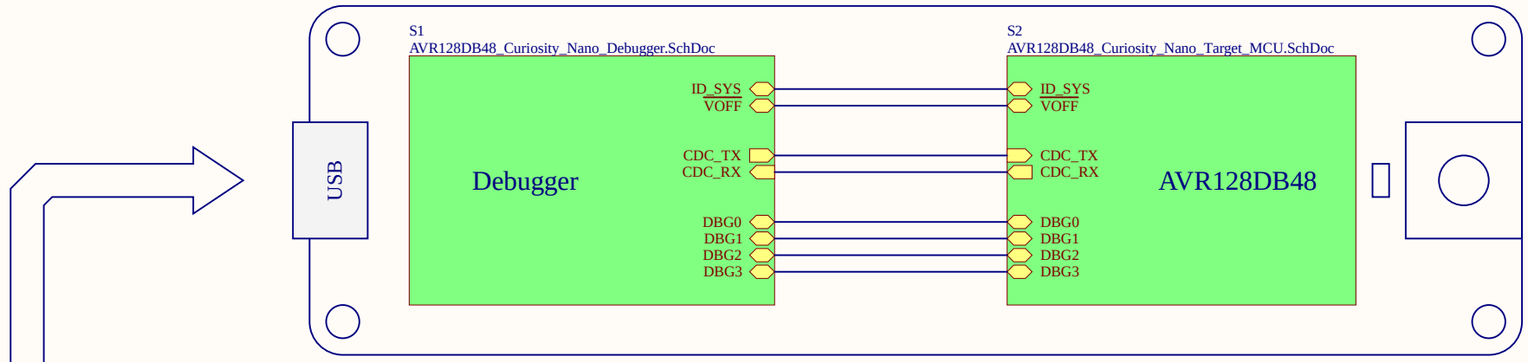
AVR128DB48 Curiosity Nano



On-Board Peripherals		
LED0	PB3	Active Low
SW0	PB2	Active Low

Program / Debug Interface

UPDI	UPDI

IDE

Program Debug

Mass Storage

CURIOSITY (E:)

Drag & Drop Programming

helloworld.hex

Serial / CDC port

USART3 TX	PB0
USART3 RX	PB1

Terminal

> Hello World!

DGI (Data Gateway Interface)

Debug GPIO 0	PB2 (SW0)
Debug GPIO 1	PB3 (LED0)

