

TPS2343 PCIX2 Hot Plug Controller Demo System

This manual provides descriptive and operational information for the Texas Instruments TPS2343 reference design/demo board.

Contents

1	Introduction	1
2	Materials Needed	2
3	System Operation	3
4	Power Connections.....	4
5	Cables.....	5
6	Demo Board Slots	5
7	Demo Board Test Points and Jumpers	6
8	Demo Board Switches and Indicators	7
9	Load Board	8
10	Load Board Switches and Indicators.....	8
11	Operation	9
12	Interface Operating Mode	9
13	Direct Mode Switches	9
Appendix A Schematics		10
Appendix B Board Layouts		23

1 Introduction

The TPS2343 is a highly integrated hot plug controller for PCI, PCIX and PCIX2 slots. It communicates with the main system's PCI bridge slot controller over direct mode interface.

This reference design describes the TPS2343 demo module setup which includes schematics and parts list.

The demonstration system is a reference design to the user for a faster design turn. Observation of hot plug signals and system operation is convenient with test points and LED indicators. Operator interaction is through manual switch inputs that emulate the direct mode interface.

The TPS2343 hot plug controller demo system uses the same printed circuit board as the TPS2342 demo system. The components to support the ServerWorks™ serial interface on TPS2342 have been de-populated for TPS2343. This includes sheet 2 of the schematic, Figure 4 of this document. Other board changes are accommodated through a series of 0-Ω resistors.

Materials Needed

The List of Materials, Table 10, shows the distinction between TPS2342 and TPS2343 EVM boards. Since there is no software interface, switches are used to emulate the bridge's direct mode interface. All switches are populated on the circuit board but some are always set in one position for TPS2343. The table below shows the switch settings.

DESIGNATOR	SWITCH LABEL	SETTING
S5	Direct/Serial	Direct
S2, S3	CPLD/Slot	Slot
S1, S4	Regulated/Switched	Switched

The TPS2343 package and pin-out is different from TPS2342. An adapter PC board with the TPS2343 is connected to the circuit board through the TPS2342 socket saver. The adapter schematic is shown in Figure 10.

The load board is the same for both demo systems.

2 Materials Needed

2.1 TI Supplied

TPS2343 reference design/demo board kit consisting of:

- TPS2343 demo board
- Load board
- Power cables for J1 and P1
- Current probe cables
- TPS2343 PCIX2 hot plug controller demo system - reference design
- TPS2343 datasheet

2.2 User Supplied

Power Supplies

- 3.3 V_{AUX}, 2 A
- 12 V, 2 A
- -12 V, 2 A
- 5 V, 14 A
- 3.3 V, 20 A

Test Equipment

- Digital oscilloscope
- Current probe

3 System Operation

There are two PCI slots on the demo board. Figure 1 is a block diagram of the demo module board. A test load board is supplied so that full load, no load and short circuit may be applied to bus power momentarily. The user can test that the proper result occurs. Alternatively, remove the test load board and install any PCI compatible module for test. When standard PCI cards are used on the motherboard, remove the metal bracket from the PCI card because of interference with the demo circuit board.

With the TPS2343 demo system there are convenient test points to view the characteristics of the device. For example, determine the fault-to-overload turnoff time of the 12 V in slot A. Insert the load board into slot A and turn on main power. Trigger the scope on the overload applied signal, TP9, of the load board. Put the other scope channel on the P12VGA, TP11 of the demo board. Apply the load with the load board SW8 on the upper left corner of the load board. Notice that TP11 stays high for the first 4 μ s while the filter determines there is a fault.

