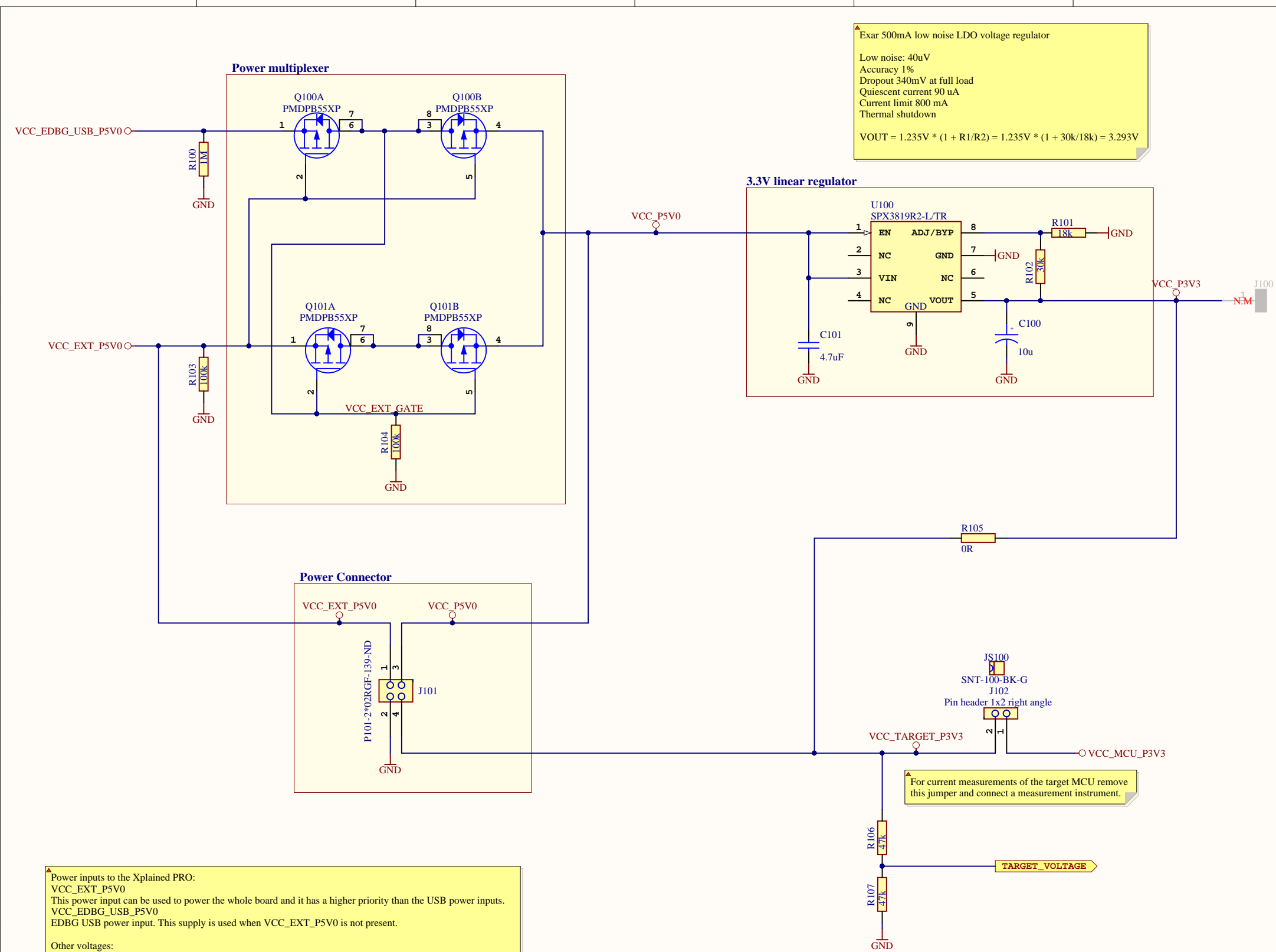


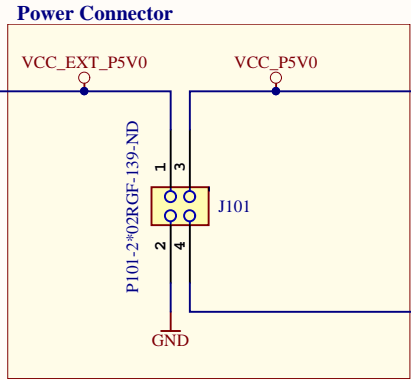
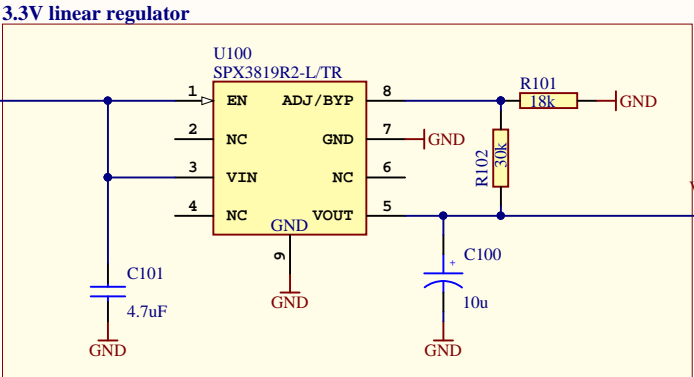
ATMEL Norway	*			
Vestre Rosten 79	*			
N-7075 TILLER	*			
NORWAY				
Date:	16.11.2015	11:25:45	PAGE: 2 of 5	
Document number:	A09-2589		Revision:	2
TITLE: Top Level Schematics				
ATmega324PB_Xplained_Pro_TopLevel.SchDoc				