Data Visualizer

TESTDOC1
A12-1314

TEST1
$ >_
A11-0474

FW1
A11-0406

PCBADOC1
A12-1425

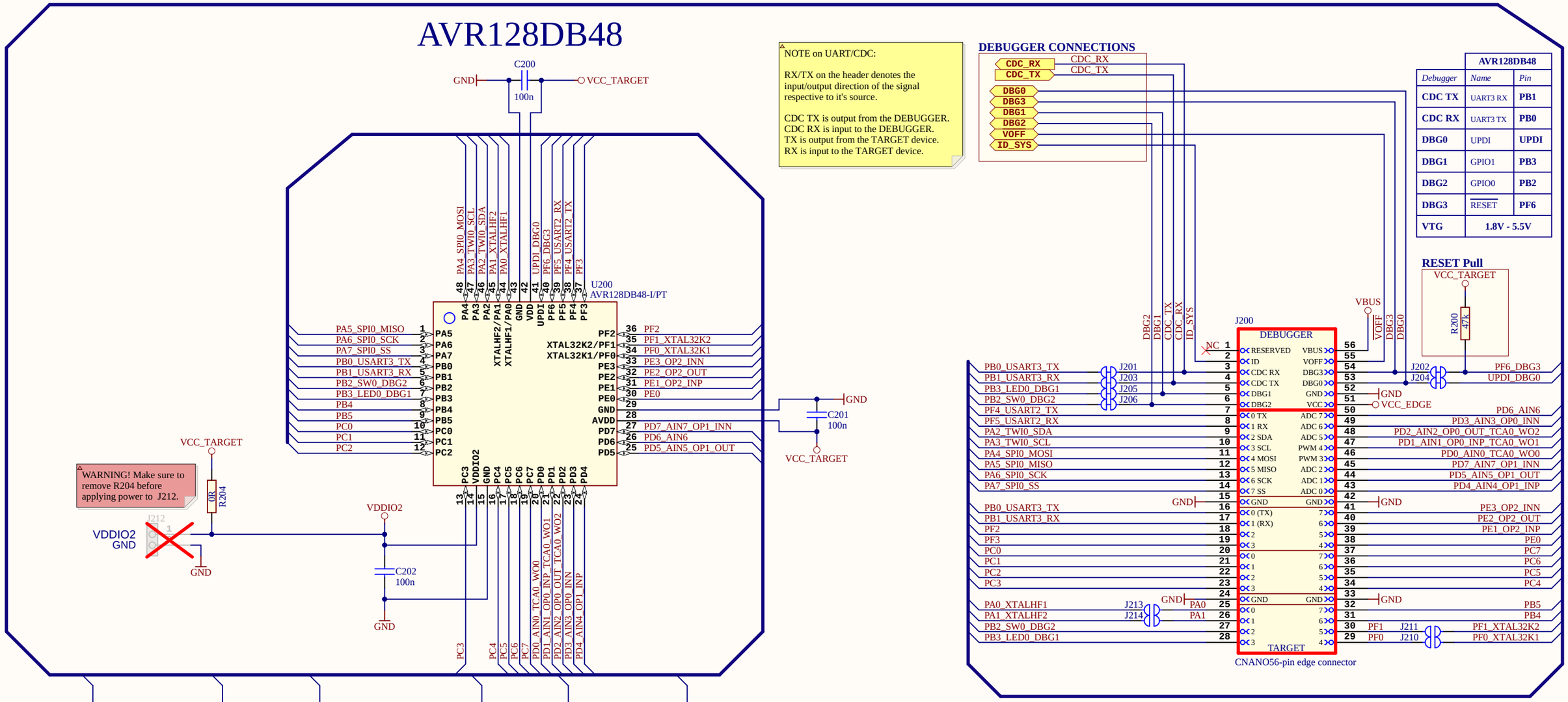
PCB1
A08-3057

LABEL1
Product number/revision
Serial number
Label PCBA

S3
AVR128DB48_Curiosity_Nano_Revision_History.SchDoc

Drawn By: ML			
Engineer: AH			
Project Title: *AVR128DB48 Curiosity Nano*			Designed with Altium — Altium.com
Sheet Title: Top Level			
Size A3	PCB Assembly Number: A09-3372	PCBA Revision: 2	Date: 13.08.2020
	PCB Number: A08-3057	PCB Revision: 1	Page: 1 of 4
File: AVR128DB48_Curiosity_Nano_TopLevel.SchDoc			

AVR128DB48



NOTE on UART/CDC:

RX/TX on the header denotes the input/output direction of the signal respective to it's source.

CDC TX is output from the DEBUGGER.
CDC RX is input to the DEBUGGER.
TX is output from the TARGET device.
RX is input to the TARGET device.

DEBUGGER CONNECTIONS

AVR128DB48		
Debugger	*Name*	*Pin*
CDC TX	UART3 RX	PB1
CDC RX	UART3 TX	PB0
DBG0	UPDI	UPDI
DBG1	GPIO1	PB3
DBG2	GPIO0	PB2
DBG3	RESET	PF6
VTG	1.8V - 5.5V	

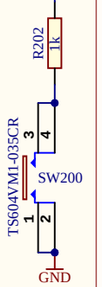
RESET Pull

WARNING! Make sure to remove R204 before applying power to J212.

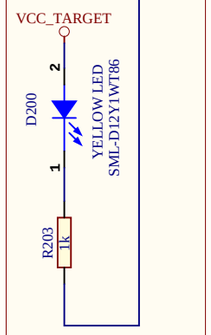
NOTE on I2C:

No pull-ups on board. Pull-ups should be mounted close to slave device(s).

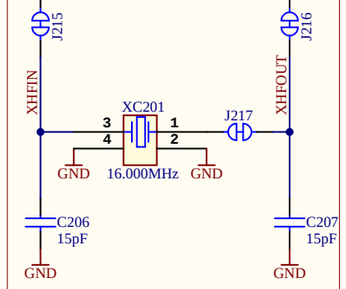
USER BUTTON



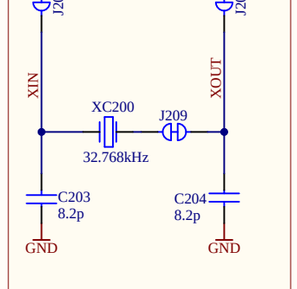
USER LED



16MHz Crystal



32KHz Crystal



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

AVR48DB128 datasheet:
Cxin = 4.0pF (typical value)
Cxout = 4.0pF (typical value)
Cl ≈ 1/((1/4.0pF)+ (1/4.0pF)) ≈ 2.0pF
Maximum Load = 12.5pF
Maximum ESR = 50kOhm

Estimated Cpcb = 0.5pF

Estimated load
C = 2 (Ccrystal- Cpara - Cpcb)
C = 2 (9pF - 2.0pF - 0.5pF)
C = 13.0pF

Selected in design after verification
C= 8.2pF/8.2pF

Crystal datasheet:
Ccrystal = 12pF
max ESR = 60Ohm
Accuracy ±30ppm

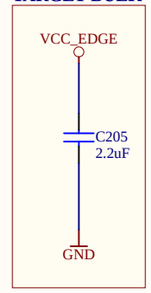
AVR48DB128 datasheet:
Cxin = 4.0pF (typical value)
Cxout = 4.0pF (typical value)
Cl ≈ 1/((1/4.0pF)+ (1/4.0pF)) ≈ 2.0pF
Maximum Load = 12.5pF
Maximum ESR = ??kOhm

Estimated Cpcb = 0.5pF

Estimated load
C = 2 (Ccrystal- Cpara - Cpcb)
C = 2 (12pF - 2.0pF - 0.5pF)
C = 19.0pF

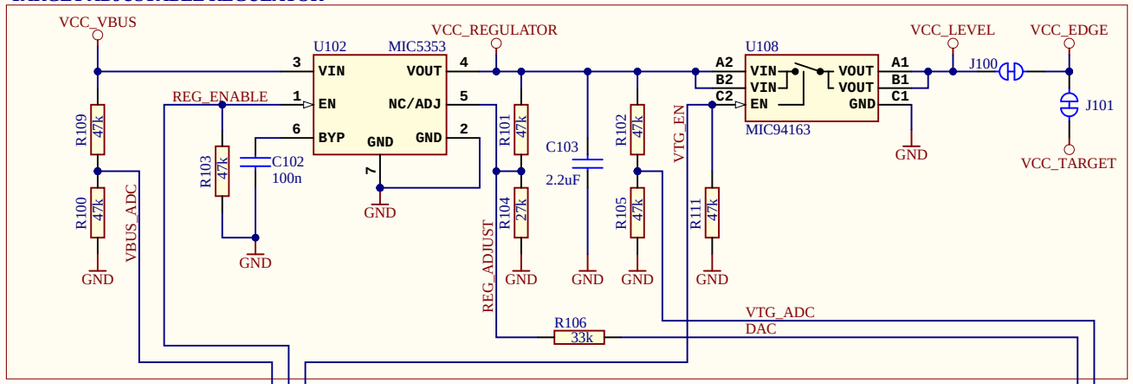
Selected in design after verification
C= 15pF/15pF

