

Introduction

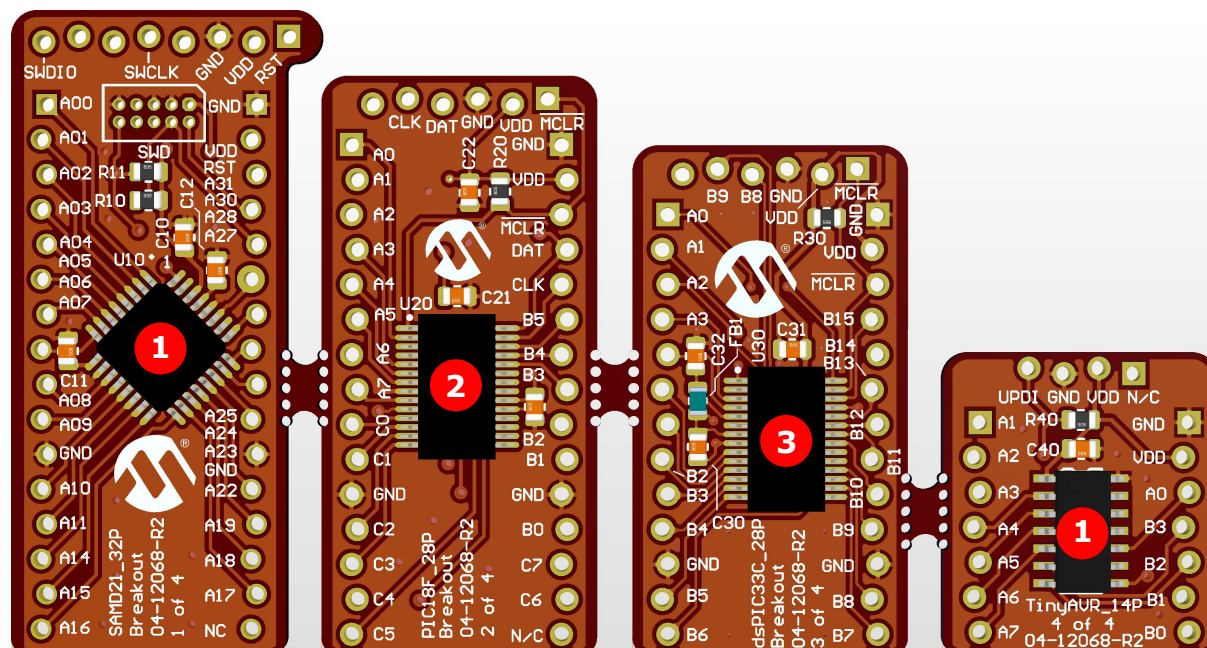
The Breakout Board Solution MCU Sample Kit 1 is a hardware platform designed to evaluate a sample from each of our Microcontroller (MCU) families. External programming tools, such as the MPLAB® PICkit™ 5, can be connected directly to each board's programming header. The programming tools are supported by the MPLAB X Integrated Development Environment (IDE) and the Microcontroller Code Configuration tools. The evaluation kit provides easy access to the features of each of the MCUs to integrate the Breakout Board Solution into a custom design or quick prototype. There is no on-board debugger, which allows for a true indication of how the MCU will perform in the final design. This allows for simpler power and operational engineering design and evaluation.

The Breakout Board Solution MCU Sample Kit 1 consists of four individual boards to support each Microchip Microcontroller family:

- AVR® (8-bit)
 - ATTINY1614
- PIC® (8-bit)
 - PIC18F26Q71
- dsPIC® (16-bit)
 - dsPIC33CK32MP502
- SAM/PIC32 (32-bit)
 - PIC32CM5164JH01032
- Compatible with Curiosity Base and Explorer Boards
- Unpopulated Version of Each of the Four Boards for Customer-Targeted Devices
- Packages Selected to Allow Manual Hand Soldering
- Each Board Provides a Single Part with all Supporting Circuitry for Minimal Operation
- 2.54mm (.100") Headers for Programming and Connections
- Programming Header
- Each Device Pin is Connected to an External Header Pin
- 0805 Components Where Possible for Easy Board Modification
- No Additional Unnecessary Circuitry
- Easily Determine Sleep and Operation Power
- Full Voltage Capability for Each Microcontroller Specification
- Powered from External Programming Tool or External Power Supply

An overview of the product with each MCU breakout board highlighted is shown in [Figure 1](#).

Figure 1. Breakout Board Solution MCU Sample Kit 1 Overview



1. SAMD21_32P - Featuring PIC32CM5164JH01032
2. PIC18F_28P - Featuring PIC18F26Q71
3. dsPIC33C_28P - Featuring dsPIC33CK256MP502
4. TinyAVR_14P - Featuring ATTINY1614

