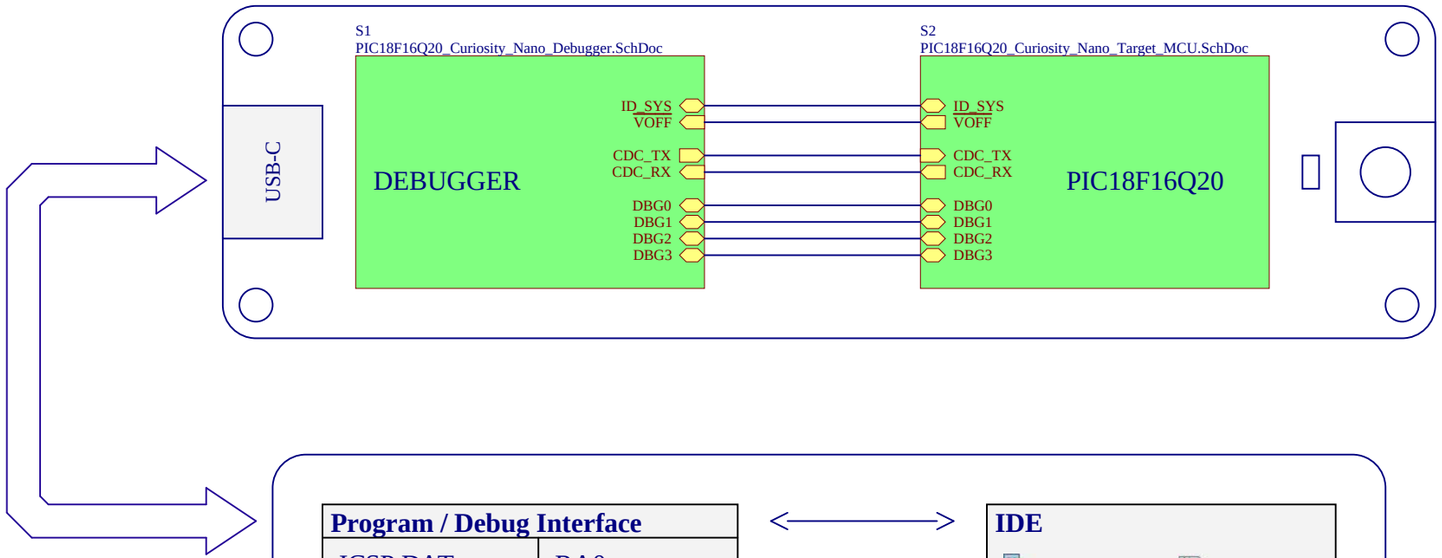
PIC18F16Q20 Curiosity Nano



On-Board Peripherals		
LED0	RC7	Active Low
SW0	RA2	Active Low

Program / Debug Interface	
ICSP DAT	RA0
ICSP CLK	RA1
MCLR	RA3

IDE

Program Debug

Mass Storage

CURIOSITY (E:)

Drag & Drop Programming

helloworld.hex

Serial / CDC port	
UART[n]* TX	RC4
UART[n]* RX	RC5

*configure with Peripheral Pin Select (PPS)

Terminal

> Hello World!

DGI (Data Gateway Interface)	
Debug GPIO 0	RA2 (SW0)

Data Visualizer

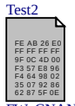
TEST FIXTURE1

Curiosity Nano Test Fixture

Test1

TEST, PIC18F16Q20-CNANO

Test2



FW, CNANO-DEBUGGER

LABEL1

[ASSY# / REV]
SN: [SERIAL]
[DATE yyyy.mm.dd]

PCBA LABEL 18X6mm

S3
PIC18F16Q20_Curiosity_Nano_Revision_History.SchDoc

"Text in Silkscreen on PCB"

CNANO Template Revision: 2.3

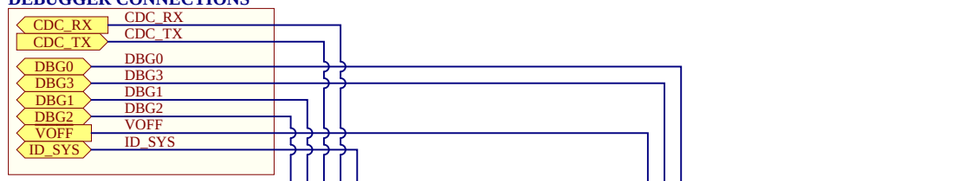
Project Owner: ST			
PCB Layout Contact: TF			
PartNumber: EV73T25A	Project Title: *PIC18F16Q20 Curiosity Nano*	Variant: Default Assembly	
Sheet Title: Top Level			
Size A3	SCH #: 02-00457	Rev: 3	Date: 18.09.2023
	PCB #: 04-11563	Rev: 3	Sheet 1 of 3
File: PIC18F16Q20_Curiosity_Nano_TopLevel.SchDoc			

Designed with Altium — Altium.com

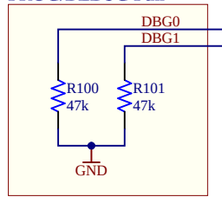
PIC18F16Q20

	PIC18F16Q20	
Debugger	*Name*	*Pin*
CDC TX	UART[n] RX	**RC5**
CDC RX	UART[n] TX	**RC4**
DBG0	ICSPDAT	**RA0**
DBG1	ICSPCLK	**RA1**
DBG2	SW0 / GPIO0	**RA2**
DBG3	MCLR	**RA3**
VTG	**1.8V - 3.6V**	

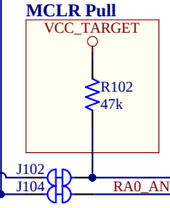
DEBUGGER CONNECTIONS

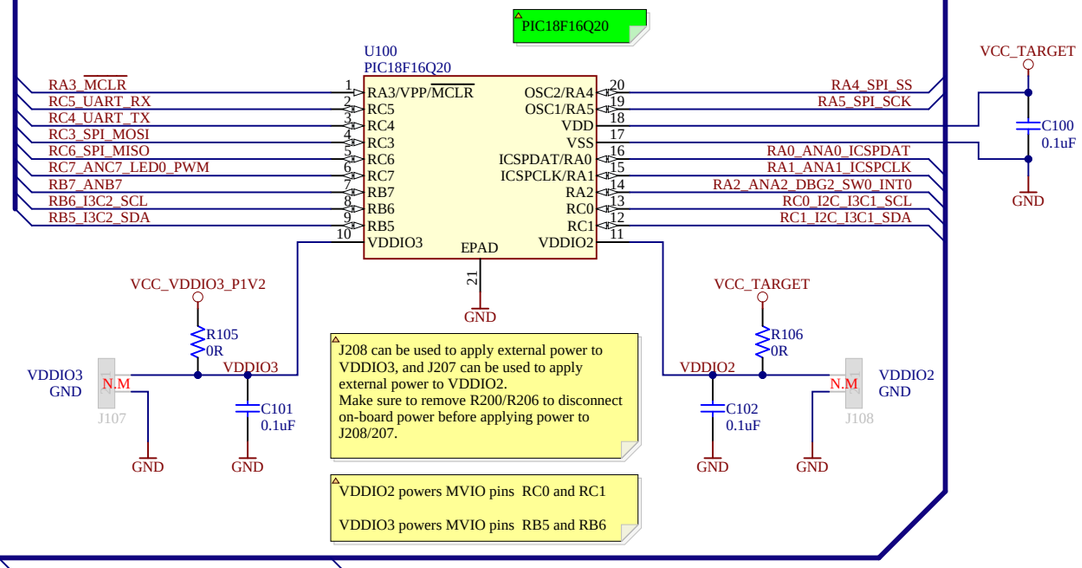


PROG/DEBUG Pull



MCLR Pull





J100 DEBUGGER

NOTE on I2C:

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

NOTE on UART/CDC:

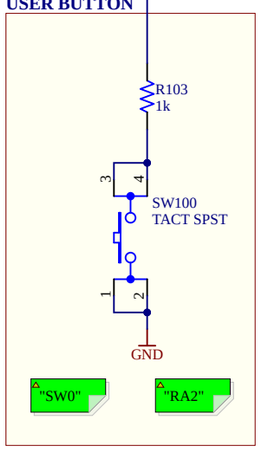
RX/TX on the header denotes the input/output direction of the signal respective to it's source.