▲ 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

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

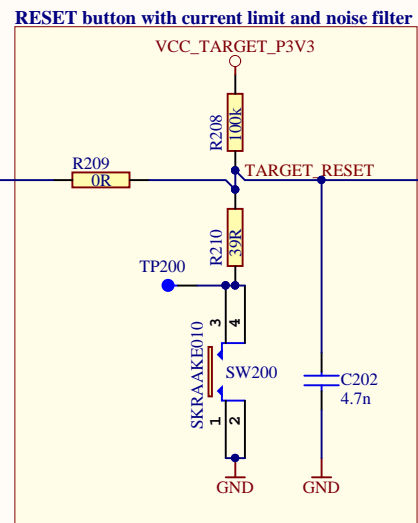
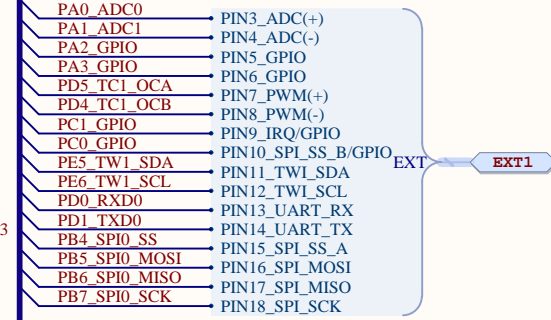
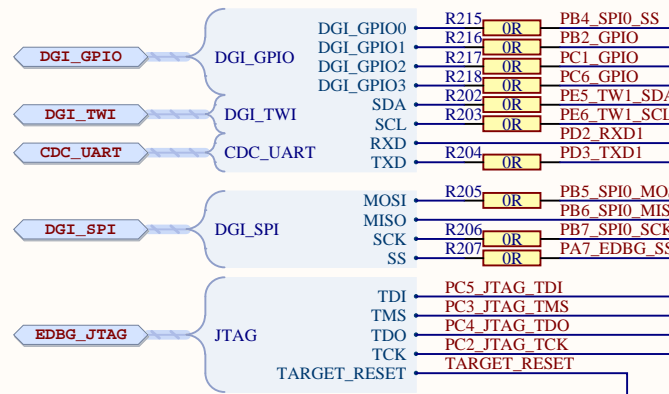
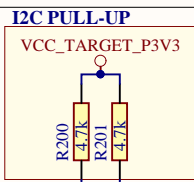
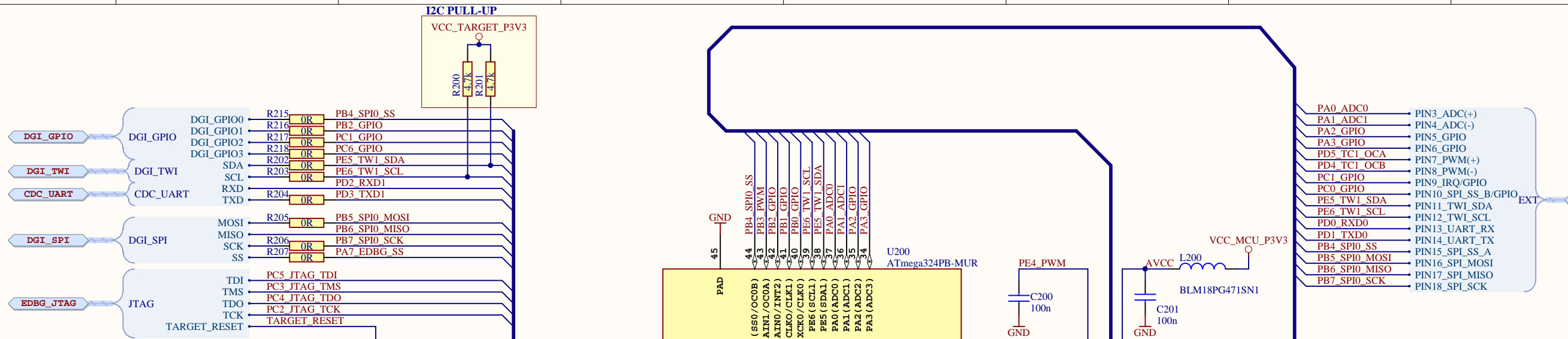


▲ For current measurements of the target MCU remove this jumper and connect a measurement instrument.

▲ 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 than the USB power inputs.
 VCC_EDBG_USB_P5V0
 EDBG USB power input. This supply is used when VCC_EXT_P5V0 is not present.

