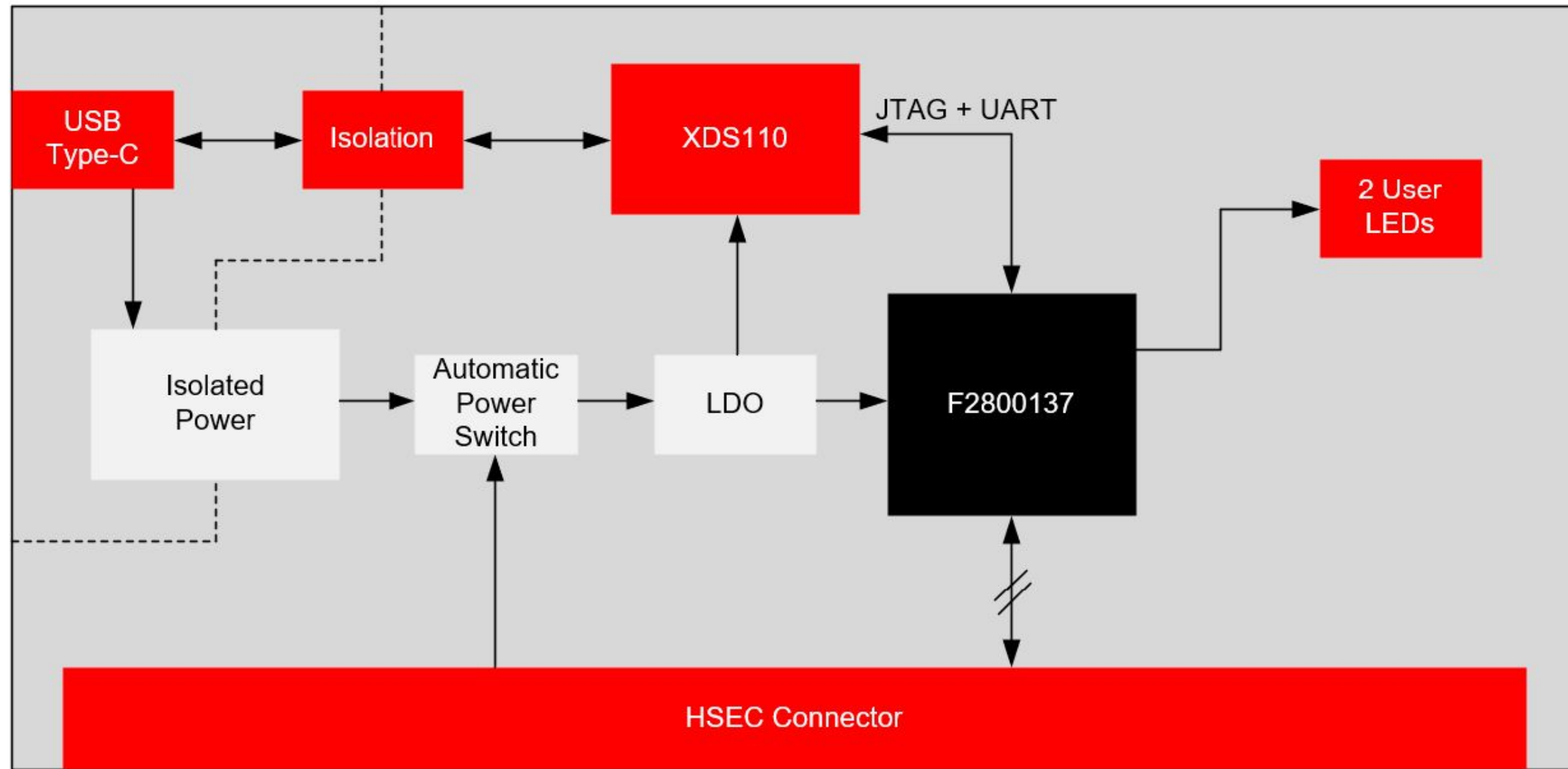


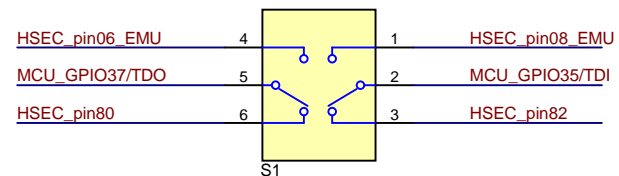
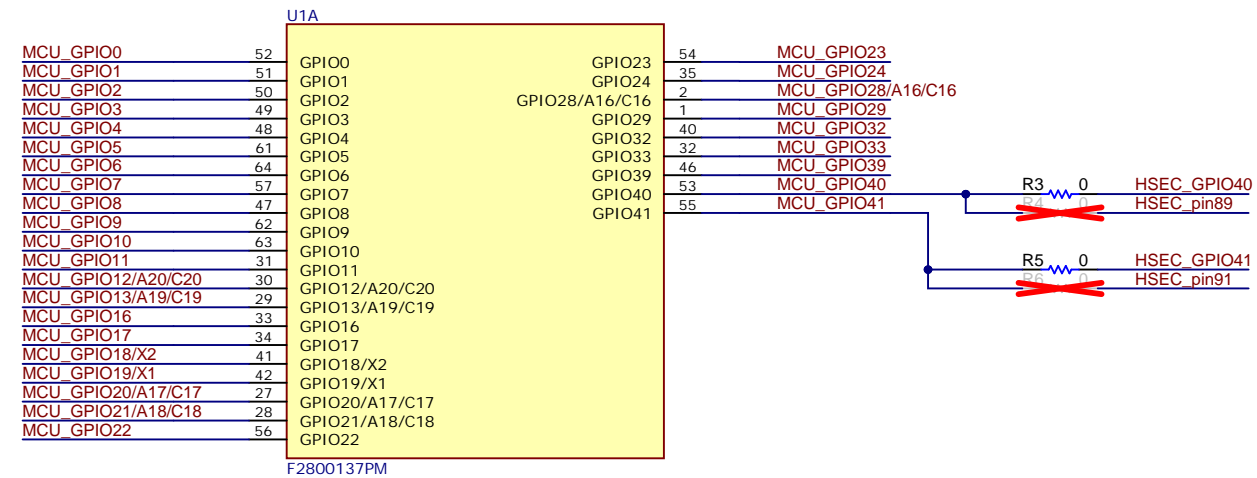
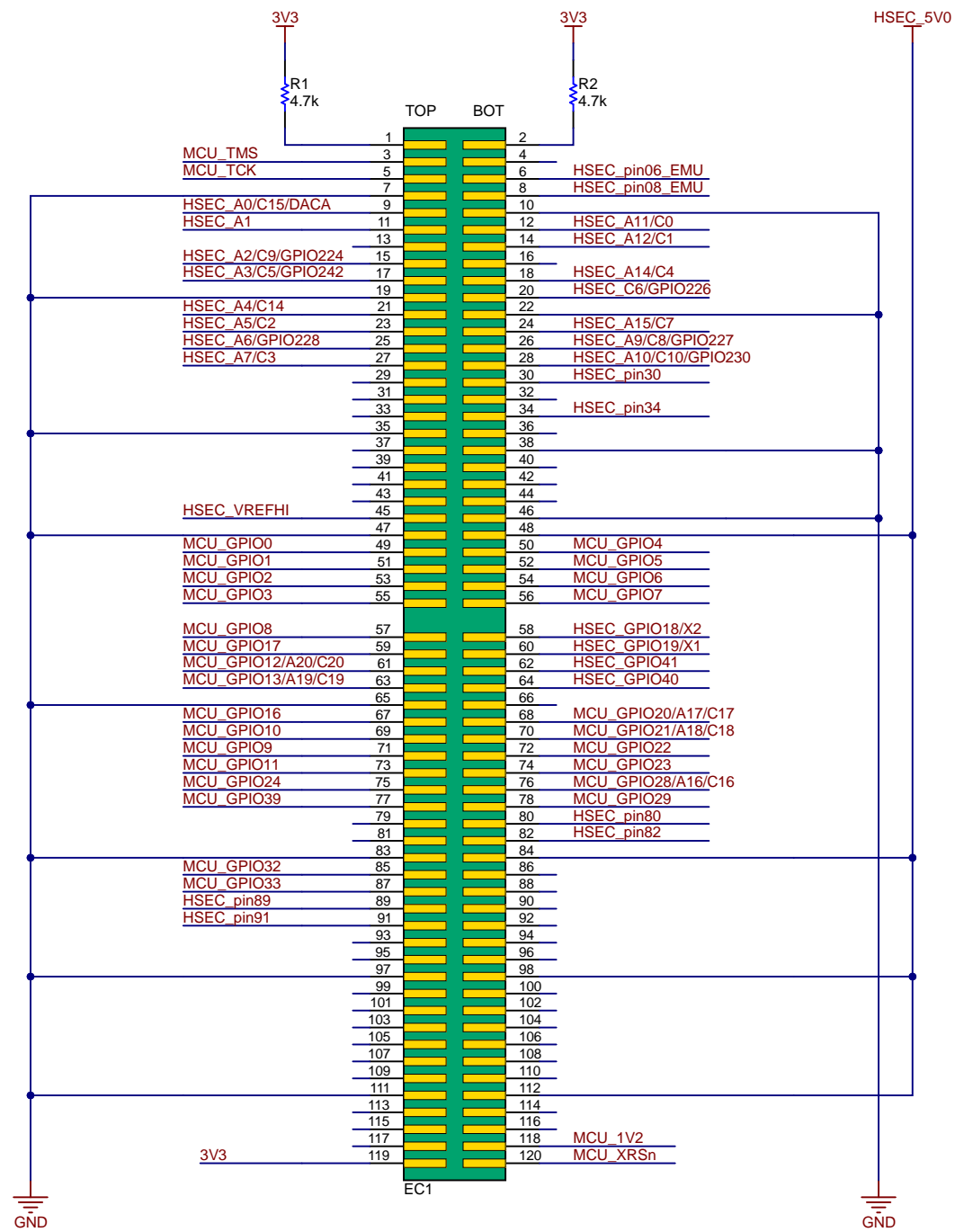
Revision History

Rev	ECN #	Approved Date	Approved by	Notes
E1	N/A	April 13, 2021	BL	First Draft of F280013x cCARD design
A	N/A	March 2, 2022	GM	Updated crystal and load circuit. Corrected MCU part number. Used 0-ohm series resistors on USB.
B	N/A	January 9, 2023	GM	Remapped GPIO-09, GPIO-10, and GPIO-17 in HSEC connector to bring SPIA_CLK to correct location. Remapped GPIO-40 and GPIO-41 in HSEC connector to bring PWM2 A/B outputs to correct location.



