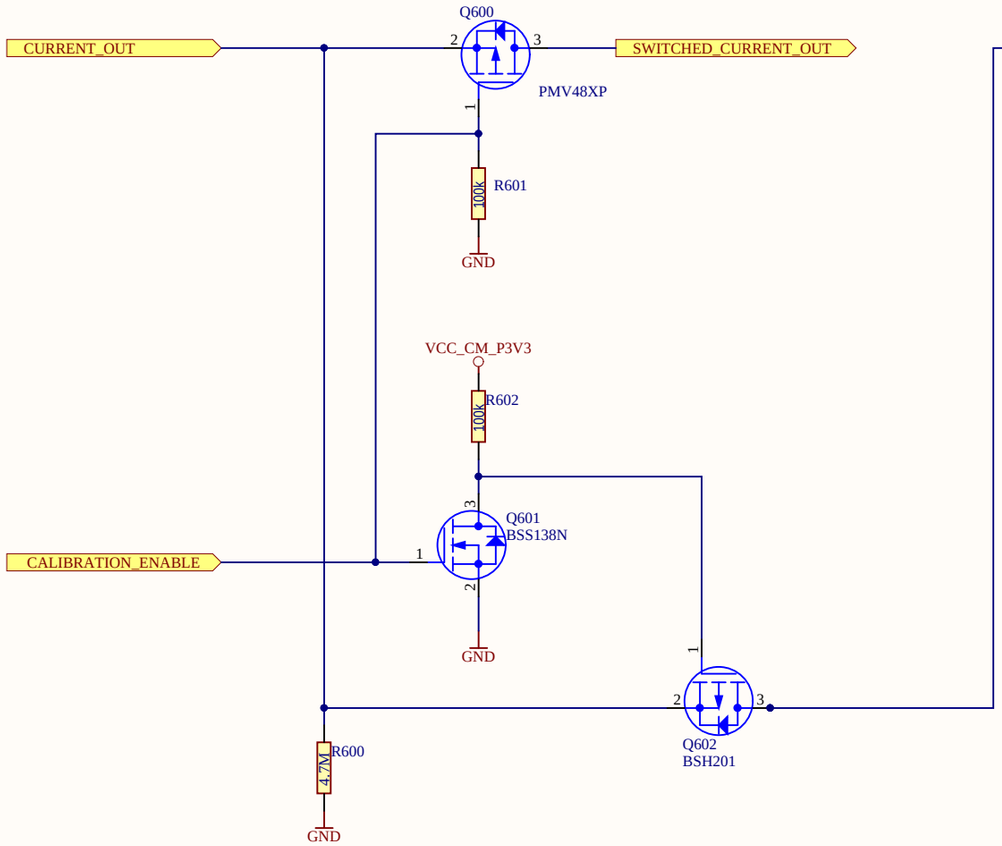
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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | | | | | | | | | | | | | | | | | | |
| A | B | C | D | | | | | | | | | | | | | | | | | | | | |

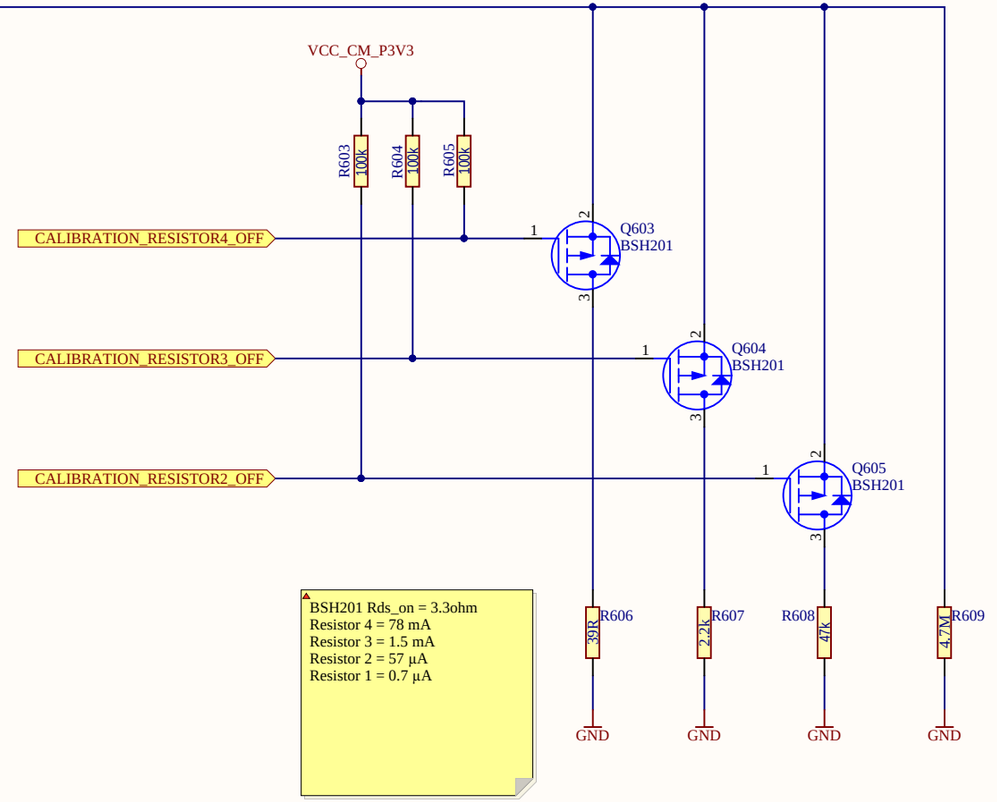
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|---|---|
| Drawn By: Roger Hathaway | MICROCHIP |
| Engineer: Roger Hathaway | |
| PartNumber: 07-07349_L11 | Project Title: *SAM L11 Xplained Pro* |
| Sheet Title: Target MCU | Designed with Altium — Altium.com |
| Size: B | Sch #:03-07349_L11 — Date: 5/14/2018 1:14:59 PM |
| | Revision:5 — Sheet 4 of 9 |
| File: SHT_4_MCU_07349-R5_L11.SchDoc | |