Other voltages:
 VCC_P5V0
 This supply is connected to either VCC_EXT_P5V0 or VCC_EDBG_USB_P5V0, based on the availability and priority of these supplies.
 VCC_P3V3
 Regulated 3.3V from VCC_P5V0
 VCC_TARGET_P3V3
 Target supply voltage (target MCU and peripherals)

ATMEL Norway	*		
Vestre Rosten 79	*		
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NORWAY			
Date:	16.11.2015	11:25:45	PAGE: 2 of 5
Document number:	A09-2419		Revision: 2
TITLE: Power supply			
ATmega324PB_Xplained_Pro_dual_input_power_supply.SchDoc			

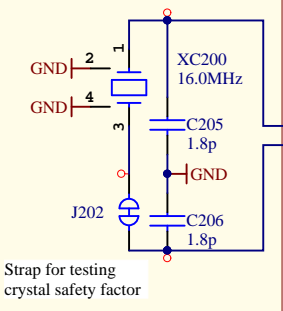


16MHz Crystal

Crystal datasheet (16MHz):
 Load capacitance CL = 9pF
 ESR 60 Ohm Max.
 Frequency tolerance +/- 10 ppm

$C_e = 2(CL - C_i - C_s) = 2(9pF - 8.1pF) = 1.8pF$
 where:
 Ce - is the external capacitance needed
 CL - is the load capacitance specified by the crystal vendor
 Ci - is the pin capacitance
 Cs - is the total stray capacitance, assumed to be <1pF and can be ignored

Ce of 1.8pF was selected after measuring frequency, this gives an approximate combination of pin capacitance and stray capacitance of 8.1pF

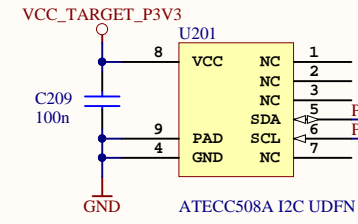
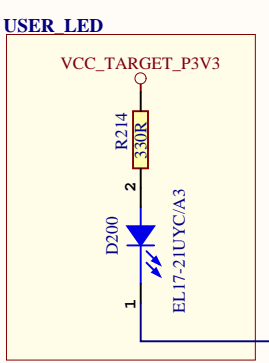
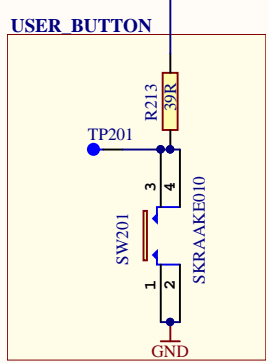
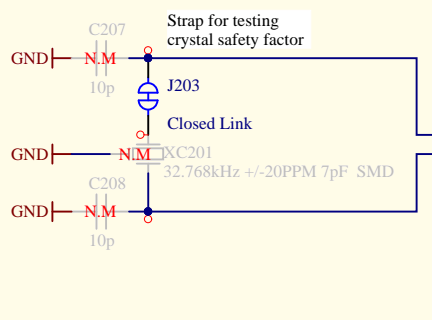


Footprint for 32.768kHz Crystal

Crystal datasheet (32.768kHz):
 Load Capacitance CL = 12.5 pF
 ESR 60k Ohm Max.
 Frequency tolerance +/- 20ppm