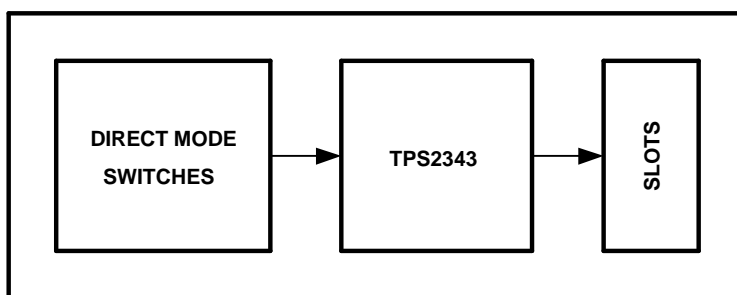


Figure 1. Demo Block

4 Power Connections

Power cables are supplied. Identify the power cable and locate the connector pin numbers as stamped on the demo circuit board. Connect the proper pins to power supplies with voltage and capacity as shown in Tables 1 and 2. Figure 2 is a connection diagram for the TPS2343 demo board to power supplies.

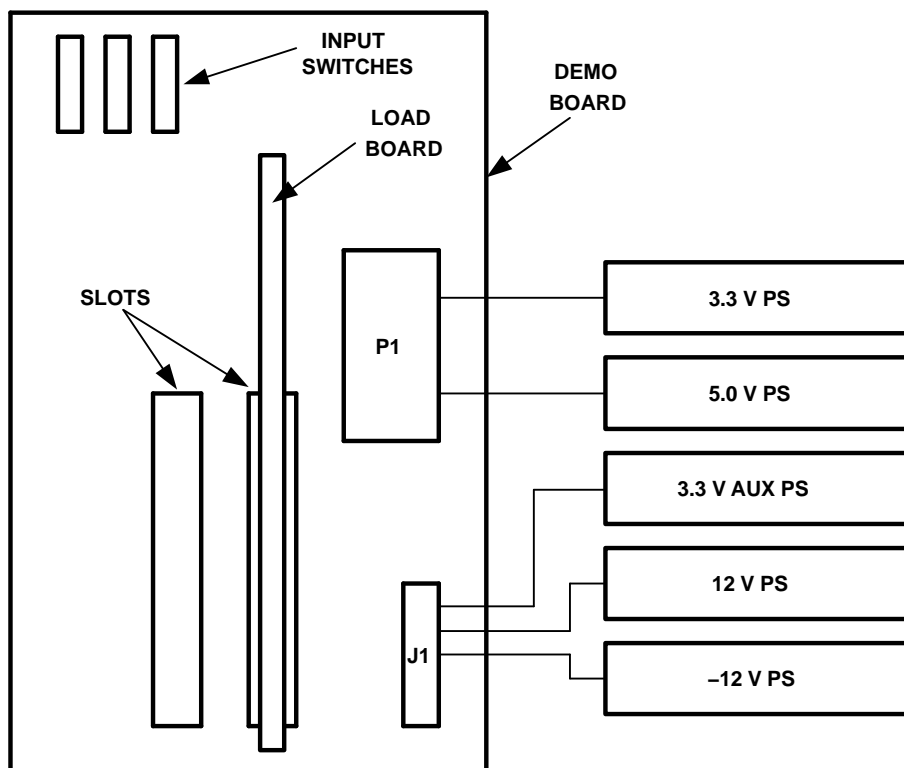


Figure 2. Demo Board Connections

5 Cables

5.1 J1 Connector

Pin 1 on the J1 connector is marked on the connector body and on the printed circuit board.

Table 1.

J1	Voltage	Min Capacity
1	3.3 VAUX	2 A
2	12 V	2 A
3	12 V	2 A
4	GND	
5	GND	
6	GND	

5.2 P1 Connector

Table 2.

P1	Voltage	Min Capacity	P1	Power
1	5 V	14 A	8	GND
2	5 V		9	GND
3	5 V		10	GND
4	3.3 V	20 A	11	GND
5	3.3 V		12	GND
6	3.3 V		13	GND
7	3.3 V		14	GND

6 Demo Board Slots

There are two PCI slots on the demo module; slot A and slot B. These are standard 64-bit PCI slots that can be defined for operation from 33 MHz to 533 MHz by the PCIXCAP signals. PCIXCAP can be input from either the load board or the GUI. The active signals on these slots are RST, POWEN, BUSEN, CLKEN, and power pins. The address, data and other control signals are each tied to a pull-down resistor.

