MSP432™ SimpleLink™ Microcontrollers Hardware Tools

User's Guide

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Read This First

About This Manual

This manual describes the hardware tools that support the Texas Instruments SimpleLink™ MSP432™ device family of ARM® Cortex®-M based microcontrollers.

How to Use This Manual

This manual describes the setup and operation of the hardware tools. It does not fully describe the MSP432 microcontrollers or the development software systems. For details of these items, see the appropriate TI documents listed in Important MSP432 Documents on the Web.

Important MSP432 Documents on the Web

The primary sources of MSP432 information are the device-specific data sheets and user's guides. The MSP432 web site contains the most recent versions of these documents.

Documents that describe the Code Composer Studio™ tools (Code Composer Studio IDE, assembler, C compiler, linker, and librarian) are available on the Code Composer Studio page. A Wiki page (FAQ) that is specific to the Code Composer Studio tools is available at processors.wiki.ti.com/index.php/Category:CCS. The TI E2E™ Community support forums provide additional help.

Documentation for third-party tools, such as the IAR Embedded Workbench® for ARM IDE or the Segger J-Link debug probe, can be found on the respective third-party website.

If You Need Assistance

Support for the MSP432 devices and the hardware development tools is provided by the Texas Instruments Product Information Center (PIC). Contact information for the PIC can be found on the TI web site. The TI E2E™ Community support forums for the MSP432 provide open interaction with peer engineers, TI engineers, and other experts. Additional device-specific information can be found on the MSP432 web site.

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ARM, Cortex are registered trademarks of ARM Limited.
IAR Embedded Workbench is a registered trademark of IAR Systems.

Hardware

This chapter contains information relating to the hardware tools and includes schematics, PCB pictorials, and bills of materials. Other tools such as EVMs and LaunchPad development kits are described in separate product-specific user's guides. Information about the TI XDS100 and XDS200 debug probes is not included in this document and can be found at www.ti.com/tool/xds100 and www.ti.com/tool/xds200, respectively.

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1.1 MSP-FET-432ADPTR

1.1.1 Introduction

The MSP-FET-432ADPTR is an adapter to convert the 14-pin JTAG connector to either standard ARM 10-pin or ARM 20-pin connectors. This allows for use of the MSP-FET debug probe with MSP432 Cortex-M devices.

1.1.2 Key Features

- Use MSP-FET to debug MSP432 Cortex-M Devices
- 10-pin ARM support
- 20-pin ARM support

1.1.3 Kit Contents

- 1x MSP-FET-432ADPTR 14-pin JTAG to ARM adapter

1.1.4 Configuration and Usage

The MSP-FET-432ADPTR allows the use of the MSP-FET debug probe with the MSP432 Cortex-M family of devices. Operation is straight-forward, with only one selection for how the power is sourced. This selection is required because of the difference in the power source and sense behavior of the MSP-FET and the ARM debug standard.

The MSP-FET debug probe has two power states:

1. V_{CC} Output
   - MSP-FET outputs a voltage to the target.
   - Output voltage is configurable in the IDE.
   - In V_{CC} output state, the MSP-FET voltage sense functionality is not enabled.
2. V_{CC} Sense
   - MSP-FET senses an existing external voltage (not from the MSP-FET itself).
   - The JTAG signals are level shifted accordingly to match this voltage.
   - In V_{CC} Sense state, the MSP-FET output voltage is not provided.

The Cortex-M debug standard works a bit differently. In this standard, the V_{CC} Sense is always active, no matter where the external voltage is coming from. Some debug probes, such as the IAR I-jet and Segger J-Link have a voltage output, all while still sensing the V_{CC} Sense.

Table 1-1. Matrix of S1 Switch Orientation Compared to ARM Connector Option

	V_{CC} Sense (S1 Left)	V_{CC} Output (S1 Right)
ARM 20-pin connector	• External power is sensed through ARM pin 1 • External power needs to be connected to debug target	• Power is provided by the MSP-FET through ARM pin 19. • Alternatively, power can be wired to the target using connector J4. • This output matches other ARM debug probes like IAR i-Jet and SEGGER J-Link • Note that the IAR i-Jet outputs 3.3 V, and SEGGER J-Link outputs 5 V on this pin. Ensure the target accounts for the specific voltage output by MSP-FET.
ARM 10-pin connector	• External power is sensed through ARM pin 1 • External power needs to be connected to debug target	• There is no pin to connect the power output on the 10 pin connector • Power output is provided on connector J4. This can be wired to the target board.

1.1.5 Hardware Design

Figure 1-1 shows the schematic of the MSP-FET-432ADPTR.

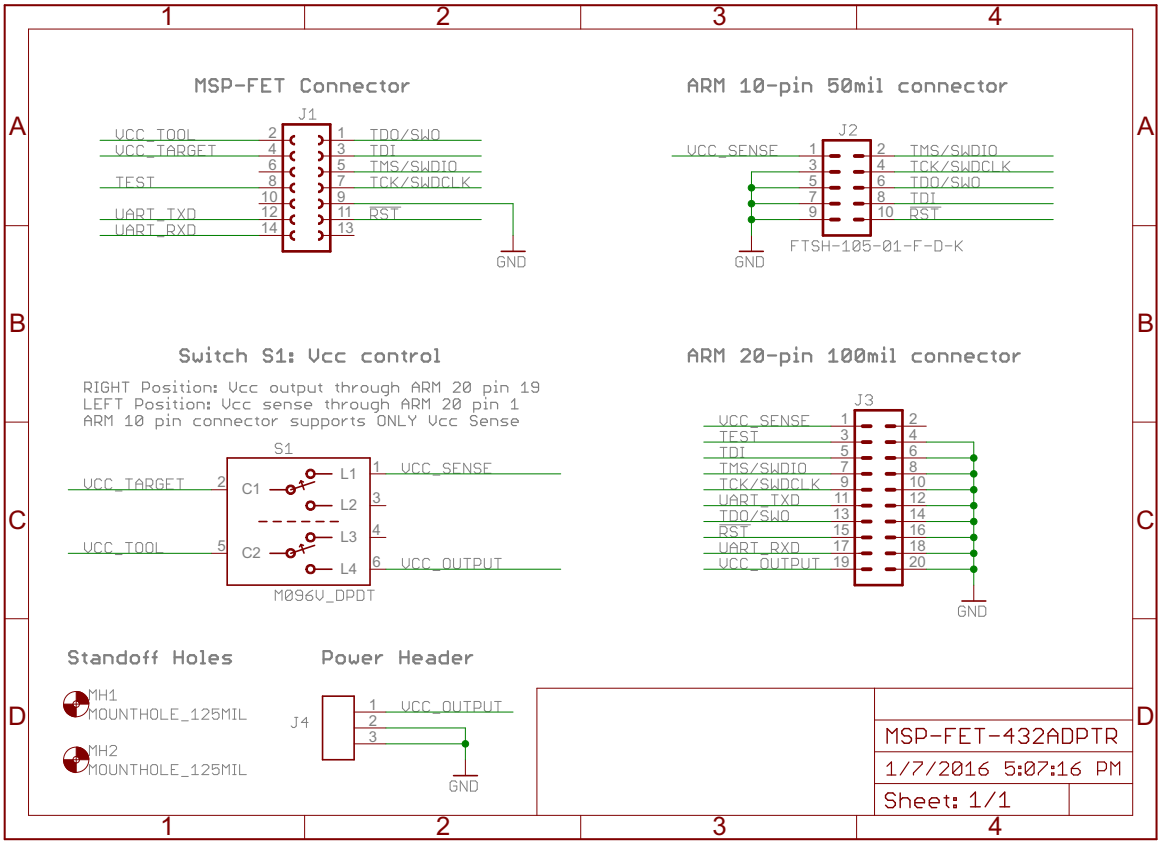

Figure 1-1. MSP-FET-432ADPTR Schematic

Table 1-2 lists the bill of materials for the MSP-FET-432ADPTR.

