

MSP430 Hardware Tools

User's Guide



Literature Number: SLAU278F
May 2009—Revised December 2010

Preface	9
1 Get Started Now!	13
1.1 Flash Emulation Tool (FET) Overview	14
1.2 Kit Contents, MSP-FET430PIF	14
1.3 Kit Contents, eZ430-F2013	14
1.4 Kit Contents, eZ430-T2012	14
1.5 Kit Contents, eZ430-RF2500	15
1.6 Kit Contents, eZ430-RF2500T	15
1.7 Kit Contents, eZ430-RF2500-SEH	15
1.8 Kit Contents, eZ430-Chronos-xxx	15
1.9 Kit Contents, MSP-FET430UIF	15
1.10 Kit Contents, MSP-FET430xx	16
1.11 Kit Contents, FET430Fx137RF900	17
1.12 Kit Contents, MSP-TS430xx	17
1.13 Kit Contents, EM430Fx137RF900	19
1.14 Hardware Installation, MSP-FET430PIF	19
1.15 Hardware Installation, MSP-FET430UIF	20
1.16 Hardware Installation, eZ430-F2013, eZ430-RF2500, eZ430-Chronos	20
1.17 Hardware Installation, MSP-FET430Uxx, MSP-TS430xxx, FET430Fx137RF900, EM430Fx137RF900	20
1.18 Important MSP430 Documents on the CD-ROM and Web	21
2 Design Considerations for In-Circuit Programming	23
2.1 Signal Connections for In-System Programming and Debugging	24
2.2 External Power	27
2.3 Bootstrap Loader (BSL)	27
A Frequently Asked Questions and Known Issues	29
A.1 Hardware FAQs	30
A.2 Known Issues	32
B Hardware	33
B.1 MSP-TS430PW14	34
B.2 MSP-TS430L092	37
B.3 MSP-TS430L092 Active Cable	40
B.4 MSP-TS430PW24	43
B.5 MSP-TS430DW28	46
B.6 MSP-TS430PW28	49
B.7 MSP-TS430PW28A	52
B.8 MSP-TS430DA38	55
B.9 MSP-TS430QFN23x0	58
B.10 MSP-TS430RSB40	61
B.11 MSP-TS430RHA40A	64
B.12 MSP-TS430DL48	67
B.13 MSP-TS430RGZ48B	70
B.14 MSP-TS430PM64	73
B.15 MSP-TS430PM64A	76
B.16 MSP-TS430RGC64B	79

B.17	MSP-TS430RGC64USB	82
B.18	MSP-TS430PN80	86
B.19	MSP-TS430PN80A	89
B.20	MSP-TS430PN80USB	91
B.21	MSP-TS430PZ100	96
B.22	MSP-TS430PZ100A	99
B.23	MSP-TS430PZ100B	102
B.24	MSP-TS430PZ5x100	105
B.25	MSP-TS430PZ100USB	107
B.26	EM430F5137RF900	112
B.27	EM430F6137RF900	116
B.28	MSP-FET430PIF	120
B.29	MSP-FET430UIF	122
B.29.1	MSP-FET430UIF Revision History	127
C	Hardware Installation Guide	129
C.1	Hardware Installation	130
	Document Revision History	136

List of Figures

2-1.	Signal Connections for 4-Wire JTAG Communication.....	25
2-2.	Signal Connections for 2-Wire JTAG Communication (Spy-Bi-Wire).....	26
B-1.	MSP-TS430PW14 Target Socket Module, Schematic	34
B-2.	MSP-TS430PW14 Target Socket Module, PCB	35
B-3.	MSP-TS430L092 Target Socket Module, Schematic.....	37
B-4.	MSP-TS430L092 Target Socket Module, PCB	38
B-5.	MSP-TS430L092 Active Cable Target Socket Module, Schematic.....	40
B-6.	MSP-TS430L092 Active Cable Target Socket Module, PCB	41
B-7.	MSP-TS430PW24 Target Socket Module, Schematic	43
B-8.	MSP-TS430PW24 Target Socket Module, PCB	44
B-9.	MSP-TS430DW28 Target Socket Module, Schematic	46
B-10.	MSP-TS430DW28 Target Socket Module, PCB	47
B-11.	MSP-TS430PW28 Target Socket Module, Schematic	49
B-12.	MSP-TS430PW28 Target Socket Module, PCB	50
B-13.	MSP-TS430PW28A Target Socket Module, Schematic.....	52
B-14.	MSP-TS430PW28A Target Socket Module, PCB (Red)	53
B-15.	MSP-TS430DA38 Target Socket Module, Schematic	55
B-16.	MSP-TS430DA38 Target Socket Module, PCB	56
B-17.	MSP-TS430QFN23x0 Target Socket Module, Schematic	58
B-18.	MSP-TS430QFN23x0 Target Socket Module, PCB	59
B-19.	MSP-TS430RSB40 Target Socket Module, Schematic	61
B-20.	MSP-TS430RSB40 Target Socket Module, PCB	62
B-21.	MSP-TS430RHA40A Target Socket Module, Schematic	64
B-22.	MSP-TS430RHA40A Target Socket Module, PCB	65
B-23.	MSP-TS430DL48 Target Socket Module, Schematic	67
B-24.	MSP-TS430DL48 Target Socket Module, PCB	68
B-25.	MSP-TS430RGZ48B Target Socket Module, Schematic	70
B-26.	MSP-TS430RGZ48B Target Socket Module, PCB	71
B-27.	MSP-TS430PM64 Target Socket Module, Schematic.....	73
B-28.	MSP-TS430PM64 Target Socket Module, PCB	74
B-29.	MSP-TS430PM64A Target Socket Module, Schematic	76
B-30.	MSP-TS430PM64A Target Socket Module, PCB	77
B-31.	MSP-TS430RGC64B Target Socket Module, Schematic	79
B-32.	MSP-TS430RGC64B Target Socket Module, PCB	80
B-33.	MSP-TS430RGC64USB Target Socket Module, Schematic	82
B-34.	MSP-TS430RGC64USB Target Socket Module, PCB	83
B-35.	MSP-TS430PN80 Target Socket Module, Schematic	86
B-36.	MSP-TS430PN80 Target Socket Module, PCB	87
B-37.	MSP-TS430PN80A Target Socket Module, Schematic	89
B-38.	MSP-TS430PN80A Target Socket Module, PCB	90
B-39.	MSP-TS430PN80USB Target Socket Module, Schematic	92
B-40.	MSP-TS430PN80USB Target Socket Module, PCB.....	93
B-41.	MSP-TS430PZ100 Target Socket Module, Schematic	96
B-42.	MSP-TS430PZ100 Target Socket Module, PCB	97
B-43.	MSP-TS430PZ100A Target Socket Module, Schematic	99
B-44.	MSP-TS430PZ100A Target Socket Module, PCB.....	100
B-45.	MSP-TS430PZ100B Target Socket Module, Schematic.....	102

B-46.	MSP-TS430PZ100B Target Socket Module, PCB.....	103
B-47.	MSP-TS430PZ5x100 Target Socket Module, Schematic	105
B-48.	MSP-TS430PZ5x100 Target Socket Module, PCB.....	106
B-49.	MSP-TS430PZ100USB Target Socket Module, Schematic	108
B-50.	MSP-TS430PZ100USB Target Socket Module, PCB	109
B-51.	EM430F5137RF900 Target Socket Module, Schematic.....	112
B-52.	EM430F5137RF900 Target Socket Module, PCB	113
B-53.	EM430F6137RF900 Target Socket Module, Schematic.....	116
B-54.	EM430F6137RF900 Target Socket Module, PCB	117
B-55.	MSP-FET430PIF FET Interface Module, Schematic	120
B-56.	MSP-FET430PIF FET Interface Module, PCB	121
B-57.	MSP-FET430UIF USB Interface, Schematic (1 of 4)	122
B-58.	MSP-FET430UIF USB Interface, Schematic (2 of 4)	123
B-59.	MSP-FET430UIF USB Interface, Schematic (3 of 4)	124
B-60.	MSP-FET430UIF USB Interface, Schematic (4 of 4)	125
B-61.	MSP-FET430UIF USB Interface, PCB	126
C-1.	Windows XP Hardware Recognition.....	130
C-2.	Windows XP Hardware Wizard	130
C-3.	Windows XP Driver Location Selection Folder.....	131
C-4.	Windows XP Driver Installation	132
C-5.	Device Manager Using MSP-FET430UIF or eZ430-F2013 (CCE and CCS Only)	133
C-6.	Device Manager Using MSP-FET430UIF or eZ430-F2013 (IAR Only)	134
C-7.	Device Manager Using eZ430-RF2500 (CCE/CCS and IAR).....	135

List of Tables

1-1.	Flash Emulation Tool (FET) Features	14
1-2.	Individual Kit Contents, MSP-TS430xx	18
B-1.	MSP-TS430PW14 Bill of Materials	36
B-2.	MSP-TS430L092 Bill of Materials	39
B-3.	MSP-TS430L092 JP1 Settings	41
B-4.	MSP-TS430L092 Active Cable Bill of Materials	42
B-5.	MSP-TS430PW24 Bill of Materials	45
B-6.	MSP-TS430DW28 Bill of Materials	48
B-7.	MSP-TS430PW28 Bill of Materials	51
B-8.	MSP-TS430PW28A Bill of Materials	54
B-9.	MSP-TS430DA38 Bill of Materials	57
B-10.	MSP-TS430QFN23x0 Bill of Materials.....	60
B-11.	MSP-TS430RSB40 Bill of Materials	63
B-12.	MSP-TS430RHA40A Bill of Materials.....	66
B-13.	MSP-TS430DL48 Bill of Materials.....	69
B-14.	MSP-TS430RGZ48B Bill of Materials.....	72
B-15.	MSP-TS430PM64 Bill of Materials	75
B-16.	MSP-TS430PM64A Bill of Materials	78
B-17.	MSP-TS430RGC64B Bill of Materials	81
B-18.	MSP-TS430RGC64USB Bill of Materials.....	84
B-19.	MSP-TS430PN80 Bill of Materials	88
B-20.	MSP-TS430PN80A Bill of Materials	91
B-21.	MSP-TS430PN80USB Bill of Materials.....	94
B-22.	MSP-TS430PZ100 Bill of Materials	98
B-23.	MSP-TS430PZ100A Bill of Materials.....	101
B-24.	MSP-TS430PZ100B Bill of Materials.....	104
B-25.	MSP-TS430PZ5x100 Bill of Materials.....	107
B-26.	MSP-TS430PZ100USB Bill of Materials	110
B-27.	EM430F5137RF900 Bill of Materials	114
B-28.	EM430F6137RF900 Bill of Materials	118

Read This First

About This Manual

This manual describes the hardware of the Texas Instruments MSP-FET430 Flash Emulation Tool (FET). The FET is the program development tool for the MSP430 ultra-low-power microcontroller. Both available interface types, the parallel port interface and the USB interface, are described.

How to Use This Manual

Read and follow the instructions in [Chapter 1](#). This chapter lists the contents of the FET, provides instructions on installing the hardware and according software drivers. After you see how quick and easy it is to use the development tools, TI recommends that you read all of this manual.

This manual describes the setup and operation of the FET but does not fully describe the MSP430™ microcontrollers or the development software systems. For details of these items, see the appropriate TI documents listed in [Section 1.18](#).

This manual applies to the following tools (and devices):

- MSP-FET430PIF (debug interface with parallel port connection, for all MSP430 flash-based devices)
- MSP-FET430UIF (debug interface with USB connection, for all MSP430 flash-based devices)
- eZ430-F2013 (USB stick form factor interface with attached MSP430F2013 target, for all MSP430F20xx, MSP430G2x01, MSP430G2x11, MSP430G2x21 and MSP430G2x31 devices)
- eZ430-T2012 (three MSP430F2012 based target boards)
- eZ430-RF2500 (USB stick form factor interface with attached MSP430F2274/CC2500 target, for all MSP430F20xx, MSP430F21x2, MSP430F22xx, MSP430G2x01, MSP430G2x11, MSP430G2x21 and MSP430G2x31 devices)
- eZ430-RF2500T (one MSP430F2274/CC2500 target board including battery pack)
- eZ430-RF2500-SEH (USB stick form factor interface with attached MSP430F2274/CC2500 target and solar energy harvesting module)
- eZ430-Chronos-xxx (USB stick form factor interface with CC430F6137 based development system contained in a watch. Includes <1 GHz RF USB access point)

The following tools contain the USB debug interface (MSP-FET430UIF) and the respective target socket module:

- MSP-FET430U14 (for MSP430F20xx, MSP430F20xx, MSP430G2x01, MSP430G2x11, MSP430G2x21 and MSP430G2x31 devices in 14-pin PW packages)
- MSP-FET430U092 (for MSP430FL092 devices in 14-pin PW packages)
- MSP-FET430U24 (for MSP430AFE2xx devices in 24-pin PW packages)
- MSP-FET430U28 (for MSP430F11xx(A) devices in 20- and 28-pin DW or PW packages)
- MSP-FET430U28A (for MSP430F20xx and MSP430G2xxx devices in 14-, 20-, and 28-pin PW)
- MSP-FET430U38 (for MSP430F22x2 and MSP430F22x4 devices in 38-pin DA packages)
- MSP-FET430U23x0 (for MSP430F23x0 devices in 40-pin RHA packages)
- MSP-FET430U40 (for MSP430F51x1, MSP430F51x2 devices in 40-pin RSB packages)
- MSP-FET430U40A (for MSP430FR572x, MSP430FR573x devices in 40-pin RHA packages)
- MSP-FET430U48 (for MSP430F22x2 and MSP430F22x4 devices in 48-pin DL packages)
- MSP-FET430U48B (for MSP430F534x devices in 48-pin RGZ packages)
- MSP-FET430U64 (for MSP430F13x, MSP430F14x, MSP430F14x1, MSP430F15x, MSP430F16x(1), MSP430F23x, MSP430F24x, MSP430F24xx, MSP430F261x, MSP430F41x, MSP430F42x(A), MSP430FE42x(A), MSP430FE42x2, and MSP430FW42x devices in 64-pin PM packages)
- MSP-FET430U64A (for MSP430F41x2 devices in 64-pin PM packages)
- MSP-FET430U64B (for MSP430F530x devices in 64-pin RGC packages)
- MSP-FET430U64USB (for MSP430F550x, MSP430F551x, MSP430552x, devices in 64-pin RGC packages)
- MSP-FET430U80 (for MSP430F241x, MSP430F261x, MSP430F43x, MSP430F43x1, MSP430FG43x, MSP430F47x, and MSP430FG47x devices in 80-pin PN packages)
- MSP-FET430U80A (for MSP430F532x devices in 80-pin PN packages)
- MSP-FET430U80USB (for MSP430F552x devices with USB peripheral in 80-pin PN packages)
- MSP-FET430U100 (for MSP430F43x, MSP430F43x1, MSP430F44x, MSP430FG461x, and MSP430F47xx devices in 100-pin PZ packages)
- MSP-FET430U100A (for MSP430F471xx devices in 100-pin PZ packages - red PCB)
- MSP-FET430U5x100 (for MSP430F54xx(A) devices and the MSP430BT5190 in 100-pin PZ packages)
- MSP-FET430U100USB (for MSP430F663x and MSP430F563x devices in 100-pin PZ packages)
- FET430F5137RF900 (for CC430F513x devices in 48-pin RGZ packages)
- FET430F6137RF900 (for CC430F612x and CC430F613x devices in 64-pin RGC packages)

Stand-alone target-socket modules (without debug interface):

- MSP-TS430PW14 (for MSP430F20xx, MSP430G2x01, MSP430G2x11, MSP430G2x21 and MSP430G2x31 devices in 14-pin PW packages)
- MSP-TS430L092 (for MSP430FL092 devices in 14-pin PW packages)
- MSP-TS430PW24 (for MSP430AFE2xx devices in 24-pin PW packages)
- MSP-TS430DW28 (for MSP430F11xx(A) devices in 28-in DW packages)
- MSP-TS430PW28 (for MSP430F11xx(A) devices in 28-in PW packages)
- MSP-TS430PW28A (for MSP430F20xx and MSP430G2xxx devices in 14, 20 and 28-pin PW)
- MSP-TS430DA38 (for MSP430F22x2 and MSP430F22x4 devices in 38-pin DA packages)
- MSP-TS430QFN23x0 (for MSP430F23x0 devices in 40-pin RHA packages)
- MSP-TS430RSB40 (for MSP430F51x1, MSP430F51x2 devices in 40-pin RSB packages)
- MSP-TS430RHA40A ((for MSP430FR572x, MSP430FR573x devices in 40-pin RHA packages)
- MSP-TS430DL48 (for MSP430F22x2 and MSP430F22x4 devices in 48-pin DL packages)
- MSP-TS430RGZ48B (for MSP430F534x devices in 48-pin RGZ packages)
- MSP-TS430PM64 (for MSP430F13x, MSP430F14x, MSP430F14x1, MSP430F15x, MSP430F16x(1), MSP430F23x, MSP430F24x, MSP430F24xx, MSP430F261x, MSP430F41x, MSP430F42x(A), MSP430FE42x(A), MSP430FE42x2, and MSP430FW42x devices in 64-pin PM packages)
- MSP-TS430PM64A (for MSP430F41x2 devices in 64-pin PM packages)

- MSP-TS430RGC64B (for MSP430F530x devices in 64-pin RGC packages)
- MSP-TS430RGC64USB (for MSP430F550x, MSP430F551x, MSP430552x, devices in 64-pin RGC packages)
- MSP-TS430PN80 (for MSP430F241x, MSP430F261x, MSP430F43x, MSP430F43x1, MSP430FG43x, MSP430F47x, and MSP430FG47x devices in 80-pin PN packages)
- MSP-TS430PN80A (for MSP430F532x devices in 80-pin PN packages)
- MSP-TS430PN80USB (for MSP430F552x devices with USB peripheral in 80-pin PN packages)
- MSP-TS430PZ100 (for MSP430F43x, MSP430F43x1, MSP430F44x, MSP430FG461x, and MSP430F47xx devices in 100-pin PZ packages)
- MSP-TS430PZ100A (for MSP430F471xx devices in 100-pin PZ packages — red PCB)
- MSP-TS430PZ5x100 (for MSP430F54xx(A) and the MSP430BT5190 devices in 100-pin PZ packages)
- MSP-TS430PZ100USB (for MSP430F663x and MSP430F563x devices in 100-pin PZ packages)
- EM430F5137RF900 (with integrated CC430F5137 IC in a 48-pin RGZ package)
- EM430F6137RF900 (with integrated CC430F6137 IC in a 64-pin RGC package)

These tools contain the most up-to-date materials available at the time of packaging. For the latest materials (data sheets, user's guides, software, application information, etc.), visit the TI MSP430 web site at www.ti.com/msp430 or contact your local TI sales office.

Information About Cautions and Warnings

This document may contain cautions and warnings.

CAUTION

This is an example of a caution statement.

A caution statement describes a situation that could potentially damage your software or equipment.

WARNING

This is an example of a warning statement.

A warning statement describes a situation that could potentially cause harm to you.

The information in a caution or a warning is provided for your protection. Read each caution and warning carefully.

Related Documentation From Texas Instruments

MSP430 development tools documentation:

CCS for MSP430 User's Guide, literature number [SLAU157](#)

Code Composer Studio v4.x Core Edition, [CCS Mediawiki](#)

IAR for MSP430 User's Guide, literature number [SLAU138](#)

IAR Embedded Workbench KickStart, [SLAC050](#)

eZ430-F2013 Development Tool User's Guide, literature number [SLAU176](#)

eZ430-RF2480 User's Guide, literature number [SWRA176](#)

eZ430-RF2500 Development Tool User's Guide, literature number [SLAU227](#)

eZ430-RF2500-SEH Development Tool User's Guide, literature number [SLAU273](#)

eZ430-Chronos Development Tool User's Guide, literature number [SLAU292](#)

MSP430xxxx device user's guides:

MSP430x1xx Family User's Guide, literature number [SLAU049](#)

MSP430x2xx Family User's Guide, literature number [SLAU144](#)

MSP430x3xx Family User's Guide, literature number [SLAU012](#)

MSP430x4xx Family User's Guide, literature number [SLAU056](#)

MSP430x5xx Family User's Guide, literature number [SLAU208](#)

CC430 Family User's Guide, literature number [SLAU259](#)

If You Need Assistance

Support for the MSP430 devices and the FET 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 [MSP430](#) provide open interaction with peer engineers, TI engineers, and other experts. Additional device-specific information can be found on the [MSP430 web site](#).

FCC Warning

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio-frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case, the user is required to take whatever measures may be required to correct this interference at his own expense.

Get Started Now!

This chapter lists the contents of the FET and provides instruction on installing the hardware.

Topic	Page
1.1 Flash Emulation Tool (FET) Overview	14
1.2 Kit Contents, MSP-FET430PIF	14
1.3 Kit Contents, eZ430-F2013	14
1.4 Kit Contents, eZ430-T2012	14
1.5 Kit Contents, eZ430-RF2500	15
1.6 Kit Contents, eZ430-RF2500T	15
1.7 Kit Contents, eZ430-RF2500-SEH	15
1.8 Kit Contents, eZ430-Chronos-xxx	15
1.9 Kit Contents, MSP-FET430UIF	15
1.10 Kit Contents, MSP-FET430xx	16
1.11 Kit Contents, FET430Fx137RF900	17
1.12 Kit Contents, MSP-TS430xx	17
1.13 Kit Contents, EM430Fx137RF900	19
1.14 Hardware Installation, MSP-FET430PIF	19
1.15 Hardware Installation, MSP-FET430UIF	20
1.16 Hardware Installation, eZ430-F2013, eZ430-RF2500, eZ430-Chronos	20
1.17 Hardware Installation, MSP-FET430Uxx, MSP-TS430xxx, FET430Fx137RF900, EM430Fx137RF900	20
1.18 Important MSP430 Documents on the CD-ROM and Web	21

1.1 Flash Emulation Tool (FET) Overview

TI offers several flash emulation tools according to different requirements.

Table 1-1. Flash Emulation Tool (FET) Features

	eZ430-F2013	eZ430-RF2500	eZ430-Chronos	MSP-FET430UIF	MSP-FET430PIF
Supports all MSP430 and CC430 flash-based devices ('F1xx, 'F2xx, 'F4xx, 'F5xx, 'F6xx, 'G2xx, 'L092)				X	X
Supports only 'F20xx, 'G2x01, 'G2x11, 'G2x21, 'G2x31	X				
Supports only MSP430F20xx, 'F21x2, 'F22xx, 'G2x01, 'G2x11, 'G2x21, 'G2x31		X			
Supports only CC430F51xx, 'F61xx, MSP430F20xx, 'F21x2, 'F22xx, 'F41x2, 'F54xx, 'F54xxA, 'F55xx			X		
Allows fuse blow				X	
Adjustable target supply voltage				X	
Fixed 2.8-V target supply voltage					X
Fixed 3.6-V target supply voltage	X	X	X		
4-wire JTAG				X	X
2-wire JTAG⁽¹⁾	X	X	X	X	
Application UART		X	X		
Supported by CCE	X	X		X	X
Supported by CCS	X	X	X	X	X ⁽²⁾
Supported by IAR	X	X	X	X	X

⁽¹⁾ The 2-wire JTAG debug interface is also referred to as Spy-Bi-Wire (SBW) interface.

⁽²⁾ Not supported by default. Driver installation needs to be selected manually during the CCS installation process.

1.2 Kit Contents, MSP-FET430PIF

- One READ ME FIRST document
- One MSP430 CD-ROM
- One MSP-FET430PIF interface module
- One 25-conductor cable
- One 14-conductor cable

1.3 Kit Contents, eZ430-F2013

- One QUICK START GUIDE document
- One eZ430-F2013 CD-ROM
- One eZ430-F2013 development tool including one MSP430F2013 target board

1.4 Kit Contents, eZ430-T2012

- Three MSP430F2012-based target boards

1.5 Kit Contents, eZ430-RF2500

- One QUICK START GUIDE document
- One eZ430-RF2500 CD-ROM
- One eZ430-RF2500 development tool including one MSP430F2274/CC2500 target board
- One eZ430-RF2500T target board
- One AAA battery pack with expansion board (batteries included)

1.6 Kit Contents, eZ430-RF2500T

- One eZ430-RF2500T target board
- One AAA battery pack with expansion board (batteries included)

1.7 Kit Contents, eZ430-RF2500-SEH

- One MSP430 development tool CD containing documentation and development software
- One eZ430-RF USB debugging interface
- Two eZ430-RF2500T wireless target boards
- One SEH-01 solar energy harvester board
- One AAA battery pack with expansion board (batteries included)

1.8 Kit Contents, eZ430-Chronos-xxx**'433, '868, '915**

- One QUICK START GUIDE document
- One eZ430-Chronos CD-ROM
- One ez430-Chronos emulator
- One screwdriver
- Two spare screws

eZ430-Chronos-433:

- One 433-MHz eZ430-Chronos watch (battery included)
- One 433-MHz eZ430-Chronos access point

eZ430-Chronos-868:

- One 868-MHz eZ430-Chronos watch (battery included)
- One 868-MHz eZ430-Chronos access point

eZ430-Chronos-915:

- One 915-MHz eZ430-Chronos watch (battery included)
- One 915-MHz eZ430-Chronos access point

1.9 Kit Contents, MSP-FET430UIF

- One READ ME FIRST document
- One MSP430 CD-ROM
- One MSP-FET430UIF interface module
- One USB cable
- One 14-conductor cable

1.10 Kit Contents, MSP-FET430xx

'U14, 'U092, 'U24, 'U28, 'U28A, 'U38, 'U23x0, 'U40, 'U40A, 'U48, 'U48B, 'U64, 'U64A, 'U64USB, 'U80, 'U80USB, 'U100, 'U100A, 'U100B, 'U5x100, 'U100USB

- One READ ME FIRST document
- One MSP430 CD-ROM
- One MSP-FET430UIF USB interface module. This is the unit that has a USB B-connector on one end of the case, and a 2x7-pin male connector on the other end of the case.
- One USB cable
- One 32.768-kHz crystal from Micro Crystal (except MSP-FET430U24)
- A 2x7-pin male JTAG connector is also present on the PCB (see different setup for L092)
- One 14-Pin JTAG conductor cable
- One small box containing two MSP430 device samples (See table for Sample Type)
- One target socket module. To check the devices used for each board and a summary of the board, see [Table 1-2](#). MSP-TS430xx below is the target socket module for each MSP-FET430Uxx kit.

MSP-FET430U14: One **MSP-TS430PW14** target socket module.

MSP-FET430U092: One **MSP-TS430L092** target socket module with Active Cable.

MSP-FET430U24: One **MSP-TS430PW24** target socket module.

MSP-FET430U28: One **MSP-TS430PW28** target socket module.

MSP-FET430U28A: One **MSP-TS430PW28A** target socket module.

MSP-FET430U38: One **MSP-TS430DA38** target socket module..

MSP-FET430U23x0: One **MSP-TS430QFN23x0** (former name MSP-TS430QFN40) target socket module.

MSP-FET430U40: One **MSP-TS430RSB40** target socket module.

MSP-FET430U48: One **MSP-TS430DL48** target socket module.

MSP-FET430U48B: One **MSP-TS430RGZ48B** target socket module.

MSP-FET430U64: One **MSP-TS430PM64** target socket module.

MSP-FET430U64A: One **MSP-TS430PM64A** target socket module.

MSP-FET430U64B: One **MSP-TS430RGC64B** target socket module.

MSP-FET430U64USB: One **MSP-TS430RGC64USB** target socket module.

MSP-FET430U80: One **MSP-TS430PN80** target socket module.

MSP-FET430U80A: One **MSP-TS430PN80A** target socket module.

MSP-FET430U80USB: One **MSP-TS430PN80USB** target socket module.

MSP-FET430U100: One **MSP-TS430PZ100** target socket module.

MSP-FET430U100A: One **MSP-TS430PZ100A** target socket module

MSP-FET430U100B: One **MSP-TS430PZ100B** target socket module

MSP-FET430U5x100: One **MSP-TS430PZ5x100** target socket module.

MSP-FET430U100USB: One **MSP-TS430PZ100USB** target socket module.

Consult the device data sheets for device specifications. Device errata can be found in the respective device product folder on the web provided as a PDF document. Depending on the device, errata may also be found in the device bug database at www.ti.com/sc/cgi-bin/buglist.cgi.

1.11 Kit Contents, FET430Fx137RF900

- One READ ME FIRST document
- One legal notice
- One MSP430 CD-ROM
- One MSP-FET430UIF interface module
- Two target socket module

MSP-FET430F5137RF900: Two EM430F5137RF900 target socket modules. This is the PCB on which is soldered a CC430F5137 device in a 48-pin RGZ package. A 2x7-pin male connector is also present on the PCB

MSP-FET430F6137RF900: Two EM430F6137RF900 target socket modules. This is the PCB on which is soldered a CC430F6137 device in a 64-pin RGC package. A 2x7-pin male connector is also present on the PCB

- Two CC430EM battery packs
- Four AAA batteries
- Two 868-/915-MHz antennas
- Two 32.768-kHz crystals
- 18 PCB 2x4-pin headers
- One USB cable
- One 14-Pin JTAG conductor cable

1.12 Kit Contents, MSP-TS430xx

'PW14, 'L092, 'PW24, 'DW28, 'PW28, 'PW28A, 'DA38, 'QFN32x0, 'RSB40, 'DL48, 'RGZ48B, 'PM64, 'PM64A, 'RGC64B, 'RGC64USB, 'PN80, 'PN80A, 'PN80USB, 'PZ100, 'PZ100A, 'PZ100B, 'PZ5x100, 'PZ100USB

- One READ ME FIRST document
- One MSP430 CD-ROM
- One 32.768-kHz crystal from Micro Crystal (except MSP-TS430PW24)
- One target socket module
- A 2x7-pin male JTAG connector is also present on the PCB (see different setup for L092)
- One small box containing two MSP430 device samples (See table for Sample Type)

Table 1-2. Individual Kit Contents, MSP-TS430xx

Target Socket Module	Socket Type	Supported Devices	Included Devices	Headers / Comment
MSP-TS430PW14	14-pin PW (TSSOP ZIF)	MSP430F20xx, 'G2x01, 'G2x11, 'G2x21, 'G2x31	2 x MSP430F2013IPW	Four PCB 1x7-pin headers (two male and two female)
MSP-TS430L092	14-pin PW (TSSOP ZIF)	MSP-TS430L092	2 x MSP430L092IPW	Four PCB 1x7-pin headers (two male and two female). A "Micro-MaTch" 10-pin female connector is also present on the PCB which connects the kit with an 'Active Cable' PCB, this 'Active Cable' PCB is connected by 14 Pin JTAG cable with the FET430UIF
MSP-TS430PW24	24-pin PW (TSSOP ZIF)	MSP430AFE2xx	2 x MSP430AFE253IPW	Four PCB 1x12-pin headers (two male and two female)
MSP-TS430DW28	28-pin DW (SSOP ZIF)	MSP430F11x1, 'F11x2, 'F12x 'F12x2 'F21xx. Supports devices in 20- and 28-pin DA packages	2 x MSP430F123IDW	Four PCB 1x12-pin headers (two male and two female)
MSP-TS430PW28	28-pin PW (TSSOP ZIF)	MSP430F11x1, 'F11x2, 'F12x, 'F12x2, 'F21xx	2 x MSP430F2132IPW	Four PCB 1x12-pin headers (two male and two female)
MSP-TS430PW28A	28-pin PW (TSSOP ZIF)	MSP430F20xx, MSP430G2xxx in 14-, 20-, and 28-pin PW packages	2 x MSP430G2452IPW28	Four PCB 1x12-pin headers (two male and two female)
MSP-TS430DA38	38-pin DA (TSSOP ZIF)	MSP430F22xx	2 x MSP430F2274IDA	Four PCB 1x19-pin headers (two male and two female)
MSP-TS430QFN23x0	40-pin RHA (QFN ZIF)	MSP430F23x0	2 x MSP430F2370IRHA	Eight PCB 1x10-pin headers (four male and four female)
MSP-TS430RSB40	40-pin RSB (QFN ZIF)	MSP430F51x1, 'F51x2	2 x MSP430F5172IRSB	Eight PCB 1x10-pin headers (four male and four female)
MSP-TS430RHA40A	40-pin RHA (QFN ZIF)	MSP430FR572x, 'FR573x	2 x MSP430FR5739IRHA	Eight PCB 1x10-pin headers (four male and four female)
MSP-TS430DL48	48-pin DL (TSSOP ZIF)	MSP430F42x0	2 x MSP430F4270IDL	Four PCB 2x12-pin headers (two male and two female)
MSP-TS430RGZ48B	48-pin RGZ (QFN ZIF)	MSP430F534x	2 x MSP430F5342IRGZ	Eight PCB 1x12-pin headers (four male and four female)
MSP-TS430PM64	64-pin PM (QFP ZIF)	MSP430F13x, 'F14x, 'F14x1, 'F15x, 'F16x(1), 'F23x, 'F24x, 'F24xx, 'F261x, 'F41x, 'F42x(A), 'FE42x(A), 'FE42x2, 'FW42x	TS Kit: 2 x MSP430F2618IPM; FET Kit: 2 x MSP430F417IPM and 2 x MSP430F169IPM	Eight PCB 1x16-pin headers (four male and four female)
MSP-TS430PM64A	64-pin PM (QFP ZIF)	MSP430F41x2	2 x MSP430F4152IPM	Eight PCB 1x16-pin headers (four male and four female)
MSP-TS430RGC64B	64-pin RGC (QFN ZIF)	MSP430F530x	2 x MSP430F5310IRGC	Eight PCB 1x16-pin headers (four male and four female)
MSP-TS430RGC64USB	64-pin RGC (QFN ZIF)	MSP430F550x, 'F551x, 'F552x	2 x MSP430F5510IRGC and/or 2 x MSP430F5528IRGC	Eight PCB 1x16-pin headers (four male and four female)
MSP-TS430PN80	80-pin PN (QFP ZIF)	MSP430F241x, 'F261x, 'F43x, 'F43x1, 'FG43x, 'F47x, 'FG47x	2 x MSP430FG439IPN	Eight PCB 1x20-pin headers (four male and four female)
MSP-TS430PN80A	80-pin PN (QFP ZIF)	MSP430F532x	2 x MSP430F5329IPN	Eight PCB 1x20-pin headers (four male and four female)
MSP-TS430PN80USB	80-pin PN (QFP ZIF)	MSP430F552x, 'F551x	2 x MSP430F5529IPN	Eight PCB 1x20-pin headers (four male and four female)
MSP-TS430PZ100	100-pin PZ (QFP ZIF)	MSP430F43x, 'F43x1, 'F44x, 'FG461x, 'F47xx	2 x MSP430FG4619IPZ	Eight PCB 1x25-pin headers (four male and four female)
MSP-TS430PZ100A	100-pin PZ (QFP ZIF)	MSP430F471xx	2 x MSP430F47197IPZ	Eight PCB 1x25-pin headers (four male and four female)

Table 1-2. Individual Kit Contents, MSP-TS430xx (continued)

Target Socket Module	Socket Type	Supported Devices	Included Devices	Headers / Comment
MSP-TS430PZ100B	100-pin PZ (QFP ZIF)	MSP430F67xx	2 x MSP430F6733IPZ	Eight PCB 1x25-pin headers (four male and four female)
MSP-TS430PZ5x100	100-pin PZ (QFP ZIF)	MSP430F543x, MSP430 BT5190IPZ	2 x MSP430F5438IPZ	Eight PCB 1x25-pin headers (four male and four female)
MSP-TS430PZ100USB	100-pin PZ (QFP ZIF)	MSP430F663x, 'F563x	2 x MSP430F6638IPZ	Eight PCB 1x25-pin headers (four male and four female)

See the device data sheets for device specifications. Device errata can be found in the respective device product folder on the web provided as a PDF document. Depending on the device, errata may also be found in the device bug database at www.ti.com/sc/cgi-bin/buglist.cgi.

1.13 Kit Contents, EM430Fx137RF900

- One READ ME FIRST document
- One legal notice
- One MSP430 CD-ROM
- Two target socket module

MSP-EM430F5137RF900: Two EM430F5137RF900 target socket modules. This is the PCB on which is soldered a CC430F5137 device in a 48-pin RGZ package. A 2x7-pin male connector is also present on the PCB

MSP-EM430F6137RF900: Two EM430F6137RF900 target socket modules. This is the PCB on which is soldered a CC430F6137 device in a 64-pin RGC package. A 2x7-pin male connector is also present on the PCB

- Two CC430EM battery packs
- Four AAA batteries
- Two 868-/915-MHz antennas
- Two 32.768-kHz crystals
- 18 PCB 2x4-pin headers

1.14 Hardware Installation, MSP-FET430PIF

Follow these steps to install the hardware for the MSP-FET430PIF tools:

1. Use the 25-conductor cable to connect the FET interface module to the parallel port of the PC. The necessary driver for accessing the PC parallel port is installed automatically during CCE/CCS or IAR Embedded Workbench installation. Note that a restart is required after the CCE/CCS or IAR Embedded Workbench installation for the driver to become active.
2. Use the 14-conductor cable to connect the parallel-port debug interface module to a target board, such as an MSP-TS430xxx target socket module. Module schematics and PCBs are shown in [Appendix B](#).

1.15 Hardware Installation, MSP-FET430UIF

Follow these steps to install the hardware for the MSP-FET430UIF tool:

1. Use the USB cable to connect the USB-FET interface module to a USB port on the PC. The USB FET should be recognized, as the USB device driver should have been installed with the IDE (Code Composer Essentials/Studio or IAR Embedded Workbench).. If the install wizard starts, follow the prompts and point the wizard to the driver files.
 The default location for CCE is C:\Program Files\Texas Instruments\MSP430_USB_DRIVERS_v3\.
 The default location for CCS is C:\Program Files\Texas Instruments\ccs4\emulation\drivers\msp430\.
 The default location for IAR Embedded Workbench is <Installation Root>\Embedded Workbench x.x\430\bin\WinXP.
 Detailed driver installation instructions can be found in [Appendix C](#).
2. After connecting to a PC, the USB FET performs a self-test during which the red LED flashes for approximately two seconds. If the self-test passes successfully, the green LED stays on.
3. Use the 14-conductor cable to connect the USB-FET interface module to a target board, such as an MSP-TS430xxx target socket module.
4. Ensure that the MSP430 device is securely seated in the socket, and that its pin 1 (indicated with a circular indentation on the top surface) aligns with the "1" mark on the PCB.
5. Compared to the parallel-port debug interface, the USB FET has additional features including JTAG security fuse blow and adjustable target V_{CC} (1.8 V to 3.6 V). Supply the module with up to 100 mA.

1.16 Hardware Installation, eZ430-F2013, eZ430-RF2500, eZ430-Chronos

Follow these steps to install the hardware for the eZ430-F2013 and eZ430-RF2500 tools:

1. Connect the eZ430-F2013, eZ430-RF2500 and eZ430-Chronos to a USB port of the PC.
2. The USB FET should be recognized by the PC. The USB device driver should have been installed with the IDE (Code Composer Studio or IAR Embedded Workbench - Code Composer Essentials only supports eZ430-F2013 and eZ430-RF2500). If the install wizard starts, follow the prompts and point the wizard to the driver files.

The default location for CCE is C:\Program Files\Texas Instruments\MSP430_USB_DRIVERS_v3\.
 The default location for CCS is C:\Program Files\Texas Instruments\ccs4\emulation\drivers\msp430\.
 The default location for IAR Embedded Workbench is <Installation Root>\Embedded Workbench x.x\430\bin\WinXP.

Detailed driver installation instructions can be found in [Appendix C](#).

1.17 Hardware Installation, MSP-FET430Uxx, MSP-TS430xxx, FET430Fx137RF900, EM430Fx137RF900

MSP-FET430Uxx – 'U14, 'U092, ,U24, 'U28, 'U28A, 'U38, 'U23x0, 'U40, 'U40A, 'U48, 'U48B, 'U64, 'U64A, 'U64USB, 'U80, 'U80USB, 'U100, 'U100A, 'U100B, 'U5x100, 'U100USB

TS430xxx – 'PW14, 'L092, 'PW24, 'DW28, 'PW28, 'PW28A, 'DA38, 'QFN32x0, 'RSB40, 'DL48, 'RGZ48B, 'PM64, 'PM64A, 'RGC64B, 'RGC64USB, 'PN80, 'PN80A, 'PN80USB, 'PZ100, 'PZ100A, 'PZ100B, 'PZ5x100, 'PZ100USB

Follow these steps to install the hardware for the MSP-FET430Uxx and MSP-TS430xxx tools:

1. Connect the MSP-FET430PIF or MSP-FET430UIF debug interface to the appropriate port of the PC. Use the 14-conductor cable to connect the FET interface module to the supplied target socket module.
2. Ensure that the MSP430 device is securely seated in the socket and that its pin 1 (indicated with a circular indentation on the top surface) aligns with the "1" mark on the PCB.
3. Ensure that the two jumpers (LED and VCC) near the 2x7-pin male connector are in place. Illustrations of the target socket modules and their parts are found in [Appendix B](#).

NOTE: Regarding 'U38, see FAQ [Hardware #2](#) in [Appendix A](#).

1.18 Important MSP430 Documents on the CD-ROM and Web

The primary sources of MSP430 information are the device-specific data sheet and user's guide. The most up-to-date versions of these documents that are available at the time of production are provided on the CD-ROM included with this tool. The MSP430 web site (www.ti.com/msp430) contains the most recent version of these documents.

PDF documents describing the CCS tools (CCS IDE, the assembler, the C compiler, the linker, and the librarian) are in the msp430\documentation folder. A Code Composer Studio specific [Wiki page \(FAQ\)](#) is available, and the Texas Instruments [E2E Community support forums](#) for the MSP430 and Code Composer Studio v4 provide additional help besides the product help and Welcome page.

PDF documents describing the IAR tools (Workbench/C-SPY, the assembler, the C compiler, the linker, and the librarian) are in the common\doc and 430\doc folders. Supplements to the documents (i.e., the latest information) are available in HTML format in the same directories. 430\doc\readme_start.htm provides a convenient starting point for navigating the IAR documentation.

Design Considerations for In-Circuit Programming

This chapter presents signal requirements for in-circuit programming of the MSP430.

Topic	Page
2.1 Signal Connections for In-System Programming and Debugging	24
2.2 External Power	27
2.3 Bootstrap Loader (BSL)	27

2.1 Signal Connections for In-System Programming and Debugging

MSP-FET430PIF, MSP-FET430UIF, MSP-GANG430, MSP-PRGS430

With the proper connections, the debugger and an FET hardware JTAG interface (such as the MSP-FET430PIF and MSP-FET430UIF) can be used to program and debug code on the target board. In addition, the connections also support the MSP-GANG430 or MSP-PRGS430 production programmers, thus providing an easy way to program prototype boards, if desired.