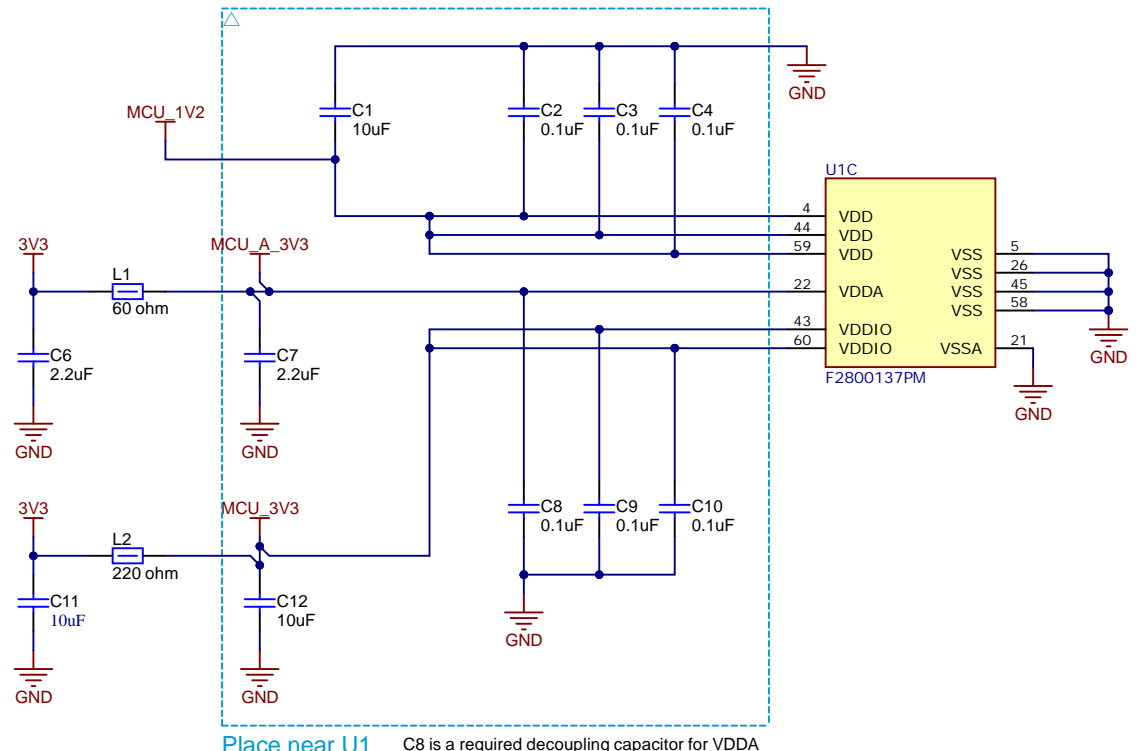
Texas Instruments and/or its licensors do not warrant the accuracy or completeness of this specification or any information contained therein. Texas Instruments and/or its licensors do not warrant that this design will meet the specifications, will be suitable for your application or fit for any particular purpose, or will operate in an implementation. Texas Instruments and/or its licensors do not warrant that the design is production worthy. You should completely validate and test your design implementation to confirm the system functionality for your application.