Table 1-2. MSP-FET-432ADPTR Bill of Materials

Qty	Reference	Manufacturer	Description	Part Number	Alternate Part Number	PCB Decal, Package	Supplier	Digi-Key Number
1	J1	Standard	Conn Header 14POS 0.100" TH, RA, Gold, Digikey S9203-ND			2 x 7 0.100"	Digikey	S9203-ND
1	J2	Samtec	CONN HEADER 10POS DUAL VERT, Digikey FTSH-105-01-F-D-K-ND	FTSH-105-01-F-D-K		2 x 5 0.050"	Digikey	FTSH-105-01-F-D-K-ND
1	J3	Standard	CONN HEADER LOW-PRO 20POS GOLD, Digikey HRP20H-ND			2 x 10 0.100"	Digikey	HRP20H-ND
1	J4	Standard	CONN HEADER .100 SINGL STR 3POS, Digikey S1012E-03-ND			1 x 3 0.100"	Digikey	S1012E-03-ND
1	S1	Standard	SW SLIDE DPDT 2POS, Digikey 401-2001-ND		M096V		Digikey	401-2001-ND
1	MH1	Standard	Standoff Nylon 4-40 8mm/ 0.375"				CM	
1	MH2	Standard	Standoff Nylon 4-40 8mm/ 0.375"				CM	

1.2 MSP-TS432PZ100

1.2.1 Introduction

NOTE: This kit does not include MSP432 microcontroller samples. To sample the compatible devices, visit the product page or select the related MCU after adding the tool to the TI Store cart: MSP432P401R.

The MSP-TS432PZ100 is a stand-alone ZIF socket target board used to program and debug the MSP432 MCU in-system through the JTAG interface or the Serial Wire Debug (SWD 2-wire JTAG) protocol. Two standard ARM Cortex-M debug connectors provide connectivity to a large number of debug probes from Texas Instruments and third parties.

All device pins are readily accessible through dedicated headers, which makes the board the ideal center of a prototype setup.

1.2.2 Key Features

- ZIF socket for 100-pin QFP (PZ) packages
- Access to all 100 device pins
- LEDs and buttons
- 2 x Cortex-M JTAG connectors supporting all 10- or 20-pin compatible debug probes

1.2.3 Kit Contents

- One READ ME FIRST document
- One MSP-TS432PZ100 target socket board
- One TI Terms and Conditions for Evaluation Modules
- One 32.768-kHz crystal from Micro Crystal
- Four SAM1029-25-ND 25-pin 100-mil through-hole male headers
- Four SAM1213-25-ND 25-pin 100-mil through-hole female headers

1.2.4 Configuration and Usage

Table 1-3 lists the devices that are compatible with the MSP-TS432PZ100 target socket board.

Table 1-3. Device Compatibility

Board	Socket Type	Supported Devices
MSP-TS432PZ100	100-pin QFP (PZ100)	MSP432P401RIPZ MSP432P401MIPZ MSP432P4111TPZ MSP432P4111IPZ MSP432P411YTPZ MSP432P411YIPZ MSP432P411VTPZ MSP432P411VIPZ

1.2.4.1 MSP-TS432PZ100 Rev 1.1

1.2.4.1.1 Board Configuration For External Target Power Supply

If the application needs to operate in stand-alone mode (for example, to measure current consumption without debug overhead) or when using ARM Cortex-M debug probes that do not provide power for the target device (for example, TI XDS100, XDS200, Keil ULINK2, or Keil ULINK Pro), power must be supplied externally to the target socket board.

Always follow the voltage limits defined in the device data sheet. Set the jumpers according to Table 1-4 before connecting the debug probe and power supply (see Figure 1-2).

Table 1-4. Jumper Settings for External Target Power Supply

Jumper	State	Description
J1	Close 2-3	Connect EXTERNAL VCC to board VCC
J2		Connect external VCC to J2-1, and external GND to J2-2 or J2-3, per the labelling on the PCB silkscreen.
JP1	Closed	Current-measurement header (closed unless measuring I_{CC})
JP2	Closed	Current-measurement header (closed unless measuring I_{DVCC})
JP16	Closed	Current-measurement header (closed unless measuring I_{AVCC})
JP8	Open	Disconnect Pin 19 from LDO input
JP12	Open	Disconnect LDO output from internal VCC (INTVCC)
JP15	Open	Do not short LDO input to output