[Figure 2-1](#) shows the connections between the 14-pin FET interface module connector and the target device required to support in-system programming and debugging for 4-wire JTAG communication.

[Figure 2-2](#) shows the connections for 2-wire JTAG mode (Spy-Bi-Wire). While 4-wire JTAG mode is supported on all MSP430 devices, 2-wire JTAG mode is available on selected devices only. See the CCS User's Guide for MSP430 ([SLAU157](#)) or IAR for MSP430 User's Guide ([SLAU138](#)) for information on which interface method can be used on which device.

The connections for the FET interface module and the MSP-GANG430 or MSP-PRGS430 are identical. Both the FET interface module and MSP-GANG430 can supply V_{CC} to the target board (via pin 2). In addition, the FET interface module and MSP-GANG430 have a V_{CC} -sense feature that, if used, requires an alternate connection (pin 4 instead of pin 2). The V_{CC} -sense feature senses the local V_{CC} present on the target board (i.e., a battery or other local power supply) and adjusts the output signals accordingly. If the target board is to be powered by a local V_{CC} , then the connection to pin 4 on the JTAG should be made, and not the connection to pin 2. This utilizes the V_{CC} -sense feature and prevents any contention that might occur if the local on-board V_{CC} were connected to the V_{CC} supplied from the FET interface module or the MSP-GANG430. If the V_{CC} -sense feature is not necessary (i.e., the target board is to be powered from the FET interface module or the GANG430) the V_{CC} connection is made to pin 2 on the JTAG header and no connection is made to pin 4. [Figure 2-1](#) and [Figure 2-2](#) show a jumper block that supports both scenarios of supplying V_{CC} to the target board. If this flexibility is not required, the desired V_{CC} connections may be hard-wired eliminating the jumper block. Pins 2 and 4 must not be connected simultaneously.

Note that in 4-wire JTAG communication mode (see [Figure 2-1](#)), the connection of the target RST signal to the JTAG connector is optional when using devices that support only 4-wire JTAG communication mode. However, when using devices that support 2-wire JTAG communication mode in 4-wire JTAG mode, the RST connection must be made. The MSP430 development tools and device programmers perform a target reset by issuing a JTAG command to gain control over the device. However, if this is unsuccessful, the RST signal of the JTAG connector may be used by the development tool or device programmer as an additional way to assert a device reset.

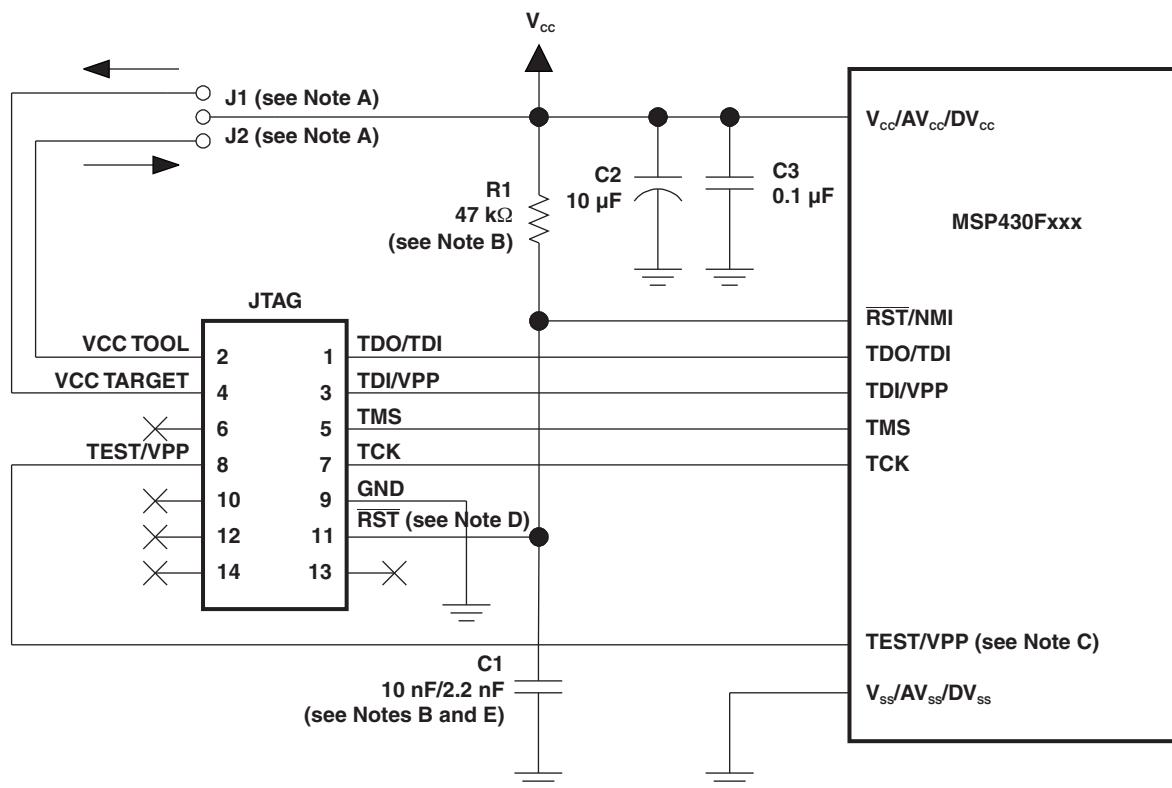
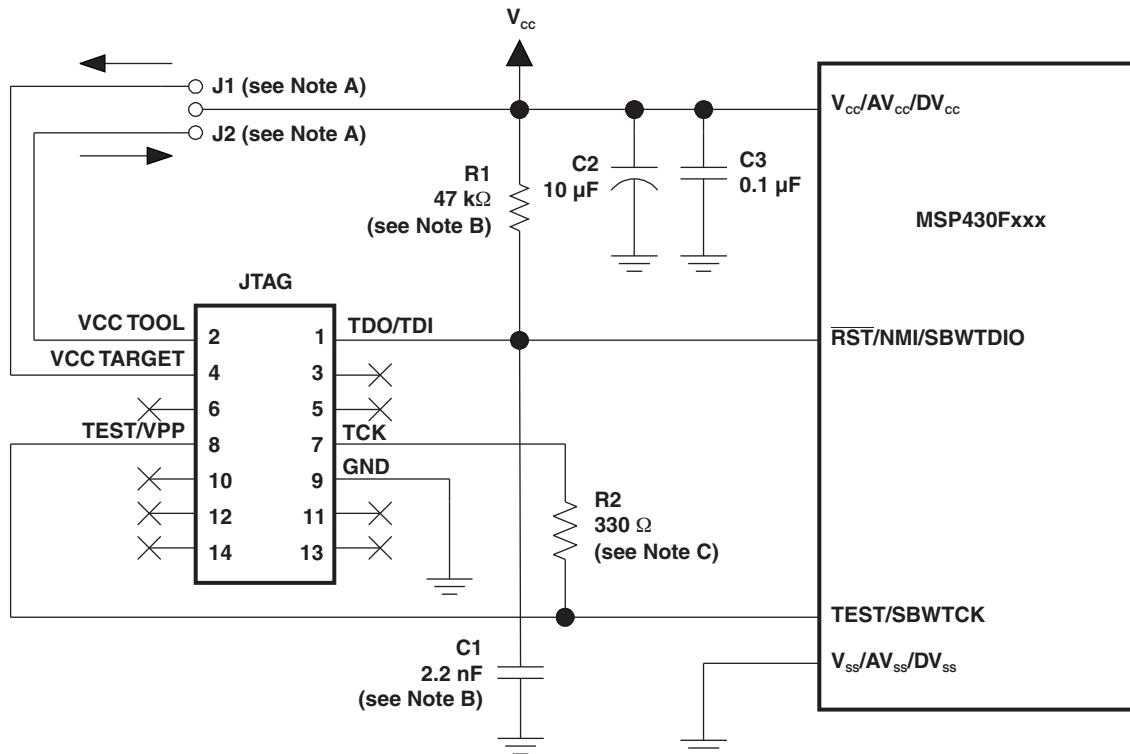


Figure 2-1. Signal Connections for 4-Wire JTAG Communication



- A Make either connection J1 in case a local target power supply is used or connection J2 to power target from the debug/programming adapter.
- B The device RST/NMI/SBWTDIO pin is used in 2-wire mode for bidirectional communication with the device during JTAG access and that any capacitance attached to this signal may affect the ability to establish a connection with the device. The upper limit for C1 is 2.2 nF when using current TI FET interface modules (USB FET).
- C R2 protects the JTAG debug interface TCK signal from the JTAG security fuse blow voltage that is supplied by the TEST/VPP pin during the fuse blow process. If fuse blow functionality is not needed, R2 is not required (populate 0 ?), and do not connect TEST/VPP to TEST/SBWTCR.

Figure 2-2. Signal Connections for 2-Wire JTAG Communication (Spy-Bi-Wire)

2.2 External Power

The PC parallel port can source a limited amount of current. Because of the ultra-low-power requirement of the MSP430, a standalone FET does not exceed the available current. However, if additional circuitry is added to the tool, this current limit could be exceeded. In this case, external power can be supplied to the tool via connections provided on the target socket modules. See the schematics and pictorials of the target socket modules in [Appendix B](#) to locate the external power connectors.

The MSP-FET430UIF can supply targets with up to 100 mA through pin 2 of the 14-pin connector. V_{CC} for the target can be selected between 1.8 V and 5 V in steps of 0.1 V. Alternatively, the target can be supplied externally. In this case, the external voltage should be connected to pin 4 of the 14-pin connector. The MSP-FET430UIF then adjusts the level of the JTAG signals to external V_{CC} automatically. Only pin 2 (MSP-FET430UIF supplies target) or pin 4 (target is externally supplied) must be connected; not both at the same time.

When a target socket module is powered from an external supply, the external supply powers the device on the target socket module and any user circuitry connected to the target socket module, and the FET interface module continues to be powered from the PC via the parallel port. If the externally supplied voltage differs from that of the FET interface module, the target socket module must be modified so that the externally supplied voltage is routed to the FET interface module (so that it may adjust its output voltage levels accordingly). See the target socket module schematics in [Appendix B](#).

2.3 Bootstrap Loader (BSL)

The JTAG pins provide access to the flash memory of the MSP430Fxxx devices. On some devices, these pins are shared with the device port pins, and this sharing of pins can complicate a design (or sharing may not be possible). As an alternative to using the JTAG pins, most MSP430Fxxx devices contain a program (a "bootstrap loader") that permits the flash memory to be erased and programmed using a reduced set of signals. The [*MSP430 Programming Via the Bootstrap Loader User's Guide \(SLAU319\)*](#) describes this interface. TI does not produce a BSL tool. However, customers can easily develop their own BSL tools using the information in the application reports, or BSL tools can be purchased from third parties. See the [MSP430 web site](#) for the application reports and a list of MSP430 third-party tool developers.

TI suggests that MSP430Fxxx customers design their circuits with the BSL in mind (i.e., TI suggests providing access to these signals via, for example, a header).

See FAQ [**Hardware #11**](#) for a second alternative to sharing the JTAG and port pins.

Frequently Asked Questions and Known Issues

This appendix presents solutions to frequently asked questions regarding the MSP-FET430 hardware.

Topic	Page
A.1 Hardware FAQs	30
A.2 Known Issues	32

A.1 Hardware FAQs

1. **The state of the device** (CPU registers, RAM memory, etc.) **is undefined following a reset.**
Exceptions to the above statement are that the PC is loaded with the word at 0xFFFF (i.e., the reset vector), the status register is cleared, and the peripheral registers (SFRs) are initialized as documented in the device family user's guides. The CCE/CCS debugger and C-SPY reset the device after programming it.
2. **MSP430F22xx Target Socket Module (MSP-TS430DA38) – Important Information**
Due to the large capacitive coupling introduced by the device socket between the adjacent signals XIN/P2.6 (socket pin 6) and $\overline{\text{RST}}$ /SBWTUDIO (socket pin 7), in-system debugging can disturb the LFXT1 low-frequency crystal oscillator operation (ACLK). This behavior applies only to the Spy-Bi-Wire (2-wire) JTAG configuration and only to the period while a debug session is active.
Workarounds:
 - Use the 4-wire JTAG mode debug configuration instead of the Spy-Bi-Wire (2-wire) JTAG configuration. This can be achieved by placing jumpers JP4 through JP9 accordingly.
 - Use the debugger option "Run Free" that can be selected from the Advanced Run drop-down menu (at top of Debug View). This prevents the debugger from accessing the MSP430 while the application is running. Note that, in this mode, a manual halt is required to see if a breakpoint was hit. See the IDE documentation for more information on this feature.
 - Use an external clock source to drive XIN directly.
3. **With current interface hardware and software, there is a weakness when adapting target boards that are powered externally.** This leads to an accidental fuse check in the MSP430. This is valid for PIF and UIF but is mainly seen on UIF. A solution is being developed.
Workarounds:
 - Connect $\overline{\text{RST}}$ /NMI pin to JTAG header (pin 11), LPT/USB tools are able to pull the RST line, which also resets the device internal fuse logic.
 - Use the debugger option "Release JTAG On Go" that can be selected from the IDE drop-down menu. This prevents the debugger from accessing the MSP430 while the application is running. Note that in this mode, a manual halt is required to see if a breakpoint was hit. See the IDE documentation for more information on this feature.
 - Use an external clock source to drive XIN directly.
4. **The 14-conductor cable connecting the FET interface module and the target socket module **must not exceed 8 inches (20 centimeters) in length.****
5. **The signal assignment on the 14-conductor cable is identical for the parallel port interface and the USB FET.**
6. **To utilize the on-chip ADC voltage references, C6 (10 ?F, 6.3 V, low leakage) must be installed** on the target socket module.
7. **To utilize the charge pump on the devices with LCD+ Module, C4 (10 ?F, low leakage) must be installed** on the target socket module.
8. **Crystals/resonators Q1 and Q2 (if applicable) are not provided on the target socket module.** For MSP430 devices that contain user-selectable loading capacitors, the effective capacitance is the selected capacitance plus 3 pF (pad capacitance) divided by two.
9. **Crystals/resonators have no effect upon the operation of the tool and the CCE/CCS debugger or C-SPY** (as any required clocking/timing is derived from the internal DCO/FLL).
10. **On 20-pin and 28-pin devices with multiplexed port/JTAG pins** (P1.4 to P1.7), to use these pin in their port capacity:
For CCE/CCS: "Run Free" (in Run pull-down menu at top of Debug View) must be selected.
For C-SPY: "Release JTAG On Go" must be selected.
11. **As an alternative to sharing the JTAG and port pins** (on 20 and 28 pin devices), **consider using an MSP430 device that is a "superset" of the smaller device.** A very powerful feature of the MSP430 is that the family members are code and architecturally compatible, so code developed on one device (for example, one without shared JTAG and port pins) ports effortlessly to another (assuming an equivalent set of peripherals).

12. **Information memory may not be blank** (erased to 0xFF) when the device is delivered from TI. Customers should erase the information memory before its first use. Main memory of packaged devices is blank when the device is delivered from TI.
13. **The device current increases by approximately 10 ?A when a device in low-power mode is stopped** [using Halt (CCE/CCS) or Esc (C-SPY)] **and then the low-power mode is restored** [using Run (CCE/CCS) or Go (C-SPY)]. This behavior appears to happen on all devices except the MSP430F12x.
14. The following **ZIF sockets** are used in the FET tools and target socket modules:
 - 14-pin device (PW package): Enplas OTS-14-065-01
 - 14-pin package for 'L092 (PW package): Yamaichi IC189-0142-146
 - 24-pin package (PW package): Enplas OTS-24(28)-0.65-02
 - 28-pin device (DW package): Wells-CTI 652 D028
 - 28-pin device (PW package): Enplas OTS-28-0.65-01
 - 38-pin device (DA package): Yamaichi IC189-0382-037
 - 40-pin device (RHA package): Enplas QFN-40B-0.5-01
 - 40-pin device (RSB package): Enplas QFN-40B-0.4
 - 48-pin device (RGZ package): Yamaichi QFN11T048-008 A101121-001
 - 48-pin device (DL package): Yamaichi IC51-0482-1163
 - 64-pin device (PM package): Yamaichi IC51-0644-807
 - 64-pin device (RGC package): Yamaichi QFN11T064-006
 - 80-pin device (PN package): Yamaichi IC201-0804-014
 - 100-pin device (PZ package): Yamaichi IC201-1004-008

Enplas: www.enplas.com

Wells-CTI: www.wellscti.com

Yamaichi: www.yamaichi.us

A.2 Known Issues

MSP-FET430PIF	<i>Some PCs do not supply 5 V through the parallel port</i>
Problem Description	Device identification problems with modern PCs, because the parallel port often does not deliver 5 V as was common with earlier hardware. <ol style="list-style-type: none">1. When connected to a laptop, the test signal is clamped to 2.5 V.2. When the external V_{CC} becomes less than 3 V, up to 10 mA is flowing in the adapter via pin 4 (sense).
Solution	Measure the voltage level of the parallel port. If it is too low, provide external 5 V to the V_{CC} pads of the interface. The jumper on a the target socket must be switched to external power.
MSP-FET430UIF	<i>Current detection algorithm of the UIF firmware</i>
Problem Description	If high current is detected, the I_{CC} Monitor algorithm stays in a loop of frequently switching on and off the target power supply. This power switching puts some MSP430 devices such as the MSP430F5438 in a state that requires a power cycle to return the device to JTAG control. A side issue is that if the UIF firmware has entered this switch on / switch off loop, it is not possible to turn off the power supply to the target by calling <code>MSP430_VCC(0)</code> . A power cycle is required to remove the device from this state.
Solution	IAR KickStart and Code Composer Essentials that have the MSP430.dll version 2.04.00.003 and higher do not show this problem. Update the software development tool to this version or higher to update the MSP-FET430UIF firmware.

Hardware

This appendix contains information relating to the FET hardware, including schematics, PCB pictorials, and bills of materials. All other tools, such as the eZ430 series, are described in separate product-specific user's guides.

Topic	Page
B.1 MSP-TS430PW14	34
B.2 MSP-TS430L092	37
B.3 MSP-TS430L092 Active Cable	40
B.4 MSP-TS430PW24	43
B.5 MSP-TS430DW28	46
B.6 MSP-TS430PW28	49
B.7 MSP-TS430PW28A	52
B.8 MSP-TS430DA38	55
B.9 MSP-TS430QFN23x0	58
B.10 MSP-TS430RSB40	61
B.11 MSP-TS430RHA40A	64
B.12 MSP-TS430DL48	67
B.13 MSP-TS430RGZ48B	70
B.14 MSP-TS430PM64	73
B.15 MSP-TS430PM64A	76
B.16 MSP-TS430RGC64B	79
B.17 MSP-TS430RGC64USB	82
B.18 MSP-TS430PN80	86
B.19 MSP-TS430PN80A	89
B.20 MSP-TS430PN80USB	91
B.21 MSP-TS430PZ100	96
B.22 MSP-TS430PZ100A	99
B.23 MSP-TS430PZ100B	102
B.24 MSP-TS430PZ5x100	105
B.25 MSP-TS430PZ100USB	107
B.26 EM430F5137RF900	112
B.27 EM430F6137RF900	116
B.28 MSP-FET430PIF	120
B.29 MSP-FET430UIF	122

B.1 MSP-TS430PW14

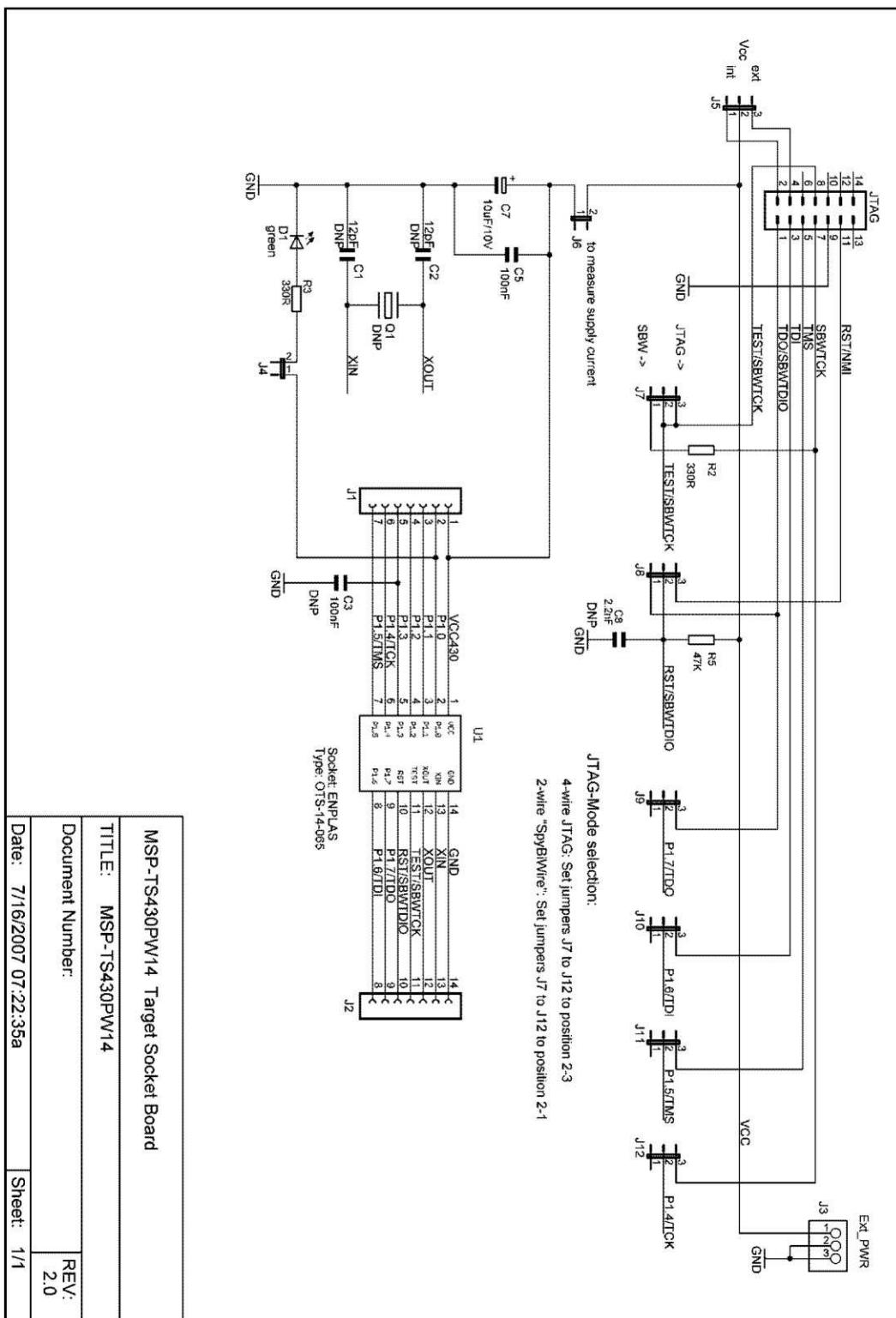


Figure B-1. MSP-TS430PW14 Target Socket Module, Schematic

MSP-TS430PW14 Target Socket Board	
TITLE:	MSP-TS430PW14
Document Number:	REV: 2.0
Date: 7/16/2007 07:22:35a	Sheet: 1/1

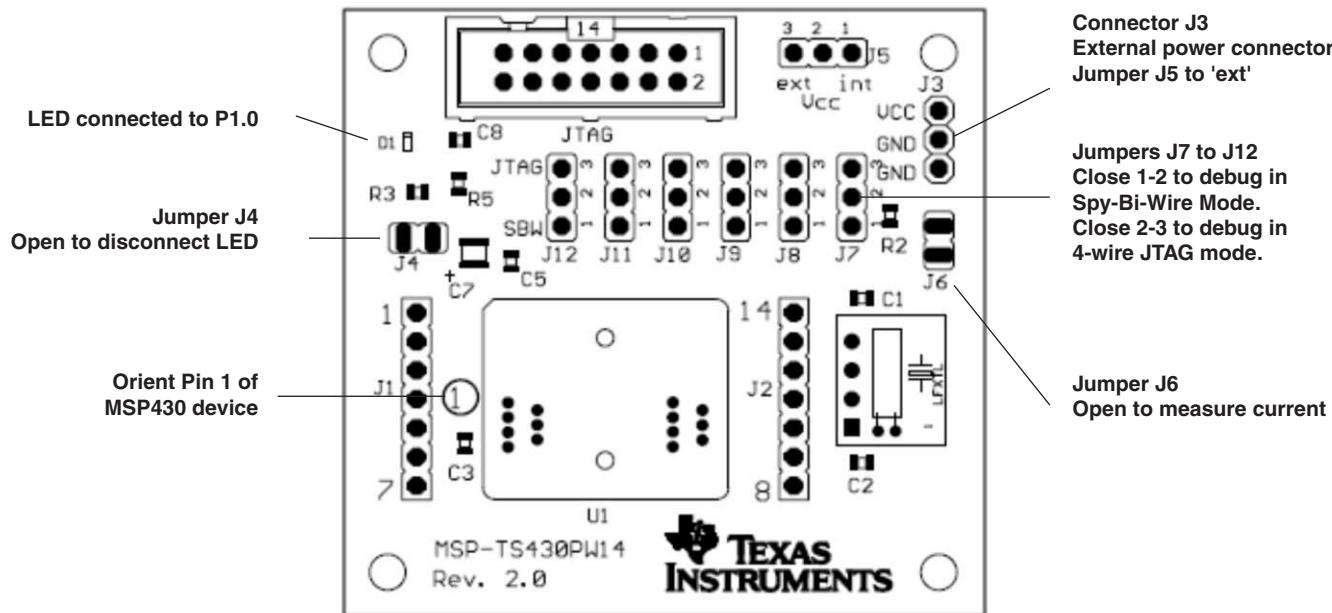


Figure B-2. MSP-TS430PW14 Target Socket Module, PCB

Table B-1. MSP-TS430PW14 Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C7	1	10uF/10V, Tantal Size B	511-1463-2-ND	
3	C3, C5	1	100nF, SMD0805	478-3351-2-ND	DNP: C3
4	C8	0	2.2nF, SMD0805		DNP
5	D1	1	green LED, SMD0603	475-1056-2-ND	
6	J1, J2	0	7-pin header, TH	"SAM1029-07-NDSAM1213-07-ND"	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder: Header: Receptacle
7	J3, J5, J7, J8, J9, J10, J11, J12	8	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on headers J5, J7, J8, J9, J10, J11, J12; Pos 1-2
8	J4, J6	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		9	Jumper	15-38-1024-ND	Place on: J5, J7-J12; Pos 1-2
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: keep vias free of solder
13	R2, R3	2	330 Ω, SMD0805	541-330ATR-ND	
15	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: OTS-14-0.65-01		Manuf.: Enplas
17	PCB	1	56 x 53 mm		2 layers
18	Adhesive plastic feet	4	about 6mm width, 2mm height	e.g., 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430F2013IPW		DNP: enclosed with kit, supplied by TI

B.2 MSP-TS430L092

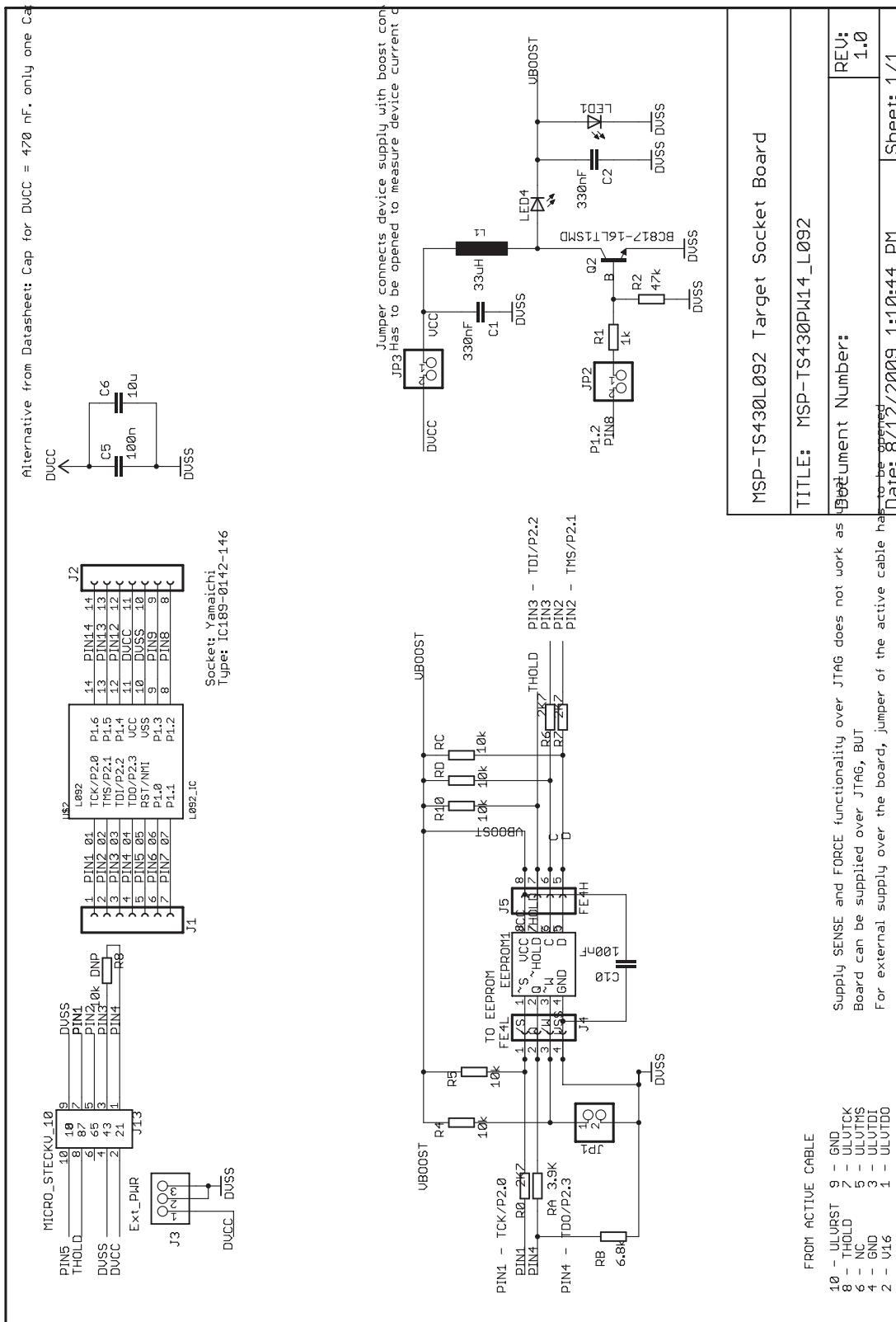


Figure B-3. MSP-TS430L092 Target Socket Module, Schematic

TITLE: MSP-TS430L092 Target Socket Board	REV: 1.0
Document Number: Date: 8/12/2009 1:10:44 PM	Sheet: 1/1

Settings of the MSP-TS430L092 Target Socket

Figure B-4 shows the PCB layout of the MSP-TS430L092 target socket. The following pinning is recommended:

- JP1 is write enable for the EPROM. If this is not set, the EPROM can only be read.
- JP2 and JP3 connect device supply with boost converter. They can be opened to measure device current consumption. For default operation, they should be closed.

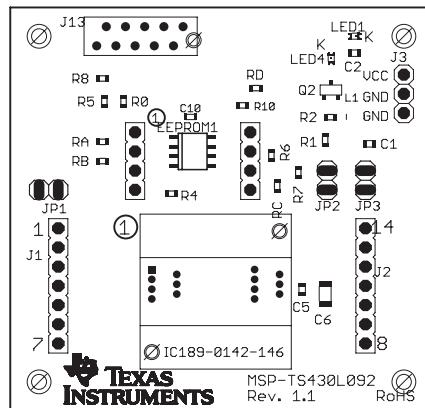


Figure B-4. MSP-TS430L092 Target Socket Module, PCB

Table B-2. MSP-TS430L092 Bill of Materials

Pos.	Ref Des No.	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C2	2	330nF, SMD0603		
2	C5	1	100n, SMD0603		
3	C6	1	10u, SMD0805		
4	C10	1	100n, SMD0603		
5	EEPROM1	1	M95512 SO08 (SO8)	ST Micro M95160R	Digikey: 497-8688-1-ND
7	J1, J2	2	7-pin header, TH	SAM1213-07-ND SAM1035-07-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J3	1	3-pin header, male, TH	SAM1035-03-ND	
9	J4, J5	2	FE4L, FE4H	4 pol. Stiftreihe	DNP; Keep vias free of solder.
11	J13	1	MICRO_STECKV_10		Reichelt: MicroMaTch-Connector: MM FL 10G
12	JP1, JP2,JP3	3	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
15	L1	1	33uH, SMD0806	LQH2MCN330K02L	Farnell: 151-5557
16	LED1, LED4	2	LEDCHIPLED_0603		Farnell: 1686065
17	Q2	1	BC817-16LT1SMD	BC817-16LT1SMD	SOT23-BEC
18	R0, R6, R7	3	2K7, SMD0603		
19	R1	1	1k, SMD0603		
20	R2	1	47k, SMD0603		
21	R4, R5, R8, R10, RC, RD	6	10k, SMD0603		
22	RA	1	3.9k, SMD0603		
23	RB	1	6.8k, SMD0603		
24	U1	1	14 Pin Socket - IC189-0142-146	Manuf. Yamaichi	
22	MSP430	2	MSP430L092PWR	DNP: enclosed with kit. Is supplied by TI	

B.3 MSP-TS430L092 Active Cable

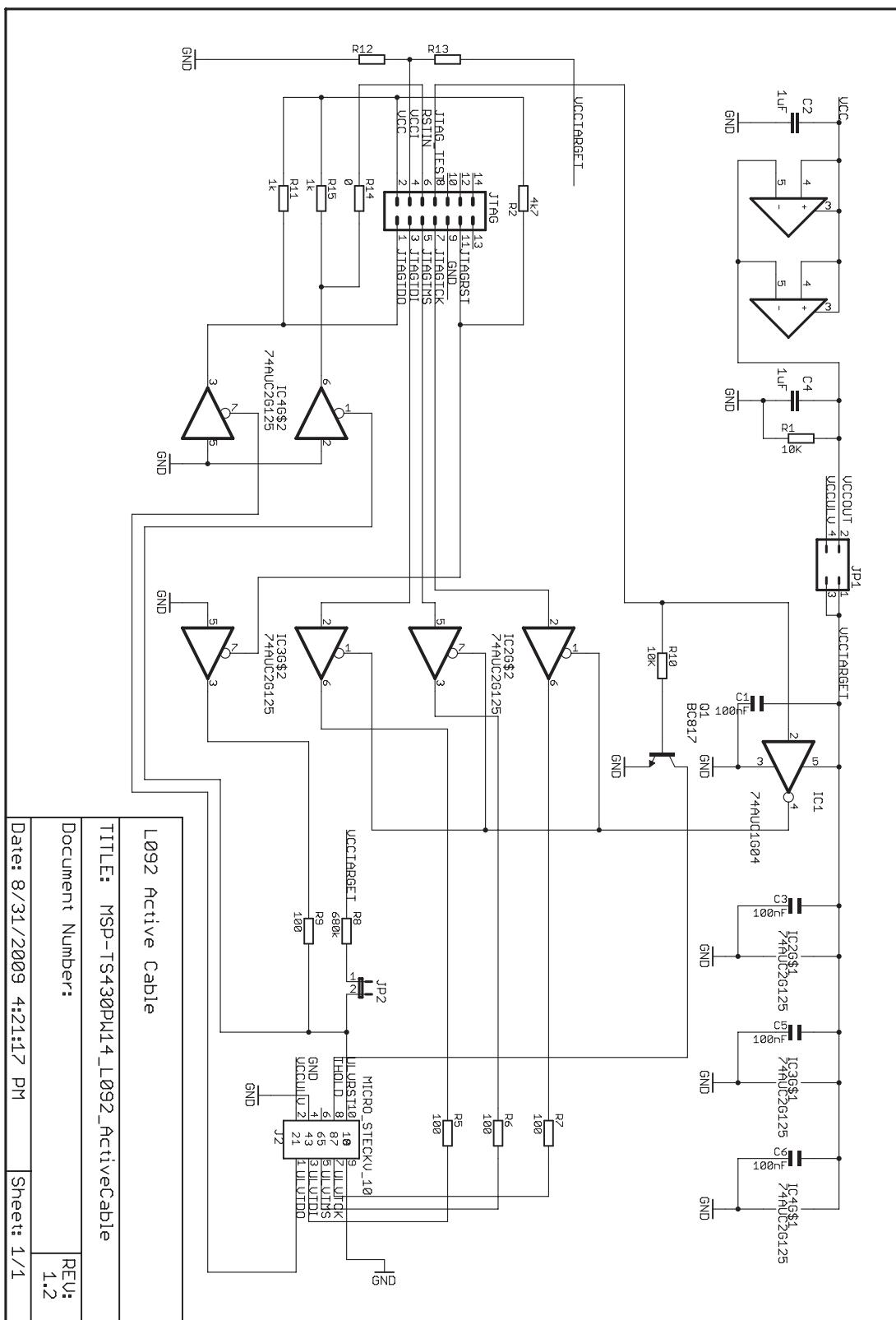


Figure B-5. MSP-TS430L092 Active Cable Target Socket Module, Schematic

Figure B-6 shows the PCB layout for the Active Cable. The following pinning is possible:

- JP1 has two jumpers (Jumper 1 and Jumper 2) that can be set as shown in [Table B-3](#).

Table B-3. MSP-TS430L092 JP1 Settings

Jumper 1	Jumper 2	Description
Off	Off	The active cable has no power and does not function.
Off	On	The active cable receives power from target socket. For this option, the target socket must have its own power supply.
On	Off	The active cable receives power from the JTAG connector.
On	On	The JTAG connector powers the active cable and the target socket. For this option, the target socket must not have its own power source, as this would cause a not defined state.

- JP2 is for reset. For the standard MSP-TS430L092, this jumper must be set. It sets the reset pin to high and can also control it. Without this jumper on the MSP-TS430L092, reset is set to zero.

