

MSP432 Hardware Tools

User's Guide



Literature Number: SLAU571
March 2015

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Read This First

About This Manual

This manual describes the hardware tools that support the Texas Instruments 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](#).

This manual applies to the following hardware tool:

- Stand-alone target socket board named MSP-TS432PZ100

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 (www.ti.com/msp432) 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) can be found at www.ti.com/tool/ccstudio. 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 Texas Instruments E2E™ Community support forums at e2e.ti.com 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 at www.ti.com/support. The Texas Instruments E2E Community support forums for the MSP432 at e2e.ti.com provide open interaction with peer engineers, TI engineers, and other experts. Additional device-specific information can be found on the MSP432 web site at www.ti.com/msp432.

Hardware

This chapter contains information relating to the hardware tools and includes schematics, PCB pictorials, and bills of materials. All other tools are described in separate product specific user's guides. Information about the Texas Instruments 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.

Table 1-1. Device and Hardware Tool Compatibility List

Part Number	Socket Type	Supported Devices
MSP-TS432PZ100	100-pin QFP (PZ100)	MSP432P401RIPZ

Topic	Page
1.1 MSP-TS432PZ100 Rev1.0	7
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1.1 MSP-TS432PZ100 Rev1.0

The MSP-TS432PZ100 target socket board can be used to develop applications with the MSP432P401RPZ devices in 100-pin QFP package. 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.

