

EV2400 EVM Interface Board

This user's guide describes the function and operation of the EV2400 evaluation module interface board. A complete description, as well as the bill of materials and schematic are included.

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1 Introduction

The EV2400 EVM interface board enables an IBM-compatible or other type PC (with the required driver for its particular platform) to communicate with the Texas Instruments SMBus, I²C, HDQ, or DQ interface gas gauges via a Universal Serial Bus (USB) port. In addition to this board, PC software is required to interpret the gas gauge data to complete the evaluation system.

1.1 Features

- Fully powered from the USB port
- Optional 5-V port for powering high power voltage drivers (future upgrade)
- Complete interface between the USB and SMBus, I²C, and HDQ (8/16) interfaces using a simple API
- Expansion port for future upgrades

1.2 Kit Contents

- EV2400 circuit module
- Standard USB cable

1.3 Ordering Information

Table 1. Ordering Information

EVM Part Number
EV2400

2 Interfaces

The EV2400 interfaces are described in the following table. The reference designators on the circuit board and the functions are also listed.

Reference Designator	Function	Details
Port 1: SMB	SMBus Interface Port	Terminal block for connecting to a target device
Port 2: I2C	I ² C Interface Port	Terminal block for connecting to a target device
Port 3: HDQ	HDQ and DQ Interface Ports	Terminal block for connecting to a target device
Port 4	Single Wire Port	Future expansion port
Port 5	GPIO Port	Future expansion port

2.1 Overview

The EV2400 ports are shown in [Figure 1](#).

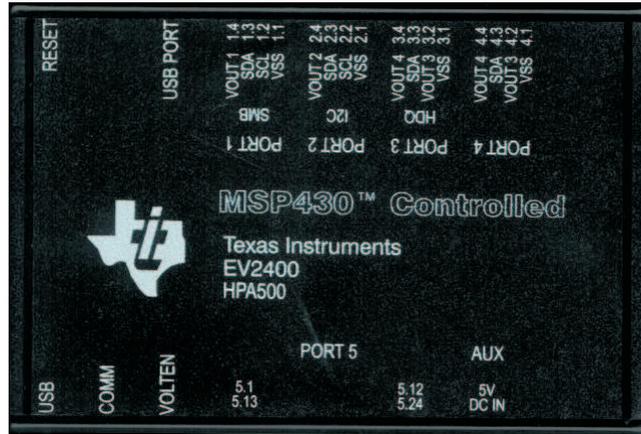


Figure 1. EV2400 Ports

NOTE: The additional power input 5-V port on the EV2400 must not be connected in normal operation. Normal operation uses power from the USB port.

2.2 EV2400 Controller

The EV2400 controller is an MSP430F5529 running at 4 MHz. The controller firmware is stored in flash memory and is executed by the core at power-up.

The controller communicates with target device(s) through either: a 2-wire SMBus communication port, a 1-wire HDQ port, or a 2-wire EEPROM I²C port. The 2-wire SMBus communication port supports both SMBus and I²C protocols. CRC-8 checksum verification for the data packets prevents data corruption over the USB.

2.3 USB Interface (USB)

The interface board connects to a USB port (version 1.1 or later) on a host computer and is powered from the port. All communication over the USB is human Interface device (HID) class. Drivers are built into Windows[®] and most of the operating systems.

2.4 HDQ Interface (HDQ)

This interface allows a host computer to interact with a slave or target device through the 1-wire HDQ interface. The ports are labeled with the corresponding signal names above each port connector. Connect the signal and a ground reference (VSS) to a target device.

Pin	Name	Description
3.1	VSS	Ground return/reference for HDQ interface.
3.2	VOUT 3	Optional voltage output (future expansion)
3.3	SDA	HDQ 1-wire interface. Pulled up to variable pullup voltage with a 20-kΩ resistor. Uses bus acceleration in positive direction to allow for larger pullup.
3.4	VOUT 4	Optional voltage output (future expansion)

2.5 I²C Interface (I²C)

This interface allows a host computer to interact with I²C interfaces, such as a battery monitor device and EEPROM through a 2-wire I²C interface. Connect the data, clock, and a ground reference (VSS) to a target device.

Pin	Name	Description
2.1	VSS	Ground return/reference for I ² C interface.
2.2	SCL	I ² C clock. Uses level translation. Pulled up to variable pullup voltage with a 20-k Ω resistor. Uses bus acceleration in positive direction to allow for larger pullup.
2.3	SDA	I ² C data. Uses level translation. Pulled up to variable pullup voltage with a 20-k Ω resistor. Uses bus acceleration in positive direction to allow for larger pullup.
2.4	VOUT 2	Optional voltage output (future expansion)

2.6 SMBus Interface (SMBus)

This interface allows a host computer to interact with an SMBus interface device such as a battery monitor device through a 2-wire SMBus interface. Connect the data, clock, and a ground reference (VSS) to a target device.

Pin	Name	Description
1.1	VSS	Ground return/reference for SMBus interface.
1.2	SCL	SMBus clock. Pulled up to variable pullup voltage with a 20-k Ω resistor. Uses bus acceleration in positive direction to allow for larger pullup.
1.3	SDA	SMBus data. Pulled up to variable pullup voltage with a 20-k Ω resistor. Uses bus acceleration in positive direction to allow for larger pullup.
1.4	VOUT 1	Optional voltage output (future expansion)

3 EV2400 Bill of Materials, Component Placement, Schematic

This chapter includes the bill of materials, component placement on the circuit board, and schematic for the EV2400 EVM.

