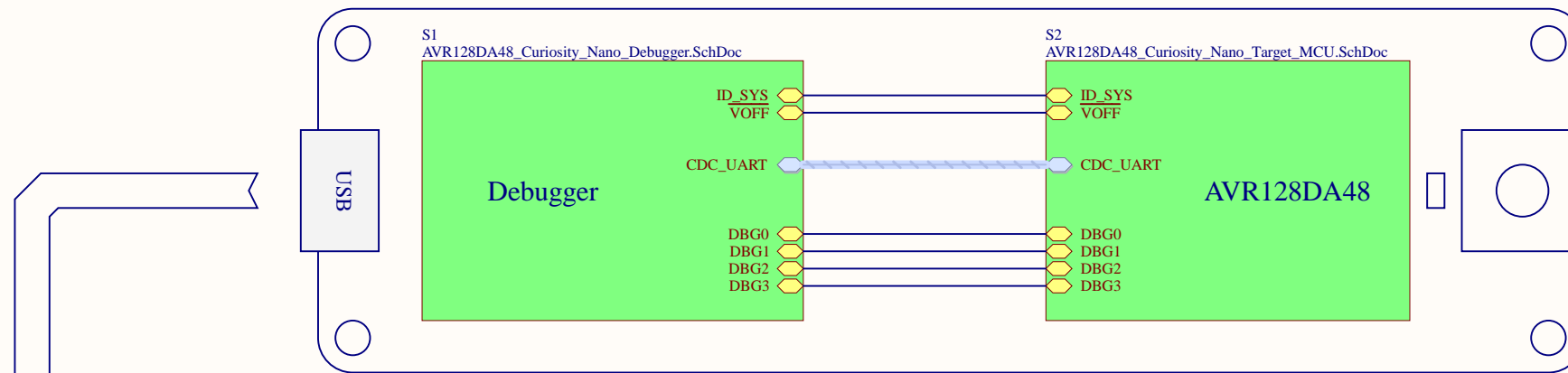
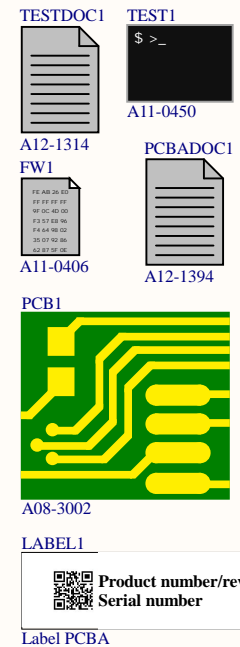
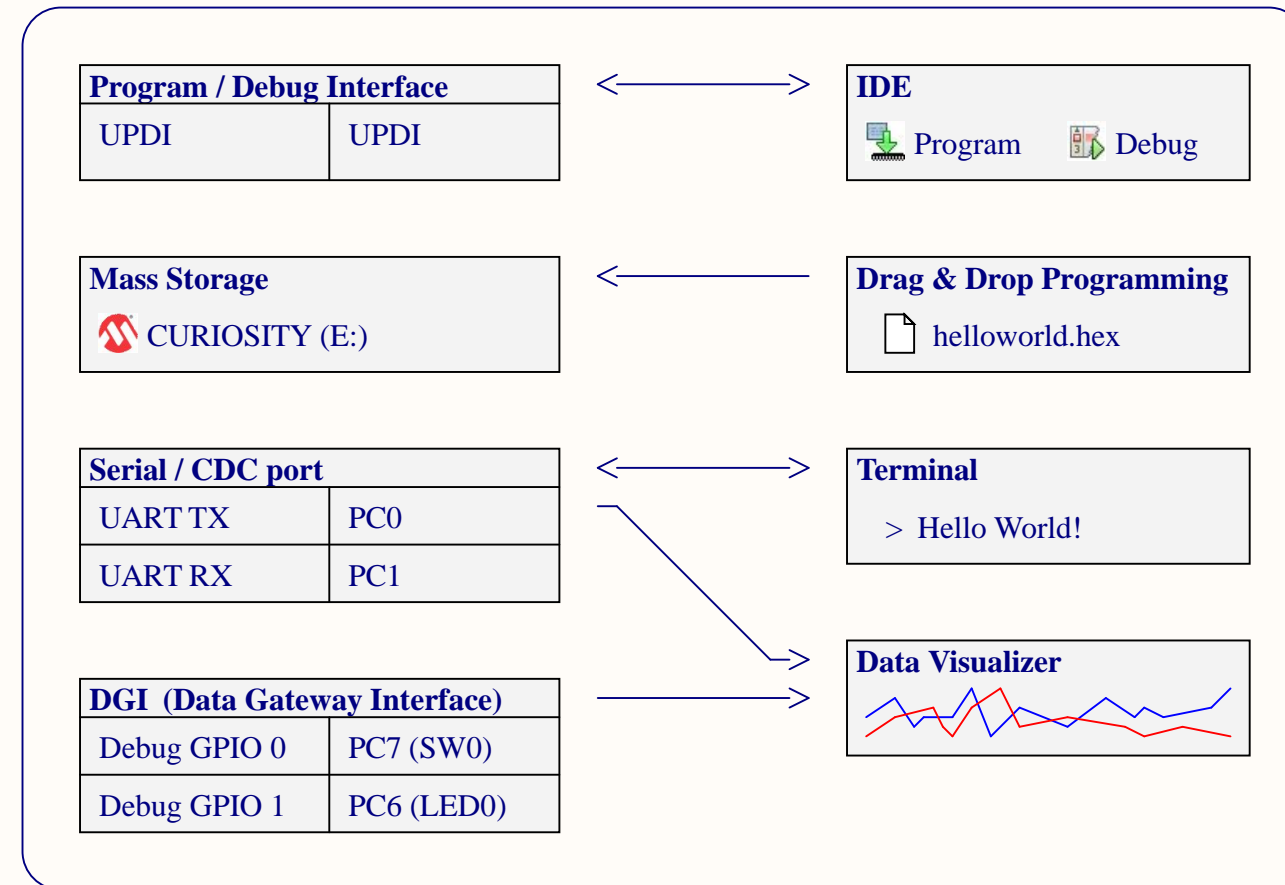