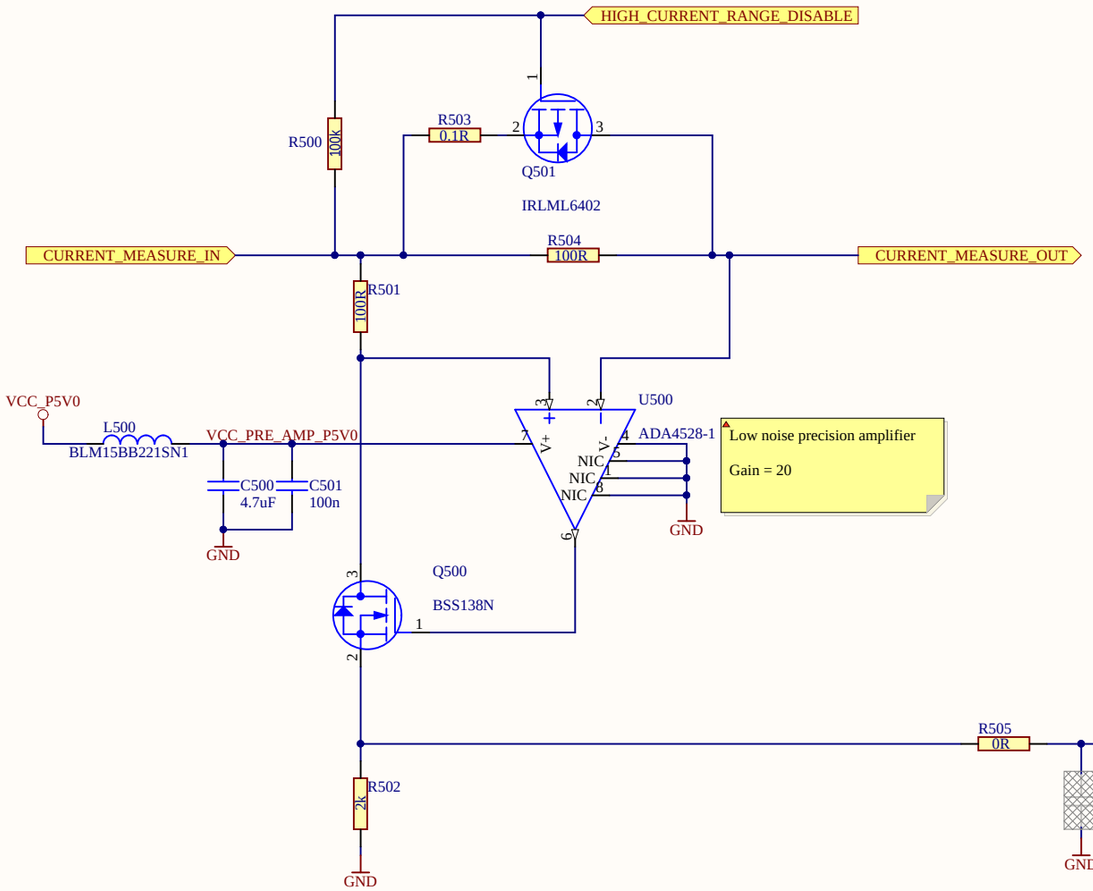

| | |
|---|---|
| Drawn By: Roger Hathaway | MICROCHIP |
| Engineer: Roger Hathaway | |
| PartNumber: 07-07349_L11 | Project Title: *SAM L11 Xplained Pro* |
| Sheet Title: Current Measurement Control | Designed with Altium — Altium.com |
| Size: B | Sch #:03-07349_L11 · Date: 5/14/2018 1:15:00 PM · Revision:5 · Sheet 5 of 9 |
| File: SHT_5_I_Controller_07349-R5_L11.SchDoc | |

Target disconnect for calibration

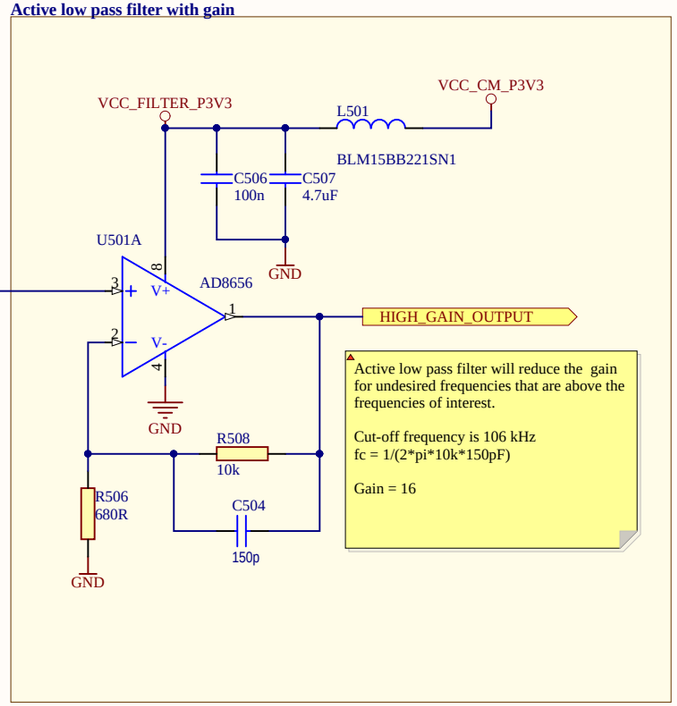


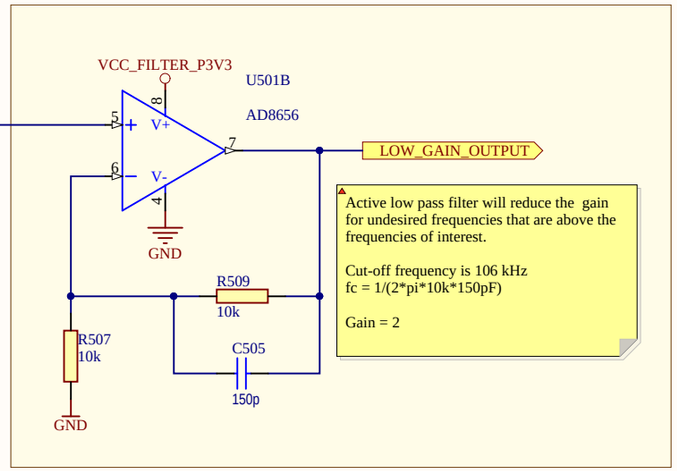

| | |
|---|---|
| Drawn By: Roger Hathaway | MICROCHIP |
| Engineer: Roger Hathaway | |
| PartNumber: 07-07349_L11 | Project Title: *SAM L11 Xplained Pro* |
| Sheet Title: Current Measurement Calibration | Designed with Altium (Altium.com) |
| Size: B | Sch #: 03-07349_L11 · Date: 5/14/2018 1:15:00 PM · Revision: 5 · Sheet: 6 of 9 |
| File: SHT_7_I_Calibration_07349-R5_L11.SchDoc | |