Although a load board is provided and discussed here, any PCI interface board can be installed and tested with respect to hot plug. The load board, when a standard PCI board is used in the slot, power is supplied to the load the when the slot power is enabled.

If the TPS2343 is soldered to the board, it utilizes the power pad package and will have good thermal conductance. Demo boards with TPS2343 could reach thermal shutdown under high constant load. Unlike the load board, when a standard PCI board is used in the slot, power is supplied to the load the when the slot power is enabled.

The load board is on for a short duty cycle and will not cause the TPS2343 to overheat.

7 Demo Board Test Points and Jumpers

7.1 Test Points

The voltage across the sense resistors can be measured to determine current for each supply. Table 3 shows the test points and sense resistor values.

Table 3. Test Points and Sense Resistor Values

Voltage (V)	Sense Resistor (Ω)	Test Points	Jumpers
3.3 V _{AUXA}	0.1 Ω	TP22, TP23	J6
3.3 V _A	0.006 Ω	TP36, TP37	
5.0 V _A	0.006 Ω	TP38, TP39	
12 V _A	0.1 Ω	TP30, TP31	J8
12 V _A	0.1 Ω	TP33, TP34	J9
3.3 V _{AUXB}	0.1 Ω	TP20, TP21	J5
3.3 V _B	0.006 Ω	TP3, TP4	
5.0 V _B	0.006 Ω	TP1, TP2	
12 V _B	0.1 Ω	TP9, TP10	J3
12 V _B	0.1 Ω	TP6, TP7	J2

7.2 Jumpers

Jumpers J2, J3, J5, J6, J8 and J9 must be installed to connect the power to the slot. Any of these jumpers can be replaced by wire loops supplied in the demo board cable kit to use a current probe. The Jumpers for supplies supporting this feature are listed in Table 3

8 Demo Board Switches and Indicators

8.1 Switches

The PCIXCAP switches select the source of these signals from the load board. The V_{IO} switches select regulated or switched mode for the 1.5-V V_{IO} . The positions of these slide switches and their functions are silk screened on the demo board. Table 4 summarizes these switches.

Table 4. V_{IO} Slide Switches

Function	Slot A	Slot B
PCIXCAP	S3	S2
VIO switched or regulated	S4	S1

In SLOT operation, the voltage is read by the TPS2343 and converted to an octal number for the slot controller. Below is the table of output voltage at TP28, slot A, TP12, slot B for PCIXCAP. LEDs D8, D9, D10 correspond to PCIXCAP1 thru 3 respectively for slot A and D3, D4, D5 for slot B. The LED is lit when the PCIXCAP bit is at 0 V.

Table 5.

PCIXCAP1	PCIXCAP2	PCIXCAP3	TP28/TP12	BUS SPEED
0 V	0 V	0 V	0.0 V	33/66 2.2
0 V	0 V	3 V	1.7 V	266
3 V	0 V	0 V	2.5 V	66 X
3 V	0 V	3 V	0.8 V	533
3 V	3 V	0 V	3.3 V	133

Switches S5 to S16 are switches for direct mode operation without the GUI. These are described in the Section 7, Interface Operating Modes and Section 9, Direct Mode Switches (No GUI).

8.2 Indicators

The following indicators on the front center of the demo module left to right are listed here top to bottom in Table 6.

Table 6. Indicators

Slot A		Slot B	
LED	Function	LED	Function
D10	PCIXCAP1A	D5	PCIXCAP1B
D9	PCIXCAP2A	D4	PCIXCAP2B
D8	PCIXCAP3A	D3	PCIXCAP3B
D7	ATTLEDA	D2	ATTLEDB
D6	PWRLEDA	D1	PWRLEDB
D21	RSTA	D22	RSTB
D19	AUXFAULTA	D17	AUXFAULTB
D20	FAULTA	D18	FAULTB

9 Load Board

The load board allows the operator to apply power to the slots and check proper operation of the hot plug controller functions. Standard PCI, PCIX and PCIX2 boards can be inserted in the demo board backplane for hot plug testing.