# AVR128DA48 Curiosity Nano



| On-Board Peripherals |     |            |
|----------------------|-----|------------|
| LED0                 | PC6 | Active Low |
| SW0                  | PC7 | Active Low |



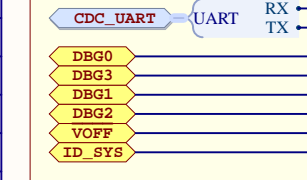
S3  
AVR128DA48\_Curiosity\_Nano\_Revision\_History.SchDoc

|   |                               |                  |
|---|-------------------------------|------------------|
| Drawn By:<br>PB                                   |                               |                  |
| Engineer:<br>AH, TF                               |                               |                  |
| Project Title<br><b>AVR128DA48 Curiosity Nano</b> | <br>Designed with Altium.com  |                  |
| Sheet Title<br><b>Top Level</b>                   |                               |                  |
| Size A3   | PCB Assembly Number: A09-3280 | PCBA Revision: 3 |
| File: AVR128DA48_Curiosity_Nano_TopLevel.SchDoc   | PCB Number: A08-3002          | PCB Revision: 3  |
|   |                               | Date: 2/20/2020  |
|   |                               | Page: 1 of 4     |

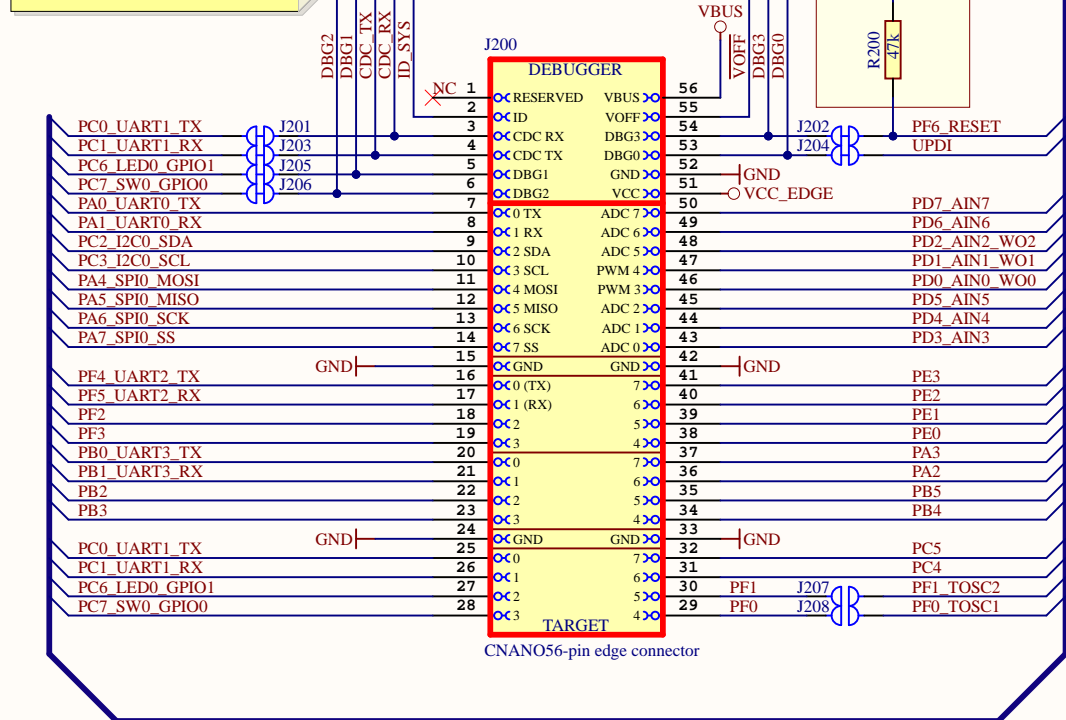
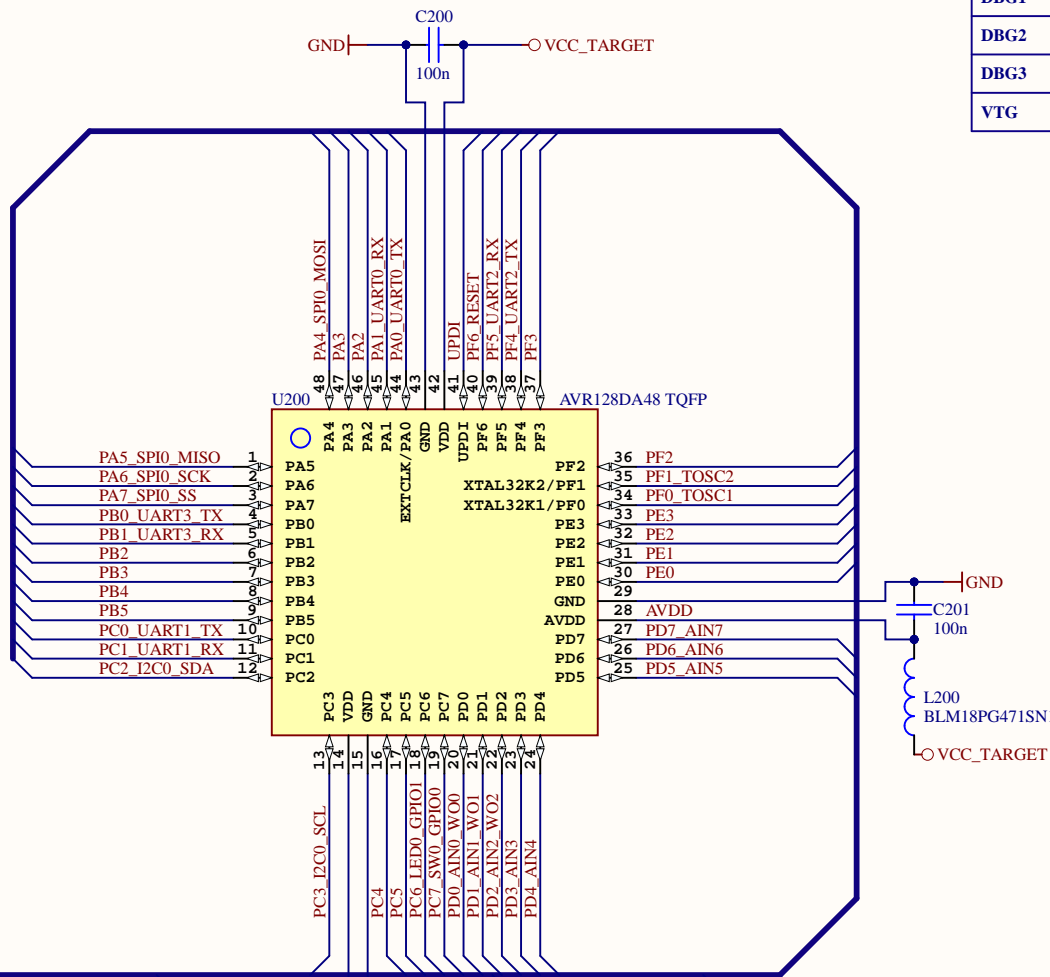
# AVR128DA48