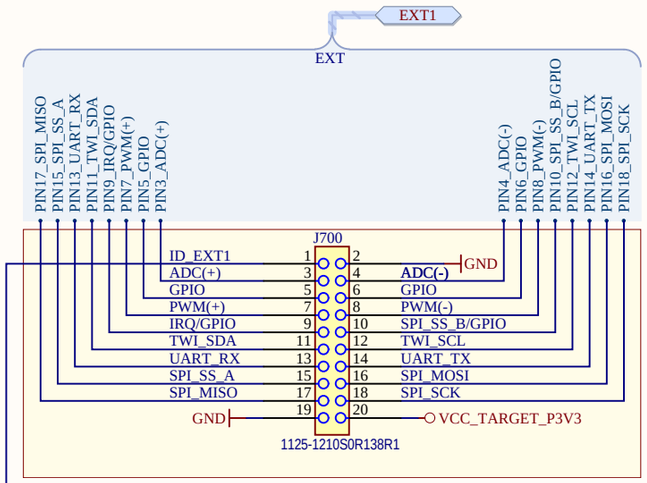

**Active low pass filter with gain**



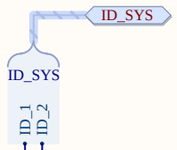

**Active low pass filter with gain**

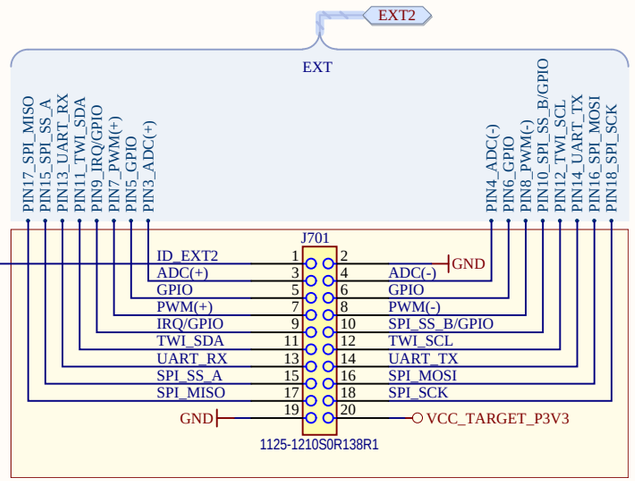



| | |
|---|---|
| Drawn By: Roger Hathaway | MICROCHIP |
| Engineer: Roger Hathaway | |
| PartNumber: 07-07349_L11 | Project Title: *SAM L11 Xplained Pro* |
| Sheet Title: Current Measurement Front End | Designed with Altium — Altium.com |
| Size: B | Sch #:03-07349_L11 · Date: 5/14/2018 1:15:01 PM · Revision:5 · Sheet 7 of 9 |
| File: SHT_6_I_Measure_07349-R5_L11.SchDoc | |

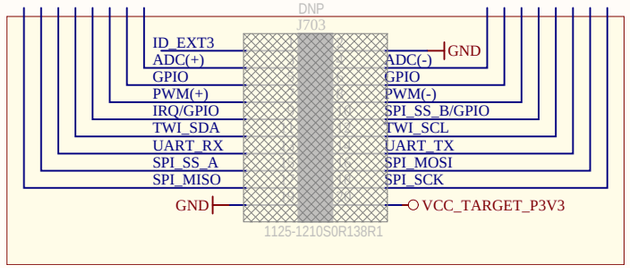



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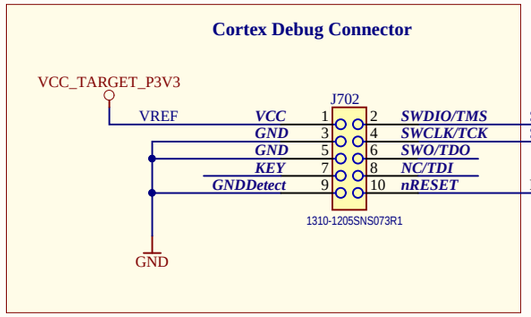


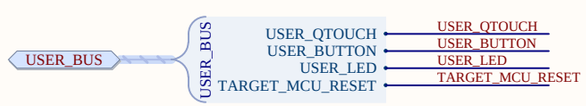



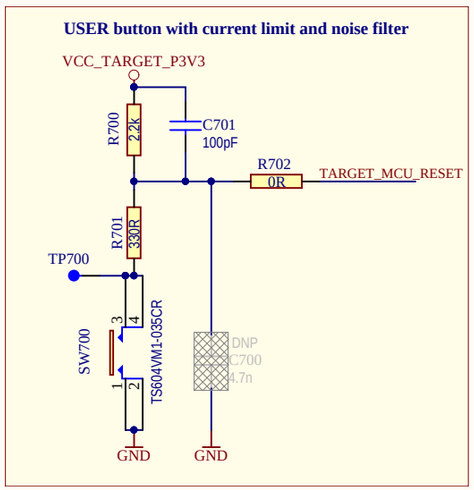

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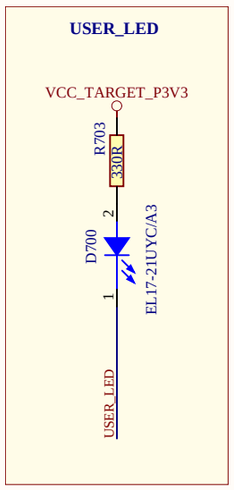


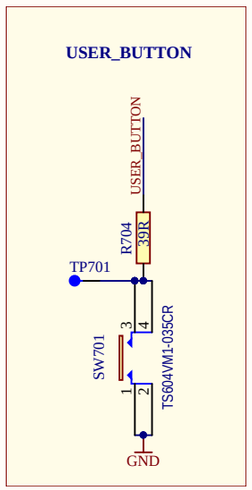

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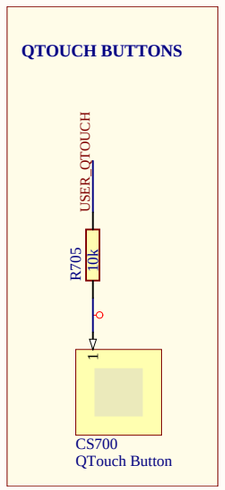