Orderable: TMDSCNCD2800137	Designed for: Public Release	Mod. Date: 1/10/2023	
TID #: N/A	Project Title: F280013x controlCARD	Sheet Title: Cover Sheet	
Number: MCU102	Rev: B	Assembly Variant: 001	Sheet: 1 of 8
SVN Rev: Version control disabled	File: MCU102B_CoverSheet.SchDoc	Size: B	http://www.ti.com
Drawn By: Brett Larimore	Engineer: Brett Larimore	Contact: http://www.ti.com/support	© Texas Instruments 2021

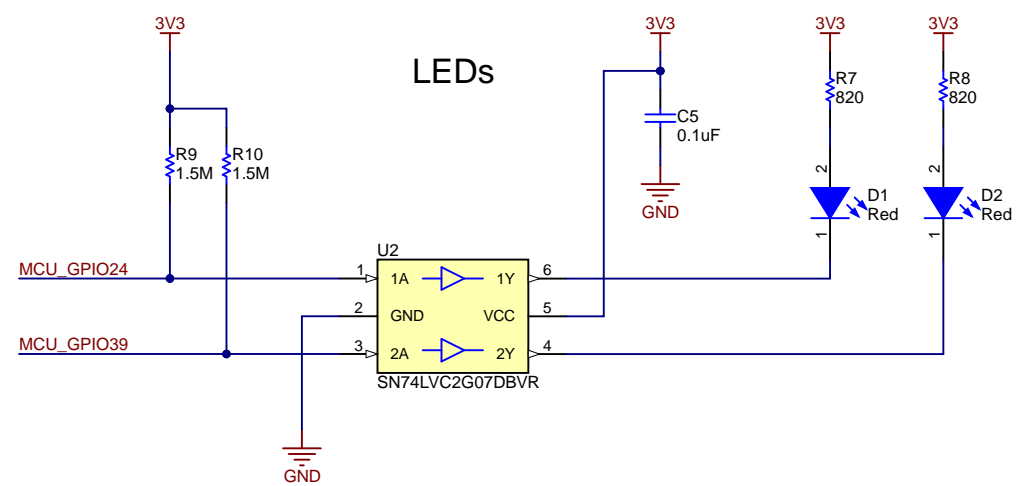


Texas Instruments and/or its licensors do not warrant the accuracy or completeness of this specification or any information contained therein. Texas Instruments and/or its licensors do not warrant that this design will meet the specifications, will be suitable for your application or fit for any particular purpose, or will operate in an implementation. Texas Instruments and/or its licensors do not warrant that the design is production worthy. You should completely validate and test your design implementation to confirm the system functionality for your application.

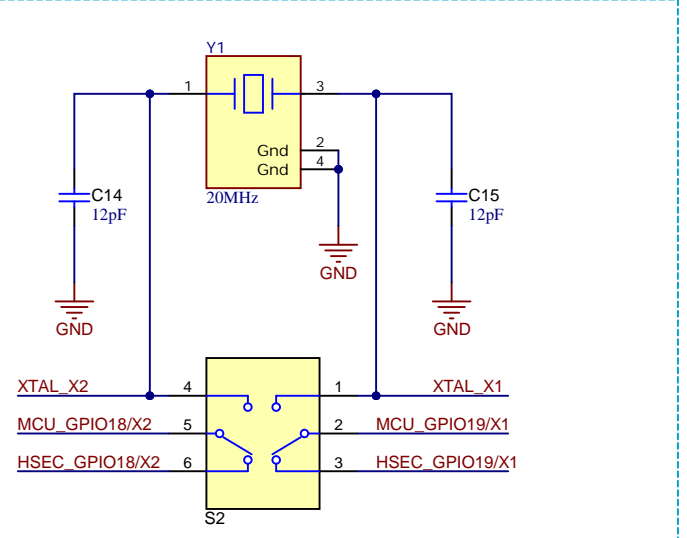
Orderable: TMDSCNCD2800137	Designed for: Public Release	Mod. Date: 1/9/2023
TID #: N/A	Project Title: F280013x controlCARD	
Number: MCU102	Rev: B	Sheet Title: GPIO
SVN Rev: Version control disabled	Assembly Variant: 001	Sheet: 2 of 8
Drawn By: Brett Larimore	File: MCU102B_GPIO.SchDoc	Size: B
Engineer: Brett Larimore	Contact: http://www.ti.com/support	



Place near U1 C8 is a required decoupling capacitor for VDDA



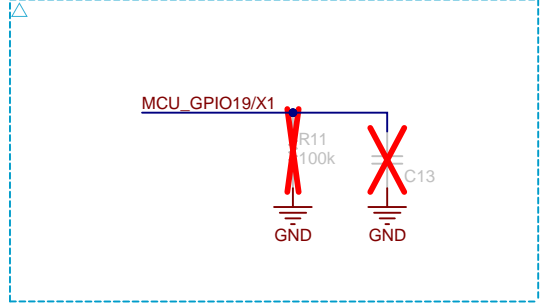
External X-tal or PWM Selection



S2 enables the selection of an external crystal or the use of GPIOs through the HSEC connector. In this controlCARD's design this switch is required to support a variety of baseboards. However, in a final system the designer should remove S2 and route these signals cleanly depending on the system's requirements.