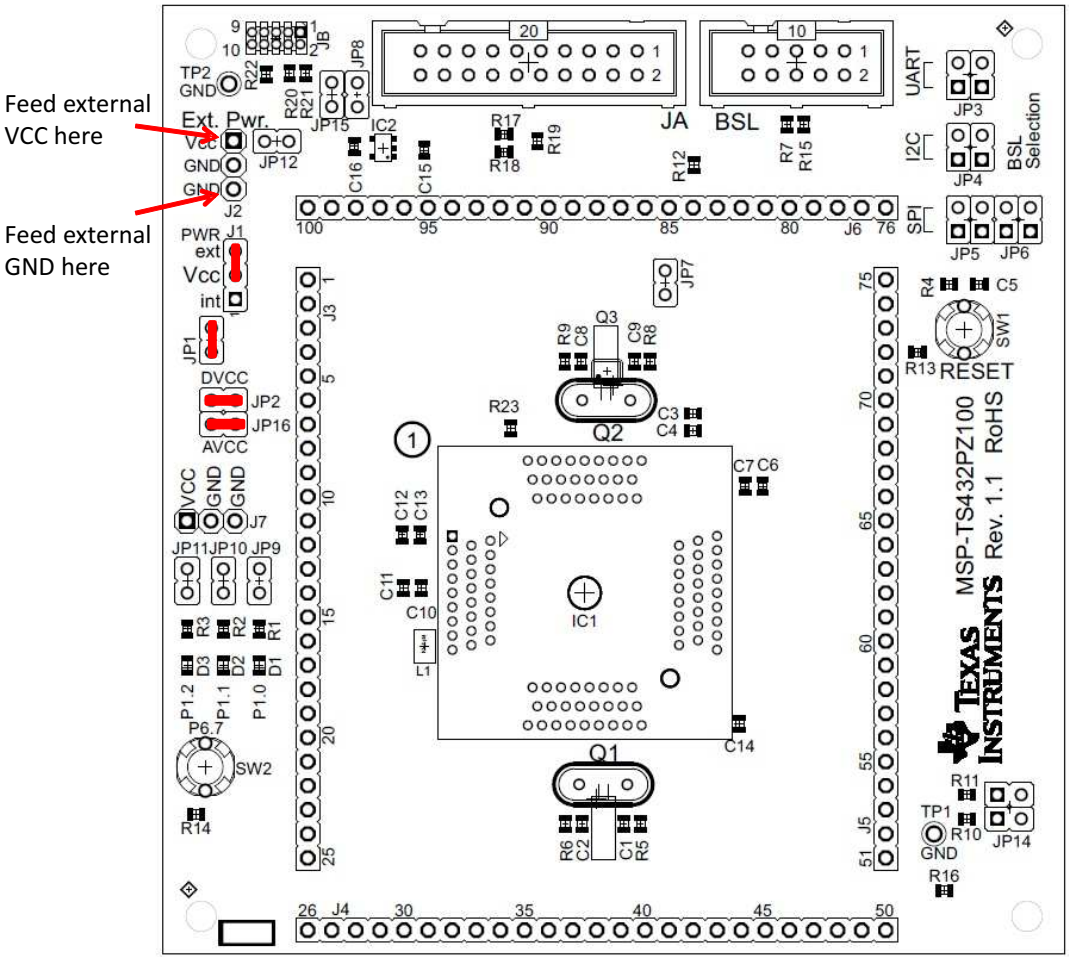

Figure 1-2. Board Configuration For External Target Power Supply

1.2.4.1.2 Board Configuration When Using ARM Cortex-M Debug Probes With Target Power Supply Capability

Some third-party ARM Cortex-M debuggers (for example, Segger J-Link and IAR i-Jet) can optionally supply a 5-V voltage to the target system through pin 19 of the debug connector. The LDO IC2 uses this voltage to generate the 3.3-V target supply voltage. To use the LDO, set the jumpers according to Table 1-5 before connecting the debug probe (see Figure 1-3).

Table 1-5. Jumper Settings to Use Onboard LDO

Jumper	State	Description
J1	Close 1-2	Connect Internal VCC (INTVCC) to board VCC
JP1	Closed	Current-measurement header (closed unless measuring I_{CC})
JP2	Closed	Current-measurement header (closed unless measuring I_{DVCC})
JP16	Closed	Current-measurement header (closed unless measuring I_{AVCC})

If the debug probe does not supply a logic level through pin 19 on the 20-pin connector, follow the jumper setting in Table 1-5.

Table 1-6. Jumpers for Debug Probe Does Not Supply Logic Level on Pin 19

Jumper	State	Description
JP8	Closed	Connect pin 19 to LDO input
JP12	Closed	Connect LDO output to the internal VCC (INTVCC)
JP15	Open	Do not short LDO input to output

If the debug probe does supply a logic level through pin 19 on the 20-pin connector, follow the jumper settings in Table 1-7.

Table 1-7. Jumpers for Debug Probe Does Supply Logic Level on Pin 19

Jumper	State	Description
JP8	Open	Disconnect pin 19 from LDO input
JP12	Open	Disconnect LDO output from internal VCC (INTVCC)
JP15	Closed	Bypasses the LDO by connecting pin 19 directly to onboard VCC (INTVCC)

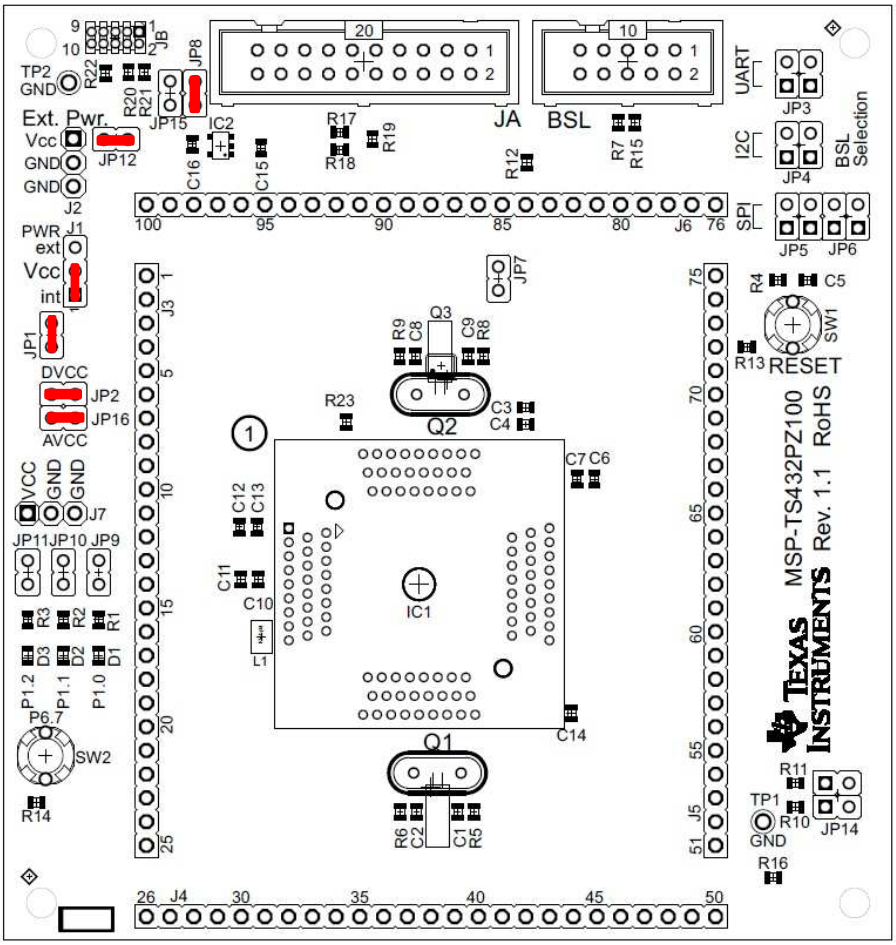

Figure 1-3. Board Configuration For Debugger-Supplied Target Power

1.2.4.2 MSP-TS432PZ100 Rev 1.3 and Newer

1.2.4.2.1 Board Configuration For External Target Power Supply

If the applications needs to operate in stand-alone mode (for example, to measure current consumption without debug overhead) or when using ARM Cortex-M debug probes that do not provide power for the target device (for example, TI XDS100, XDS200, Keil ULINK2, or Keil ULINK Pro), power must be supplied externally to the target socket board.

Always follow the voltage limits defined in the device data sheet. Set the jumpers according to Table 1-8 before connecting the debug probe and power supply (see Figure 1-4).

Table 1-8. Jumper Settings

Jumper	State	Description
J2		Connect external VCC to J2-1, and external GND to J2-2 or J2-3, per the labelling on the PCB silkscreen. NOTE: Some V1.3 boards have incorrect silkscreen labeling. Make sure to follow the figures shown in this user's guide.
JP1	Closed	Current-measurement header (closed unless measuring I_{CC})
JP2	Closed	Current-measurement header (closed unless measuring I_{DVCC})
JP3	Closed	Current-measurement header (closed unless measuring I_{AVCC})
JP6	Open	Disconnects input of LDO to allow VCC to be driven externally

