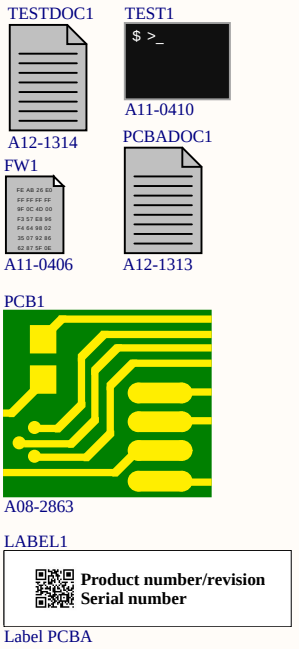
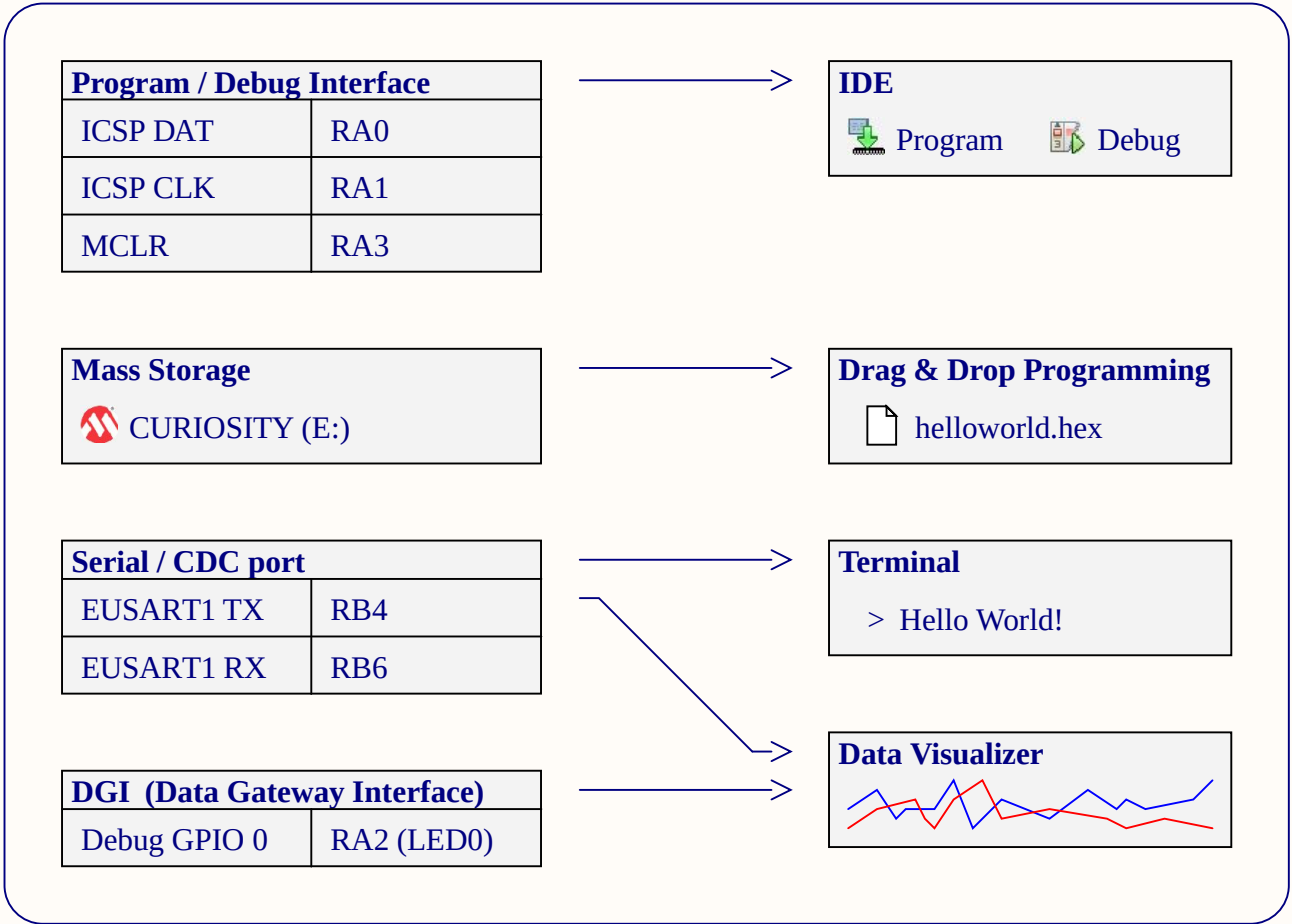
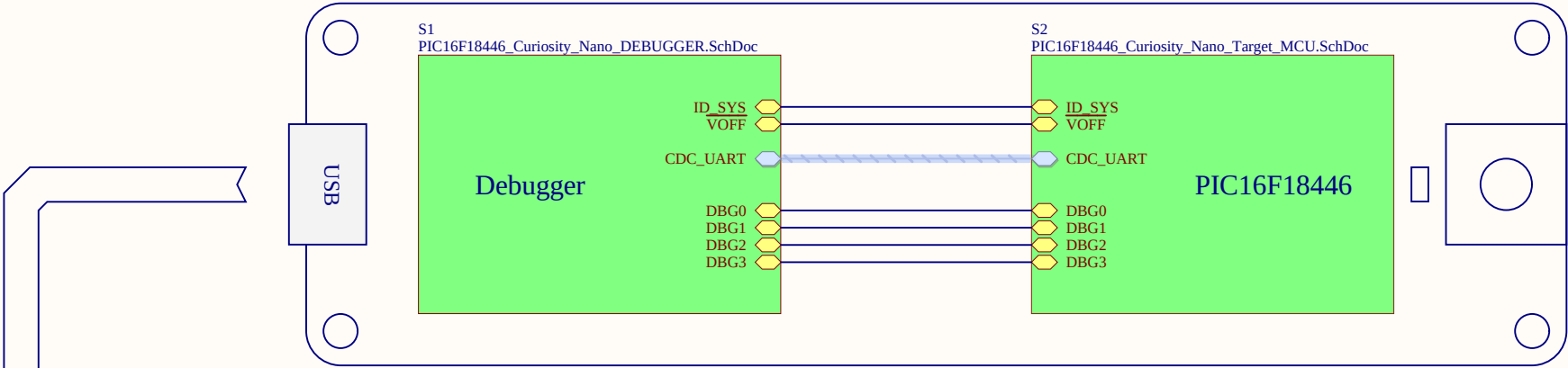