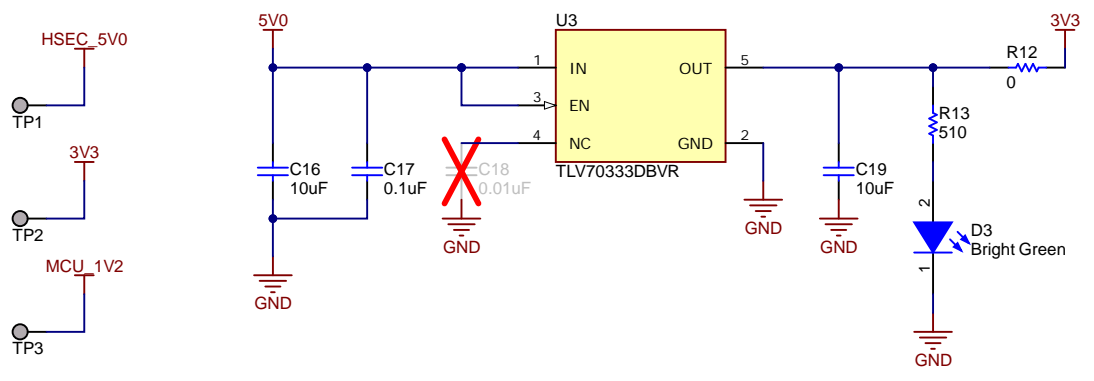
Place near U1 and route cleanly

External Precision Resistor (ExtR)

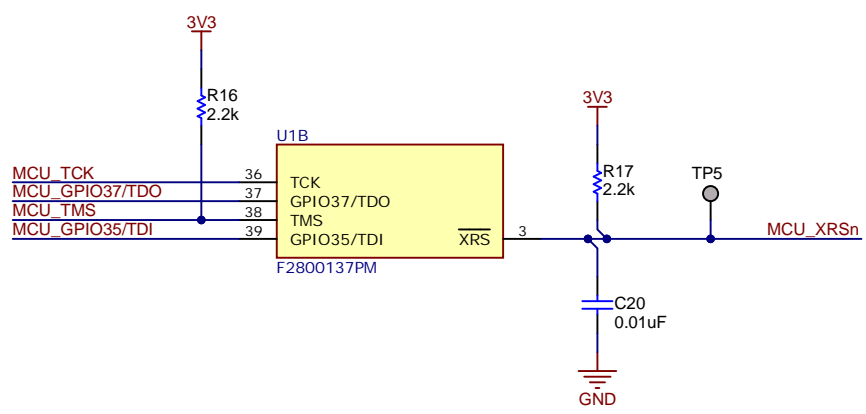


Place near X1 pin

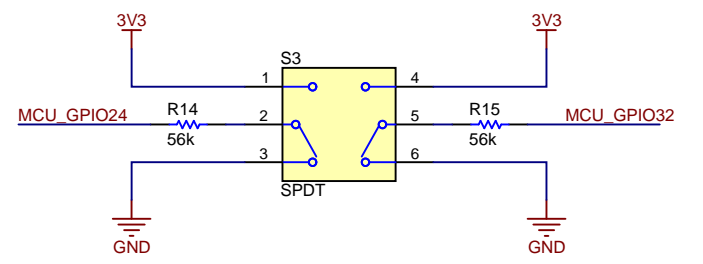
Power Supply



Reset and JTAG



Boot Mode Switch

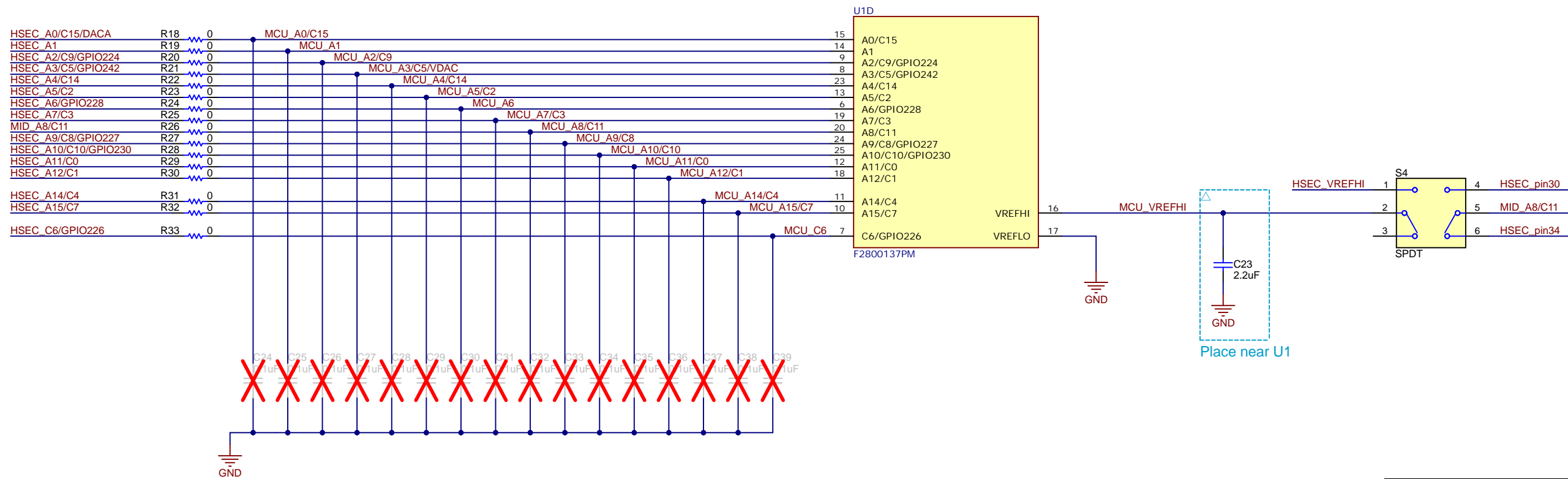
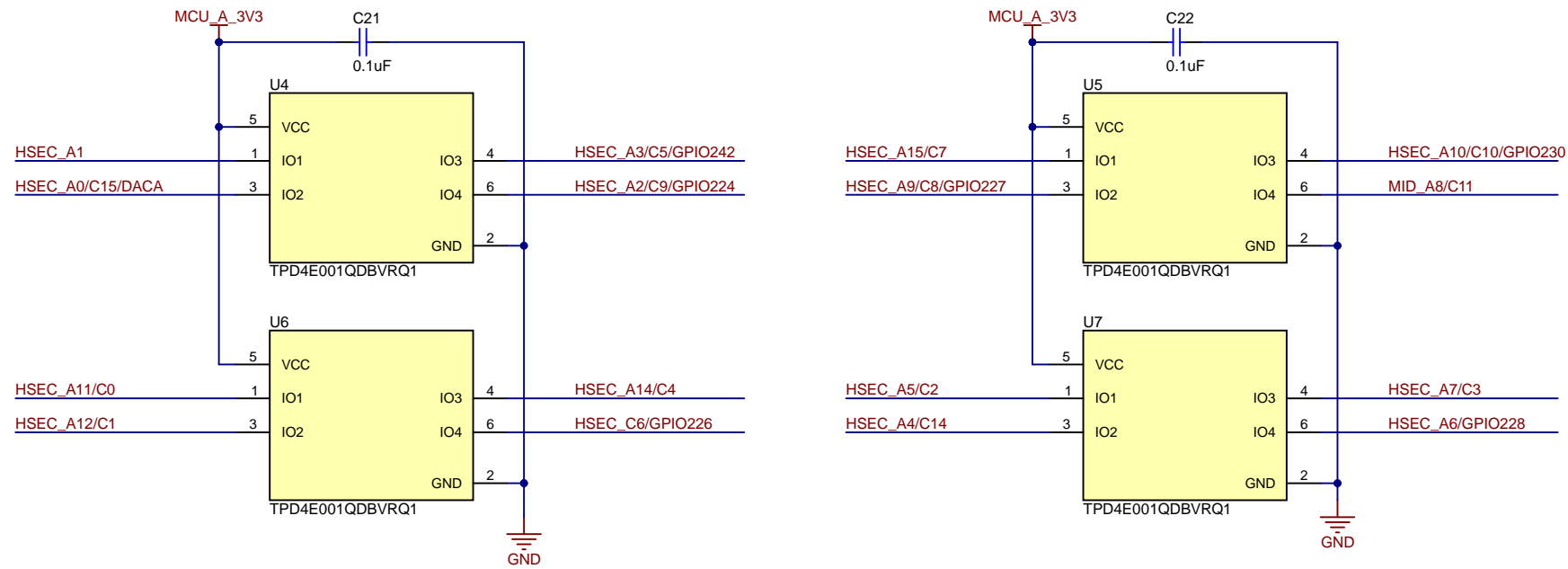