TARGET BULK



Drawn By: ML			MICROCHIP
Engineer: AH			
Project Title: *AVR128DB48 Curiosity Nano*			Designed with Altium — Altium.com
Sheet Title: Target MCU			
Size A3	PCB Assembly Number: A09-3372	PCBA Revision: 2	Date: 13.08.2020
	PCB Number: A08-3057	PCB Revision: 1	Page: 2 of 4
File: AVR128DB48_Curiosity_Nano_Target_MCU.SchDoc			

TARGET ADJUSTABLE REGULATOR



Adjustable output and limitations:
- The DEBUGGER can adjust the output voltage of the regulator between 1.25V and 5.1V to the target.
- The voltage output is limited by the input (USB), which can vary between 4.40V to 5.25V
- The level shifters have a minimal voltage level of 1.65V and will limit the minimum operating voltage allowed for the target to still allow communication.
- The MIC94163 has a minimal volatege level of 1.70V and will limit the minimum voltage delivered to the target.
- Firmware configuration will limit the voltage range to be within the the target specification.

J100:
- Cut-strap used for full separation of target power from the level shifters and on-board regulators.
- For current measurements using the on-board power supply, this strap must be cut and an ammeter connected across.
- For current measurements using an external power supply, this strap could be cut for more accurate measurements. Leakage back through the switch is in the micro ampere range.

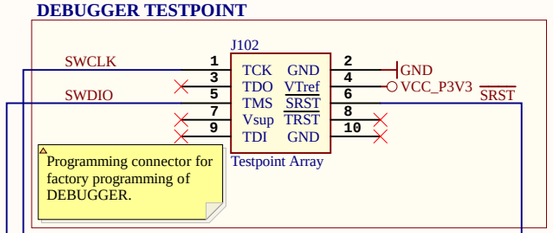
MIC5353:
Vin: 2.6V to 6V
Vout: 1.25V to 5.1V
Imax: 500mA
Dropout (typical): 50mV@150mA, 160mV @ 500mA
Accuracy: 2% initial
Thermal shutdown and current limit

Maximum output voltage is limited by the input voltage and the dropout voltage in the regulator. (Vmax = Vin - dropout)

Signal \ Interface	ICSP TARGET	UPDI TARGET
CDC TX	UART RX	UART RX
CDC RX	UART TX	UART TX
DBG0	DAT	UPDI
DBG1	CLK	GPIO
DBG2	GPIO	GPIO
DBG3	$\overline{\text{MCLR}}$	$\overline{\text{RESET}}$
VCC	-	-

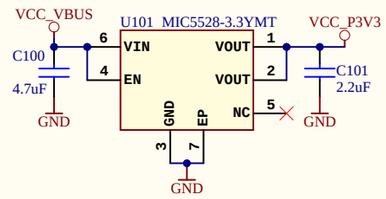
MIC5528:
Vin: 2.5V to 5.5V
Vout: Fixed 3.3V
Imax: 500mA
Dropout: 260mV @ 500mA

DEBUGGER TESTPOINT

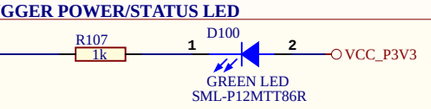


Programming connector for factory programming of DEBUGGER.