| AVR128DA48 |             |      |
|------------|-------------|------|
| Debugger   | Name        | Pin  |
| CDC TX     | UART1 RX    | PC1  |
| CDC RX     | UART1 TX    | PC0  |
| DBG0       | UPDI        | UPDI |
| DBG1       | GPIO1       | PC6  |
| DBG2       | GPIO0       | PC7  |
| DBG3       | RESET       | PF6  |
| VTG        | 1.8V - 5.5V |      |

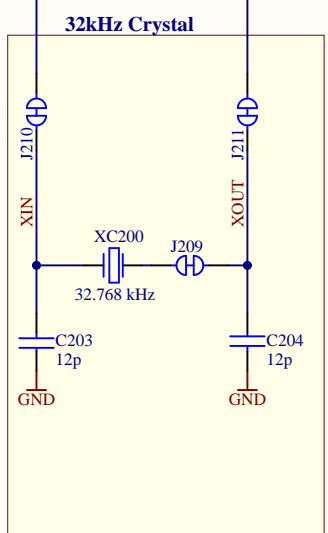
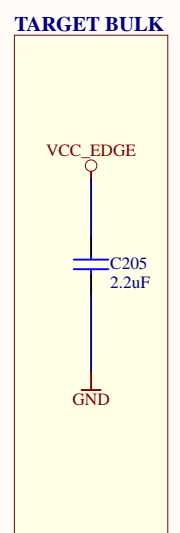
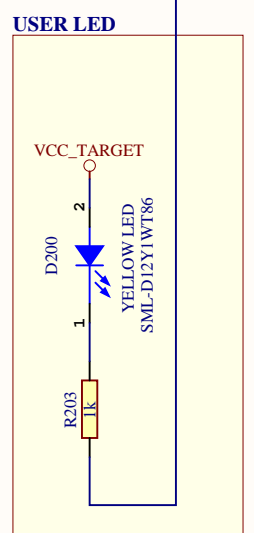
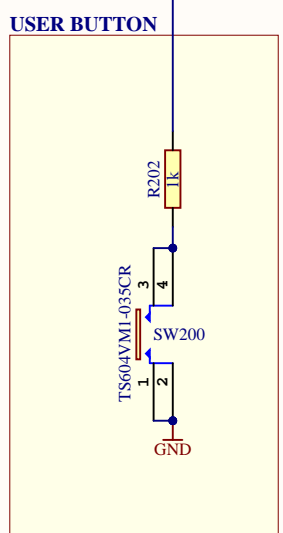
## DEBUGGER CONNECTIONS