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.

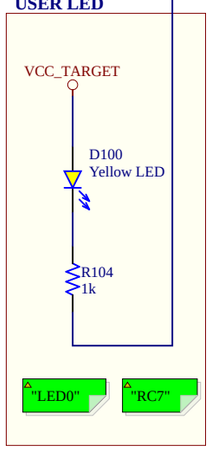
RA2_ANA2_DBG2_SW0_INT0

RC7_ANC7_LED0_PWM

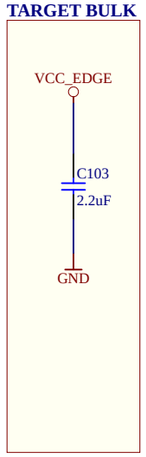
USER BUTTON



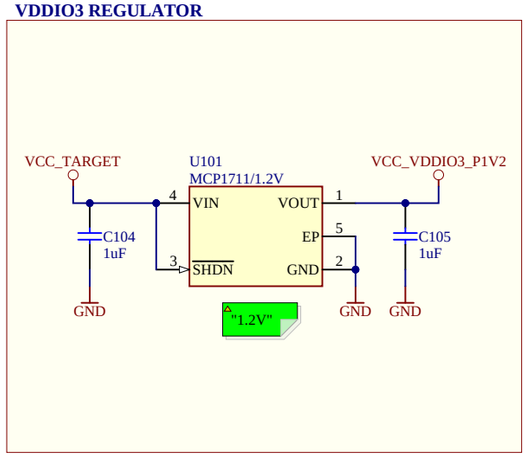
USER LED



TARGET BULK



VDDIO3 REGULATOR

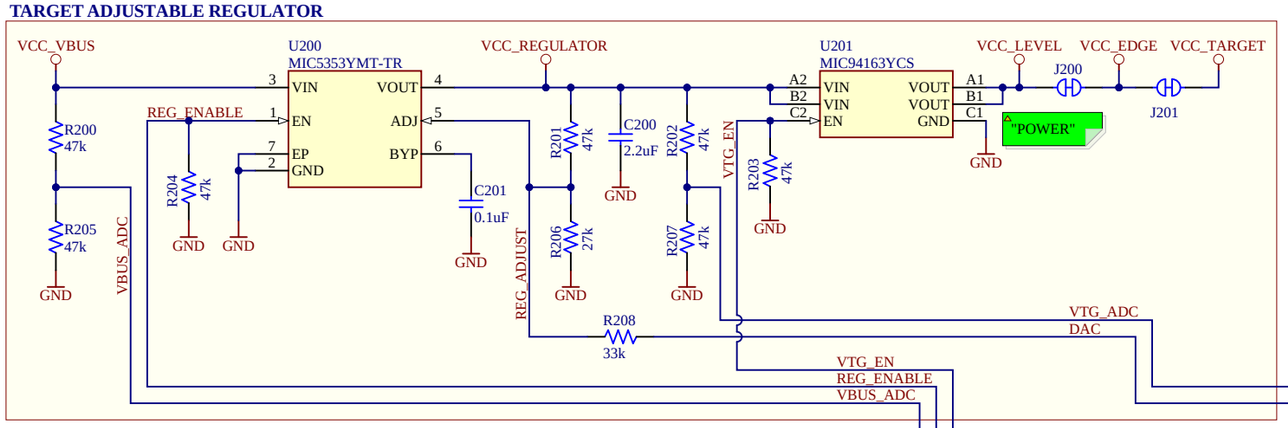


CNANO Template Revision: 2.3

Project Owner: ST	MICROCHIP
PCB Layout Contact: TF	
PartNumber: EV73T25A	Project Title: *PIC18F16Q20 Curiosity Nano* — Variant: Default Assembly
Sheet Title: Target MCU	Designed with Altium — Altium.com
Size A3 — SCH #: 02-00457 — Rev: 3 — Date: 18.09.2023	
PCB #: 04-11563 — Rev: 3 — Sheet 2 of 3	
File: PIC18F16Q20_Curiosity_Nano_Target_MCU.SchDoc	

DEBUGGER

TARGET ADJUSTABLE REGULATOR



J200:
- 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.

J201:
- For current measurements using the on-board power supply, this strap must be cut and an ammeter connected across.

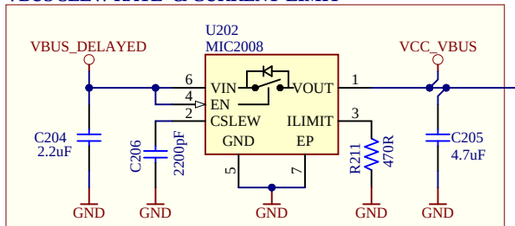
MIC5353:
Vin: 2.6V to 6V
Vout: 1.25V to 5.1V
Imax: 500mA
Dropout (typical): 50mV@150mA, 160mV @ 500mA
Accuracy: 2% initial
Thermal shutdown and current limit

Maximum output voltage is limited by the input voltage and the dropout voltage in the regulator.

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

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.

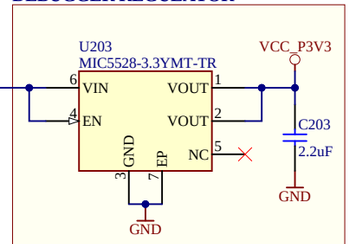
VBUS SLEW RATE- & CURRENT-LIMIT



SLEW RATE LIMIT:
- With C206 set to 2200pF, the slew rate of VCC_VBUS is limited to 2 V/ms by the power switch MIC2008.

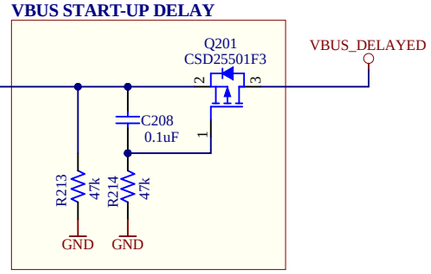
CURRENT LIMIT:
- With R211 set to 470ohm, the current through the power switch MIC2008 is limited to 500mA.

DEBUGGER REGULATOR



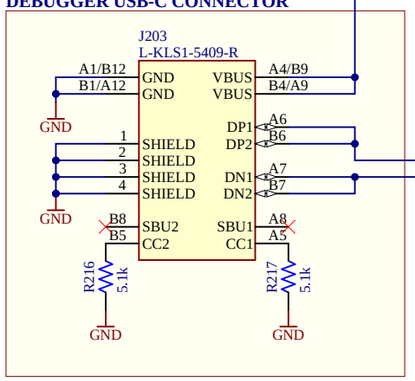
MIC5528:
Vin: 2.5V to 5.5V
Vout: Fixed 3.3V
Imax: 500mA
Dropout: 260mV @ 500mA

VBUS START-UP DELAY



START-UP DELAY::
- With C208 set to 0.1uF and R214 set to 47kohm, the P-MOS is delaying the turn-on of VCC_DELAYED by 1ms, compared to VBUS.