9.1 Load Board Jumpers and Test Points

Jumpers are added to the load board to add a step capacitive load to each voltage. Table 7 shows the jumpers associated with each supply and the capacitive load added for each. For example, J6 and J7 installed add a 2000- μ F load to the +5-V supply.

Table 7. Load Board Jumpers and Test Points

Voltage	Jumpers	Loading Each Jumper (μ F)	SupplyTest Points	Ground Test Points
12 V	J2, J3	150 μ F	TP1	TP2
5 V	J6, J7, J8	1000 μ F	TP3	
12 V	J11	150 μ F	TP5	TP4
3.3 V _{AUX}	J14	150 μ F	TP6	TP7
3.3 V	J17, J18, J19	1000 μ F	TP8	
VIO	J22, J23, J24	150 μ F	TP10	

V_{PULSE} is available on TP9 and is active when switch 8 is pressed or an external trigger is applied.

10 Load Board Switches and Indicators

10.1 Switches

Each supply voltage has a DIP switch that controls the power supply loading. The switch positions for some power segments are no load, short circuit, overload, and full load. Other segments are no load, overload and full load. The following table shows the dip switch and position for loading any segment. Turn on only one switch position in a switch pack at a time.

Table 8.

Voltage	Switch	SwitchPosition	Function	Indicator	TestPoints
12	SW1	1	Short	D2	TP1
		2	Overload		
		3	Full load		
5	SW2	1	Overload	D3	TP3
		2	Full load		
12	SW3	1	Short	D4	TP5
		2	Overload		
		3	Full load		
3.3 VAUX	SW4	1	Short	D6	TP6
		2	Overload		
		3	Full load		
3.3	SW5	1	Overload	D7	TP8
		2	Full load		

Table 8. (continued)

Voltage	Switch	SwitchPosition	Function	Indicator	TestPoints
VIO	SW7	1	Overload	D9 (1.5)	TP10
		2	Full load	D8 (3.3)	

The selected load is applied to the power supply for a 10-ms duration when the load push button, SW8, is pressed. When the button is held down, the load is applied for 10-ms at a 1-Hz rate. A signal can be applied to the BNC input J26 instead of pressing the manual pushbutton.

10.2 Indicators

The load board has an LED for each power supply that is on when the supply is ok. These are the indicators listed in Table 8.

DIP switch SW6 is used to switch resistors in a voltage divider to create a slot generated PCIXCAP signal. Table 9 lists switch settings for bus speed.

Table 9. Bus Speed Switch Settings

Switch On	Bus Speed MHz
S1	533
S2	266
S3	66
S4	33
All off	133

11 Operation

Power up the motherboard with no special sequencing of the bench power supplies.

12 Interface Operating Mode

Direct mode is the configuration where logic signals are tied directly to the TPS2343. The controller receives fault information from the TPS2343 and can control the power state with an input signal.

13 Direct Mode Switches

Turn off SW6 through SW15 on the demo module. Install the load board or a PCI board in slot A or B. Both slots work the same way but this write up will use the slot A. Select the direct position with the S5 switch and press the momentary button S16 to apply the PGOOD signal. Turn on SWA and this will apply V_{AUX} to the add-in module. Use the VIOSEL switch S13 to select V_{IO} for 3.3 V (Right) or 1.5 V (Left). Turn on the POWENA switch S12 to turn on main power. Cycle the main power by toggling either the PWRENA switch or the PGOOD switch. Main power must be off in order to change the VIO setting. The selected VIO turns on with the main power.

ALEDENA, S14, and PLEDENA, S15, turn on the attention LED and the power LED, respectively.