3.1 Bill of Materials (BOM)

Count	Reference Design	Value	Description	Size	Part Number	Manufacturer
31	C1, C2, C3, C4, C5, C6, C7, C11, C13, C15, C16, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C38, C39	0.1 μ F	Capacitor, Ceramic, 25 V, X7R, 20%	0603	STD	Any
1	C12	4.7 μ F	Capacitor, Ceramic, 25 V, X7R, 20%	0805	STD	Any
1	C36	2.2 nF	Capacitor, Ceramic, 25 V, X7R, 20%	0603	STD	Any
2	C37, C41	220 pF	Capacitor, Ceramic, 50 V, C0G, 5%	0603	STD	Any
1	C40	470 nF	Capacitor, Ceramic, 25 V, X7R, 20%	0603	STD	Any
2	C42, C43	12 pF	Capacitor, Ceramic, 50 V, C0G, 10%	0603	STD	Any
2	C8, C10	2.2 μ F	Capacitor, Ceramic, 25 V, X7R, 20%	0603	STD	Any
3	C9, C14, C17	10 μ F	Capacitor, Tantalum, 10 μ F, 10 V, 20%	3216	293D106X0010A 2T	Vishay
6	D1, D2, D3, D4, D5, D6	GL05T	Diode, TVS diode, Low Capacitance	SOT23	GL05T	General
3	D7, D8, D9	SSF-LXH305GD-TR	Diode, LED, 2.6 V, 25 mA	0.250 x 0.250 inch	SSF-LXH305GD-TR	Lumex
1	J1	67068-1000	Connector, USB Upstream (Type B)	0.47 x 0.67 inch	67068-1000	Molex
4	J2, J3, J4, J5	22-05-3041	Header, Friction Lock Ass'y, 4-pin Right Angle,	0.400 x 0.500 inch	22-05-3041	Molex
1	J6	PEC12DBAN	Header, Right Angle, Male 2x12-pin, 100mil spacing (12-pin strip), right-angle	0.100 inch x 12 x 2	PEC12DBAN	Sullins
1	J7	RAPC 722	Connector, 2.1mm, DC Jack w/Switch, TH	0.57 x 0.35 inch	RAPC 722	Switchcraft
1	J8	22-23-2041	Header, 4-pin Friction Lock, 100-mil spacing	0.250 x 0.400 inch	22-23-2041	Molex
0	JP1, JP2, JP3, JP4, JP5, JP6	DNP	Header, 2-pin, 100-mil spacing	0.100 inch x 2	PEC02SAAN	Sullins

Count	Reference Design	Value	Description	Size	Part Number	Manufacturer
1	JP7	PEC02SAAN	Header, 2-pin, 100-mil spacing	0.100 inch x 2	PEC02SAAN	Sullins
6	Q1, Q2, Q3, Q4, Q5, Q6	BSS223PW	MOSFET, Pch, -20 V, -0.39 A, 1.2 Ohm	SOT323	BSS223PW	Infineon
3	Q7, Q8, Q9	2N7002W	MOSFET, Nch, 60 V, 115 mA	SOT323 [SC70]	2N7002W	Diodes
1	R1	33 kΩ	Resistor, Chip, 1/16 W, 5%	0603	STD	Any
4	R10, R11, R13, R14	20 kΩ	Resistor, Chip, 1/16 W, 5%	0603	STD	Any
2	R2, R3	33 Ω	Resistor, Chip, 1/16 W, 5%	0603	STD	Any
1	R26	470 Ω	Resistor, Chip, 1/16 W, 1%	0603	STD	Any
1	R27	51 kΩ	Resistor, Chip, 1/16 W, 1%	0603	STD	Any
1	R28	100 kΩ	Resistor, Chip, 1/10 W, 1%	0603	STD	Any
3	R39, R40, R41	200 Ω	Resistor, Chip, 1/16 W, 5%	0603	STD	Any
1	R4	1.5 kΩ	Resistor, Chip, 1/16 W, 5%	0603	STD	Any
1	R42	47 kΩ	Resistor, Chip, 1/16 W, 5%	0603	STD	Any
3	R43, R44, R45	10 kΩ	Resistor, Chip, 1/10 W, 1%	0603	STD	Any
3	R46, R47, R48	100 kΩ	Resistor, Chip, 1/16 W, 5%	0603	STD	Any
21	R5, R6, R7, R12, R15, R16, R19, R20, R22, R24, R25, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38	10 kΩ	Resistor, Chip, 1/16 W, 5%	0603	STD	Any
6	R8, R9, R17, R18, R21, R23	100 Ω	Resistor, Chip, 1/16 W, 5%	0603	STD	Any
1	SW1	EVQPSD02K	Switch, SMD Light-Touch, Side Operation	6.1 mm x 4.0 mm	EVQPSD02K	Panasonic
1	TP1	5VUSB	Test Point, Red, Thru Hole Color Keyed	0.100 x 0.100 inch	5000	Keystone
1	TP2	5VPLUG	Test Point, Red, Thru Hole Color Keyed	0.100 x 0.100 inch	5000	Keystone
1	TP3	3.3V	Test Point, Red, Thru Hole Color Keyed	0.100 x 0.100 inch	5000	Keystone
1	TP4	GND	Test Point, Black, Thru Hole Color Keyed	0.100 x 0.100 inch	5001	Keystone
1	U1	MSP430F5529IP N	IC, Mixed Signal Microcontroller	TQFP-80	MSP430F5529IP N	TI
6	U10, U11, U12, U13, U15, U18	TPS73601DBV	IC, Cap-Free, NMOS, 400mA LDO Regulator with Reverse Current Protection.	SOT23-5	TPS73601DBV	TI

Count	Reference Design	Value	Description	Size	Part Number	Manufacturer
1	U2	TPS2550DBV	IC, Power-Distribution Switch, Current-Limited	SOT-23-6	TPS2550DBV	TI
1	U3	TPS76333DBV	IC, Micro-Power 150-mA LDO Regulator	SOT23-5	TPS76333DBV	TI
3	U4, U5, U6	ST2329AQTR	IC, 2-bit dual supply level translator without direction control pin	10-QFN	ST2329AQTR	ST
1	U7	TPS79650DCQ	IC, Ultralow-Noise, High PSRR Fast RF, LDO, 1A, 5V	SOT223-6	TPS79650DCQ	TI
1	U8	TPS2113APW	IC, Auto Switching Power Mux, Rds 84 milli Ohm, 1A.	SO8	TPS2113APW	TI
2	U9, U14	ISL90842UIV1427Z	IC, Quad Digitally Controlled Potentiometers	TSSOP	ISL90842UIV1427Z	Intersil
1	Y1	4 MHz	Crystal, SMT Quartz Crystal	0.484 x 0.190 inch	ATS040SM	CTS
1	—		PCB		HPA500	Any
1			Plastic, Enclosure, Silkscreened, Two Custom end panels, screws		115574-501-000	PACTEC
Notes:	1. These assemblies are ESD sensitive, ESD precautions shall be observed.					
	2. These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.					
	3. These assemblies must comply with workmanship standards IPC-A-610 Class 2.					
	4. Ref designators marked with an asterisk (***) cannot be substituted. All other components can be substituted with equivalent manufacturers' components.					