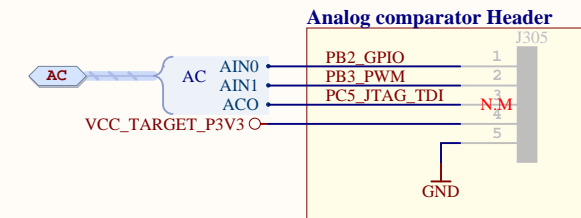
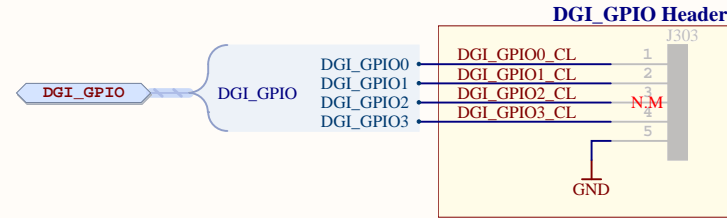
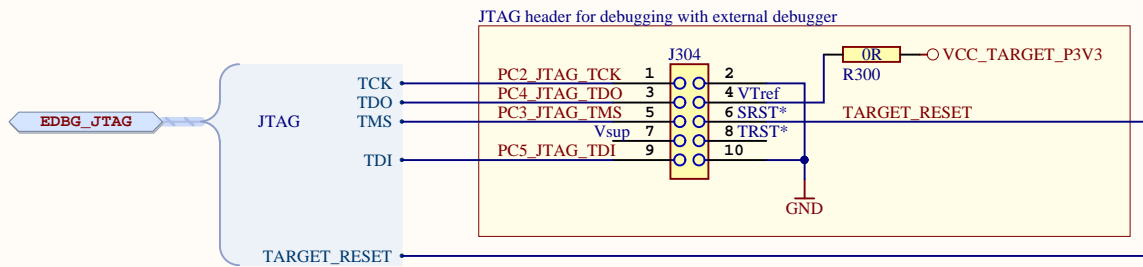
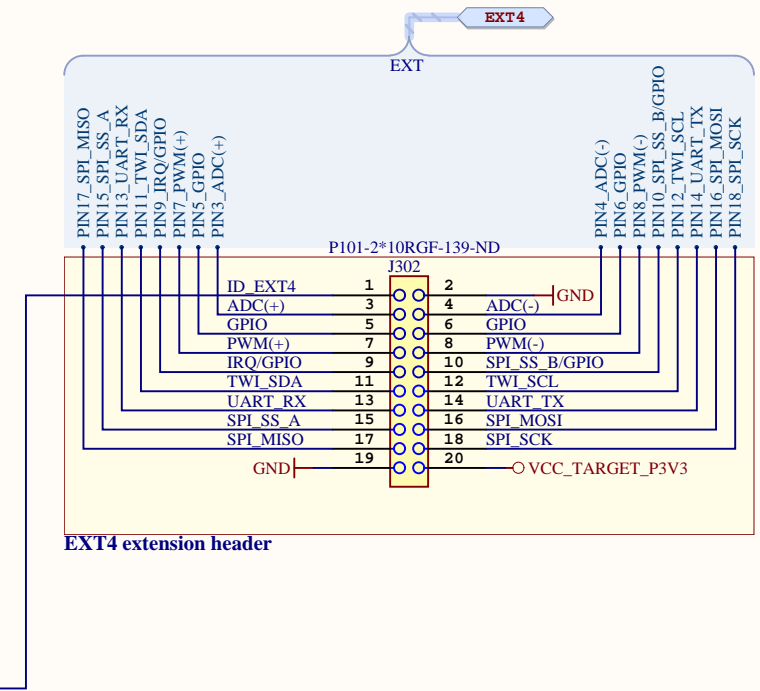
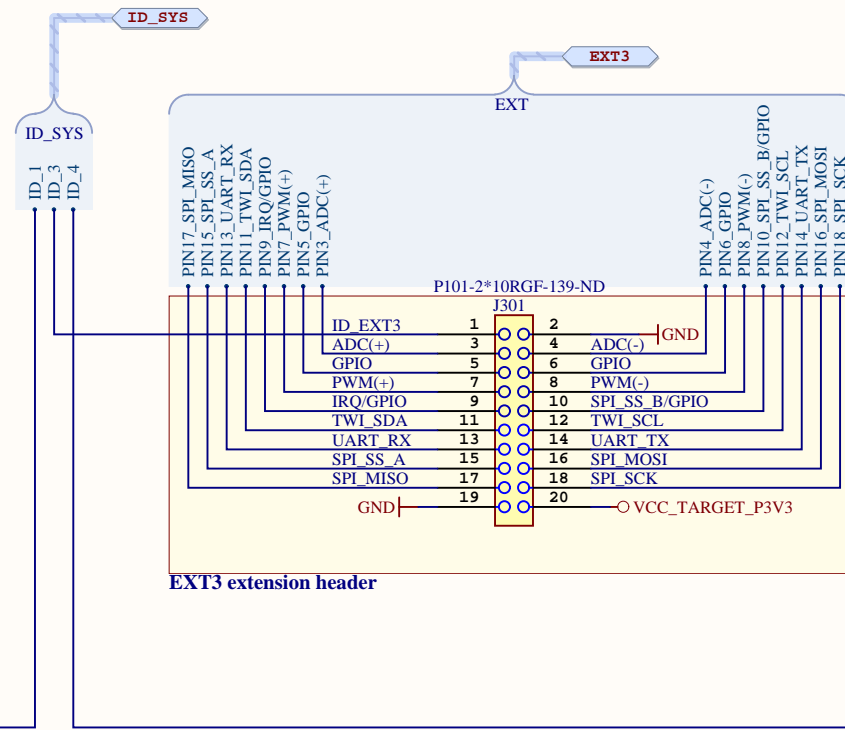
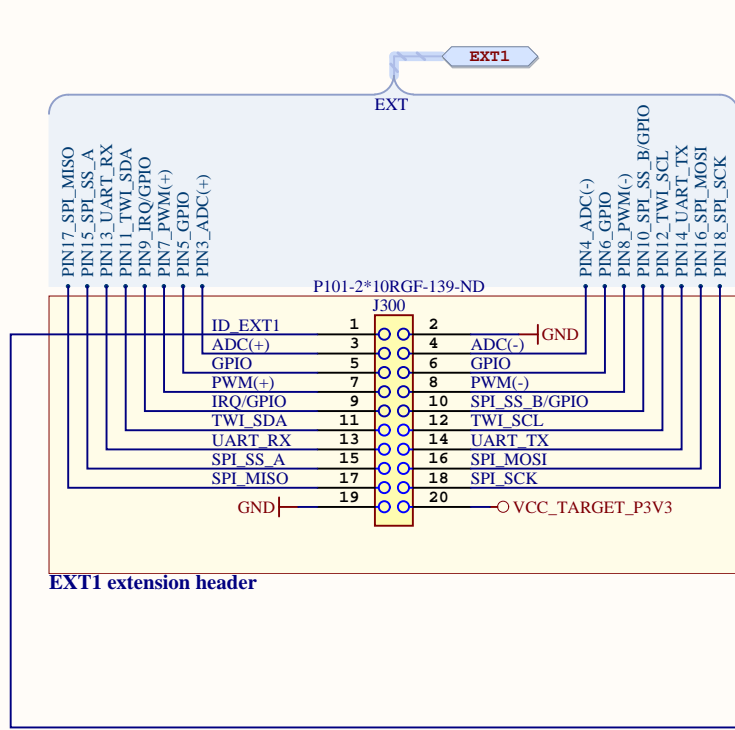
$C_e = 2(CL - C_i - C_s) = 2(12.5pF - 7.5pF) = 10pF$
 where:
 Ce - is the external capacitance needed
 CL - is the load capacitance specified by the crystal vendor
 Ci - is the pin capacitance
 Cs - is the total stray capacitance, assumed to be <1pF and can be ignored