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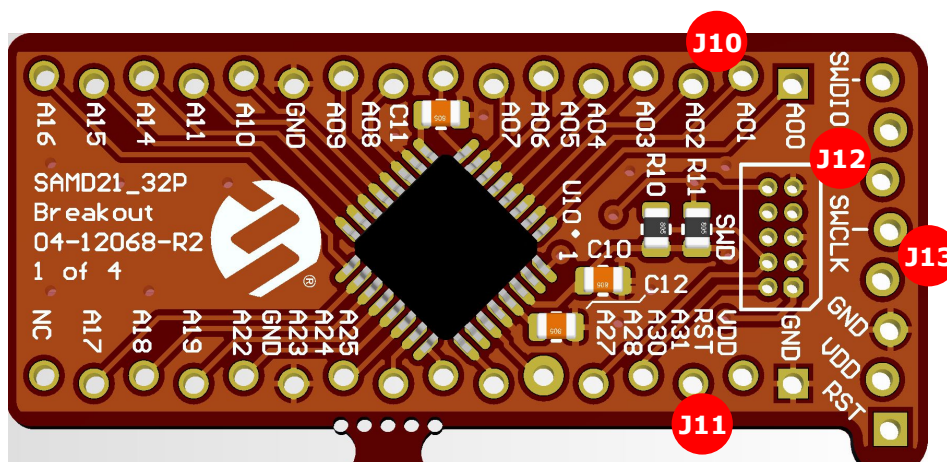
1. Hardware

1.1 SAMD21_32P Details

1.1.1 Powering the SAMD21_32P Breakout Board

Power is applied to the pins labeled GND and VDD on J11 as shown in [Figure 1-1](#). Refer to the device data sheet to determine proper power and operation.

Figure 1-1. SAMD21_32P Breakout Board Overview Image



1.1.2 Programming the SAMD21_32P Breakout Board⁽¹⁾

The PICkit 5 8-pin connector mates directly to J13 in [Figure 1-1](#). Programming connections for the SAM device using the Cortex SWD Program and Debug Interface are shown in [Table 1-1](#).

Table 1-1. PICkit5™ Programming Details for the SAMD21_32P Breakout Board

J12 Cortex Debug		
BBS Pin	BBS Name	Function
J12-1	-	V _{DD}
J12-2	-	PA32/SWDIO
J12-3	-	GND
J12-4	-	PA30/SWCLK
J12-5	-	GND
J12-6	-	-
J12-7	-	-
J12-8	-	-
J12-9	-	GND
J12-10	-	RESET
J13 PICkit™ Target		
BBS Pin	BBS Name	Function
J13-1	RST	RESET
J13-2	V _{DD}	PA32/SWDIO
J13-3	GND	GND
J13-4	-	-
J13-5	SWCLK	PA30/SWCLK

.....continued

J13 PICkit™ Target			
BBS Pin	BBS Name	Function	
J13-6	-	-	
J13-7	-	-	
J13-8	SWDIO	PA31/SWDIO	

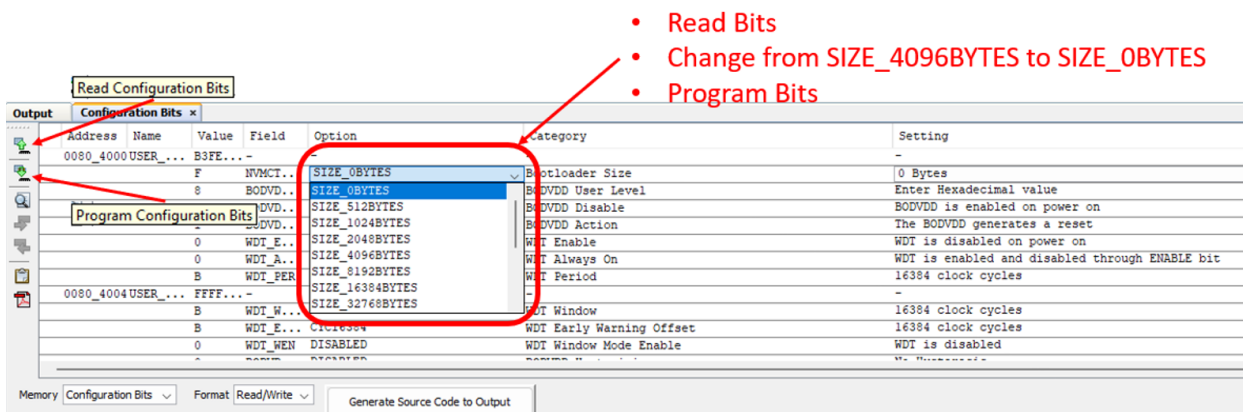
Note:

1. If using MPLABx IDE version 6.20 or older, the factory default boot protection feature must be manually disabled in the Configuration bits window to successfully program the included PIC32CM5164JH01032 device. Newer versions of MPLABx will be updated to disable the boot protection when a bulk erase is performed prior to a regular programming sequence in a development environment.

To disable the boot protection feature, perform the following steps and refer to [Figure 1-2](#):

1. In the MPLABx IDE, navigate to the Configuration bits screen.
 - a. Select **Windows → Target Memory Views → Configuration Bits**
2. Read the Configuration bits using the **Read Configuration Bits** icon.
3. You will see that the bootloader size is 4096. Change the selection to 0.
4. Program the Configuration bits using the **Program Configuration Bits** icon.