3.2 EV2400 Component Placement

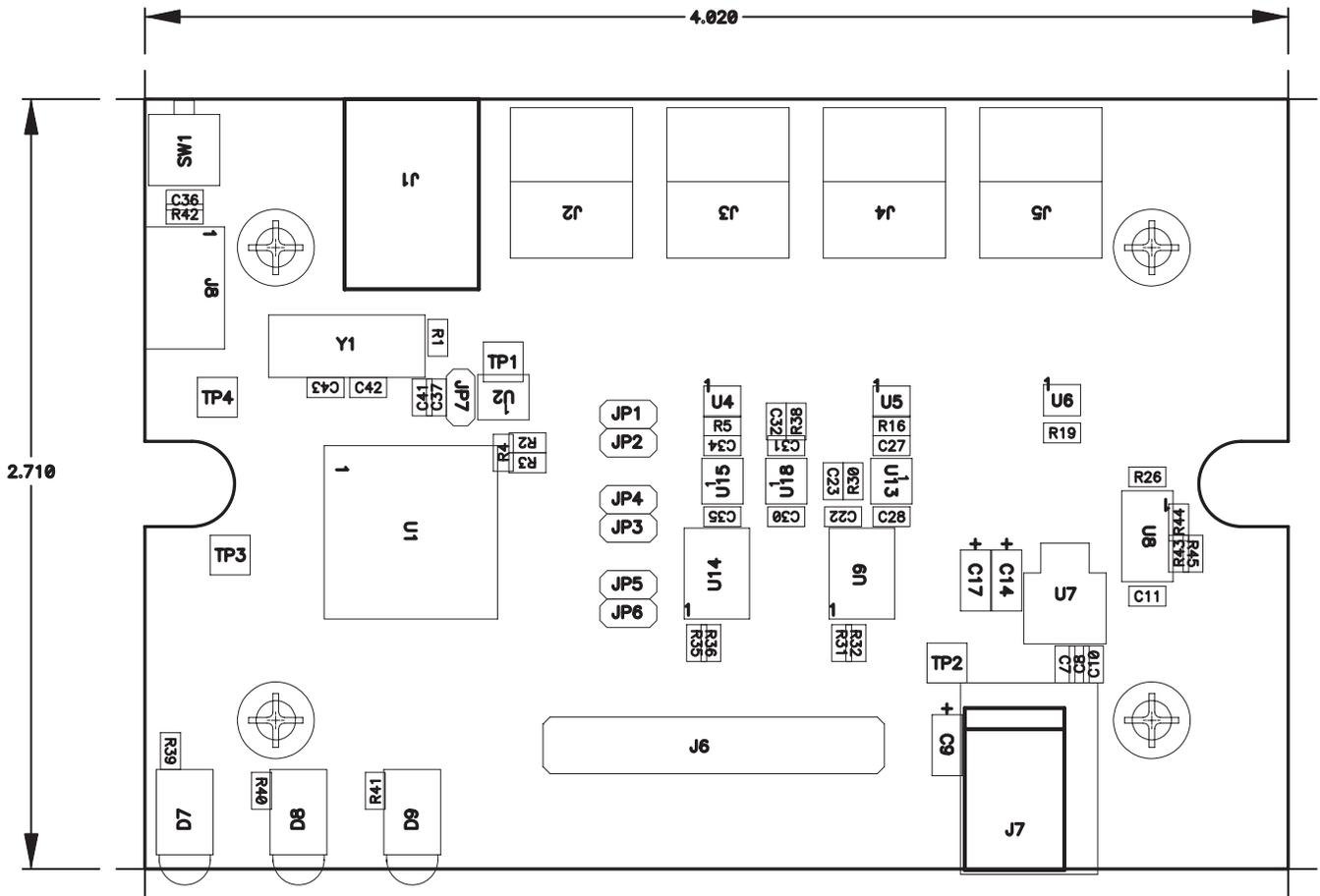


Figure 2. Top Assembly

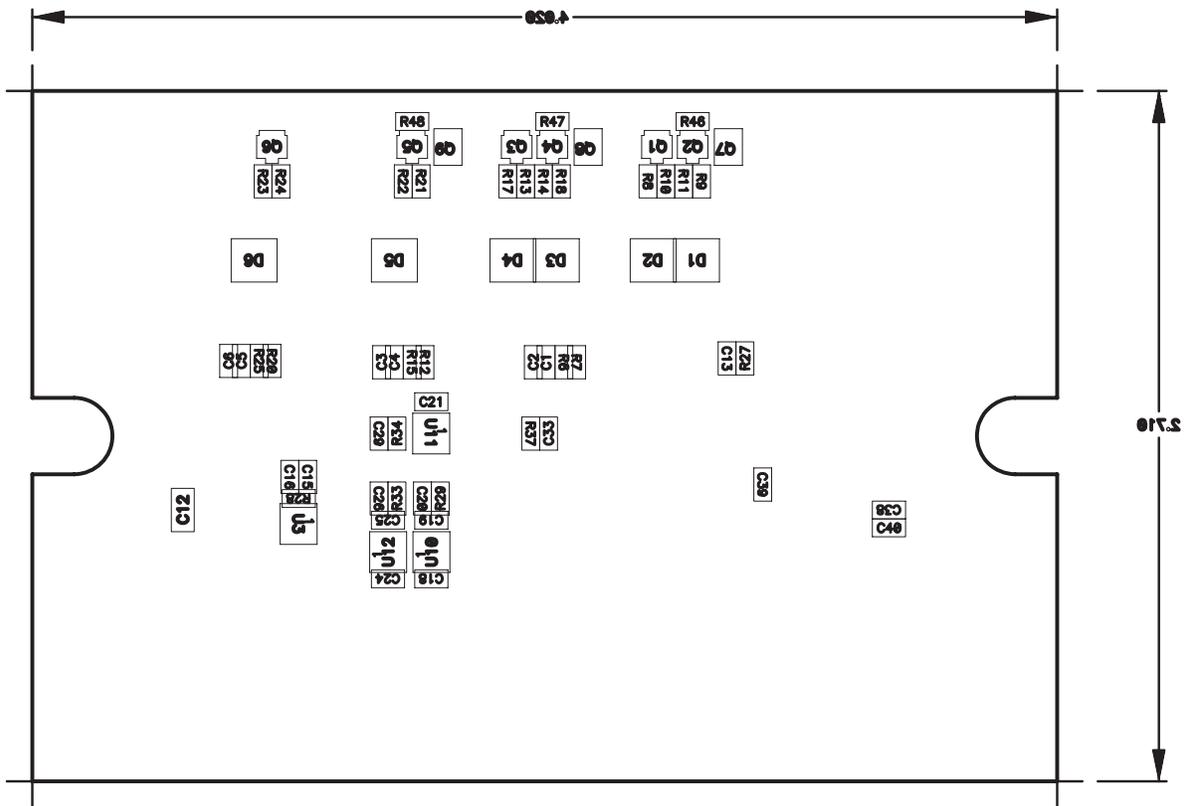


Figure 3. Bottom Assembly