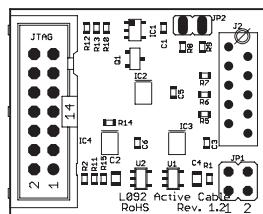


Figure B-6. MSP-TS430L092 Active Cable Target Socket Module, PCB

Table B-4. MSP-TS430L092 Active Cable Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C3, C5, C6	4	100nF, SMD0603		
2	C2, C4	2	1uF, SMD0805		
3	R1, R10	2	10K, SMD0603		
4	R2	1	4K7, SMD0603		
5	R5, R6, R7, R9	4	100, SMD0603		
6	R8	1	680k, SMD0603		
7	R11, R15	2	1K, SMD0603		
8	R12	0	SMD0603		DNP
9	R13	0	SMD0603		DNP
10	R14	1	0, SMD0603		
11	IC1	1	SN74AUC1G04DBVR		Manu: TI
12	IC2, IC3, IC4	3	SN74AUC2G125DCTR		Manu: TI
13	J2	1	MICRO_STECKV_10	Reichelt: MicroMaTch-Connector: MM FL 10G	
14	JP1	1	2x2 Header	JP2Q	Put jumper on Position 1 and 2. Do not mix direction.
15	JP2	1	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
16	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
17	Q1	1	BC817-25LT1SMD, SOT23-BEC	Digi-Key: BC817-25LT1GOSCT-ND	
18	U1, U2	2	TLVH431IDBVR	SOT23-5	Manu: TI

B.4 MSP-TS430PW24

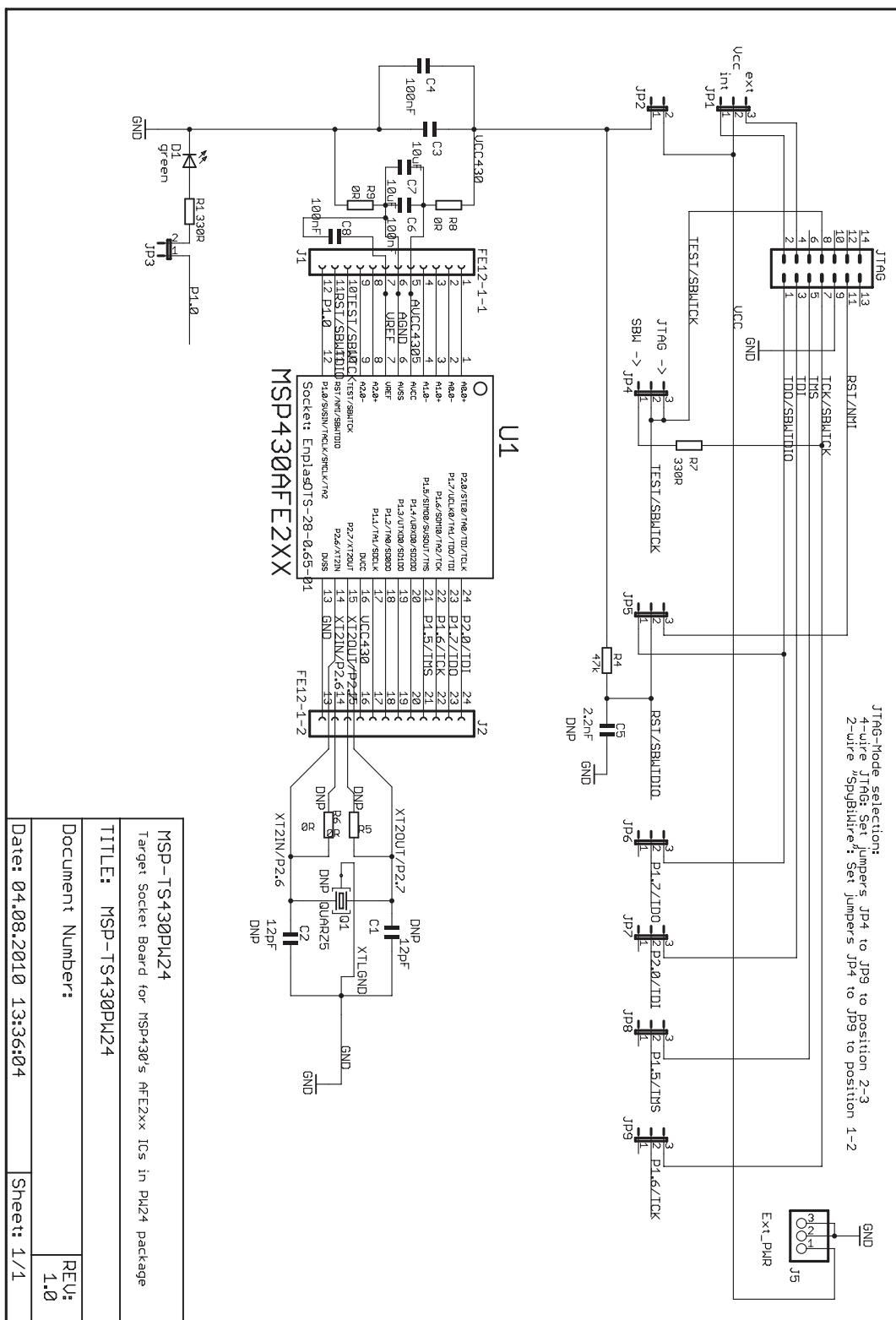


Figure B-7. MSP-TS430PW24 Target Socket Module, Schematic

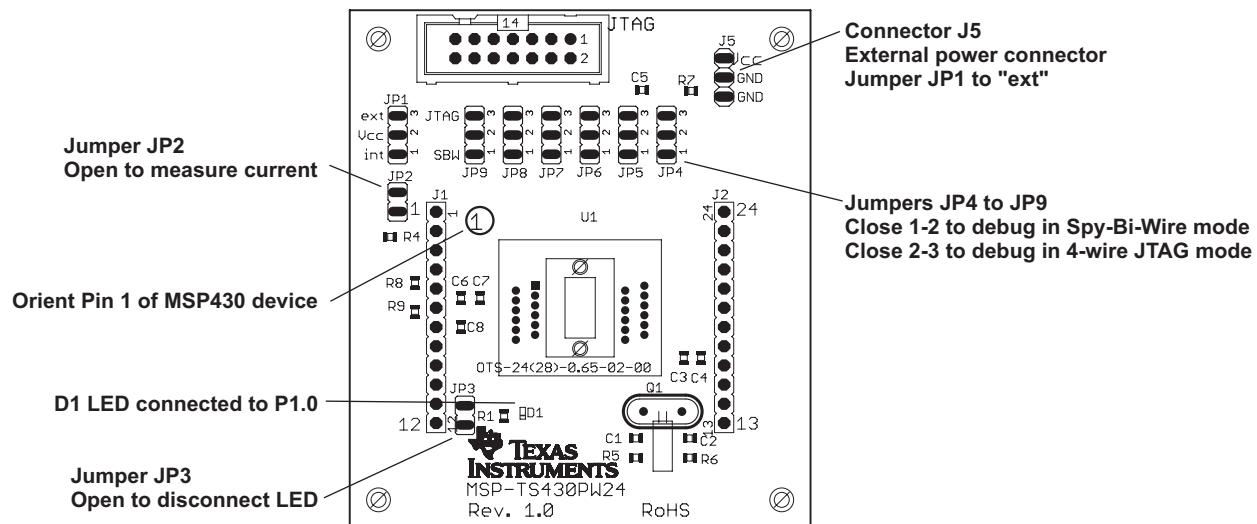


Figure B-8. MSP-TS430PW24 Target Socket Module, PCB

Table B-5. MSP-TS430PW24 Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C5	1	2.2nF, SMD0805		
3	C3, C7	2	10uF/10V, SMD0805		
4	C4, C6, C8	3	100nF, SMD0805	478-3351-2-ND	
5	D1	1	green LED, SMD0805	P516TR-ND	
6	J1, J2	0	12-pin header, TH	"SAM1029-07-NDSAM1213-07-ND"	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder. (Header & Receptacle)
7	J5, JP1, JP4, JP5, JP6, JP7, JP8, JP9	8	3-pin header, male, TH	SAM1035-03-ND	Place jumper on 1-2 of JP4-JP9 Place on 1-2 on JP1
8	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		9	Jumper	15-38-1024-ND	see Pos 7 an 8
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	Q1	0	Crystal		DNP: keep vias free of solder
12	R1, R7	2	330 Ω, SMD0805	541-330ATR-ND	
13	R5, R6, R8, R9,	2	0 Ohm, SMD0805	541-000ATR-ND	DNP R5, R6
14	R4	1	47k Ohm, SMD0805	541-47000ATR-ND	
15	U1	1	Socket: OTS 24(28)-065-02-00		Manuf.: Enplas
16	PCB	1	68.5 x 61 mm		2 layers
17	Adhesive plastic feet	4	about 6mm width, 2mm height	e.g., 3M Bumpers Part No. SJ-5302	Apply to corners at bottom side
18	MSP430	2	MSP430AFE2xx		DNP: enclosed with kit, supplied by TI

B.5 MSP-TS430DW28

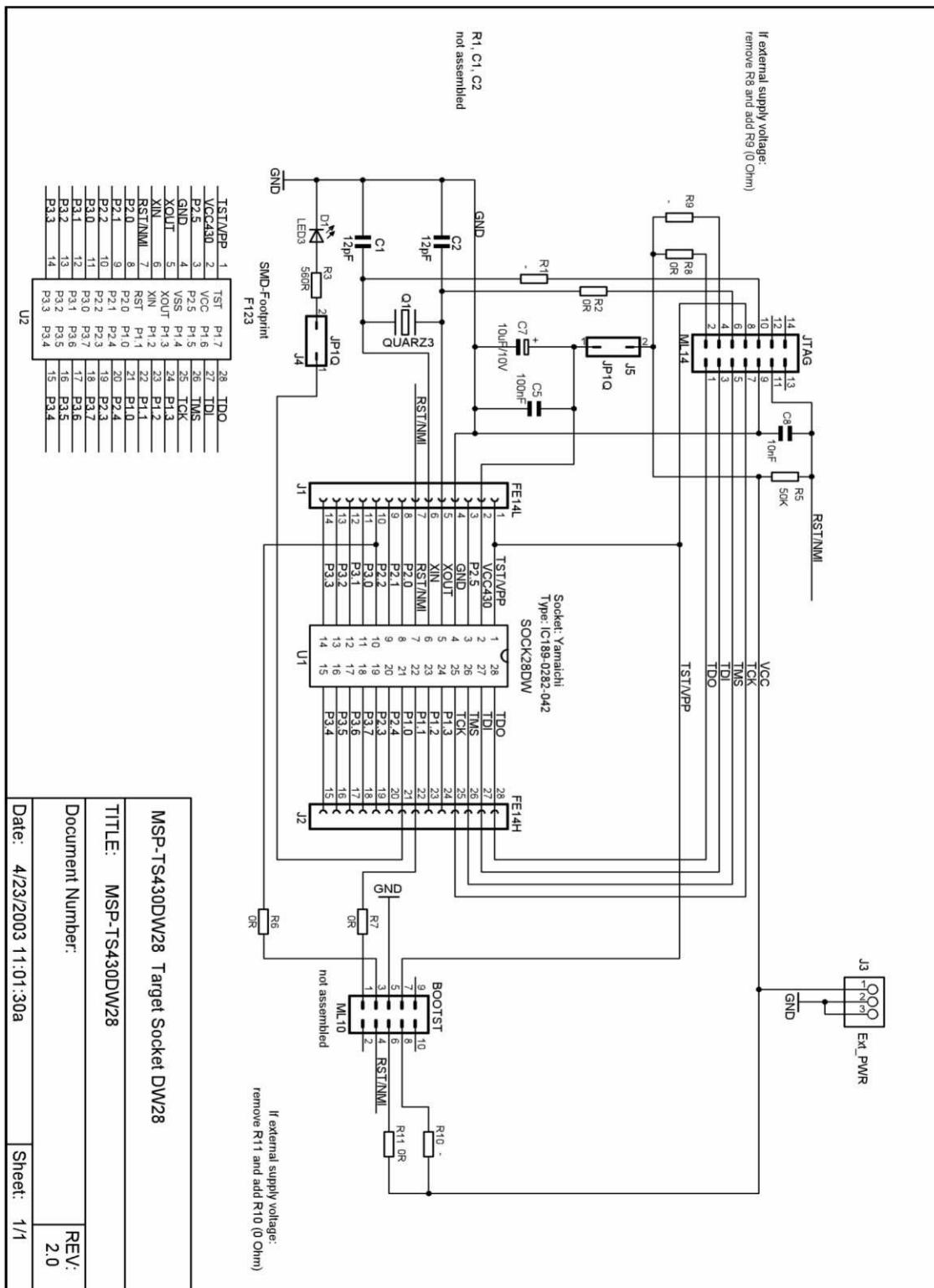


Figure B-9. MSP-TS430DW28 Target Socket Module, Schematic

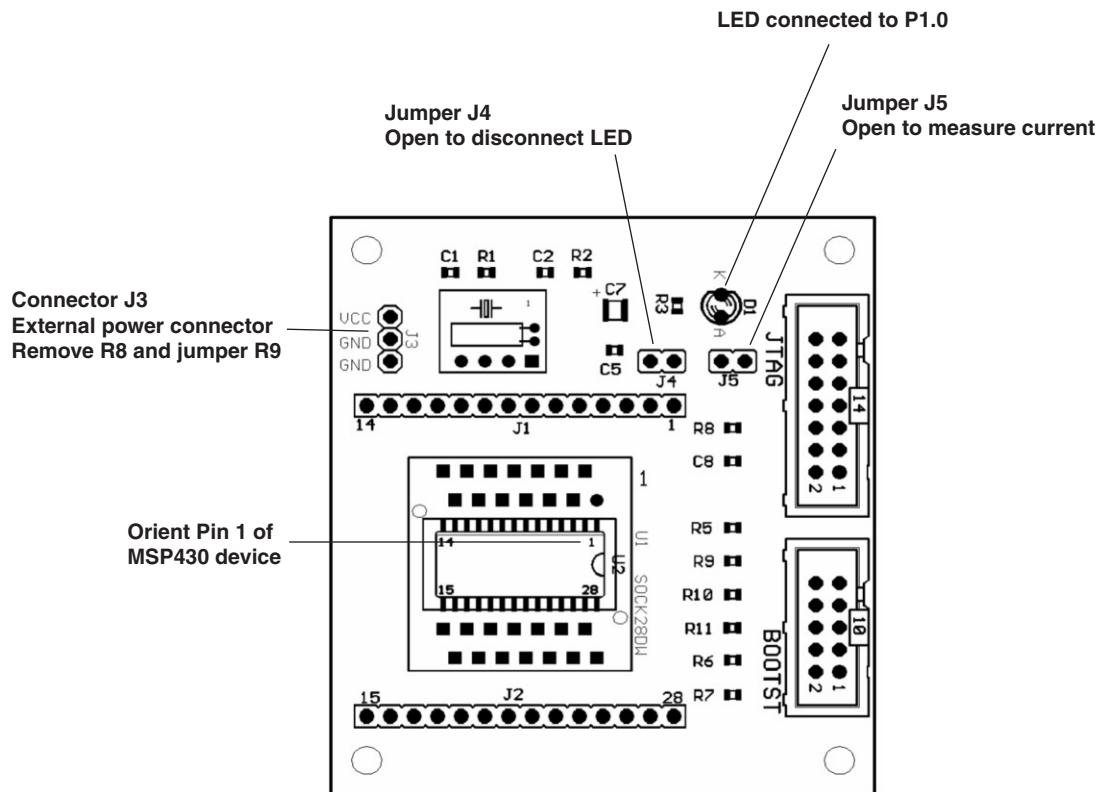


Figure B-10. MSP-TS430DW28 Target Socket Module, PCB

Table B-6. MSP-TS430DW28 Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2, Cover holes while soldering
2	C5	1	100nF, SMD0805		
3	C7	1	10uF/10V Tantal Elko B		
4	C8	1	10nF	SMD0805	
5	D1	1	LED3 T1 3mm yellow	RS: 228-4991	
6	Q1	0	QUARZ, Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Cover holes while soldering
7	J1, J2	2	14-pin header, TH male		DNP: Headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
7.1		2	14-pin header, TH female		DNP: Headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
8	J3	1	3-Pin Connector, male		
9	J4, J5	2	2-Pin Connector, male		With jumper
10	BOOTST	0	ML10, 10-Pin Conn., m	RS: 482-115	DNP, Cover holes while soldering
11	JTAG	1	ML14, 14-Pin Conn., m	RS: 482-121	
12	R1, R2, R6, R7, R8,R9, R10, R11	4	0R, SMD0805		DNP: R1, R2, R9, R10
13	R3	1	560R, SMD0805		
14	R5	1	47K, SMD0805		
15	U1	1	SOP28DW socket	Yamaichi: IC189-0282-042	
16	U2	0	TSSOP		DNP

B.6 MSP-TS430PW28

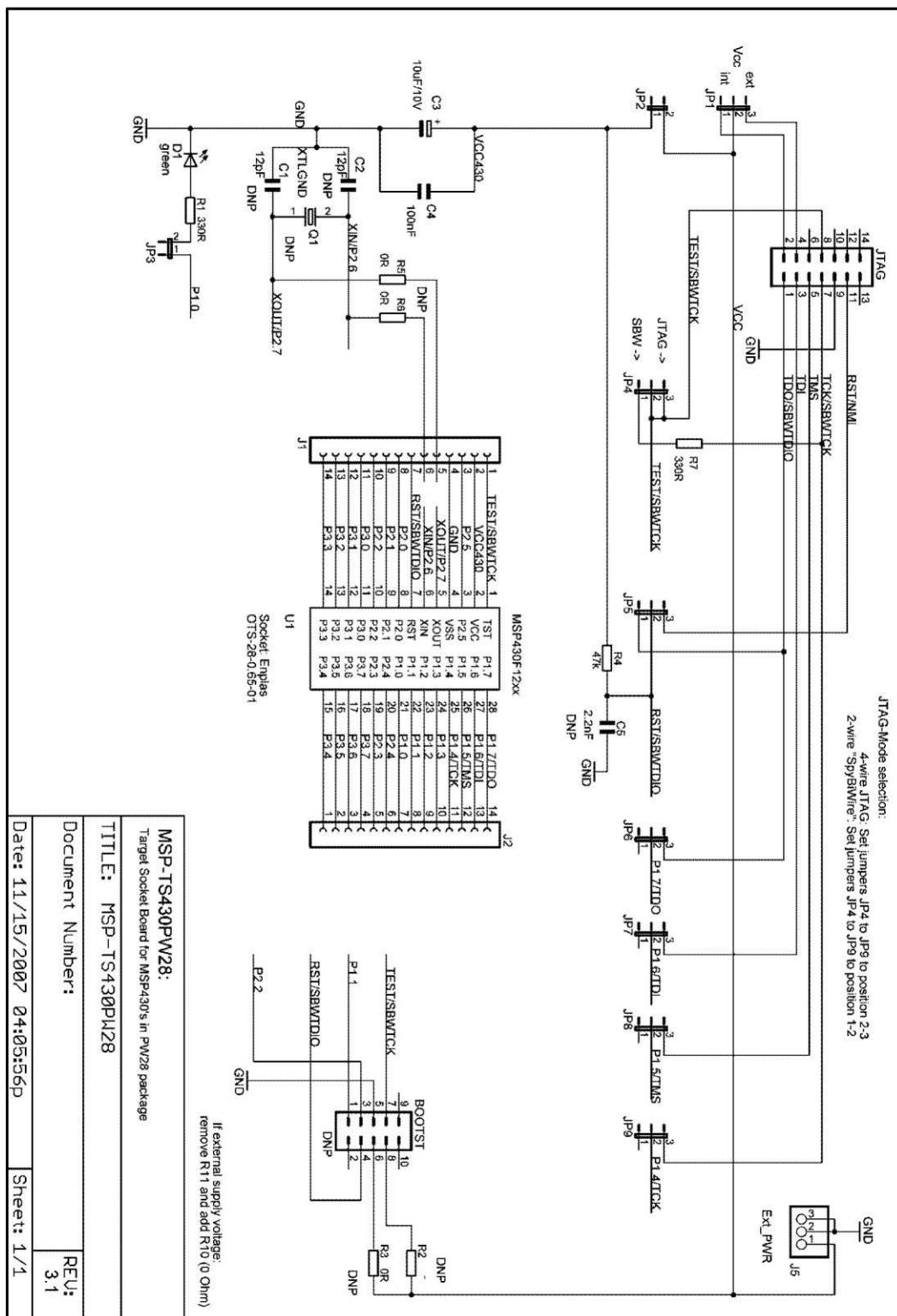


Figure B-11. MSP-TS430PW28 Target Socket Module, Schematic

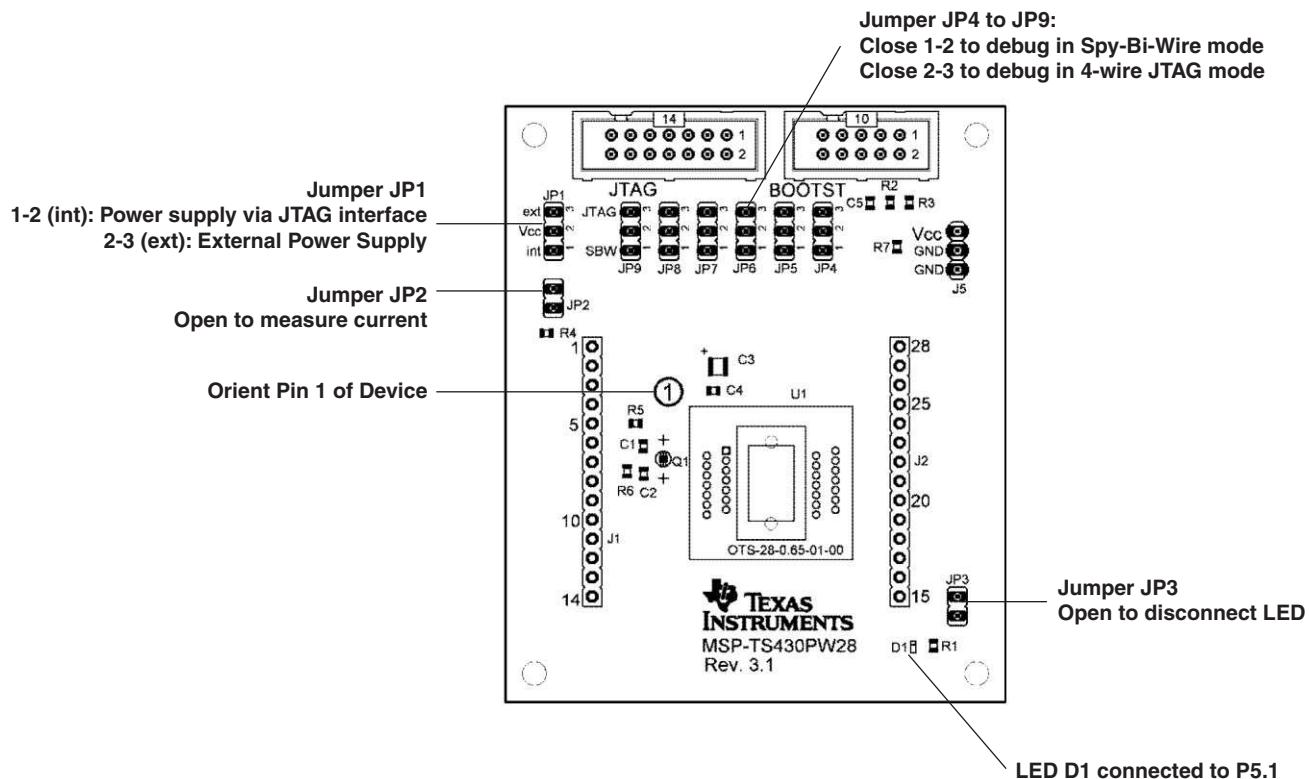


Figure B-12. MSP-TS430PW28 Target Socket Module, PCB

Table B-7. MSP-TS430PW28 Bill of Materials⁽¹⁾

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2 , Cover holes while soldering
2	C3	1	10uF/10V Tantal Elko B		
3	C4	1	100nF, SMD0805		
4	C5	0	2.2nF, SMD0805		DNP
5	D1	1	LED green SMD0603		
6	Q1	0	QUARZ, Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Cover holes and neighboring holes while soldering
7	J1, J2	2	14-pin header, TH male		DNP: Headers and receptacles enclosed with kit.Keep vias free of solder.: Header: Receptacle
7.1		2	14-pin header, TH female		DNP: headers and receptacles enclosed with kit.Keep vias free of solder.: Header: Receptacle
8	J5, IP1	1	3-Pin Connector , male		
8a	JP1, JP4, JP5, JP6, JP7, JP8, JP9	7	3-Pin Connector , male		Jumper on Pos 1-2
9	JP2, JP3	2	2-Pin Connector , male		with Jumper
10	BOOTST	0	ML10, 10-Pin Conn. , m	RS: 482-115	DNP: Cover holes while soldering
11	JTAG	1	ML14, 14-Pin Conn. , m	RS: 482-121	
12	R1, R7	2	330R, SMD0805		
12	R2, R3, R5, R6	0	0R, SMD0805		DNP
14	R4	1	47K, SMD0805		
15	U1	1	SOP28PW socket	Enplas: OTS-28-0.65-01	

⁽¹⁾ PCB 66 x 79 mm, two layers; Rubber stand off, four pieces

B.7 MSP-TS430PW28A

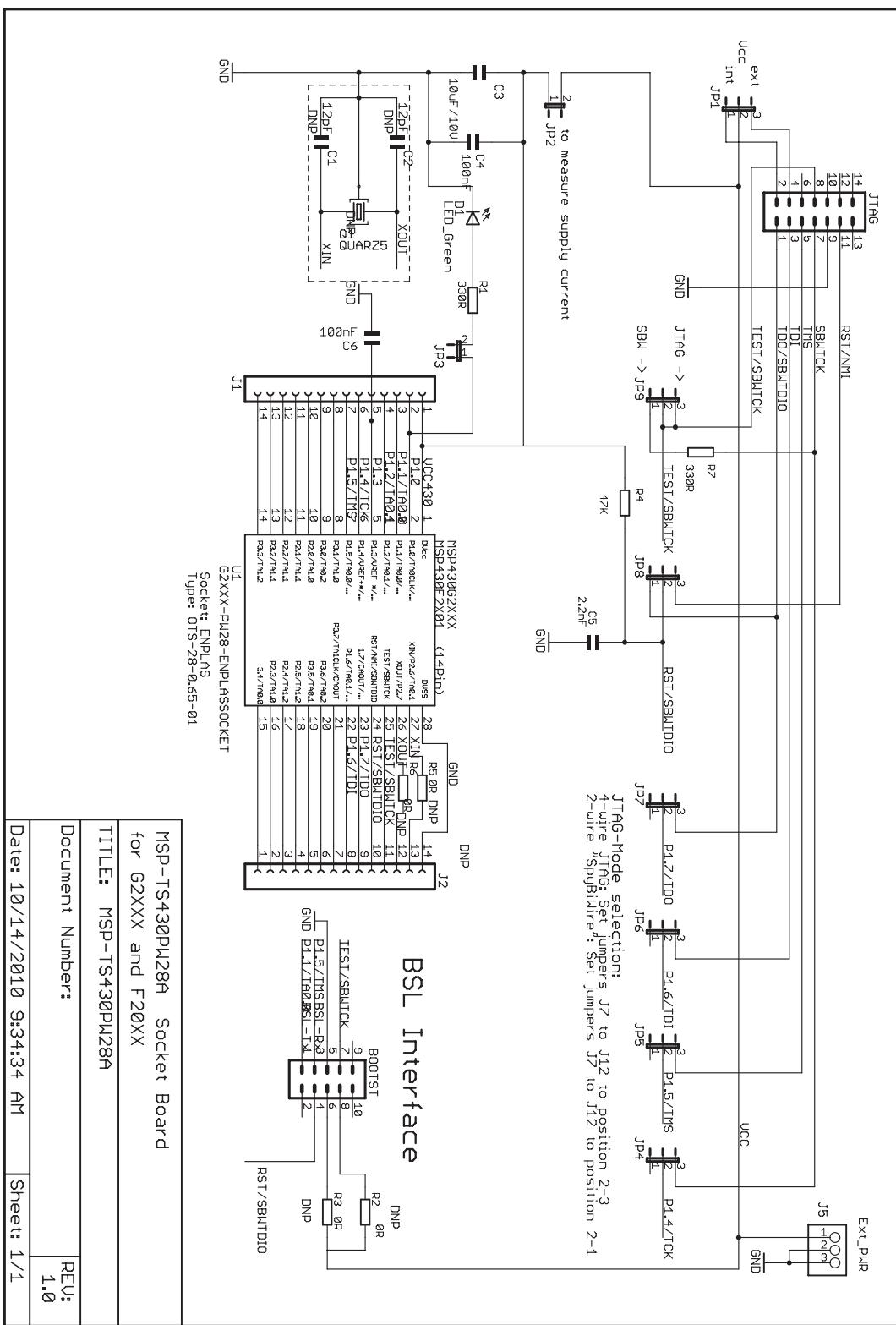


Figure B-13. MSP-TS430PW28A Target Socket Module, Schematic

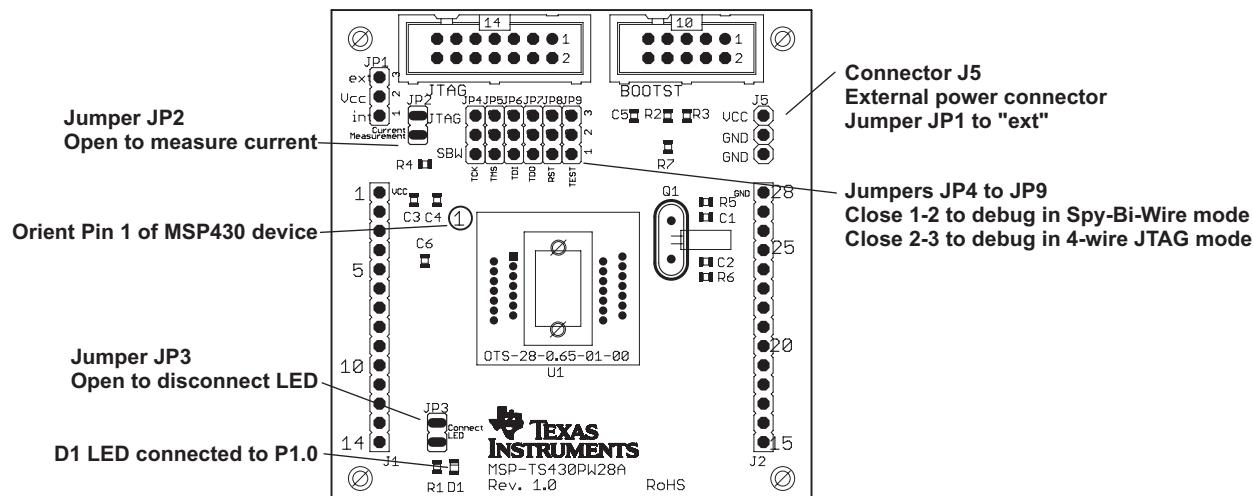


Figure B-14. MSP-TS430PW28A Target Socket Module, PCB (Red)

Table B-8. MSP-TS430PW28A Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C5	1	2.2nF, SMD0805		
3	C3	1	10uF/10V, SMD0805		
4	C4, C6,	2	100nF, SMD0805	478-3351-2-ND	
5	D1	1	green LED, SMD0805	P516TR-ND	
6	J1, J2	0	14-pin header, TH		DNP: Headers and receptacles enclosed with kit. Keep vias free of solder: (Header & Receptacle)
7	J5, JP1, JP4, JP5, JP6, JP7, JP8, JP9	8	3-pin header, male, TH	SAM1035-03-ND	Place jumper on 1-2 of JP4-JP9 Place on 1-2 on JP1
8	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		9	Jumper	15-38-1024-ND	see Pos 7 an 8
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0			DNP Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS3V 32.768kHz, C(Load) = 12.5pF	DNP: keep vias free of solder
13	R1, R7	2	330 Ω, SMD0805	541-330ATR-ND	
14	R2, R3,R5, R6,	0	0 Ohm, SMD0805	541-000ATR-ND	DNP R2, R3,R5, R6
15	R4	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: OTS-28-0.65-01		Manuf.: Enplas
17	PCB	1	63.5 x 64.8 mm		2 layers
18	Adhesive plastic feet	4	about 6mm width, 2mm height	e.g., 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430G2553IPW28		DNP: enclosed with kit, supplied by TI

B.8 MSP-TS430DA38

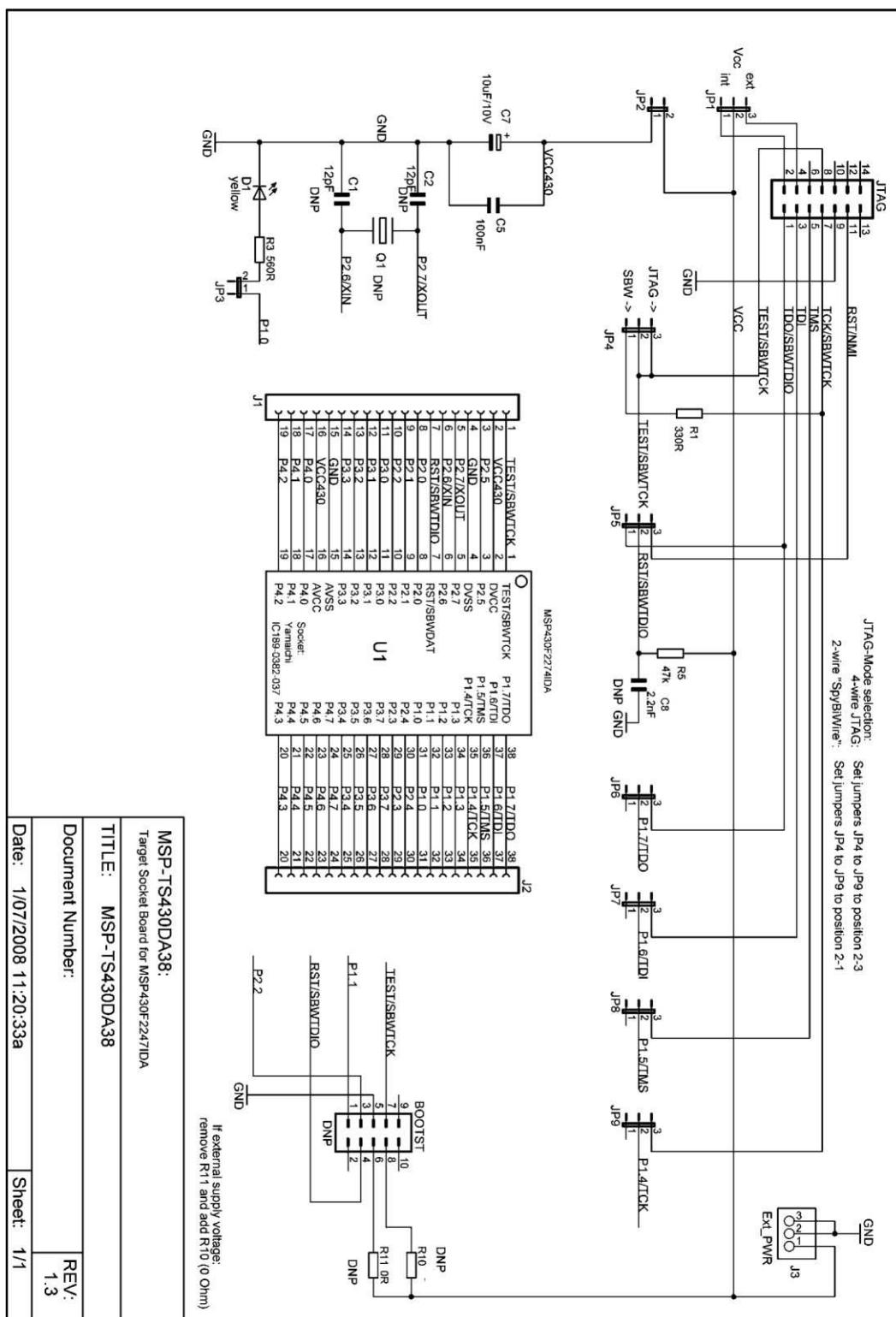


Figure B-15. MSP-TS430DA38 Target Socket Module, Schematic

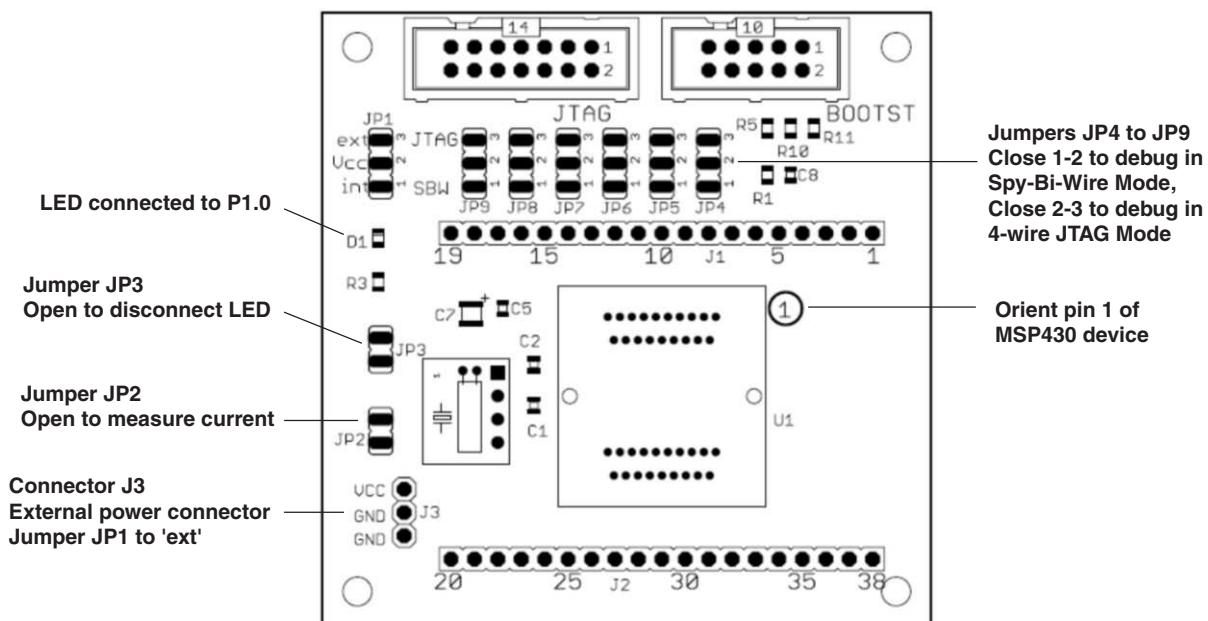


Figure B-16. MSP-TS430DA38 Target Socket Module, PCB

Table B-9. MSP-TS430DA38 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C7	1	10uF/10V, Tantal Size B	511-1463-2-ND	
3	C5	1	100nF, SMD0805	478-3351-2-ND	
4	C8	0	2.2nF, SMD0805		DNP
5	D1	1	green LED, SMD0603	475-1056-2-ND	
6	J1, J2	0	19-pin header, TH	"SAM1029-19-NDSAM1213-19-ND"	DNP: headers and receptacles enclosed with kit.Keep vias free of solder.: Header: Receptacle
7	"J3, JP1, JP4, JP5, JP6, JP7, JP8, JP9"	8	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on headers JP1, JP4, JP5, JP6, JP7, JP8, JP9; Pos 1-2
8	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		9	Jumper	15-38-1024-ND	Place on: JP1 - JP9; Pos 1-2
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R1, R3	2	330 Ω, SMD0805	541-330ATR-ND	
14	R10, R11	0	0 Ω, SMD0805	541-000ATR-ND	DNP
15	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: IC189-0382--037		Manuf.: Yamaichi
17	PCB	1	67 x 66 mm		2 layers
18	Adhesive Plastic feet	4	~6mm width, 2mm height	e.g., 3M Bumpers Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430F2274IDA		DNP: enclosed with kit supplied by TI

B.9 MSP-TS430QFN23x0

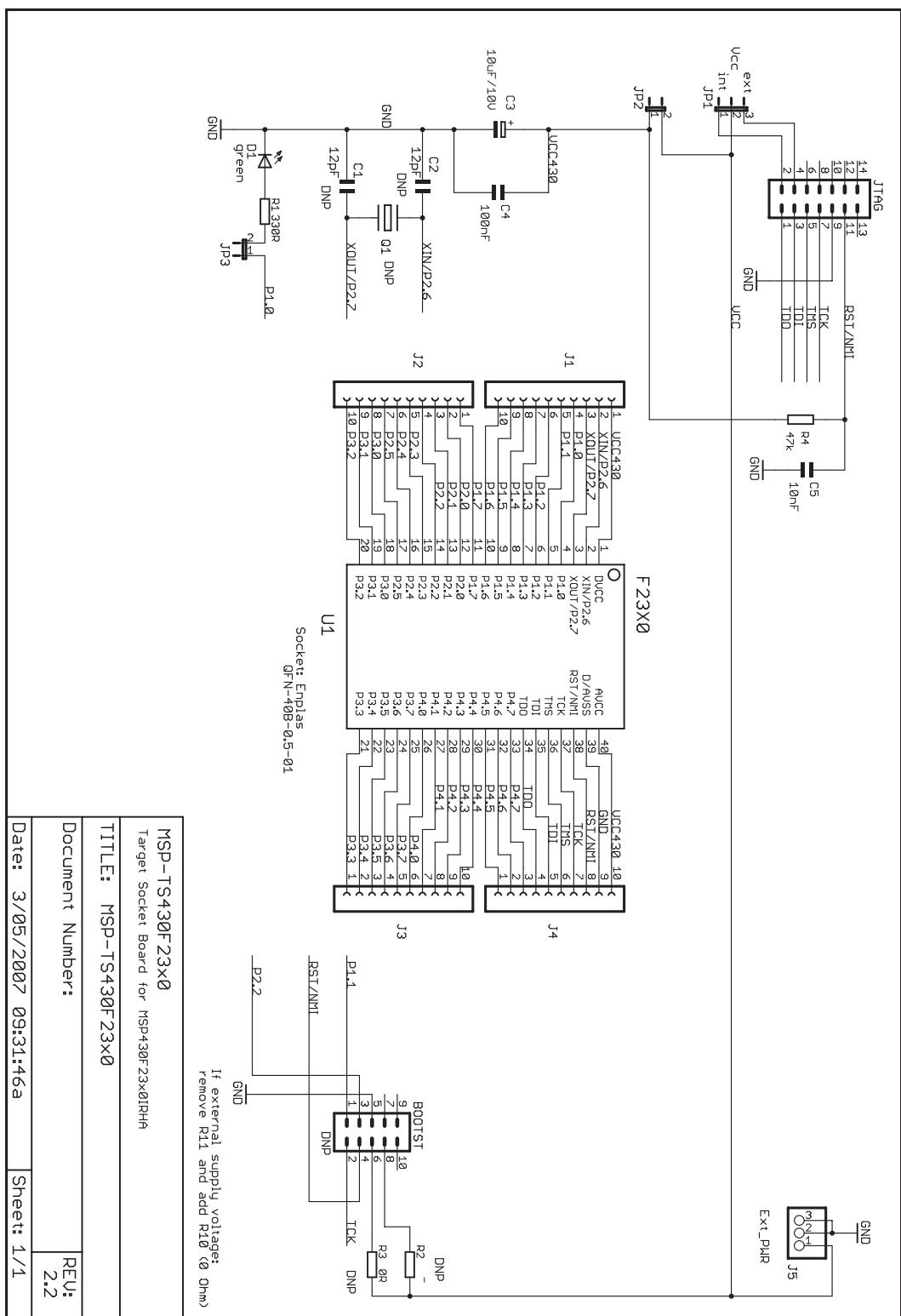


Figure B-17. MSP-TS430QFN23x0 Target Socket Module, Schematic

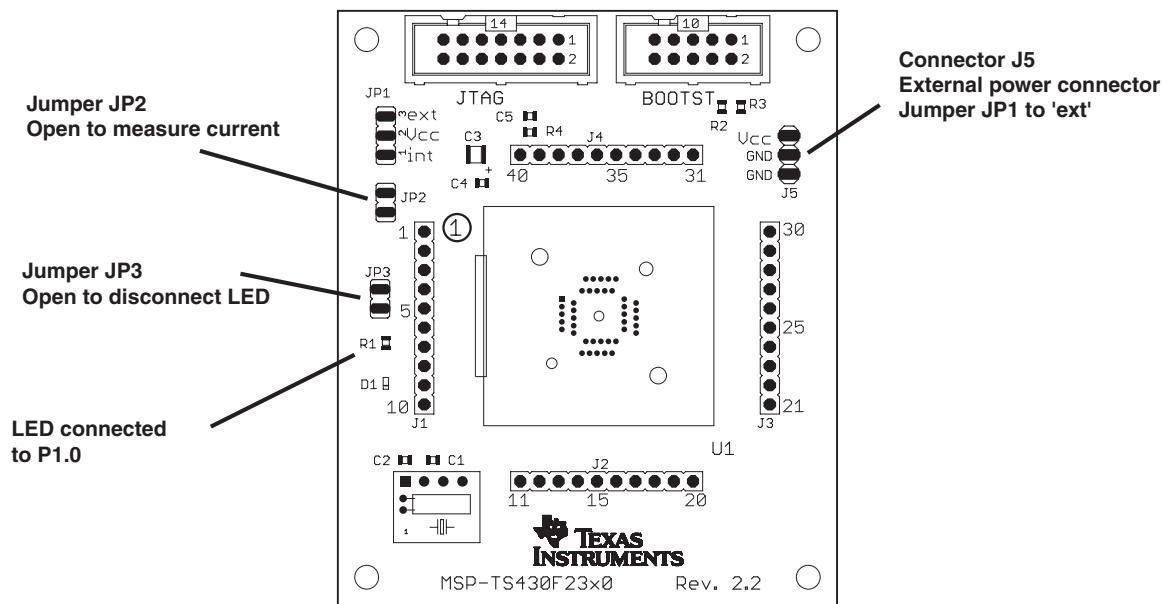


Figure B-18. MSP-TS430QFN23x0 Target Socket Module, PCB

Table B-10. MSP-TS430QFN23x0 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C3	1	10uF/10V, Tantal Size B	511-1463-2-ND	
3	C4	1	100nF, SMD0805	478-3351-2-ND	
4	C5	1	10nF, SMD0805	478-1383-2-ND	
5	D1	1	green LED, SMD0603	475-1056-2-ND	
6	J1, J2, J3, J4	0	10-pin header, TH	SAM1034-10-NDSAM1212-10-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
7	J5, JP1	2	3-pin header, male, TH	SAM1035-03-ND	Place jumper on header JP1; Pos 1-2.
8	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		3	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R1	1	330 Ω, SMD0805	541-330ATR-ND	
14	R2, R3	0	0 Ω, SMD0805	541-000ATR-ND	DNP
15	R4	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: QFN-40B-0.5-01		Manuf.: Enplas
17	PCB	1	79 x 66 mm		2 layers
18	Adhesive Plastic feet	4	~6mm width, 2mm height	e.g., 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430F2370IRHA		DNP: enclosed with kit supplied by TI