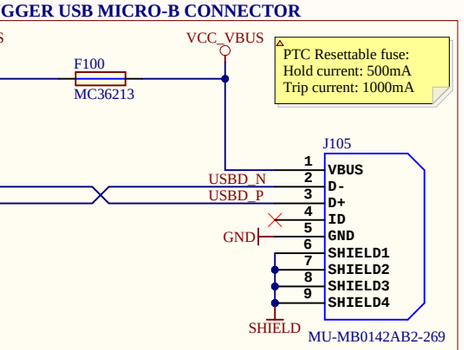
DEBUGGER REGULATOR



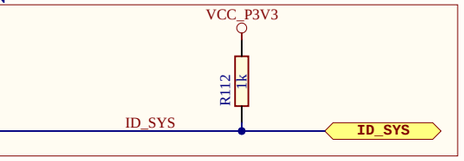
DEBUGGER POWER/STATUS LED

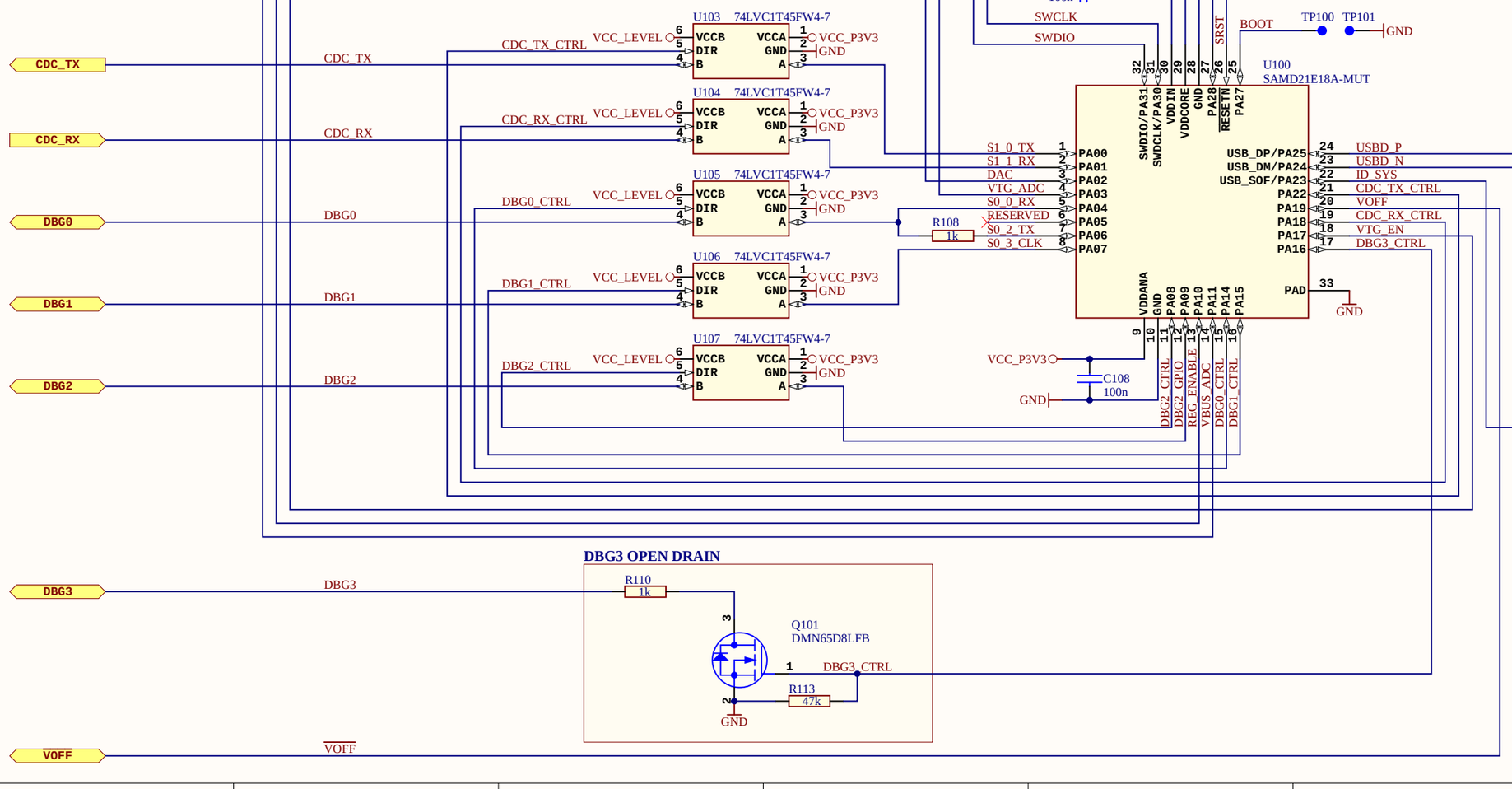


DEBUGGER USB MICRO-B CONNECTOR



ID PIN





DBG3 OPEN DRAIN

Drawn By: ML			
Engineer: AH			
Project Title: *AVR128DB48 Curiosity Nano*			Designed with Altium — Altium.com
Sheet Title: Debugger			
Size A3	PCB Assembly Number: A09-3372	PCBA Revision: 2	Date: 13.08.2020
	PCB Number: A08-3057	PCB Revision: 1	Page: 3 of 4
File: AVR128DB48_Curiosity_Nano_Debugger.SchDoc			

Revision History

PCB Assembly Rev 1:

Design Changes:

Initial Design

PCB:

PCB revision 1

PCB Assembly Rev 2:

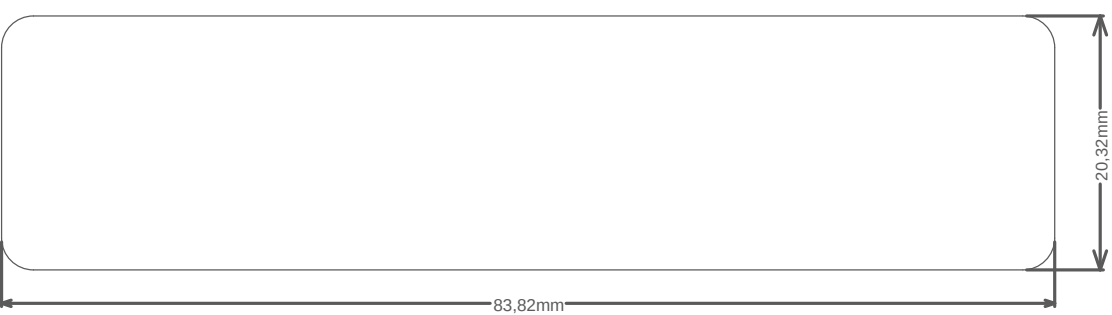
Design Changes:

Changed to crystals from Microchip (Vectron)