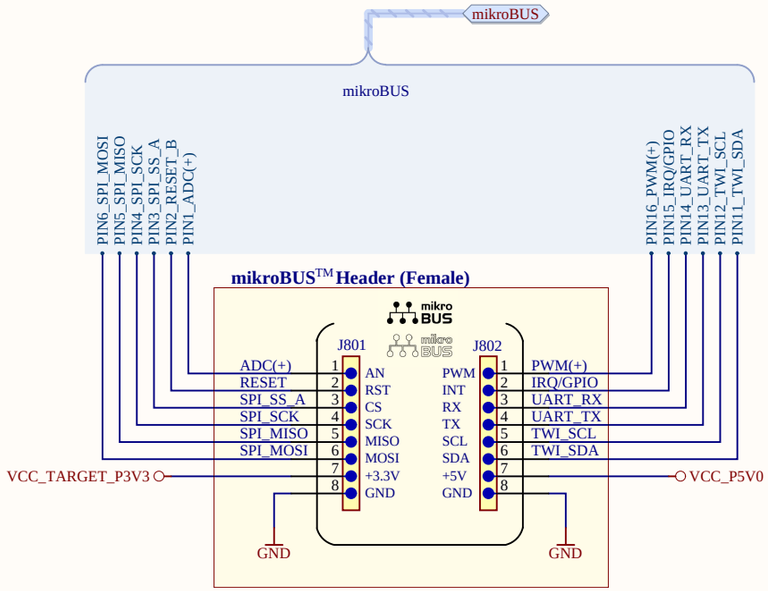



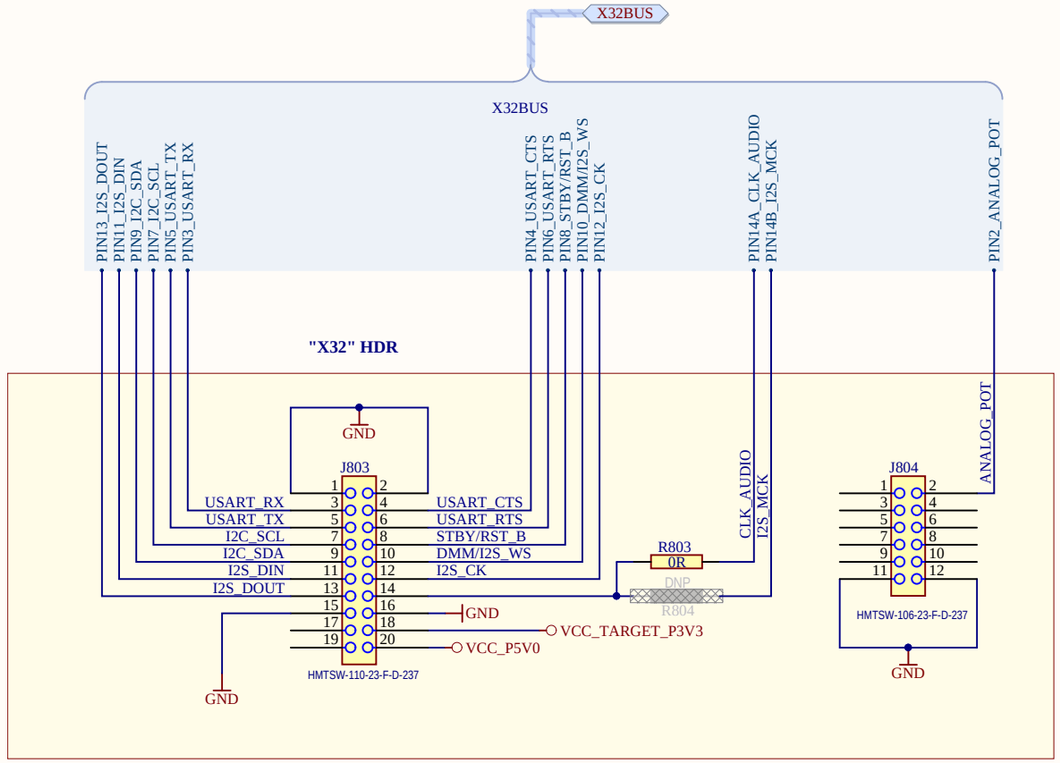



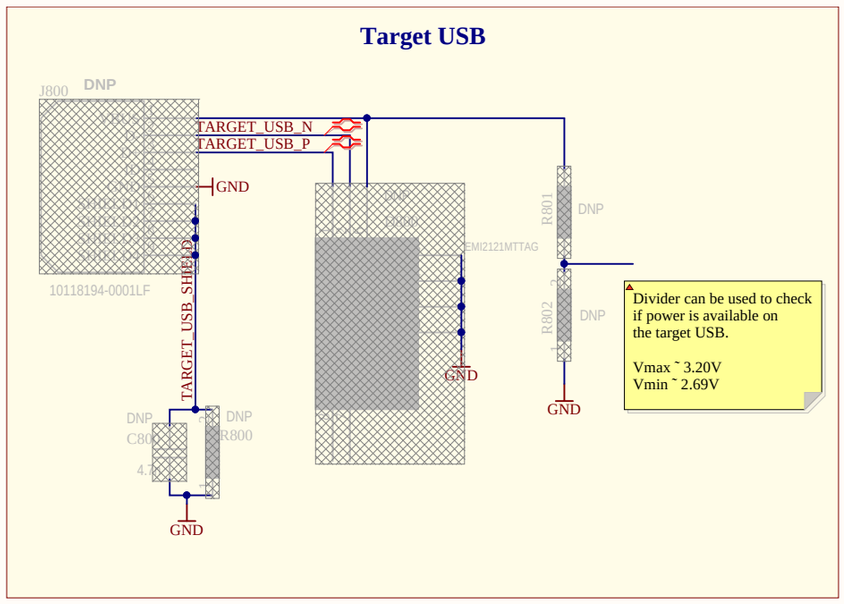




| | |
|---|---|
| Drawn By: Roger Hathaway | |
| Engineer: Roger Hathaway | |
| PartNumber: 07-07349_L11 | Project Title: *SAM L11 Xplained Pro* |
| Sheet Title: Extension Connectors | Designed with Altium — Altium.com |
| Size: B | Sch #:03-07349_L11 · Revision:5 · Date: 5/14/2018 1:15:01 PM · Sheet 8 of 9 |
| File: SHT_8_Ext_Headers_07349-R5_L11.SchDoc | |