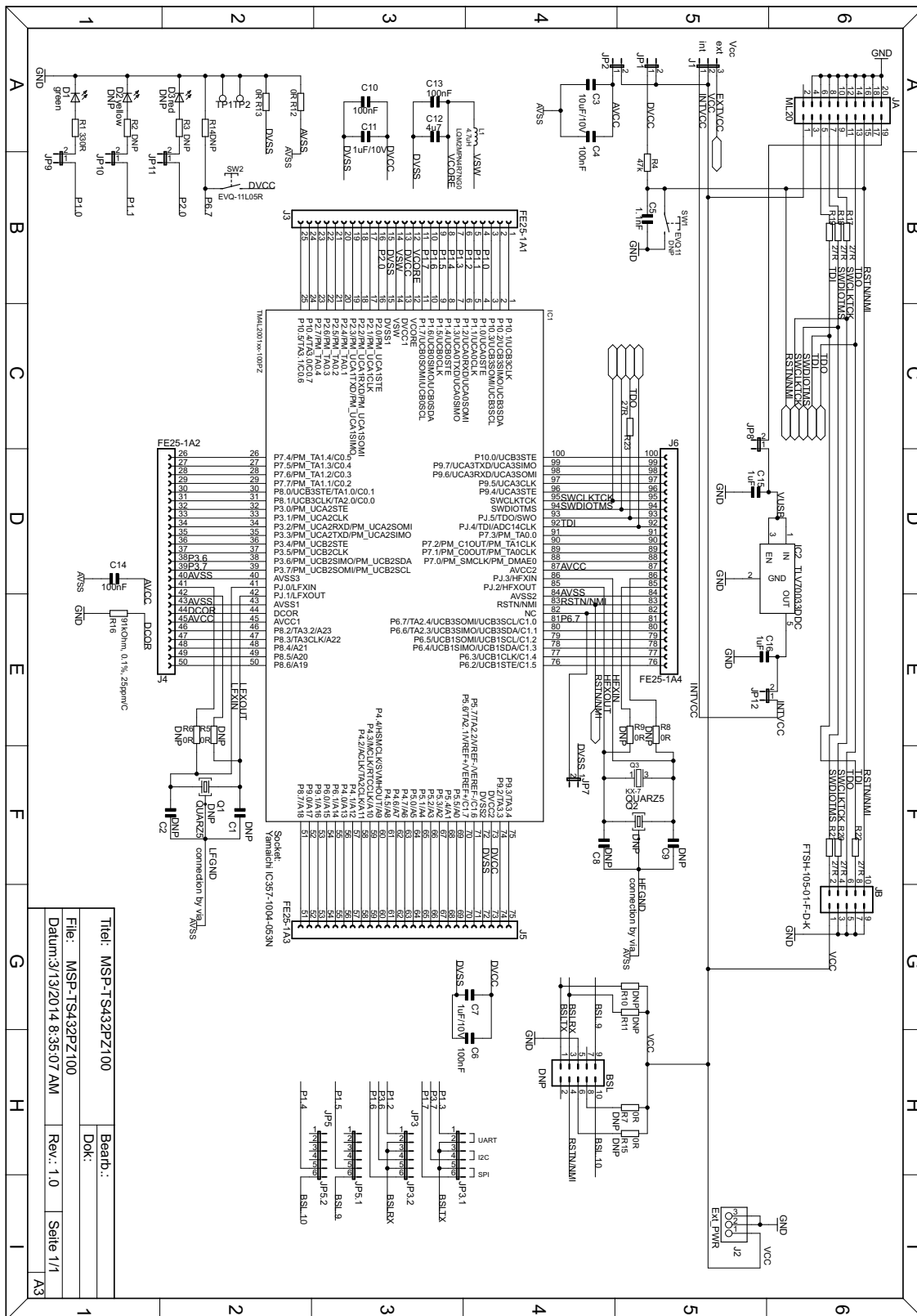


Figure 1-1. MSP-TS432PZ100 Target Socket Board, Schematic

Title: MSP-TS432PZ100		Beard: ..	
File: MSP-TS432PZ100		Dok: ..	
Datum: 3/13/2014 8:35:07 AM		Rev.: 1.0	
Sheet 1/1		A3	

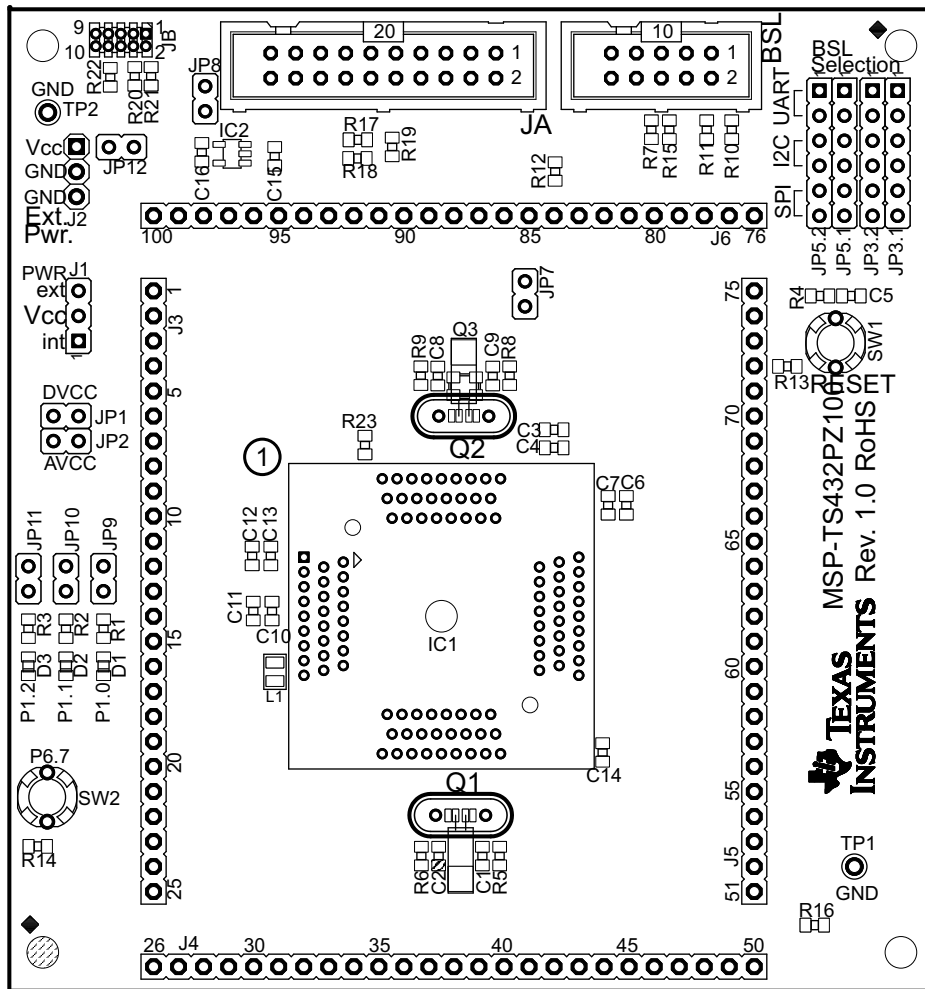


Figure 1-2. MSP-TS432PZ100 Target Socket Board, PCB

Table 1-2. Important Board Components

Reference	Description
IC1	Socket for PZ100 package
JA	20-pin Cortex-M debug connector
JB	10-pin Cortex-M debug connector
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.
J1	Selector between internal and external power supply. Keep J1-1 and J1-2 always connected.
JP1	Header to disconnect DVCC from VCC supply. Connect an ampere meter to measure current flowing into the digital domain.
JP2	Header to disconnect AVCC from VCC supply. Connect an ampere meter to measure current flowing into the analog domain.
J2	VCC header. Can be used to observe device VCC when supplied by the debug probe or to feed in external power.