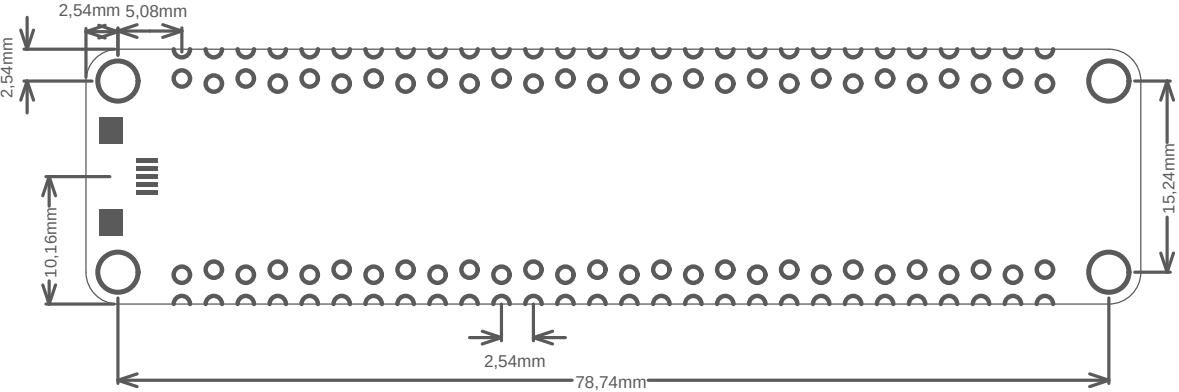
PCB:

PCB revision 1

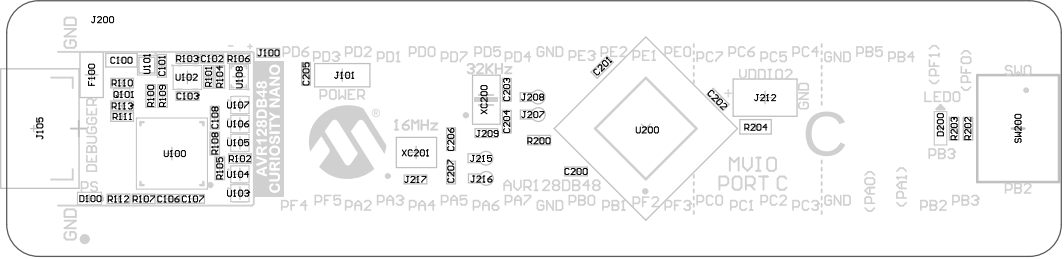
Drawn By: ML		MICROCHIP	
Engineer: AH			
Project Title: *AVR128DB48 Curiosity Nano*			Designed with Altium — Altium.com
Sheet Title: Revision History			
Size: A3	PCB Assembly Number: A09-3372	PCBA Revision: 2	Date: 13.08.2020
	PCB Number: A08-3057	PCB Revision: 1	Page: 4 of 4
File: AVR128DB48_Curiosity_Nano_Revision_History.SchDoc			