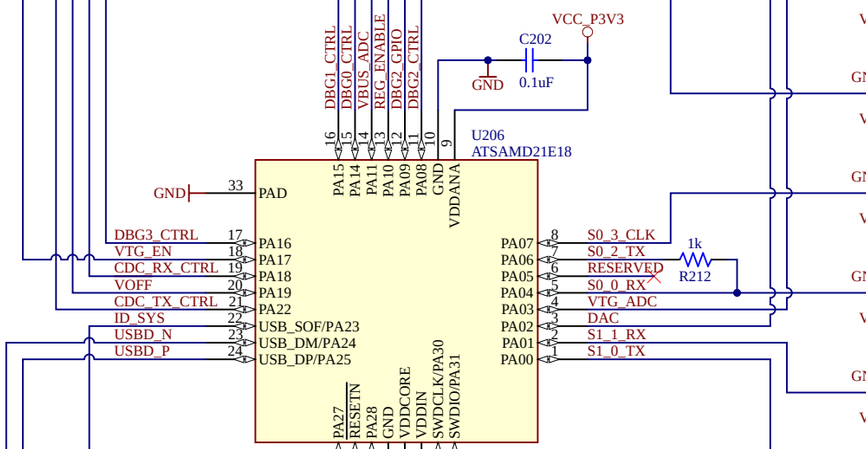
DEBUGGER USB-C CONNECTOR



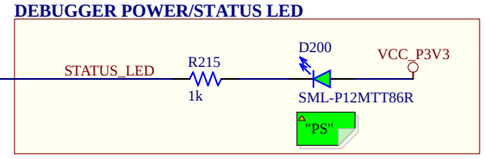
TP200
TP201
"GND"

TP200 and TP201 are MTG Holes in the corners of the PCB in the DEBUGGER section labelled "GND" on the silkscreen.

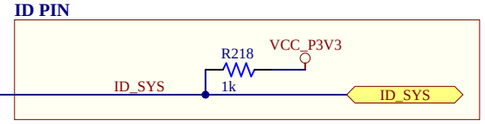
TP200 and TP201 are MTG Holes in the corners of the PCB in the DEBUGGER section labelled "GND" on the silkscreen.



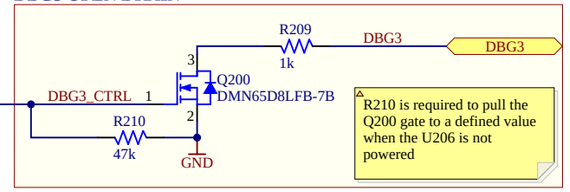
DEBUGGER POWER/STATUS LED



ID PIN

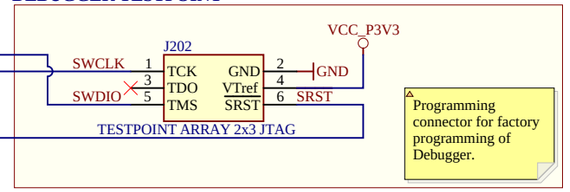


DBG3 OPEN DRAIN

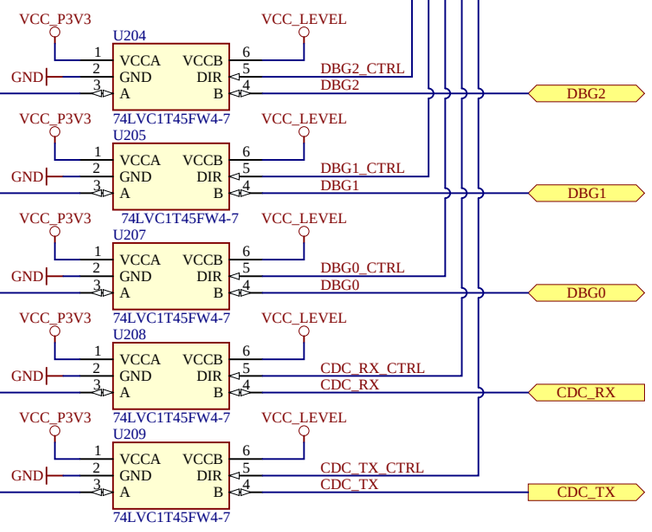


R210 is required to pull the Q200 gate to a defined value when the U206 is not powered

DEBUGGER TESTPOINT



Programming connector for factory programming of Debugger.



CNANO Template Revision: 2.3

Project Owner: ST	MICROCHIP
PCB Layout Contact: TF	
PartNumber: EV73T25A	Project Title: *PIC18F16Q20 Curiosity Nano* — Variant: Default Assembly
Sheet Title: Debugger	Designed with Altium — Altium.com
Size: A3 — SCH #: 02-00457 Rev: 3 — PCB #: 04-11563 Rev: 3 — Date: 18.09.2023 — Sheet 3 of 3	
File: PIC18F16Q20_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 RA4 and RA5 net labels

PCB:

PCB revision 2
Silkscreen refers to the correct pins for SW0 and LED0.
Added UKCA logo to silkscreen

PCB Assembly Rev 3:

Design Changes:

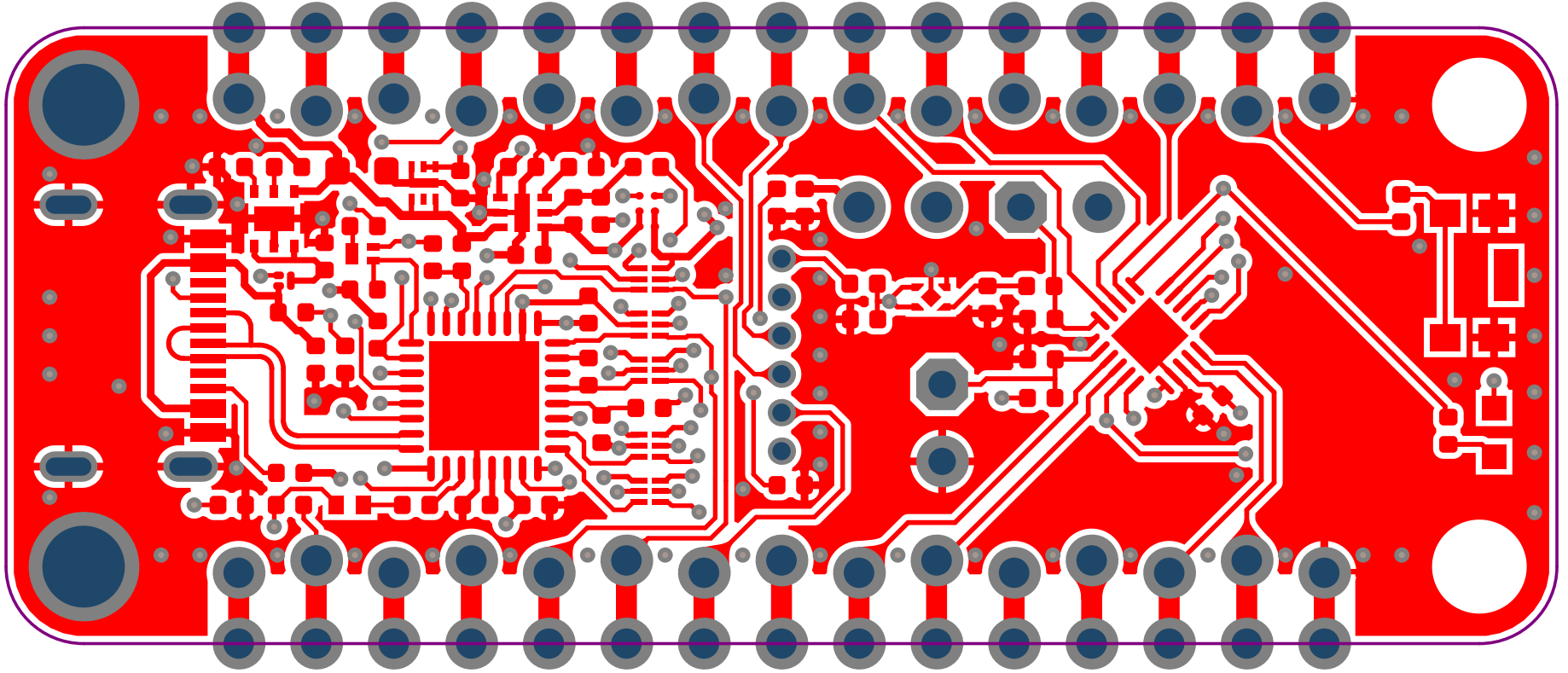
- Changed USB connector to USB-C version
- Removed RC-filter and added start-up delay circuit instead
- Removed PTC and added current and slew-rate limter instead