1.1.1 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. Also make sure that the following jumpers have been set as shown here before connecting the debug probe and power supply:

- JP8: Open
- JP12: Open
- J1: Close 1-2
- JP1: Closed
- JP2: Closed
- J2: Connect external VCC to pin 1, and external GND to pins 2 or 3

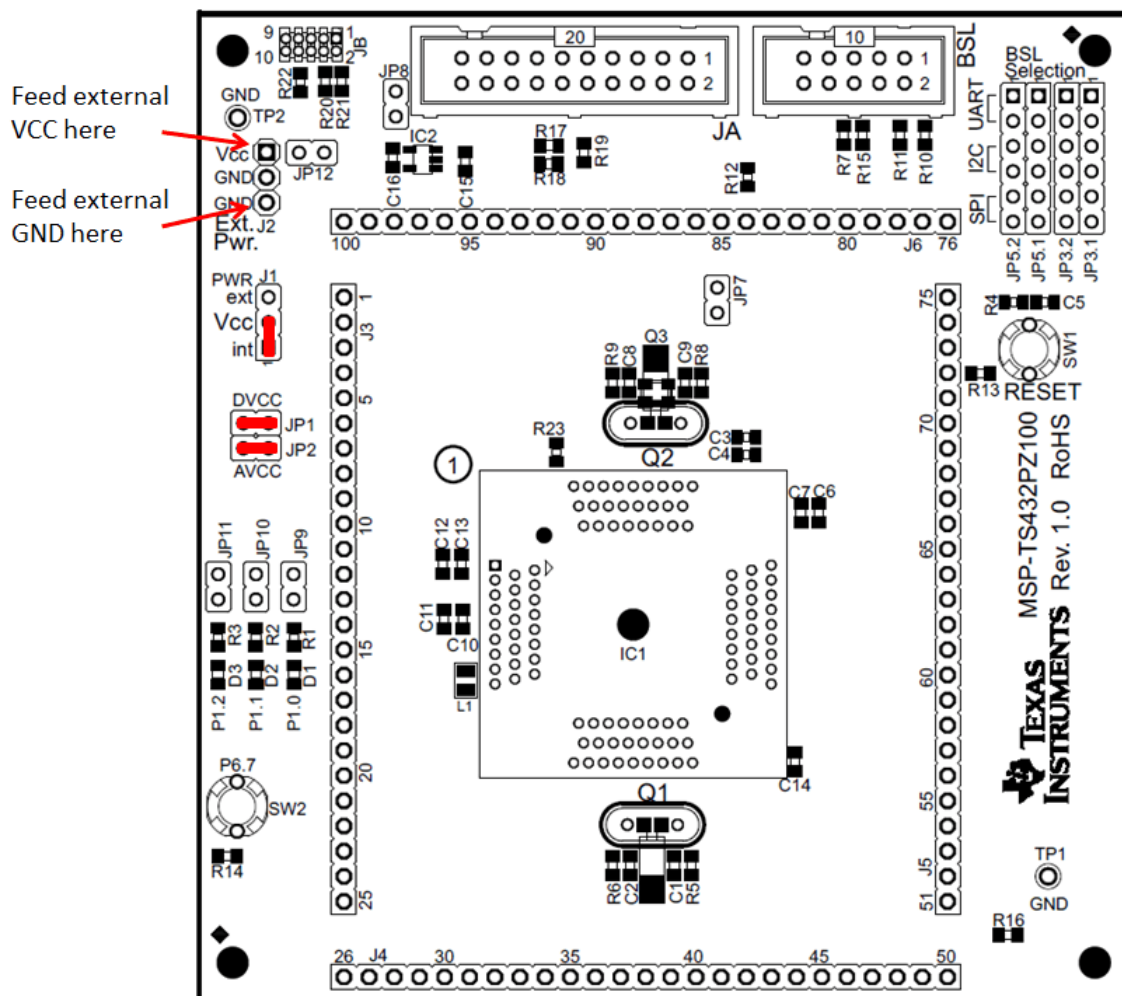


Figure 1-3. Board Configuration For External Target Power Supply

1.1.2 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, make sure the following jumpers are set as shown here before connecting the debug probe:

- JP8: Closed
- JP12: Closed
- J1: Close 1-2
- JP1: Closed
- JP2: Closed

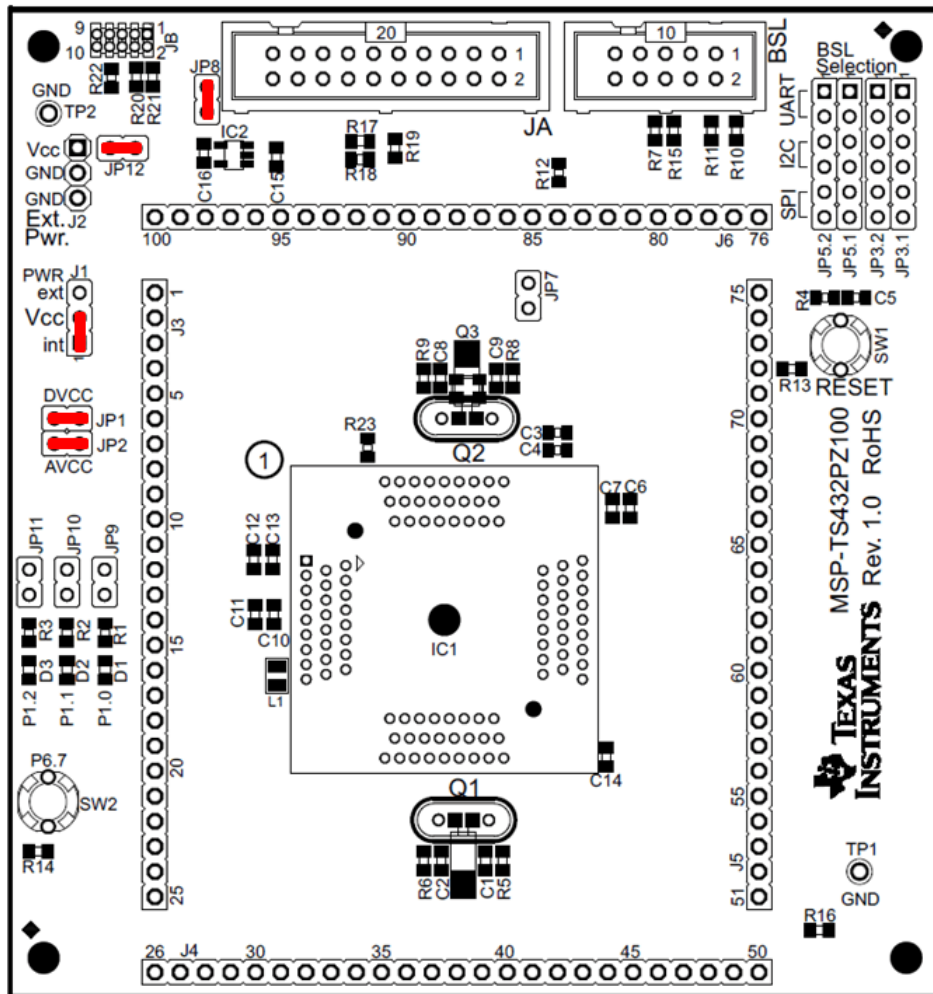


Figure 1-4. Board Configuration For Debugger-Supplied Target Power

1.1.3 Bill Of Materials

Table 1-3. MSP-TS432PZ100 Bill Of Materials

Pos.	Ref Des. No.	No. Per Board	Description	Digi-Key Part No.	Comment
1	C1, C2, C8, C9	4	DNP, CSMD0805		DNP
2	C3	1	10uF/10V, CSMD0805	490-1709-2-ND	
3	C4, C6, C10,C13,C14	5	100nF, CSMD0805	490-1666-1-ND	
4	C5	1	1.1nF, CSMD0805	490-1623-2-ND	
5	C7,C11,C15,C16	4	1uF/10V, CSMD0805	490-1702-2-ND	
6	C12	1	4u7, CSMD0805	445-1370-1-ND	
7	D1	1	green LED, DIODE0805	P516TR-ND	
8	D2	1	yellow LED, DIODE0805		DNP
9	D3	1	red LED, DIODE0805		DNP
10	R1	1	330R, 0805	541-330ATR-ND	
11	R2, R3,	2	330R, 0805	541-330ATR-ND	DNP
12	R5, R6, R7, R8, R9, R15	8	0R, 0805	541-0.0ATR-ND	DNP
13	R12, R13	2	0R, 0805	541-0.0ATR-ND	
14	R4	1	47k, 0805	541-47KATR-ND	
15	R10, R11	2	0R, 0805	541-0.0ATR-ND	DNP
16	R14	1	47k, 0805	541-47KATR-ND	DNP
17	R16	1	91kOhm, 0.1%, 25ppm/°C , 0805	P91KDACT-ND	
18	R17, R18, R19, R20, R21, R22, R23	7	27R, 0805	541-27ATR-ND	
19	JP1, JP2, JP9, JP7, JP8, JP12	6	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
20	JP10, JP11	2	2-pin header, male, TH	SAM1035-02-ND	DNP
21	J1	1	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 1-2
22	JP3, JP5	2	12-pin header, male, TH	SAM1034-06-ND	
23	J2	1	3-pin header, male, TH	SAM1035-03-ND	
24	J3, J4, J5, J6	4	25-pin male or female header, TH	SAM1029-25-ND or SAM1213-25-ND	DNP, male and female headers enclosed with kit
25	JA	1	20-pin connector, male, TH	HRP20H-ND	
26	JB	1	10-pin connector		Samtec: FTSH-105-01-F-D-K
27	BSL	1	10-pin connector, male, TH	HRP10H-ND	DNP
28	IC1	1	Socket: IC357-1004-053N, LQFP100		Manuf. Yamaichi
29	IC1	1	MSP432P401RPZ		DNP, enclosed with kit
30	L1	1	4.7uH, 0806	490-4044-1-ND	Murata
31	Q1	1	MS3V-TR1 (32,768kHz/ 20ppm/12,5pF)		DNP, enclosed with kit
32	Q2	1	DNP, Crystal		DNP
33	Q3	1	KX-7T 48MHz 12pF 30/30/50ppm		Geyer Electronic - 12.88710
34	SW2	1	EVQ-11L05R	P8079STB-ND	
35	SW1	1	EVQ-11L05R	P8079STB-ND	
36	U1	1	TLV70033DDC, TSOT23-5	296-25276-2-ND	

1.1.4 Kit Contents

- One READ ME FIRST document
- One MSP-TS432PZ100 target socket board
- Two MSP432P401RPZ device samples
- 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 MSP-TS432PZ100 Rev1.1

The MSP-TS432PZ100 target socket board can be used to develop applications with the MSP432P401RPZ devices in 100-pin QFP package. 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.