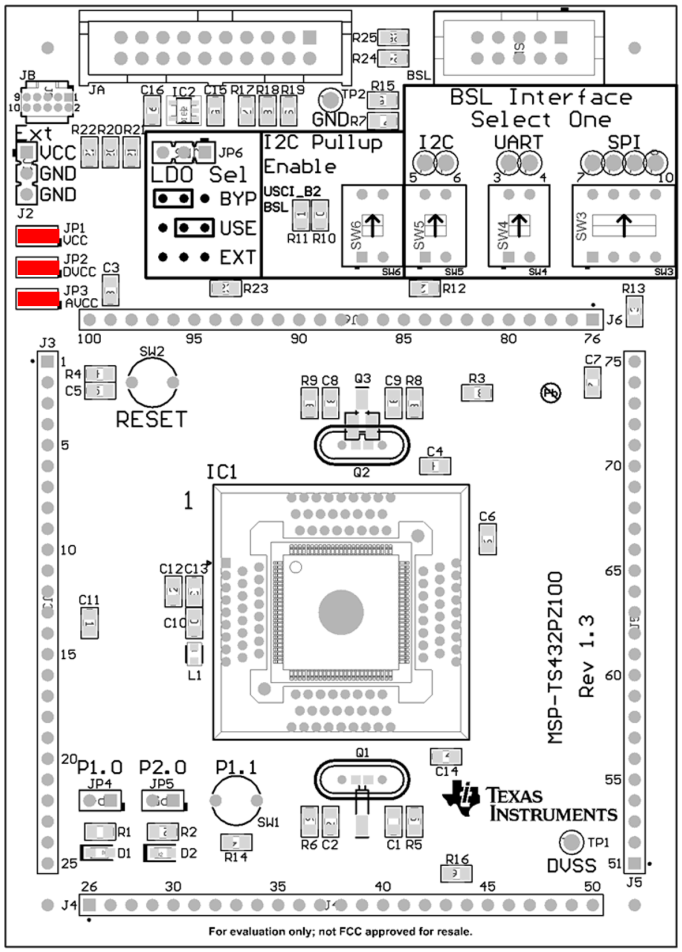

Figure 1-4. Board Configuration When Using Cortex-M Debug Probes With Target Power Supply Capability

Some third-party ARM Cortex-M debuggers (for example, Segger J-Link and IAR i-Jet) can optionally supply a 5-V voltage to the target system through pin 19 of the debug connector. The LDO IC2 uses this voltage to generate the 3.3-V target supply voltage. To use the LDO, set the jumpers according to Table 1-9 before connecting the debug probe (see Figure 1-5 or Figure 1-6):

Table 1-9. Jumper Settings to Use LDO

Jumper	State	Description
JP1	Closed	Current-measurement header (closed unless measuring I_{CC})
JP2	Closed	Current-measurement header (closed unless measuring I_{DVCC})
JP3	Closed	Current-measurement header (closed unless measuring I_{AVCC})

If the debug probe does not supply a logic level through pin 19 on the 20-pin connector, also close pins 1-2 on JP6 (see Figure 1-5):

Table 1-10. Jumper Settings for Debug Probe Does Not Supply Logic Level on Pin 19

Jumper	State	Description
JP6	Close 1-2	Connect board VCC to LDO output

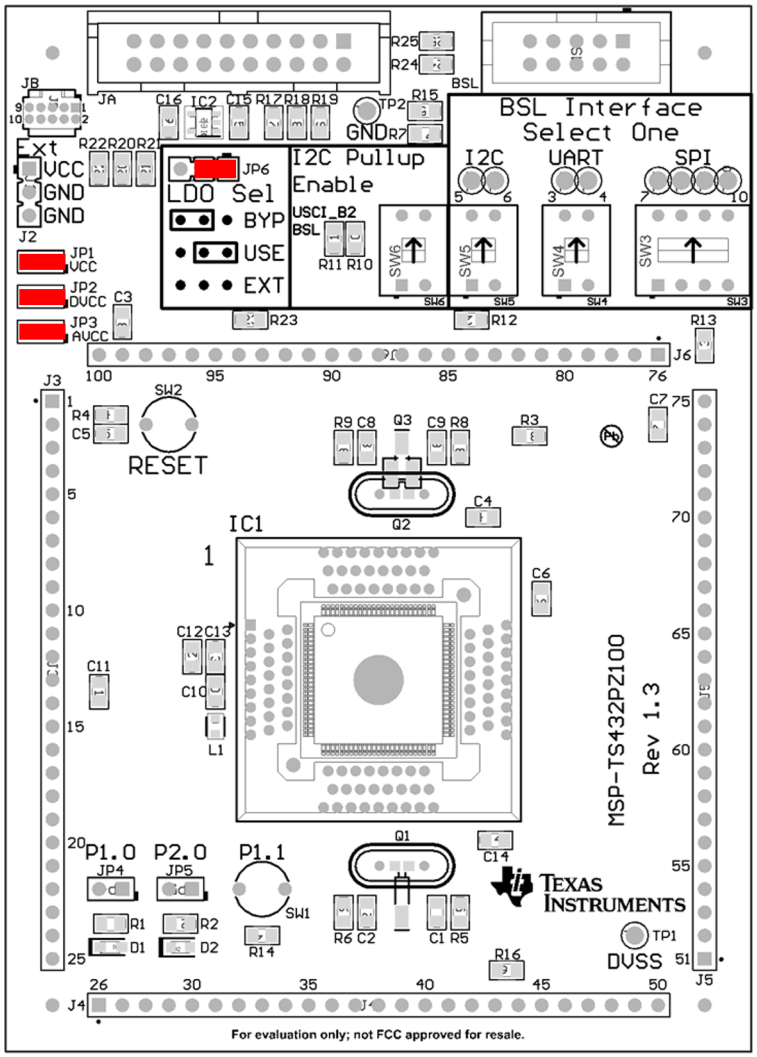

Figure 1-5. Board Configuration for Debug Probe Does Not Supply Logic Level on Pin 19

If the debug probe does supply a logic level through pin 19 on the 20-pin connector, also close pins 2-3 on JP6 (see Figure 1-6):

Table 1-11. Jumper Settings for Debug Probe Does Supply Logic Level on Pin 19

Jumper	State	Description
JP6	Close 2-3	Connect board VCC to pin 19, bypassing LDO

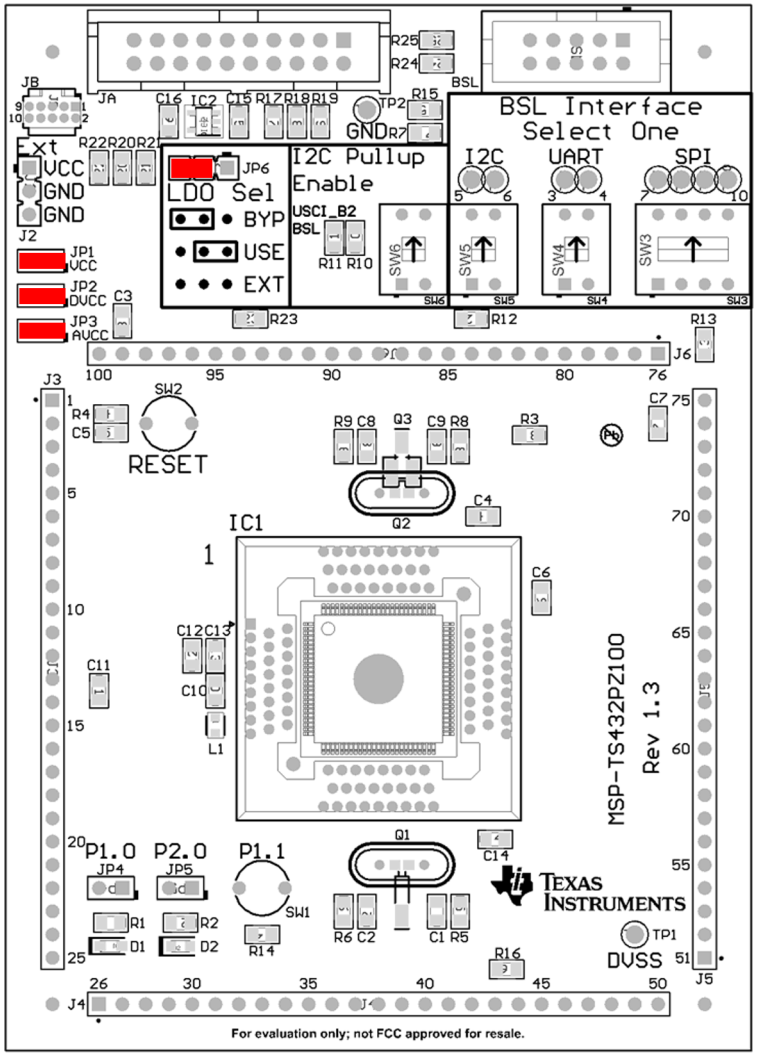

Figure 1-6. Board Configuration for Debug Probe Does Supply Logic Level on Pin 19

1.2.5 Hardware Design

1.2.5.1 MSP-TS432PZ100 Rev 1.1

Figure 1-7 shows the MSP-TS432PZ100 Rev 1.1 schematic.