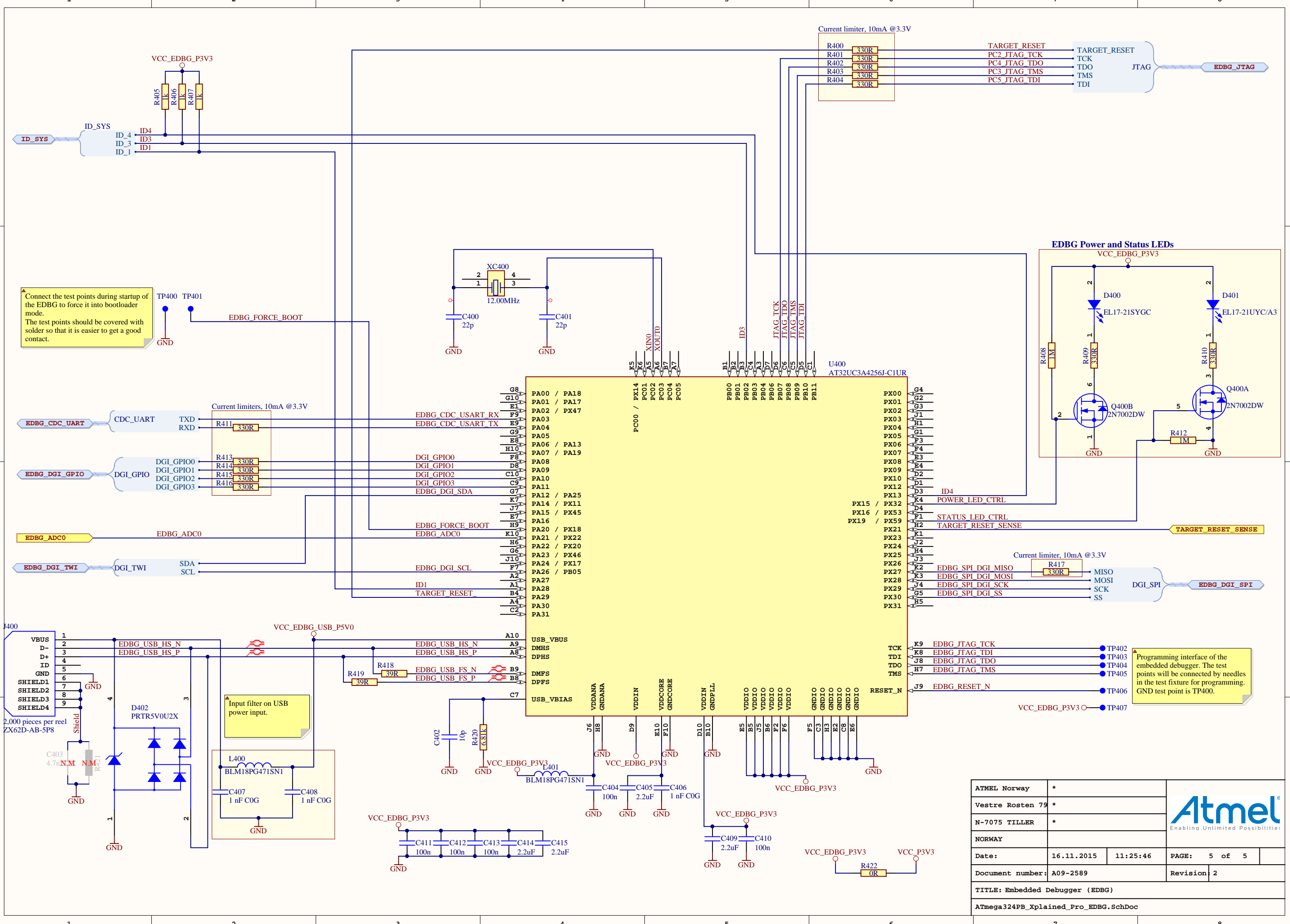
Ce of 10pF was selected after measuring frequency, this gives an approximate pin capacitance and stray capacitance of 7.5pF



ATMEL Norway	*			
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N-7075 TILLER	*			
NORWAY				
Date:	16.11.2015	11:25:45	PAGE:	3 of 5
Document number:	A09-2589		Revision:	2
TITLE: Target MCU				
ATmega324PB_Xplained_Pro_Target_MCU.SchDoc				