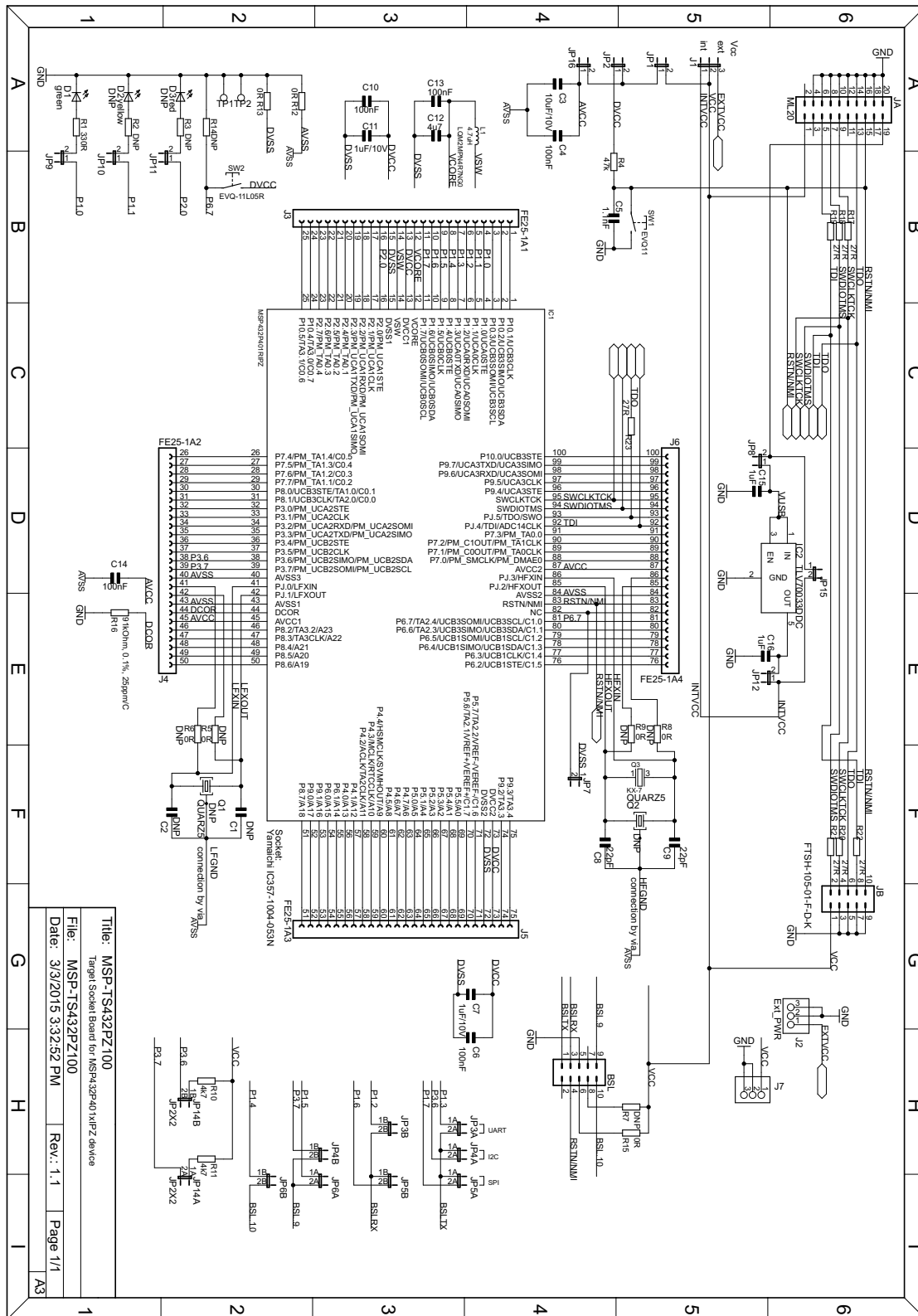
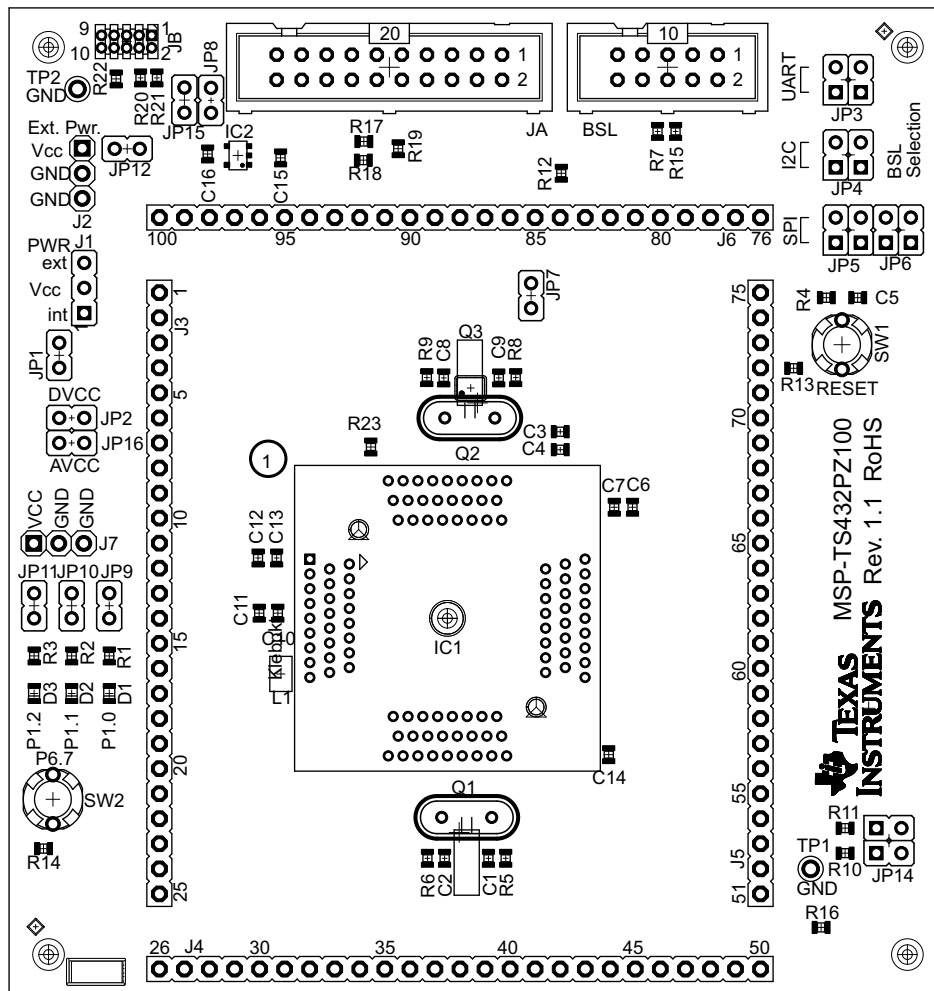