B.10 MSP-TS430RSB40

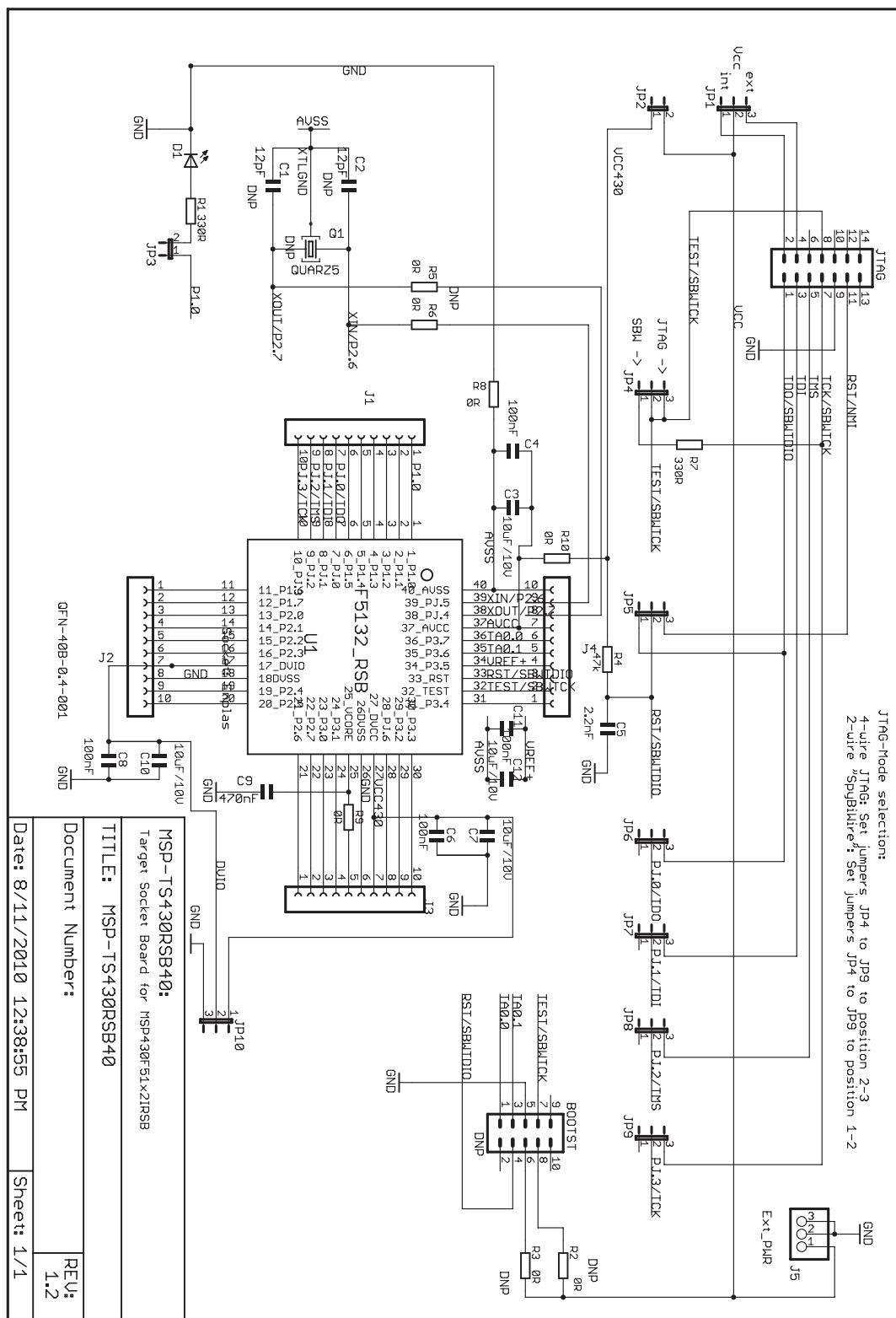


Figure B-19. MSP-TS430RSB40 Target Socket Module, Schematic

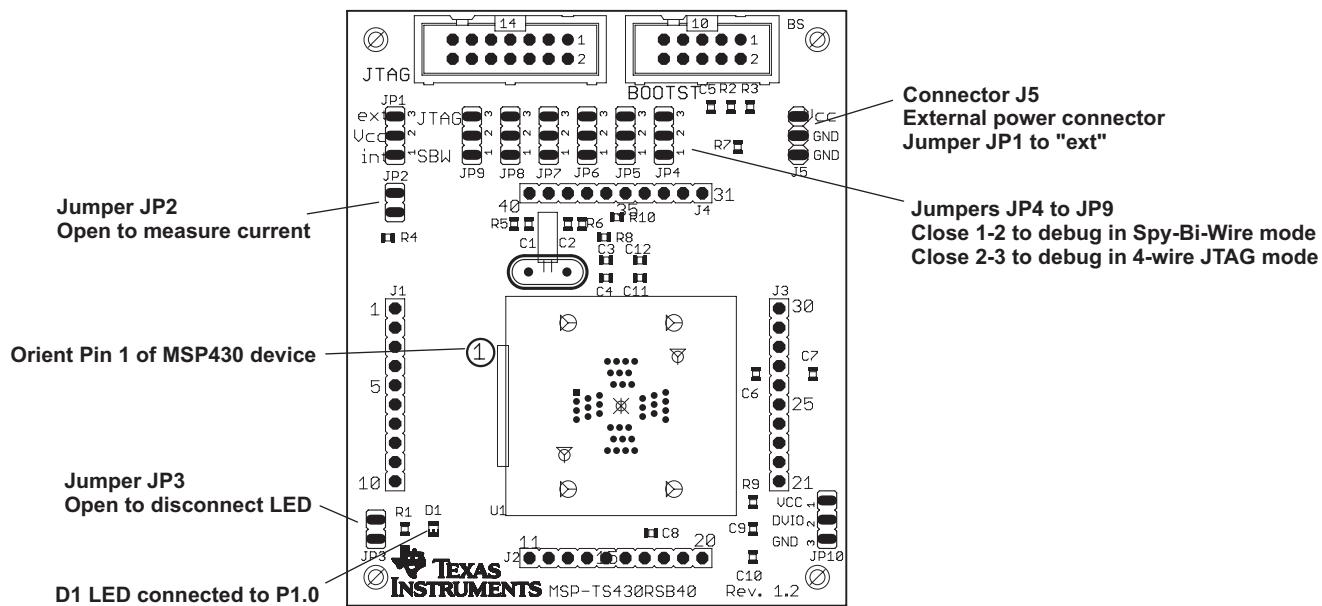


Figure B-20. MSP-TS430RSB40 Target Socket Module, PCB

Table B-11. MSP-TS430RSB40 Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
2	C3, C7, C10, C12	3	10uF/10V, SMD 0805	445-1371-1-ND	DNP C12
3	C4, C6, C8, C11	3	100nF, SMD0805	311-1245-2-ND	DNP C11
4	C5	1	2.2nF, SMD0805		
5	C9	1	470nF, SMD0805		
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	10-pin header, TH		DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
7.1		4	10-pin header, TH		DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	JP1, JP4,JP5, JP6, JP7, JP8, JP9, J5, JP10	9	3-pin header, male, TH	SAM1035-03-ND	Jumper: 1-2 on JP1, JP10; 2-3 on JP4-JP9
9	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP. Keep vias free of solder
12	U1	1	QFN-40B-0.4_ENPLAS_SOCKET	Enplas	
13	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1. Keep vias free of solder
15		10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
16	R1, R7	2	330R SMD0805		
17	R2, R3, R5, R6, R8, R9, R10	3	0R SMD0805		DNP R2, R3, R5, R6
18	R4	1	47k SMD0805		
19	MSP430	2	MSP430F5132		DNP: enclosed with kit. Is supplied by TI
20	Rubber stand off	4		select appropriate; e.g., Buerklin: 20H1724	apply to corners at bottom side

B.11 MSP-TS430RHA40A

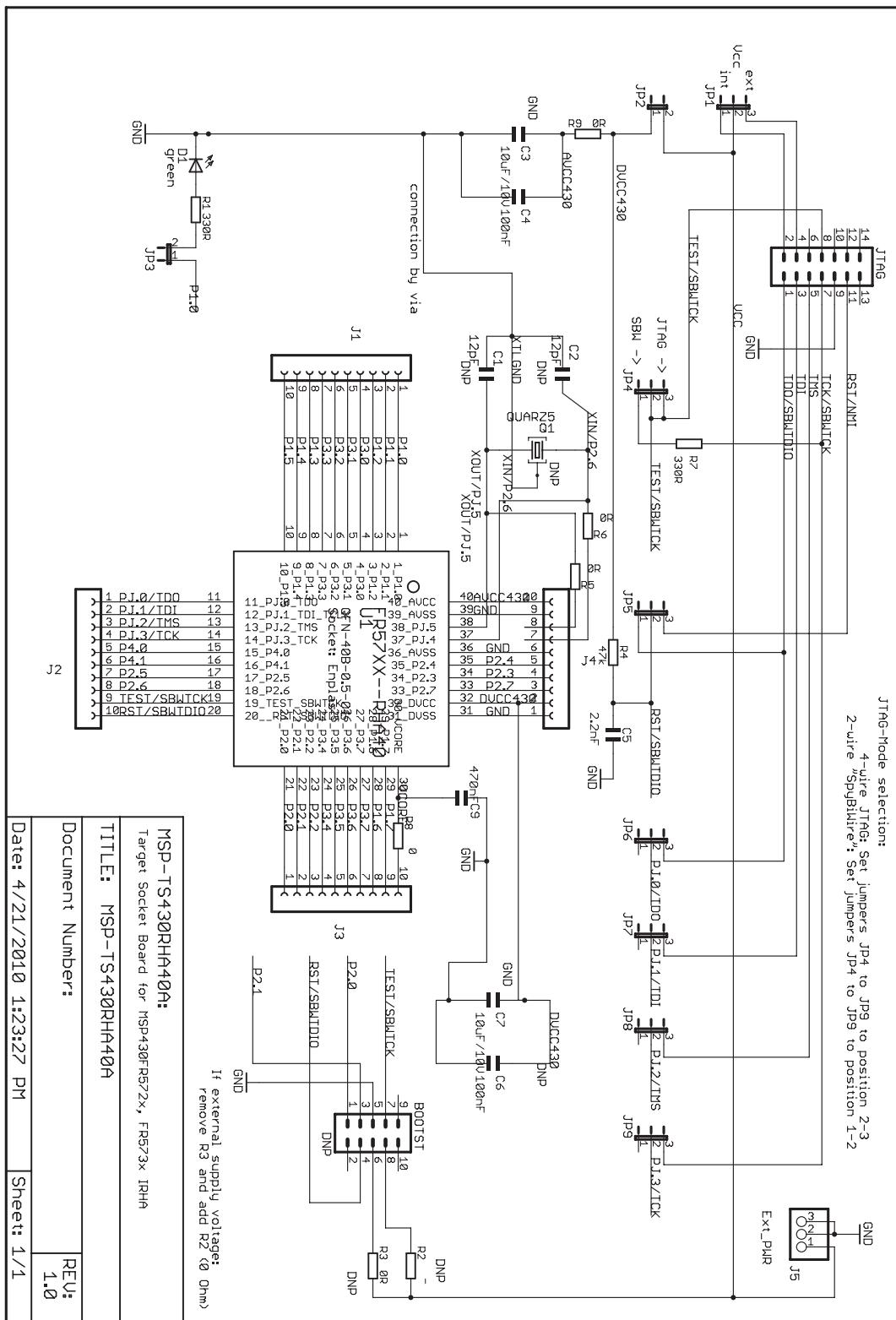


Figure B-21. MSP-TS430RHA40A Target Socket Module, Schematic

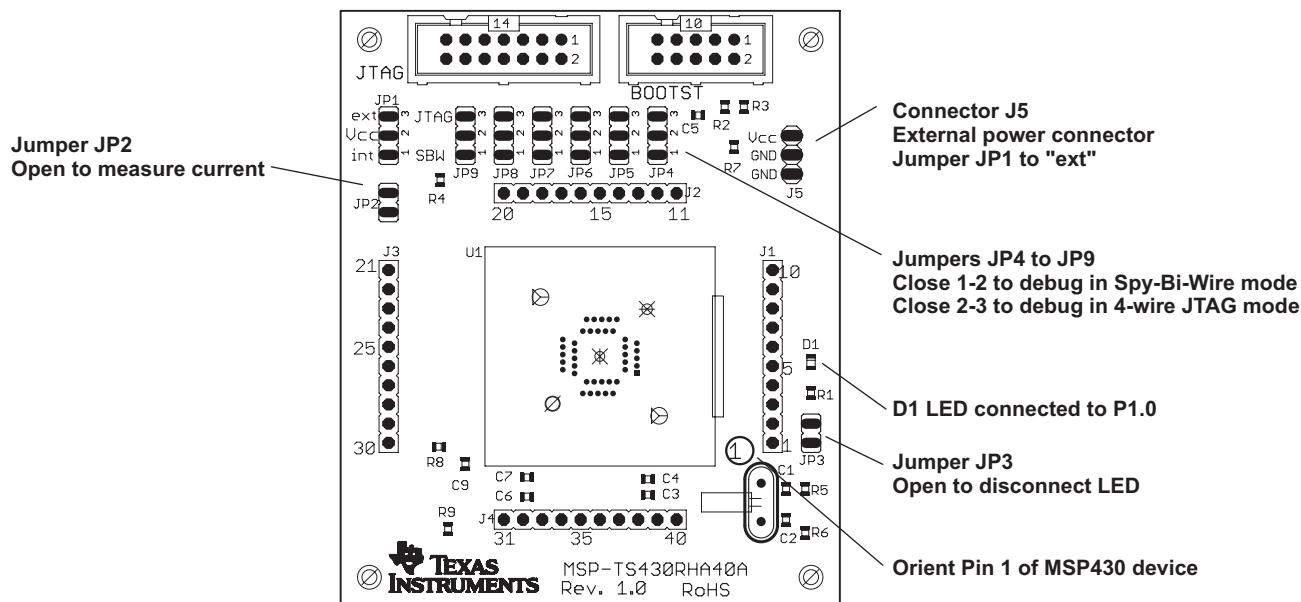


Figure B-22. MSP-TS430RHA40A Target Socket Module, PCB

Table B-12. MSP-TS430RHA40A Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
2	C5	0	2.2nF, SMD0805		DNP C12
3	C3, C7	2	10uF/10V, SMD0805 5		DNP C11
4	C4, C6	2	100nF, SMD0805	478-3351-2-ND	
5	C9	1	470nF, SMD0805		
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	10-pin header, TH		DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
7.1		4	10-pin header, TH		DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J5, JP1, JP4, JP5, JP6, JP7, JP8, JP9	8	3-pin header, male, TH	SAM1035-03-ND	Place jumper on 1-2 of JP4-JP9; Place on 1-2 on JP1
9	JP2, JP3	2	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
10		9	Jumper	15-38-1024-ND	see Pos 8 an 9
11	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
12	BOOTST	0	10-pin connector, male, TH		DNP. Keep vias free of solder
13	U1	1	Socket: QFN-40B-0.5-01		Manuf.: Enplas
14	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1. Keep vias free of solder
15	R1,R7	2	330R SMD0805	541-330ATR-ND	
16	R2, R3, R5, R6, R8, R9,	2	0 Ohm, SMD0805	541-000ATR-ND	DNP:R2, R3, R5, R6
17	R4	1	47k SMD0805		
18	PCB	1	79 x 66 mm		2 layers
19	Rubber stand off	4		select appropriate; e.g., Buerklin: 20H1724	apply to corners at bottom side
20	MSP430	2	MSP430N5736IRHA		DNP: enclosed with kit. Is supplied by TI

B.12 MSP-TS430DL48

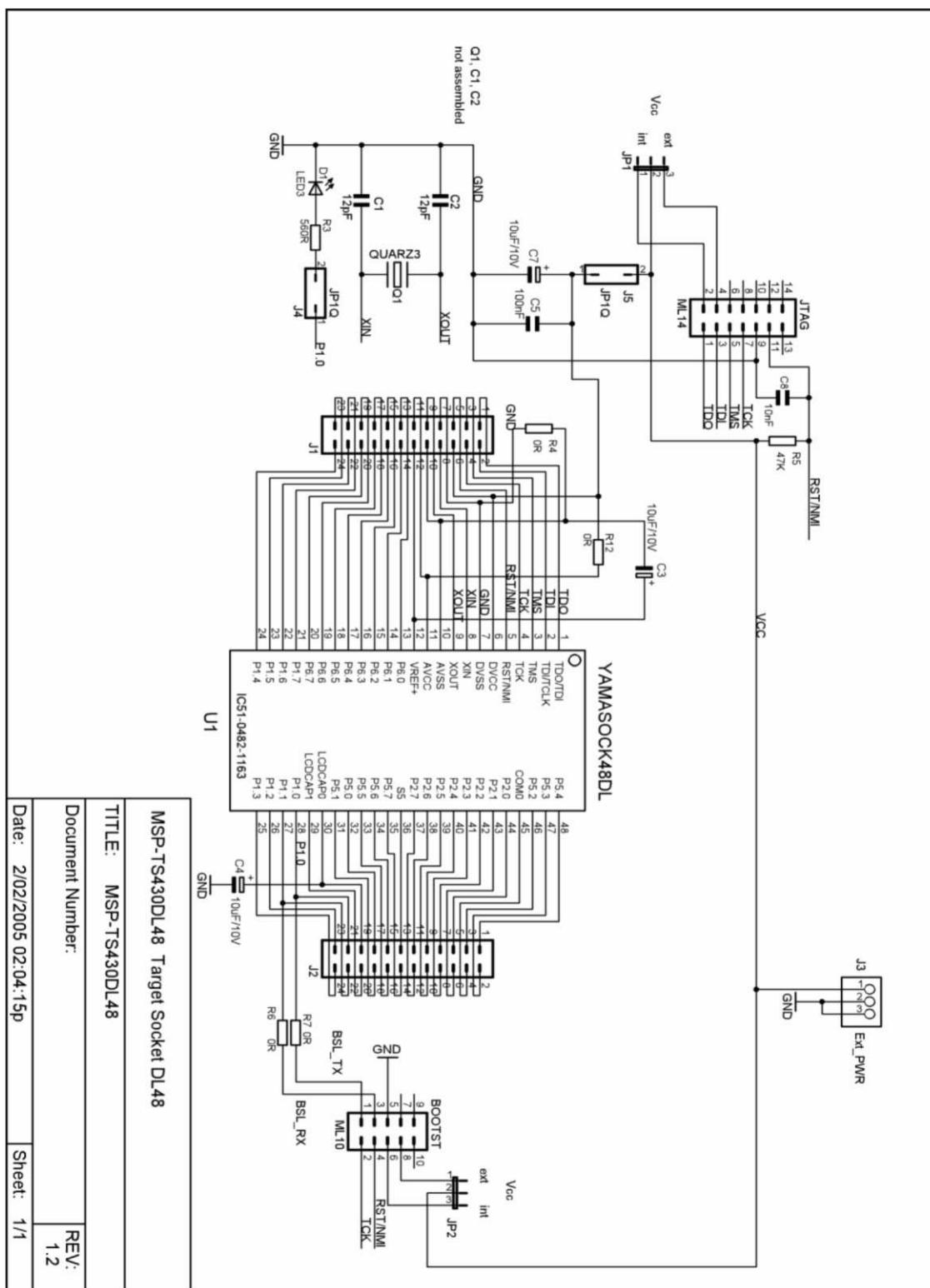


Figure B-23. MSP-TS430DL48 Target Socket Module, Schematic

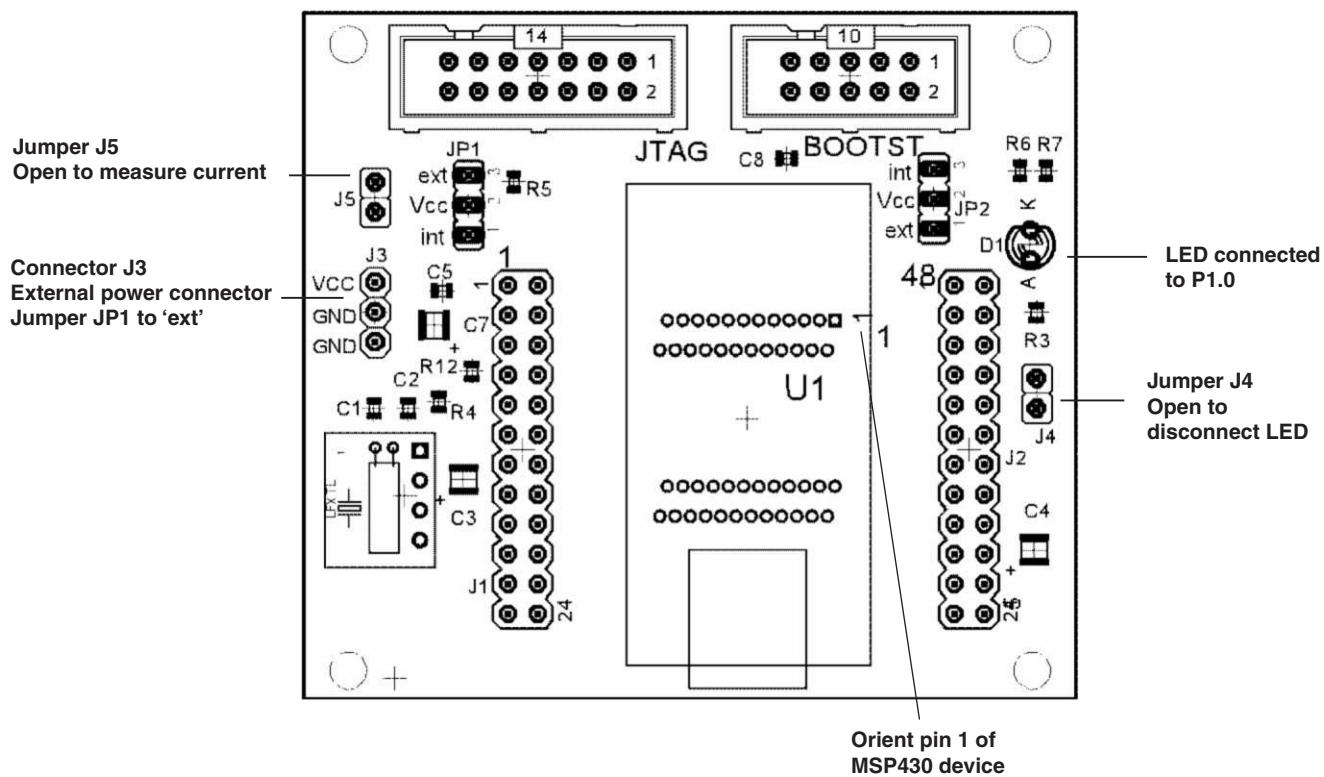


Figure B-24. MSP-TS430DL48 Target Socket Module, PCB

Table B-13. MSP-TS430DL48 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C4, C7	2	10uF/10V, Tantal Size B	511-1463-2-ND	
3	C3, C5	2	100nF, SMD0805	478-3351-2-ND	
4	C8	1	10nF, SMD0805	478-1383-2-ND	
5	D1	1	yellow LED, TH, 3mm, T1	511-1251-ND	
6	J1, J2	0	24-pin header, TH	SAM1034-12-NDSAM1212-12-ND	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
7	J3, JP1, JP2	2	3-pin header, male, TH	SAM1035-03-ND	Place jumper on header JP1; Pos 1-2. DNP: JP2
8	J4, J5	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		3	Jumper	15-38-1024-ND	Place on: JP1, J4, J5
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R3	1	560 Ω, SMD0805	541-560ATR-ND	
14	R4, R6, R7, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R6, R7
15	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: IC51-1387 KS-15186		Manuf.: Yamaichi
17	PCB	1	58 x 66 mm		2 layers
18	Adhesive Plastic feet	4	~6mm width, 2mm height	e.g., 3M Bumpers Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430F4270IDL		DNP: Enclosed with kit supplied by TI

B.13 MSP-TS430RGZ48B

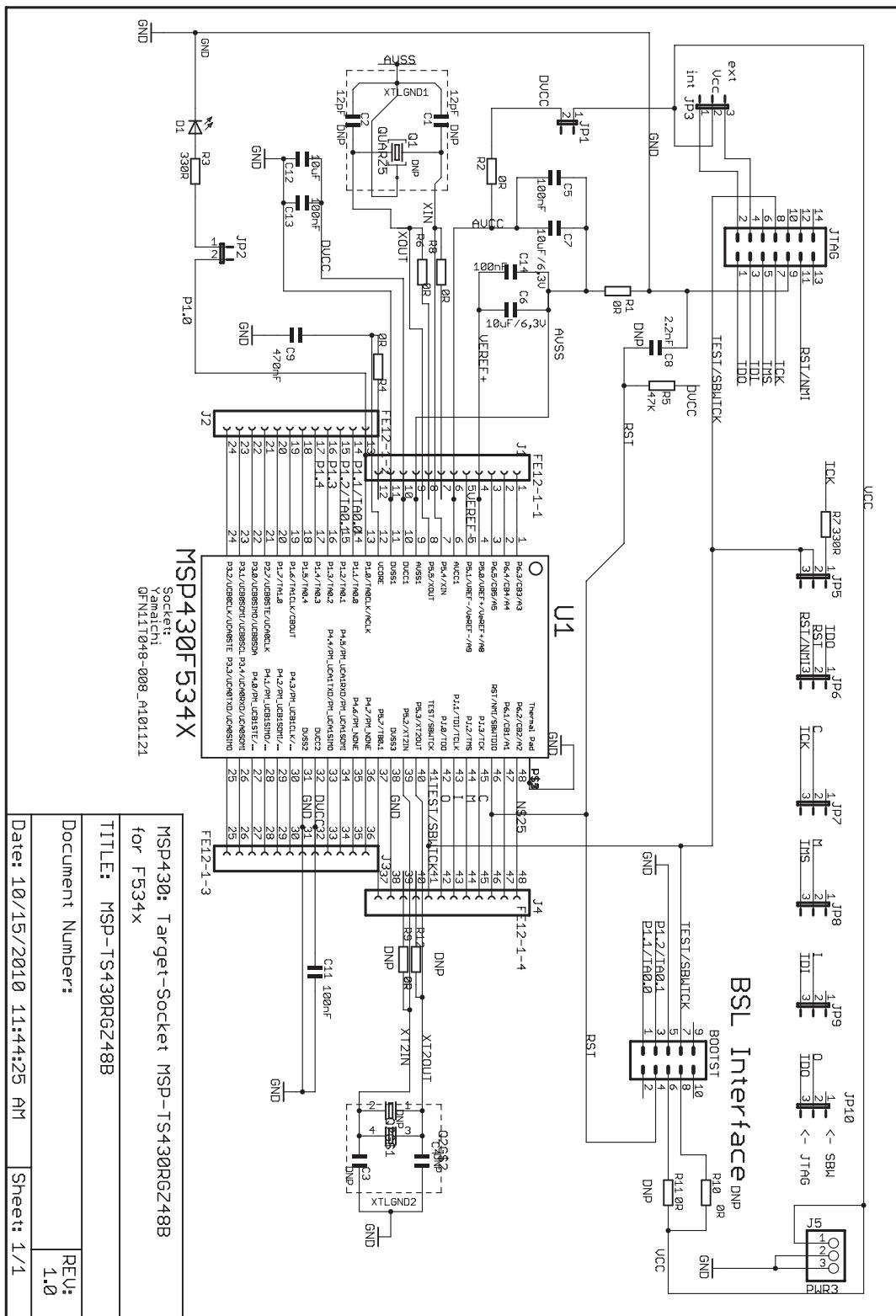


Figure B-25. MSP-TS430RGZ48B Target Socket Module, Schematic

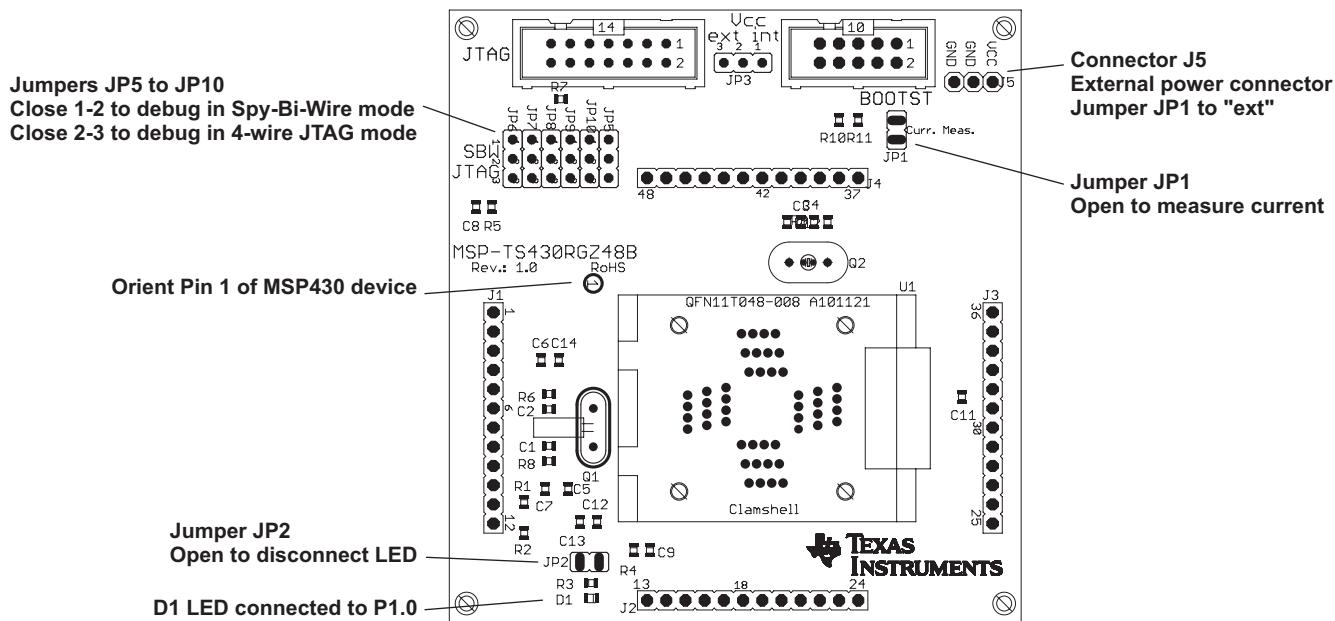
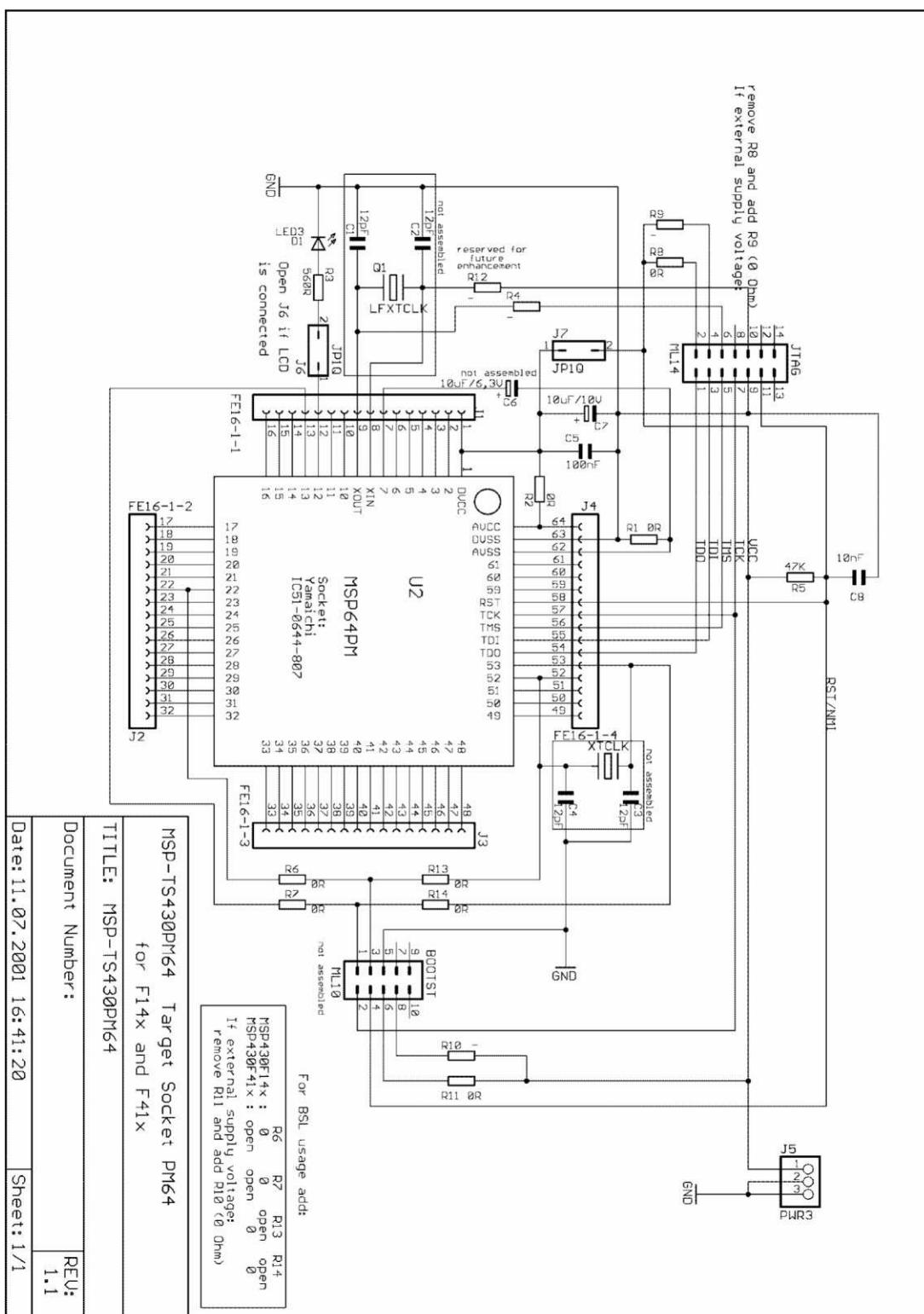


Figure B-26. MSP-TS430RGZ48B Target Socket Module, PCB

Table B-14. MSP-TS430RGZ48B Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C3, C4	0	47pF, SMD0805		DNP
3	C6, C7, C12	3	10uF/6.3V, SMD0805		
4	C5, C11, C13, C14	4	100nF, SMD0805	311-1245-2-ND	
5	C8	1	2.2nF, SMD0805		
6	C9	1	470nF, SMD0805	478-1403-2-ND	
7	D1	1	green LED, SMD0805	P516TR-ND	
8	J1, J2, J3, J4	0	12-pin header, TH	SAM1029-12-ND (Header) SAM1213-12-ND (Receptacle)	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder:
9	J5	1	3-pin header, male, TH		
10	JP3, JP5, JP6, JP7, JP8, JP9, JP10	7	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3 on JP5, JP6, JP7, JP8, JP9, JP10 place jumpers on pins 1-2 on JP3,
11	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
12		9	Jumper	15-38-1024-ND	See Pos. 10and Pos. 11
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	BOOTST	0	10-pin connector, male, TH		"DNP Keep vias free of solder"
15	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder
16	Q2	0	Crystal	Q2: 4MHz Buerklin: 78D134	DNP: Q2 Keep vias free of solder
17	Insulating disk to Q2	0	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.08.121	
18	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
19	R1, R2, R4, R6, R8, R9,R10, R11, R12	3	0 Ohm, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R10, R11,R12
20	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
21	U1	1	Socket: QFN11T048-008_A101121_RGZ48		Manuf.: Yamaichi
22	PCB	1	81 x 76 mm		2 layers
23	Adhesive plastic feet	4	about 6mm width, 2mm height	e.g., 3M Bumpers Part No. SJ-5302	Apply to corners at bottom side
24	MSP430	2	MSP430F5342IRGZ		DNP: enclosed with kit, supplied by TI

B.14 MSP-TS430PM64



NOTE: Connections between the JTAG header and pins XOUT and XIN are no longer required and should not be made.

Figure B-27. MSP-TS430PM64 Target Socket Module, Schematic

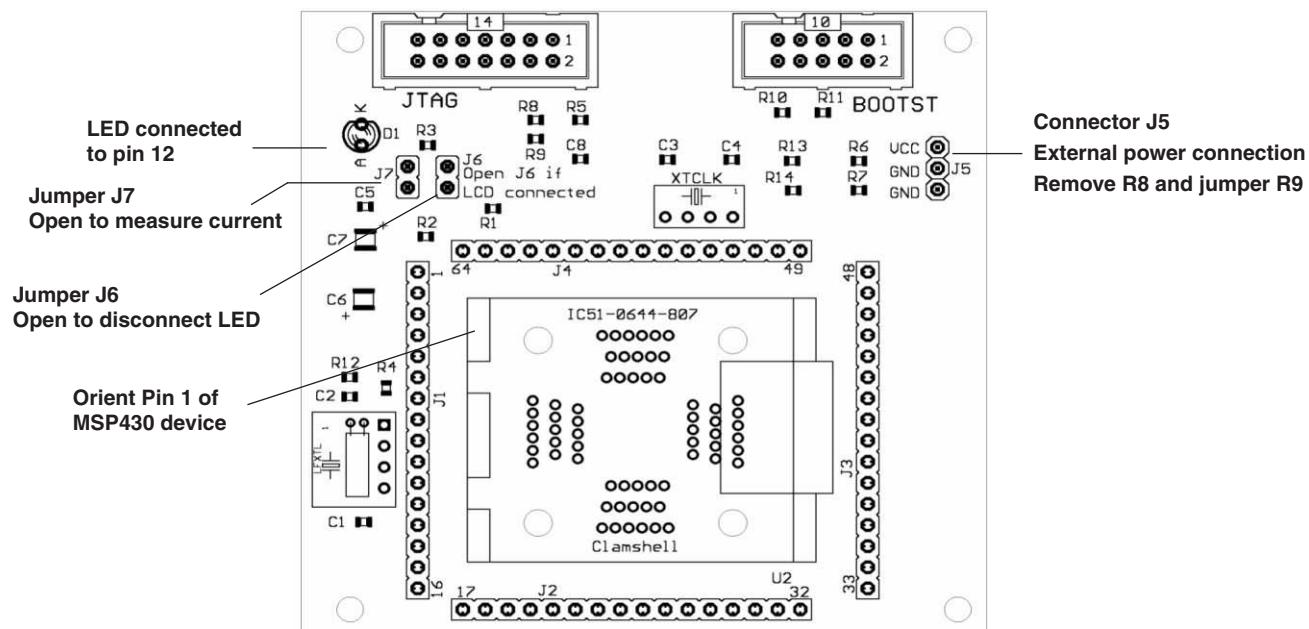


Figure B-28. MSP-TS430PM64 Target Socket Module, PCB

Table B-15. MSP-TS430PM64 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
1.1	C3, C4	0	47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C6, C7	1	10uF/10V, Tantal Size B	511-1463-2-ND	DNP: C6
3	C5	1	100nF, SMD0805	478-3351-2-ND	
4	C8	1	10nF, SMD0805	478-1383-2-ND	
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	0	16-pin header, TH	SAM1029-16-NDSAM1213-16-ND	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	J6, J7	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
11		2	Jumper	15-38-1024-ND	Place on: J6, J7
12	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
13	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
14	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
15	R3	1	330 Ω, SMD0805	541-330ATR-ND	
16	R1, R2, R4, R6, R7, R8, R9, R10, R11, R12, R13, R14	3	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R7, R9, R10, R11, R12, R13, R14
17	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
18	U1	1	Socket: IC51-0644-807		Manuf.: Yamaichi
19	PCB	1	78 x 75 mm		2 layers
20	Rubber standoff	4		select appropriate	Apply to corners at bottom side
21	MSP430	22	MSP430F2619IPM MSP430F417IPM		DNP: Enclosed with kit supplied by TI