Boot Mode Selection Chart

(S3: UP is '1', DOWN is '0')

Mode #	GPIO24	GPIO32	Boot Mode
00	0	0	Boot from Parallel GPIO
01	0	1	Boot from SCI / Wait Mode
02	1	0	Boot from CAN
03	1	1	Boot from Flash

Texas Instruments and/or its licensors do not warrant the accuracy or completeness of this specification or any information contained therein. Texas Instruments and/or its licensors do not warrant that this design will meet the specifications, will be suitable for your application or fit for any particular purpose, or will operate in an implementation. Texas Instruments and/or its licensors do not warrant that the design is production worthy. You should completely validate and test your design implementation to confirm the system functionality for your application.



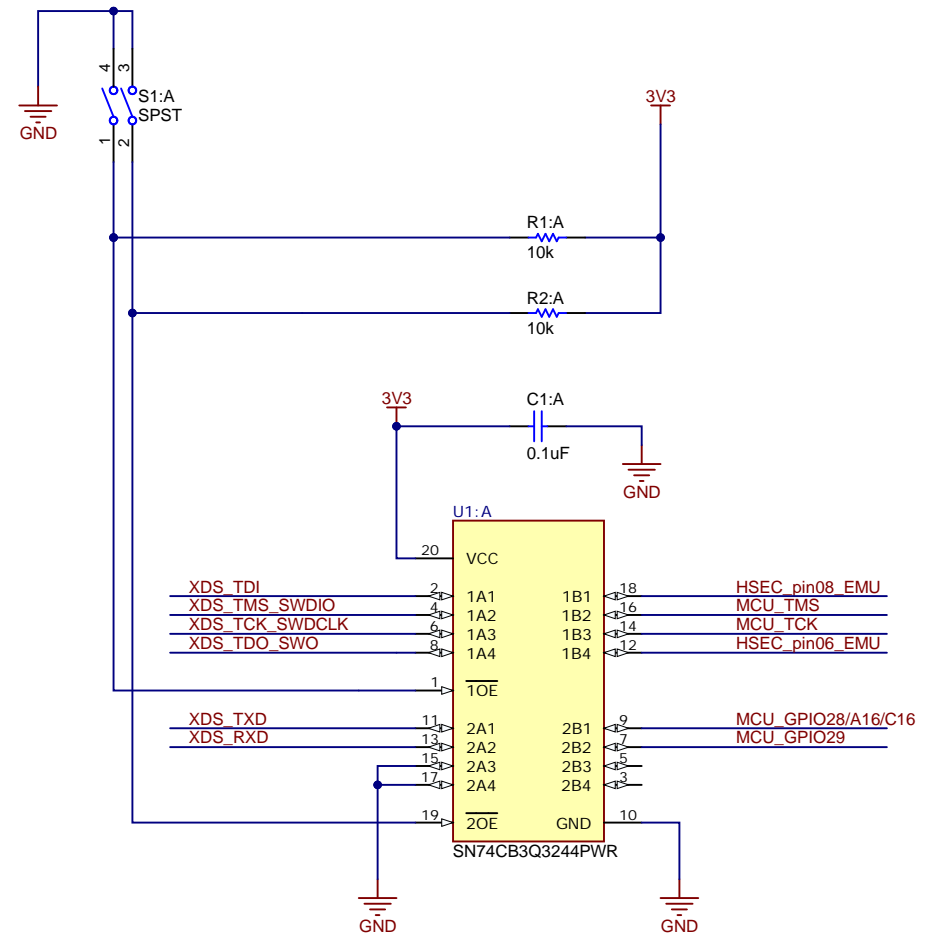
S4 is the analog configuration switch

- 1- ON
 - ADC should be configured to disable the internal reference and instead a reference voltage should be attached to HSEC pin 45
- 1-OFF
 - ADC should use the internal voltage reference
- 2-ON
 - ADC channel A8 is connected to HSEC_pin30
- 2-OFF
 - ADC channel A8 is connected to HSEC_pin34

Texas Instruments and/or its licensors do not warrant the accuracy or completeness of this specification or any information contained therein. Texas Instruments and/or its licensors do not warrant that this design will meet the specifications, will be suitable for your application or fit for any particular purpose, or will operate in an implementation. Texas Instruments and/or its licensors do not warrant that the design is production worthy. You should completely validate and test your design implementation to confirm the system functionality for your application.