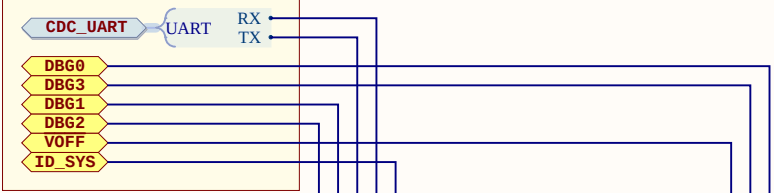
PIC16F18446 Curiosity Nano



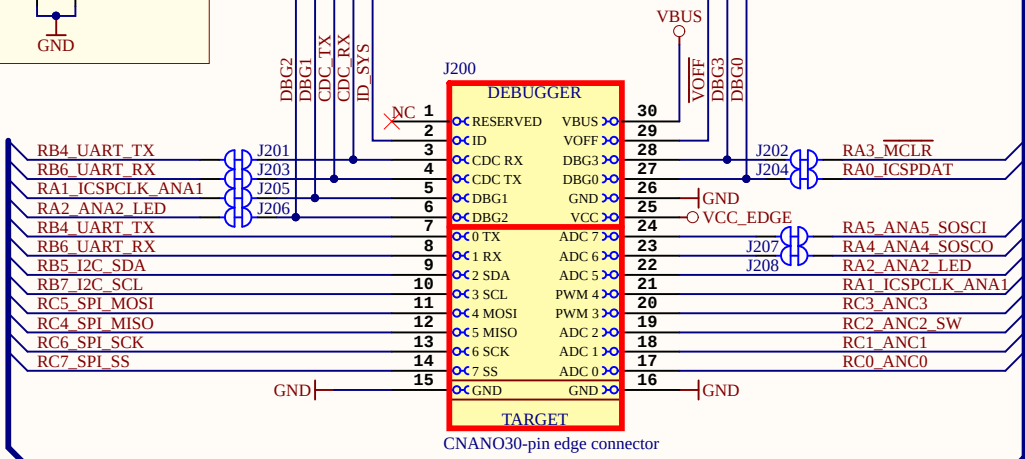
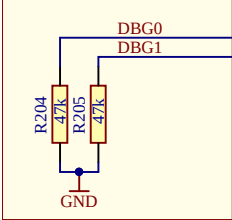
PIC16F18446