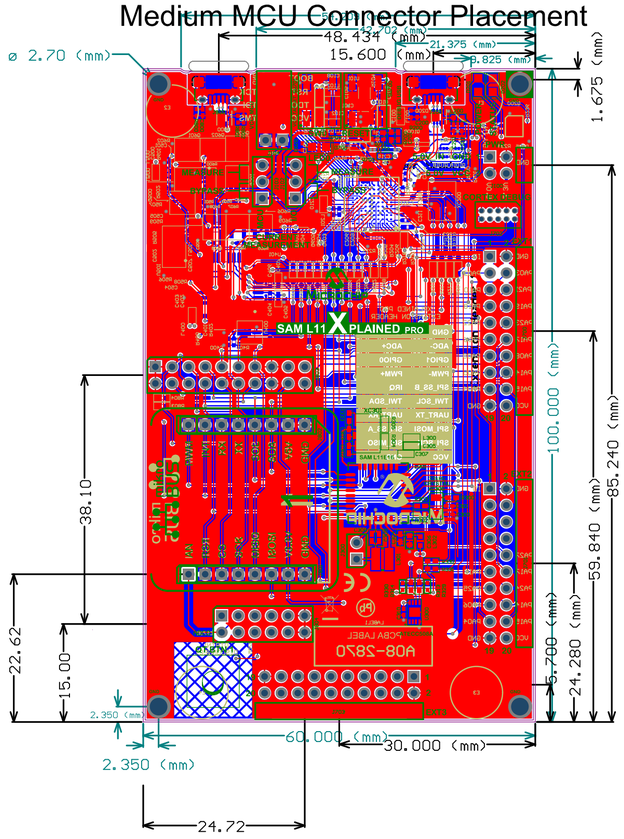



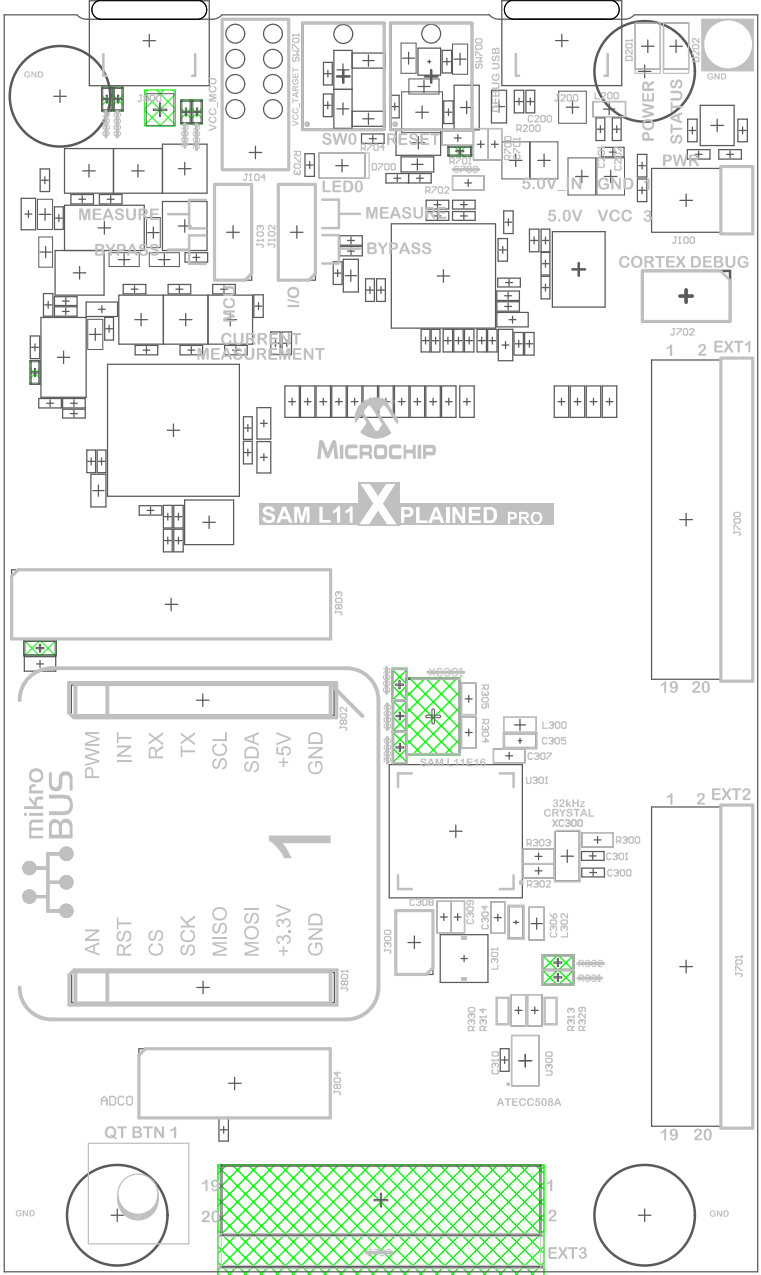

| | |
|---|---|
| Drawn By: Roger Hathaway | MICROCHIP |
| Engineer: Roger Hathaway | |
| PartNumber: 07-07349_L11 | Project Title: *SAM L11 Xplained Pro* |
| Sheet Title: X32 and mikroBUS Connectors | Designed with Altium |
| Size: B | Sch #:03-07349_L11 · Date: 5/14/2018 1:15:02 PM · Revision:5 · Sheet 9 of 9 |
| File: SHT_9_X32-mikroBUS_07349-R5_L11.SchDoc | Altium.com |