**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.



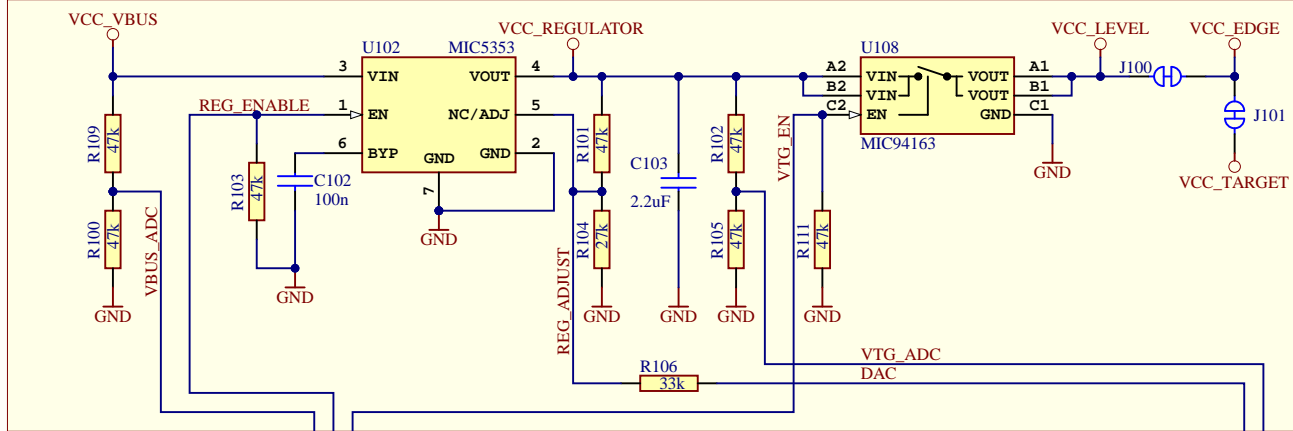
**NOTE on I2C:**  
 No pull-ups on board. Pull-ups should be mounted close to slave device(s).



**Crystal datasheet:**  
 Ccrystal = 9pF  
 max ESR = 70kOhm  
 Accuracy ±20ppm  
**AVR128DA48 datasheet:**  
 Cxin = 4.1pF  
 Cxout = 6.0pF  
 $C1 \approx 1 / ((1/4.1pF) + (1/6.0pF)) \approx 2.44pF$   
 Maximum Load = 12.5pF  
 Maximum ESR = 80kOhm  
 Estimated Cpcb = 0.5pF  
 Estimated load  
 $C = 2 (Ccrystal - Cpara - Cpcb)$   
 $C = 2 (9pF - 2.44pF - 0.5pF)$   
 $C = 12.12pF$   
 Selected in design after verification  
 $C = 12pF/12pF$

|   |                               |                  |
|---|-------------------------------|------------------|
| Drawn By:<br>PB                                   |                               |                  |
| Engineer:<br>AH, TF                               |                               |                  |
| Project Title<br><b>AVR128DA48 Curiosity Nano</b> |                               |                  |
| Sheet Title<br><b>Target MCU</b>                  |                               |                  |
| Size A3   | PCB Assembly Number: A09-3280 | PCBA Revision: 3 |
|   | PCB Number: A08-3002          | PCB Revision: 3  |
| File: AVR128DA48_Curiosity_Nano_Target_MCU.SchDoc |                               | Date: 2/20/2020  |
|   |                               | Page: 2 of 4     |

**TARGET ADJUSTABLE REGULATOR**



**J100:**  
Cut-strap used for full separation of target power from the level shifters and on-board regulators.  
- 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.

**J101:**  
This is footprint for a 1x2 100mil pitch pin-header that can be used for easy current measurement to the target microcontroller and the LED / Button. To use the footprint:  
- Cut the track between the holes, and mount a pin-header

**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)

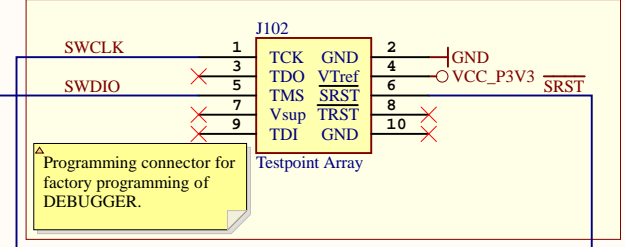
| Interface | ICSP TARGET | UPDI TARGET |
|-----------|-------------|-------------|
| CDC TX    | UART RX     | UART RX     |
| CDC RX    | UART TX     | UART TX     |
| DBG0      | DAT         | UPDI        |
| DBG1      | CLK         | GPIO        |
| DBG2      | GPIO        | GPIO        |
| DBG3      | MCLR        | RESET       |
| VCC       | -           | -           |

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

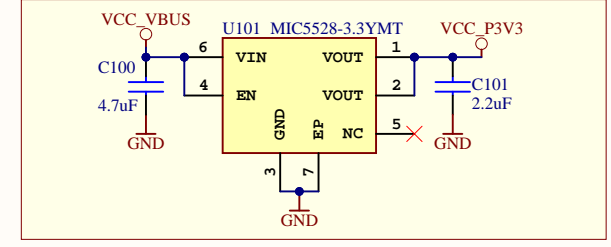
**Adjustable output and limitations:**

- 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 voltage 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 target specification.