PIC16F18446		
Debugger	Name	Pin
CDC TX	EUSART1 RX	RB6
CDC RX	EUSART1 TX	RB4
DBG0	ICSPDAT	RA0
DBG1	ICSPCLK	RA1
DBG2	GPIO0	RA2
DBG3	MCLR	RA3
VTG	2.3V - 5.5V	

DEBUGGER CONNECTIONS

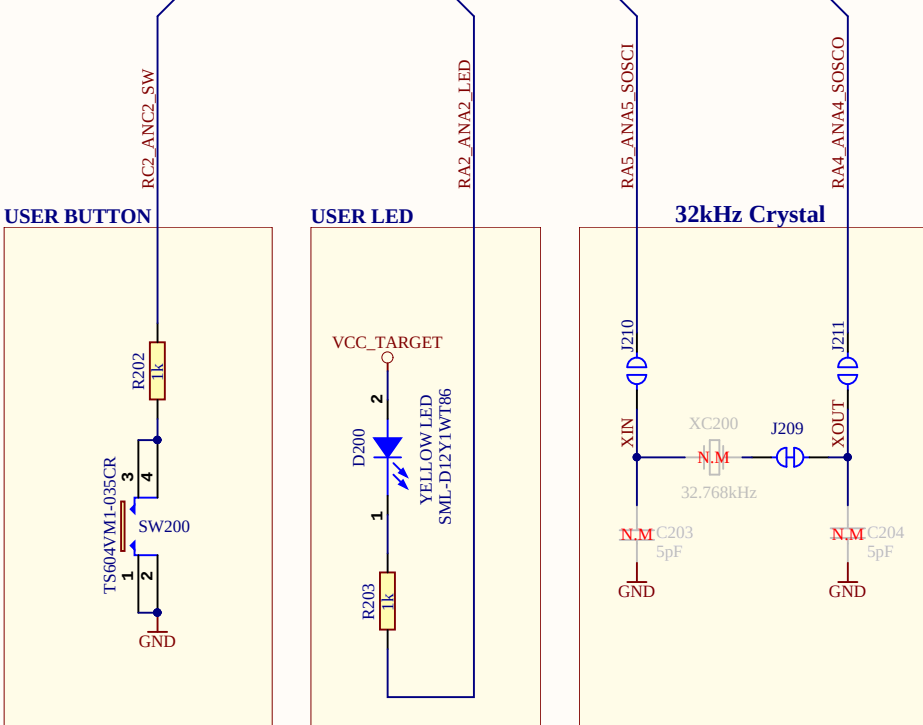


PROG/DEBUG Pull



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).



NOTE on Crystal calculations:
The calculations are based on a crystal used on an earlier revision of this board.

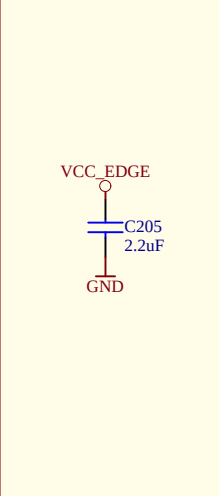
Crystal datasheet:
Ccrystal = 7pF
max ESR = 70kOhm
Accuracy ±20ppm

PIC16F18446 datasheet:
Cxin = 5pF (estimate)
Cxout = 5pF (estimate)
Maximum Load = ?
Maximum ESR = ?

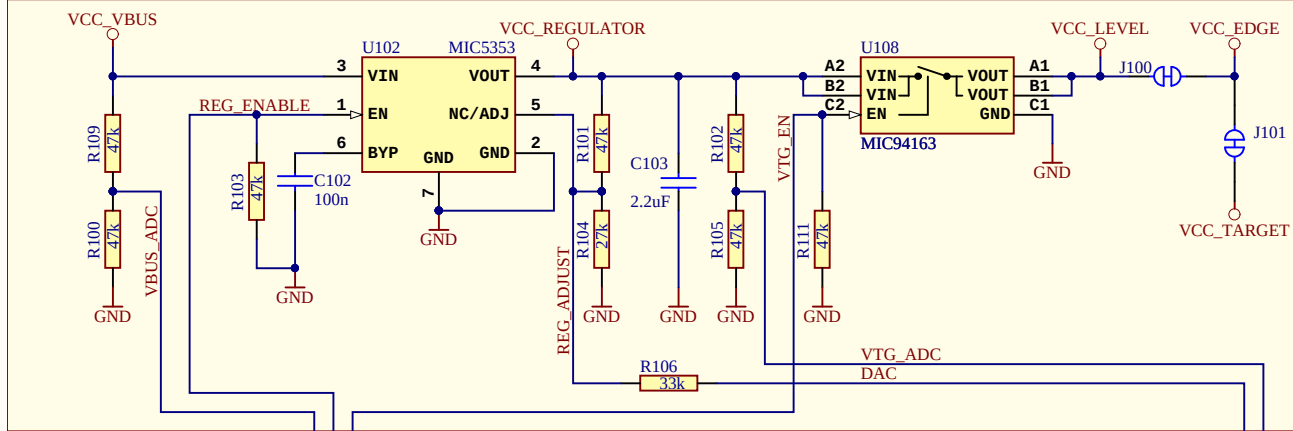
Estimated Cpcb = 2pF
Estimated load
C = 2 (Ccrystal - Cpara - Cpcb)
C = 2 (7pF - 2.5pF - 2pF)
C = 5pF