Figure 1-2. PIC32 Configuration Bits

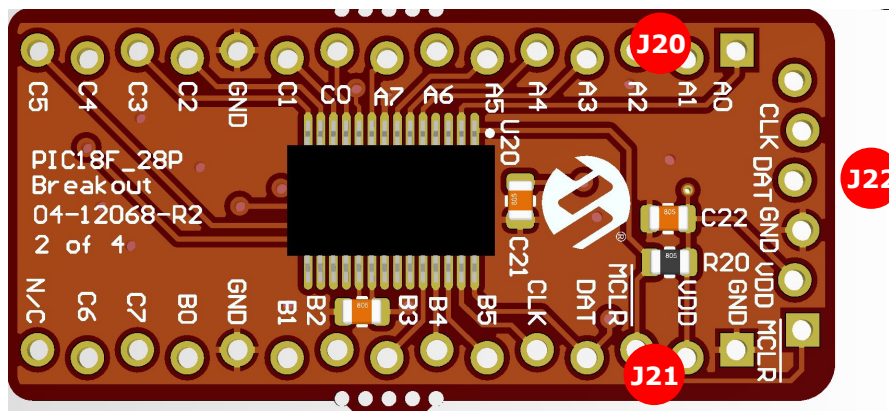


1.2 PIC18F_28P Details

1.2.1 Powering the PIC18F_28P Breakout Board

Power is applied to the pins labeled GND and VDD on J21 as shown in [Figure 1-3](#). Refer to the device data sheet to determine proper power and operation.

Figure 1-3. PIC18F_28P Breakout Board Overview Image



1.2.2 Programming the PIC18F_28P Breakout Board

The PICkit 5 8-pin connector mates directly to J22 as shown in [Figure 1-3](#). Programming connections for a PIC device using the Microchip ISD Program and Debug Interface are shown in [Table 1-2](#).

Table 1-2. PICkit5™ Programming Details for the PIC18F_28P Breakout Board

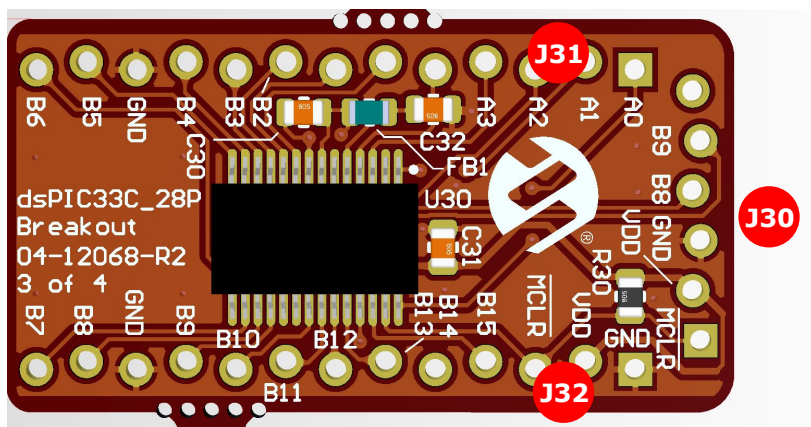
J22 PICkit™ Target		
BBS Pin	BBS Name	Function
J22-1	MCLR	RE3/MCLR/VPP
J22-2	VDD	VDD
J22-3	GND	GND
J22-4	DAT	RB7/ISCPDAT
J22-5	CLK	RB6/ISCPCLK
J22-6	-	No Connection

1.3 dsPIC33C_28P Details

1.3.1 Powering the dsPIC33C_28P Breakout Board

Power is applied to the pins labeled GND and VDD on J32 as shown in [Figure 1-4](#). Refer to the device data sheet to determine proper power and operation.

Figure 1-4. dsPIC33C_28P Breakout Board Overview Image

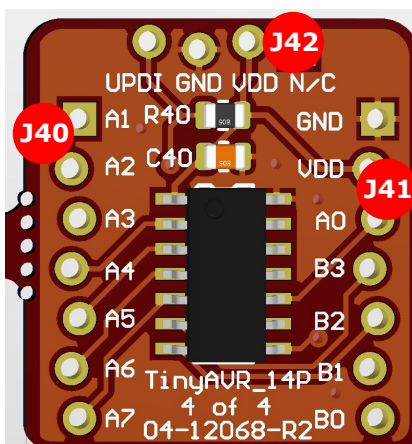


1.4 TinyAVR_14P Details

1.4.1 Powering the TinyAVR_14P Breakout Board

Power is applied to the pins labeled GND and VDD on J41 as shown in [Figure 1-5](#). Refer to the device data sheet to determine proper power and operation.

Figure 1-5. TinyAVR_14P Breakout Board Overview Image



1.4.2 Programming the TinyAVR_14P Breakout Board

The PICkit 5 8-pin connector mates directly to the pins on J42 as shown in [Figure 1-5](#). Programming connections for a PIC device using the Microchip ISD Program and Debug Interface are shown in [Table 1-4](#).

Table 1-4. PICkit5™ Programming Details for the TinyAVR_14P Breakout Board

J42 PICkit™ Target		
BBS Pin	BBS Name	Function
J42-1	N/C	No Connection
J42-2	V _{DD}	Input Supply
J42-3	GND	Ground
J42-4	UPD1	PA0/RESET/UPDI

2. Appendix A. Board Layout and Schematics

This appendix contains the pinout, schematics and board layouts for the Breakout Board Solution MCU Sample Kit. The topics covered in this appendix include:

- [Breakout Board Solution MCU Sample Kit 1 Pin Mapping](#)
- [Breakout Board Solution MCU Sample Kit 1 Schematics](#)
- [Breakout Board Solution MCU Sample Kit 1 PCB Layout](#)

2.1 Breakout Board Solution MCU Sample Kit 1 Pin Mapping

[Table 2-1](#) shows the pin mapping for the SAMD21_32P breakout board section.

[Table 2-2](#) shows the pin mapping for the PIC18F_28P breakout board section.