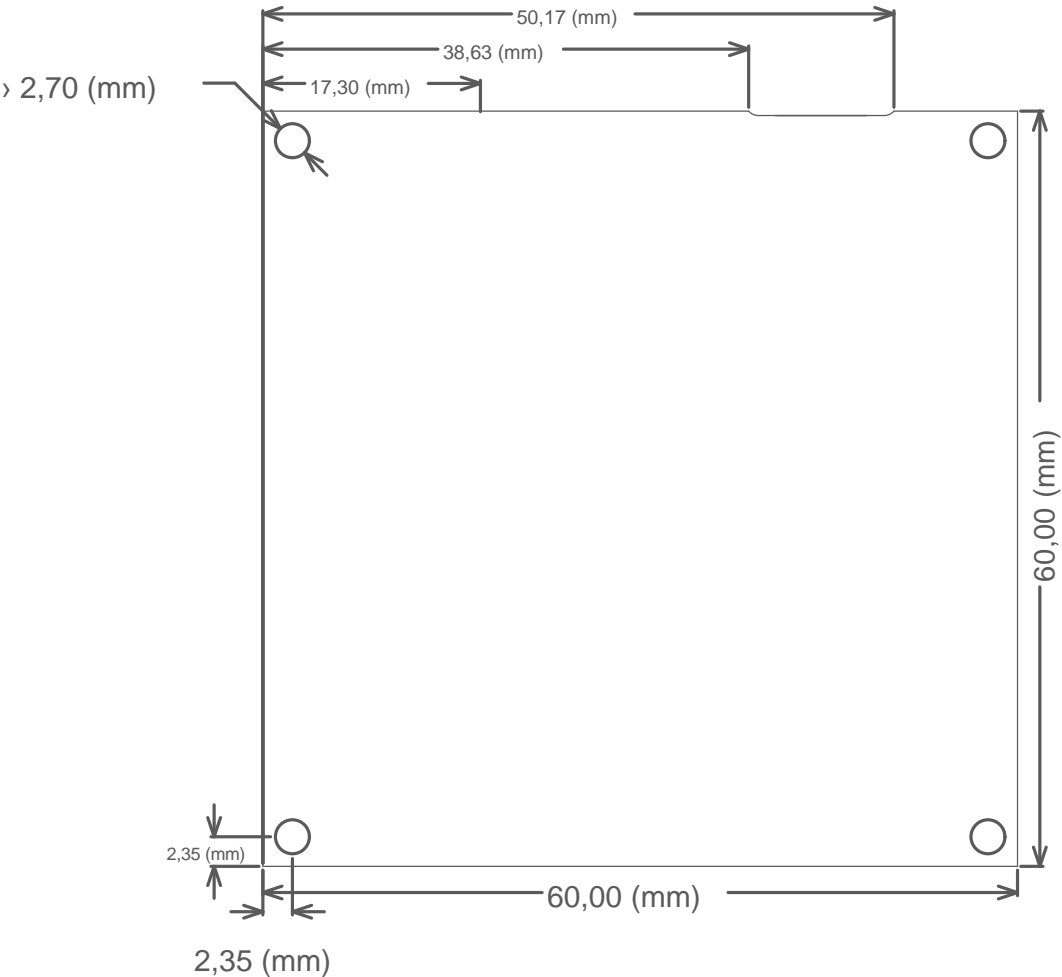


Connect the test points during startup of the EDBG to force it into bootloader mode. The test points should be covered with solder so that it is easier to get a good contact.

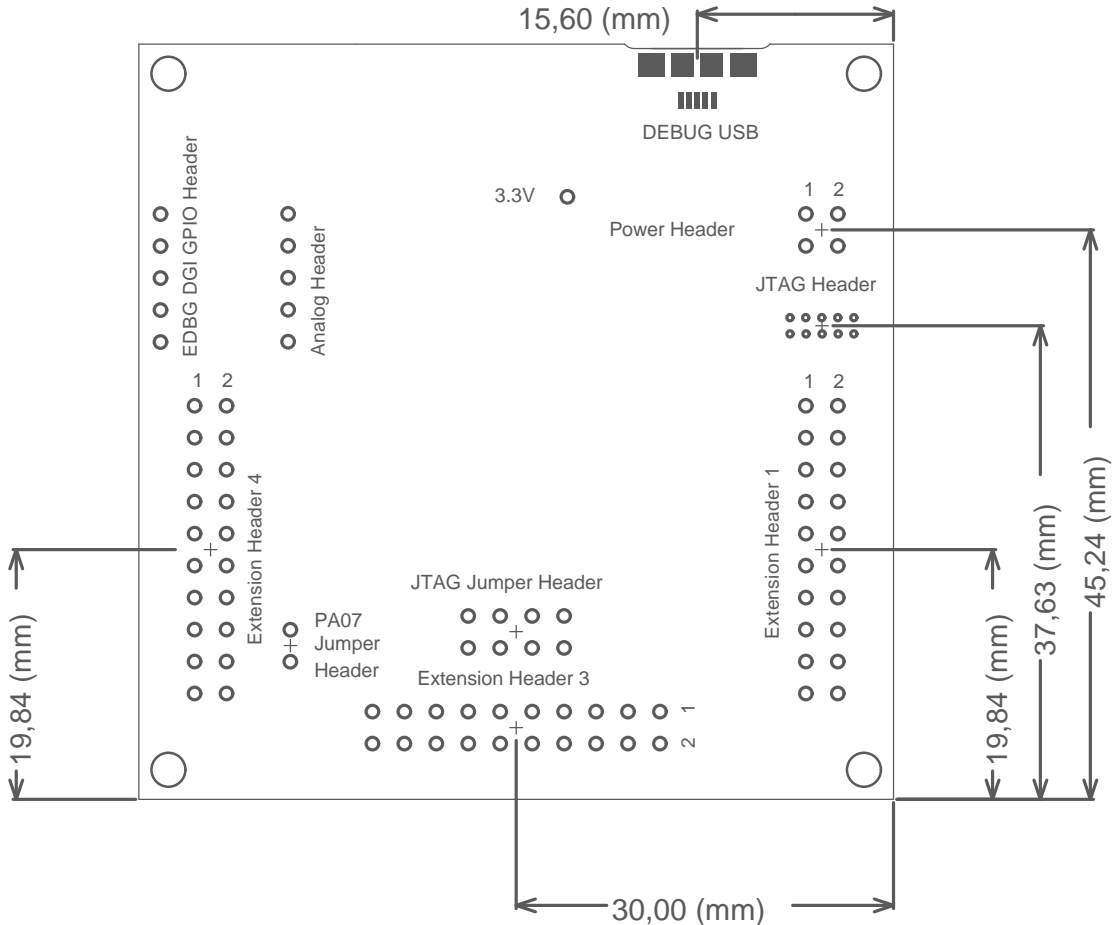
Programming interface of the embedded debugger. The test points will be connected by needles in the test fixture for programming. GND test point is TP400.