Selected in design
C = 5pF

TARGET BULK



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 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.

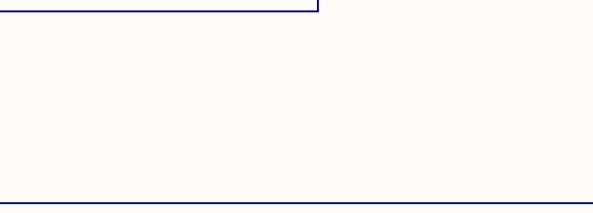
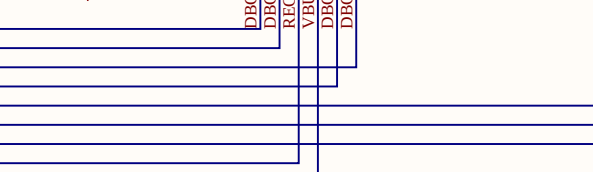
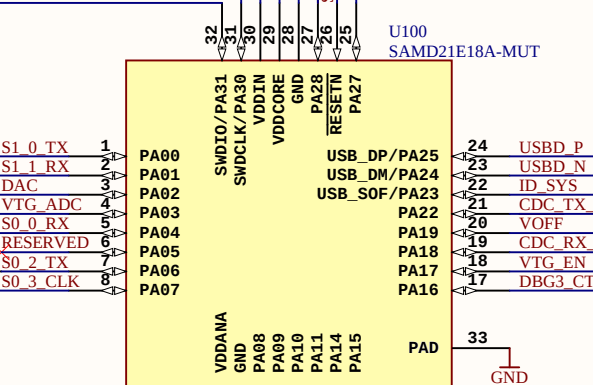
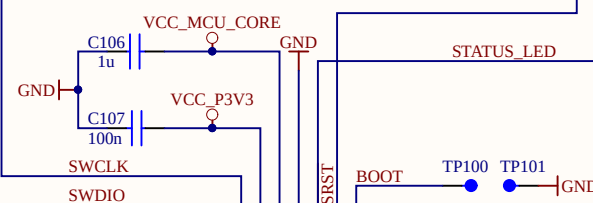
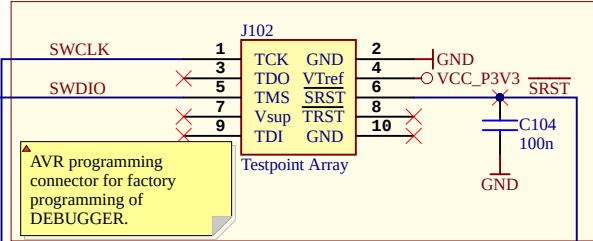
J100:
Cut-strap used for full separation of target power from the level shifters and on-board regulators.
- For current measurements using an external power supply, this strap could be cut for more accurate measurements. Leakage back through the switch is in the micro ampere range.

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)

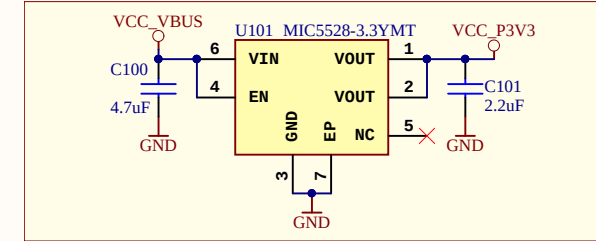
DEBUGGER TESTPOINT



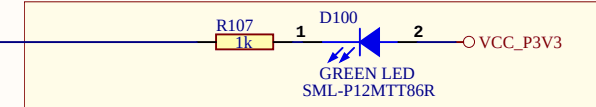
Interface	ICSP TARGET	UPDI TARGET
CDC TX	UART RX	UART RX
CDC RX	UART TX	UART TX
DBG0	DAT	UPDI
DBG1	CLK	GPIO
DBG2	GPIO	GPIO
DBG3	MCLR	RESET
VCC	-	-