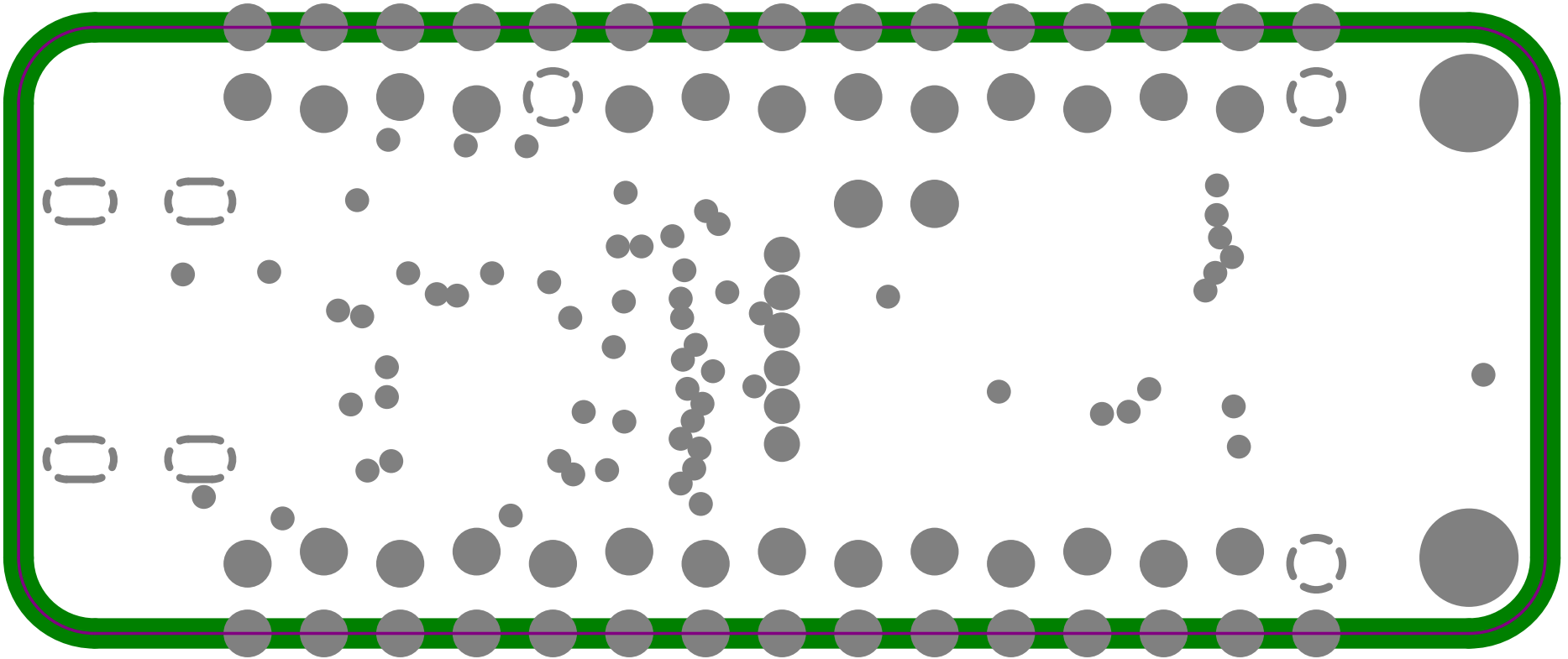
PCB:

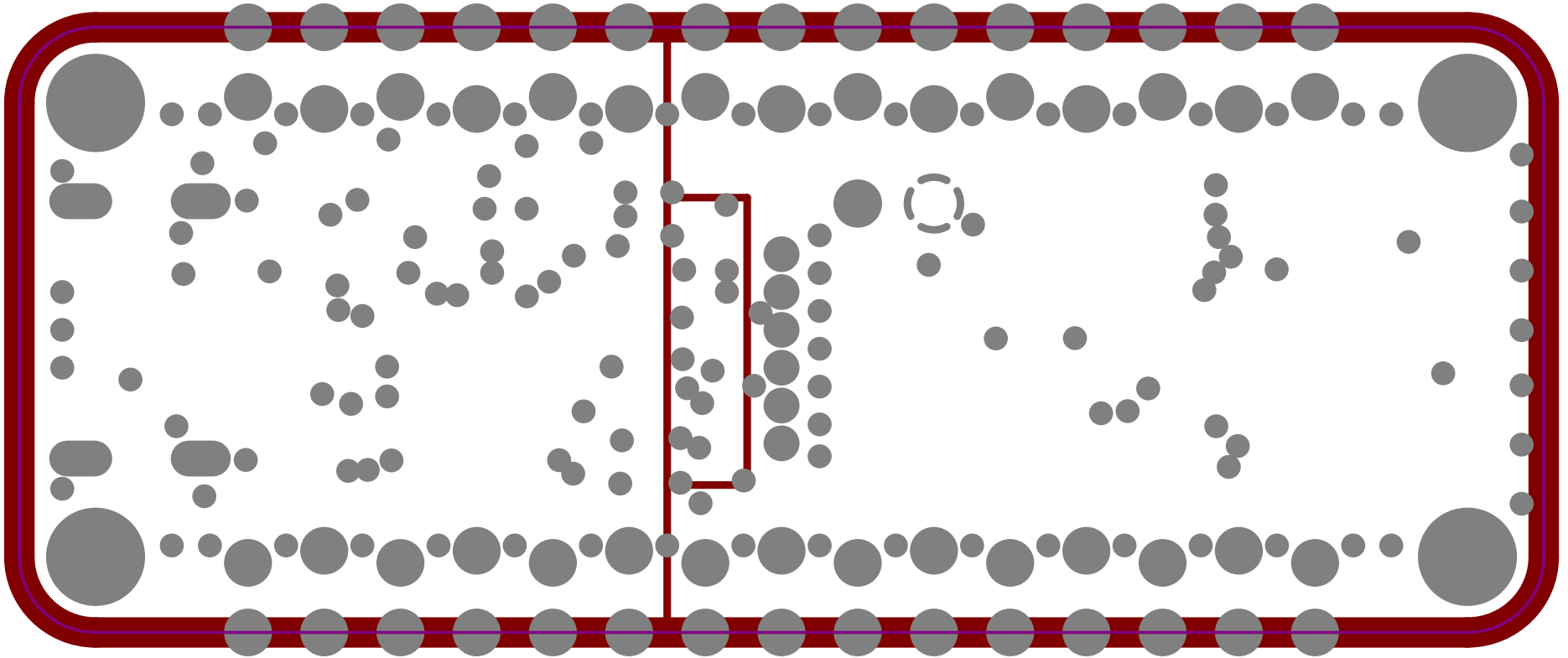
PCB revision 3
- Changed footprint for Level-shifters