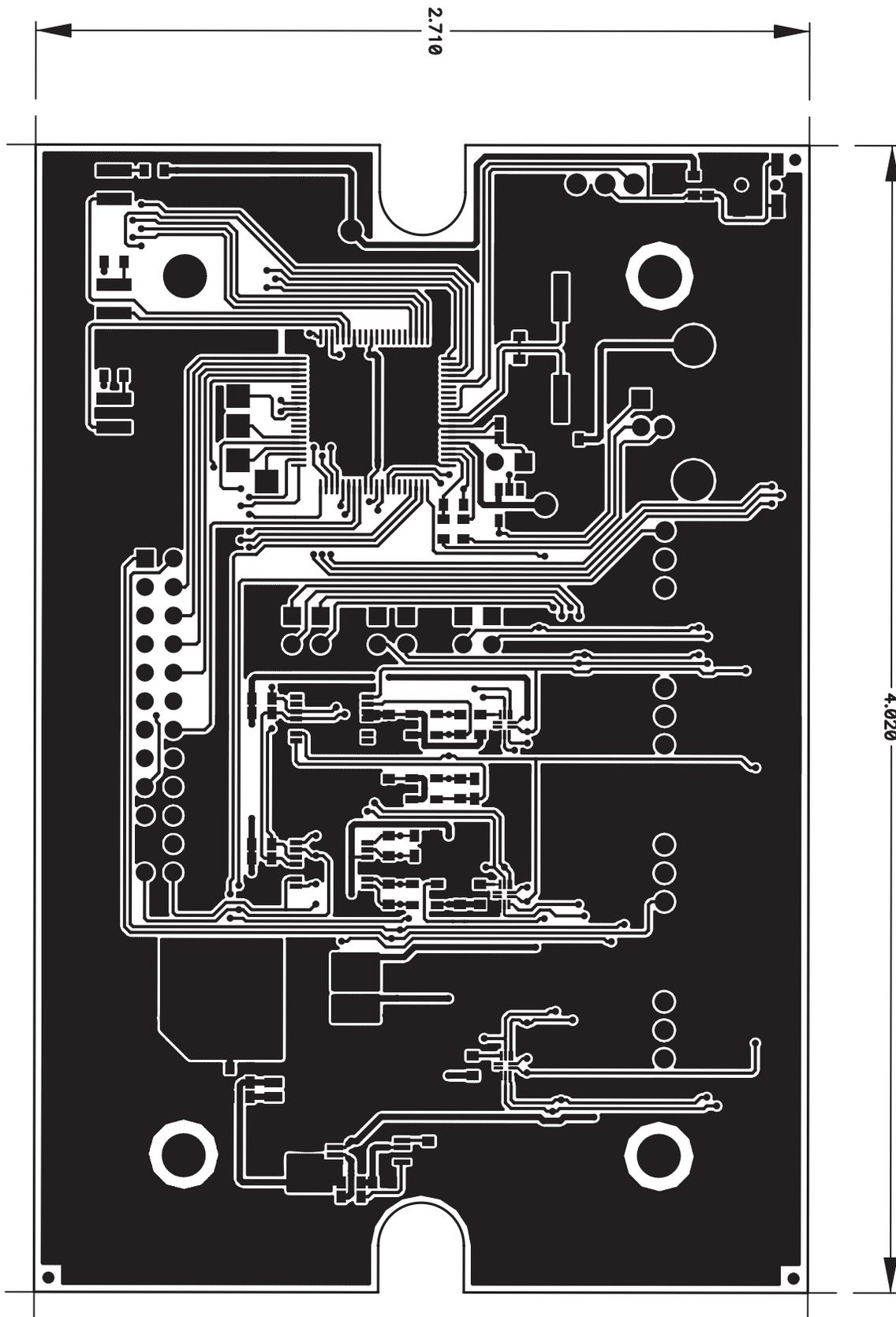


Figure 4. Board Layer 1

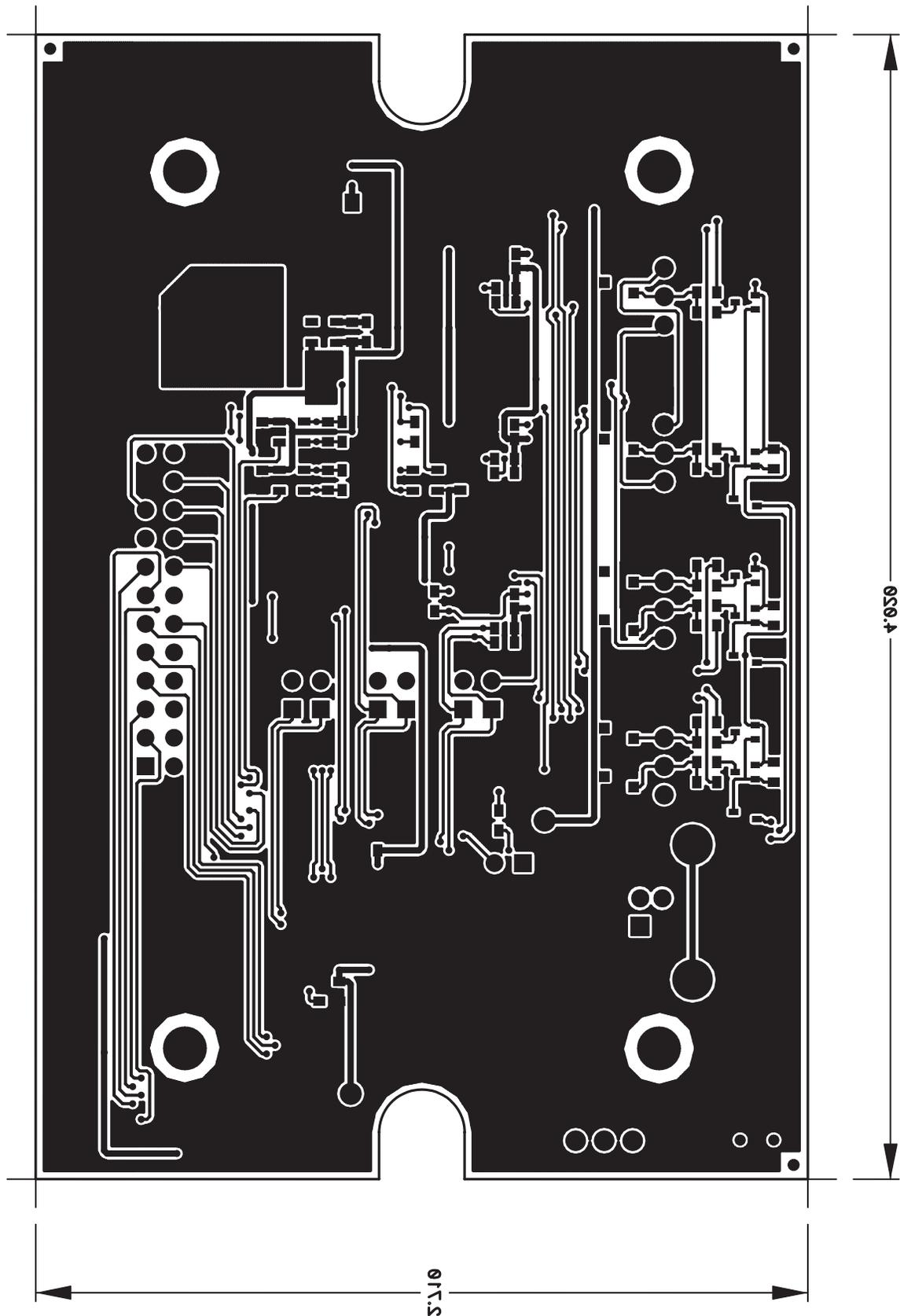


Figure 5. Board Layer 2

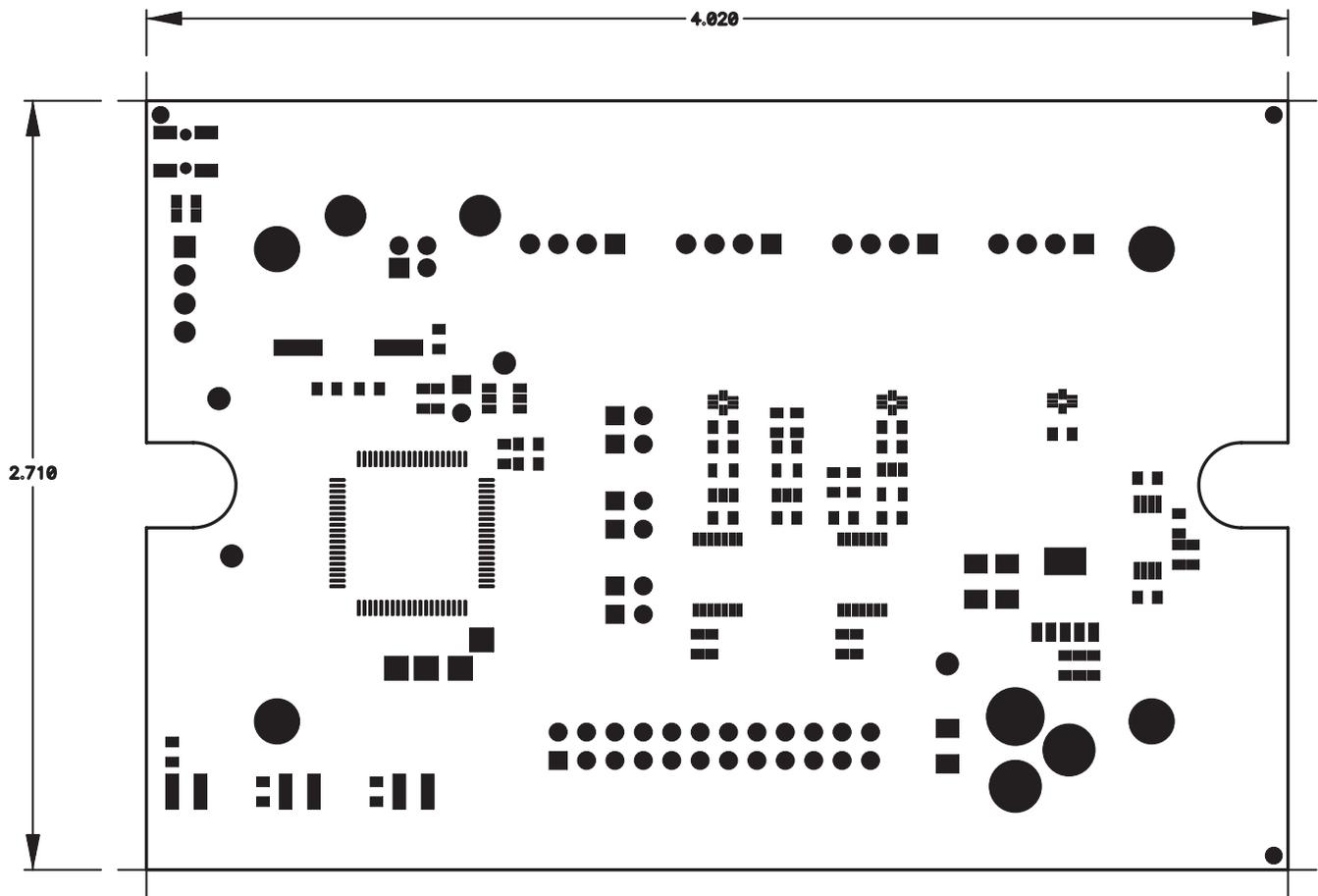