S1:A - Emulation & GPIO28 Switch

POS 1 ON: Use XDS110 emulator that is on the cCARD
 POS 1 OFF: Boot from FLASH/peripheral (see boot mode switch) OR use emulator on baseboard
 POS 2 ON: GPIO-28 will be controlled by the USB-to-UART adapter on the XDS110 emulator MCU
 POS 2 OFF: GPIO-28 can be controlled by a pin in HSEC connector

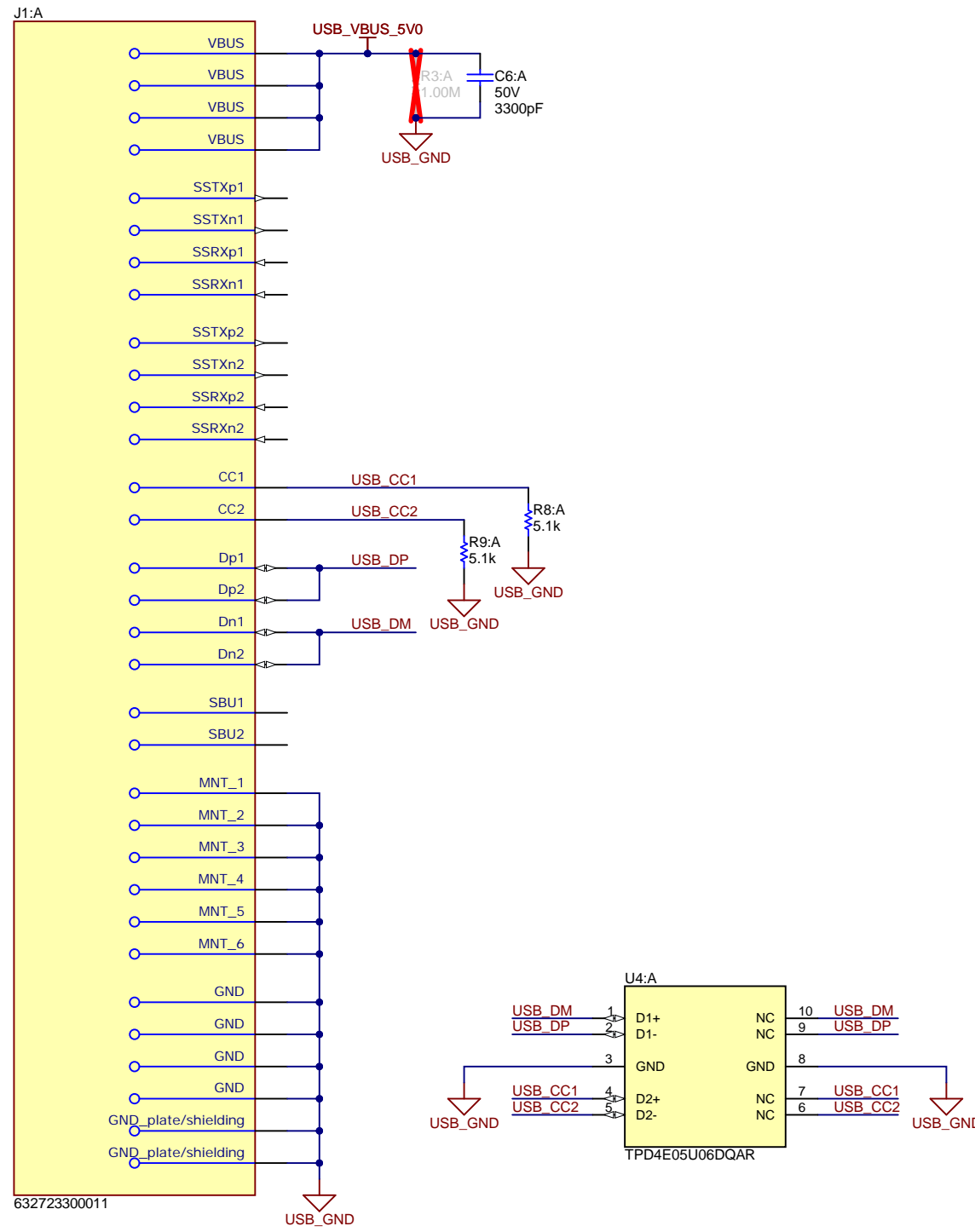


Texas Instruments and/or its licensors do not warrant the accuracy or completeness of this specification or any information contained therein. Texas Instruments and/or its licensors do not warrant that this design will meet the specifications, will be suitable for your application or fit for any particular purpose, or will operate in an implementation. Texas Instruments and/or its licensors do not warrant that the design is production worthy. You should completely validate and test your design implementation to confirm the system functionality for your application.