[Table 2-3](#) shows the pin mapping for the dsPIC33C_28P breakout board section.

[Table 2-4](#) shows the pin mapping for the TinyAVR_14P breakout board section.

Table 2-1. SAMD21_32P Pin Mapping

J10				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J10-1	A00	PA00	1	PA00, XIN32
J10-2	A01	PA01	2	PA01, OUT32
J10-3	A02	PA02	3	PA02
J10-4	A03	PA03	4	PA03
J10-5	A04	PA04	5	PA04
J10-6	A05	PA05	6	PA05
J10-7	A06	PA06	7	PA06
J10-8	A07	PA07	8	PA07
J10-9	A08	PA08	11	PA08
J10-10	A09	PA09	12	PA09
J10-11	GND	GND	10 28	GND
J10-12	A10	PA10	13	PA10
J10-13	A11	PA11	14	PA11
J10-14	A14	PA14	15	PA14/XIN
J10-15	A15	PA15	16	PA15/XOUT
J10-16	A16	PA16	17	PA16

J11				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J11-1	GND	GND	10 28	GND
J11-2	V _{DD}	V _{DD}	9 30	V _{DD}
J11-3	RST	RESET	26	RESET
J11-4	A31	PA31	32	PA31/SWDIO
J11-5	A31	PA30	31	PA30/SCCLK
J11-6	A28	PA28	27	PA28
J11-7	A27	PA27	25	PA27
J11-8	A25	PA25	24	PA25
J11-9	A24	PA24	23	PA24
J11-10	A23	PA23	22	PA23
J11-11	GND	GND	10 28	GND

.....continued

J11				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J11-12	A22	PA22	21	PA22
J11-13	A19	PA19	20	PA19
J11-14	A17	PA18	19	PA18
J11-15	A17	PA17	18	PA17
J11-16	NC	-	-	-

J12 Cortex Debug				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J12-1	-	V _{DD}	9 30	V _{DD}
J12-2	-	SWDIO	32	PA31/SWDIO
J12-3	-	GND	10 28	GND
J12-4	-	SWCLK	31	PA30/SWCLK
J12-5	-	GND	10 28	GND
J12-6	-	-	-	-
J12-7	-	-	-	-
J12-8	-	-	-	-
J12-9	-	GND	28	GND
J12-10	-	RESET	26	RESET

J13 PICKIT™ Target				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J13-1	RST	RESET	26	RESET
J13-2	V _{DD}	V _{DD}	9 30	V _{DD}
J13-3	GND	GND	10 28	GND
J13-4	-	-	-	-
J13-5	SWCLK	SWCLK	31	PA30/SWCLK
J13-6	-	-	-	-
J13-7	-	-	-	-
J13-8	SWDIO	SWDIO	32	PA31/SWDIO

Table 2-2. PIC18F_28P Pin Mapping

J20				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J20-1	A0	RA0	2	RA0
J20-2	A1	RA1	3	RA1
J20-3	A2	RA2	4	RA2
J20-4	A3	RA3	5	RA3
J20-5	A4	RA4	6	RA4
J20-6	A5	RA5	7	RA5
J20-7	A6	RA6	10	RA6/CLKOUT/OSC2
J20-8	A7	RA7	9	RA7/CLKIN/OSC1
J20-9	C0	RC0	11	RC0/SOSCO
J20-10	C1	RC1	12	RC1/SOSC1
J20-11	GND	GND	8 19	GND
J20-12	C2	RC2	13	RC2
J20-13	C3	RC3	14	RC3

.....continued

J20				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J20-14	C4	RC4	15	RC4
J20-15	C5	RC5	16	RC5

J21				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J21-1	GND	GND	8 19	GND
J21-2	V _{DD}	V _{DD}	20	V _{DD}
J21-3	MCLR	MCLR	1	RE3/MCLR/VPP
J21-4	DAT	ISCPDAT	28	RB7/ISCPDAT
J21-5	CLK	ISCPCLK	27	RB6/ISCPCLK
J21-6	B5	RB5	26	RB5
J21-7	B4	RB4	25	RB4
J21-8	B3	RB3	24	RB3
J21-9	B2	RB2	23	RB2
J21-10	BV1	RB1	22	RB1
J21-11	GND	GND	8 19	GND
J21-12	B0	RB0	21	RB0
J21-13	C7	RC7	18	RC7
J21-14	C6	RC6	17	RC6
J21-15	N/C	N/C	x	No Connection

J22 PICkit™ Target				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J22-1	MCLR	MCLR	1	RE3/MCLR/VPP
J22-2	V _{DD}	V _{DD}	20	V _{DD}
J22-3	GND	GND	8 19	GND
J22-4	DAT	ICSPDAT	28	RB7/ICSPDAT
J22-5	CLK	ISCPCLK	27	RB6/ISCPCLK
J22-6	-	N/C	x	No Connection

Table 2-3. dsPIC33C_28P Pin Mapping

J31				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J31-1	A0	RA0	28	RA0
J31-2	A1	RA1	1	RA1
J31-3	A2	RA2	2	RA2
J31-4	A3	RA3	3	RA3
J31-5	A4	RA4	4	RA4
J31-6	B0	RB0	9	RB0
J31-7	B1	RB1	10	RB1
J31-8	B2	RB2	11	RB2
J31-9	B3	RB3	12	RB3
J31-10	B4	RB4	13	RB4
J31-11	GND	GND	6 8 19	GND
J31-12	B5	RB5	14	RB5
J31-13	B6	RB6	15	RB6