Appendix A Schematics

A.1 Demo Board Schematic

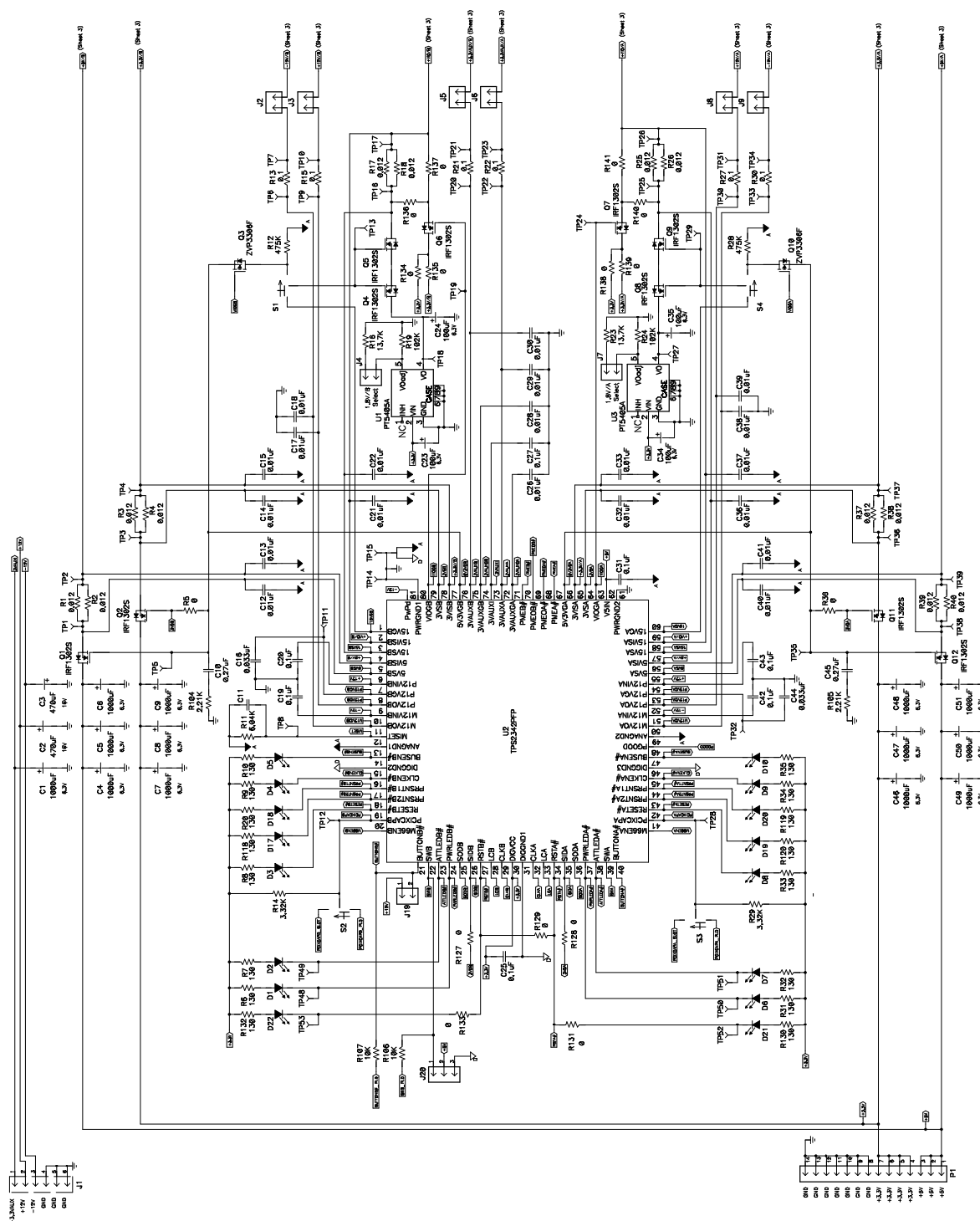