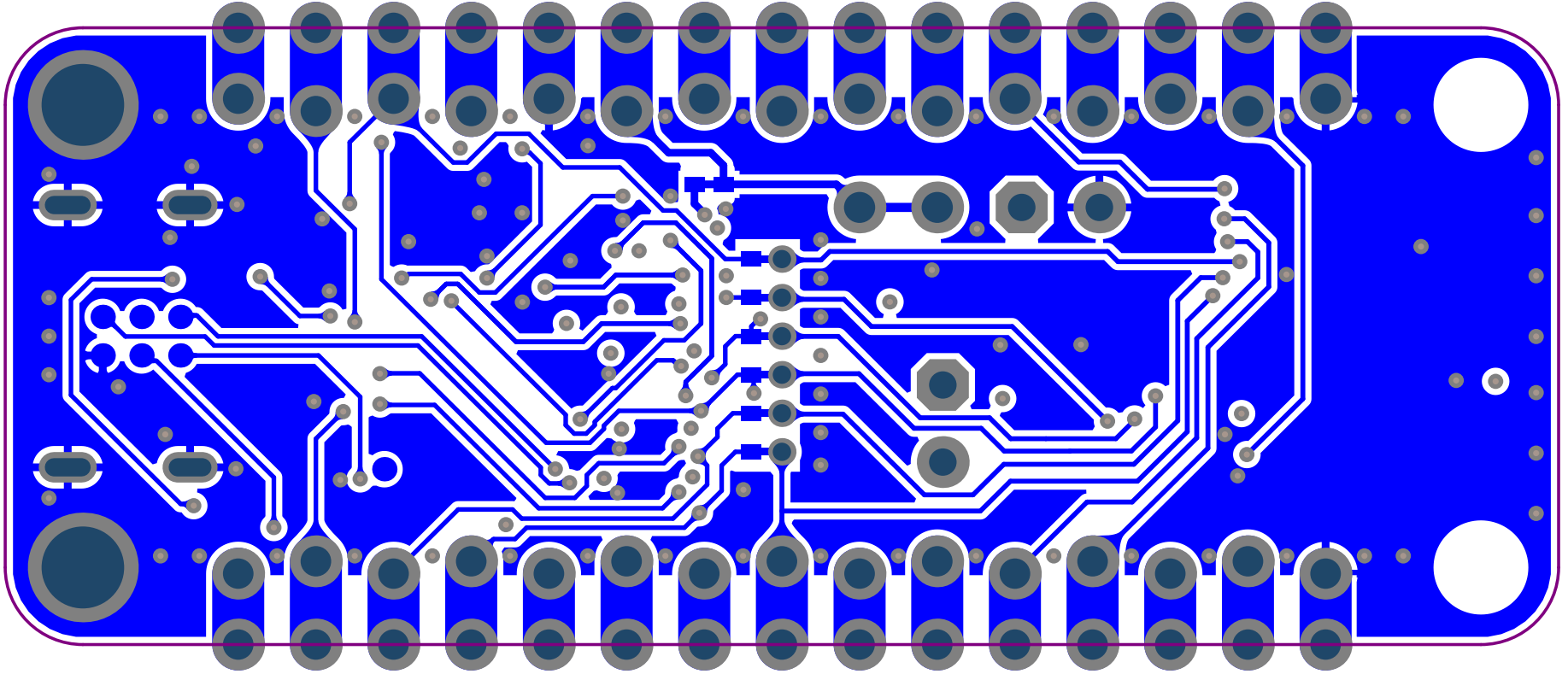
CNANO Template Revision: 2.3

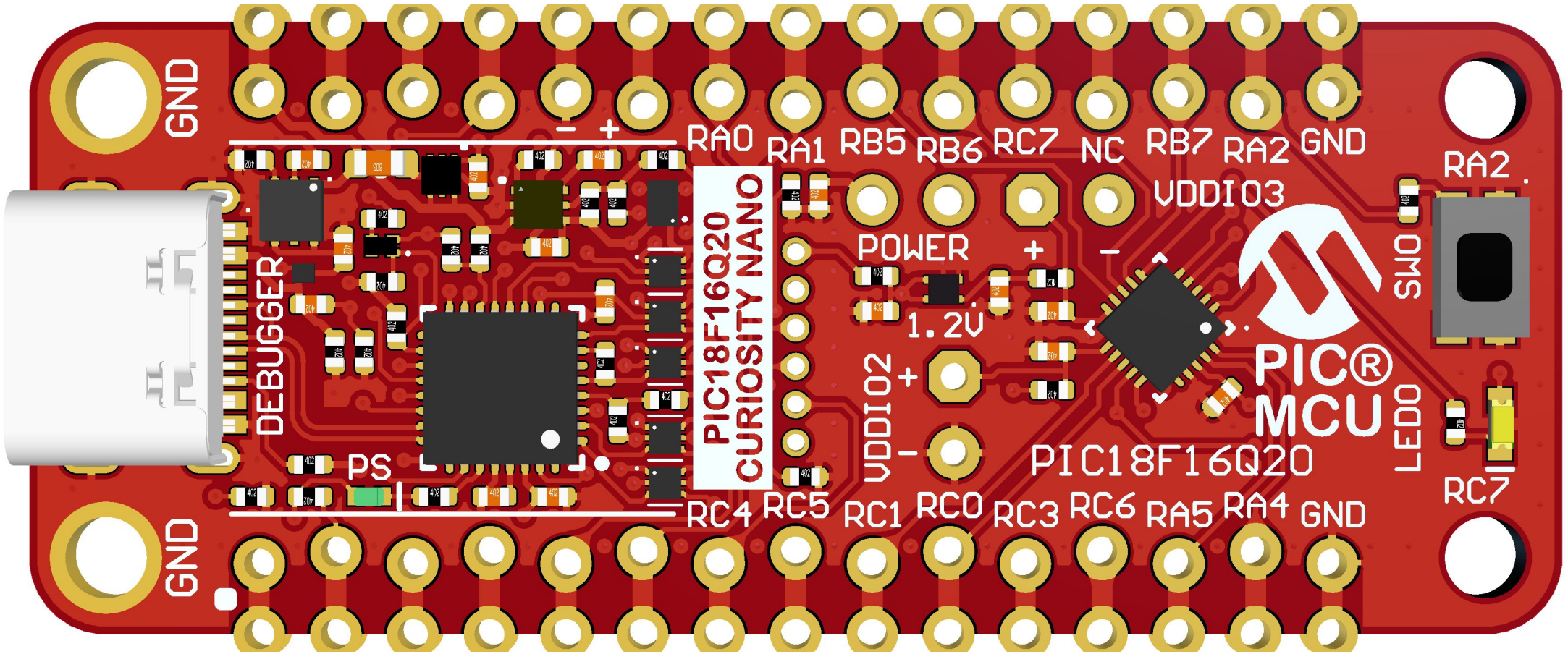
Project Owner: ST			MICROCHIP
PCB Layout Contact: TF			
PartNumber: EV73T25A	Project Title: *PIC18F16Q20 Curiosity Nano*	Variant: Default Assembly	
Sheet Title: Revision History			Designed with Altium
Size A3	SCH #: 02-00457 / PCB #: 04-11563	Rev: 3 / Rev: 3	Date: 18.09.2023 / Sheet 4 of 4
File: PIC18F16Q20_Curiosity_Nano_Revision_History.SchDoc			Altium.com