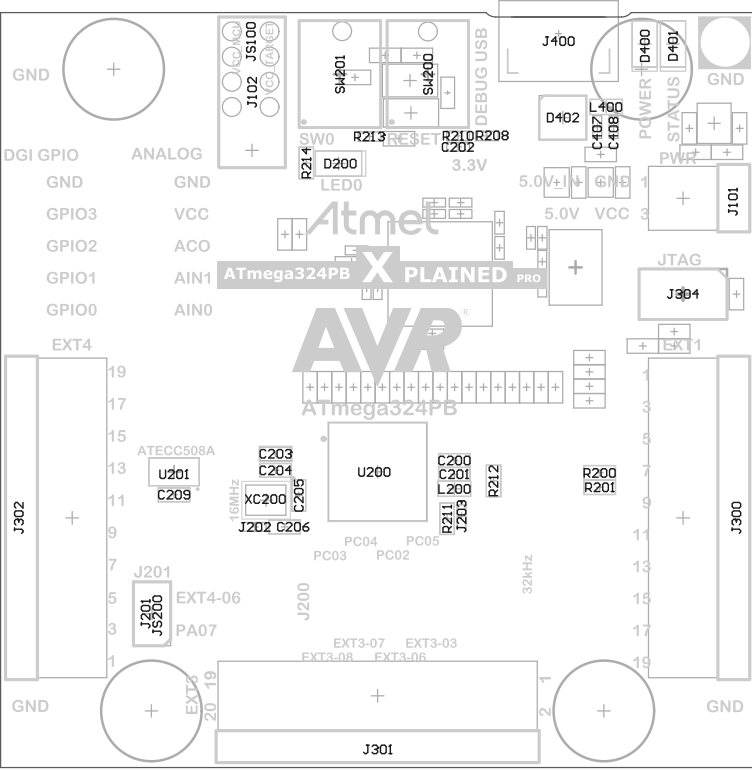
ATMEL Norway	*			 Enabling Unlimited Possibilities!
Vestre Rosten 79	*			
N-7075 TILLER	*			
NORWAY				
Date:	16.11.2015	11:25:46	PAGE:	5 of 5
Document number:	A09-2589		Revision:	2
TITLE: Embedded Debugger (EDBG)				
ATmega324PB_Xplained_Pro_EDBG.SchDoc				