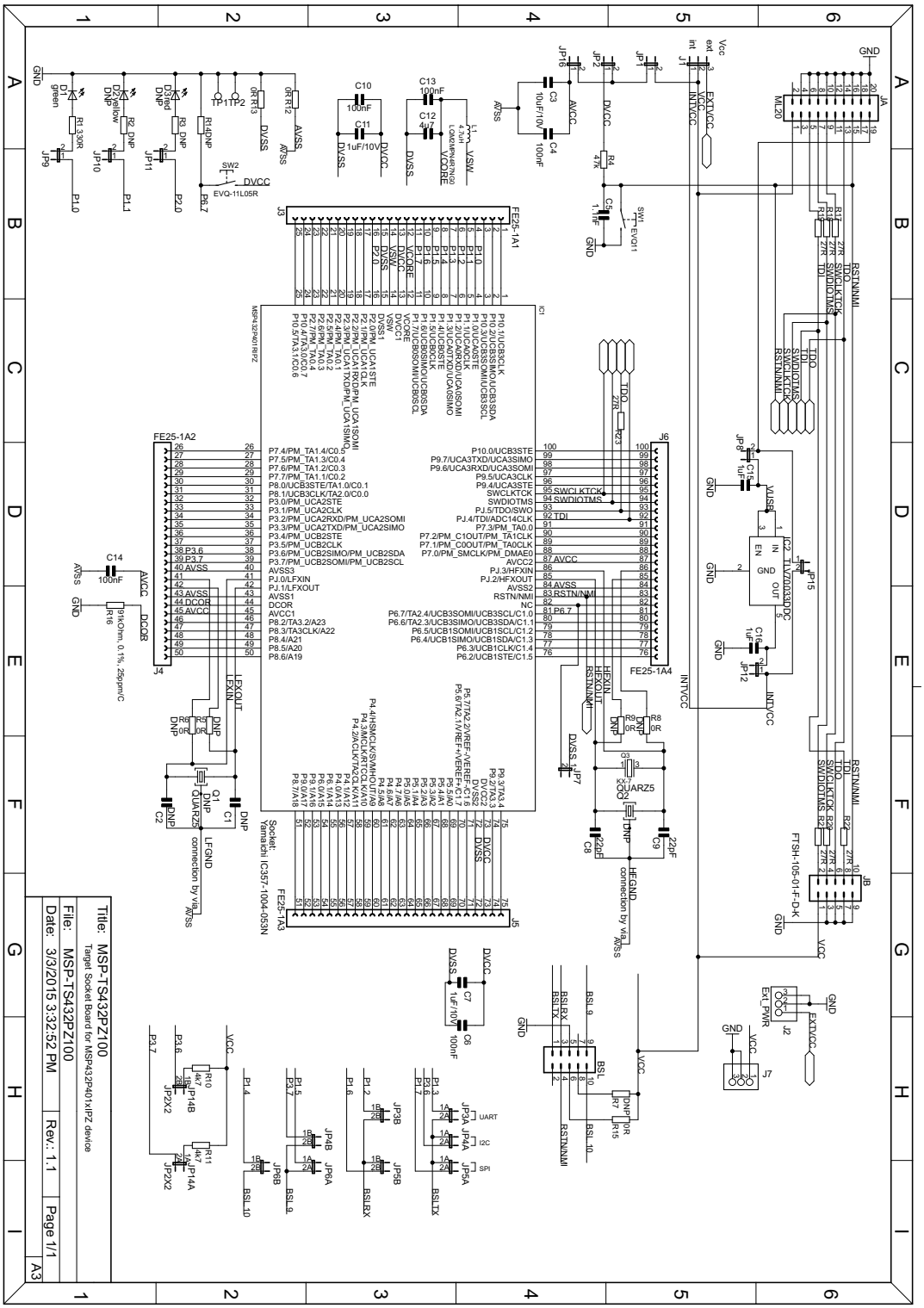

Figure 1-7. MSP-TS432PZ100 Rev 1.1 Target Socket Board, Schematic

Figure 1-8 shows the MSP-TS432PZ100 Rev 1.1 assembly drawing.

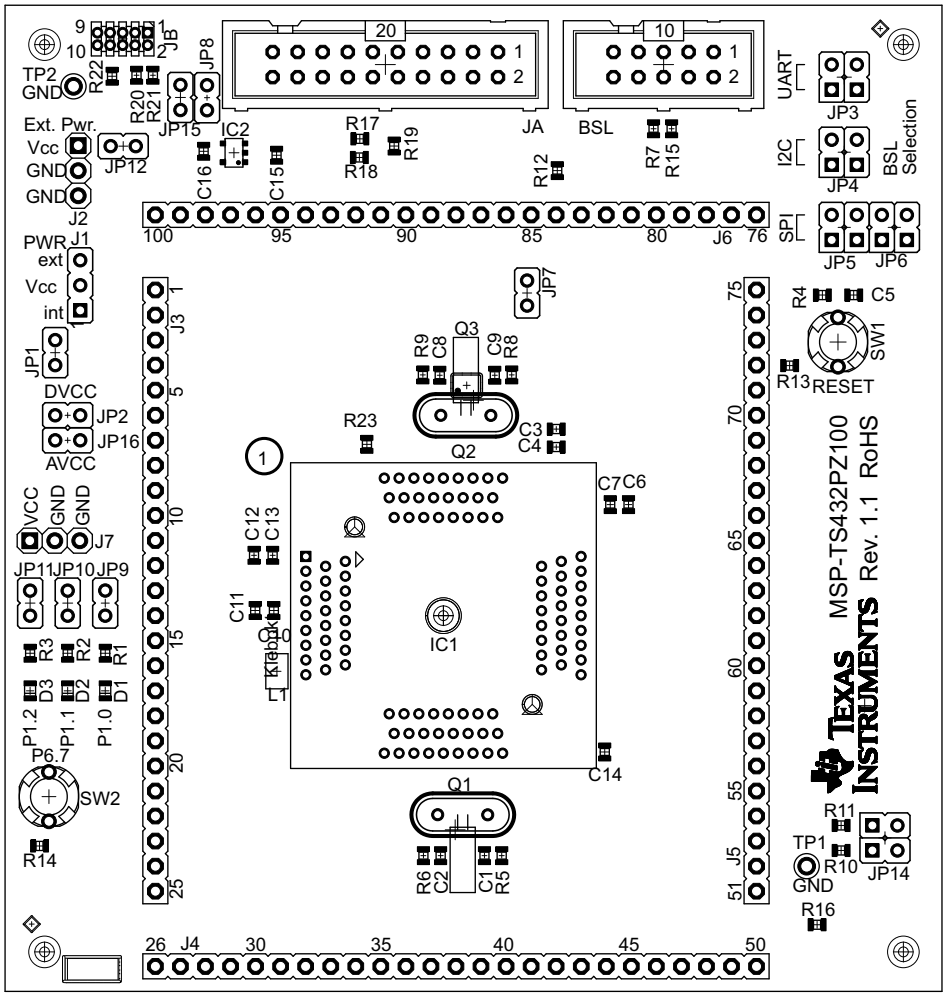

Figure 1-8. MSP-TS432PZ100 Rev 1.1 Target Socket Board, PCB

Table 1-12 lists the key components of the MSP-TS432PZ100 Rev 1.1 board.