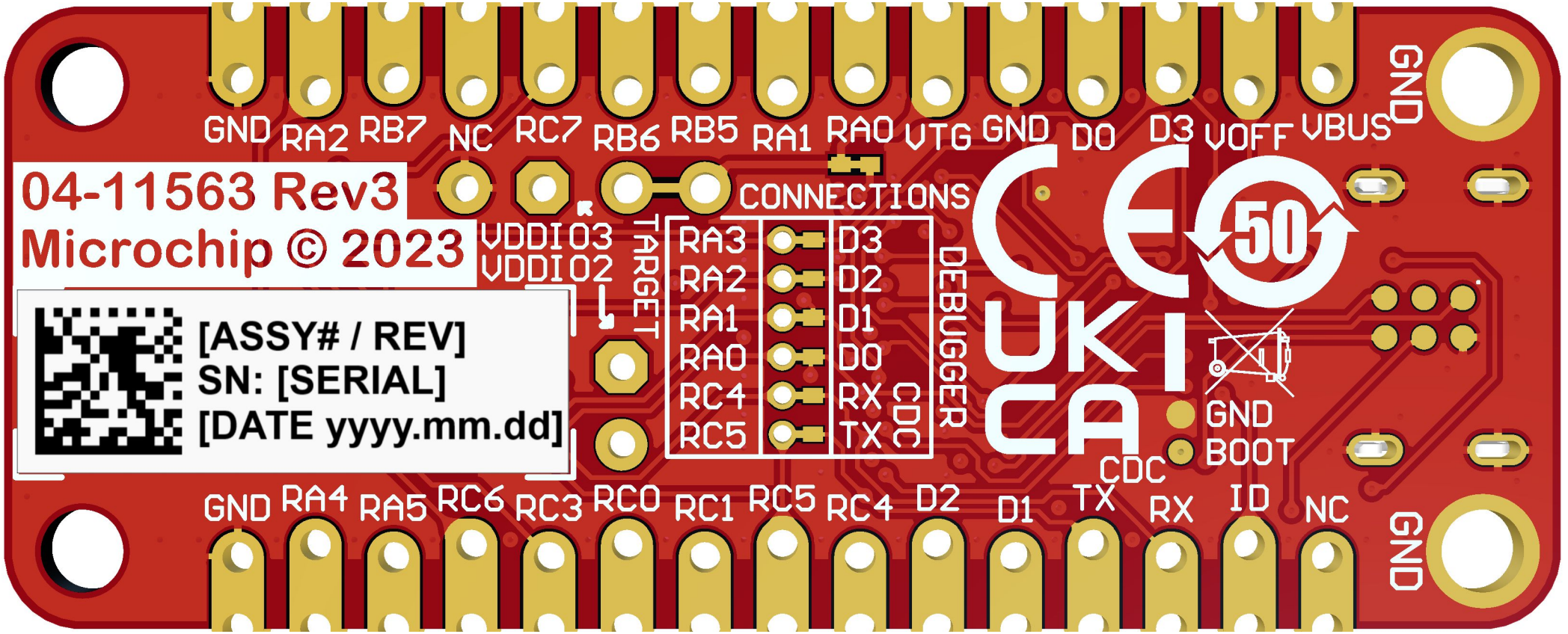


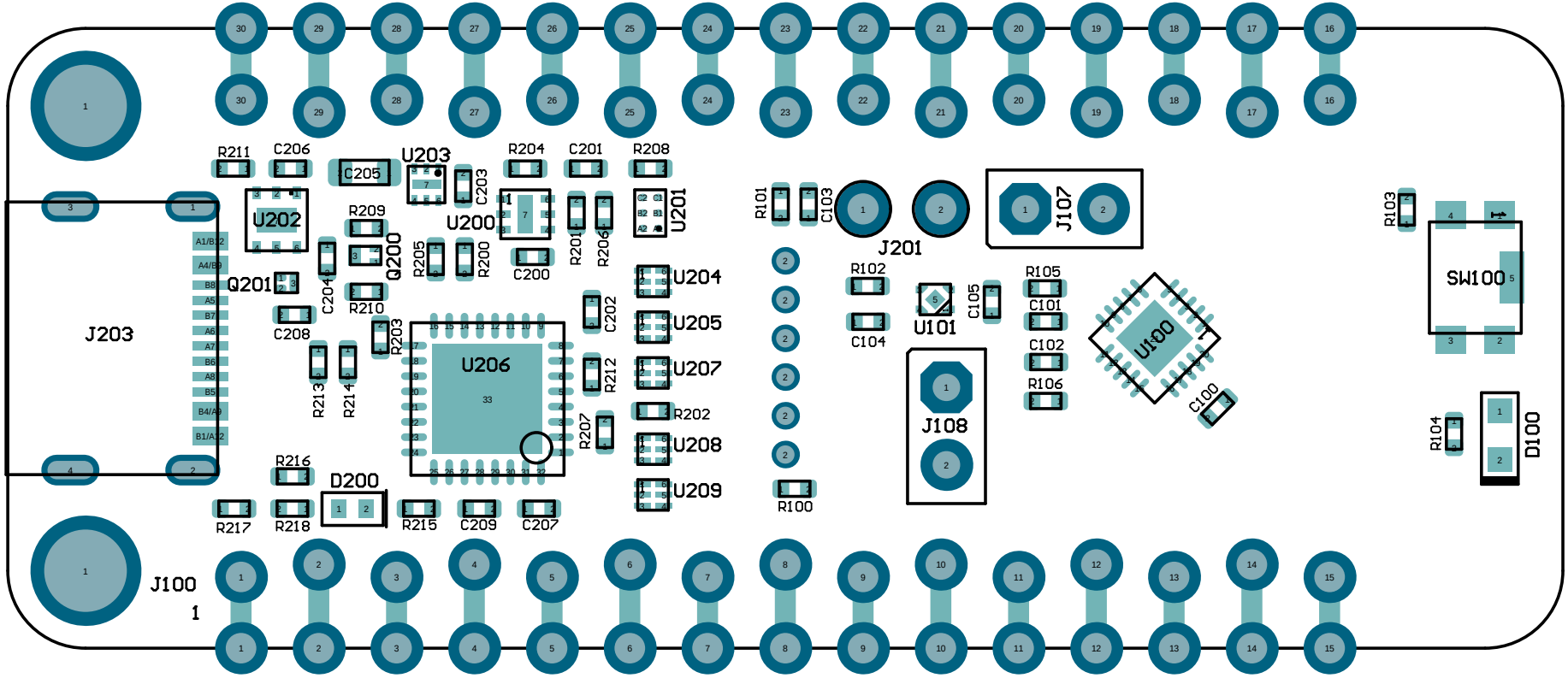


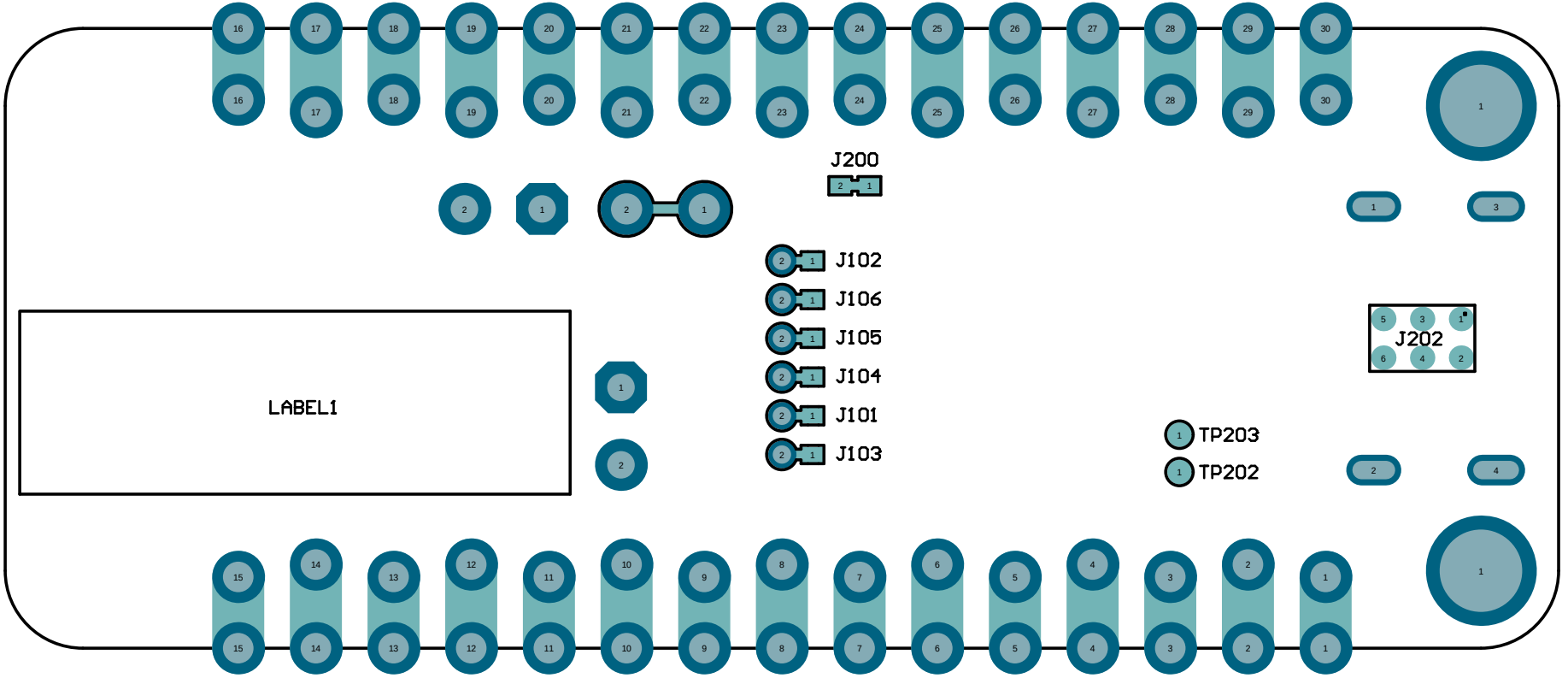




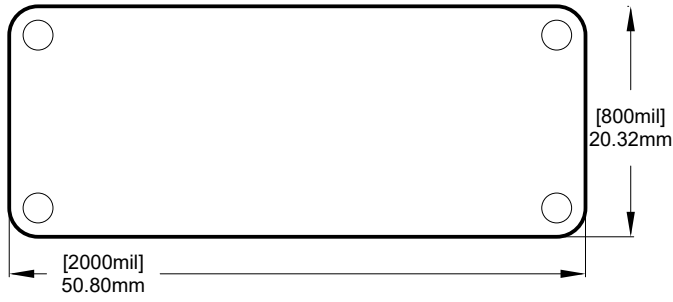

GND
GND
DEBUGGER
PS
PIC18F16Q20
CURIOSITY NANO
RA0
RA1
RB5
RB6
RC7
NC
RB7
RA2
GND
VDDIO3
POWER
1.2V
VDDIO2
RC4
RC5
RC1
RC0
RC3
RC6
RA5
RA4
GND
PIC®
MCU
PIC18F16Q20
SW0
LED0
RA2
RC7


GND RA2 RB7 NC RC7 RB6 RB5 RA1 RA0 VTG GND D0 D3 VOFF VBUS GND
04-11563 Rev3
Microchip © 2023
[ASSY# / REV]
SN: [SERIAL]
[DATE yyyy.mm.dd]
VDDIO3
VDDIO2
TARGET
CONNECTIONS
RA3 D3
RA2 D2
RA1 D1
RA0 D0
RC4 RX
RC5 TX
CDC
DEBUGGER
GND
BOOT
CDC
GND RA4 RA5 RC6 RC3 RC0 RC1 RC5 RC4 D2 D1 TX RX ID NC GND