Figure 6. Solder Mask 1

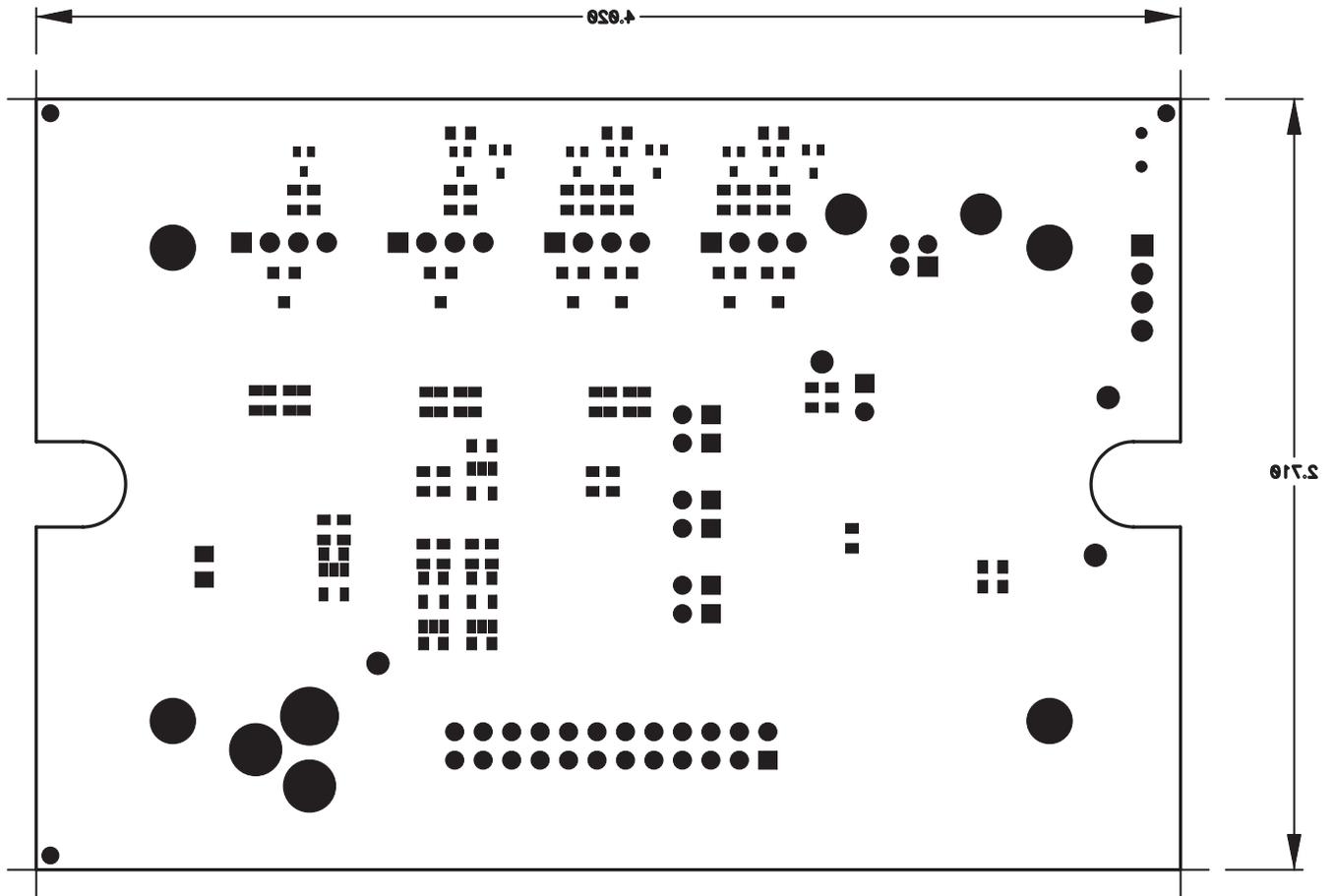


Figure 7. Solder Mask 2

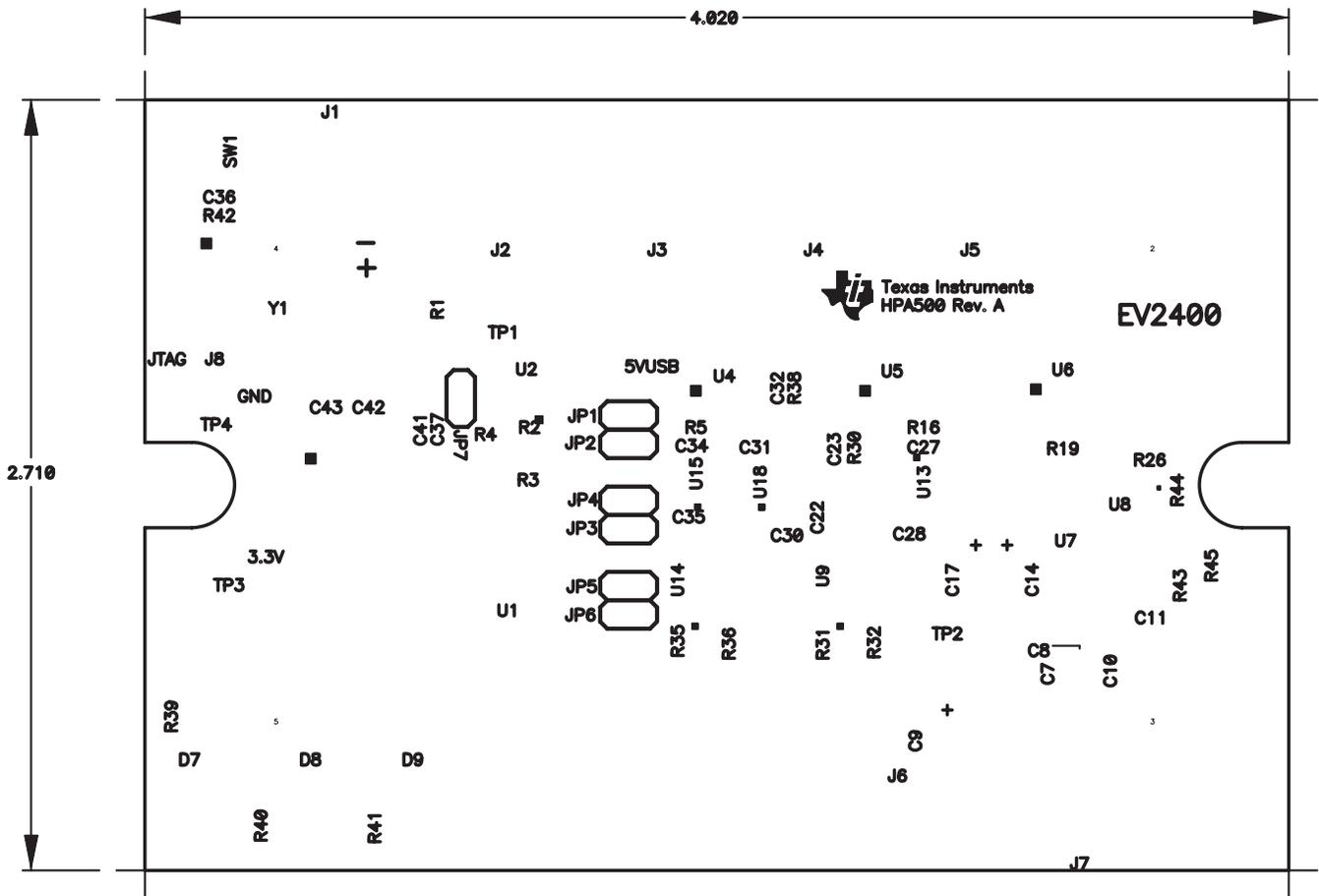


Figure 8. Silkscreen