Table 1-12. MSP-TS432PZ100 Rev 1.1 Important Board Components

Reference	Description	Comment
IC1	Socket for PZ100 package	
J1	Selector between internal and external power supply.	J1-J2 = Internal J2-J3 = External
J2	Header to feed external voltage to device. If used, connect a 2-wire cable to J1-1, J1-2 (Vcc,Gnd).	
J7	VCC header. Can be used to observe device VCC when supplied by the debug probe or to feed in external power.	
JA	20-pin Cortex-M debug connector	
JB	10-pin Cortex-M debug connector	
JP1	Header to measure current flowing into AVCC and DVCC power domains.	Jumper = Normal operation Open = Measure current from pin 2 to 1
JP2	Header to disconnect DVCC from VCC supply. Connect an ammeter to measure current flowing into the digital domain.	Jumper = Normal operation Open = Measure current from pin 2 to 1

Table 1-12. MSP-TS432PZ100 Rev 1.1 Important Board Components (continued)

Reference	Description	Comment
JP8	Header to disconnect 3.3-V LDO voltage input from pin 19 of header JA. Pin 19 of header JA is used by some third party ARM Cortex-M debuggers (for example, Segger J-Link and IAR i-Jet) to supply a 5-V voltage to the target system.	
JP12	Header to disconnect 3.3-V LDO voltage output from INTVCC. Remove this header if your debugger does not supply power to avoid current draw by the unpowered LDO.	
JP15	Header to bypass 3V3 LDO in case a debug probe supplies a logic level voltage through pin 19 of header JA.	
JP16	Header to disconnect AVCC from VCC supply. Connect an ammeter to measure current flowing into the analog domain.	Jumper = Normal operation Open = Measure current from pin 2 to 1

1.2.5.1.1 Bill Of Materials

Table 1-13 lists the bill of materials for the MSP-TS432PZ100 Rev 1.1.

Table 1-13. MSP-TS432PZ100 Rev 1.1 Bill Of Materials

Pos.	Ref Des. No.	No. Per Board	Description	Digi-Key Part No.	Comment
1	PCB	1	95.0 x 100.0 mm	"MSP-TS432PZ100" Rev. 1.1	2 layers, green solder mask
2	C1, C2	2	12pF, CSMD0805	1276-1120-1-ND	DNP
3	C8, C9	2	22pF, CSMD0805	490-3608-1-ND	
4	C3	1	10uF/10V, CSMD0805	490-1709-2-ND	
5	C4, C6, C10, C13, C14	5	100nF, CSMD0805	490-1666-1-ND	
6	C5	1	1.1nF, CSMD0805	490-1623-2-ND	
7	C7, C11, C15, C16	4	1uF/10V, CSMD0805	490-1702-2-ND	
8	C12	1	4u7, CSMD0805	445-1370-1-ND	
9	D1	1	green LED, HSMG-C170, DIODE0805	516-1434-1-ND	
10	D2	1	yellow LED, DIODE0805		DNP
11	D3	1	red LED, DIODE0805		DNP
12	R1	1	330R, 0805	541-330ATR-ND	
13	R2, R3,	2	330R, 0805	541-330ATR-ND	DNP
14	R5, R6, R7, R8, R9	5	0R, 0805	541-0.0ATR-ND	DNP
15	L1	1	4.7uH, 0806	490-4044-1-ND	Murata
16	R12, R13, R15	3	0R, 0805	541-0.0ATR-ND	
17	R4	1	47k, 0805	541-47KATR-ND	
18	R10, R11	2	4k7, 0805	541-4.7KATR-ND	
19	R14	1	47k, 0805	541-47KATR-ND	DNP
20	R16	1	91kOhm, 0.1%, 25ppm/°C , 0805	P91KDACT-ND	
21	R17, R18, R19, R20, R21, R22, R23	7	27R, 0805	541-27ATR-ND	
22	JP1, JP2, JP9, JP7, JP16	4	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
23	JP8, JP12, JP15	3	2-pin header, male, TH	SAM1035-02-ND	Not jumpered
24	JP10, JP11	2	2-pin header, male, TH	SAM1035-02-ND	DNP, keep pads free of solder
25	J1	1	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on pins 1-2

Table 1-13. MSP-TS432PZ100 Rev 1.1 Bill Of Materials (continued)

Pos.	Ref Des. No.	No. Per Board	Description	Digi-Key Part No.	Comment
26	JP3, JP4, JP5, JP6, JP14	5	2x2-pin header, male, TH	SAM1034-02-ND	
27	J2, J7	2	3-pin header, male, TH	SAM1035-03-ND	
28	J3, J4, J5, J6	4	25-pin header, TH	SAM1029-25-ND	DNP: Headers are enclosed in kit. Keep vias free of solder.
29	J3, J4, J5, J6	4	25-pin receptacle, TH	SAM1213-25-ND	DNP: Receptacles are enclosed in kit. Keep vias free of solder.
30	JA	1	20-pin connector, male, TH	HRP20H-ND	
31	JB	1	10-pin connector	FTSH-105-01-F-D-K	Samtec: FTSH-105-01-F-D-K
32	BSL	1	10-pin connector, male, TH	HRP10H-ND	
33	IC1	1	Socket: IC357-1004-053N, LQFP100		Manuf. Yamaichi
34	IC1	2	MSP432P401RIPZ		Not enclosed in kit
35	Q1	1	MS3V-TR1 (32,768kHz/ 20ppm/12,5pF)	depends on application	DNP, Micro Crystal, enclosed in kit, keep vias free of solder
36	Q2	1	DNP, Crystal	depends on application	DNP, keep vias free of solder
37	Q3	1	KX-7T 48MHz 12pF 30/30/50ppm		Geyer Electronic - 12.88710
38	SW2	1	EVQ-11L05R	P8079STB-ND	
39	SW1	1	EVQ-11L05R	P8079STB-ND	
40	IC2	1	TLV70033DDC, TSOT23-5	296-25276-2-ND	

1.2.5.2 MSP-TS432PZ100 Rev 1.3

Figure 1-9 shows the MSP-TS432PZ100 schematic.