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

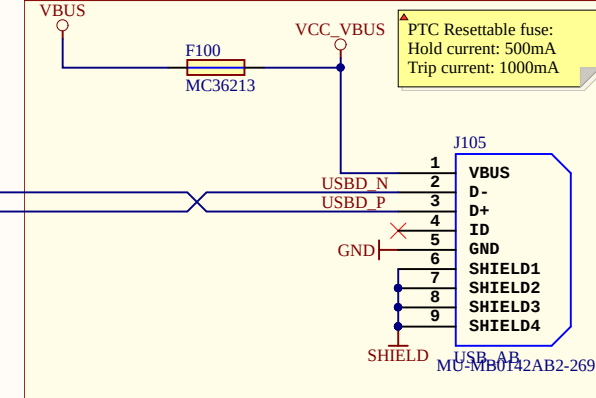
DEBUGGER REGULATOR



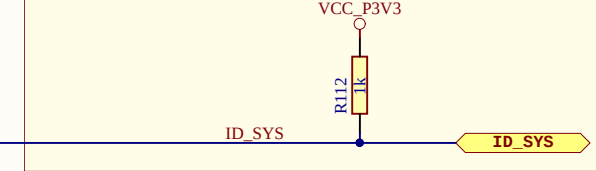
DEBUGGER POWER/STATUS LED



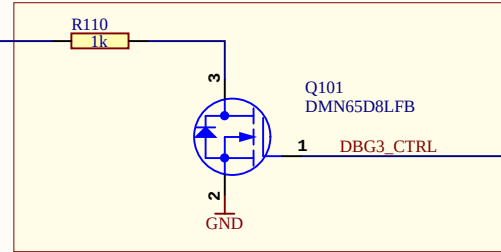
DEBUGGER USB MICRO-B CONNECTOR



ID PIN



DBG3 OPEN DRAIN



Revision History

PCB Assembly Rev 1:

Design Changes:

Initial Design
U200, PIC16F18446-I/GZ are engineering samples

PCB:

PCB revision 1

PCB Assembly Rev 2:

Design Changes:

Replaced Crystal XC200 with a 7pF variant.
Replaced C203 & C204 with 5pF Capacitors.
U200, PIC16F18446-I/GZ are RTP samples

PCB:

PCB Revision 1. no change

PCB Assembly Rev 3:

Design Changes:

Added reverse blocking switch (U108)
Added ID_SYS pin
Added VOFF pin
Changed 10uF to 4.7uF (C100)

PCB:

PCB Revision 2
Increased board size for ID and VOFF pin
Rerouted for target voltage blocking switch

PCB Assembly Rev 4:

Design Changes:

Added USB VBUS protection (U109)
Added VBUS pin

PCB:

PCB Revision 3
Increased board size for VBUS pin
Reroute the debugger section for the VBUS pin

PCB Assembly Rev 5:

Design Changes:

Added input cap on VBUS (U109)

PCB:

PCB Revision 4
Added input cap on U109

PCB Assembly Rev 6:

Design Changes:

Changed to Cut-Straps with thru-holes in Debugger Section.
Replaced Limit Switch with Fuse. Changed VBUS and VCC_VBUS nets back to previous scheme on DEBUGGER schematic.

PCB:

PCB Revision 5
Changed layout to add Fuse and Cut-Straps with holes.
Adjusted Q101 footprint and level-shift routing to improve assembly quality.

PCB Assembly Rev 7:

Design Changes:

Added 100-mil 1x2 pin-header footprint for current measurement.

PCB:

PCB Revision 6
Edge connector footprint modified with 8-mil stagger to allow usage of pin-headers without soldering.

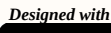
PCB Assembly Rev 8:

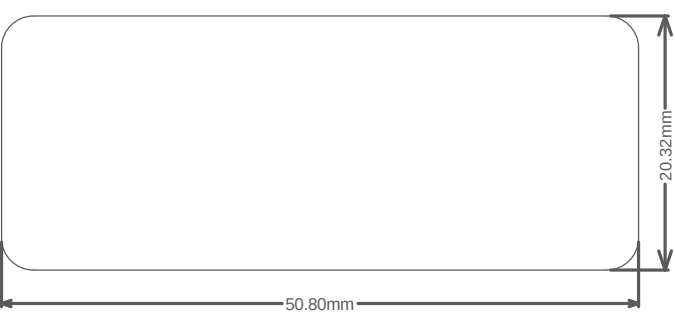
Design Changes:

Replaced obsolete 32.768kHz crystal.