J32				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J32-1	GND	GND	6 8 19	GND
J32-2	V _{DD}	V _{DD}	7 20	V _{DD}
J32-3	MCLR	MCLR	27	MCLR
J32-4	B15	RB15	26	RB15
J32-5	B14	RB14	25	RB14
J32-6	B13	RB13	24	RB13
J32-7	B12	RB12	23	RB12
J32-8	B11	RB11	22	RB11
J32-9	B10	RB10	21	RB10
J32-10	B9	RB9	18	RB9
J32-11	GND	GND	6 8 19	GND
J32-12	B8	RB8	17	RB8
J32-13	B7	RB7	16	RB7

J30 PICKIT™ Target				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J30-1	MCLR	MCLR	27	MCLR
J30-2	V _{DD}	V _{DD}	7 20	V _{DD}
J30-3	GND	GND	6 8 19	GND
J30-4	B8	RB8	17	RB8
J30-5	B9	RB9	18	RB9
J30-6	-	x	x	No Connection

Table 2-4. TinyAVR_14P Pin Mapping

J40				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J40-1	A1	PA1	11	PA1
J40-2	A2	PA2	12	PA2
J40-3	A3	PA3	13	PA3/EXTCLK
J40-4	A4	PA4	2	PA4
J40-5	A5	PA5	3	PA5
J40-6	A6	PA6	4	PA6
J40-7	A7	PA7	5	PA7

J41				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J41-1	GND	GND	14	GND
J41-2	V _{DD}	V _{DD}	1	V _{DD}
J41-3	A0	UPDI	10	PA0/RESET/UPDI
J41-4	B3	PB3	6	PB3/TOSC1
J41-5	B2	PB2	7	PB2/TOSC2
J41-6	B1	PB1	8	PB1
J41-7	B0	PB0	9	PB0

J30 PICKIT™ Target				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J42-1	N/C	x	x	No Connection

.....continued

J30 PICKIT™ Target				
BBS Pin	BBS Name	Net Name	Device Pin	Function
J42-2	V _{DD}	V _{DD}	1	Input Supply
J42-3	GND	GND	14	Ground
J42-4	UPDI	UPDI	10	PA0/RESET/UPDI

2.2 Breakout Board Solution MCU Sample Kit 1 Schematics

Figure 2-1 through Figure 2-4 show the board schematics.

Figure 2-1. Breakout Board Solution MCU Sample Kit 1 Schematics, Rev. 1.0 (SAMD21_32P)