Figure A-1. Reference Design/Demo Board

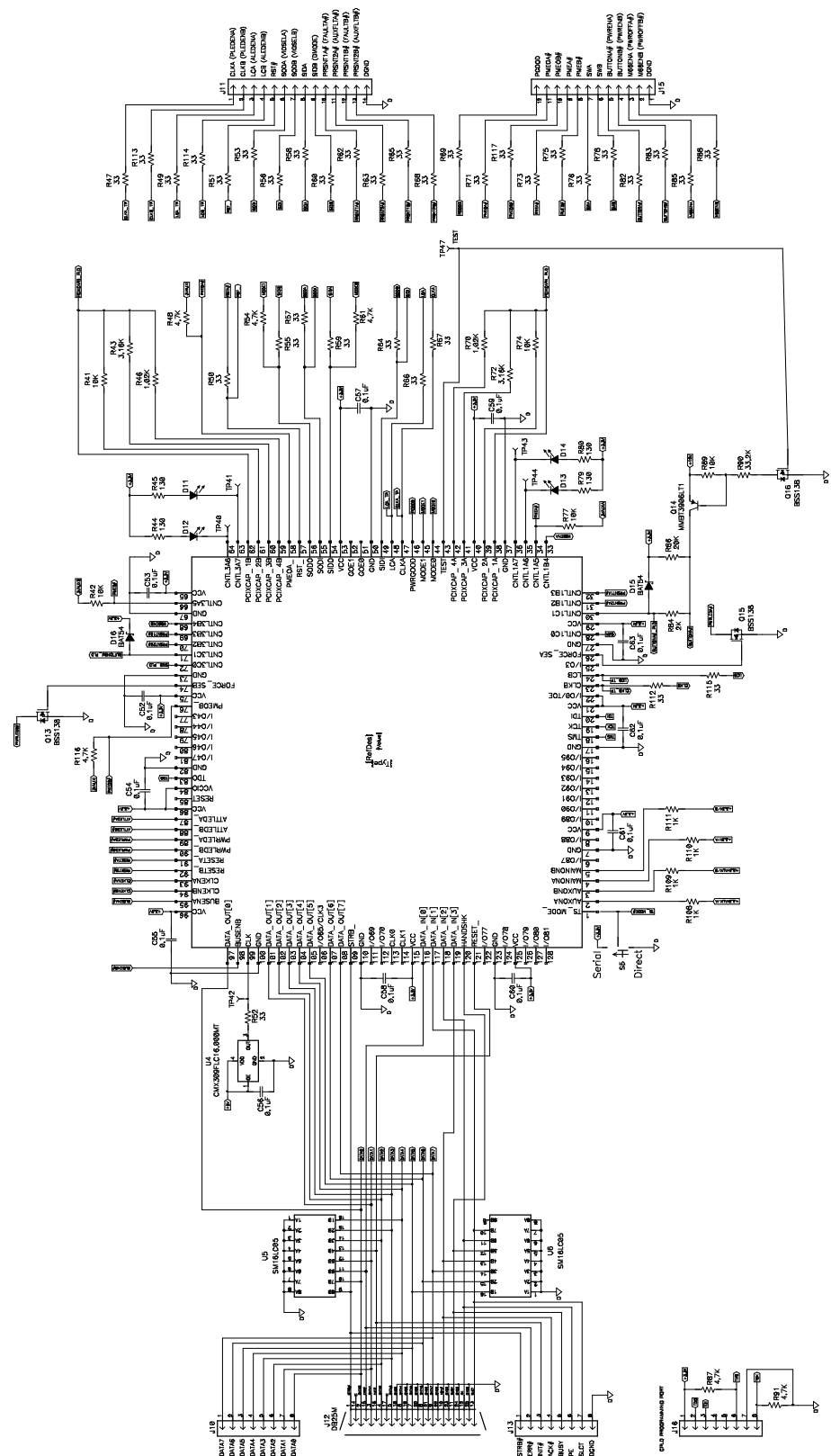


Figure A-2.