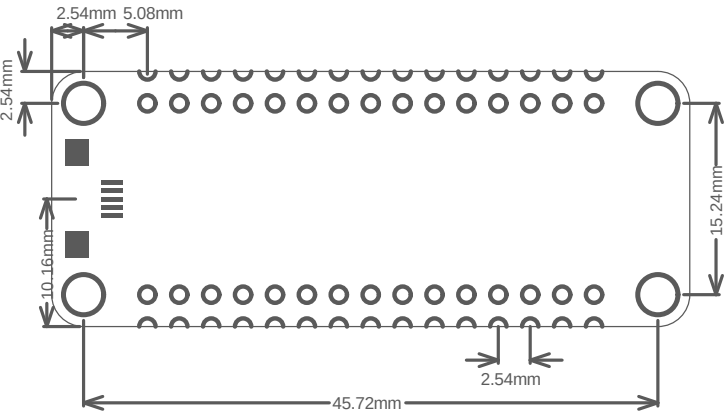
PCB:

PCB Revision 6
No changes to pcb due to crystal replacement.

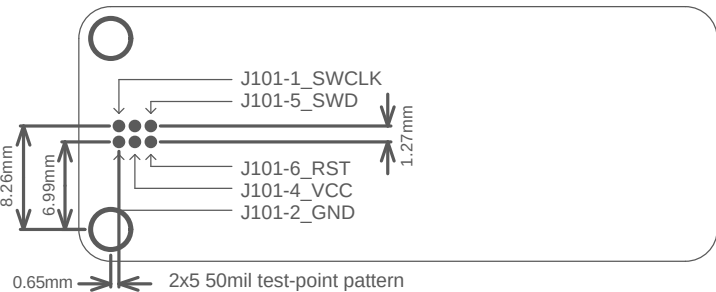
Drawn By: Microchip Norway		 MICROCHIP		
Engineer: HN				
Project Title PIC16F18446 Curiosity Nano				Designed with  Altium.com
Sheet Title Revision History				
Size A3	PCB Assembly Number: A09-3120	PCBA Revision: 8		
	PCB Number: A08-2863	PCB Revision: 6	Date: 11/8/2019	
File: PIC16F18446_Curiosity_Nano_Revision_History.SchDoc				Page: 4 of 4