3.3 EV2400 Schematic

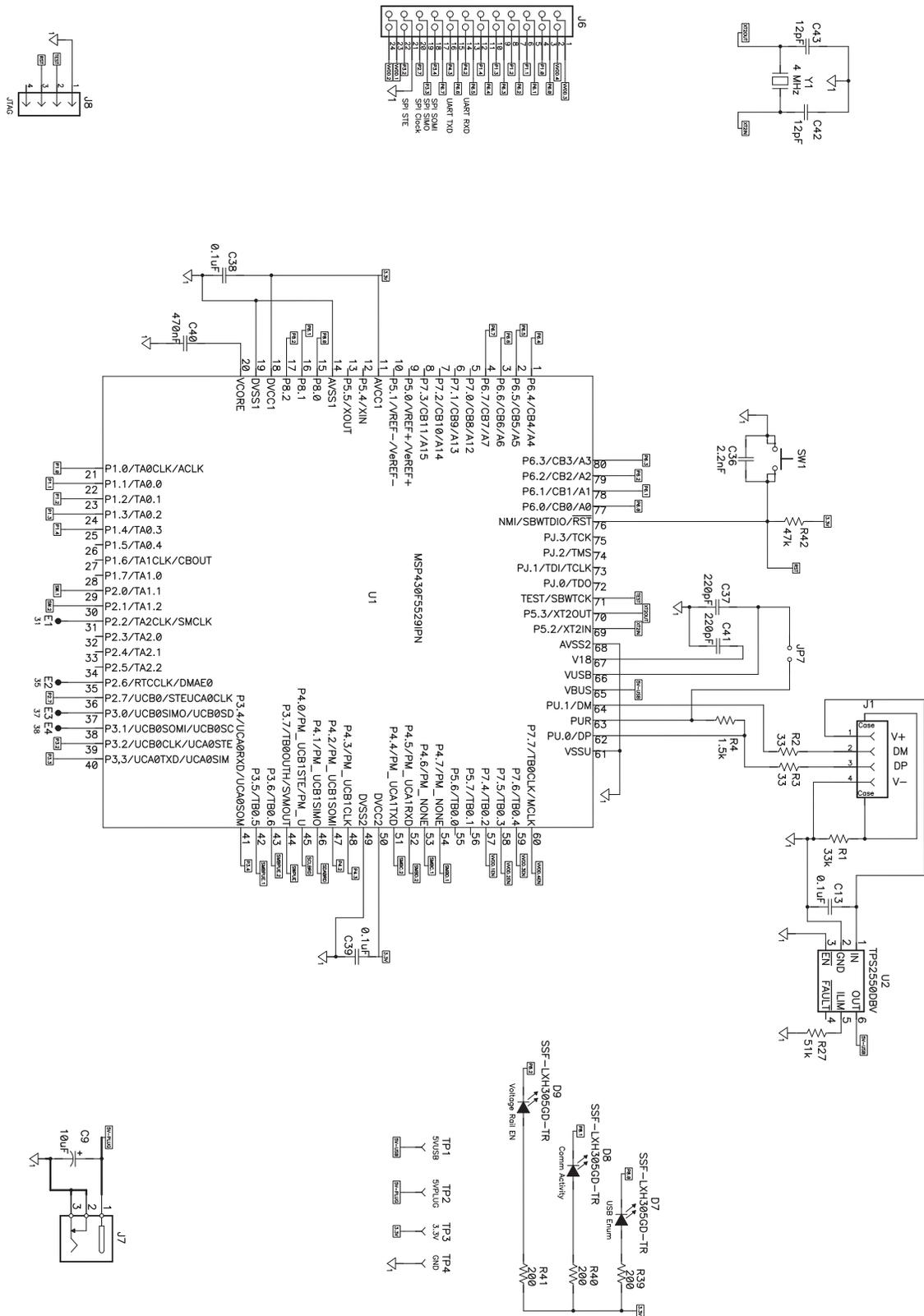


Figure 9. Schematic, Page 1

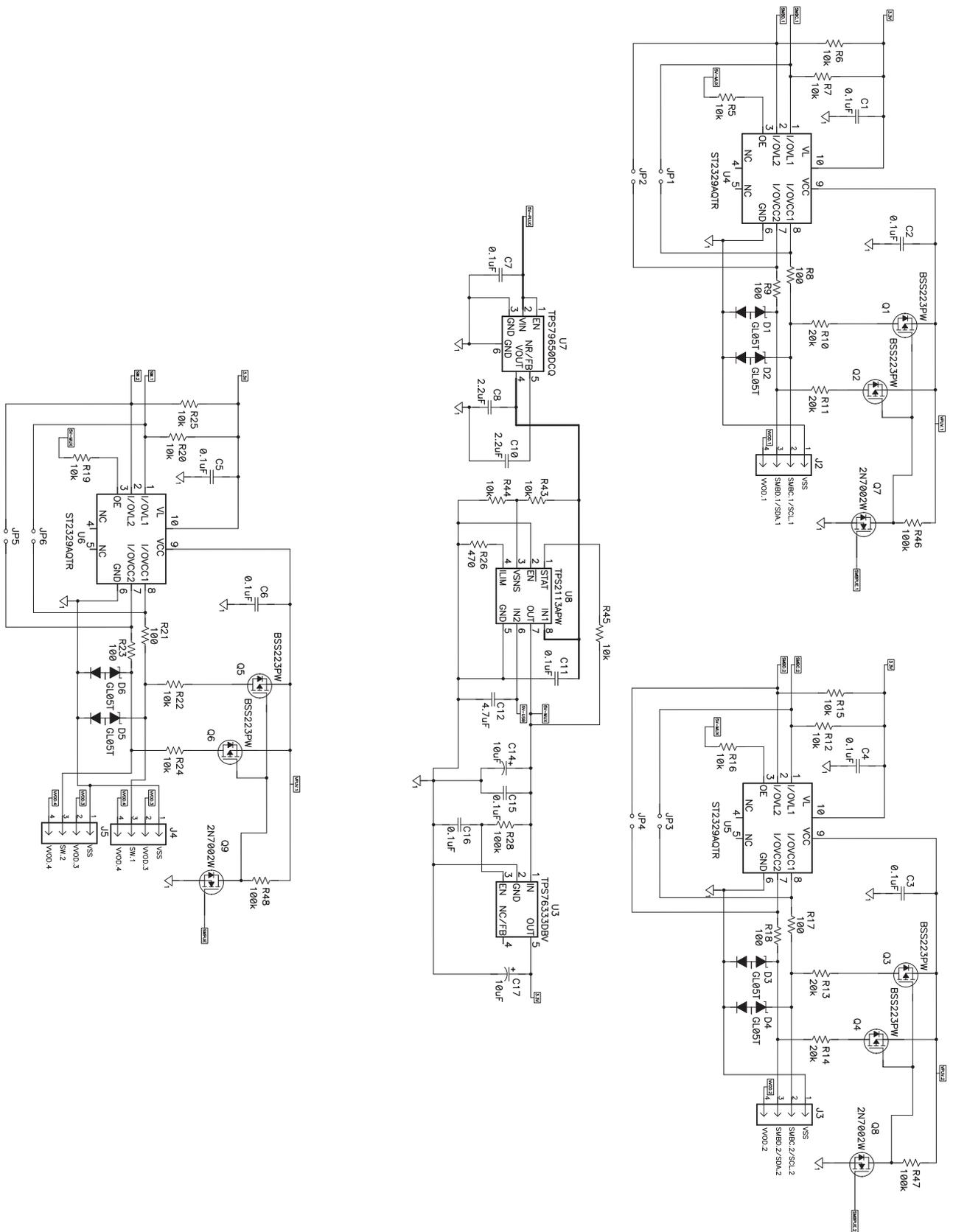


Figure 10. Schematic, Page 2