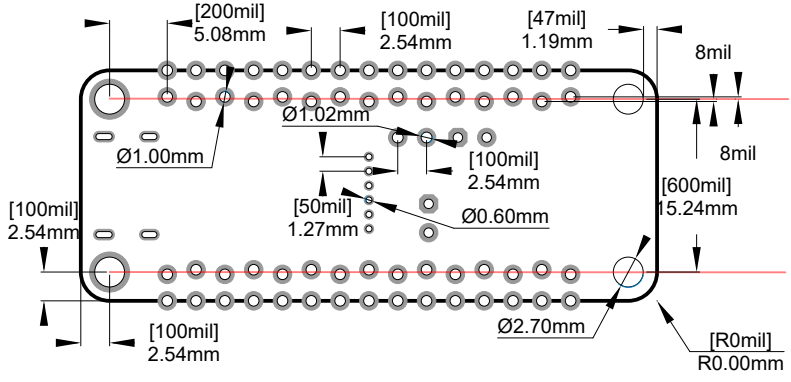

J203
J100
1
U202
Q201
U203
U200
Q200
U206
33
U204
U205
U207
U208
U209
U201
J201
J107
U101
J108
U100
SW100
D200
D100
R211
C206
C205
R204
C201
R208
C203
R209
R205
R200
C200
R201
R206
C204
R210
C208
R203
C202
R212
R207
R202
R213
R214
R216
R217
R218
R215
C209
C207
R101
C103
R102
C104
C105
R105
C101
C102
R106
C100
R100
R103
R104


J200
J102
J106
J105
J104
J101
J103
J202
TP203
TP202
LABEL1

Board Outline

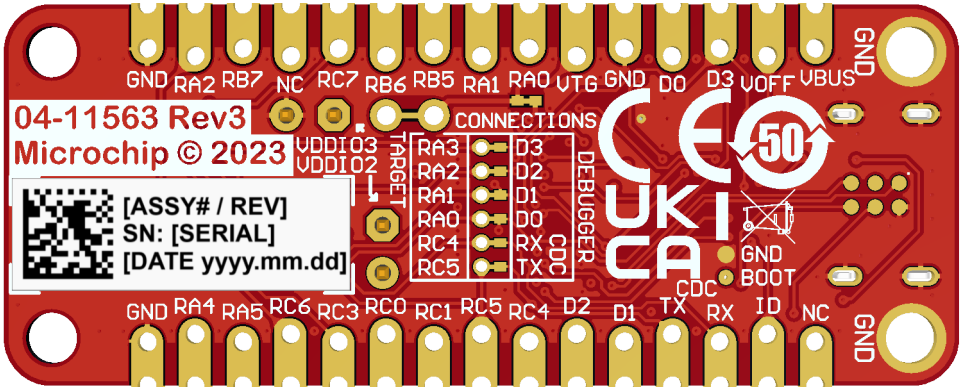


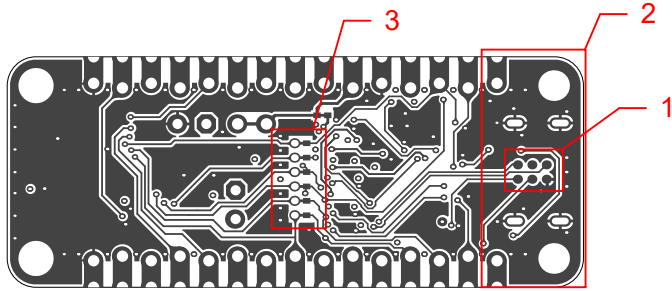
Through-Hole Dimensions

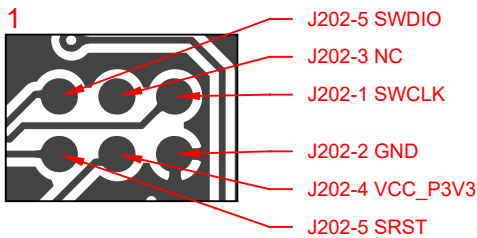


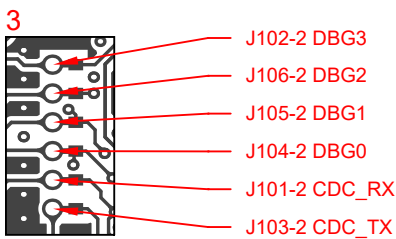
Centerline of staggered through-holes for pin headers.