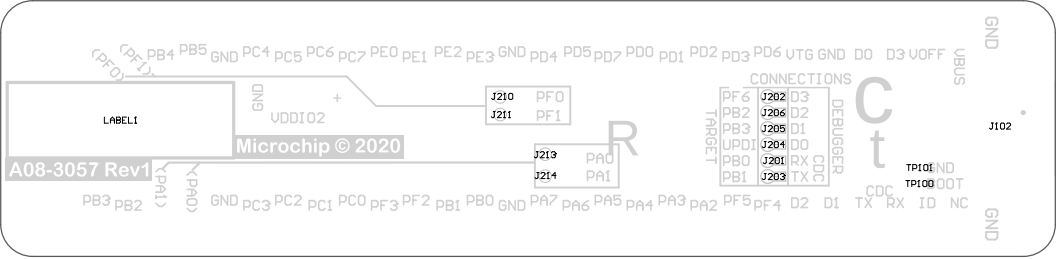

20,32mm
83,82mm

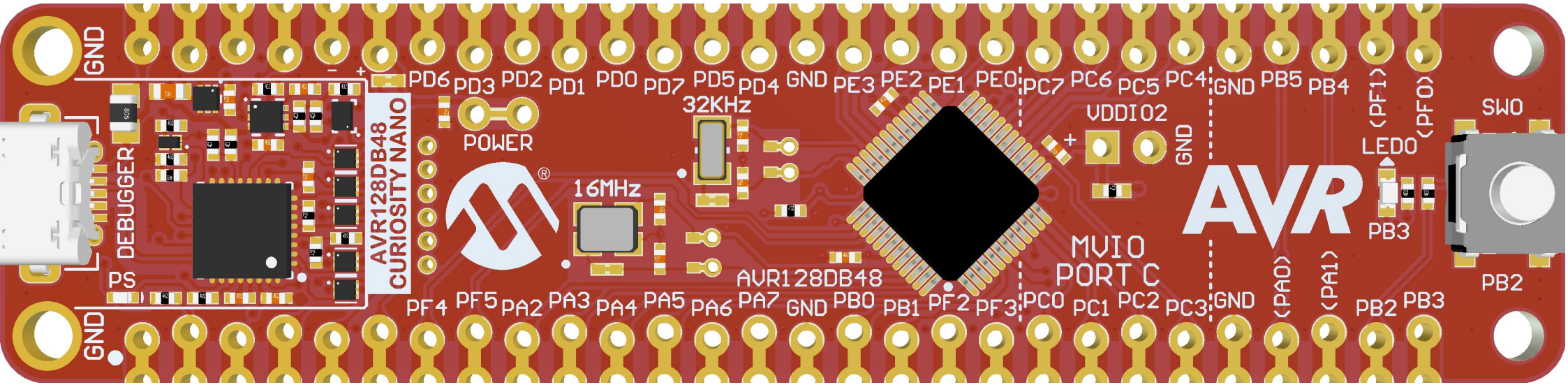
Connector Placement

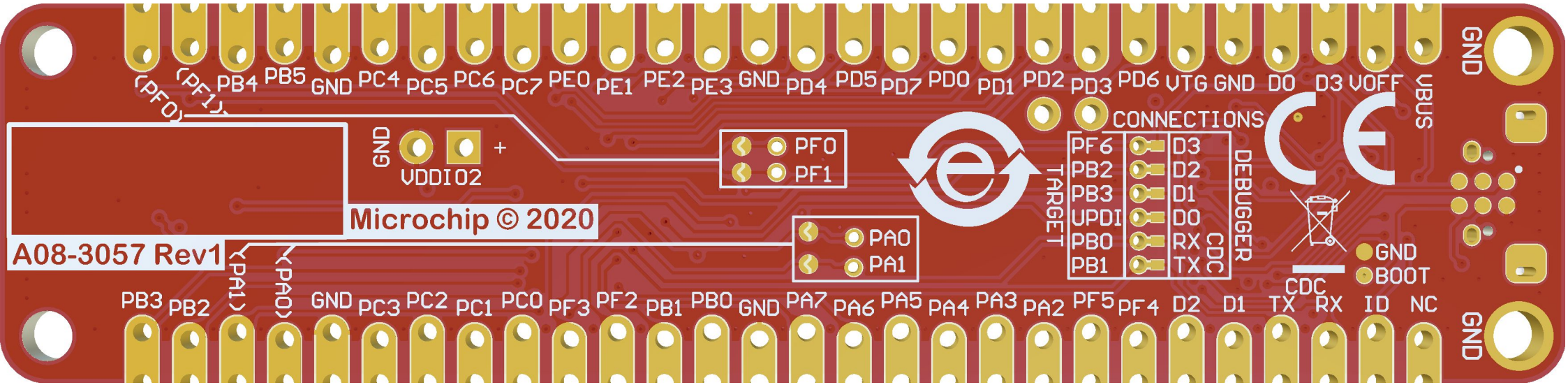


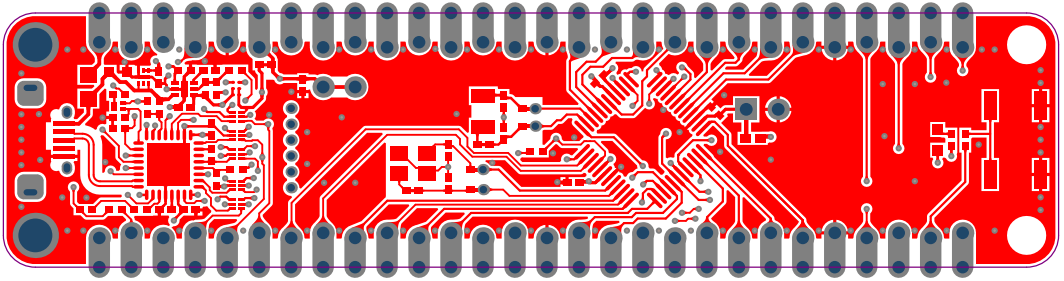
Test Point Placement

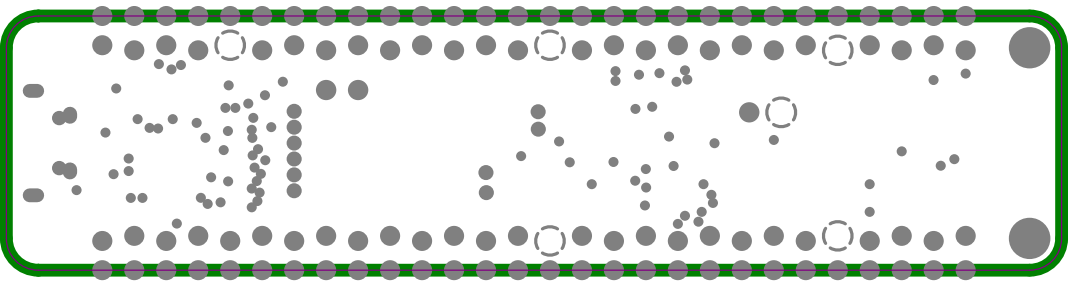

J200
GND
J105
DEBUGGER
F100
C100
U101
R110
Q101
R111
R109
C101
R103
C102
R106
U102
R101
R104
U106
C103
U107
U100
R108
C108
U105
R105
R102
U104
U103
D100
R112
R107
C106
C107
J100
C205
J101
POWER
AVR128DB48
CURIOSITY NANO
16MHz
XC201
J217
C206
C207
J215
J216
32KHz
XC200
C203
C204
J208
J207
J209
R200
C200
C201
U200
C202
J212
R204
VDDIO2
MVIO
PORT C
LED0
D200
R203
R202
SW200
SWO
(PF1)
(PF0)
PB3
PB2
PD6 PD3 PD2 PD1 PD0 PD7 PD5 PD4 GND PE3 PE2 PE1 PE0 PC7 PC6 PC5 PC4 GND PB5 PB4
PF4 PF5 PA2 PA3 PA4 PA5 PA6 PA7 GND PB0 PB1 PF2 PF3 PC0 PC1 PC2 PC3 GND (PA0) (PA1) PB2 PB3