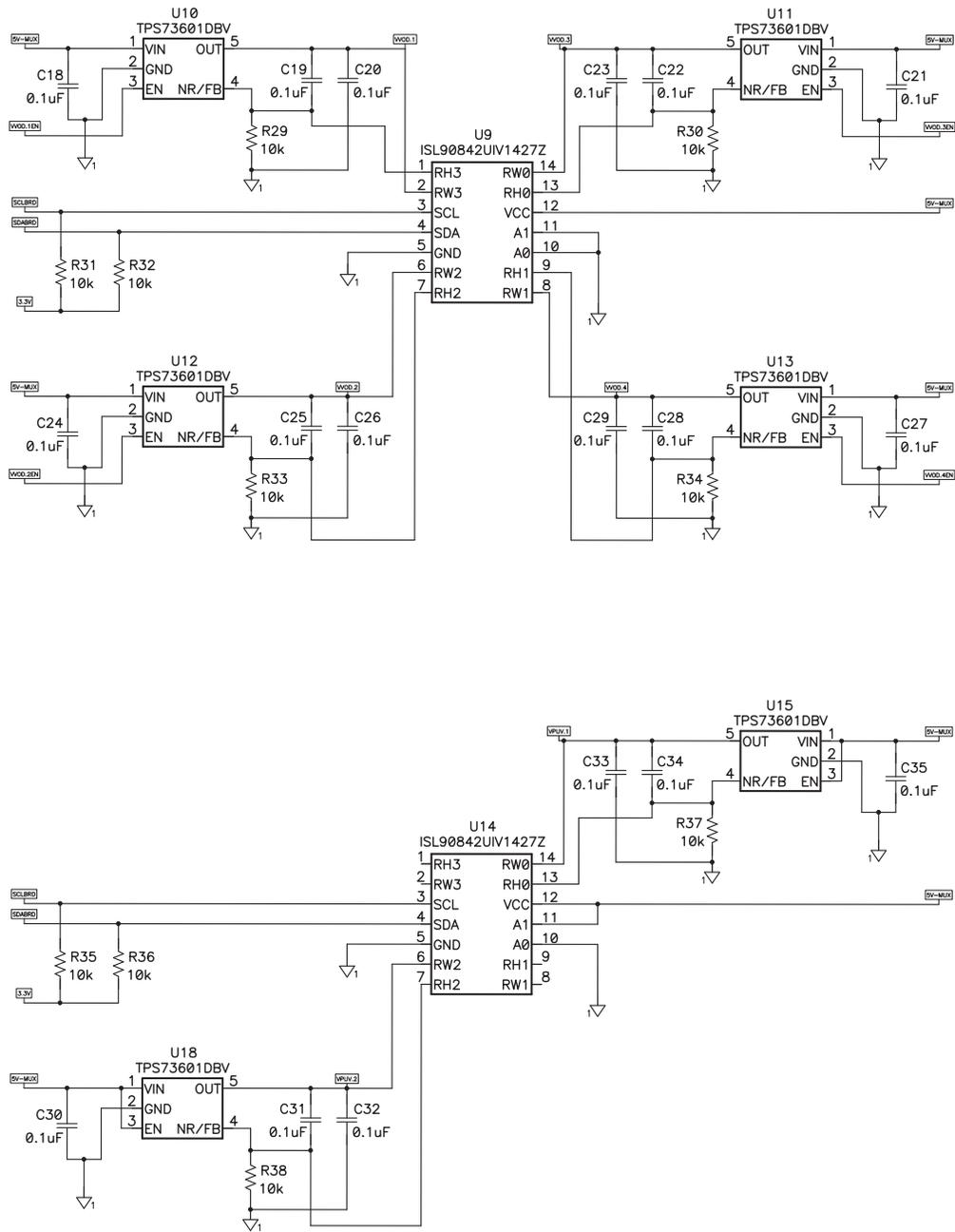


Figure 11. Schematic, Page 3

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Revision History

Changes from Original (June 2011) to A Revision	Page
• Deleted installer information	3

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

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