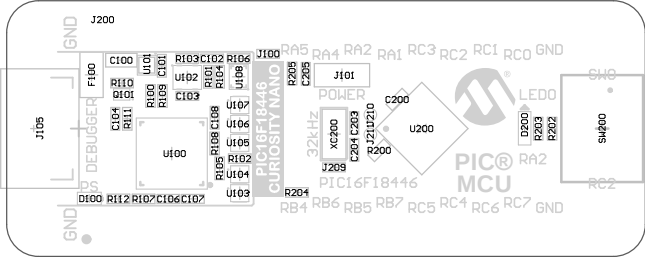


Connector Placement



Test Point Placement





GND RC0 RC1 RC2 RC3 RA1 RA2 RA4 RA5 V_{TTG} GND

Microchip © 2019

LABEL1

A08-2863 Rev6

GND RC7 RC6 RC4 RC5 RB7 RB5 RB6 RB4 D2 D1

CONNECTIONS

RA3	J202	D3	CDC DEBUGGER
RA2	J206	D2	
RA1	J205	D1	
RA0	J204	D0	
RB4	J201	RX	
RB6	J203	TX	

D0 D3 V_{OFF} V_{BUS}



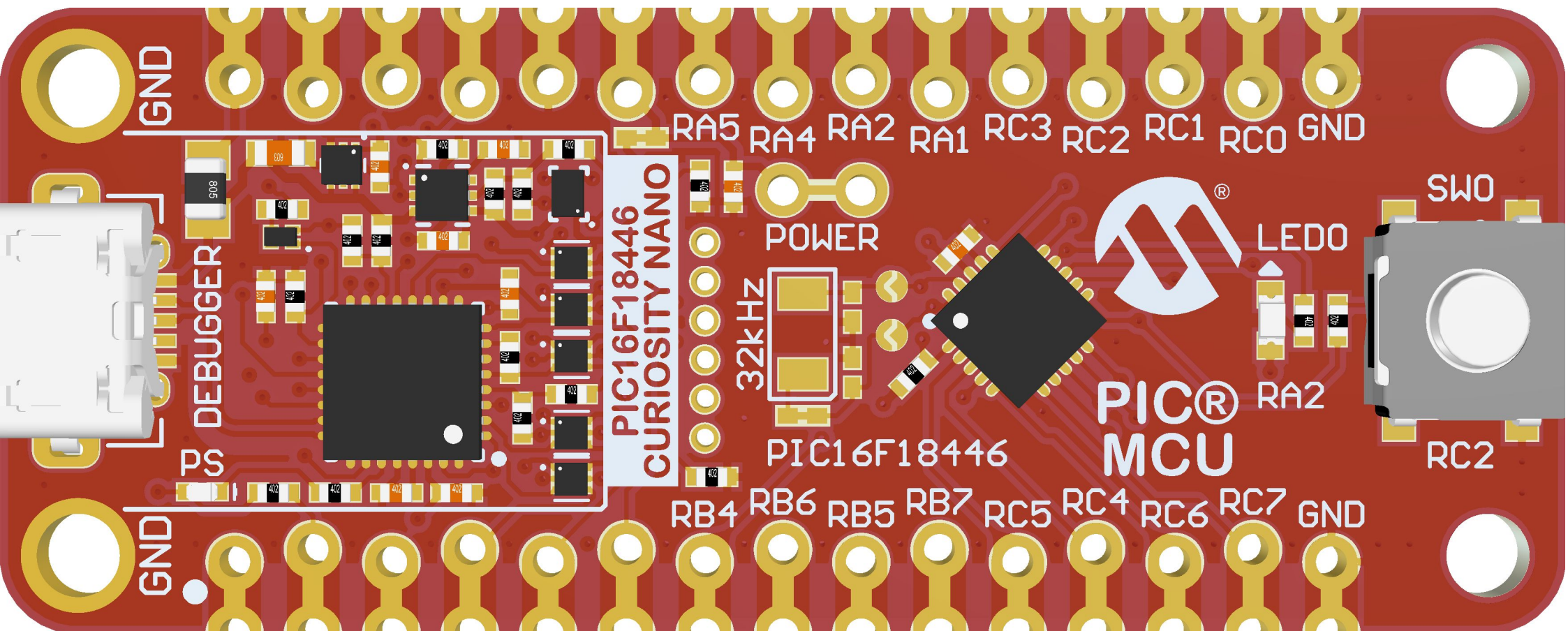
J102

TP101 GND
TP100 BOOT

CDC TX RX ID NC

GND

GND



GND

PS DEBUGGER

PS

GND

PIC16F18446
CURIOSITY NANO

RA5 RA4 RA2 RA1 RC3 RC2 RC1 RC0 GND

POWER

32kHz

PIC16F18446

RB4 RB6 RB5 RB7 RC5 RC4 RC6 RC7 GND



PIC®
MCU

LED0

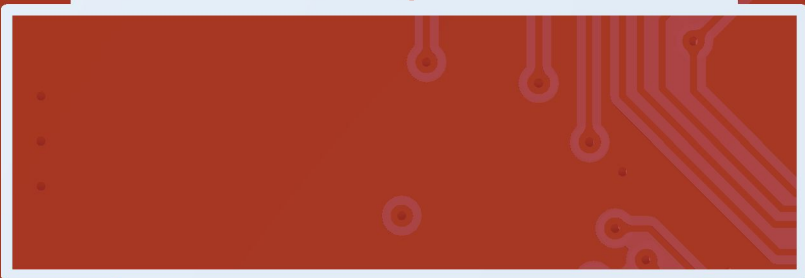
RA2

SW0

RC2

GND RC0 RC1 RC2 RC3 RA1 RA2 RA4 RA5 V_{TT} GND D0 D3 V_{OFF} V_{BUS}

Microchip © 2019



A08-2863 Rev6

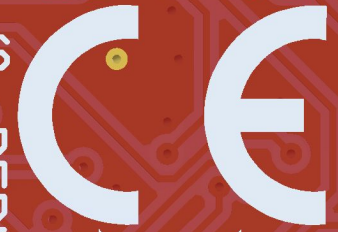


TARGET



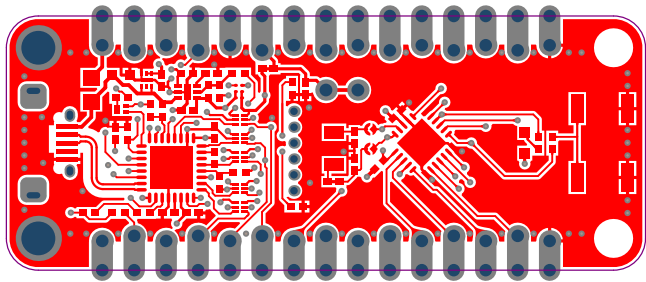
RA3	D3
RA2	D2
RA1	D1
RA0	D0
RB4	RX
RB6	TX