Figure 1-5. MSP-TS432PZ100 Target Socket Board, Schematic


Figure 1-6. MSP-TS432PZ100 Target Socket Board, PCB
Table 1-4. Important Board Components

Reference	Description
IC1	Socket for PZ100 package
JA	20-pin Cortex-M debug connector
JB	10-pin Cortex-M debug connector
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.
J1	Selector between internal and external power supply.
JP1	Header to measure current flowing into AVCC and DVCC power domains.
JP2	Header to disconnect DVCC from VCC supply. Connect an ampere meter to measure current flowing into the digital domain.
J2	Header to feed external voltage to device. If used, connect J1-2 and J1-3.
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 ampere meter to measure current flowing into the analog domain.
J7	VCC header. Can be used to observe device VCC when supplied by the debug probe or to feed in external power.

1.2.1 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. Also make sure that the following jumpers have been set as shown here before connecting the debug probe and power supply:

- JP8: Open
- JP12: Open
- J1: Close 2-3
- JP1: Closed
- JP2: Closed
- J16: Closed
- J2: Connect external VCC to pin 1, and external GND to pins 2 or 3

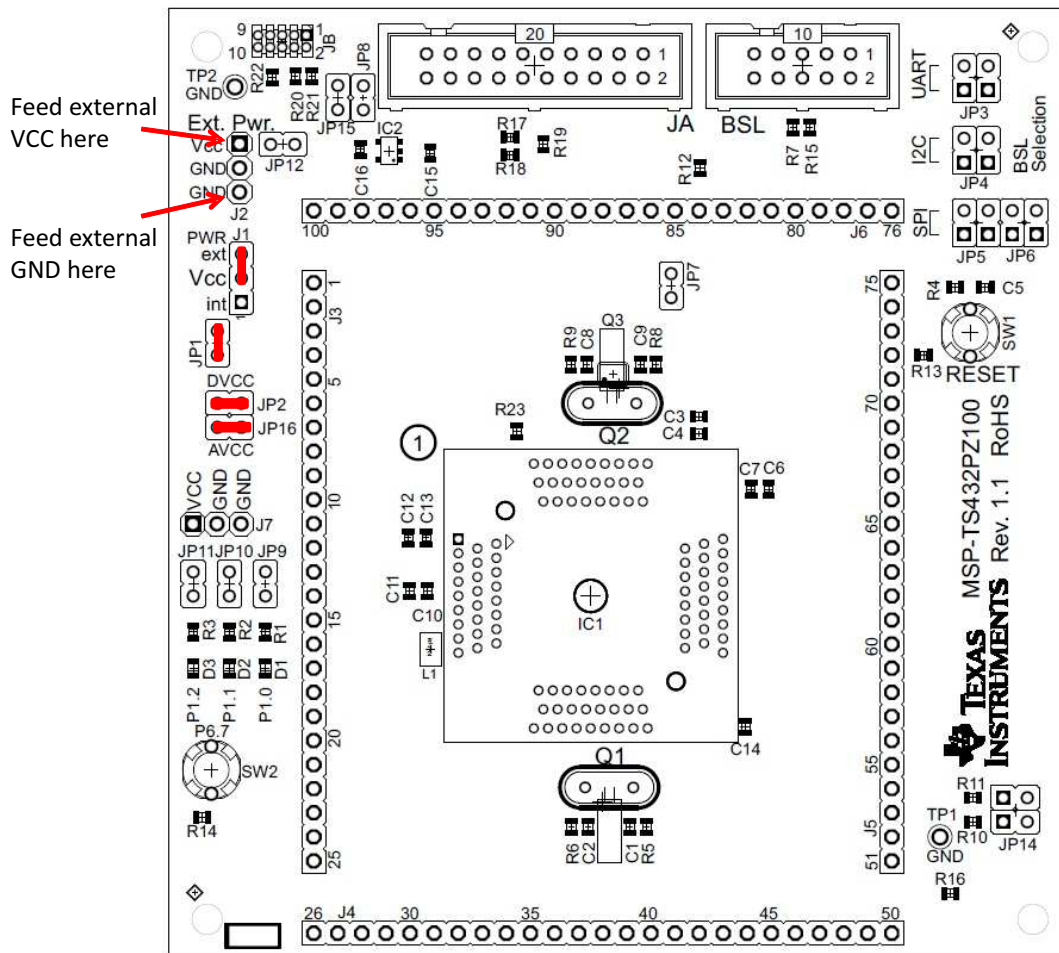


Figure 1-7. Board Configuration For External Target Power Supply

1.2.2 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, make sure the following jumpers are set as shown here before connecting the debug probe:

- JP8: Closed
- JP12: Closed
- J1: Close 1-2
- JP1: Closed
- JP2: Closed
- JP16: Closed

If the debug probe supplies a logic level voltage through pin 19, the LDO can be entirely bypassed using JP15. Always follow the voltage limits defined in the device data sheet.

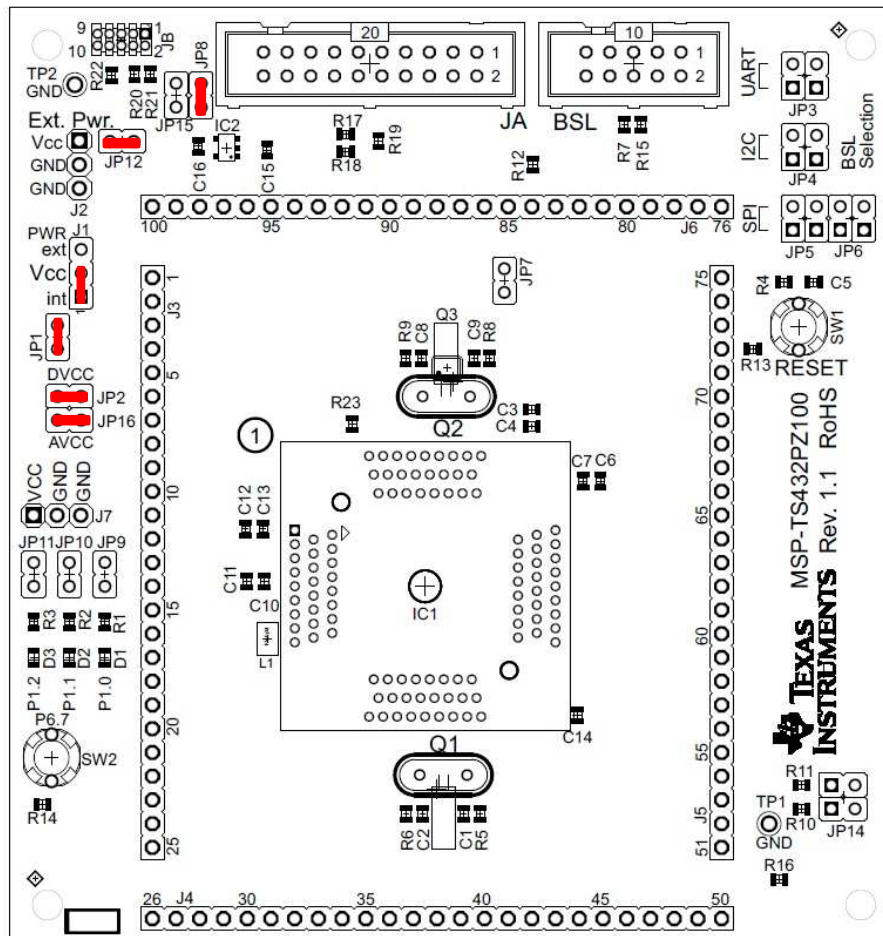


Figure 1-8. Board Configuration For Debugger-Supplied Target Power

1.2.3 Bill Of Materials

Table 1-5. MSP-TS432PZ100 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
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

Table 1-5. MSP-TS432PZ100 Bill Of Materials (continued)

Pos.	Ref Des. No.	No. Per Board	Description	Digi-Key Part No.	Comment
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	

1.2.4 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

1.3 MSP-TS432PZ100 Revision History

Revision	Date	Comments
Rev1.0	May 2014	Internal revision
Rev1.1	March 2015	First released revision

IMPORTANT NOTICE

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