B.15 MSP-TS430PM64A

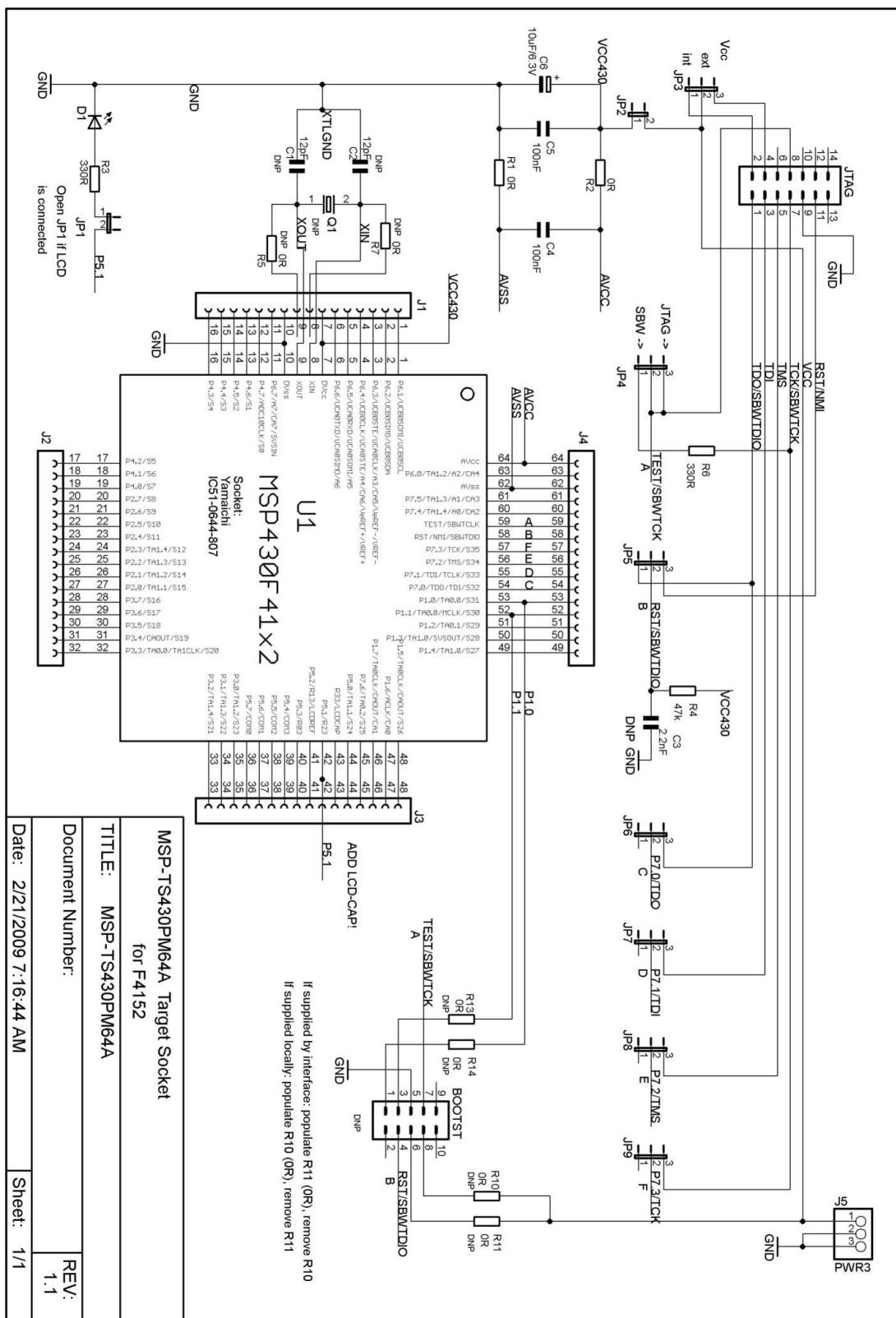


Figure B-29. MSP-TS430PM64A Target Socket Module, Schematic

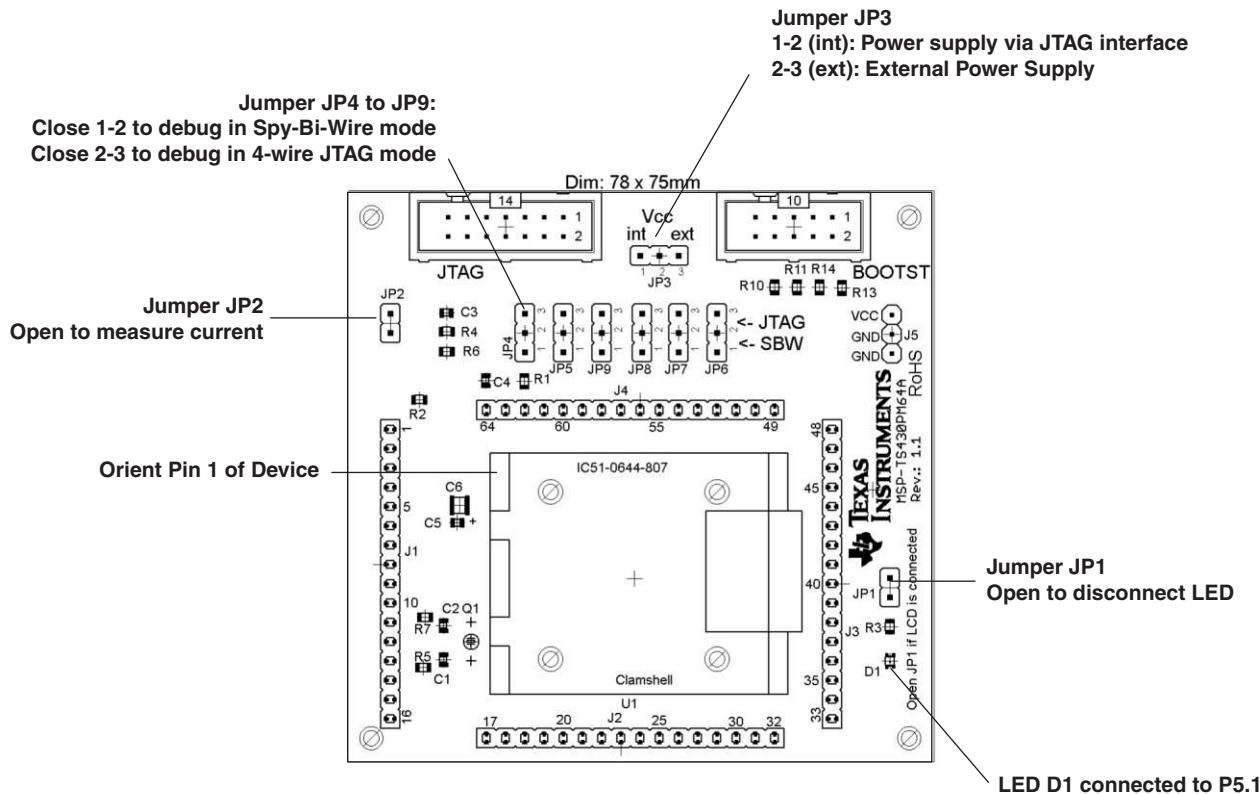


Figure B-30. MSP-TS430PM64A Target Socket Module, PCB

Table B-16. MSP-TS430PM64A Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2,	0	12pF, SMD0805		DNP
2	C3	0	2.2nF, SMD0805		DNP
3	C6,	1	10uF/10V, Tantal Size B	511-1463-2-ND	
4	C4, C5	2	100nF, SMD0805	478-3351-2-ND	
5	D1	1	green LED, SMD0805	P516TR-ND	
6	J1, J2, J3, J4	0	16-pin header, TH	SAM1029-16-NDSAM1213-16-ND	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
7	J5, JP3, JP4, JP5, JP6, JP7, JP8, JP9	8	3-pin header, male, TH	SAM1035-03-ND	
8	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		2	Jumper	15-38-1024-ND	Place on: J6, J7
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R3, R6	2	330 Ω, SMD0805	541-330ATR-ND	
14	R1, R2, R5, R7, R9, R10, R11, R13, R14	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R5, R7, R9, R10, R11, R13, R14
15	R4	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: IC51-0644-807		Manuf.: Yamaichi
17	PCB	1	78 x 75 mm		4 layers
18	Rubber stand off	4		select appropriate	Apply to corners at bottom side
19	MSP430	2	MSP430F4152IPM		DNP: Enclosed with kit supplied by TI

B.16 MSP-TS430RGC64B

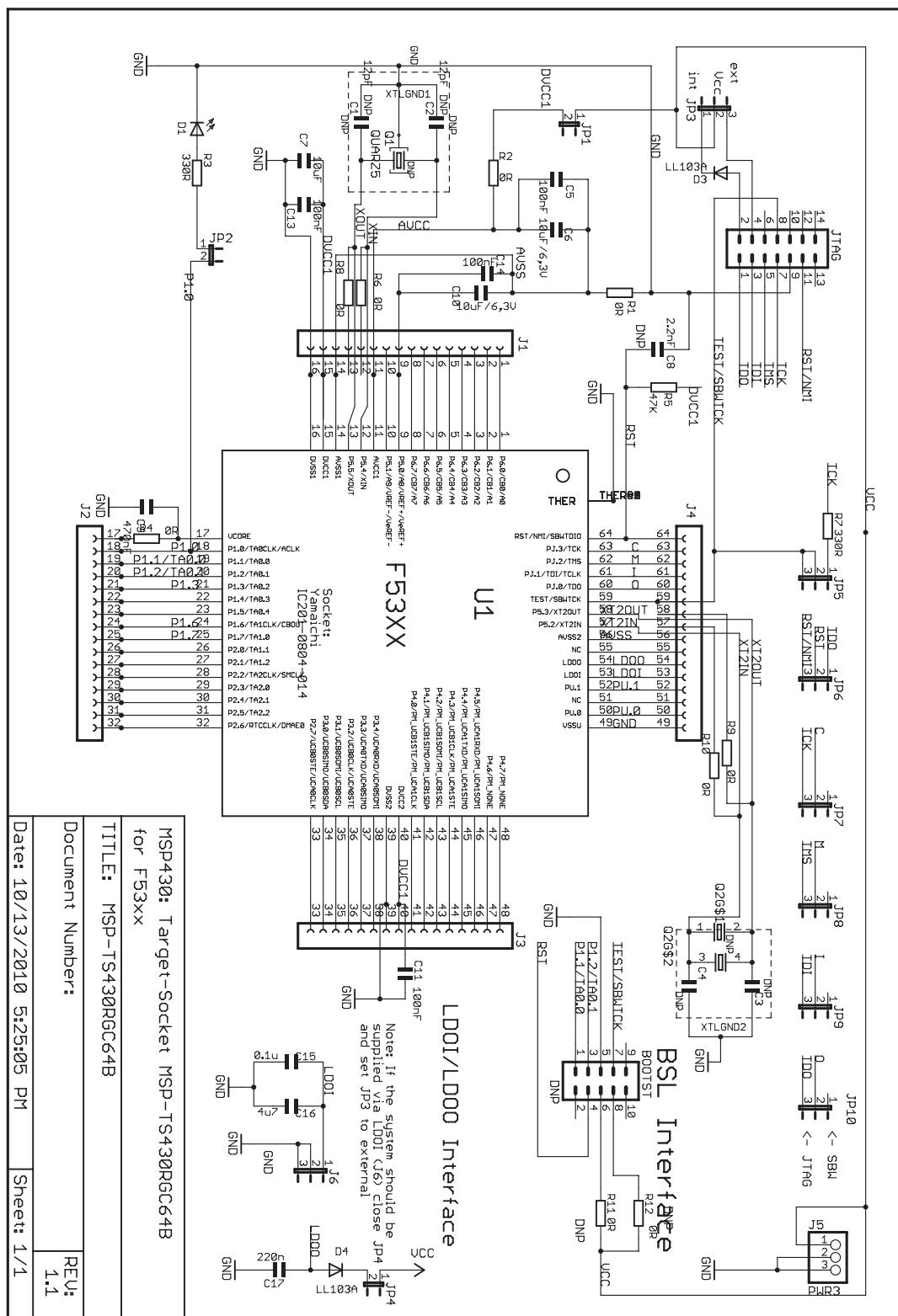


Figure B-31. MSP-TS430RGC64B Target Socket Module, Schematic

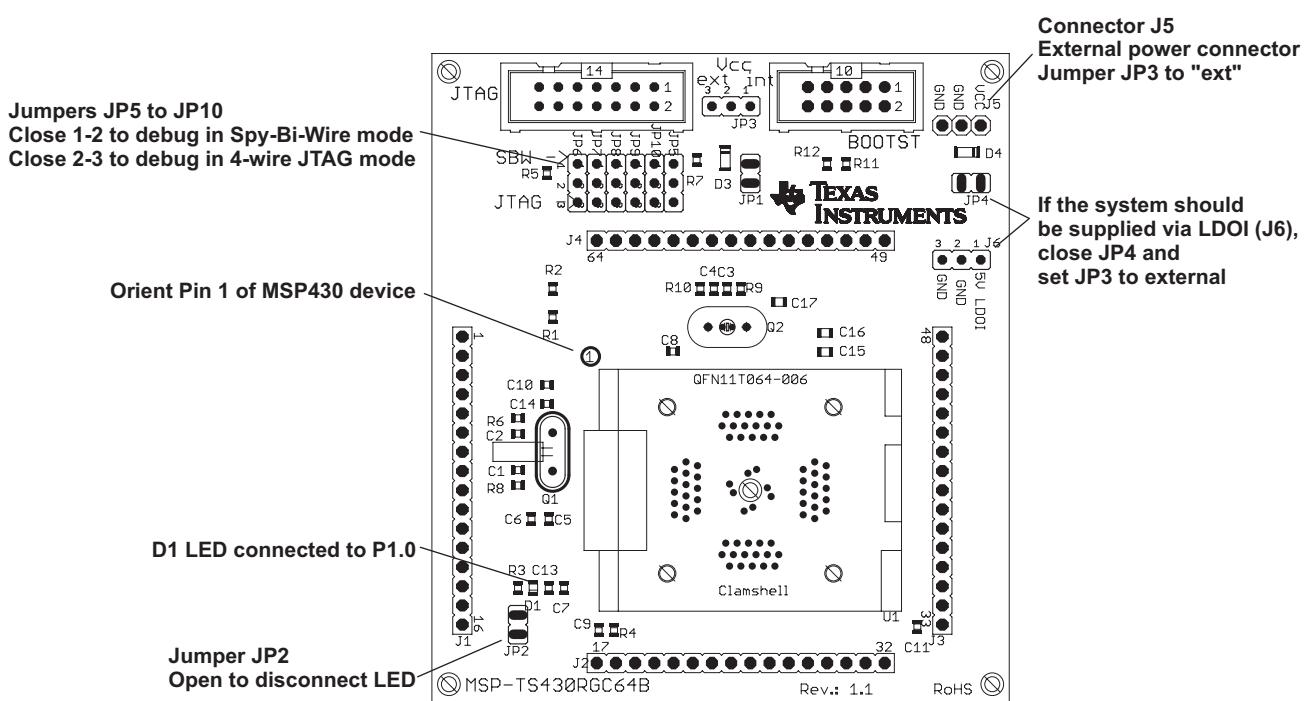


Figure B-32. MSP-TS430RGC64B Target Socket Module, PCB

Table B-17. MSP-TS430RGC64B Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C3, C4	0	47pF, SMD0805		DNP
3	C6, C7, C10	3	10uF/6.3V, SMD0805		
4	C5, C11, C13, C14, C15	5	100nF, SMD0805	311-1245-2-ND	
5	C8	1	2.2nF, SMD0805		
6	C9	1	470nF, SMD0805	478-1403-2-ND	
7	C16	1	4.7uF, SMD0805		
8	C17	1	220nF, SMD0805		
9	D1	1	green LED, SMD0805	P516TR-ND	
10	J1, J2, J3, J4	0	16-pin header, TH	SAM1029-16-ND (Header) SAM1213-16-ND (Receptacle)	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder:
11	J5 , J6	2	3-pin header, male, TH		
12	JP3, JP5, JP6, JP7, JP8, JP9, JP10	7	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3 on JP5, JP6, JP7, JP8, JP9, JP10 place jumpers on pins 1-2 on JP3,
13	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
14		10	Jumper	15-38-1024-ND	See Pos. 12 and Pos. 13
15	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
16	BOOTST	0	10-pin connector, male, TH		"DNP Keep vias free of solder"
17	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder
18	Q2	0	Crystal	Q2: 4MHz Buerklin: 78D134	DNP: Q2 Keep vias free of solder
19	Insulating disk to Q2	0	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_NUM=70.08.121	
20	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
21	R1, R2, R4, R6, R8, R9,R10, R11, R12	3	0 Ohm, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R10, R11,R12
22	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
23	U1	1	Socket: QFN11T064-006-N-HSP		Manuf.: Yamaichi
24	PCB	1	85 x 76 mm		2 layers
25	Adhesive plastic feet	4	about 6mm width, 2mm height	e.g., 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
26	D3,D4				
27	MSP430	2	MSP430F5310 RGC		DNP: enclosed with kit, supplied by TI

B.17 MSP-TS430RGC64USB

Due to the use of diodes in the power chain, the voltage on the MSP430F5xx device is approximately 0.3 V lower than is set by the debugging tool. Set the voltage in the IDE to 0.3 V higher than desired; for example, to run the MCU at 3.0 V, set it to 3.3 V.

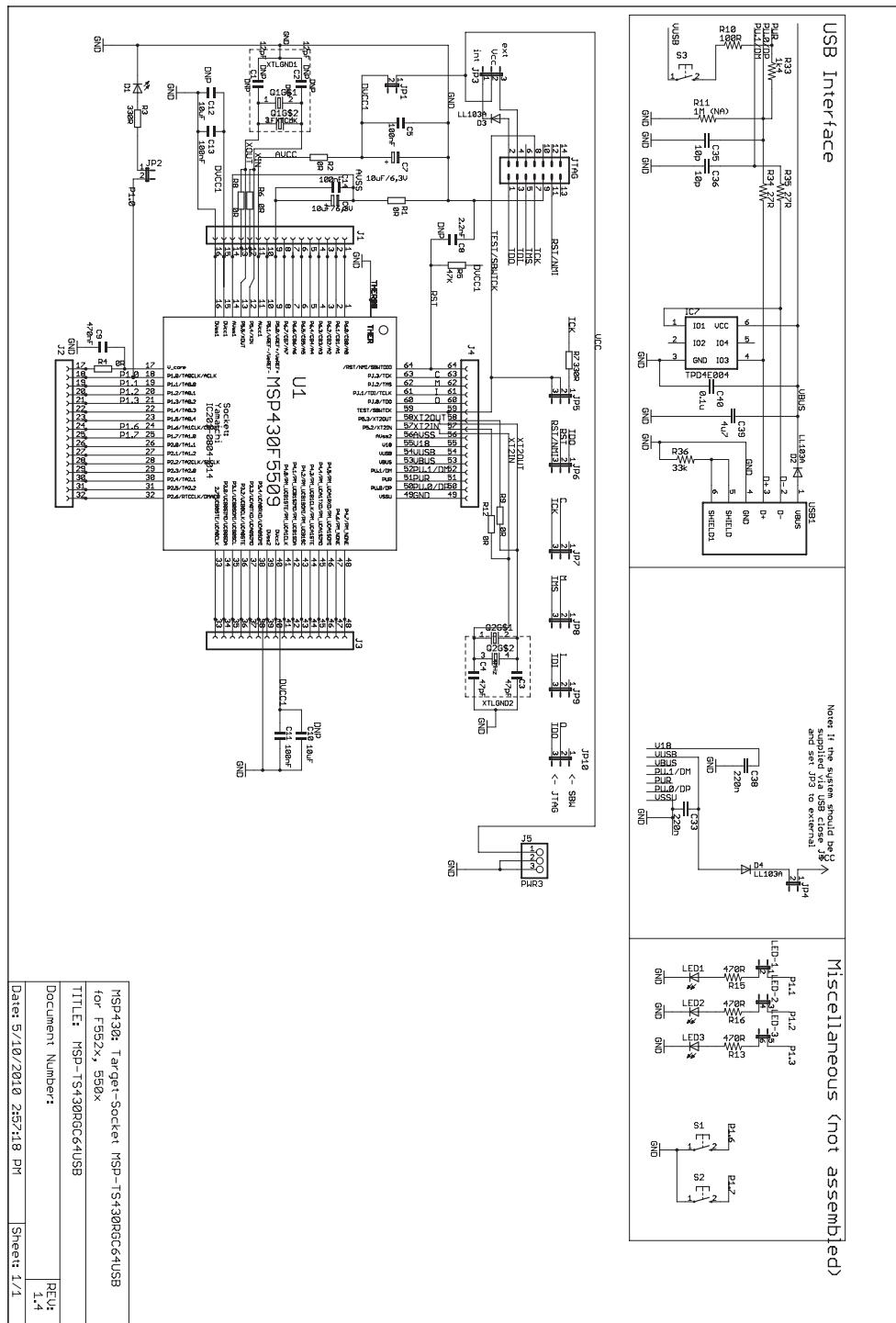


Figure B-33. MSP-TS430RGC64USB Target Socket Module, Schematic

MSP430 Target-Socket MSP-TS430RGC64USB
for F552x, 550x
Title: MSP-TS430RGC64USB
Document Number:
Date: 5/10/2010 2:57:18 PM | Sheet: 1/1
REU: 1.4

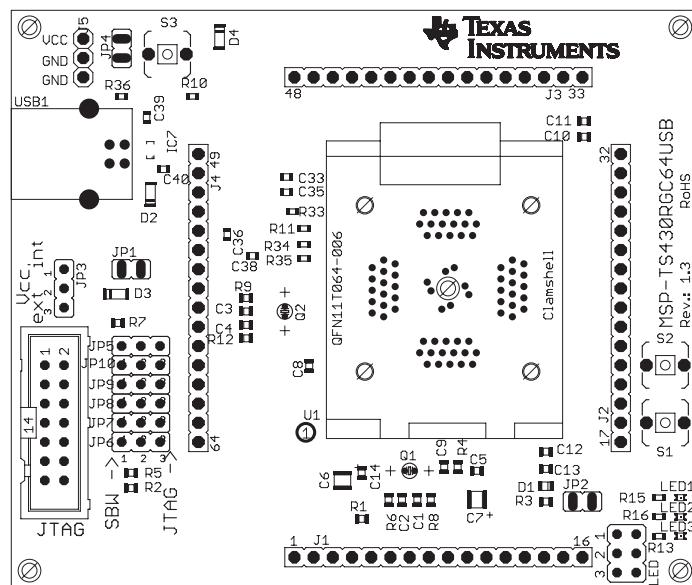


Figure B-34. MSP-TS430RGC64USB Target Socket Module, PCB

Table B-18. MSP-TS430RGC64USB Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
1.1	C3, C4	2	47pF, SMD0805		
2	C6, C7	2	10uF/6.3V, Tantal Size B	511-1463-2-ND	
3	C5, C11, C13, C14	4	100nF, SMD0805	311-1245-2-ND	
3.1	C10, C12	0	10uF, SMD0805		DNP: C10, C12
4	C8	1	2.2nF, SMD0805		
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	16-pin header, TH	SAM1029-16-ND SAM1213-16-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	JP5, JP6, JP7, JP8, JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3
10	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	place jumper on pins 1-2
12		10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	Q1	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder"
15	Q2	1	Crystal	Q2: 4MHz Buerklin: 78D134	
16	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R8, R9, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R8, R9, R12
18	R10	1	100 Ω, SMD0805	Buerklin: 07E500	
18	R11	1	1M Ω, SMD0805		
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket: QFN11T064-006		Manuf.: Yamaichi
20	PCB	1	79 x 77 mm		2 layers
21	Rubber stand off	4		Buerklin: 20H1724	apply to corners at bottom side
22	MSP430	2	MSP430F5509 RGC		DNP: enclosed with kit. Is supplied by TI
23	Insulating disk to Q2	1	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.0 8.121	
27	C33	1	220n SMD0603	Buerklin: 53D2074	
28	C35	1	10p SMD0603	Buerklin: 56D102	
29	C36	1	10p SMD0603	Buerklin: 56D102	
30	C38	1	220n SMD0603	Buerklin: 53D2074	
31	C39	1	4u7 SMD0603	Buerklin: 53D2086	
32	C40	1	0.1u SMD0603	Buerklin: 53D2068	
33	D2, D3, D4	3	LL103A	Buerklin: 24S3406	

Table B-18. MSP-TS430RGC64USB Bill of Materials (continued)

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
34	IC7	1	TPD4E004		Manu: TI
36	LED	0	JP3QE	SAM1032-03-ND	DNP
37	LED1	0	LEDCHIPLED_0603	FARNELL: 852-9833	DNP
38	LED2	0	LEDCHIPLED_0603	FARNELL: 852-9868	DNP
39	LED3	0	LEDCHIPLED_0603	FARNELL: 852-9841	DNP
40	R13, R15, R16	0	470R	Buerklin: 07E564	DNP
41	R33	1	1k4 / 1k5	Buerklin: 07E612	
42	R34	1	27R	Buerklin: 07E444	
43	R35	1	27R	Buerklin: 07E444	
44	R36	1	33k	Buerklin: 07E740	
45	S1	0	PB	P12225STB-ND	DNP
46	S2	0	PB	P12225STB-ND	DNP
46	S3	1	PB	P12225STB-ND	
47	USB1	1	USB_RECEPACLE	FARNELL: 117-7885	

B.18 MSP-TS430PN80

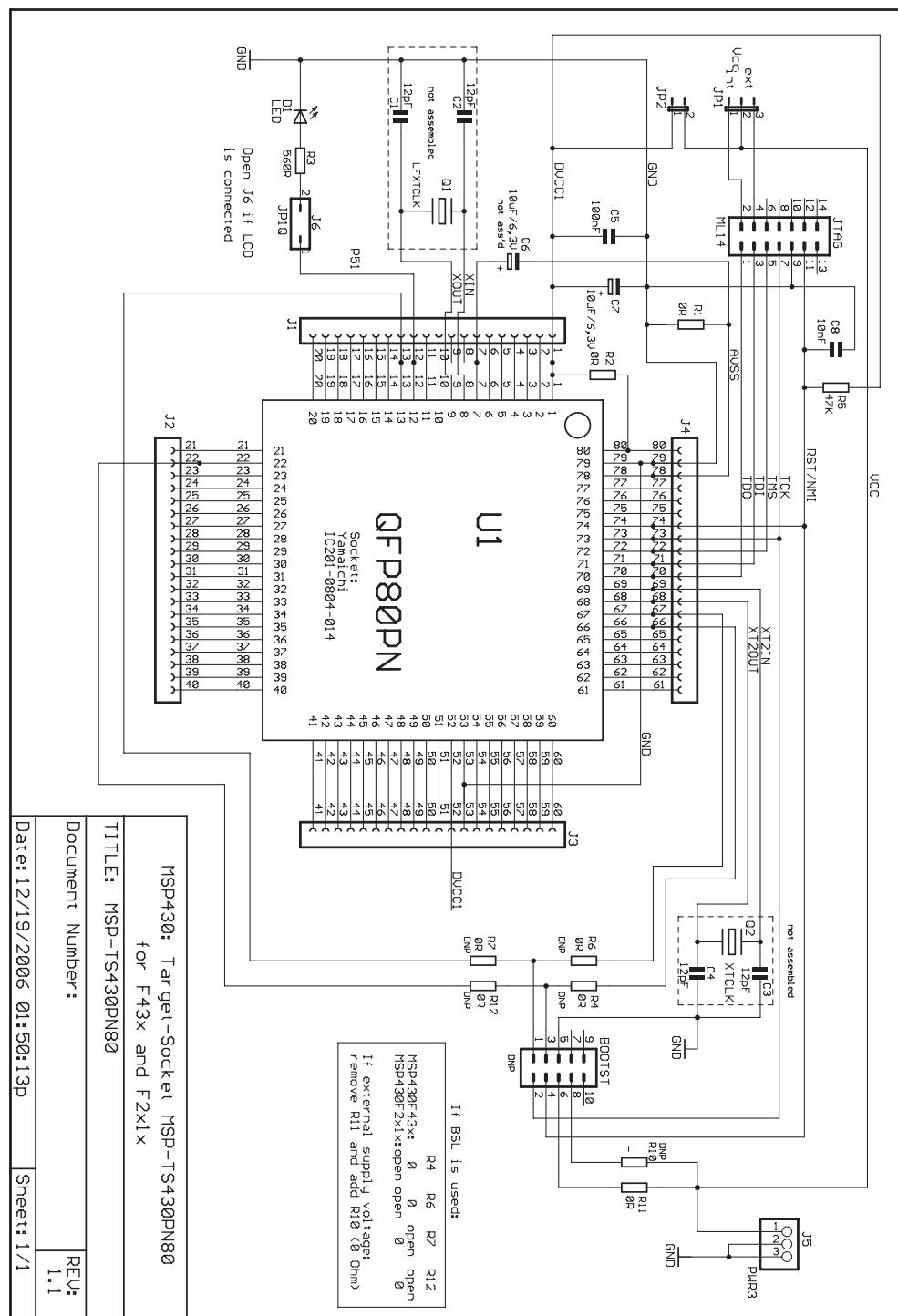


Figure B-35. MSP-TS430PN80 Target Socket Module, Schematic

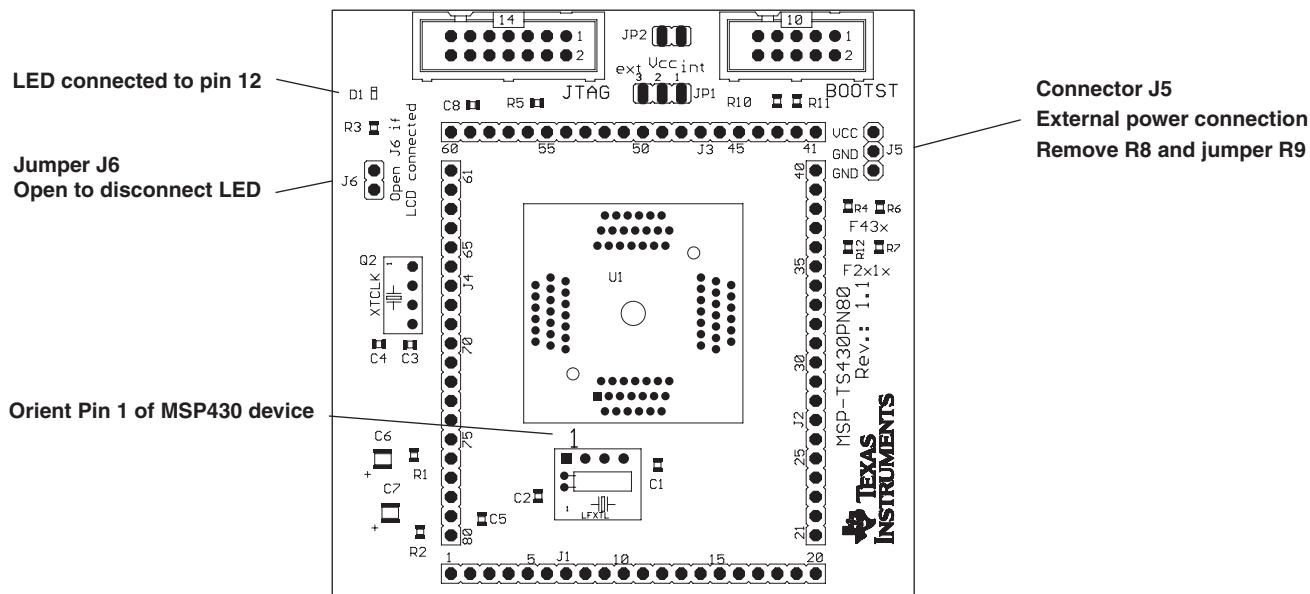


Figure B-36. MSP-TS430PN80 Target Socket Module, PCB

Table B-19. MSP-TS430PN80 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
1.1	C3, C4	0	47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C6, C7	1	10uF/10V, Tantal Size B	511-1463-2-ND	
3	C5	1	100nF, SMD0805	478-3351-2-ND	
4	C8	1	10nF, SMD0805	478-1383-2-ND	
5	D1	1	green LED, SMD0603	475-1056-2-ND	
6	J1, J2, J3, J4	0	25-pin header, TH	SAM1029-20-NDSAM1213-20-ND	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
7	J5, JP1	2	3-pin header, male, TH	SAM1035-03-ND	
8	J6, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
9		3	Jumper	15-38-1024-ND	Place on: J6, JP2, JP1/Pos1-2
10	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
11	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
12	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
13	R3	1	560 Ω, SMD0805	541-560ATR-ND	
14	R1, R2, R4, R6, R7, R10, R11, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R7, R10, R11, R12
15	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
16	U1	1	Socket: IC201-0804-014		Manuf.: Yamaichi
17	PCB	1	77 x 77 mm		2 layers
18	Adhesive Plastic feet	4	~6mm width, 2mm height	e.g., 3M Bumpers Part No. SJ-5302	Apply to corners at bottom side
19	MSP430	2	MSP430FG439IPN		DNP: Enclosed with kit supplied by TI

B.19 MSP-TS430PN80A

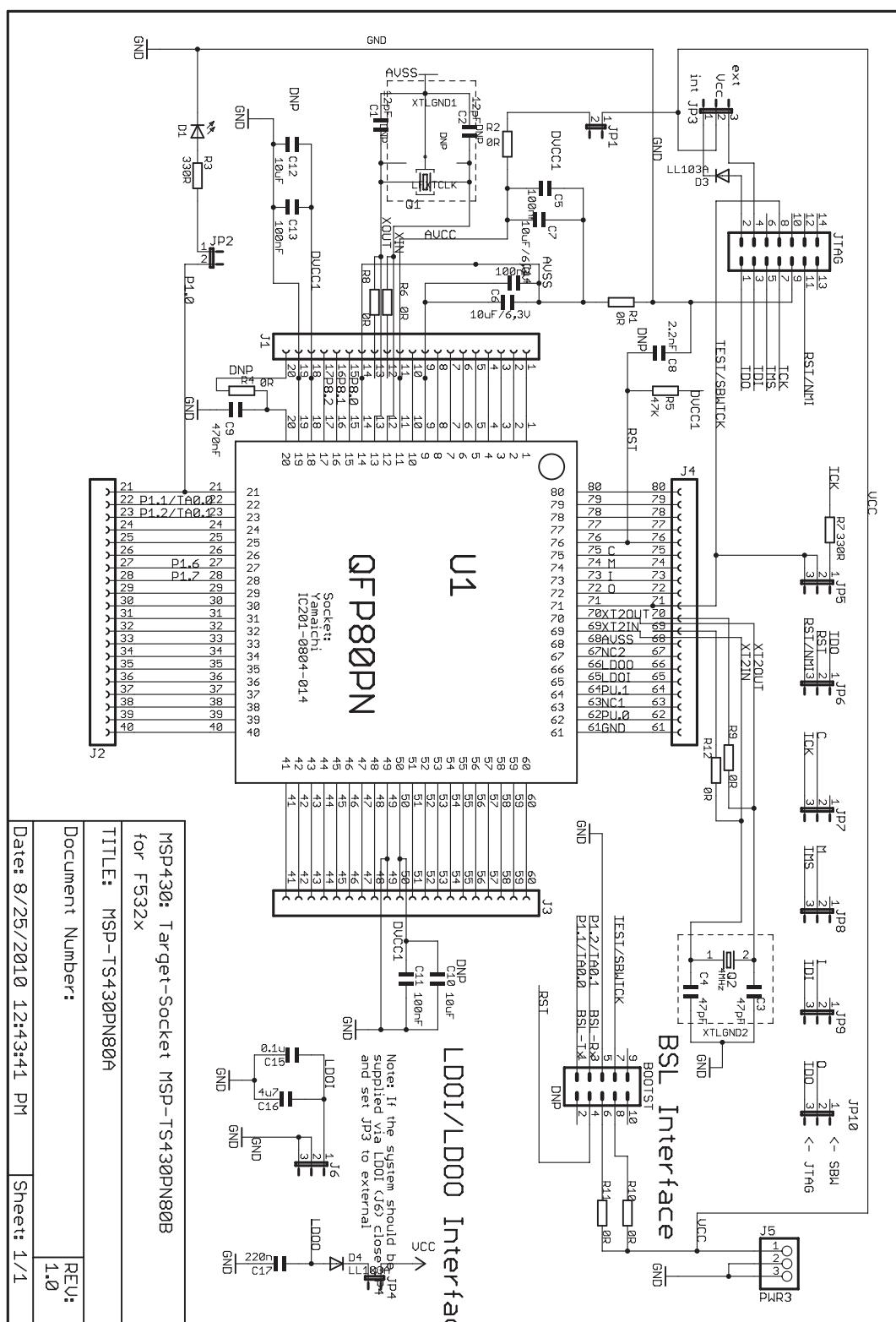


Figure B-37. MSP-TS430PN80A Target Socket Module, Schematic

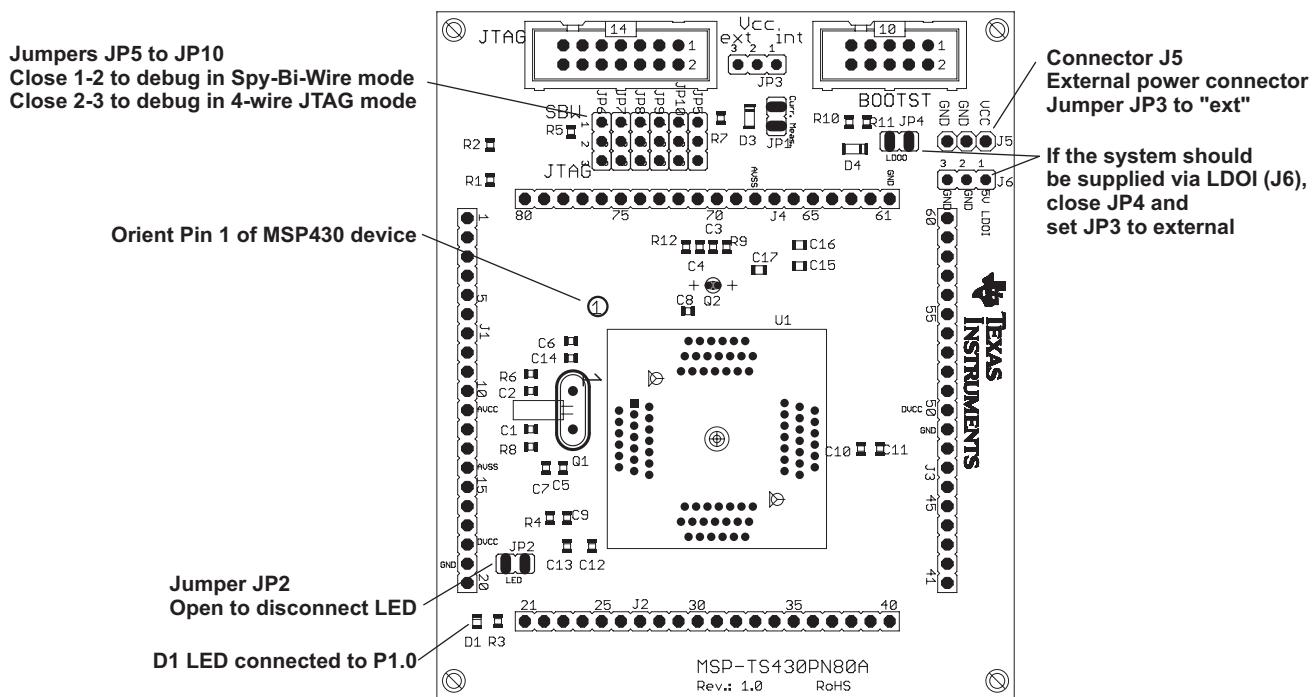


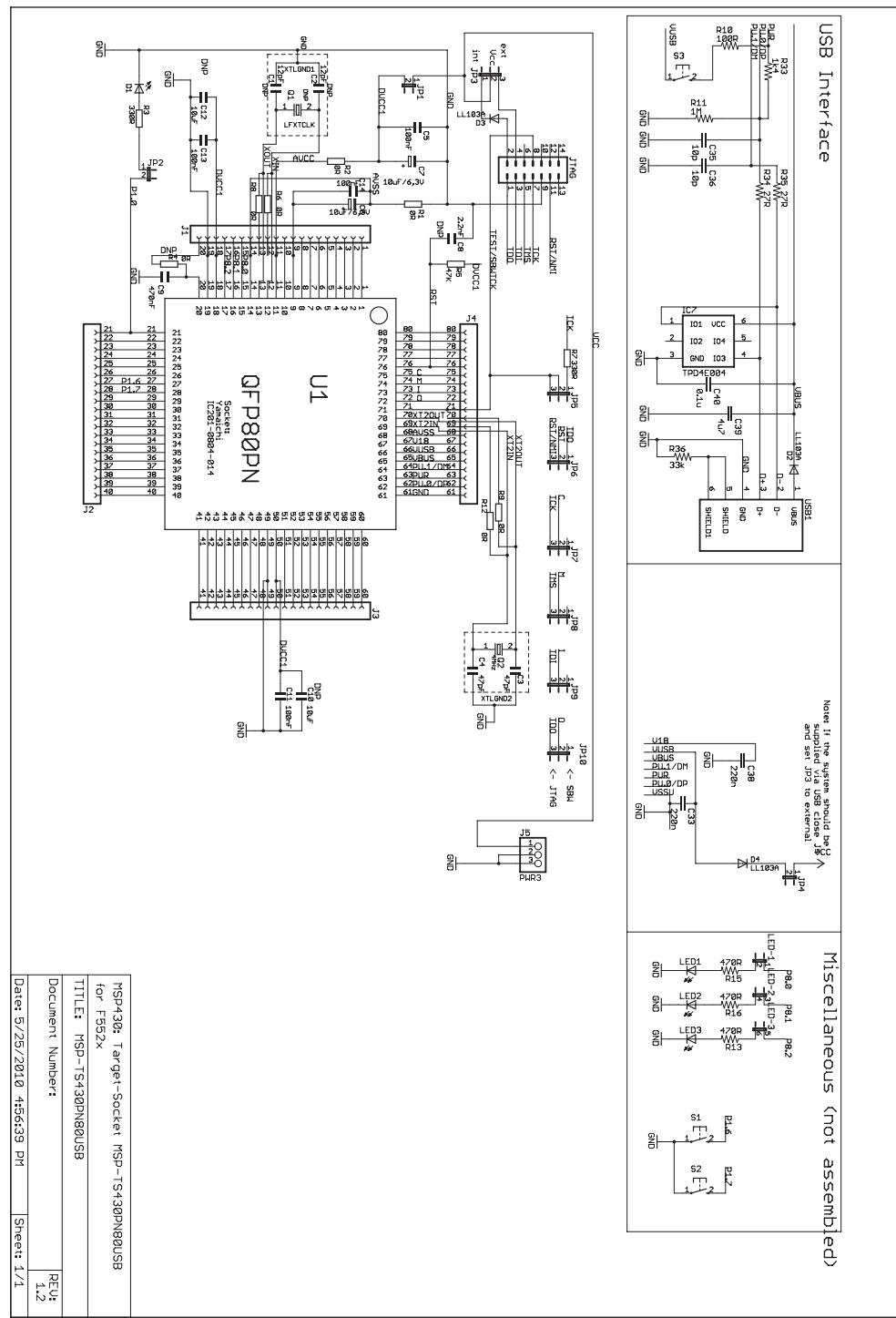
Figure B-38. MSP-TS430PN80A Target Socket Module, PCB

Table B-20. MSP-TS430PN80A Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C3, C4	0	47pF, SMD0805		DNP
3	C6, C7, C10, C12	3	10uF/6.3V, SMD0805		DNP C10
4	C5, C11, C13, C14, C15	5	100nF, SMD0805	311-1245-2-ND	
5	C8	1	2.2nF, SMD0805		
6	C9	1	470nF, SMD0805	478-1403-2-ND	
7	C16	1	4.7uF, SMD0805		
8	C17	1	220nF, SMD0805		
9	D1	1	green LED, SMD0805	P516TR-ND	
10	J1, J2, J3, J4	0	20-pin header, TH	SAM1029-20-ND (Header) SAM1213-20-ND (Receptacle)	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder:
11	J5 , J6	2	3-pin header, male, TH		
12	JP3, JP5, JP6, JP7, JP8, JP9, JP10	7	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3 on JP5, JP6, JP7, JP8, JP9, JP10 place jumpers on pins 1-2 on JP3,
13	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
14		10	Jumper	15-38-1024-ND	See Pos. 12 and Pos. 13
15	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
16	BOOTST	0	10-pin connector, male, TH		"DNP Keep vias free of solder"
17	Q1	0	Crystal	Micro Crystal MS3V-T1R 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder
18	Q2	0	Crystal	Q2: 4MHz Buerklin: 78D134	DNP: Q2 Keep vias free of solder
19	Insulating disk to Q2	0	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.08.121	
20	D3,D4	2	LL103A	Buerklin: 24S3406	
21	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
22	R1, R2, R4, R6, R8, R9,R10, R11, R12	3	0 Ohm, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R10, R11, R12
23	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
24	U1	1	Socket:IC201-0804-014		Manuf.: Yamaichi
25	PCB	1	77 x 91 mm		2 layers
26	Adhesive plastic feet	4	about 6mm width, 2mm height	e.g., 3M Bumpers Part No. SJ-5302	Apply to corners at bottom side
27	MSP430	2	MSP430F5329IPN		DNP: enclosed with kit, supplied by TI

B.20 MSP-TS430PN80USB

Due to the use of diodes in the power chain, the voltage on the MSP430F5xx device is approximately 0.3 V lower than is set by the debugging tool. Set the voltage in the IDE to 0.3 V higher than desired; for example, to run the MCU at 3.0 V, set it to 3.3 V.



NOTE: R11 should be populated.