# Medium MCU Mechanical Dimensions

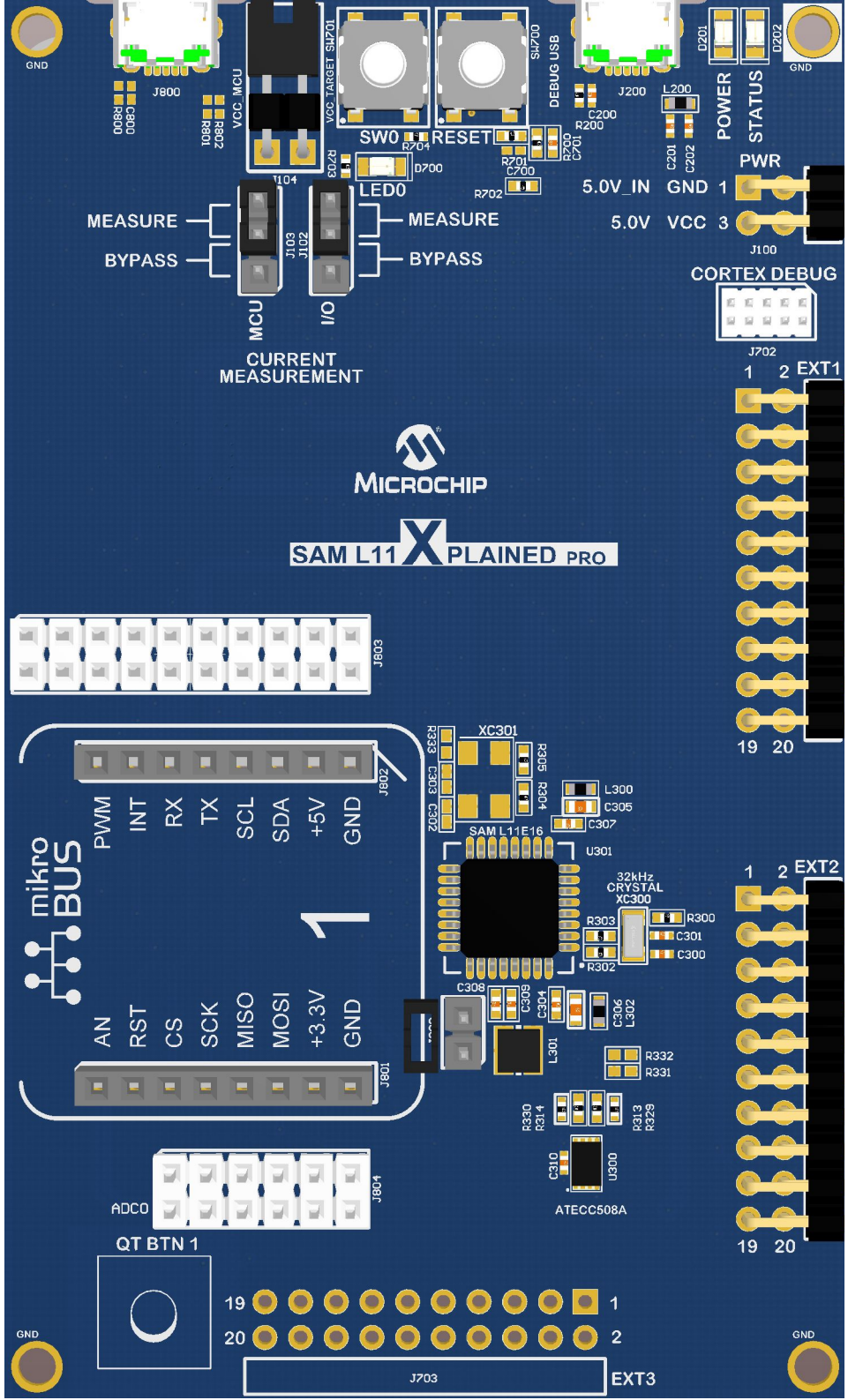
## Medium MCU Connector Placement

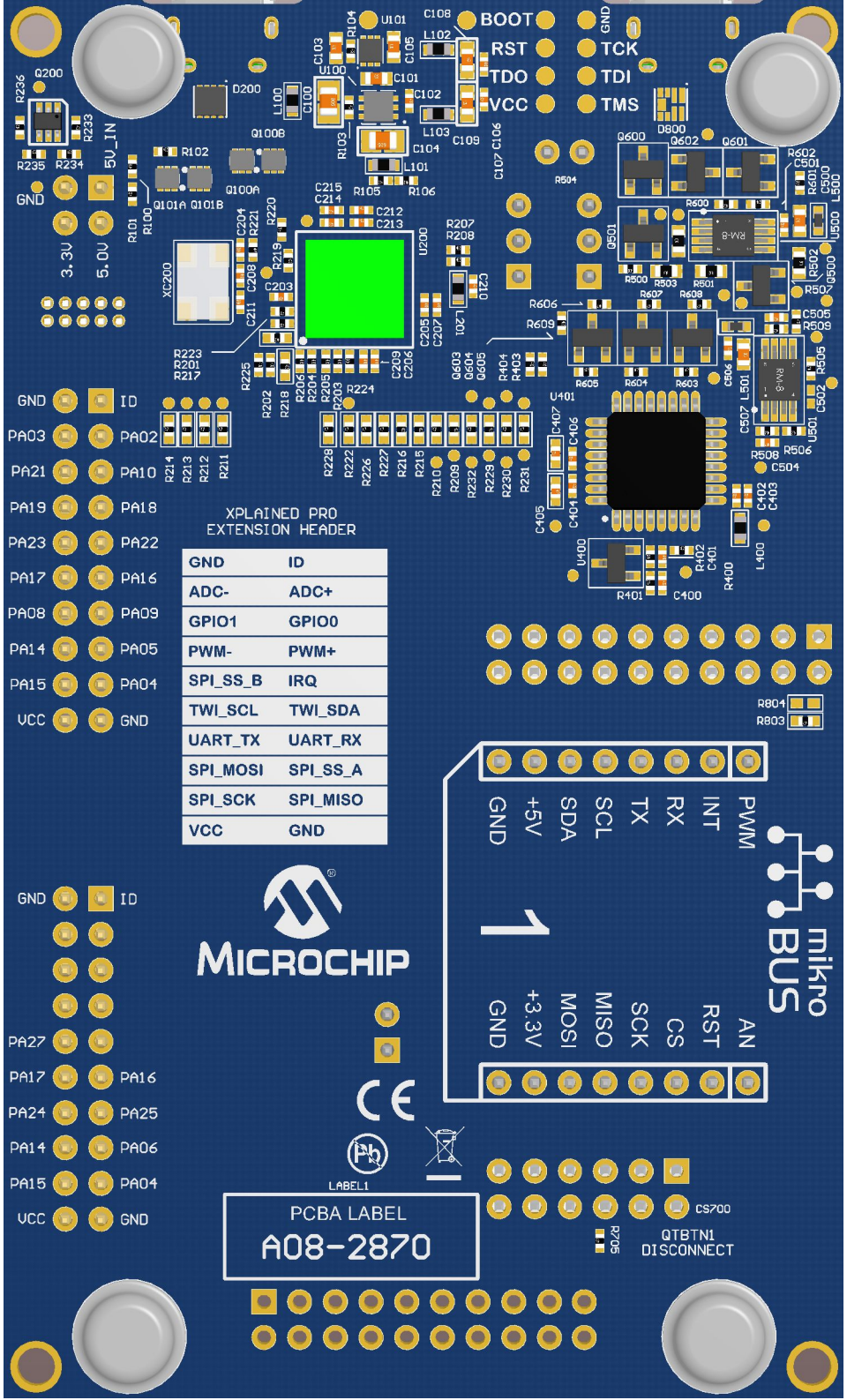


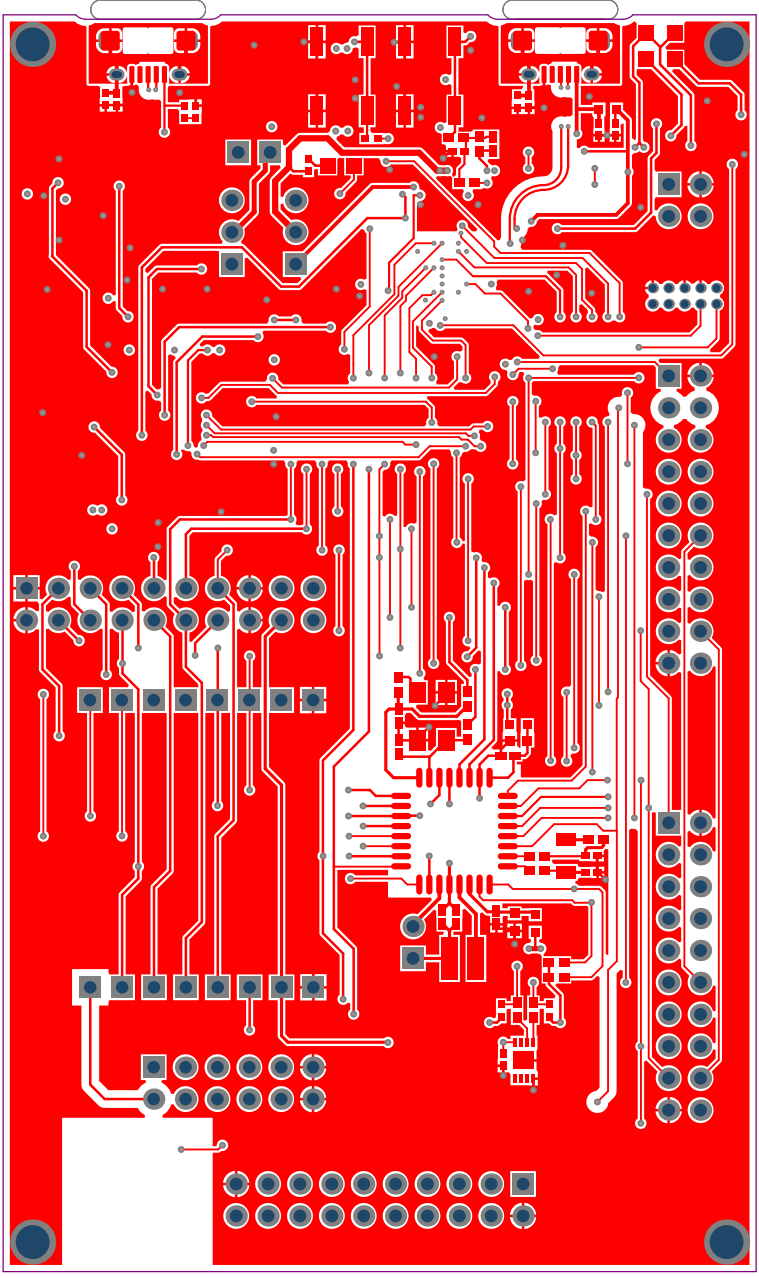

| | | |
|---|---|---|
| ATMEL NORWAY<br>Vestre Rosten 79<br>N-7075 Tiller | ENGINEER:<br>PCB DESIGNER: | TITLE: |
| | DATE: 5/14/2018 | PART NO.: REV: |
| | FILE NAME: 04-07349-R5_L11.PcbDoc | DWG NO: SCALE: |