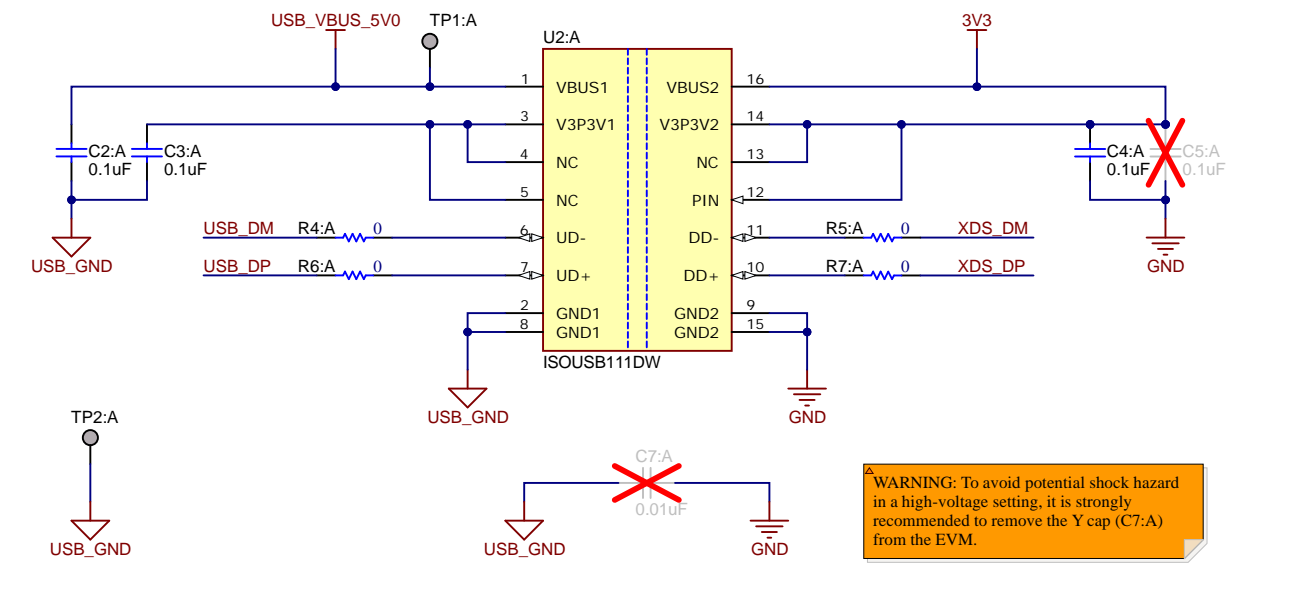
Orderable: TMDSCNCD2800137	Designed for: Public Release	Mod. Date: 6/24/2021
TID #: N/A	Project Title: F280013x controlCARD	
Number: MCU102	Rev: B	Sheet Title: Emulator Interface
SVN Rev: Version control disabled	Assembly Variant: 001	Sheet: 5 of 8
Drawn By: Cody Watkins	File: MCU102B_Emulator_Interface.SchDoc	Size: B
Engineer: Brett Larimore	Contact: http://www.ti.com/support	