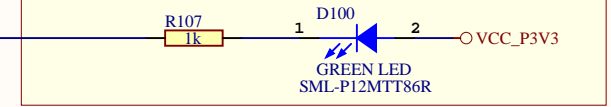
**DEBUGGER TESTPOINT**



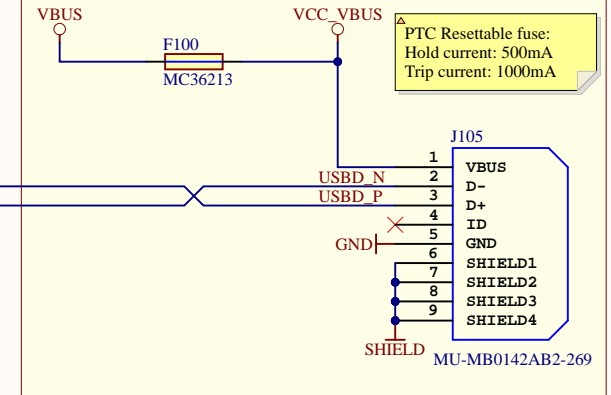
**DEBUGGER REGULATOR**



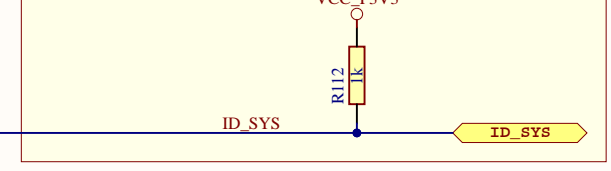
**DEBUGGER POWER/STATUS LED**



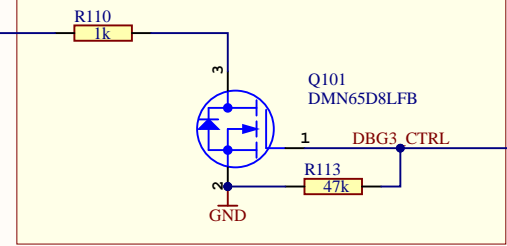
**DEBUGGER USB MICRO-B CONNECTOR**



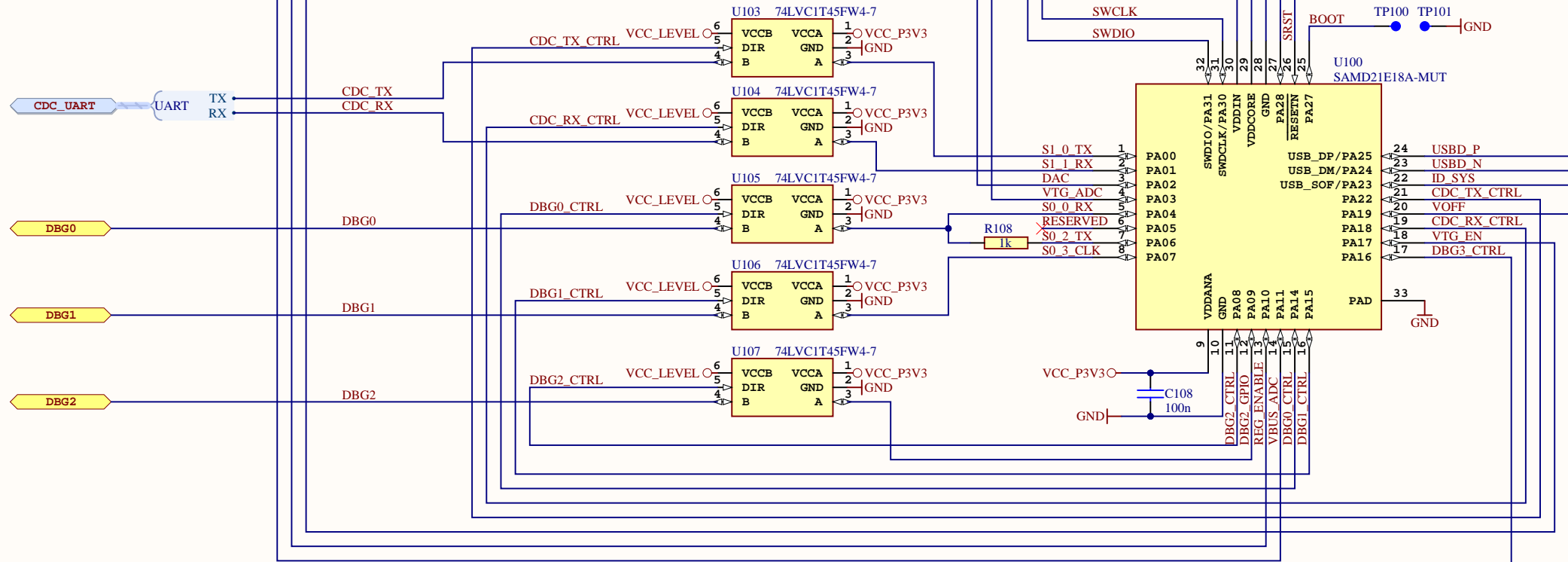
**ID PIN**



**DBG3 OPEN DRAIN**



R113 is required to pull the Q101 gate to a defined value when the U100 is not powered



# Revision History

## PCB Assembly Rev 1:

Design Changes:  
Initial Design

PCB:  
PCB revision 1

## PCB Assembly Rev 2:



Design Changes:  
Added 100-mil 1x2 pin header footprint on the microcontroller power net for easier power measurement.

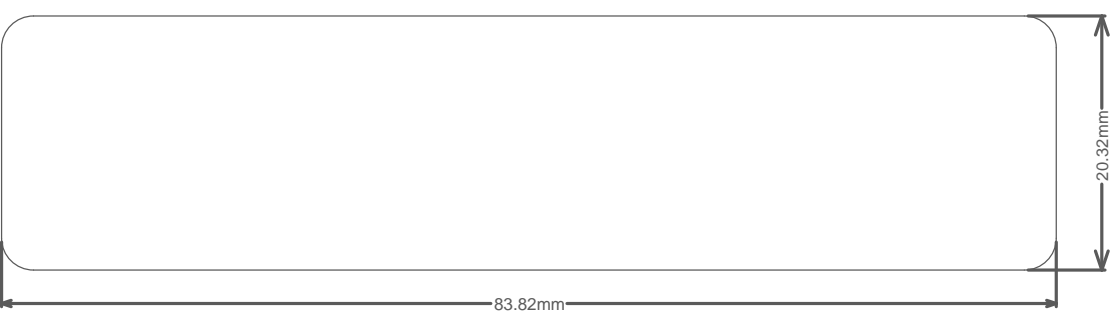
PCB:  
PCB revision 2  
Edge connector footprint modified with 8-mil stagger to allow usage of pin headers without soldering.