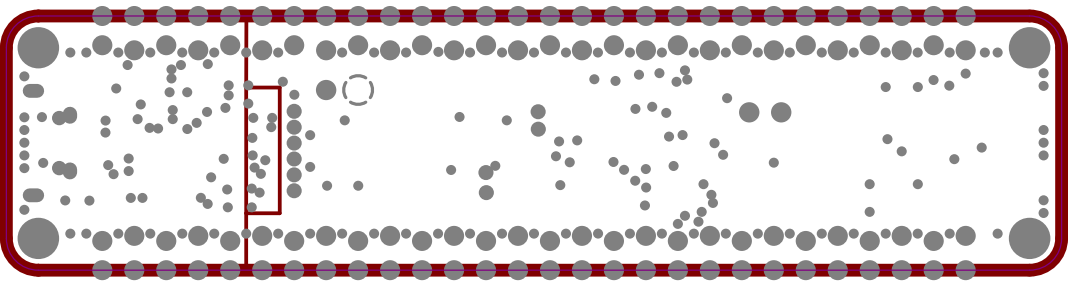

(PF0) (PF1) PB4 PB5 GND PC4 PC5 PC6 PC7 PE0 PE1 PE2 PE3 GND PD4 PD5 PD7 PD0 PD1 PD2 PD3 PD6 VTG GND DO D3 VOFF VBUS GND
LABEL1
GND
VDDIO2
+
J210 PF0
J211 PF1
CONNECTIONS
PF6 J202 D3
PB2 J206 D2
PB3 J205 D1
UPDI J204 DO
PB0 J201 RX CDC
PB1 J203 TX
TARGET
DEBUGGER
Ct
JIO2
TPIOI GND
TPIOO BOOT
Microchip © 2020
A08-3057 Rev1
R
J213 PA0
J214 PA1
(PA1) (PA0)
PB3 PB2 GND PC3 PC2 PC1 PC0 PF3 PF2 PB1 PB0 GND PA7 PA6 PA5 PA4 PA3 PA2 PF5 PF4 D2 D1 TX RX ID NC GND
CDC

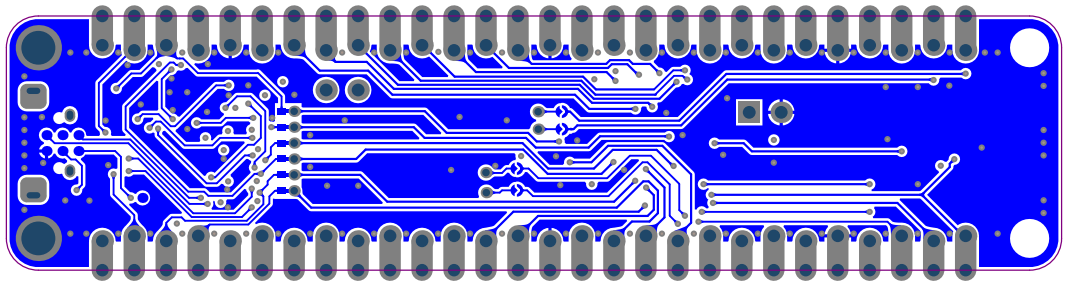

GND
DEBUGGER
PS
AVR128DB48
CURIOSITY NANO
PD6 PD3 PD2 PD1 PD0 PD7 PD5 PD4 GND PE3 PE2 PE1 PE0
POWER
32KHz
16MHz
PC7 PC6 PC5 PC4 GND PB5 PB4
VDDIO2
GND
LED0
SW0
PB3
PB2
AVR
MVIO
PORT C
AVR128DB48
PF4 PF5 PA2 PA3 PA4 PA5 PA6 PA7 GND PB0 PB1 PF2 PF3
PC0 PC1 PC2 PC3 GND PB2 PB3


(PF0)
(PF1)
PB4
PB5
GND
PC4
PC5
PC6
PC7
PE0
PE1
PE2
PE3
GND
PD4
PD5
PD7
PD0
PD1
PD2
PD3
PD6
VTG
GND
D0
D3
VOFF
VBUS
GND
GND
VDDIO2
+
PF0
PF1
CONNECTIONS
PF6
PB2
PB3
UPDI
PB0
PB1
D3
D2
D1
D0
RX
TX
CDC
DEBUGGER
TARGET
Microchip © 2020
A08-3057 Rev1
PA0
PA1
GND
BOOT
CDC
(PA1)
(PA0)
PB3
PB2
GND
PC3
PC2
PC1
PC0
PF3
PF2
PB1
PB0
GND
PA7
PA6
PA5
PA4
PA3
PA2
PF5
PF4
D2
D1
TX
RX
ID
NC
GND









Component list

Bill of Materials Fitted for Variant [Default Assembly] of Project [AVR128DB48_Curiosity_Nano.PrjPcb] (No PCB Document Selected)

Source Data From: AVR128DB48_Curiosity_Nano.PrjPcb
Project: AVR128DB48_Curiosity_Nano.PrjPcb
Variant: Default Assembly