Figure B-39. MSP-TS430PN80USB Target Socket Module, Schematic

MSP430 Target-Socket MSP-TS430PN80USB for F552x	REF ID: MSP-TS430PN80USB
TITLE:	MSP-TS430PN80USB
Document Number:	REV: 1.2
Date: 5/25/2010 4:56:39 PM	Sheet: 1/1

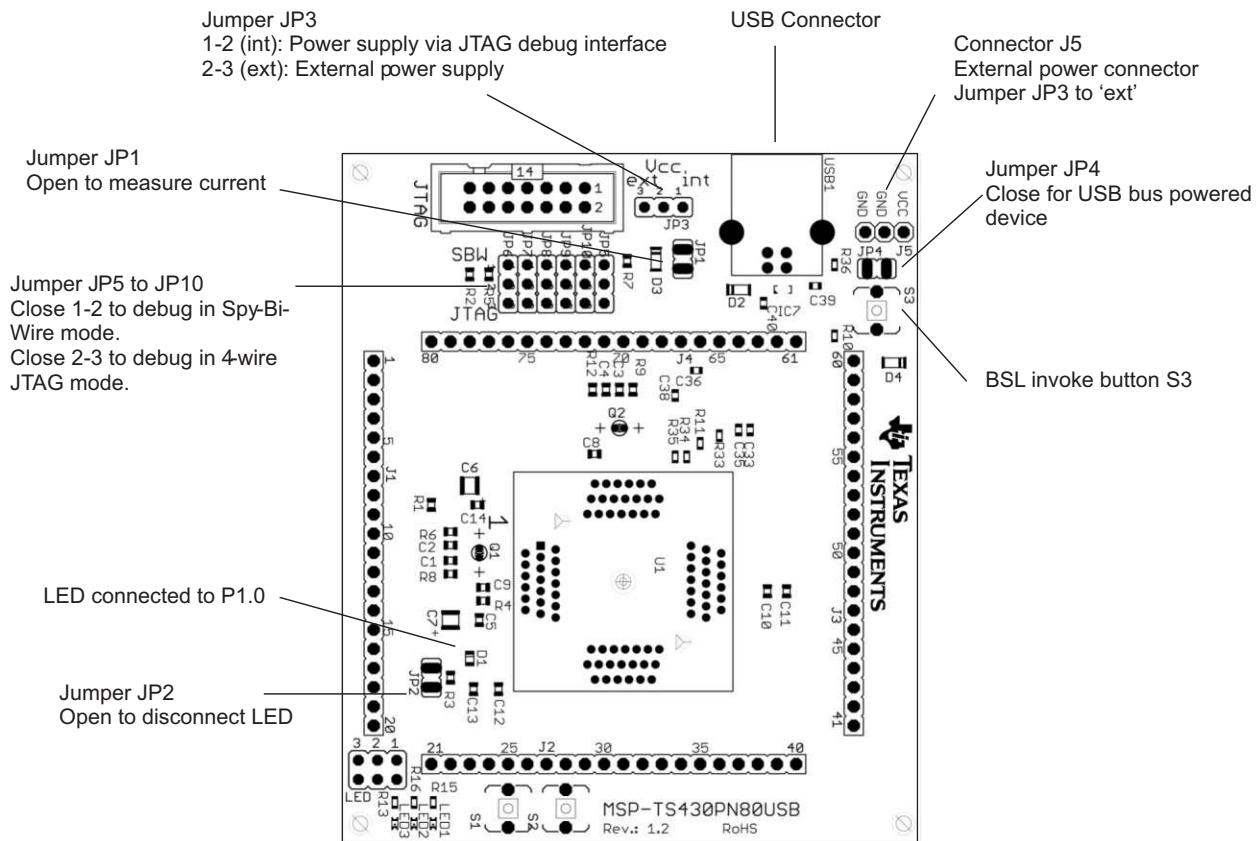


Figure B-40. MSP-TS430PN80USB Target Socket Module, PCB

Table B-21. MSP-TS430PN80USB Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
1.1	C3, C4	2	47pF, SMD0805		
2	C6, C7	2	10uF/6.3V, Tantal Size B	511-1463-2-ND	
3	C5, C11, C13, C14	4	100nF, SMD0805	311-1245-2-ND	
3.1	C10, C12	0	10uF, SMD0805	311-1245-2-ND	DNP: C10, C12
4	C8	1	2.2nF, SMD0805		
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	20-pin header, TH	SAM1029-20-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
7.1		4	20-pin header, TH	SAM1213-20-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	JP5, JP6, JP7, JP8,JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on pins 2-3
10	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
	JP4	1		SAM1035-02-ND	Place jumper only on one pin
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	Place jumper on pins 1-2
12		10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Q1 Keep vias free of solder
15	Q2	1	Crystal	"Q2: 4MHzBuerklin: 78D134"	
16	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R8, R9, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R8, R9, R12
18	R10	1	100 Ω, SMD0805	Buerklin: 07E500	
18	R11	0	1M Ω, SMD0805		DNP
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket:IC201-0804-014		Manuf.: Yamaichi
20	PCB	1	79 x 77 mm		2 layers
21	Rubber standoff	4		Buerklin: 20H1724	Apply to corners at bottom side
22	MSP430	2	MSP430F5529		DNP: Enclosed with kit supplied by TI
23	Insulating disk to Q2	1	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.08.121	
27	C33	1	220n	Buerklin: 53D2074	
28	C35	1	10p	Buerklin: 56D102	

Table B-21. MSP-TS430PN80USB Bill of Materials (continued)

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
29	C36	1	10p	Buerklin: 56D102	
30	C38	1	220n	Buerklin: 53D2074	
31	C39	1	4u7	Buerklin: 53D2086	
32	C40	1	0.1u	Buerklin: 53D2068	
33	D2, D3, D4	3	LL103A	Buerklin: 24S3406	
34	IC7	1	TPD4E004		Manu: TI
36	LED	0	JP3QE	SAM1032-03-ND	DNP
37	LED1	0	LEDCHIPLED_0603	FARNELL: 852-9833	DNP
38	LED2	0	LEDCHIPLED_0603	FARNELL: 852-9868	DNP
39	LED3	0	LEDCHIPLED_0603	FARNELL: 852-9841	DNP
40	R13, R15, R16	0	470R	Buerklin: 07E564	DNP
41	R33	1	1k4	Buerklin: 07E612	
42	R34	1	27R	Buerklin: 07E444	
43	R35	1	27R	Buerklin: 07E444	
44	R36	1	33k	Buerklin: 07E740	
45	S1	0	PB	P12225STB-ND	DNP
46	S2	0	PB	P12225STB-ND	DNP
46	S3	1	PB	P12225STB-ND	
47	USB1	1	USB_RECEPACLE	FARNELL: 117-7885	

B.21 MSP-TS430PZ100

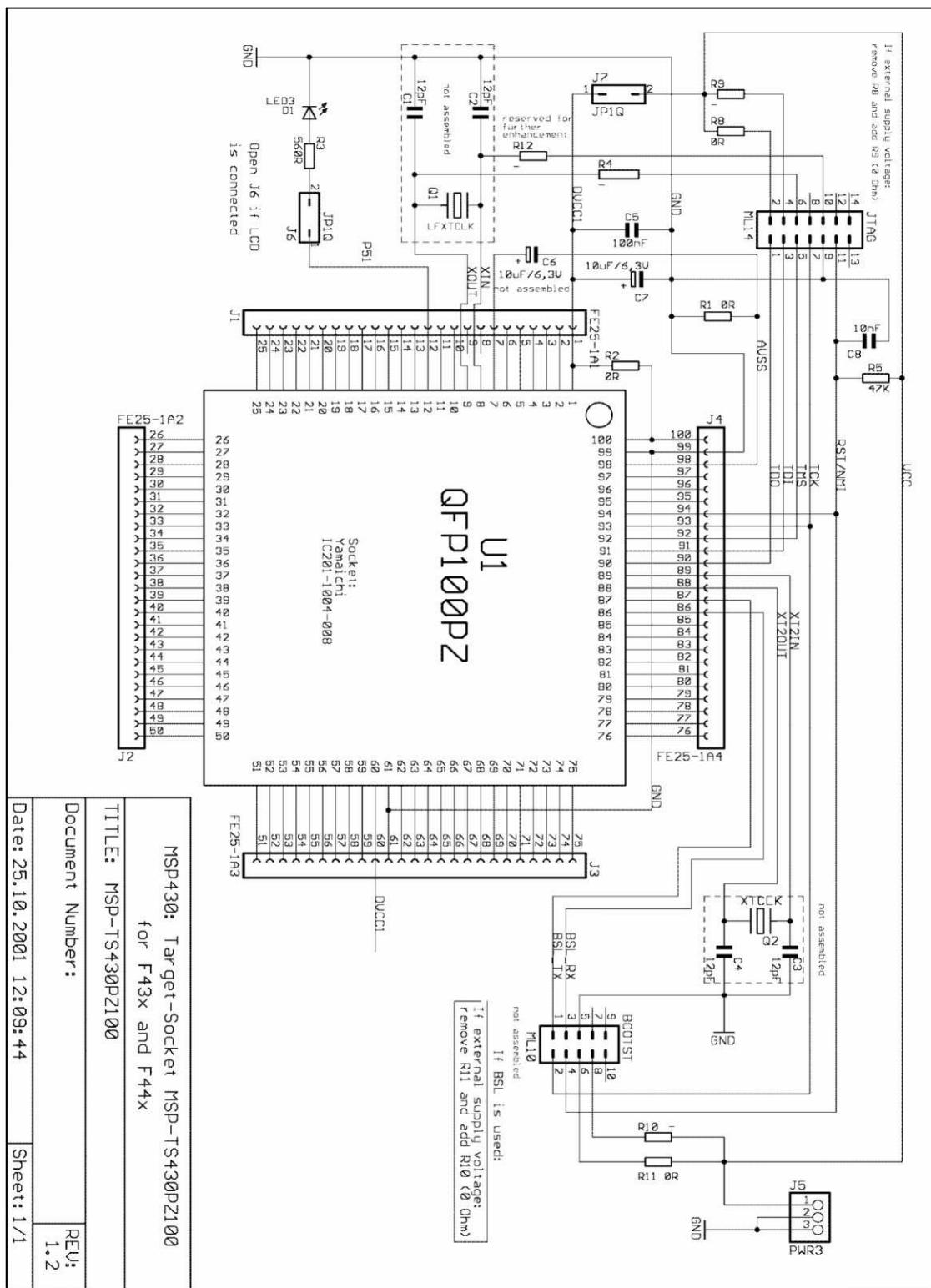


Figure B-41. MSP-TS430PZ100 Target Socket Module, Schematic

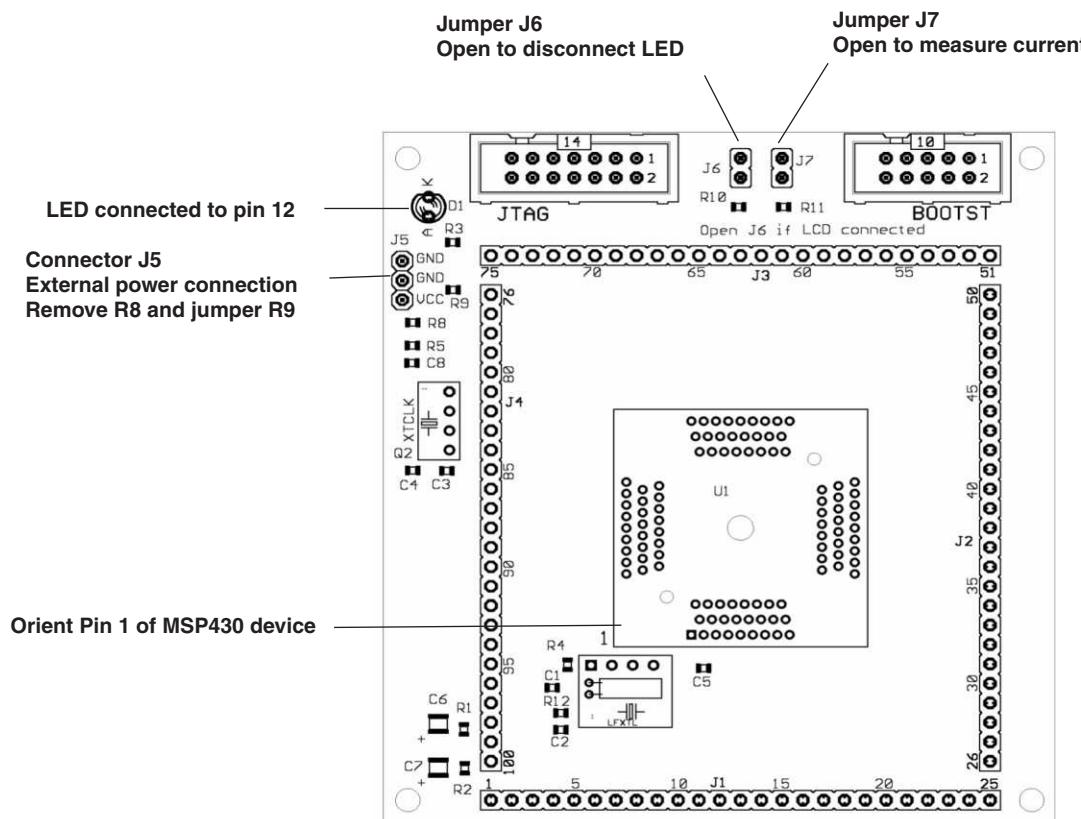


Figure B-42. MSP-TS430PZ100 Target Socket Module, PCB

Table B-22. MSP-TS430PZ100 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2,	0	12pF, SMD0805		DNP
1b	C3, C4	0	47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C6, C7	1	10uF/10V, Tantal Size B	511-1463-2-ND	DNP: C6
3	C5	1	100nF, SMD0805	478-3351-2-ND	
4	C8	1	10nF, SMD0805	478-1383-2-ND	
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	yellow LED, TH, 3mm, T1	511-1251-ND	
7	J1, J2, J3, J4	0	25-pin header, TH	SAM1029-25-NDSAM1213-25-ND	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	J6, J7	2	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
10		2	Jumper	15-38-1024-ND	Place on: J6, J7
11	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
12	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
13	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
14	R3	1	330 Ω, SMD0805	541-330ATR-ND	
15	R1, R2, R4, R8, R9, R10, R11, R12	3	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R9, R10, R12
16	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
17	U1	1	"Socket: IC201-1004-008 or IC357-1004-53N"		Manuf.: Yamaichi
18	PCB	1	82 x 90 mm		2 layers
19	Adhesive Plastic feet	4	~6mm width, 2mm height	e.g., 3M Bumpers Part No. SJ-5302	Apply to corners at bottom side
20	MSP430	2	MSP430FG4619IPZ		DNP: enclosed with kit supplied by TI

B.22 MSP-TS430PZ100A

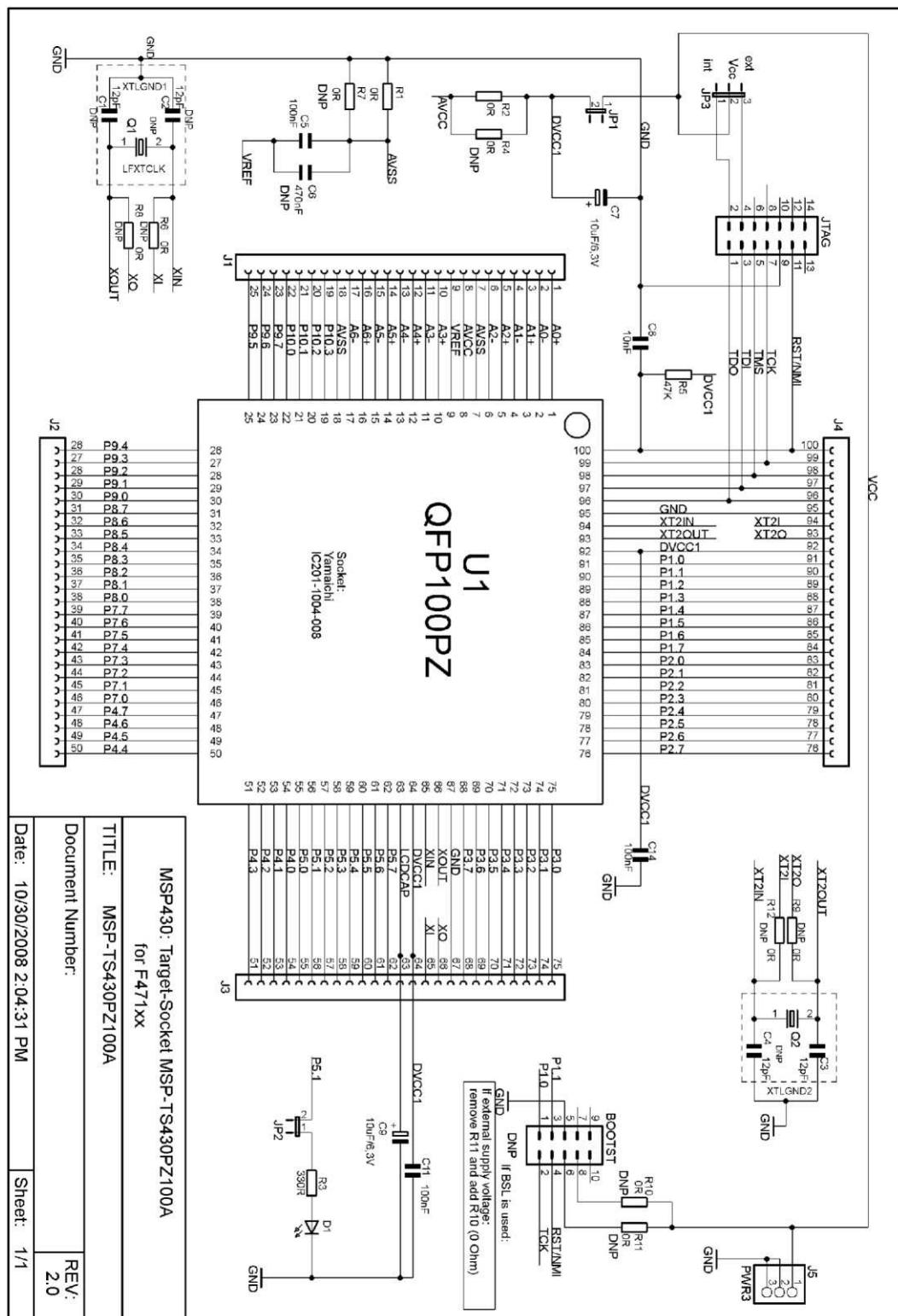


Figure B-43. MSP-TS430PZ100A Target Socket Module, Schematic

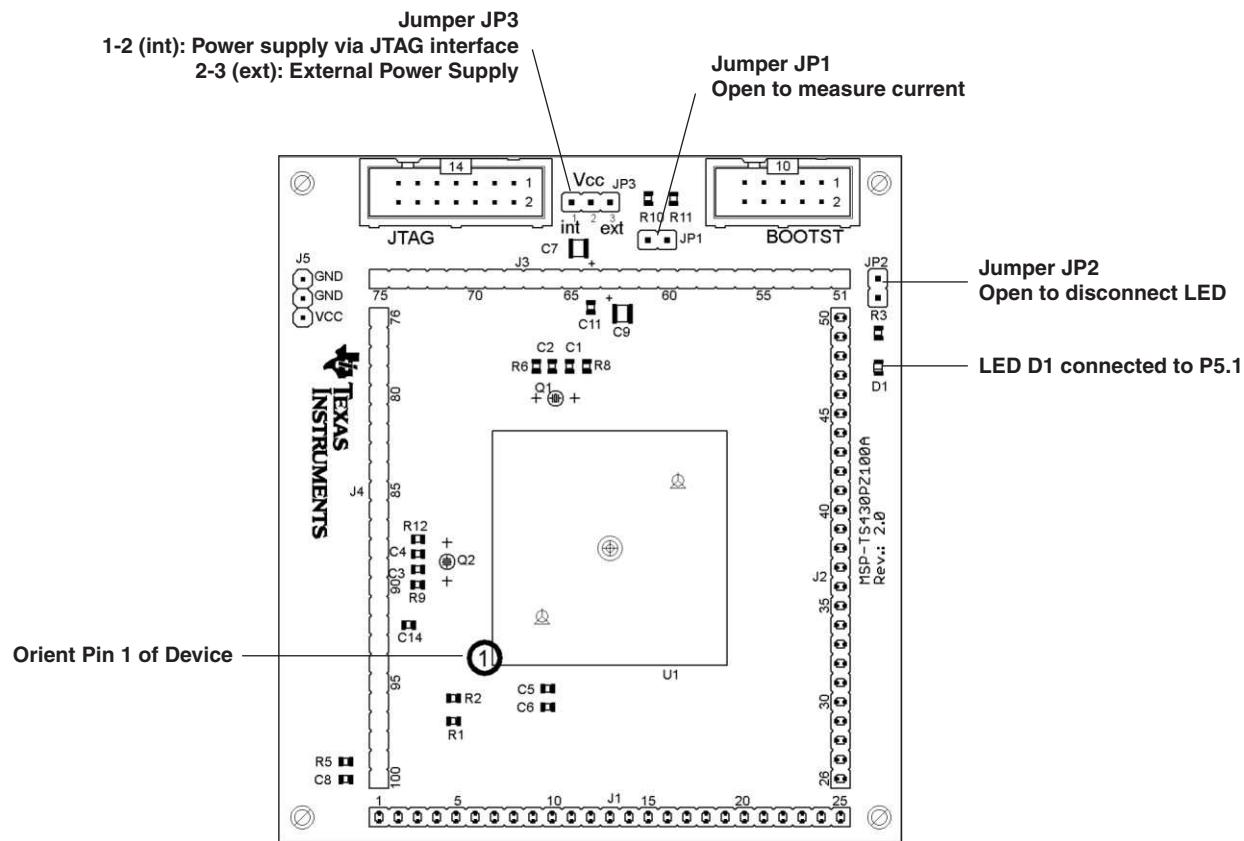


Figure B-44. MSP-TS430PZ100A Target Socket Module, PCB

Table B-23. MSP-TS430PZ100A Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
1b	C3, C4	0	47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C7, C9	2	10uF/10V, Tantal Size B	511-1463-2-ND	
3	C5, C11, C14	3	100nF, SMD0805	311-1245-2-ND	
4	C8	1	10nF, SMD0805	478-1358-1-ND	
5	C6	0	470nF, SMD0805	478-1403-2-ND	DNP
6	D1	1	green LED, SMD0805	67-1553-1-ND	
7	J1, J2, J3, J4	0	25-pin header, TH	SAM1029-25-NDSAM1213-25-ND	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
10	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	Place jumper on pins 1-2
12		3	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
15	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
16	R3	1	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R7, R8, R9, R10, R11, R12	2	0 Ω, SMD0805	541-000ATR-ND	DNP: R4, R6, R7, R8, R9, R10, R11, R12
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket: IC357-1004-53N		Manuf.: Yamaichi
20	PCB	1	90 x 82 mm		4 layers
21	Rubber standoff	4		Select appropriate	Apply to corners at bottom side
22	MSP430	2	MSP430F5438IPZ		DNP: Enclosed with kit supplied by TI

B.23 MSP-TS430PZ100B

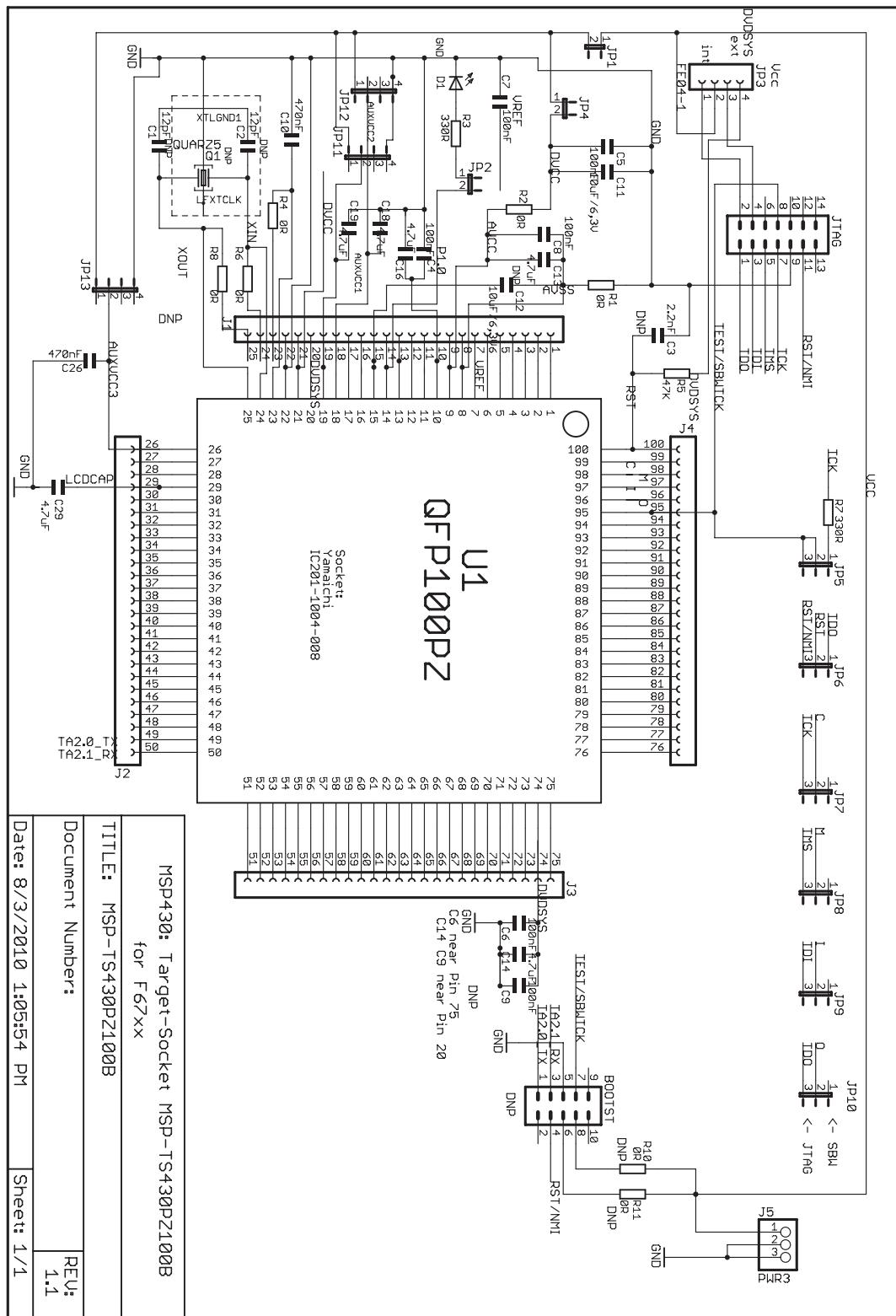


Figure B-45. MSP-TS430PZ100B Target Socket Module, Schematic

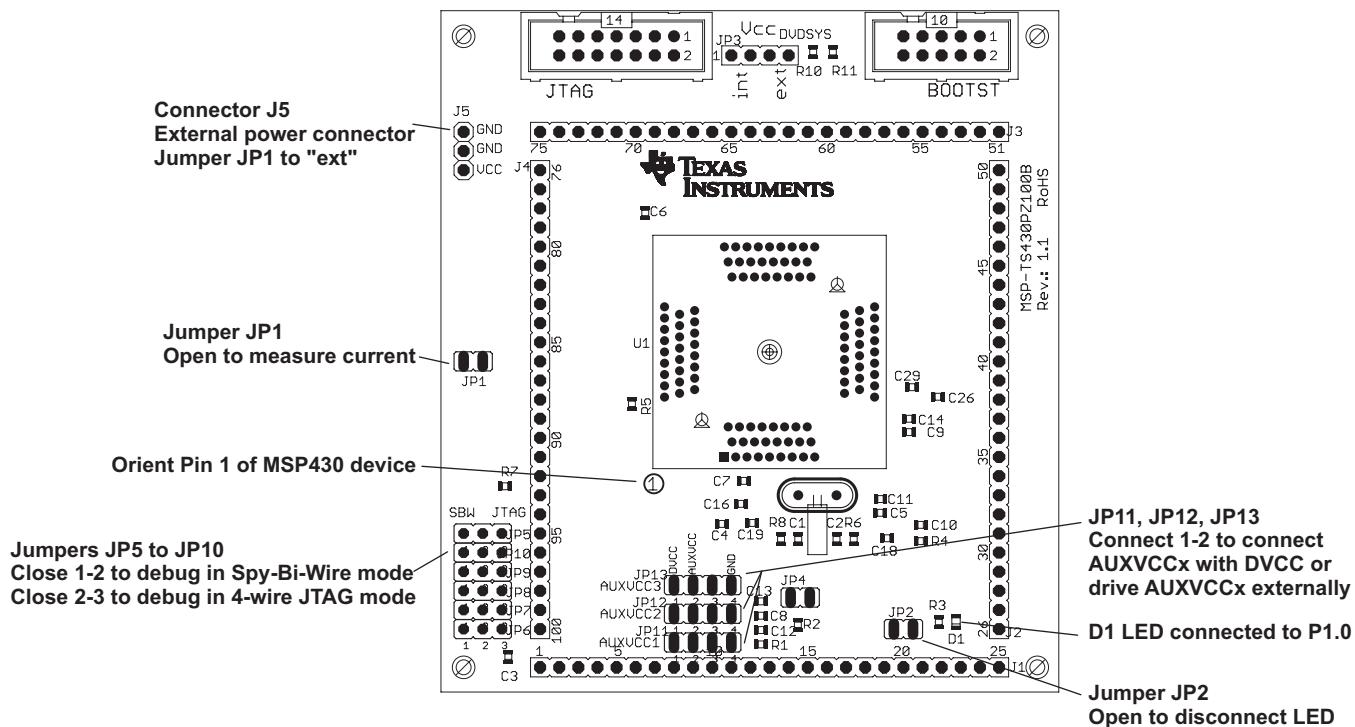


Figure B-46. MSP-TS430PZ100B Target Socket Module, PCB

Table B-24. MSP-TS430PZ100B Bill of Materials

Position	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
2	C4, C5, C6 , C7, C8, C9	6	100nF, SMD0805	311-1245-2-ND	
3	C10, C26	2	470 nF, SMD0805	478-1403-2-ND	
4	C11, C12	1	10 uF / 6.3 V SMD0805		C12 DNP
5	C13, C14, C16, C18, C19, C29	6	4.7 uF SMD0805		
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	0	25-pin header, TH	SAM1029-25-ND (Header) SAM1213-25-ND (Receptacle)	DNP: Headers and receptacles enclosed with kit. Keep vias free of solder:
8	J5	1	3-pin header, male, TH		
9	JP3, JP5, JP6, JP7, JP8, JP9, JP10	7	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3 on JP5, JP6, JP7, JP8, JP9, JP10 place jumpers on pins 1-2 on JP3,
10	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
11	JP11, JP12, JP13	3	4-pin header, male, TH		place jumper on header 1-2
12		13	Jumper	15-38-1024-ND	See Pos. 9 and Pos. 10 and Pos. 11
15	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
16	BOOTST	0	10-pin connector, male, TH		"DNP Keep vias free of solder"
17	Q1	0	Crystal		DNP: Q1 Keep vias free of solder
21	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
22	R1, R2, R4, R6, R8, R10, R11	2	0 Ohm, SMD0805	541-000ATR-ND	DNP: R4, R6, R8, R10, R11
23	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
24	U1	1	Socket: IC357-1004-53N		Manuf.: Yamaichi
25	PCB	1	90 x 82 mm		2 layers
26	Adhesive plastic feet	4	about 6mm width, 2mm height	e.g., 3M Bumpons Part No. SJ-5302	Apply to corners at bottom side
27	MSP430	2	MSP430F6733IPZ		DNP: enclosed with kit, supplied by TI

B.24 MSP-TS430PZ5x100

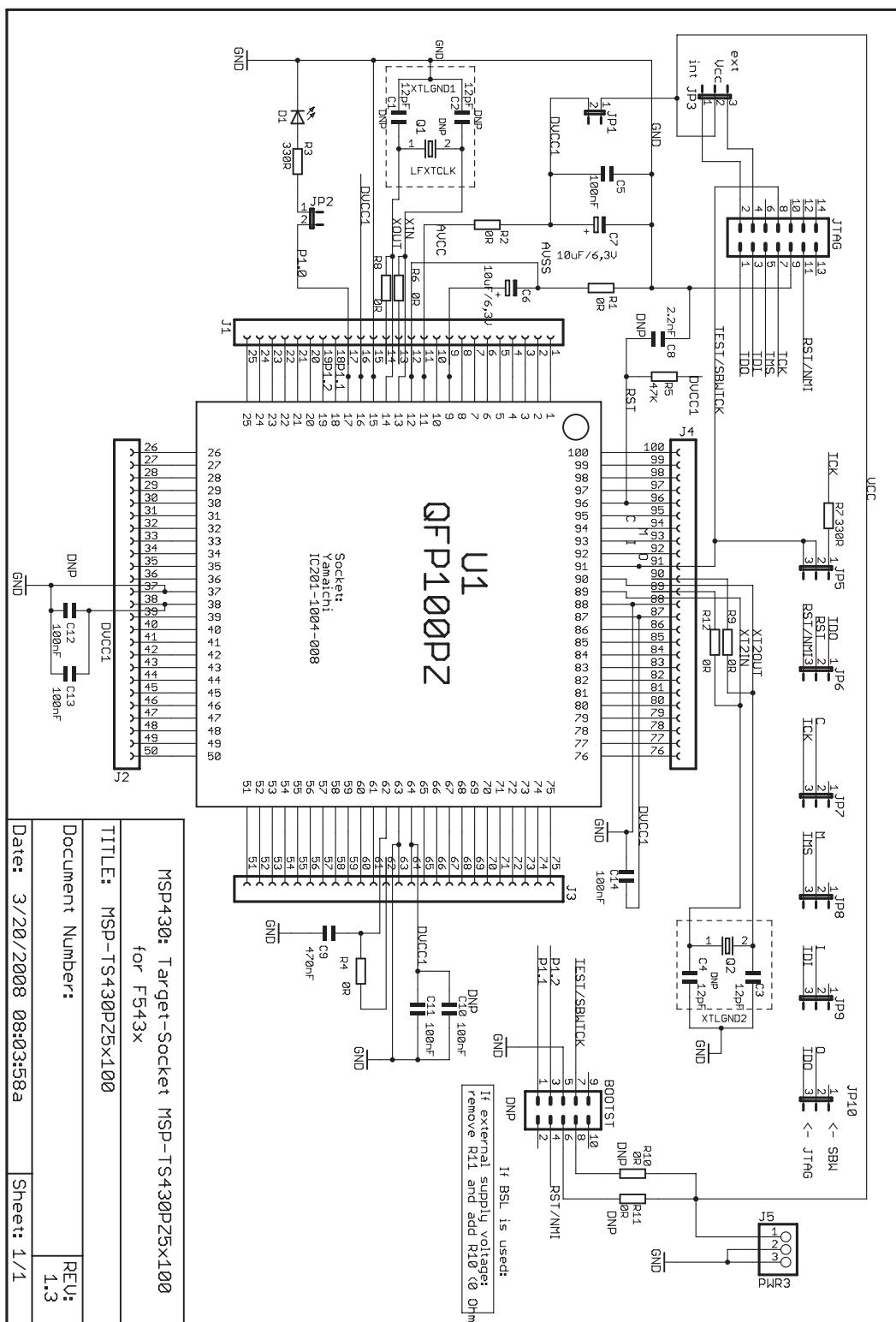


Figure B-47. MSP-TS430PZ5x100 Target Socket Module, Schematic

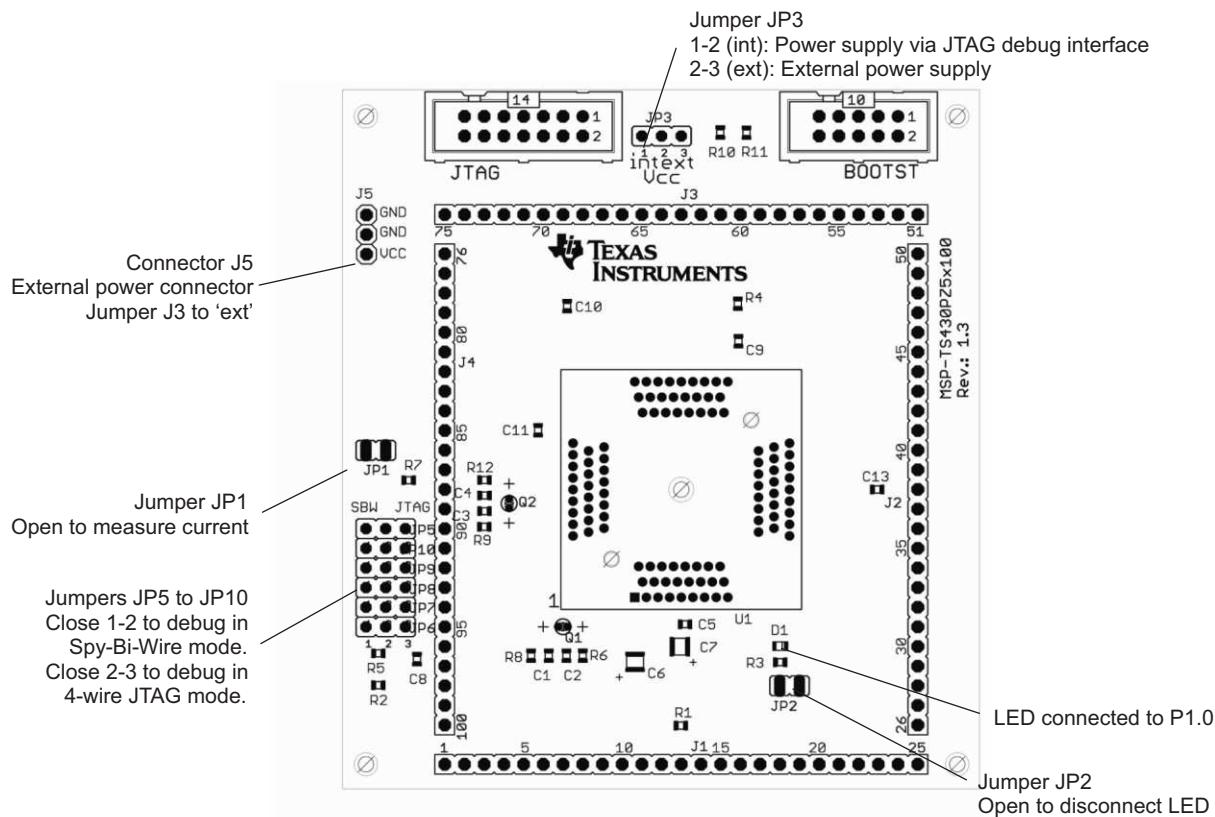


Figure B-48. MSP-TS430PZ5x100 Target Socket Module, PCB

Table B-25. MSP-TS430PZ5x100 Bill of Materials

Pos.	Ref Des	No. per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP
1b	C3, C4		47pF, SMD0805		DNP: Only recommendation. Check your crystal spec.
2	C6, C7	2	10uF/10V, Tantal Size B	511-1463-2-ND	
3	C5, C10, C11, C12,C13, C14	4	100nF, SMD0805	311-1245-2-ND	DNP: C12, C14
4	C8	0	2.2nF, SMD0805		DNP
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	67-1553-1-ND	
7	J1, J2, J3, J4	0	25-pin header, TH	"SAM1029-25- NDSAM1213-25-ND"	DNP: headers and receptacles enclosed with kit. Keep vias free of solder.: Header: Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	JP5, JP6, JP7, JP8,JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	Place jumpers on pins 2-3
10	JP1, JP2	2	2-pin header, male, TH	SAM1035-02-ND	Place jumper on header
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	Place jumper on pins 1-2
12		9	Jumper	15-38-1024-ND	Place on JP1, JP2, JP3, JP5, JP6, JP7, JP8, JP9, JP10
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	BOOTST	0	10-pin connector, male, TH		DNP: Keep vias free of solder
15	Q1, Q2	0	Crystal	Q1: Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Keep vias free of solder
16	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R8, R9, R10, R11, R12	3	0 Ω, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R10, R11, R12
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket: IC357-1004-53N		Manuf.: Yamaichi
20	PCB	1	90 x 82 mm		2 layers
21	Rubber standoff	4		Select appropriate	Apply to corners at bottom side
22	MSP430	2	MSP430F5438IPZ		DNP: Enclosed with kit supplied by TI

B.25 MSP-TS430PZ100USB

Due to the use of diodes in the power chain, the voltage on the MSP430F5xx device is approximately 0.3 V lower than is set by the debugging tool. Set the voltage in the IDE to 0.3 V higher than desired; for example, to run the MCU at 3.0 V, set it to 3.3 V.