## PCB Assembly Rev 3:

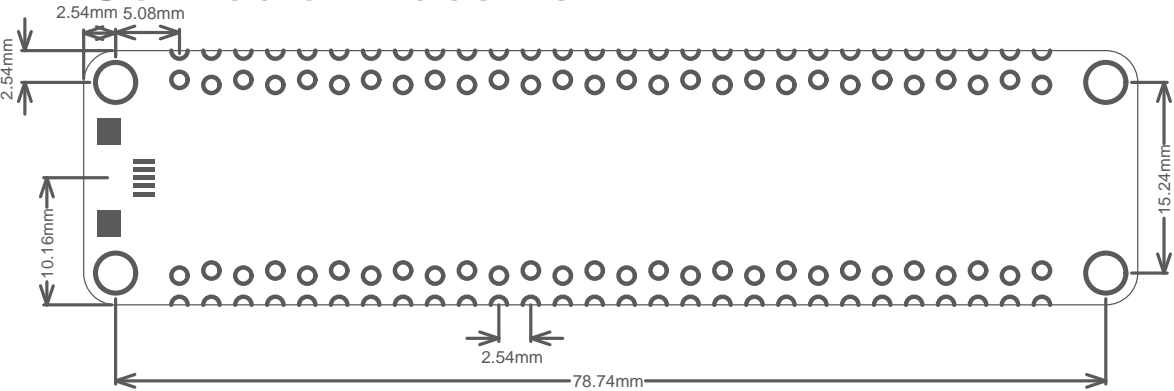
Design Changes:  
\* Remapped pinout to optimize Touch extension kit compatibility  
\* Changed 32768Hz crystal (XC200) to an available version  
\* Changed crystal load capacitances to match crystal

PCB:  
PCB revision 3

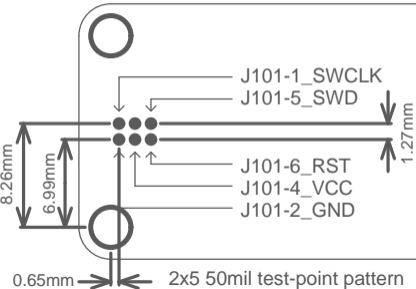
|   |   |                  |  |
|---|---|------------------|--|
| Drawn By:<br>PB   |  |                  |  |
| Engineer:<br>AH, TF                                     |   |                  |  |
| Project Title<br><b>AVR128DA48 Curiosity Nano</b>       | Sheet Title<br><b>Revision History</b>  |                  | Designed with<br><br>Altium.com |
| Size A3   | PCB Assembly Number: A09-3280   | PCBA Revision: 3 |  |
|   | PCB Number: A08-3002  | PCB Revision: 3  | Date: 2/20/2020  |
| File: AVR128DA48_Curiosity_Nano_Revision_History.SchDoc |   |                  | Page: 4 of 4   |

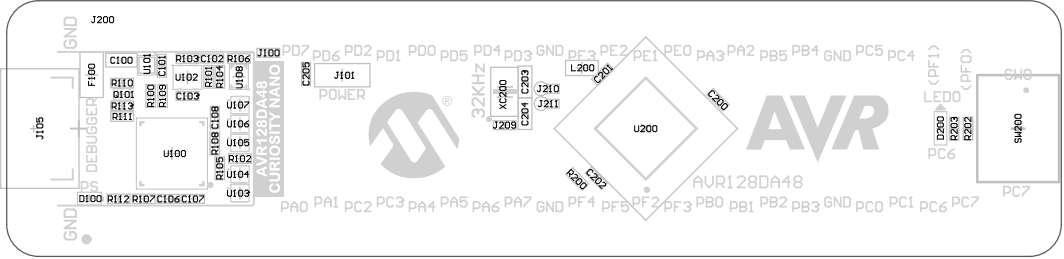


# Connector Placement



# Test Point Placement







PC4 PC5 GND PB4 PB5 PA2 PA3 PE0 PE1 PE2 PE3 GND PD3 PD4 PD5 PD0 PD1 PD2 PD6 PD7 VTT GND DO D3 VOFF VBUS

(PF0)  
(PF1)

LABEL1

A08-3002 Rev3  
Microchip © 2019

J207 PF1  
J208 PF0



CONNECTIONS

|      |      |    |                 |
|------|------|----|-----------------|
| PF6  | J202 | D3 | CDC<br>DEBUGGER |
| PC7  | J206 | D2 |                 |
| PC6  | J205 | D1 |                 |
| UPDI | J204 | DO |                 |
| PC0  | J201 | RX |                 |
| PC1  | J203 | TX |                 |
|      |      |    |                 |