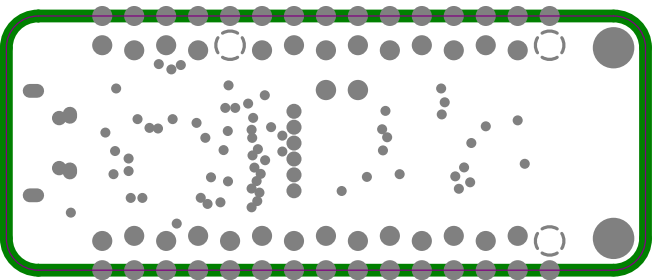
DEBUGGER

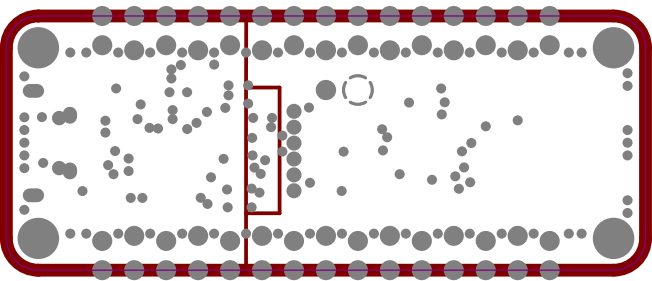


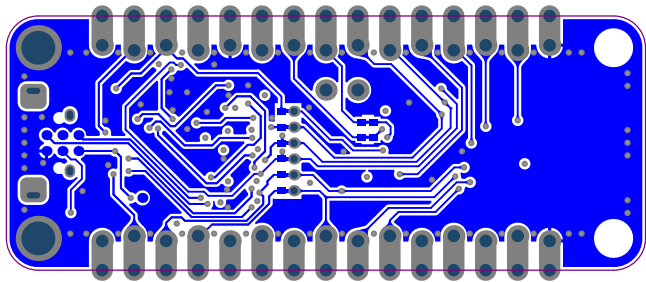
GND BOOT ID NC

GND RC7 RC6 RC4 RC5 RB7 RB5 RB6 RB4 D2 D1 TX RX ID NC









Component list

Bill of Materials Fitted for Variant [Default Assembly] of Project [PIC16F18446_Curiosity_Nano.PrjPcb] (No PCB Document Selected)

Source Data From: PIC16F18446_Curiosity_Nano.PrjPcb
 Project: PIC16F18446_Curiosity_Nano.PrjPcb
 Variant: Default Assembly



Report Date: 11/8/2019 3:08 PM
 Print Date: 11/8/2019 3:06:08 PM

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, C104, C107, C108, C200	5	100n	Kemet	C0402C104K4RACTU	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)
Not Fitted	C203, C204	0	5pF	Murata	GRM1555C1H5R0CA01D	Ceramic capacitor, SMD 0402, NP0 (C0G), 50V, +/-0.25pF
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	Resettable 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	PIC16F18446 Curiosity Nano PCB documentation			PIC16F18446 Curiosity Nano PCB documentation
Fitted	PCBADOC1	1	A09-3120 PCBA files			PIC16F18446 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, R204, R205	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	R200	1	10k	Yageo	RC0402FR-0710KL	Thick film resistr, 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	PIC16F18446 Curiosity Nano test			Fixture test for PIC16F18446 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-T5	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, Rds(on) = 14.5mohm, 1.0mm x 1.5mm WLCSP, reverse blocking
Fitted	U200	1	PIC16F18446-I/GZ	Microchip	PIC16F18446T-I/GZ	PIC 8-bit RISC MCU, UQFN-20, 4mm x 4mm
Not	XC200	0	32.768kHz	Abracon	ABS07-32.768kHz-7-T	Crystal, 32.768kHz, CL=7.0pF, ESR=70kOhm, SMD LxW=3.2 x 1.5mm, 20ppm

Approved	Notes