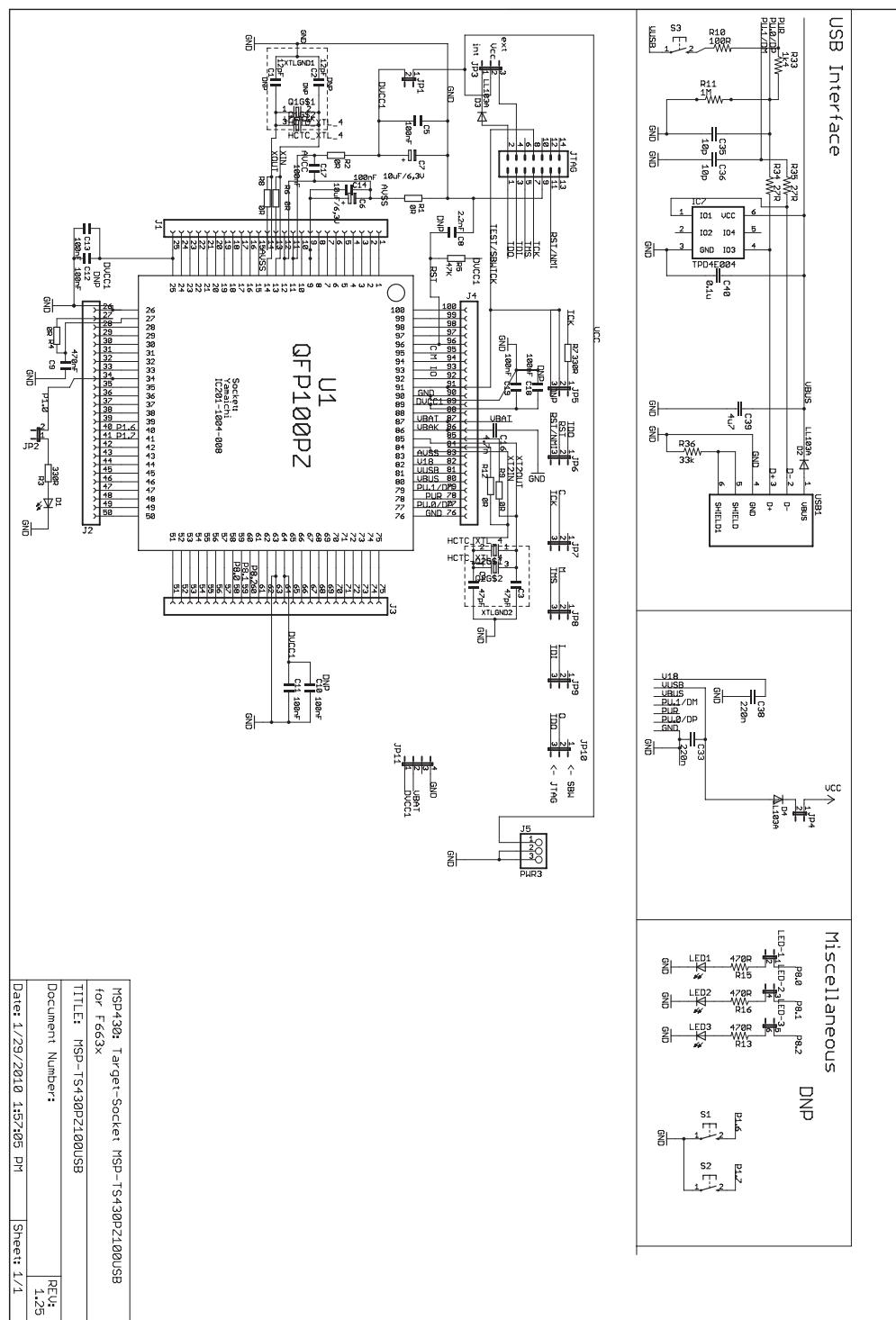


Figure B-49. MSP-TS430PZ100USB Target Socket Module, Schematic

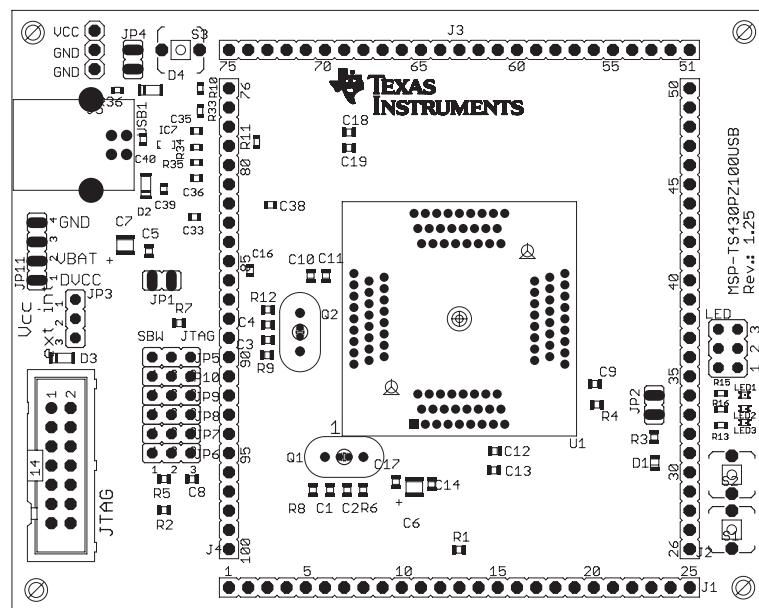


Figure B-50. MSP-TS430PZ100USB Target Socket Module, PCB

Table B-26. MSP-TS430PZ100USB Bill of Materials

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
1	C1, C2	0	12pF, SMD0805		DNP: C1, C2
1.1	C3, C4	2	47pF, SMD0805		
2	C6, C7	2	10uF/6.3V, Tantal Size B	511-1463-2-ND	
3	C5, C11, C13, C14, C19	5	100nF, SMD0805	311-1245-2-ND	
3.1	C10, C12, C18,17	0	100nF, SMD0805	311-1245-2-ND	DNP: C10, C12,C18, C17
4	C8	1	2.2nF, SMD0805		
5	C9	1	470nF, SMD0805	478-1403-2-ND	
6	D1	1	green LED, SMD0805	P516TR-ND	
7	J1, J2, J3, J4	4	25-pin header, TH	SAM1029-25-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
7.1		4	25-pin header, TH	SAM1213-25-ND	DNP: headers and receptacles enclosed with kit. Keep vias free of solder. : Header : Receptacle
8	J5	1	3-pin header, male, TH	SAM1035-03-ND	
9	JP5, JP6, JP7, JP8, JP9, JP10	6	3-pin header, male, TH	SAM1035-03-ND	place jumpers on pins 2-3
10	JP1, JP2, JP4	3	2-pin header, male, TH	SAM1035-02-ND	place jumper on header
11	JP3	1	3-pin header, male, TH	SAM1035-03-ND	place jumper on pins 1-2
12		10	Jumper	15-38-1024-ND	Place on: JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
13	JTAG	1	14-pin connector, male, TH	HRP14H-ND	
14	Q1	0	Crystal	Micro Crystal MS1V-T1K 32.768kHz, C(Load) = 12.5pF	DNP: Q1. Keep vias free of solder
15	Q2	1	Crystal	Q2: 4MHz, Buerklin: 78D134	
16	R3, R7	2	330 Ω, SMD0805	541-330ATR-ND	
17	R1, R2, R4, R6, R8, R9, R12	3	0 Ω, SMD0805	541-000ATR-ND	DNP: R6, R8, R9, R12
18	R10	1	100 Ω, SMD0805	Buerklin: 07E500	
18	R11	1	1M Ω, SMD0603		not existing in Rev 1.0
18	R5	1	47k Ω, SMD0805	541-47000ATR-ND	
19	U1	1	Socket:IC201-1004-008		Manuf.: Yamaichi
20	PCB	1	79 x 77 mm		2 layers
21	Rubber stand off	4		Buerklin: 20H1724	apply to corners at bottom side
22	MSP430	2	MSP430F5529		DNP: enclosed with kit. Is supplied by TI
23	nsulating disk to Q2	1	Insulating disk to Q2	http://www.ettinger.de/Art_Detail.cfm?ART_ARTNUM=70.0 8.121	
24	C16	1	4.7 nF SMD0603		
27	C33	1	220n SMD0603	Buerklin: 53D2074	
28	C35, C36	2	10p SMD0603	Buerklin: 56D102	

Table B-26. MSP-TS430PZ100USB Bill of Materials (continued)

Pos.	Ref Des	No. Per Board	Description	DigiKey Part No.	Comment
30	C38	1	220n SMD0603	Buerklin: 53D2074	
31	C39	1	4u7 SMD0603	Buerklin: 53D2086	
32	C40	1	0.1u SMD0603	Buerklin: 53D2068	
33	D2, D3, D4	3	LL103A	Buerklin: 24S3406	
34	IC7	1	TPD4E004		Manu: TI
35	LED	0	JP3QE	SAM1032-03-ND	DNP
36	LED1, LED2, LED3	0	LEDCHIPLED_0603	FARNELL: 852-9833	DNP
37	R13, R15, R16	0	470R SMD0603	Buerklin: 07E564	DNP
38	R33	1	1k4 / 1k5 SMD0603	Buerklin: 07E612	
39	R34	1	27R SMD0603	Buerklin: 07E444	
40	R35	1	27R SMD0603	Buerklin: 07E444	
41	R36	1	33k SMD0603	Buerklin: 07E740	
42	S1, S2, S3	1	PB	P12225STB-ND	DNP S1 and S2. (Only S3)
43	USB1	1	USB_RECEPCTACLE	FARNELL: 117-7885	
44	JP11	1	4-pin header, male, TH	SAM1035-04-ND	place jumper only on Pin 1

B.26 EM430F5137RF900

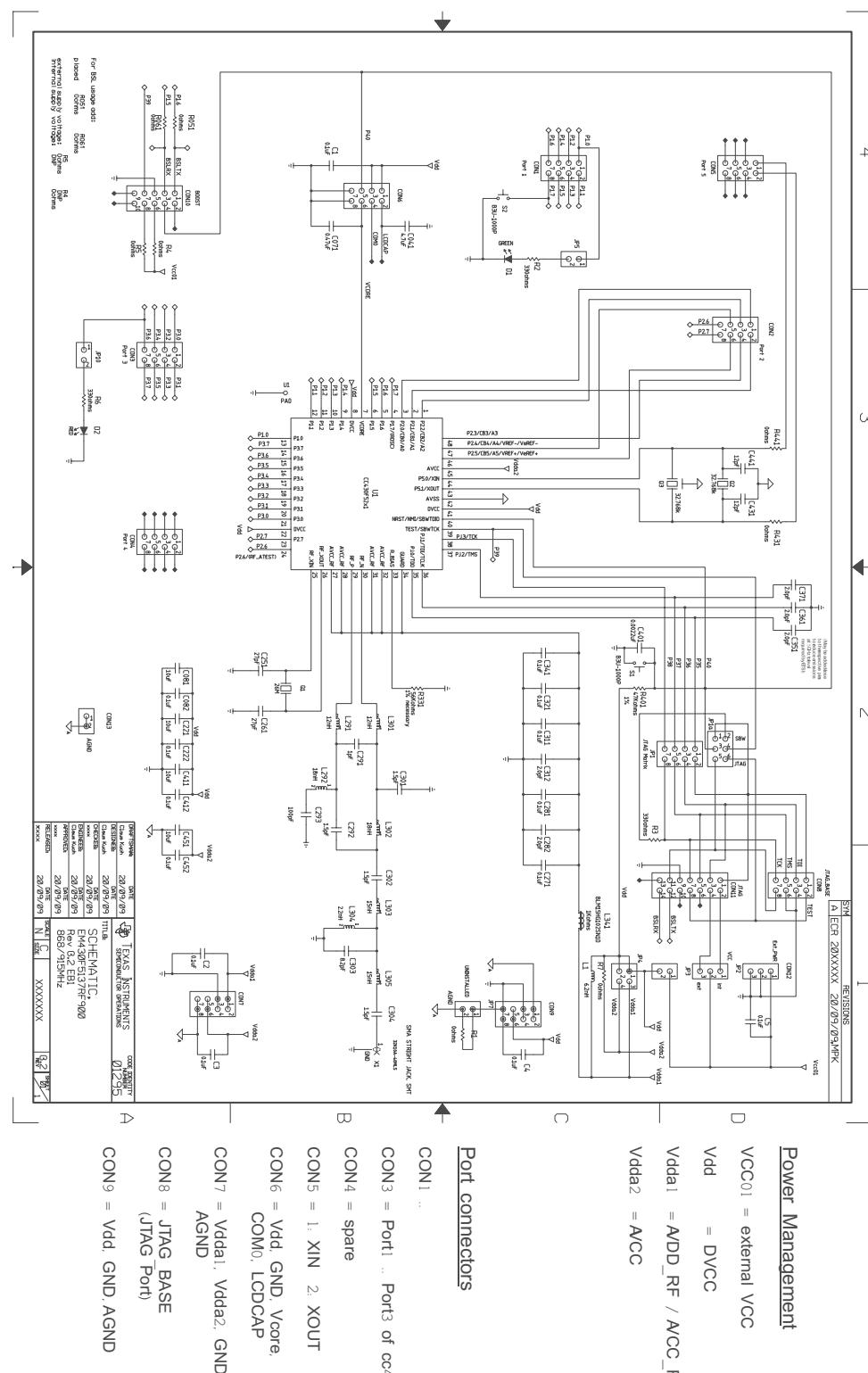


Figure B-51. EM430F5137RF900 Target Socket Module. Schematic

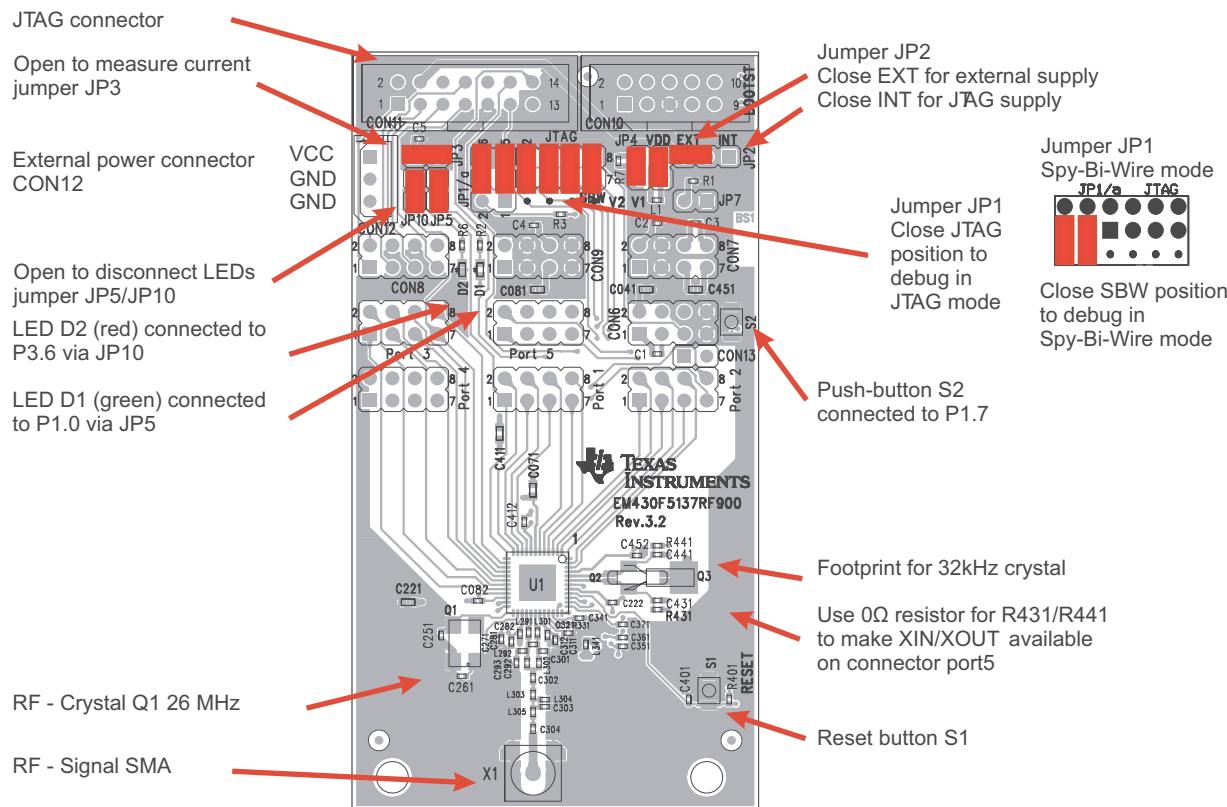


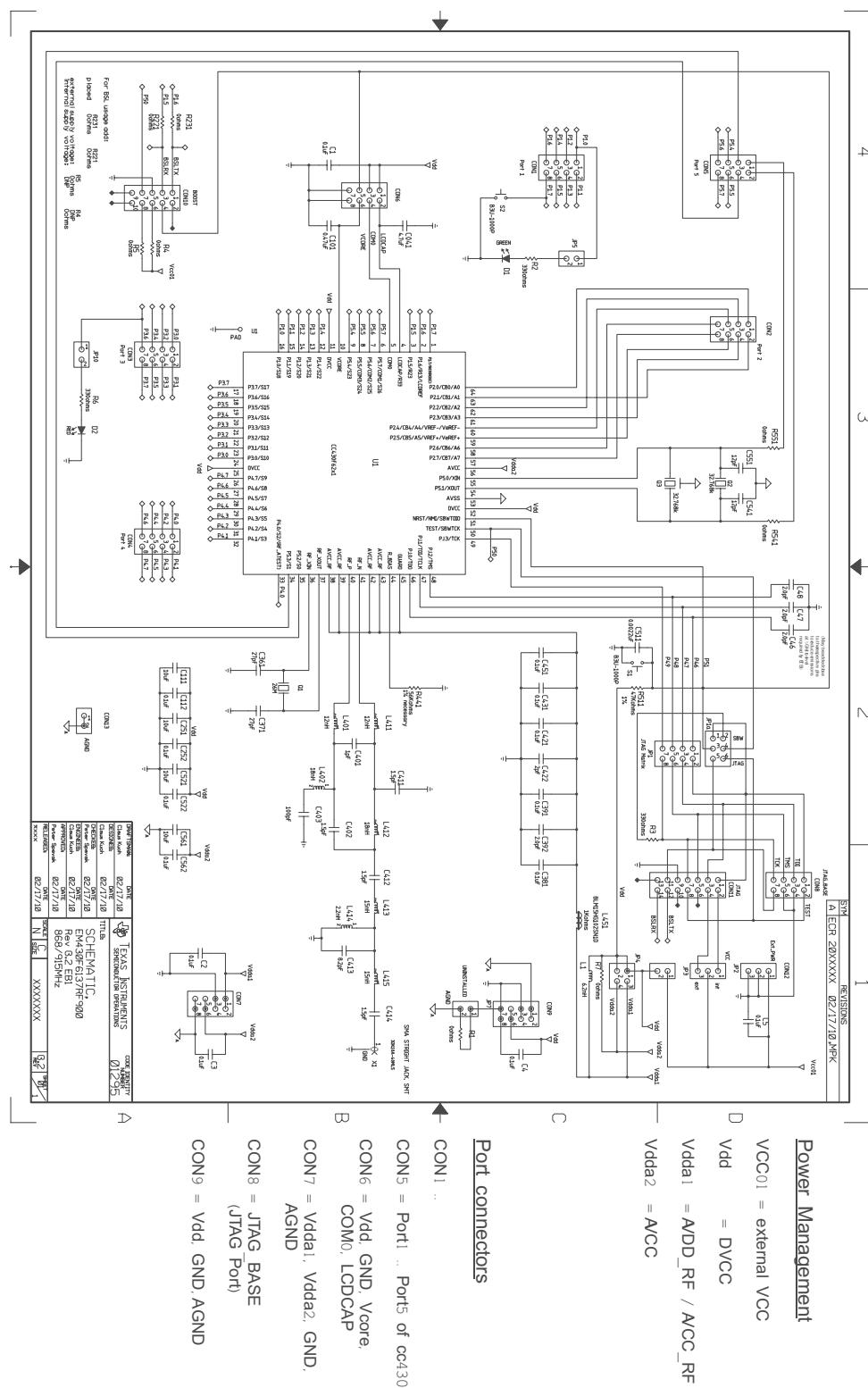
Figure B-52. EM430F5137RF900 Target Socket Module, PCB

Table B-27. EM430F5137RF900 Bill of Materials

Item	Reference	No. per Board	Description	Value	Manufacturer's Part Number	Manufacturer	Comment
1	Q1	1	(CUSTOMER SUPPLY) CRYSTAL, SMT, 4P, 26MHz	26M	ASX-531(CS)	AKER ELECTRONIC	
2	C1-C5, C082, C222, C271, C281, C311, C321, C341, C412, C452	14	CAPACITOR, SMT, 0402, CER, 16V, 10%, 0.1uF	0.1uF	0402YC104KAT2 A	AVX	
3	C071	1	CAPACITOR, SMT, 0603, CERAMIC, 0.47uF, 16V, 10%, X5R	0.47uF	0603YD474KAT2 A	AVX	
4	R401	1	RES0402, 47.0K	47kΩ	CRCW04024702F 100	DALE	
5	CON11	1	HEADER, THU, MALE, 14P, 2X7, 25.4x9.2x9.45mm		09 18 514 6323	HARTING	
6	CON10	0	HEADER, THU, MALE, 10P, 2X5, 20.32x9.2x9.45mm		09 18 510 6323	HARTING	DNP
7	D1	1	LED, SMT, 0603, GREEN, 2.1V	active	APT1608MGC	KINGBRIGHT	
8	D2	1	LED, SMT, 0603, RED, 2.0V	active	APT1608EC	KINGBRIGHT	
9	Q3	0	UNINSTALLED CRYSTAL, SMT, 3P, MS1V (Customer Supply)	32.768k	MS1V-T1K (UN)	MICRO CRYSTAL	DNP
10	CON12	1	HEADER, THU, MALE, 3P, 1x3, 9.9x4.9x5.9mm		22-03-5035	MOLEX	
11	C251, C261	2	50V, 5%, 27pF	27pF	GRM36COG270J 50	MURATA	
12	L341	1	FERRITE, SMT, 0402, 1.0kΩ, 250mA	1kΩ	BLM15HG102SN 1D	MURATA	
13	C293	1	CAPACITOR, SMT, 0402, CERAMIC, 100pF, 50V, 0.25pF, COG(NP0)	100pF	GRM1555C1H101 JZ01	MURATA	
14	L304	1	INDUCTOR, SMT, 0402, 2.2nH, 0.1nH, 220mA, 500MHz	0.0022u H	LQP15MN2N2B0 2	MURATA	
15	L303, L305	2	INDUCTOR, SMT, 0402, 15nH, 2%, 450mA, 250MHz	0.015uH	LQW15AN15NG0 0	MURATA	
16	L292, L302	2	INDUCTOR, SMT, 0402, 18nH, 2%, 370mA, 250MHz	0.018uH	LQW15AN18NG0 0	MURATA	
17	C291	1	CAPACITOR, SMT, 0402, CERAMIC, 1pF, 50V, 0.05pF, COG(NP0)	1pF	GRM1555C1H1R 0WZ01	MURATA	
18	C303	1	CAPACITOR, SMT, 0402, CERAMIC, 8.2pF, 50V, 0.05pF, COG(NP0)	8.2pF	GRM1555C1H8R 2WZ01	MURATA	
19	C292, C301-C302, C304	4	CAPACITOR, SMT, 0402, CERAMIC, 1.5pF, 50V, 0.05pF, COG(NP0)	1.5pF	GRM1555C1H1R 5WZ01	MURATA	
20	L291, L301	2	INDUCTOR, SMT, 0402, 12nH, 2%, 500mA, 250MHz	0.012uH	LQW15AN12NG0 0	MURATA	
21	C282, C312, C351, C361, C371	5	CAPACITOR, SMT, 0402, CERAMIC, 2pF, 50V, 0.1pF, COG	2.0pF	GRM1555C1H2R 0BZ01	Murata	
22	L1	1	INDUCTOR, SMT, 0402, 6.2nH, 0.1nH, 130mA, 500MHz	6.2nH	LQP15MN6N2B0 2	Murata	
23	S1-S2	2	ULTRA-SMALL TACTILE SWITCH, SMT, 2P, SPST-NO, 1.2x3x2.5mm, 0.05A, 12V		B3U-1000P	OMRON	
24	R4-R5, R051, R061, R431, R441	0	UNINSTALLED RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	0Ω	ERJ-2GE0R00X	PANASONIC	DNP

Table B-27. EM430F5137RF900 Bill of Materials (continued)

Item	Reference	No. per Board	Description	Value	Manufacturer's Part Number	Manufacturer	Comment
24a	R7	1	RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	0Ω	ERJ-2GE0R00X	PANASONIC	
25	R2-R3, R6	3	RESISTOR, SMT, 0402, THICK FILM, 5%, 1/16W, 330	330Ω	ERJ-2GEJ331	PANASONIC	
26	C431, C441	0	CAPACITOR, SMT, 0402, CER, 12pF, 50V, 5%, NPO	12pF	ECJ-0EC1H120J	PANASONIC	
27	C401	1	CAPACITOR, SMT, 0402, CER, 2200pF, 50V, 10%, X7R	0.0022u F	ECJ-0EB1H222K	PANASONIC	
28	R331	1	RESISTOR, SMT, THICK FILM, 56K, 1/16W, 5%	56kΩ	ERJ-2GEJ563	PANASONIC	
29	C081, C221, C411, C451	4	CAPACITOR, SMT, 0603, CERAMIC, 10uF, 6.3V, 20%, X5R	10uF	ECJ-1VB0J106M	PANASONIC	
30	R1	1	RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	0Ω	ERJ-2GE0R00X	PANASONIC	
31	C041	0	UNINSTALLED CAP CERAMIC 4.7uF 6.3V X5R 0603	4.7uF	ECJ-1VB0J475K	Panasonic	DNP
32	X1	1	SMA STRAIGHT JACK, SMT		32K10A-40ML5	ROSENBERG ER	
33	Q2	0	Crystal, SMT, 32.768 kHz	32.768k	MS3V-T1R	Micro Crystal	DNP
34	U1	1	DUT, SMT, PQFP, RGZ-48, 0.5mmLS, 7.15x7.15x1mm, THR.M.PAD		CC430F52x1	TI	
35	JP1	1	Pin Connector 2x4pin		61300821121	WUERTH	
36	CON1-CON9	0	Pin Connector 2x4pin		61300821121	WUERTH	DNP
37	JP2	1	Pin Connector 1x3pin		61300311121	WUERTH	
38	JP3, JP5, JP10	3	Pin Connector 1x2pin		61300211121	WUERTH	
38a	JP7, CON13	0	Pin Connector 1x2pin		61300211121	WUERTH	DNP
39	JP4	1	Pin Connector 2x2pin		61300421121	WUERTH	DNP
40	JP1a	1	Pin Connector 2x3pin		61300621121	WUERTH	

B.27 EM430F6137RF900**Figure B-53. EM430F6137RF900 Target Socket Module, Schematic**

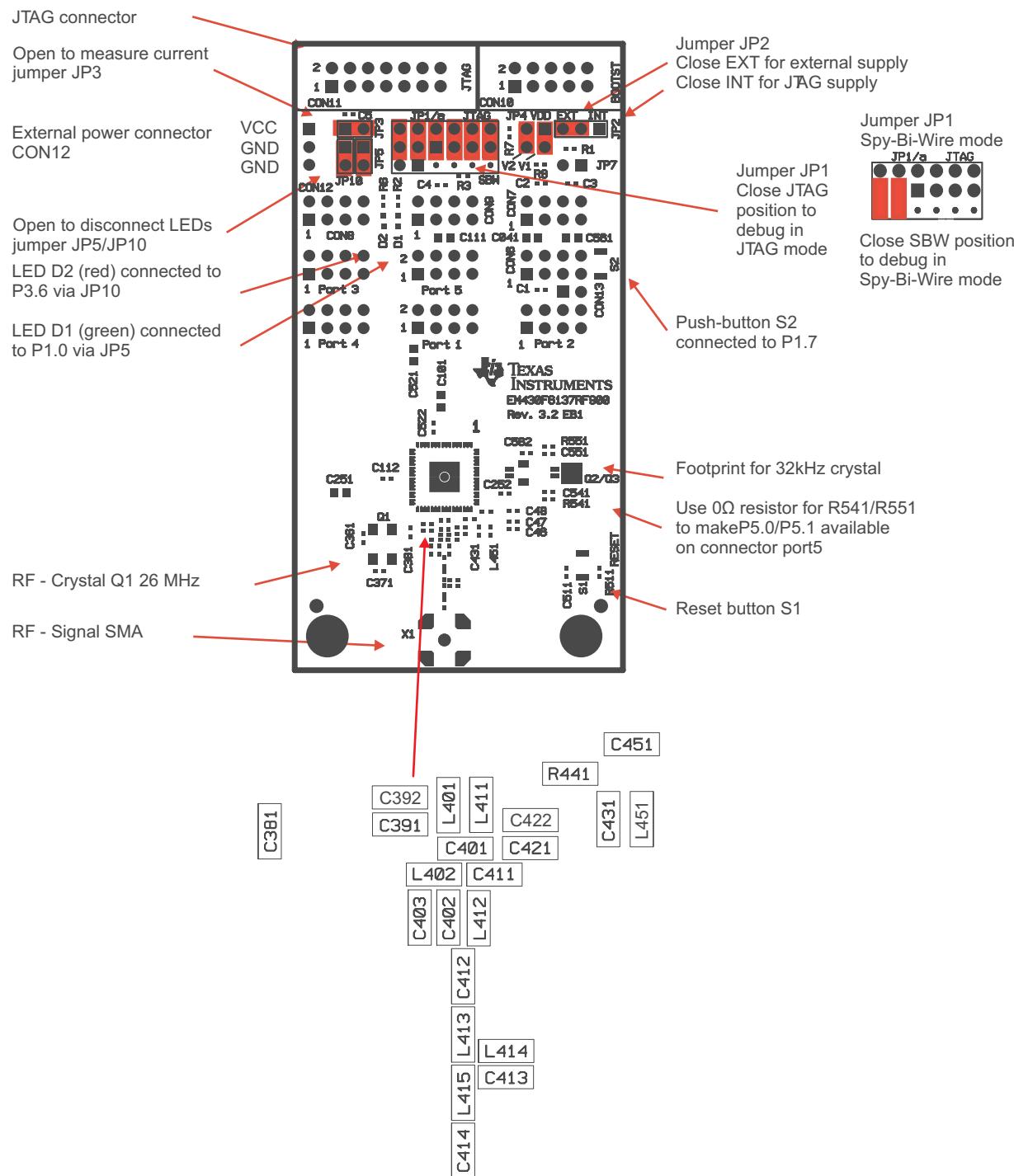


Figure B-54. EM430F6137RF900 Target Socket Module, PCB

Table B-28. EM430F6137RF900 Bill of Materials

Pos.	Ref Des	No. per Board	Description	Part No.	Manufacturer
1	Q1	1	(CUSTOMER SUPPLY) CRYSTAL, SMT, 4P, 26MHz	ASX-531(CS)	AKER ELECTRONIC
2	C1-C5, C112, C252, C381, C391, C421, C431, C451, C522, C562	14	CAPACITOR, SMT, 0402, CER, 16V, 10%, 0.1uF	0402YC104KAT2A	AVX
3	C101	1	CAPACITOR, SMT, 0603, CERAMIC, 0.47uF, 16V, 10%, X5R	0603YD474KAT2A	AVX
4	R511	1	RES0402, 47.0K	CRCW04024702F100	DALE
5	CON11	1	HEADER, THU, MALE, 14P, 2X7, 25.4x9.2x9.45mm, 90deg	09 18 514 6323	HARTING
7	D1	1	LED, SMT, 0603, GREEN, 2.1V	APT1608MGC	KINGBRIGHT
8	D2	1	LED, SMT, 0603, RED, 2.0V	APT1608EC	KINGBRIGHT
10	CON12	1	HEADER, THU, MALE, 3P, 1x3, 9.9x4.9x5.9mm	22-03-5035	MOLEX
11	C361, C371	2	50V, ±5%, 27pF	GRM36COG270J50	MURATA
12	L451	1	FERRITE, SMT, 0402, 1.0kΩ, 250mA	BLM15HG102SN1D	MURATA
13	C403	1	CAPACITOR, SMT, 0402, CERAMIC, 100pF, 50V, ±0.25pF, C0G(NPO)	GRM1555C1H101JZ01	MURATA
14	L414	1	INDUCTOR, SMT, 0402, 2.2nH, ±0.2nH, 1000mA, 250MHz	LQW15AN2N2C10	MURATA
15	L413, L415	2	INDUCTOR, SMT, 0402, 15nH, ±5%, 460mA, 250MHz	LQW15AN15NJ00	MURATA
16	L402, L412	2	INDUCTOR, SMT, 0402, 18nH, ±5%, 370mA, 250MHz	LQW15AN18NJ00	MURATA
17	C401	1	CAPACITOR, SMT, 0402, CER, 1pF, 50V, ±0.25pF, NP0	GJM1555C1H1R0CB01D	MURATA
18	C413	1	CAPACITOR, SMT, 0402, CERAMIC, 8.2pF, 50V, ±0.25pF, C0G(NPO)	GRM1555C1H8R2CZ01	MURATA
19	C402, C411-C412, C414	4	CAPACITOR, SMT, 0402, CERAMIC, 1.5pF, 50V, ±0.25pF, C0G(NPO)	GRM1555C1H1R5CZ01	MURATA
20	L401, L411	2	INDUCTOR, SMT, 0402, 12nH, ±5%, 500mA, 250MHz	LQW15AN12NJ00	MURATA
21	C46-C48, C392, C422	5	CAPACITOR, SMT, 0402, CERAMIC, 2.0pF, 50V, ±0.25pF, C0G(NPO)	GRM1555C1H2R0CZ01	Murata
22	L1	1	INDUCTOR, SMT, 0402, 6.2nH, ±0.1nH, 700mA, 250MHz	LQW15AN6N2D00	Murata
23	S1-S2	2	ULTRA-SMALL TACTILE SWITCH, SMT, 2P, SPST-NO, 1.2x3x2.5mm, 0.05A, 12V	B3U-1000P	OMRON
24	R7	1	RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	ERJ-2GE0R00X (UN)	PANASONIC
25	R2-R3, R6	3	RESISTOR, SMT, 0402, THICK FILM, 5%, 1/16W, 330	ERJ-2GEJ331	PANASONIC
27	C511	1	CAPACITOR, SMT, 0402, CER, 2200pF, 50V, 10%, X7R	ECJ-0EB1H222K	PANASONIC
28	C111, C251, C521, C561	4	CAPACITOR, SMT, 0603, CERAMIC, 10uF, 6.3V, 20%, X5R	ECJ-1VB0J106M	PANASONIC
28a	C041	1	CAP CERAMIC 4.7UF 6.3V X5R 0603	ECJ-1VB0J475M	PANASONIC
29	R441	1	RESISTOR, SMT, THICK FILM, 56K, 1/16W, 1%	ERJ-2RKF5602	PANASONIC
30	R1	1	RESISTOR/JUMPER, SMT, 0402, 0 Ω, 5%, 1/16W	ERJ-2GE0R00X	PANASONIC
31	X1	1	SMA STRAIGHT JACK, SMT	32K10A-40ML5	ROSENBERGER

Table B-28. EM430F6137RF900 Bill of Materials (continued)

Pos.	Ref Des	No. per Board	Description	Part No.	Manufacturer
33	U1	1	DUT, SMT, PQFP, RGC-64, 0.5mmLS, 9.15x9.15x1mm, THRM.PAD	CC430F6137	TI
34	JP1	1	Pin Connector 2x4pin	61300821121	WUERTH
35	JP2	1	Pin Connector 1x3pin	61300311121	WUERTH
36a	JP3, JP5, JP10	3	Pin Connector 1x2pin	61300211121	WUERTH
38	JP1a	1	Pin Connector 2x3pin	61300621121	WUERTH