TARGET



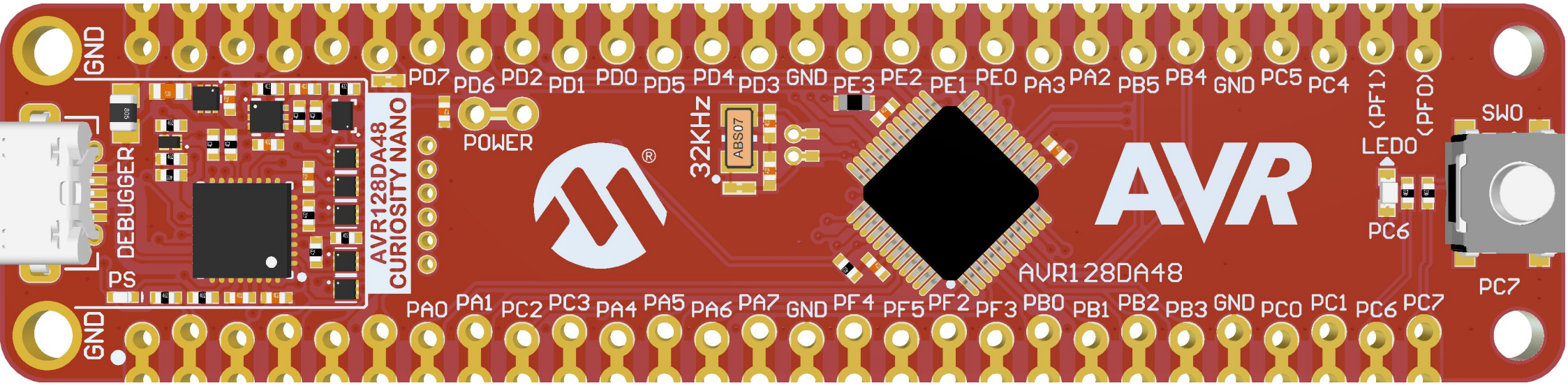
TP101 GND  
TP100 BOOT

PC7 PC6 PC1 PC0 GND PB3 PB2 PB1 PB0 PF3 PF2 PF5 PF4 GND PA7 PA6 PA5 PA4 PC3 PC2 PA1 PA0 D2 D1 TX RX ID NC

GND

J102

GND



GND

GND

AVR128DA48  
CURIOSITY NANO



AVR

AVR128DA48

PD7 PD6 PD2 PD1 PD0 PD5 PD4 PD3 GND PE3 PE2 PE1 PE0 PA3 PA2 PB5 PB4 GND PC5 PC4  
POWER  
32KHZ  
ABS07  
<PF1> <PF0>  
LED0  
PC6  
PC7  
PA0 PA1 PC2 PC3 PA4 PA5 PA6 PA7 GND PF4 PF5 PF2 PF3 PB0 PB1 PB2 PB3 GND PC0 PC1 PC6 PC7



SWO

PC7

A08-3002 Rev3  
Microchip © 2019



|      |    |
|------|----|
| PF6  | D3 |
| PC7  | D2 |
| PC6  | D1 |
| UPDI | D0 |
| PC0  | RX |
| PC1  | TX |

DEBUBGER  
CDC

CONNECTIONS  
TARGET

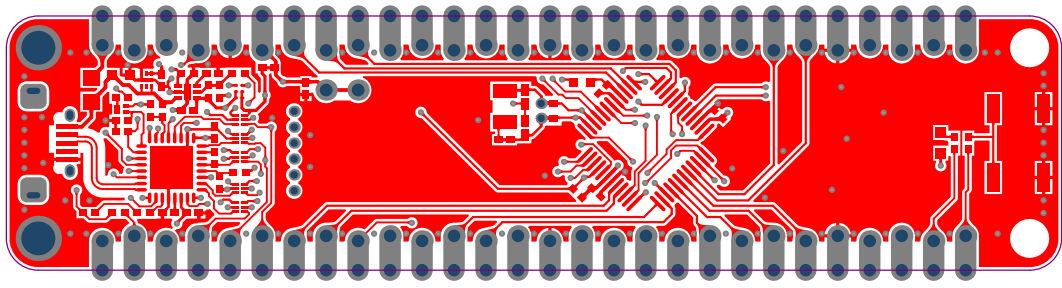


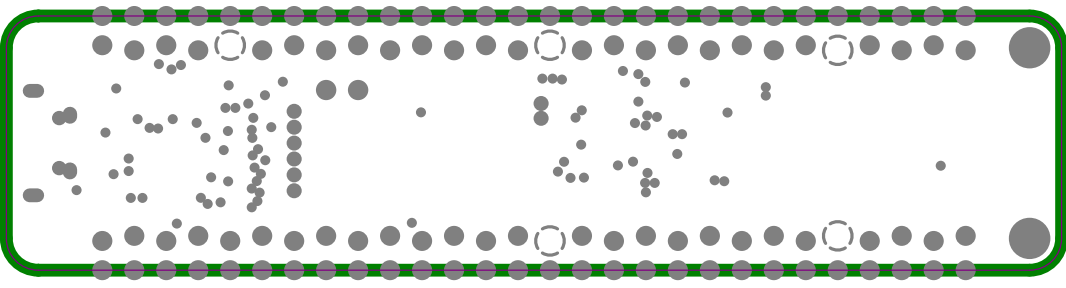
GND  
BOOT

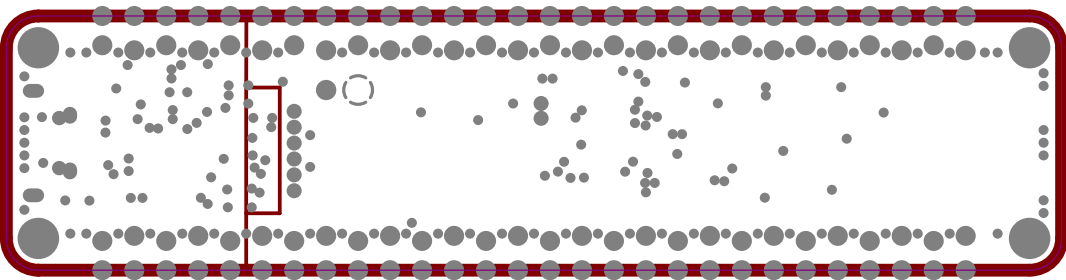
<PF0> <PF1> PC4 PC5 GND PB4 PB5 PA2 PA3 PE0 PE1 PE2 PE3 GND PD3 PD4 PD5 PD0 PD1 PD2 PD6 PD7 UTG GND D0 D3 VOFF UBUS GND