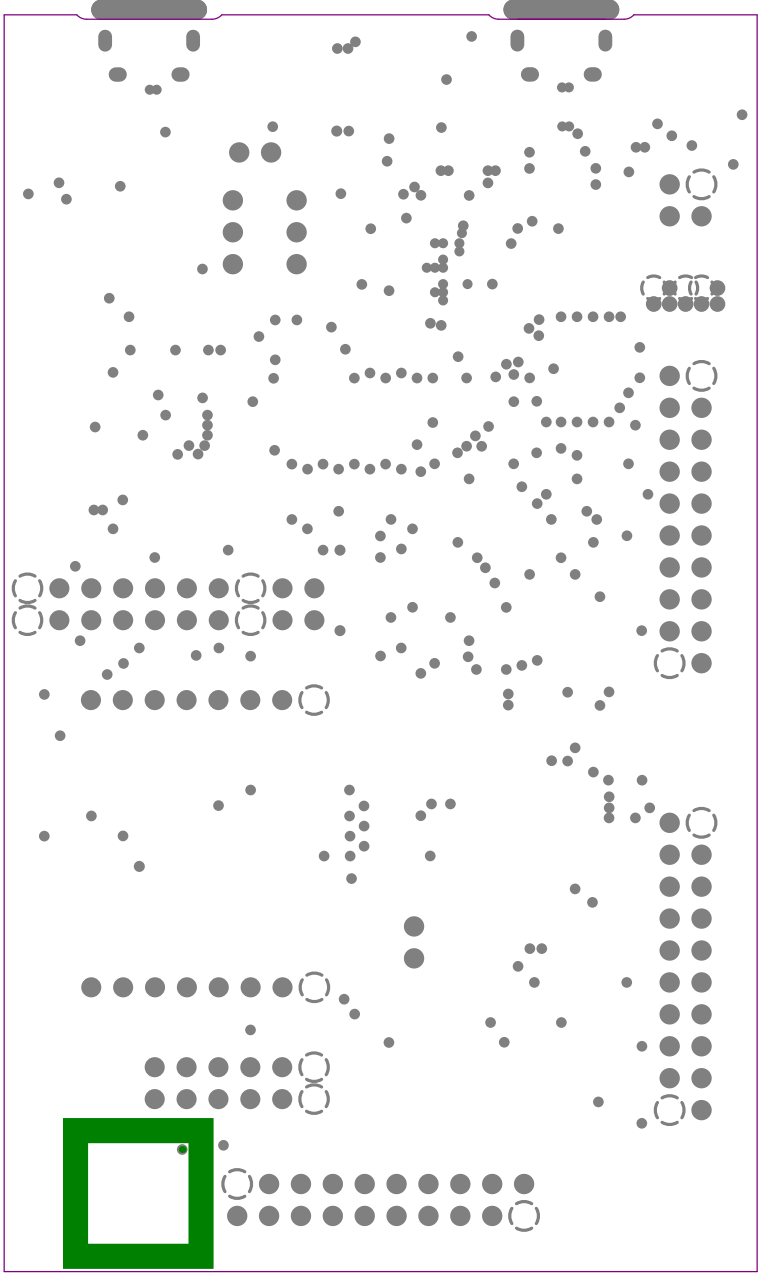

GND
VCC_MCU
VCC_TARGET SMJ701
SWJ700
SW0
RESET
LED0
D700
R702
MEASURE
BYPASS
I/O
MCU
CURRENT MEASUREMENT
MICROCHIP
SAM L11 XPLAINED PRO
POWER
STATUS
PWR
5.0V
VCC
CORTEX DEBUG
EXT1
EXT2
EXT3
J700
J701
J702
J603
J802
J801
J804
J100
J103
J102
J104
mikro BUS
PWM
INT
RX
TX
SCL
SDA
+5V
GND
AN
RST
CS
SCK
MISO
MOSI
+3.3V
ADC0
QT BTN 1
32kHz CRYSTAL XC300
ATECC508A
U301
U300
L300
L301
C300
C301
C302
C303
C304
C305
C306
C307
C308
R300
R301
R302
R303
R304
R305
R313
R314
R329
R330
J300

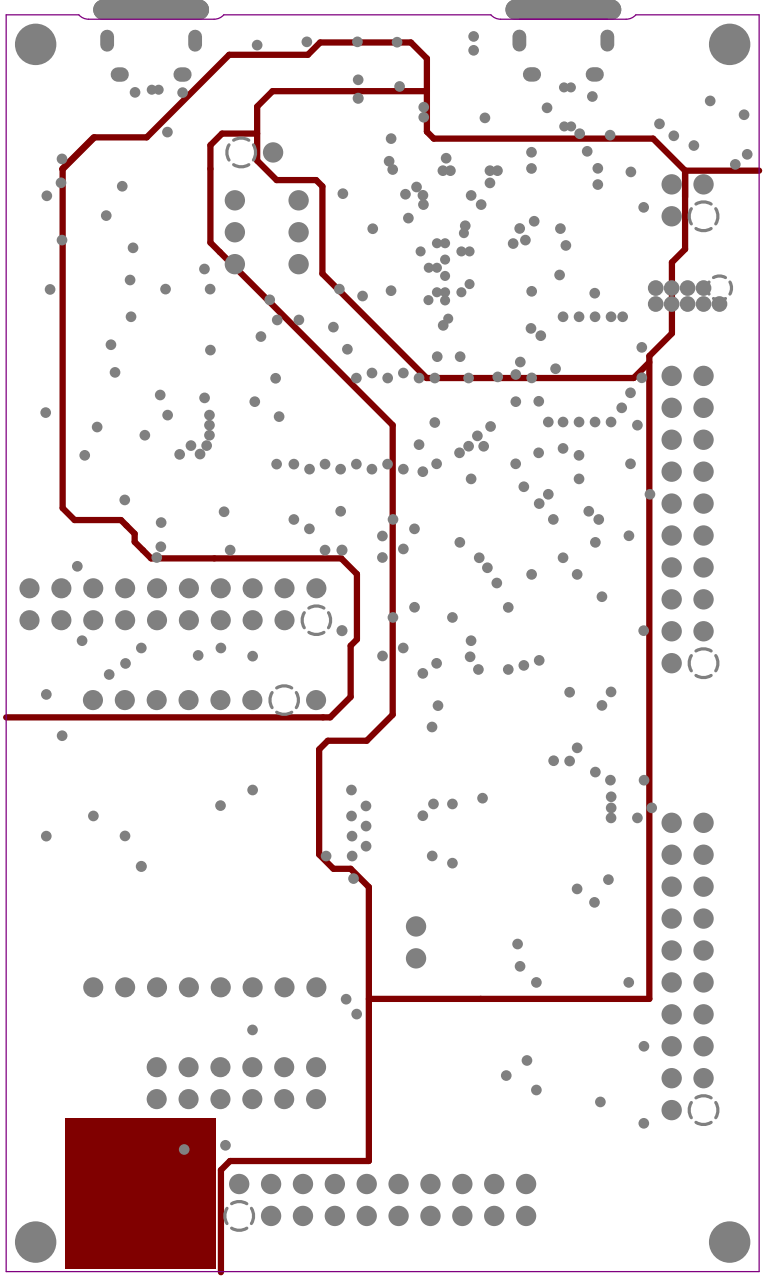
BOOT
RST
TDO
VCC
GND
TCK
TDI
TMS
E1
E2
Q200
Q600
Q602
Q601
5V_IN
3.3V
5.0V
GND
XC200
U200
U401
U400
U501
R504
R501
R502
R507
R505
R506
R508
C504
L400
L501
L500
C500
C501
C502
C505
C509
R509
R606
R609
R605
R604
R603
R607
R608
R600
R601
R602
R803
R804
XPLAINED PRO
EXTENSION HEADER
GND ID
ADC- ADC+
GPIO1 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
PA03 PA02
PA21 PA10
PA19 PA18
PA23 PA22
PA17 PA16
PA08 PA09
PA14 PA05
PA15 PA04
VCC GND
PA27
PA17 PA16
PA24 PA25
PA14 PA06
PA15 PA04
VCC GND
PWM
INT
RX
TX
SCL
SDA
+5V
GND
AN
RST
CS
SCK
MISO
MOSI
+3.3V
GND
mikro BUS
MICROCHIP
LABEL1
PCBA LABEL
A08-2870
CS700
QTBTN1
DISCONNECT