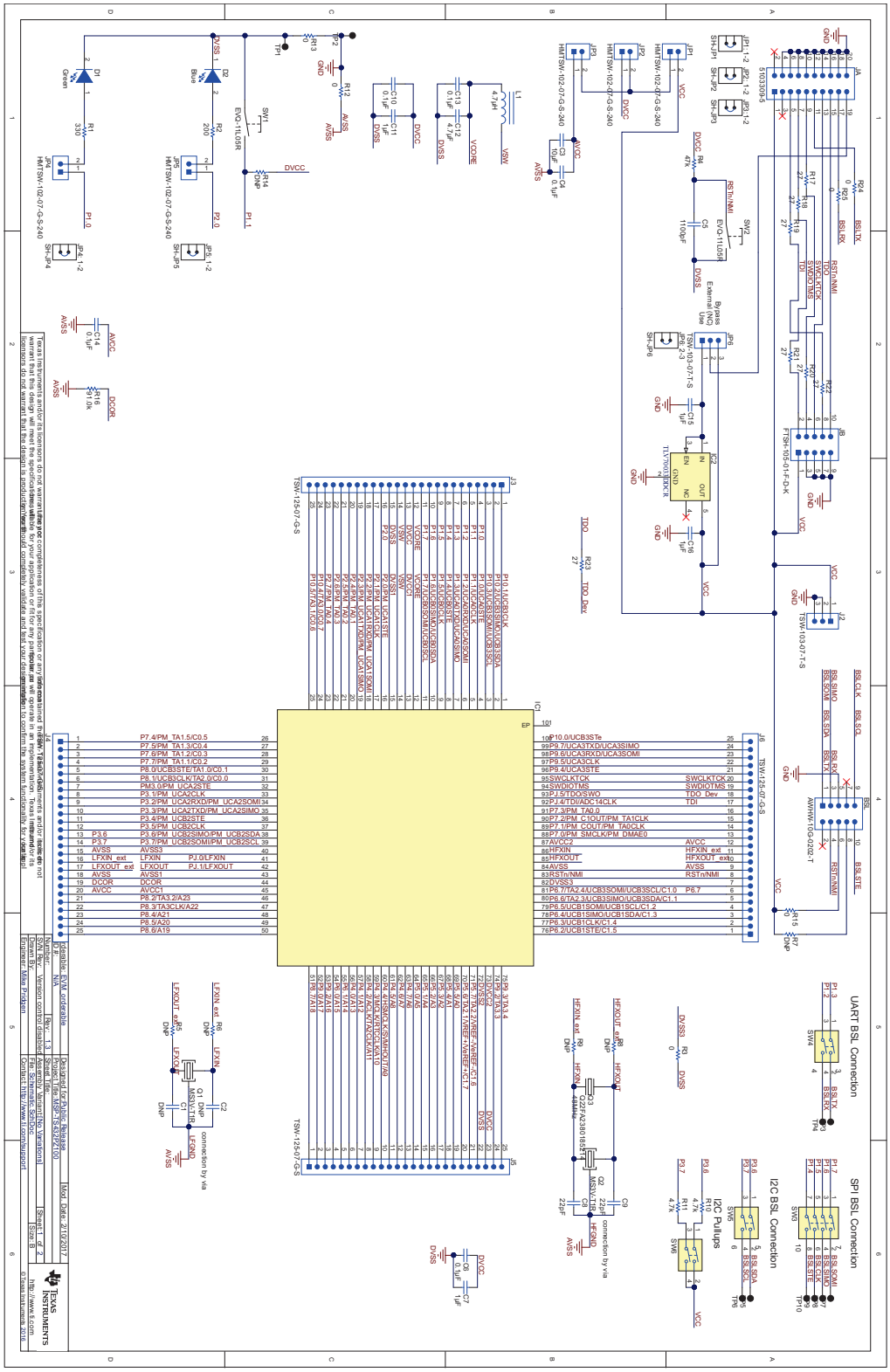

Figure 1-9. MSP-TS432PZ100 Rev 1.3 Target Socket Board, Schematic

Figure 1-10 shows the MSP-TS432PZ100 assembly drawing.

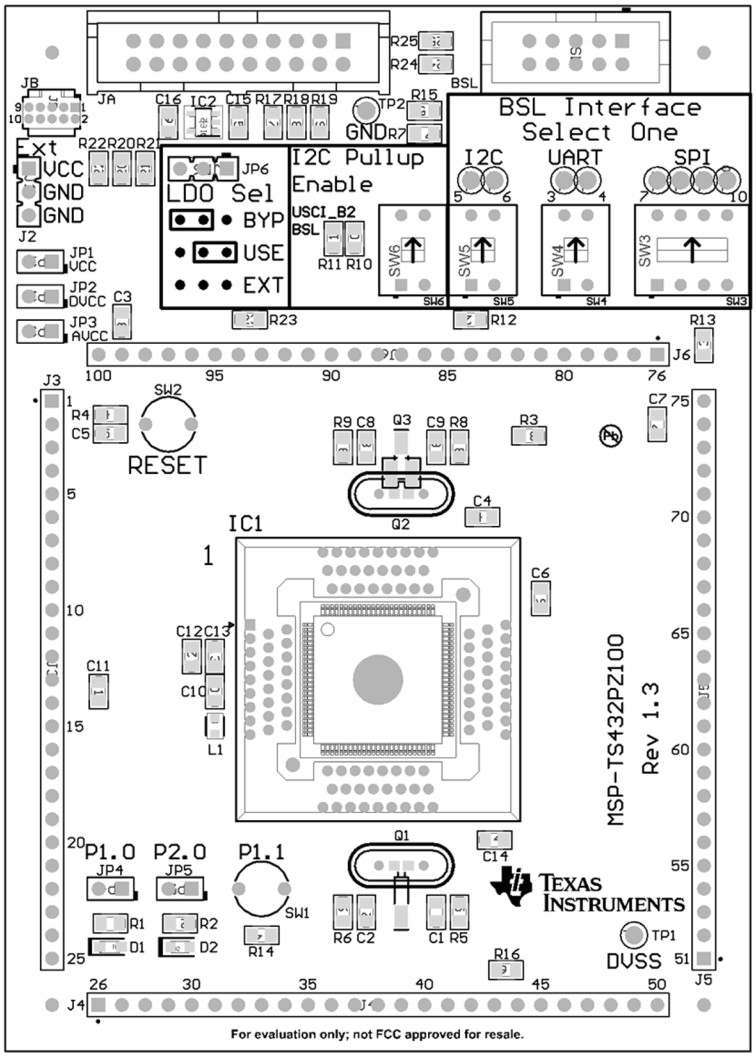

Figure 1-10. MSP-TS432PZ100 Rev 1.3 Target Socket Board, PCB

Table 1-14 lists the key components of the MSP-TS432PZ100 Rev 1.3 board.

Table 1-14. MSP-TS432PZ100 Rev 1.3 Important Board Components

Reference	Description	Comment
IC1	Socket for PZ100 package	
J2	Header to feed external voltage to device. If used, connect a 2-wire cable to J1-1, J1-2 (VCC, GND).	
JA	20-pin Cortex-M debug connector	
JB	10-pin Cortex-M debug connector	
JP1	Header to measure current flowing into AVCC and DVCC power domains.	Jumper = normal operation Open = measure current from pin 2 to 1
JP2	Header to disconnect DVCC from VCC supply. Connect an ammeter to measure current flowing into the digital domain.	Jumper = normal operation Open = measure current from pin 2 to 1
JP3	Header to disconnect AVCC from VCC supply. Connect an ammeter to measure current flowing into the analog domain.	Jumper = normal operation Open = measure current from pin 2 to 1
JP6	Header to select how VCC is supplied to the target.	No Jumper = externally sourced VCC Jumper pins 1-2 = VCC sourced from JTAG directly Jumper pins 2-3 = VCC sourced from LDO output
SW3	Switch to connect SPI BSL connections between target device and BSL header	Switch ON to enable, SW4 and SW5 should be OFF
SW4	Switch to connect UART BSL connections between target device and BSL header	Switch ON to enable, SW3 and SW5 should be OFF
SW5	Switch to connect I^2C BSL connections between target device and BSL header	Switch ON to enable, SW3 and SW4 should be OFF
SW6	Switch to connect 4.7kOhm pullup resistors to target device pins 38 and 39, which are also the I^2C BSL connections	Switch ON to connect pullup resistors Switch OFF to disconnect pullup resistors

1.2.5.2.1 Bill Of Materials

Table 1-15 lists the bill of materials for the MSP-TS432PZ100 Rev 1.3.