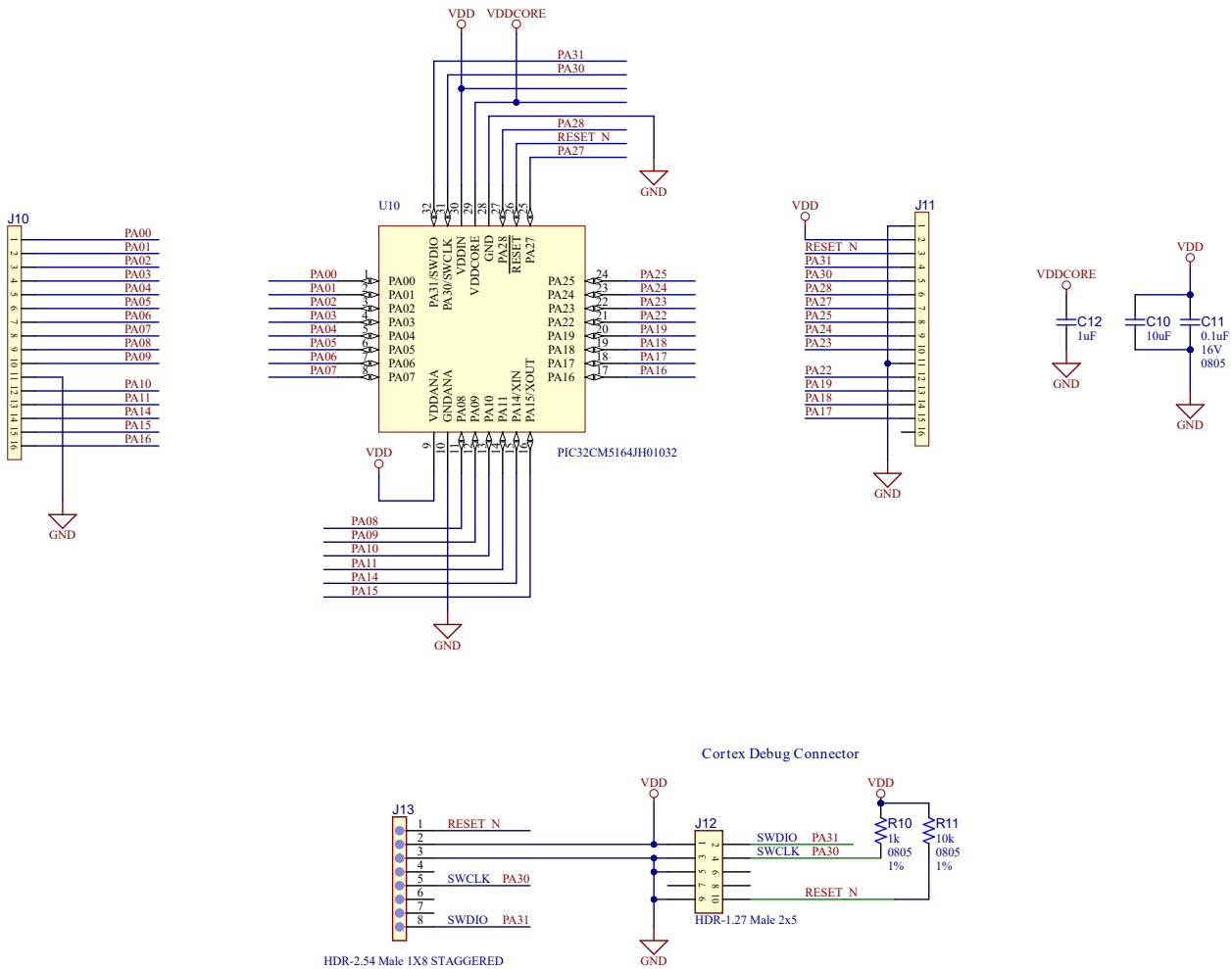


Figure 2-2. Breakout Board Solution MCU Sample Kit 1 Schematics, Rev. 1.0 (PIC18_28P)