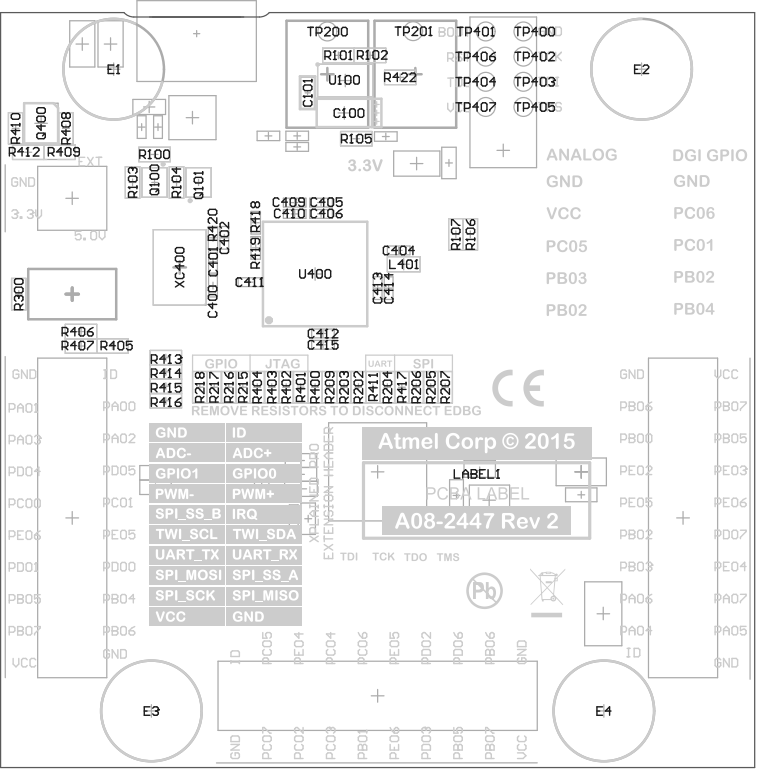
Small MCU Mechanical Dimensions



Small MCU Connector Placement







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

REMOVE RESISTORS TO DISCONNECT EDDBG

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LABEL1

PCB LABEL

A08-2447 Rev 2

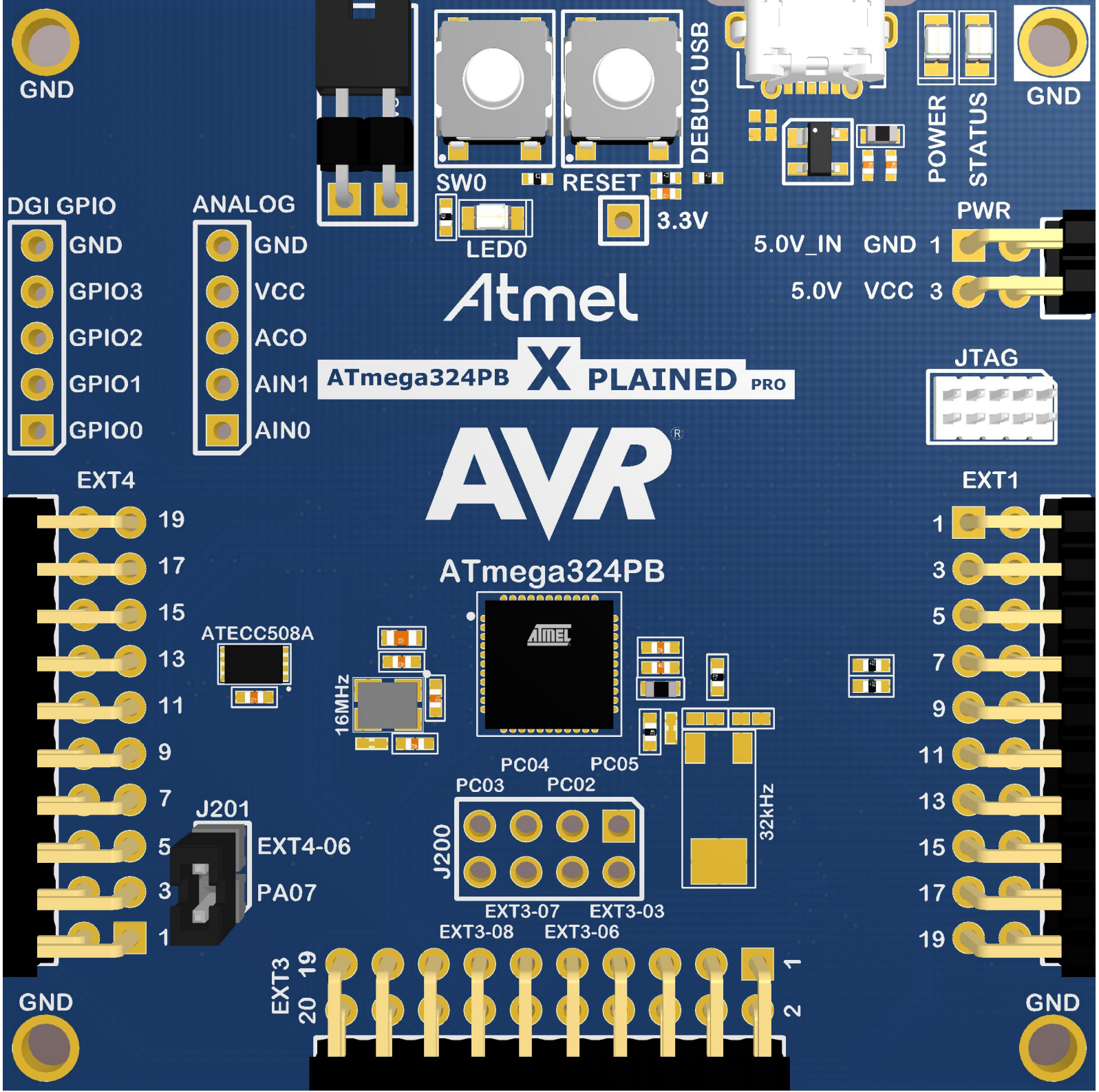
E3

E4

TDI TCK TDO TMS

XELINEN_BIO
EXTENSION-HEADER





GND

GND

DGI GPIO

- GND
- GPIO3
- GPIO2
- GPIO1
- GPIO0

ANALOG

- GND
- VCC
- ACO
- AIN1
- AIN0

SW0

RESET

3.3V

LED0

5.0V_IN

GND

1

5.0V

VCC

3

POWER

STATUS

PWR

ATmega324PB XPLAINED PRO

Atmel

AVR

ATmega324PB

JTAG

EXT4

- 19
- 17
- 15
- 13
- 11
- 9
- 7
- 5
- 3
- 1

EXT1

- 1
- 3
- 5
- 7
- 9
- 11
- 13
- 15
- 17
- 19

GND

GND

ATECC508A

16MHz

ATMEL

PC04 PC05

PC03 PC02

32kHz

J201

EXT4-06

PA07

J200

EXT3-07 EXT3-03

EXT3-08 EXT3-06

EXT3

- 20
- 19
- 18
- 17
- 16
- 15
- 14
- 13
- 12
- 11
- 10
- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1

BOOT ● GND ●
 RST ● TCK ●
 TDO ● TDI ●
 VCC ● TMS ●

EXT ●
 GND ●
 3.3V ●
 5.0V ●

3.3V

ANALOG ●
 GND ●
 VCC ●
 PC05 ●
 PB03 ●
 PB02 ●
 DGI GPIO ●
 GND ●
 PC06 ●
 PC01 ●
 PB02 ●
 PB04 ●

GND ● ID ●
 PA01 ● PA00 ●
 PA03 ● PA02 ●
 PD04 ● PD05 ●
 PC00 ● PC01 ●
 PE06 ● PE05 ●
 PD01 ● PD00 ●
 PB05 ● PB04 ●
 PB07 ● PB06 ●
 VCC ● GND ●

GPIO JTAG UART SPI
 REMOVE RESISTORS TO DISCONNECT EDBG

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

XPLAINED PRO EXTENSION HEADER

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 PCBA LABEL
 A08-2447 Rev 2

TDI TCK TDO TMS

ID ● PC05 ● PE04 ● PC04 ● PC06 ● PE05 ● PD02 ● PD06 ● PB06 ● GND ●
 GND ● PC07 ● PC02 ● PC03 ● PB01 ● PE06 ● PD03 ● PB05 ● PB07 ● VCC ●

GND ● VCC ●
 PB06 ● PB07 ●
 PB00 ● PB05 ●
 PE02 ● PE03 ●
 PE05 ● PE06 ●
 PB02 ● PD07 ●
 PB03 ● PE04 ●
 PA06 ● PA07 ●
 PA04 ● PA05 ●
 ID ● GND ●