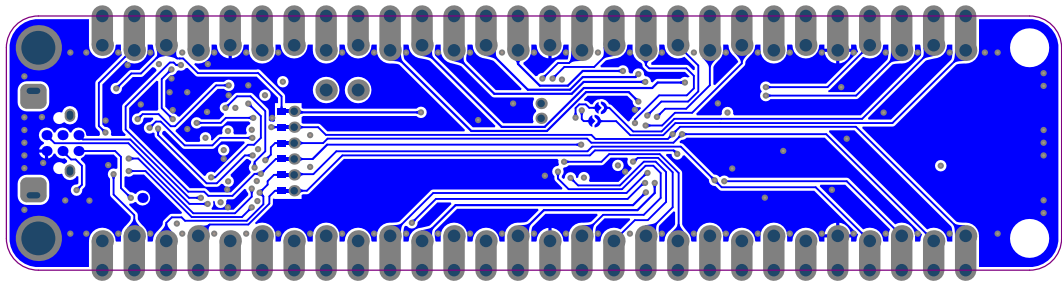
PC7 PC6 PC1 PC0 GND PB3 PB2 PB1 PB0 PF3 PF2 PF5 PF4 GND PA7 PA6 PA5 PA4 PC3 PC2 PA1 PA0 D2 D1 TX RX ID NC GND











# Component list

Bill of Materials Fitted for Variant [Default Assembly] of Project [AVR128DA48\_Curiosity\_Nano.PrjPcb] (No PCB Document Selected)

Source Data From: AVR128DA48\_Curiosity\_Nano.PrjPcb  
 Project: AVR128DA48\_Curiosity\_Nano.PrjPcb  
 Variant: Default Assembly



Report Date: 2/20/2020 1:24 PM  
 Print Date:

| 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   | 1         | 2.2uF                                       | Kemet                         | C0402C225M9PAC      | Ceramic capacitor, SMD 0402, X5R, 6.3V, +/-20%                                    |
| Fitted | C102, C107, C108, C200, C201, C202                   | 6         | 100n  | Kemet                         | C0402C104K4RA CTU   | Ceramic capacitor, SMD 0402, X7R, 16V, +/-10%                                     |
| Fitted | C103, C205   | 2         | 2.2uF                                       | TDK                           | C1005X5R1A225K      | CAP CER 2.2UF 10V 10% X5R 0402  |
| Fitted | C106   | 1         | 1u  | Kemet                         | C0402C105K9PAC      | Ceramic capacitor, SMD 0402, X5R, 6.3V, +/-10% (de26942)                          |
| Fitted | C203, C204   | 2         | 12p   | Kemet                         | C0402C120J5GAC7867  | Ceramic capacitor, SMD 0402, NPO, 50V, +/-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, I <sub>h</sub> = 0.5A, I <sub>t</sub> = 1.0A, 0805 package    |
| Fitted | FW1  | 1         | nEDBG firmw are                             |                               |                     | nEDBG firmw are   |
| Fitted | J105   | 1         | MU-MB0142AB2-269                            | Allen Creations Corp.         | MU-MB0142AB2-269    | USB micro AB, Surface mount signals and DIP shield                                |
| Fitted | L200   | 1         | BLM18PG471SN1                               | Murata                        | BLM18PG471SN1       | SMD RF inductor 0603. Z=470Ohm (@100MHz), Max R(dc)=0.20Ohm, Max current=1A       |
| Fitted | LABEL1   | 1         | Label PCBA                                  | ACT Logimark AS               | 505462              | PCBA identification label PP Top White Gloss                                      |
| Fitted | PCB1   | 1         | AVR128DA48 Curiosity Nano PCB documentation |                               |                     | AVR128DA48 Curiosity Nano PCB documentation                                       |
| Fitted | PCBADOC1   | 1         | A09-3280 PCBA files                         |                               |                     | AVR128DA48 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 | SW200  | 1         | TS604VM1-035CR                              | Dailywell Electronics Co.LTD  | TS604VM1-035CR-R    | SWITCH, SMD, 260gf, 6.4mm X 6.2mm   |
| Fitted | TEST1  | 1         | AVR128DA48 Curiosity Nano test              |                               |                     | Fixture test for AVR128DA48 Curiosity Nano  |
| Fitted | TESTDOC1   | 1         | Curiosity Nano Test Instructions            |                               |                     | Generic Test Instructions for Curiosity Nano                                      |
| Fitted | U100   | 1         | SAMD21E18A-MUT                              | Microchip                     | ATSAMD21E18A-MUT    | 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 Transceiver, 1.65-5.5 Translation and 3-State Outputs      |
| Fitted | U108   | 1         | MIC94163                                    | Microchip                     | MIC94163YCS-TR      | Loadswitch, R <sub>ds(on)</sub> = 14.5mohm, 1.0mm x 1.5mm WLCSP, reverse blocking |
| Fitted | U200   | 1         | AVR128DA48 TQFP                             | Microchip                     | AVR128DA48T-IPT     | 8-bit RISC MCU, 128K Flash, 48pin TQFP, 7x7mm, 0.5mm pitch package                |
| Fitted | XC200  | 1         | 32.768kHz                                   | Abrakon                       | ABS07-32.768kHz-9-T | Crystal, 32.768kHz, CL=9.0pF, ESR=70kOhm, SMD LxW=3.2 x 1.5mm, 20ppm              |
|        |  | <b>54</b> |   |                               |                     |   |

Approved

Notes