Report Date: 13.08.2020 16:25
Print Date: 13.08.2020 16:25:42

Fitted	Designator	Quantity	Value	Manufacturer	MPN	Description
Fitted	C100	1	4.7uF	WALSIN Technology Corporation	0603X475K100CT	Ceramic capacitor, SMD 0603, X5R, 10V, 10% (de31036)
Fitted	C101, C103, C205	3	2.2uF	Kemet, TDK	C0402C225M9PAC, C1005X5R1A225K	Ceramic capacitor, SMD 0402, X5R, 6.3V, +/-20%, CAP CER 2.2UF 10V 10% X5R 0402
Fitted	C102, C107, C108, C200, C201, C202	6	100n	Kemet	C0402C104K4RACTU	Ceramic capacitor, SMD 0402, X7R, 16V, +/-10%
Fitted	C106	1	1u	Kemet	C0402C105K9PAC	Ceramic capacitor, SMD 0402, X5R, 6.3V, +/-10% (de26942)
Fitted	C203, C204	2	8.2p	Yageo	CC0402CRNPO9BN8R2	Ceramic capacitor, SMD 0402, NP0, 50V, +/-5%
Fitted	C206, C207	2	15pF	Yageo	CC0402JRNPO9BN150	Ceramic Capacitor,15pF,0402, 50V ,C0G, 5%
Fitted	D100	1	GREEN LED	ROHM	SML-P12MTT86R	LED, SMD 0402, Green, Wave length=569nm, 2.1mcd @ (1mA, 1.9Vf)rohm
Fitted	D200	1	YELLOW LED	ROHM	SML-D12Y1WT86	LED, SMD 0603, Yellow , Wave length=590nm, 100mcd @ (20mA, 2.2Vf) rohm
Fitted	F100	1	MC36213	Multicomp	MC36213	Resetable PTC fuse, Ih = 0.5A, It = 1.0A, 0805 package
Fitted	FW1	1	nEDBG firmware			nEDBG firmware
Fitted	J105	1	MU-MB0142AB2-269	Allen Creations Corp.	MU-MB0142AB2-269	USB micro AB, Surface mount signals and DIP shield
Fitted	LABEL1	1	Label PCBA	ACT Logimark AS	505462	PCBA identification label PP Top White Gloss
Fitted	PCB1	1	AVR128DB48 Curiosity Nano PCB Documentation			AVR128DB48 Curiosity Nano PCB Documentation
Fitted	PCBADOC1	1	AVR128DB48 Curiosity Nano PCBA Documentation			AVR128DB48 Curiosity Nano PCBA Documentation
Fitted	Q101	1	DMN65D8LFB	Diodes Incorporated	DMN65D8LFB-7	N-channel MOSFET, DFN1006-3 (SOT883), 60V, 330mA, 4Ohm
Fitted	R100, R101, R102, R103, R105, R109, R111, R113, R200	9	47k	KOA	RK73H1ETTP4702F	Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R104	1	27k	Yageo	RC0402FR-0727KL	Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R106	1	33k	ASJ Holdings	CR10-3302-FK	Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R107, R108, R110, R112, R202, R203	6	1k	ASJ Holdings	CR10-1001-FK	Thick film resistor, SMD 0402, 1/16W, 1%
Fitted	R204	1	0R	(n/a)	RMCF0402ZT0R00	RES 0.0 OHM 1/16W 0402 SMD
Fitted	SW200	1	TS604VM1-035CR	Dailyw ell Electronics Co.LTD	TS604VM1-035CR-R	SWITCH, SMD, 260gf, 6.4mm X 6.2mm
Fitted	TEST1	1	AVR128DB48 Curiosity Nano Test			Fixture test for AVR128DB48 Curiosity Nano
Fitted	TESTDOC1	1	Curiosity Nano Test Instructions			Generic Test Instructions for Curiosity Nano
Fitted	U100	1	SAMD21E18A-MUT	Microchip	ATSAMD21E18A-MUT	Atmel 32-bit RISC MCU 32pin
Fitted	U101	1	MIC5528-3.3YMT	Microchip	MIC5528-3.3YMT-T5	LDO 3.3V 0.5A 6TDFN
Fitted	U102	1	MIC5353	Microchip	MIC5353YMT-TR	500mA Ultra Low Dropout LDO regulator, 2% accuracy, 1.6x1.6mm MLF
Fitted	U103, U104, U105, U106, U107	5	74LVC1T45FW4-7	Diodes Incorporated	74LVC1T45FW4-7	Single-Bit Dual-Supply Transceive, 1.65-5.5 Translation and 3-State Outputs
Fitted	U108	1	MIC94163	Microchip	MIC94163YCS-TR	Loadswitch, Rds(on) = 14.5mohm, 1.0mm x 1.5mm WLCSP, reverse blocking
Fitted	U200	1	AVR128DB48-I/PT	Microchip	AVR128DB48T-I/PT	AVR MCU 8-Bit 128kB Flash 48 pin 24MHz TQFP
Fitted	XC200	1	32.768kHz	Microchip	VMK3-9001-32K7680000TR	Crystal, 32.768kHz, CL=9.0pF, ESR=70kOhm, SMD LxW=3.2 x 1.5mm, 20ppm
Fitted	XC201	1	16.000MHz	Microchip	VXM7-9040-16M0000000TR	Crystal, 16.0MHz, CL=12.0pF, ESR=80Ohm, SMD LxW=3.2 x 25mm, 20ppm
Not Fitted	J212	0	1125-1102S0S113R1	WCON	1125-1102S0S113R1	1x2 pin header, 2.54mm pitch, Pin-in-Paste THM
		57				

Approved

Notes