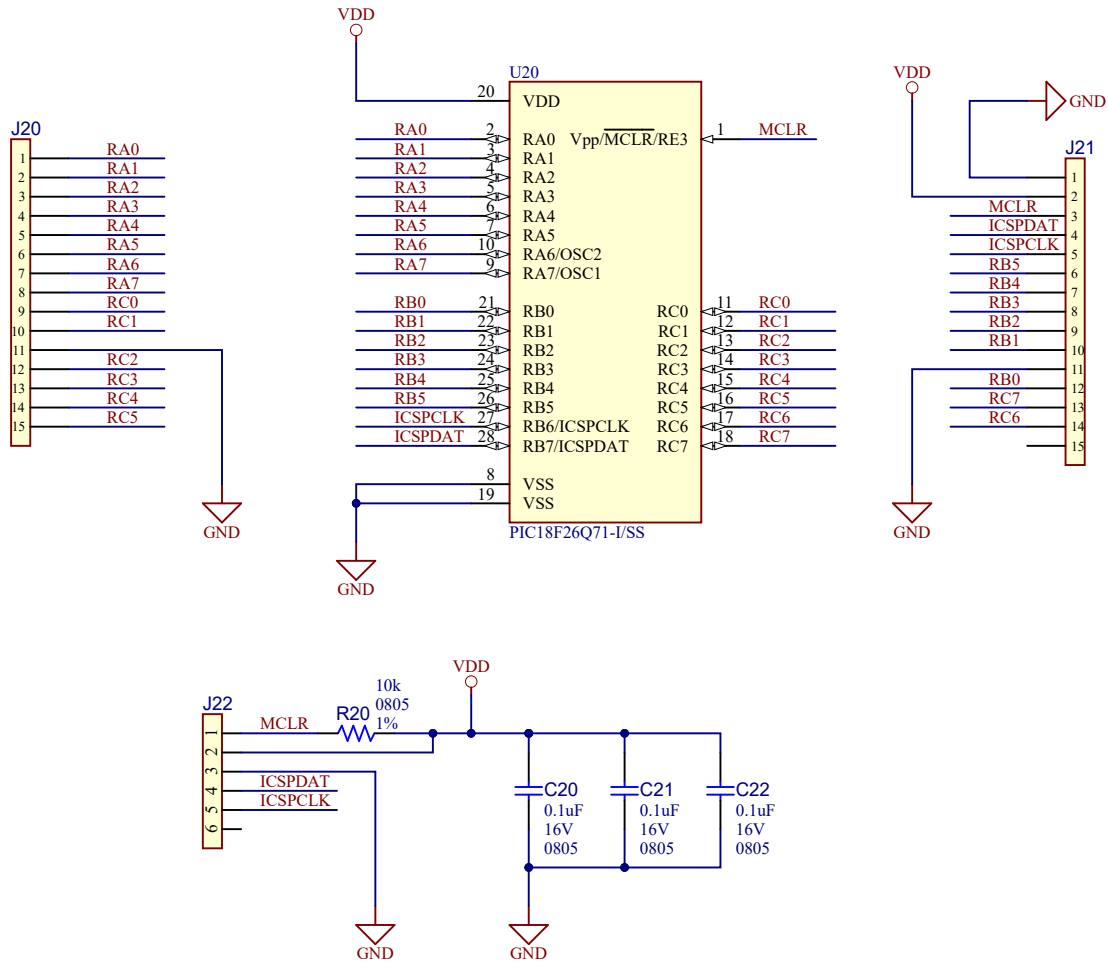
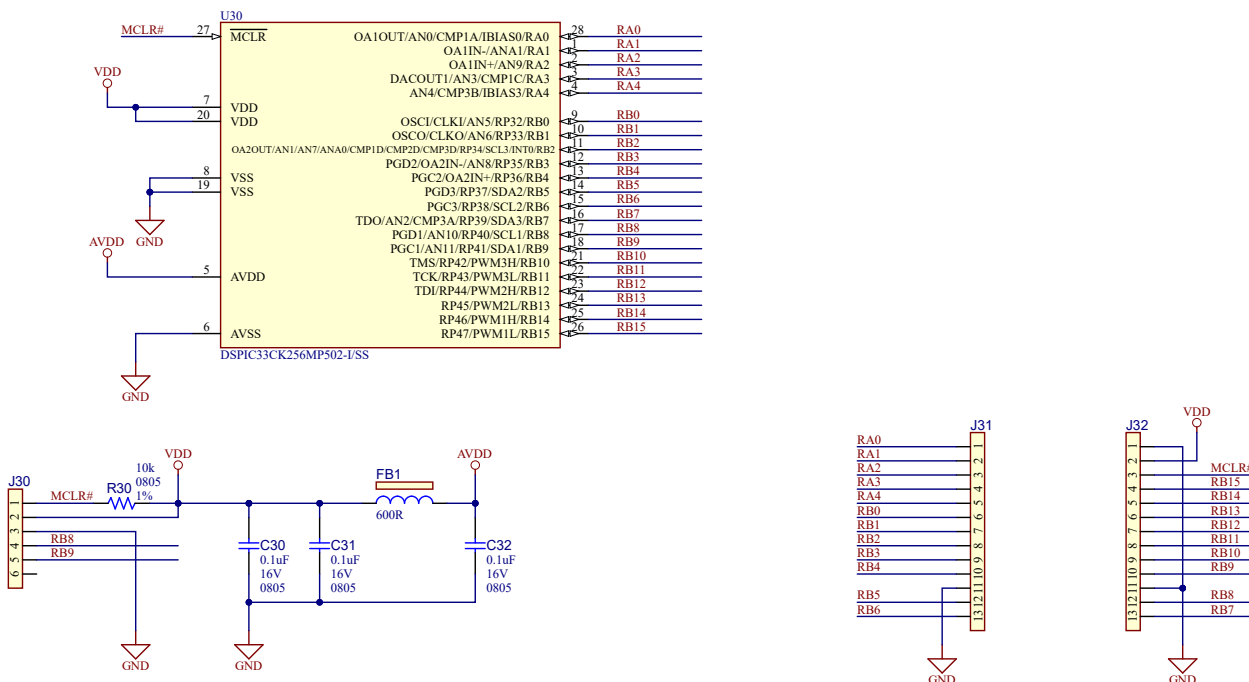
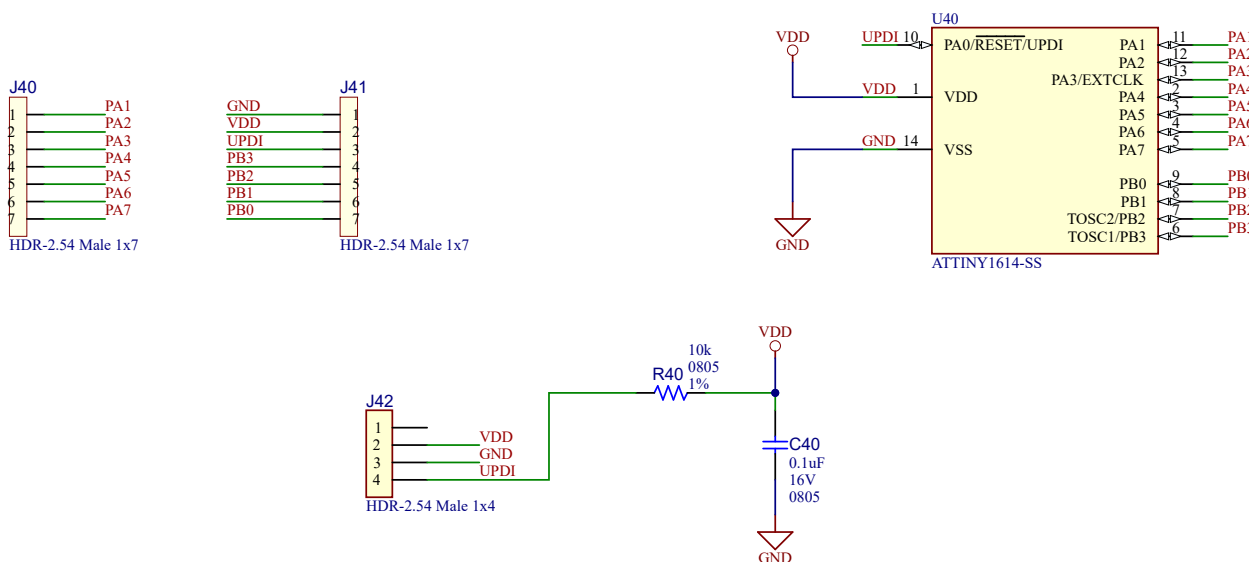


Figure 2-3. Breakout Board Solution MCU Sample Kit 1 Schematics, Rev. 1.0 (dsPIC33C_28P)**Figure 2-4.** Breakout Board Solution MCU Sample Kit 1 Schematics, Rev. 1.0 (TinyAVR_14P)

2.3 Breakout Board Solution MCU Sample Kit 1 PCB Layout

The Breakout Board Solution MCU Sample Kit 1 is a four-layer FR4, 1.6mm, Plate-Through-Hole (PTH) PCB construction. [Figure 2-5](#) and [Figure 2-6](#) illustrate the PCB layers.