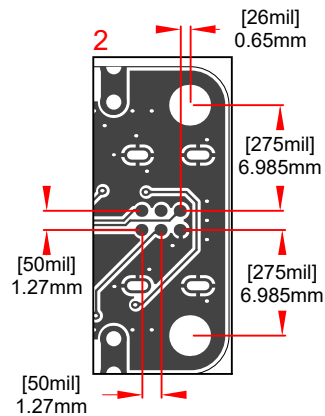
Test Point Placement [Bottom View]



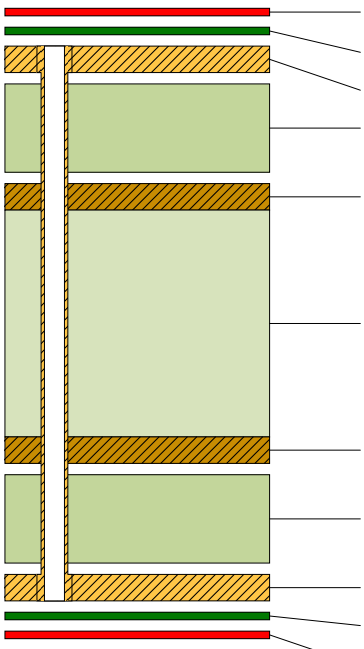








PCB Stackup



Material	Layer	Thickness	Dielectric Material	Type	Gerber
	Top Overlay			Legend	GTO
Surface Material	Top Solder	0.010mm	Solder Resist	Solder Mask	GTS
Copper	Top Layer	0.035mm		Signal	GTL
Prepreg		*0.117mm*	*PP-016*	*Dielectric*	
Copper	Gnd Plane	0.035mm		Internal Plane	GP1
Core		*1.200mm*	*FR-4*	*Dielectric*	
Copper	Pwr Plane	0.035mm		Internal Plane	GP2
Prepreg		*0.117mm*	*PP-016*	*Dielectric*	
Copper	Bottom Layer	0.035mm		Signal	GBL
Surface Material	Bottom Solder	0.010mm	Solder Resist	Solder Mask	GBS
	Bottom Overlay			Legend	GBO

Total thickness: 1.594mm

Component list

PIC18F16Q20 Curiosity Nano

PCBA Number: 02-00457
PCBA Revision: 3
Variant: Default Assembly

Print Date: 18.09.2023 14:52:03

Fitted	Designator	Quantity	Value	Manufacturer 1	Manufacturer Part Number 1	Description_
Fitted	C100, C101, C102, C201, C202, C207, C208	7	0.1uF	Hottech	C1005B104K160NT	CAP CER 0.1uF 16V 10% X7R SMD 0402
Fitted	C103, C200, C203, C204	4	2.2uF	Hottech	C1005A225K100NT	CAP CER 2.2uF 10V 10% X5R SMD 0402
Fitted	C104, C105, C209	3	1uF	KEMET	C0402C105K9PACTU	CAP CER 1uF 6.3V 10% X5R SMD 0402
Fitted	C205	1	4.7uF	KEMET	C0603C475K8PACTU	CAP CER 4.7uF 10V 10% X5R SMD 0603
Fitted	C206	1	2200pF	KEMET	C0402C222J3GACTU	CAP CER 2200pF 25V 5% C0G SMD 0402
Fitted	D100	1	Yellow LED	Rohm Semiconductor	SML-D12Y1WT86	LED YELLOW DIFFUSED 1608 SMD
Fitted	D200	1	LED SINGLE SML-P12MTT86R YELLOW-GREEN	Rohm Semiconductor	SML-P12MTT86R	DIO LED YELLOW-GREEN 2.2V 20mA 25mcd Clear SMD 0402
Fitted	J203	1	USB2.0 Type-C FEMALE	KLS Electronic	L-KLS1-5409-R	CON USB2.0 Type-C Female SMD R/A
Fitted	LABEL1	1	PCBA LABEL 18X6mm	ACT Logimark AS	505462	LABEL PCBA 18x6mm Datamatrix Assy# / Rev / Serial / Date
Fitted	Q200	1	DMN65D8LFB-7B	Diodes Incorporated	DMN65D8LFB-7	TRANS FET N-CH DMN65D8LFB-7B 260mA 60V 430mW X1_DFN1006-3
Fitted	Q201	1	CSD25501F3	Texas Instruments	CSD25501F3	TRANS FET P-CH CSD25501F3 -20V -3.6A 0.076R LGA
Fitted	R100, R101, R102, R200, R201, R202, R203, R204, R205, R207, R210, R213, R214	13	47k	Yageo	RC0402FR-0747KL	RES TKF 47k 1% 1/16W SMD 0402
Fitted	R103, R104, R209, R212, R215, R218	6	1k	Panasonic	ERJ-2RKF1001X	RES TKF 1k 1% 1/10W SMD 0402
Fitted	R105, R106	2	0R	Yageo	RC0402JR-070RL	RES TKF 0R 1/16W SMD 0402
Fitted	R206	1	27k	Yageo	RC0402FR-0727KL	RES TKF 27k 1% 1/16W SMD 0402
Fitted	R208	1	33k	Yageo	AC0402FR-0733KL	RES TKF 33k 1% 1/16W SMD 0402
Fitted	R211	1	470R	Yageo	RC0402FR-07470RL	RES TKF 470R 1% 1/16W MF 0402
Fitted	R216, R217	2	5.1k	Panasonic Electronic Components	ERJ-2RKF5101X	RES TKF 5.1k 1% 1/10W SMD 0402
Fitted	SW100	1	TACT SPST	KLS Electronic	L-KLS7-TS0304A-2-300-T	SWITCH TACT SPST 12V 50mA L-KLS7-TS0304A-2-300-T SMD
Fitted	Test1	1				TEST, PIC18F16Q20-CNANO
Fitted	Test2	1	Debugger Firmware			FW, CNANO-DEBUGGER
Fitted	TEST FIXTURE1	1	Curiosity Nano Test Fixture	Raynen	MCHP 15-00009	Curiosity Nano Test Fixture
Fitted	U100	1	PIC18F16Q20	Microchip Technology	PIC18F16Q20T-I/REB	MCHP MCU 8-BIT 64MHz 64KB 4KB PIC18F16Q20T-I/REB VQFN-20
Fitted	U101	1	MCP1711/1.2V	Microchip Technology	MCP1711T-12I/5X	MCHP ANALOG LDO 1.2V MCP1711T-12I/5X UQFN-4
Fitted	U200	1	MIC5353YMT-TR	Microchip Technology	MIC5353YMT-TR	MCHP ANALOG LDO ADJ 500mA MIC5353YMT-TR MLF-6
Fitted	U201	1	MIC94163YCS	Microchip Technology	MIC94163YCS-TR	IC LOAD SWITCH HI SIDE 3A 6WLCSP
Fitted	U202	1	MIC2008	Microchip Technology	MIC2008YML-TR	MCHP ANALOG POWER SWITCH 5.5V 2.1A MIC2008YML-TR VDFN-6
Fitted	U203	1	MIC5528 3V3	Microchip Technology	MIC5528-3.3YMT-TR	MCHP ANALOG LDO 3.3V MIC5528-3.3YMT-TR 6-TDFN
Fitted	U204, U205, U207, U208, U209	5	74LVC1T45FW4-7	Diodes Incorporated	74LVC1T45FW4-7	IC VOLTAGE TRANSLATOR BI-DIR 1 CIRCUIT 74LVC1T45FW4-7 X2-DFN1010-6
Fitted	U206	1	ATSAMD21E18	Microchip Technology	ATSAMD21E18A-MUT	MCHP MCU 32-BIT 48MHz 256Kb 32Kb ATSAMD21E18A-MUT QFN-32
Not Fitted	J107, J108	0	HDR-2.54 Male 1x2	Würth Elektronik	61300211121	CON HDR-2.54 Male 1x2 Gold 5.84MH TH VERT
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Approved

Notes