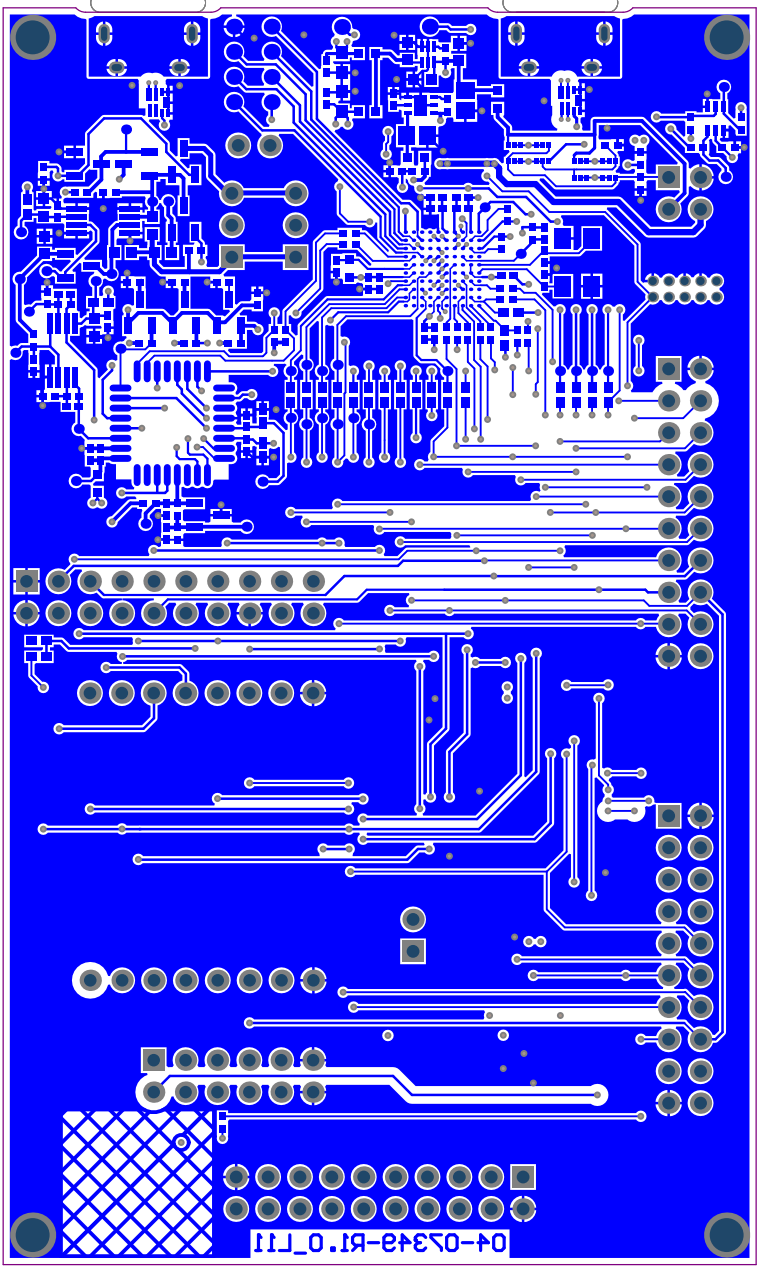

GND
J800
C800
R800
R801
R802
VCC_MCU
J104
VCC_TARGET SW701
SW700
DEBUG USB
J200
C200
R200
L200
C201
C202
D201
D202
POWER
STATUS
GND
SW0
RESET
R704
R703
D700
LED0
R700
R701
C701
C700
R702
PWR
5.0V_IN GND 1
5.0V VCC 3
J100
MEASURE
BYPASS
J103
J102
MEASURE
BYPASS
MCU
I/O
CURRENT MEASUREMENT
CORTEX DEBUG
J702
1 2 EXT1
19 20
MICROCHIP
SAM L11 XPLAINED PRO
J603
XC301
R333
C303
C302
R305
R304
L300
C305
C307
SAM L11E16
U301
J802
PWM
INT
RX
TX
SCL
SDA
+5V
GND
mikro BUS
1
AN
RST
CS
SCK
MISO
MOSI
+3.3V
GND
J801
32kHz CRYSTAL XC300
R303
R302
R300
C301
C300
C308
C309
C304
C306
L302
L301
R332
R331
R330
R314
R313
R329
C310
U300
ATECC508A
ADC0
J804
QT BTN 1
1 2 EXT2
19 20
19
20
1
2
J703
EXT3
GND
GND


BOOT
RST
TDO
VCC
GND
TCK
TDI
TMS
5V_IN
3.3V
5.0V
GND
ID
PA03
PA02
PA21
PA10
PA19
PA18
PA23
PA22
PA17
PA16
PA08
PA09
PA14
PA05
PA15
PA04
VCC
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
MICROCHIP
mikro BUS
PWM
INT
RX
TX
SCL
SDA
+5V
GND
AN
RST
CS
SCK
MISO
MOSI
+3.3V
GND
LABEL1
PCBA LABEL
A08-2870
CS700
QTBTN1
DISCONNECT








04-07349-R1.0_L11