Figure 2-5. Breakout Board Solution MCU Sample Kit 1 Top Silkscreen and Top Copper

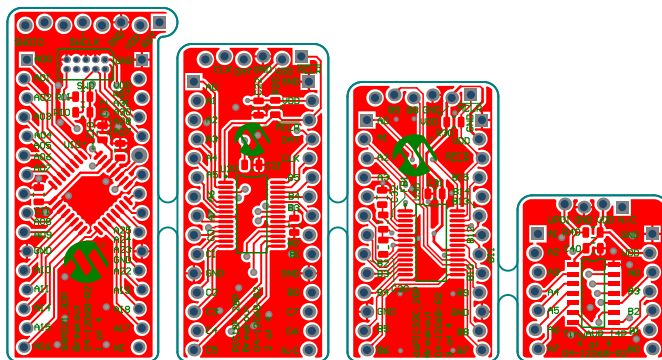
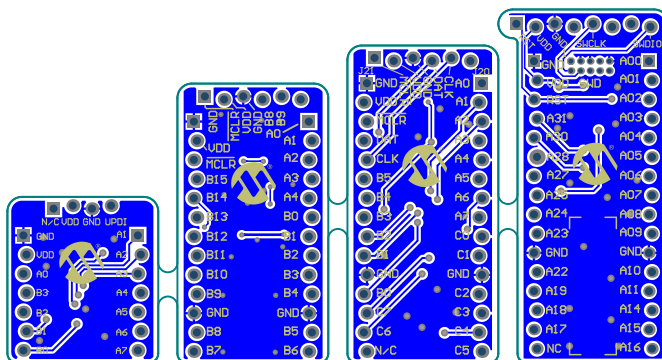


Figure 2-6. Breakout Board Solution MCU Sample Kit 1 Bottom Silkscreen and Bottom Copper



3. Appendix B. Bill of Materials (BOM)

This appendix contains the Bill of Materials (BOM) for the Breakout Board Solution MCU Sample Kit 1.

- [Bill of Materials - Breakout Board Solution MCU Sample Kit 1](#)

3.1 Bill of Materials - Breakout Board Solution MCU Sample Kit 1

Table 3-1 shows the Bill of Materials for the Breakout Board Solution MCU Sample Kit 1.

Table 3-1. Breakout Board Solution MCU Sample Kit 1 BOM

Qty.	Designator	Description	Manufacturer	Manufacturer Part Number
1	C10	CAP CER 10uF 16V 20% X5R SMD 0805	Taiyo Yuden	EMK212BJ106MG-T
8	C11, C20, C21, C22, C30, C31, C32, C40	CAP CER 0.1uF 16V 10% X7R SMD 0805	Yageo	CC0805KRX7R7BB104
1	C12	CAP CER 1uF 16V 10% X7R SMD 0805	KEMET	C0805C105K4RAC7800
1	FB1	FERRITE 742792040 2A 600R SMD 0805	Würth Elektronik	742792040
2	J10, J11	CON HDR-2.54 Male 1x16 Gold 5.84MH TH VERT	Samtec	TSW-116-07-L-S
1	J12	CON HDR-1.27 Male 2x5 Gold 3.05MH TH VERT	Amphenol Corporation	20021111-00010T4LF
1	J13	CON HDR-2.54 Male 1x8 Staggered DNP		
2	J20, J21	CON HDR-2.54 Male 1x15 Gold 5.84MH TH VERT	Samtec	TSW-115-07-G-S
2	J22, J30	CON HDR-2.54 Male 1x6 Staggered DNP	Sullins Connector Solutions	PBC06SAAN
2	J31, J32	CON HDR-2.54 Male 1x13 Staggered DNP	Sullins Connector Solutions	PBC13SAAN
2	J40, J41	CON HDR-2.54 Male 1x7 Tin 5.84MH TH VERT	Samtec	TSW-107-07-T-S
1	J42	CON HDR-2.54 Male 1x4 Tin 5.84MH TH VERT	Amphenol Corporation	68002-404HLF
1	LABEL10	LABEL PCBA 18x6mm Datamatrix Assy# / Rev / Serial / Date	ACT Logimark AS	505462
1	R10	RES TKF 1k 1% 1/8W SMD 0805	Stackpole Electronics, Inc.	RMCF0805FT1K00
4	R11, R20, R30, R40	RES TKF 10k 1% 1/16W SMD 0805	Stackpole Electronics, Inc.	RMCF0805FT10K0
1	U10	MCHP MCU 32-BIT 48MHz 512kB 64kB PIC32CM5164JH01032-I/PT TQFP-32	Microchip Technology, Inc.	PIC32CM5164JH01032-I/PT

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Qty.	Designator	Description	Manufacturer	Manufacturer Part Number
1	U20	MCHP MCU 8-BIT 64MHz 64kB 4kB PIC18F26Q71-I/SS SSOP-28	Microchip Technology, Inc.	PIC18F26Q71-I/SS
1	U30	MCHP MCU 16-BIT 100MIPS 256k 24k DSPIC33CK256MP502-I/SS SSOP-28	Microchip Technology, Inc.	DSPIC33CK256MP502-I/SS
1	U40	MCHP MCU 8-BIT 20 MHz 16KB 2KB ATTINY1614-SSNR SOIC-14	Microchip Technology, Inc.	ATTINY1614-SSNR

Microchip Information

The Microchip Website

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip design partner program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Embedded Solutions Engineer (ESE)
- Technical Support

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

Technical support is available through the website at: www.microchip.com/support

Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip products:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner, within operating specifications, and under normal conditions.
- Microchip values and aggressively protects its intellectual property rights. Attempts to breach the code protection features of Microchip product is strictly prohibited and may violate the Digital Millennium Copyright Act.
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