B.28 MSP-FET430PIF

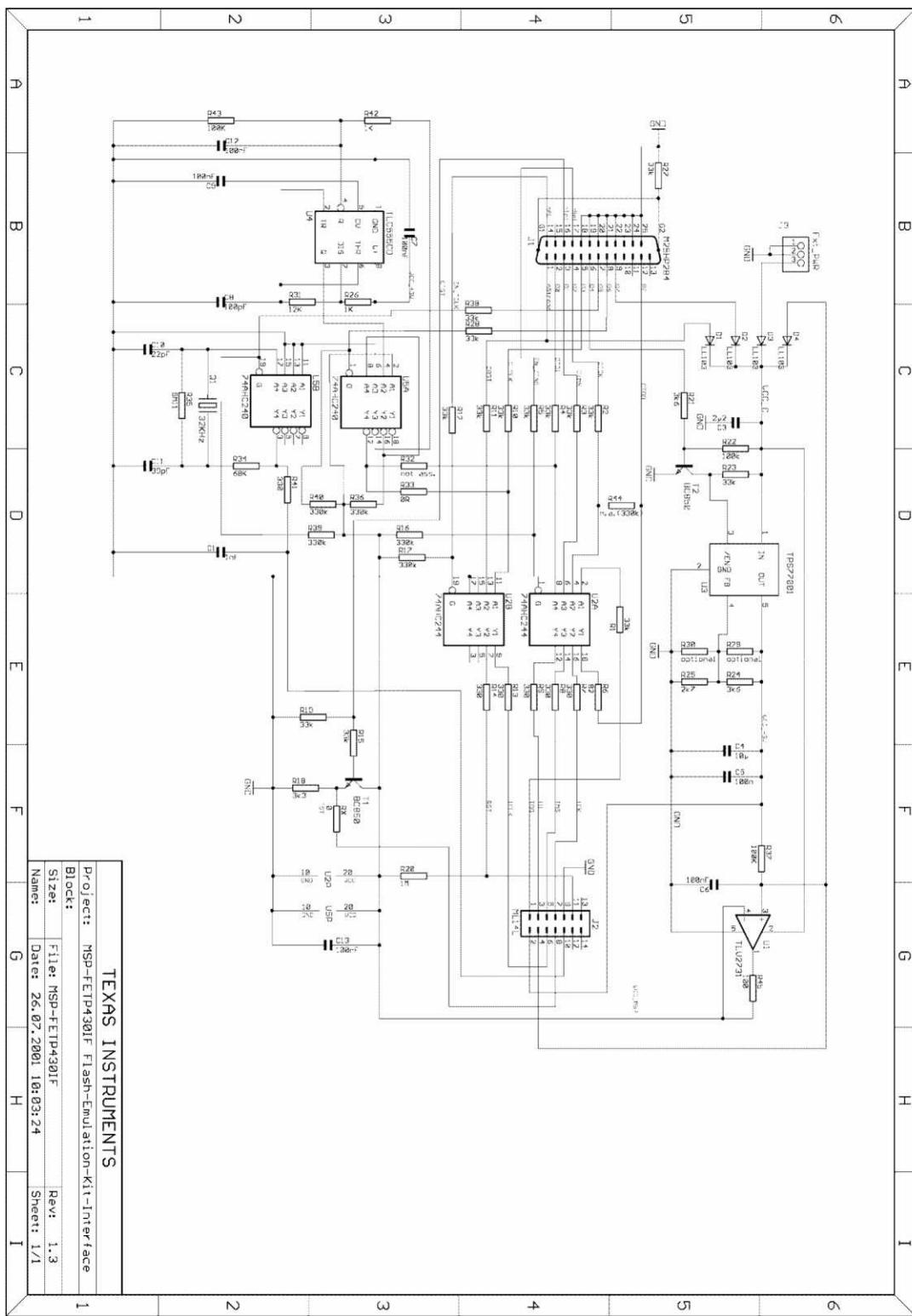


Figure B-55. MSP-FET430PIF FET Interface Module, Schematic

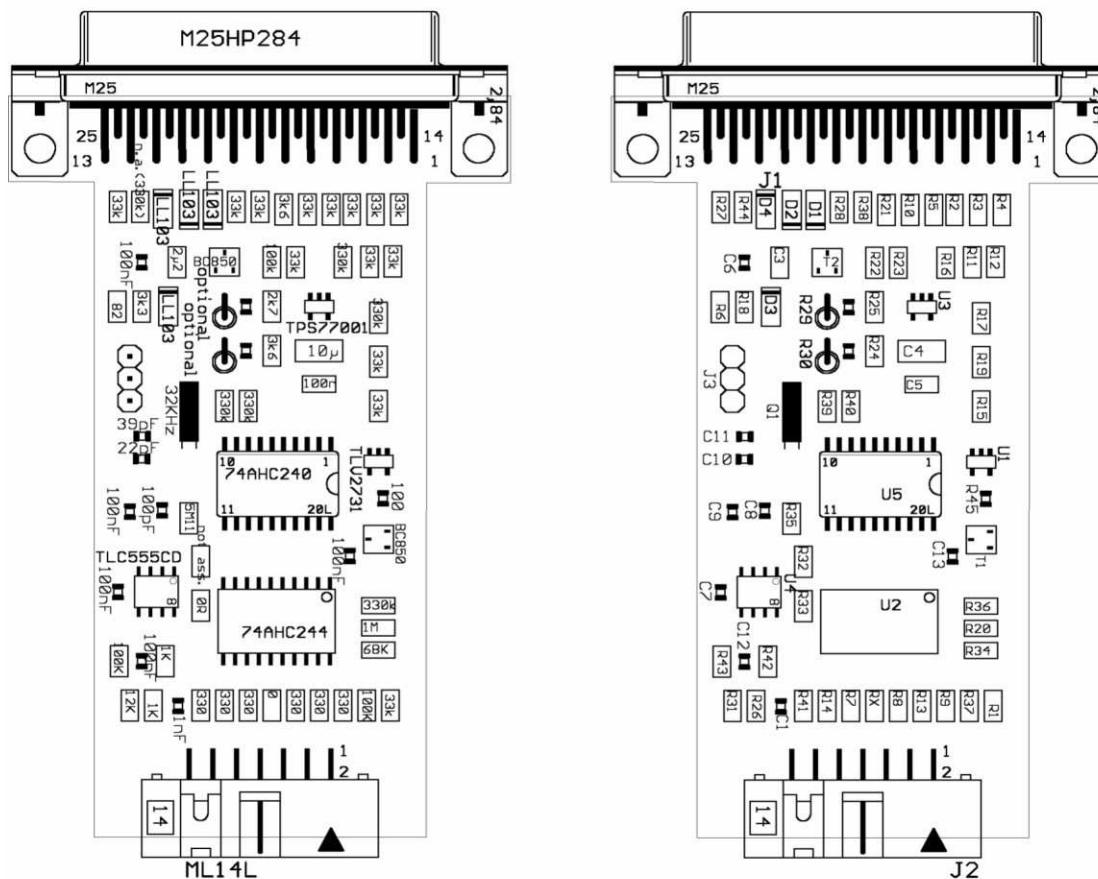


Figure B-56. MSP-FET430PIF FET Interface Module, PCB

B.29 MSP-FET430UIF

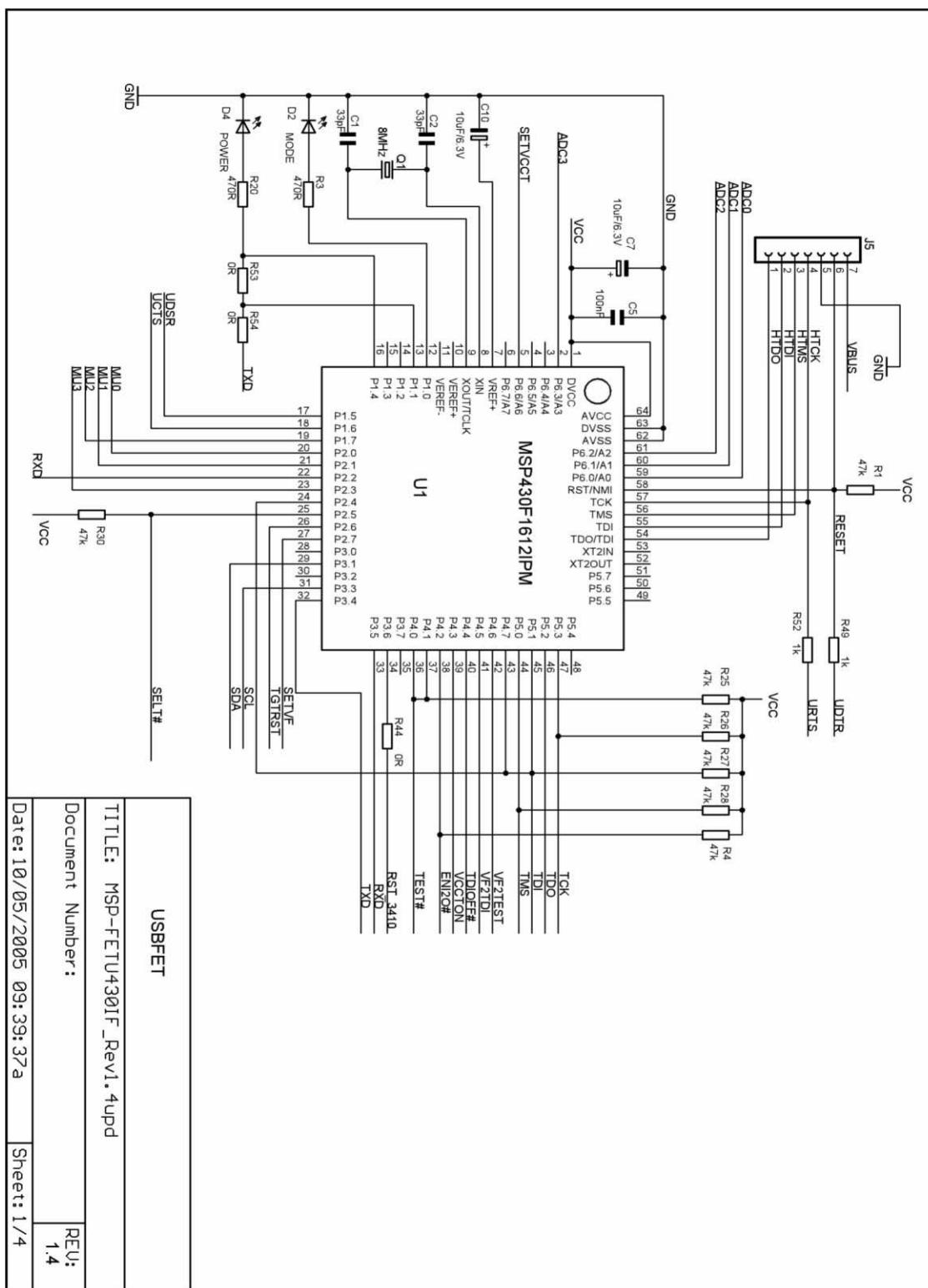
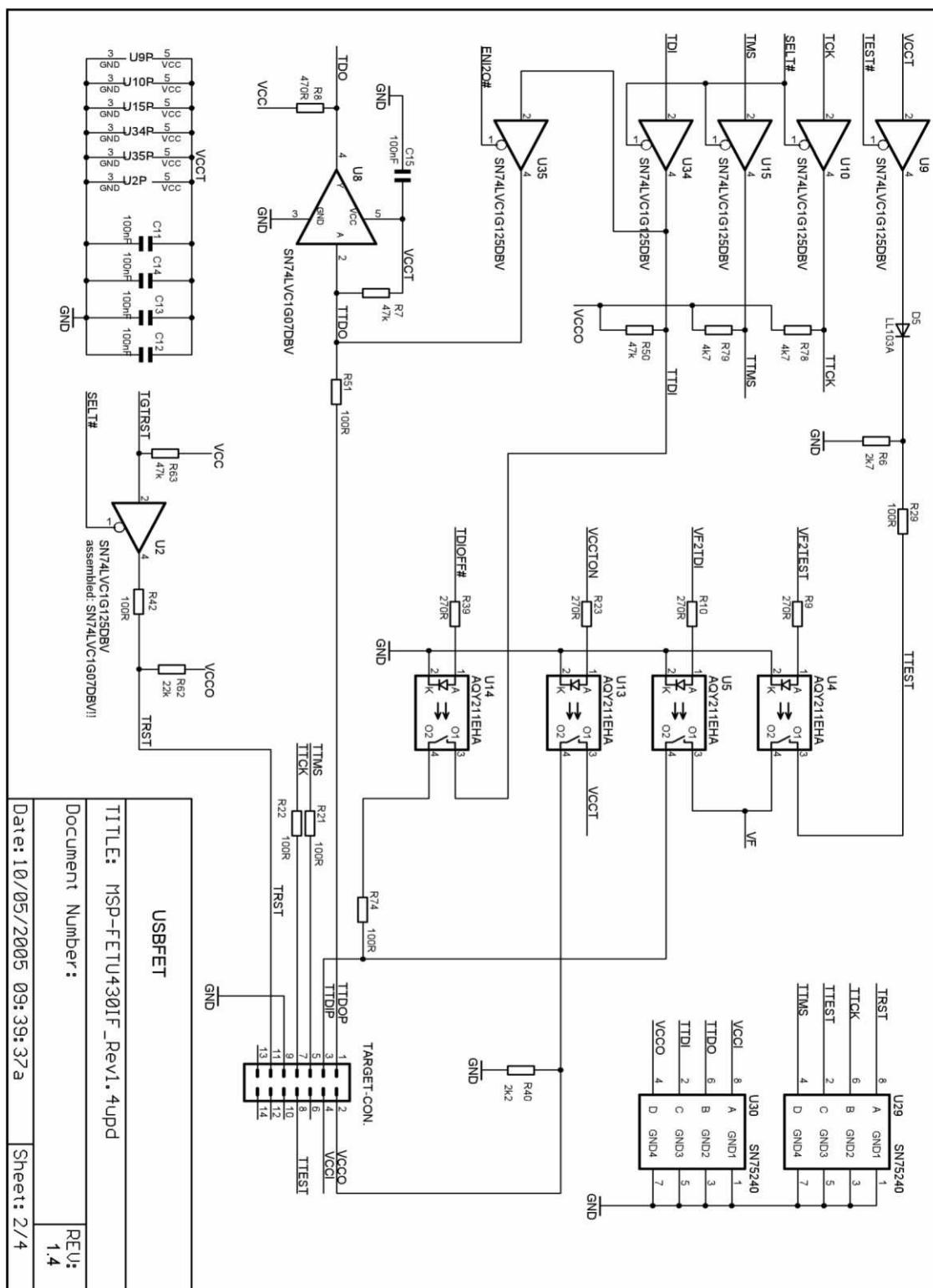
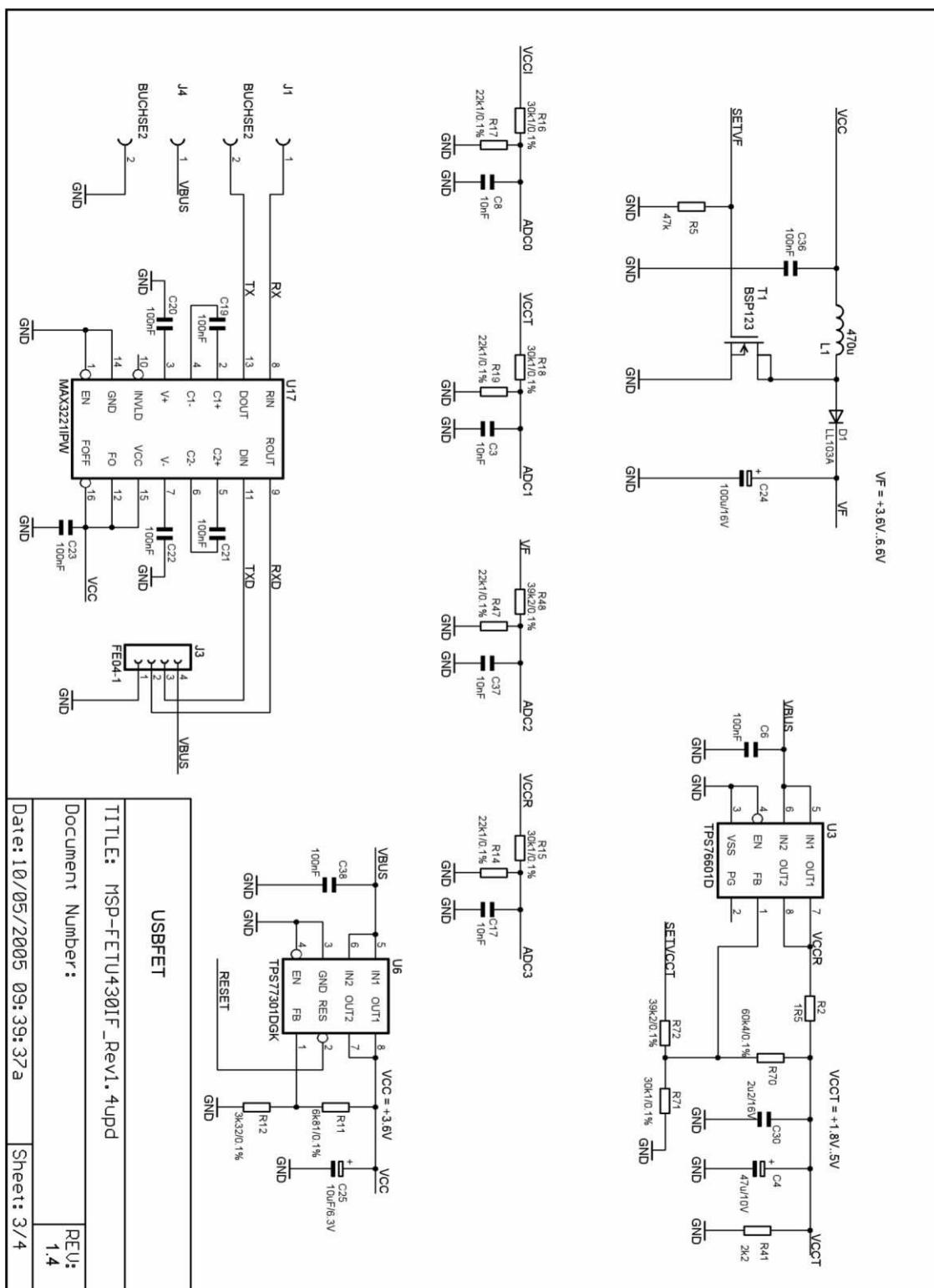
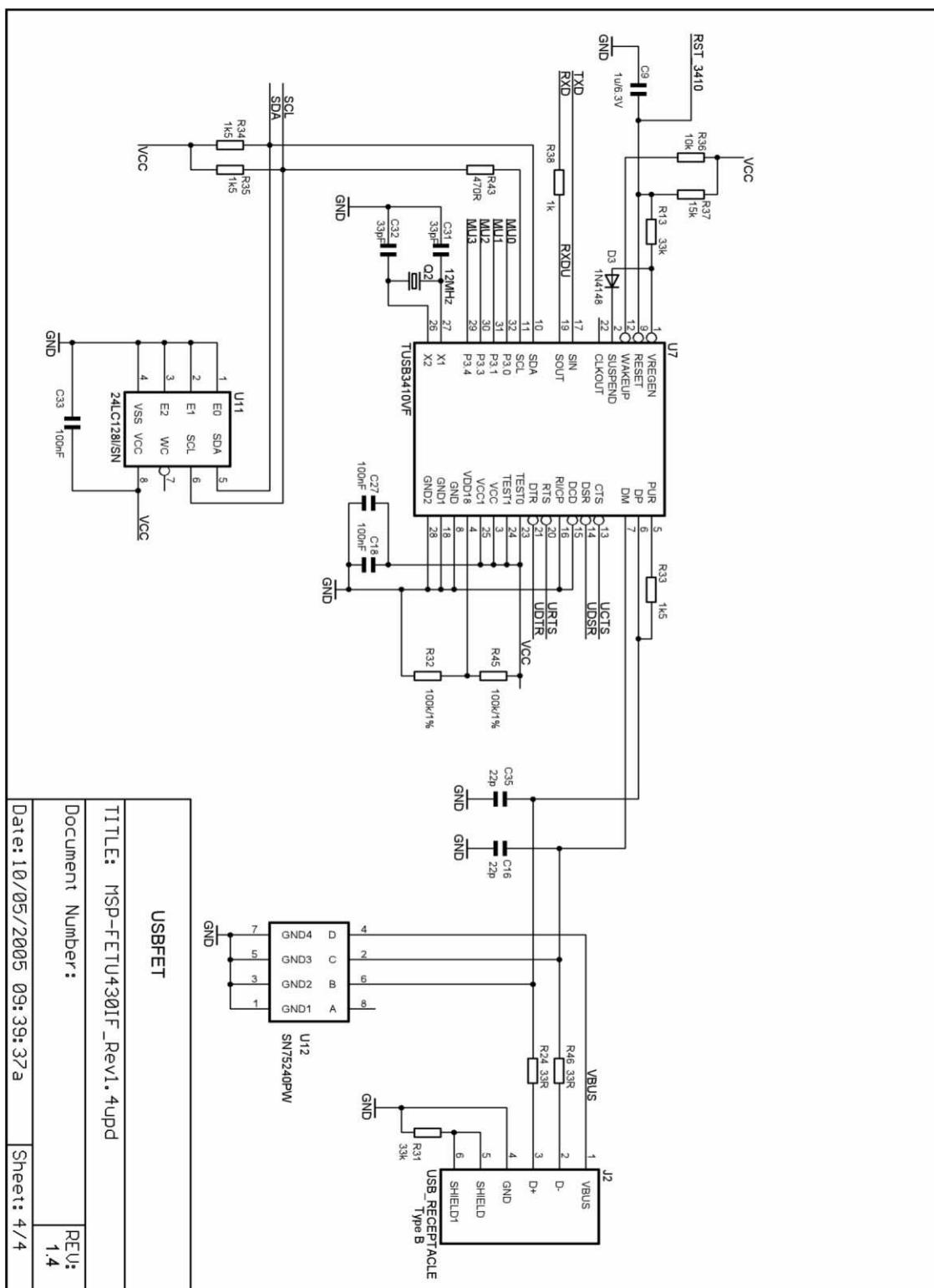


Figure B-57. MSP-FET430UIF USB Interface, Schematic (1 of 4)


Figure B-58. MSP-FET430UIF USB Interface, Schematic (2 of 4)


Figure B-59. MSP-FET430UIF USB Interface, Schematic (3 of 4)


Figure B-60. MSP-FET430UIF USB Interface, Schematic (4 of 4)

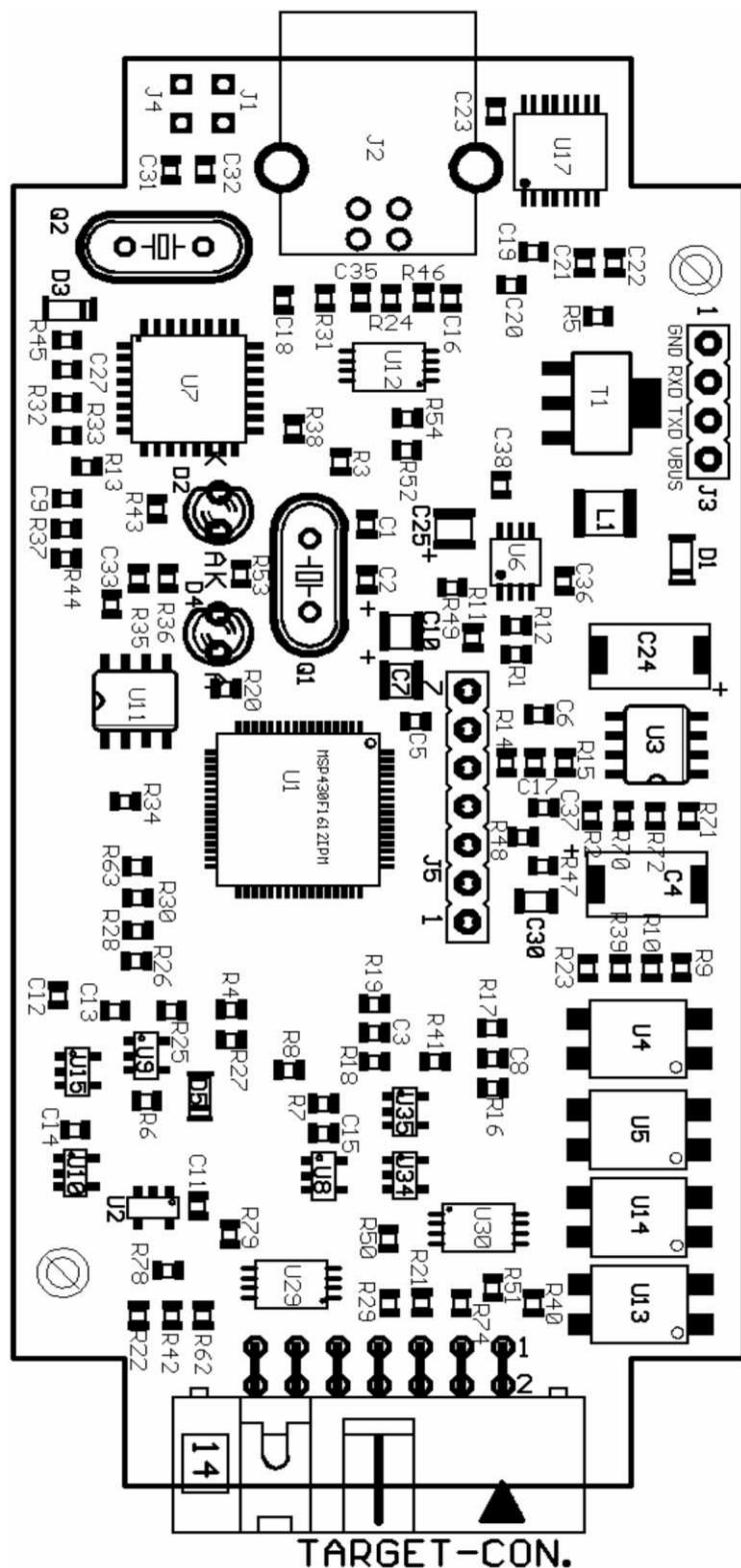


Figure B-61. MSP-FET430UIF USB Interface, PCB

B.29.1 MSP-FET430UIF Revision History

Revision 1.3

- Initial released hardware version

Assembly change on 1.3 (May 2005)

- R29, R51, R42, R21, R22, R74: value changed from 330R to 100R

Changes 1.3 to 1.4 (Aug 2005)

- J5: VBUS and RESET additionally connected
- R29, R51, R42, R21, R22, R74: value changed from 330R to 100R
- U1, U7: F1612 can reset TUSB3410; R44 = 0R added
- TARGET-CON.: pins 6, 10, 12, 13, 14 disconnected from GND
- Firmware-upgrade option through BSL: R49, R52, R53, R54 added; R49, R52 are currently DNP
- Pullups on TCK and TMS: R78, R79 added
- U2: Changed from SN74LVC1G125DBV to SN74LVC1G07DBV

NOTE: Using a locally powered target board with hardware revision 1.4

Using an MSP-FET430UIF interface hardware revision 1.4 with populated R62 in conjunction with a locally powered target board is not possible. In this case, the target device RESET signal is pulled down by the FET tool. It is recommended to remove R62 to eliminate this restriction. This component is located close to the 14-pin connector on the MSP-FET430UIF PCB. See the schematic and PCB drawings in this document for the exact location of this component.

Assembly change on 1.4 (January 2006)

- R62: not populated

Hardware Installation Guide

This section describes the hardware installation process of the following USB debug interfaces on a PC running Windows XP:

- MSP-FET430UIF
- eZ430-F2013
- eZ430-RF2500
- eZ430-Chronos

The installation procedure for other supported versions of Windows is very similar and, therefore, not shown here.

Topic	Page
C.1 Hardware Installation	130

C.1 Hardware Installation

1. Connect the USB Debug Interface with a USB cable to a USB port of the PC. (eZ430-F2013, eZ430-RF2500 and eZ430-Chronos can be connected without a cable.)
2. Windows should now recognize the new hardware as an "MSP430 XXX x.xx.xx" (see [Figure C-1](#)). The device name may be different from the one shown here.



Figure C-1. Windows XP Hardware Recognition

3. For CCE v3.1 SR1 and CCSv4.x the drivers will be installed automatically without user interaction (continue with step 13). For IAR the Hardware Wizard starts automatically and may open the "Found New Hardware Wizard" window.

NOTE: This Window may not appear. If it does not, the drivers will be installed automatically.
Continue with step 13.

4. Click "Next". The Hardware Wizard tries to find the driver in the system. If the driver is found, continue with step 8. If not, press "Back" and continue with step 5.
5. Select "Install from a list or specific location (Advanced)" (see [Figure C-2](#)).

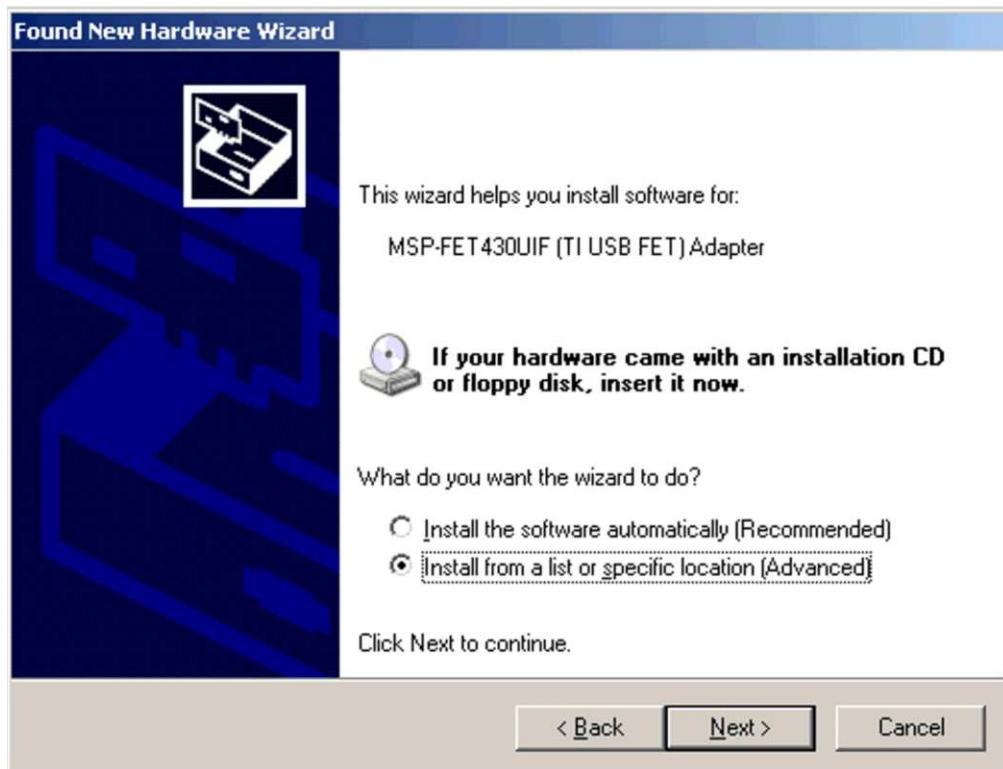


Figure C-2. Windows XP Hardware Wizard

6. Browse to the folder where the driver information files are located (see [Figure C-3](#)).

For CCE, the default folder is:

C:\Program Files\Texas Instruments\MSP430_USB_DRIVERS_v3.1\

For CCS, the default folder is:

C:\Program Files\Texas Instruments\ccs4\emulation\drivers\msp430\

For IAR Embedded Workbench, the default folder is:

C:\Program Files\Texas Instruments\IAR Systems\Embedded Workbench 4.0\430\drivers\TIUSBFET\WinXP

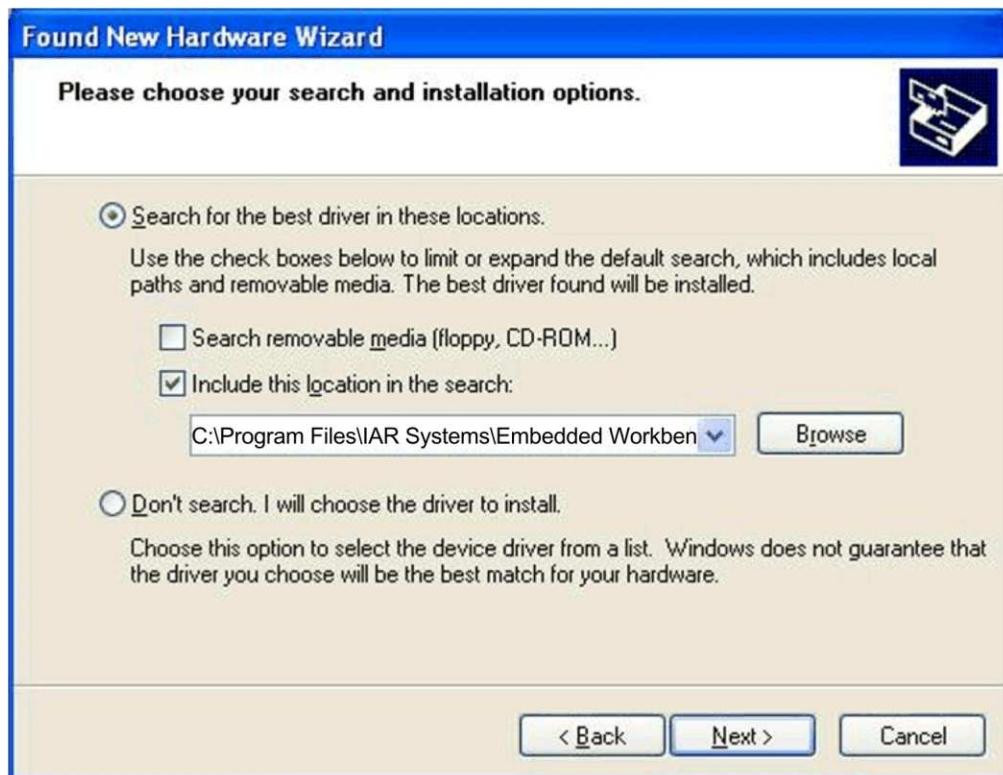


Figure C-3. Windows XP Driver Location Selection Folder

7. The Wizard generates a message that an appropriate driver has been found.

8. Note that Windows may show a warning that the driver is not certified by Microsoft. Ignore this warning and click "Continue Anyway" (see [Figure C-4](#)).

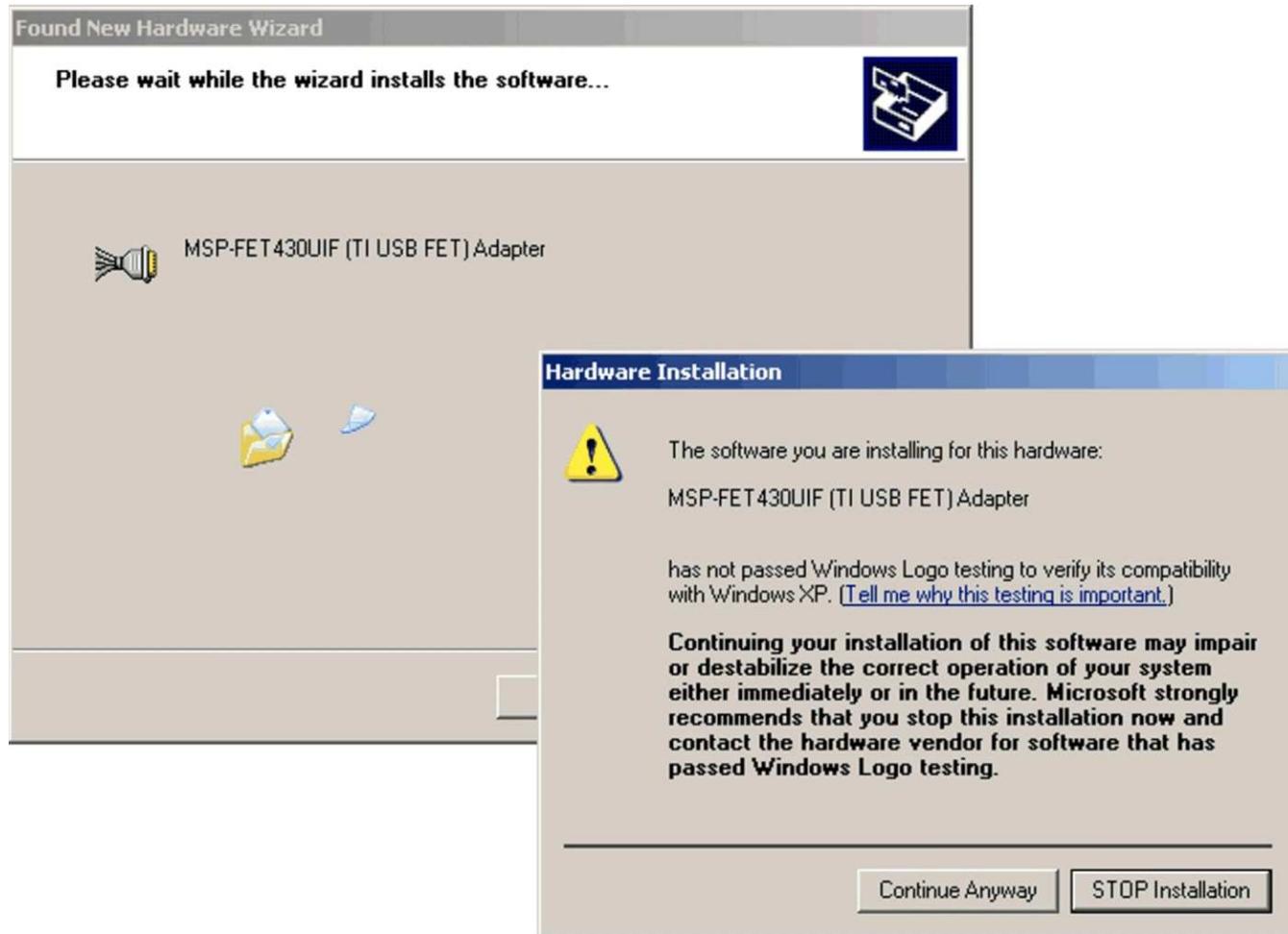


Figure C-4. Windows XP Driver Installation

9. The wizard installs the driver files.
10. The wizard shows a message that it has finished the installation of the software for "MSP-FET430UIF (TI USB FET) Adapter" (or "MSP430 Application UART").
11. **NOTE: This step is for MSP-FET430UIF and eZ430-F2013 only.**
After closing the hardware wizard, Windows automatically recognizes another new hardware device called "MSP-FET430UIF - Serial Port".
12. **NOTE: This step is for MSP-FET430UIF and eZ430-F2013 only.**
Depending on the current update version of the operating system, corresponding drivers are installed automatically or the hardware wizard opens again. **If the wizard starts again, repeat the previous steps.**

13. The USB debug interface is installed and ready to use. The Device Manager lists a new entry as shown in [Figure C-5](#), [Figure C-6](#), or [Figure C-7](#).

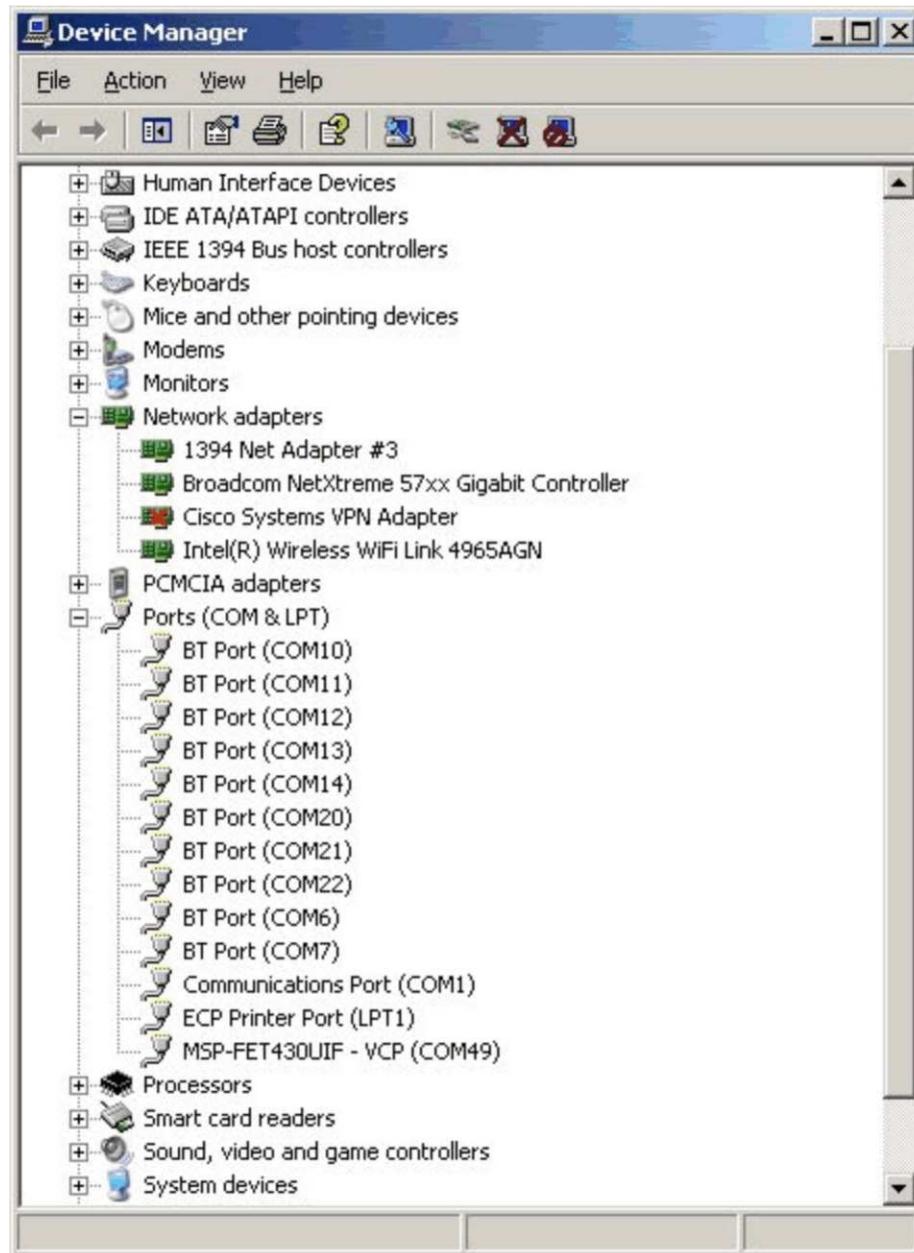


Figure C-5. Device Manager Using MSP-FET430UIF or eZ430-F2013 (CCE and CCS Only)

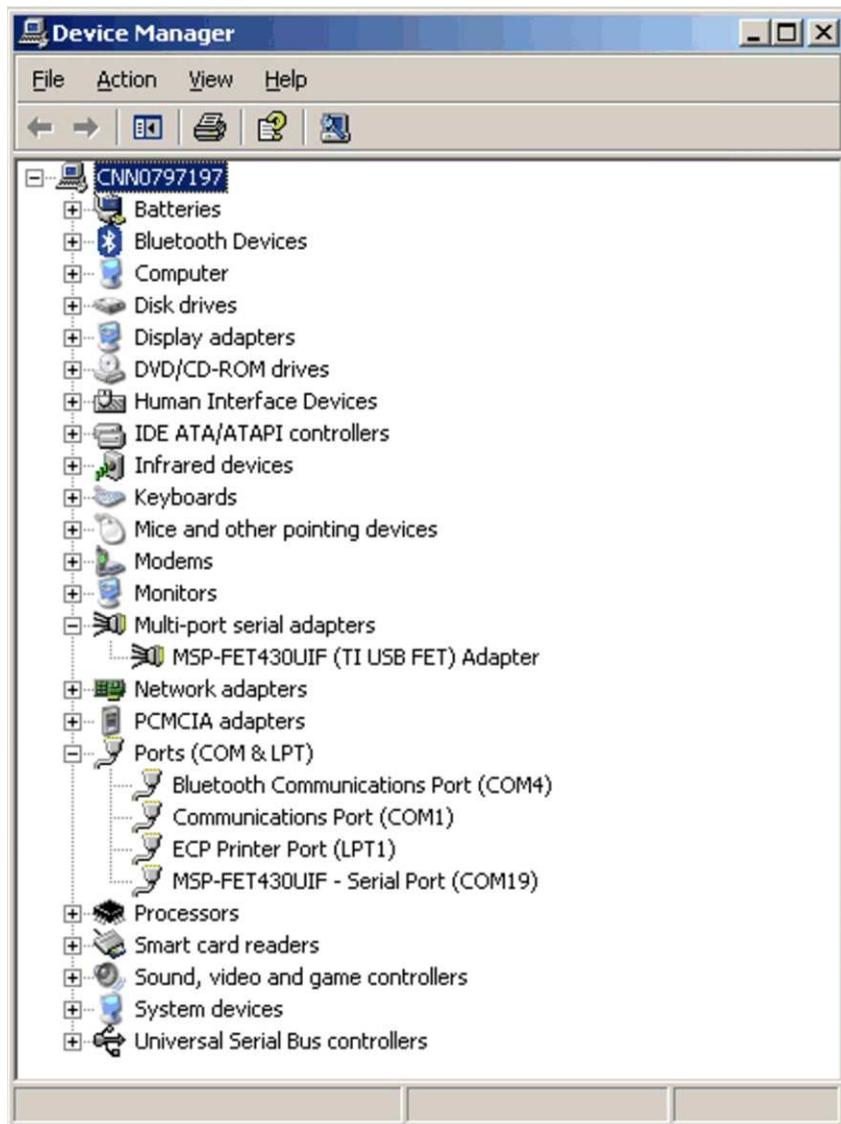


Figure C-6. Device Manager Using MSP-FET430UIF or eZ430-F2013 (IAR Only)

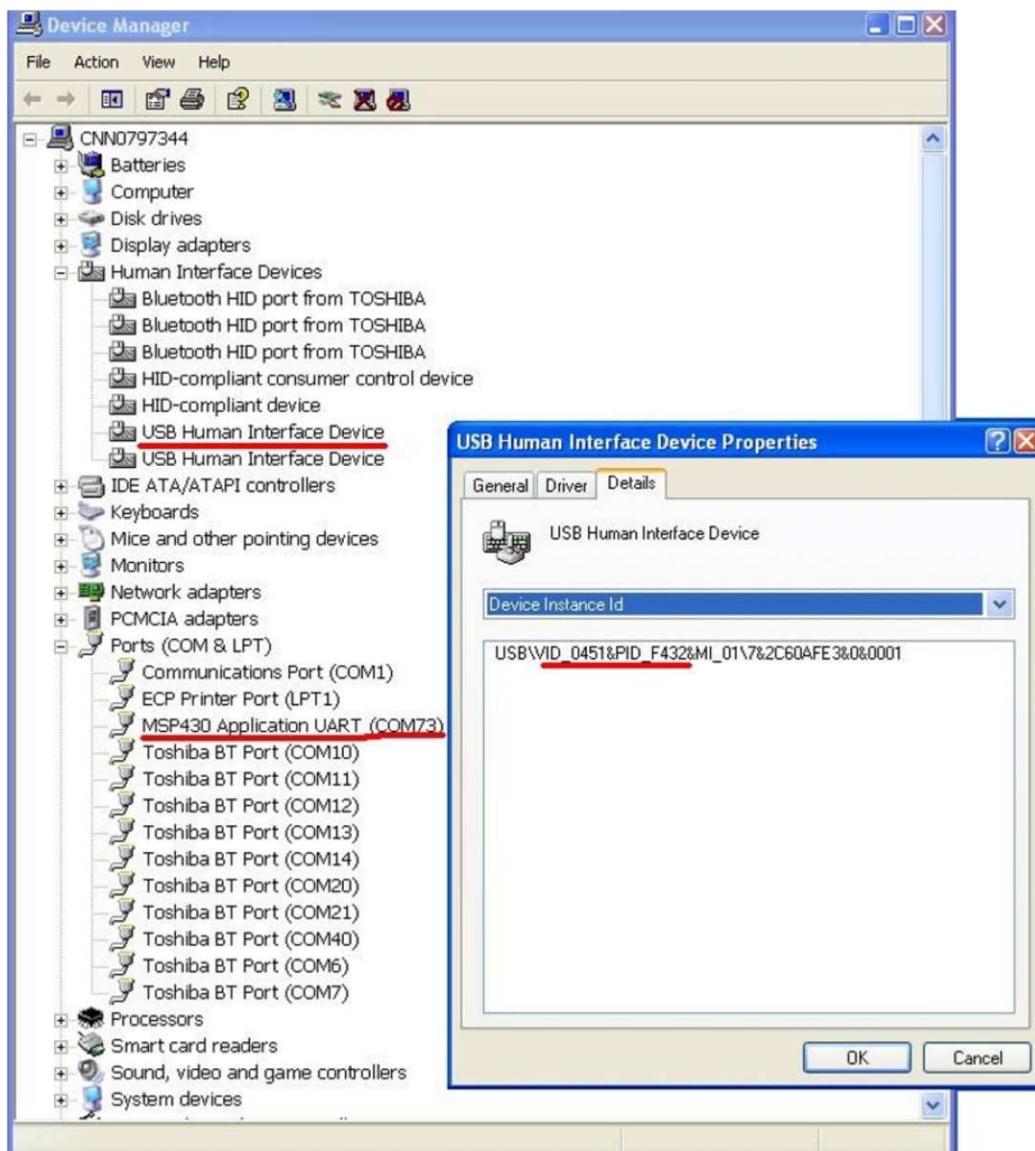


Figure C-7. Device Manager Using eZ430-RF2500 (CCE/CCS and IAR)

Document Revision History

Version	Changes/Comments
SLAU278	Initial release
SLAU278A	Updated USB driver installation according to CCE v3.1 SR1 and CCS v4.
SLAU278B	Added information about MSP-FET430U80USB, MSP-TS430PN80USB, and eZ430-Chronos.
SLAU278C	Added bills of materials and updated some PCBs in Appendix B. Added information about MSP-TS430DA38, MSP-TS430DL48, MSP-TS430PW14, MSP-TS430PW28.
SLAU278D	Added information about MSP-TS430L092, MSP-TS430RSB40, MSP-TS430RGC64USB, MSP-TS430PZ100USB, MSP-FET430F5137RF900
SLAU278E	Added jumper information for MSP-TS430L092 PCBs to Appendix B. Added new supported devices in Chapter 1.
SLAU278F	Added information about MSP-TS430PW24, MSP-TS430PW28A, MSP-TS430RHA40A, MSP-TS430RGZ48B, MSP-TS430RGC64B, MSP-TS430PN80A, and MSP-TS430PZ100B. Updated MSP-TS430RSB40 schematics

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

EVALUATION BOARD/KIT IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user is **not exclusive**.

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein**.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please contact the TI application engineer or visit www.ti.com/esh.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

FCC Warning

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DLP® Products	www.dlp.com	Communications and Telecom	www.ti.com/communications
DSP	dsp.ti.com	Computers and Peripherals	www.ti.com/computers
Clocks and Timers	www.ti.com/clocks	Consumer Electronics	www.ti.com/consumer-apps
Interface	interface.ti.com	Energy	www.ti.com/energy
Logic	logic.ti.com	Industrial	www.ti.com/industrial
Power Mgmt	power.ti.com	Medical	www.ti.com/medical
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Space, Avionics & Defense	www.ti.com/space-avionics-defense
RF/IF and ZigBee® Solutions	www.ti.com/lprf	Video and Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless-apps