Table 1-15. MSP-TS432PZ100 Rev 1.3 Bill Of Materials

Item	Designator	Quantity	Description	Supplier Part Number	Note
1	!PCB1	1	PCB, 3.20" x 4.50"		2 layers, green solder mask
2	BSL	1	Header (shrouded), 100mil, 5x2, Gold, TH	A33159-ND	
3	C1, C2	0	CAP, CERM, 12 pF, 50 V, +/- 5%, C0G/NP0, 0805	311-1100-1-ND	DNP
4	C3	1	CAP, CERM, 10 µF, 10 V, +/- 10%, X5R, 0805	490-1709-1-ND	
5	C4, C6, C10, C13, C14	5	CAP, CERM, 0.1 µF, 50 V, +/- 10%, X7R, 0805	490-1666-1-ND	
6	C5	1	CAP, CERM, 1100 pF, 50 V, +/- 5%, C0G/NP0, 0805	490-1623-1-ND	
7	C7, C11, C15, C16	4	CAP, CERM, 1 µF, 10 V, +/- 10%, X5R, 0805	490-1702-1-ND	
8	C8, C9	2	CAP, CERM, 22 pF, 50 V, +/- 5%, C0G/NP0, 0805	490-3608-1-ND	
9	C12	1	CAP, CERM, 4.7 µF, 10 V, +80/-20%, Y5V, 0805	311-1371-2-ND	
10	D1	1	LED, Green, SMD	754-1939-1-ND	
11	D2	1	LED, Blue, SMD	732-4982-1-ND	
12	H1, H2, H3, H4	4	125mil Mounting Hole		
13	IC1	1	MSP432P401RIPZ Socket	945-IC357-1004-053N	
14	IC2	1	Single Output LDO, 200 mA, Fixed 3.3 V Output, 2 to 5.5 V Input, with Low IQ, 5-pin SOT (DDC), -40 to 125 degC, Green (RoHS & no Sb/Br)	296-27937-2-ND	
15	J2, JP6	2	Header, 2.54 mm, 3x1, Tin, TH	SAM1035-03-ND	
16	J3, J4, J5, J6	4	Header, 100mil, 25x1, Gold, TH	SAM1029-25-ND	
17	JA	1	Header (shrouded), 100mil, 10x2, Gold, TH	A33166-ND	
18	JB	1	Header, 1.27 mm, 5x2, Gold, TH	FTSH-105-01-F-D-K-ND	
19	JP1, JP2, JP3, JP4, JP5	5	Header, 100mil, 2x1, Gold, TH	HMTSW-102-07-G-S-240-ND	
20	L1	1	Inductor, Wirewound, Ferrite, 4.7 µH, 0.3 A, 0.8 ohm, SMD	490-4044-1-ND	
21	Q1, Q2	0	32.768KHz +/-20ppm 12.5pF	94M8466	DNP
22	Q3	1	SMD Crystal	FA-238 48.0000MB-W0-ND	
23	R1	1	RES, 330, 5%, 0.125 W, 0805	541-330ACT-ND	
24	R2	1	RES, 200, 5%, 0.125 W, 0805	541-200ACT-ND	
25	R3, R12, R13, R15, R24, R25	6	RES, 0, 5%, 0.125 W, 0805	541-0.0ACT-ND	
26	R4	1	RES, 47 k, 5%, 0.125 W, 0805	541-47KACT-ND	
27	R5, R6, R7, R8, R9	0	RES, 0, 5%, 0.125 W, 0805	541-0.0ACT-ND	DNP
28	R10, R11	2	RES, 4.7 k, 5%, 0.125 W, 0805	541-4.7KACT-ND	
29	R14	0	RES, 47 k, 5%, 0.125 W, 0805	541-47KACT-ND	DNP
30	R16	1	RES, 91.0 k, 0.1%, 0.125 W, AEC-Q200 Grade 0, 0805	P91KDACT-ND	

Table 1-15. MSP-TS432PZ100 Rev 1.3 Bill Of Materials (continued)

Item	Designator	Quantity	Description	Supplier Part Number	Note
31	R17, R18, R19, R20, R21, R22, R23	7	RES, 27, 5%, 0.125 W, 0805	541-27ACT-ND	
32	SH-JP1, SH-JP2, SH-JP3, SH-JP4, SH-JP5, SH-JP6	6	Shunt, 100mil, Gold plated, Black	3M9580-ND	JP1: 1-2, JP2: 1-2, JP3:1-2, JP4: 1-2, JP5: 1-2, JP6: 2-3
33	SW1, SW2	2	Switch Tactile SPST-NO 0.02A 15V	P8079STB-ND	
34	SW3	1	Quad Pole Single Throw TH DIP Switch	GH7198-ND	
35	SW4, SW5, SW6	3	Double Pole Single Throw TH DIP Switch	GH7727-ND	
36	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10	0	Test Point, Miniature, Black, TH	36-5001-ND	DNP

1.2.5.3 MSP-TS432PZ100 Revision History

Revision	Date	Comments
Rev 1.1	March 2015	First released revision
Rev 1.3	September 2016	Changed LDO configuration jumpers. Replaced BSL selection jumpers with switches.

1.3 MSP-FET

See the *MSP Debuggers User's Guide*.

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from July 20, 2017 to June 8, 2018 **Page**

- Added note to description of jumper J2 in Table 1-8, *Jumper Settings* 12
- Changed Figure 1-4, *Board Configuration When Using Cortex-M Debug Probes With Target Power Supply Capability* . 12
- Changed "close pins 2-3 on JP6" to "close pins 1-2 on JP6" in the paragraph before Table 1-10, *Jumper Settings for Debug Probe Does Not Supply Logic Level on Pin 19* 13
- Changed the State column from "Close 2-3" to "Close 1-2" in Table 1-10, *Jumper Settings for Debug Probe Does Not Supply Logic Level on Pin 19* 13
- Changed Figure 1-5, *Board Configuration for Debug Probe Does Not Supply Logic Level on Pin 19* 13
- Changed "close pins 1-2 on JP6" to "close pins 2-3 on JP6" in the paragraph before Table 1-11, *Jumper Settings for Debug Probe Does Supply Logic Level on Pin 19* 14
- Changed the State column from "Close 1-2" to "Close 2-3" in Table 1-11, *Jumper Settings for Debug Probe Does Supply Logic Level on Pin 19* 14
- Changed Figure 1-6, *Board Configuration for Debug Probe Does Supply Logic Level on Pin 19* 14
- Changed Figure 1-10, *MSP-TS432PZ100 Rev 1.3 Target Socket Board, PCB* 20

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