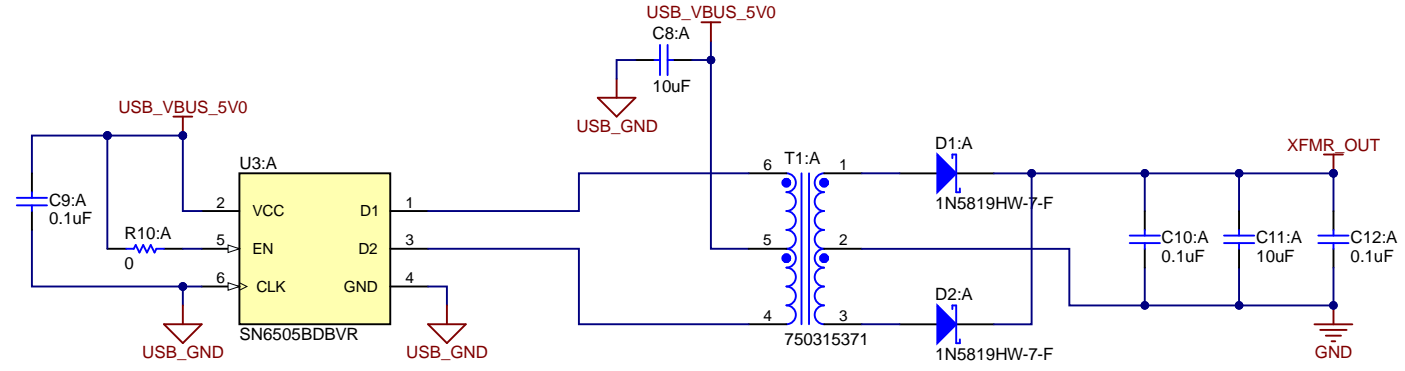
USB Connector



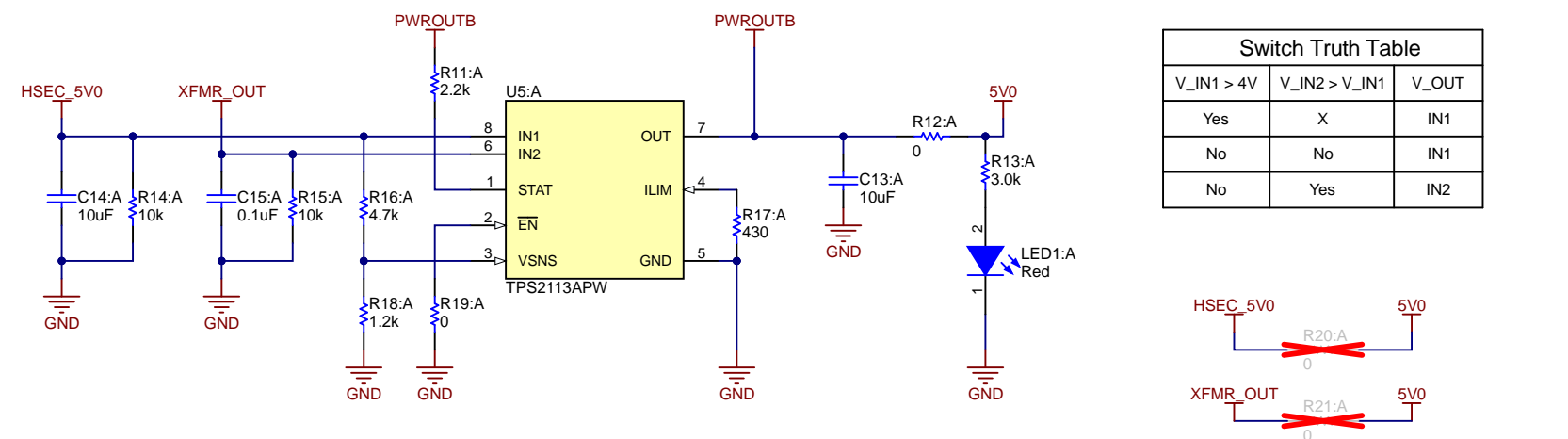
Isolation Boundary



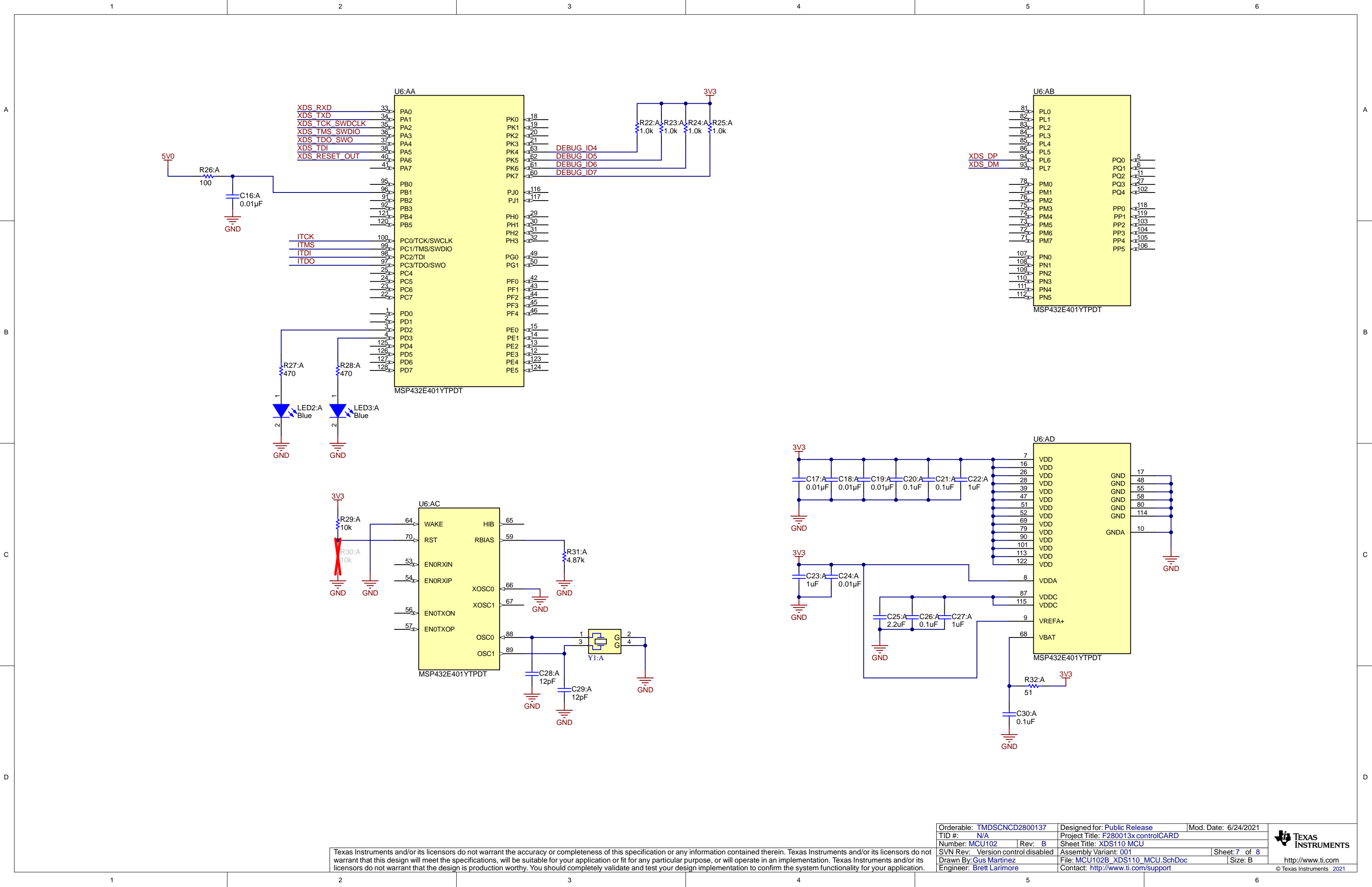
USB Isolated Power



Power Selection Switch



Texas Instruments and/or its licensors do not warrant the accuracy or completeness of this specification or any information contained therein. Texas Instruments and/or its licensors do not warrant that this design will meet the specifications, will be suitable for your application or fit for any particular purpose, or will operate in an implementation. Texas Instruments and/or its licensors do not warrant that the design is production worthy. You should completely validate and test your design implementation to confirm the system functionality for your application.



Texas Instruments and/or its licensors do not warrant the accuracy or completeness of this specification or any information contained therein. Texas Instruments and/or its licensors do not warrant that this design will meet the specifications, will be suitable for your application or fit for any particular purpose, or will operate in an implementation. Texas Instruments and/or its licensors do not warrant that the design is production worthy. You should completely validate and test your design implementation to confirm the system functionality for your application.

Orderable: TMDSCNCD2800137	Designed for: Public Release	Mod. Date: 6/24/2021
TID #: N/A	Project Title: F280013x controlCARD	
Number: MCU102	Rev: B	Sheet Title: XDS110 MCU
SVN Rev: Version control disabled	Assembly Variant: 001	Sheet: 7 of 8
Drawn By: Gus Martinez	File: MCU102B_XDS110_MCU.SchDoc	Size: B
Engineer: Brett Larimore	Contact: http://www.ti.com/support	





PCB Number: MCU102
PCB Rev: B

PCB
LOGO
Texas Instruments



PCB
LOGO
FCC disclaimer

PCB
LOGO
WEEE logo

ZZ2
Assembly Note
These assemblies are ESD sensitive, ESD precautions shall be observed.

ZZ3
Assembly Note
These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.

ZZ4
Assembly Note
These assemblies must comply with workmanship standards IPC-A-610 Class 2, unless otherwise specified.

Orderable: TMDSCNCD2800137	Designed for: Public Release	Mod. Date: 9/27/2022
TID #: N/A	Project Title: F280013x controlCARD	
Number: MCU102	Rev: B	Sheet Title: Hardware
SVN Rev: Version control disabled	Assembly Variant: 001	Sheet: 8 of 8
Drawn By: Brett Larimore	File: MCU102B_Hardware.SchDoc	Size: B
Engineer: Brett Larimore	Contact: http://www.ti.com/support	

Texas Instruments and/or its licensors do not warrant the accuracy or completeness of this specification or any information contained therein. Texas Instruments and/or its licensors do not warrant that this design will meet the specifications, will be suitable for your application or fit for any particular purpose, or will operate in an implementation. Texas Instruments and/or its licensors do not warrant that the design is production worthy. You should completely validate and test your design implementation to confirm the system functionality for your application.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](#) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2023, Texas Instruments Incorporated