Demo Board Schematic

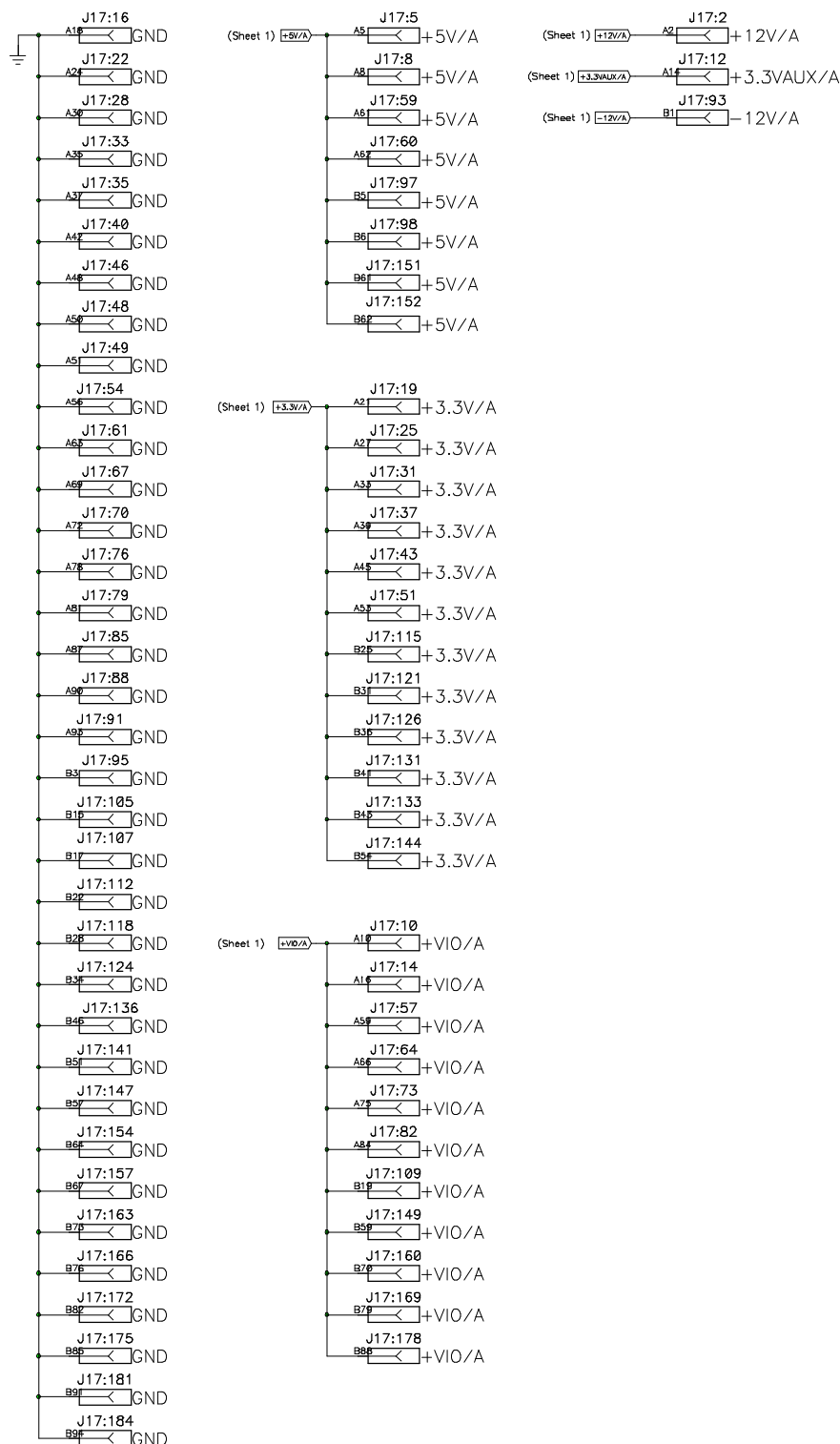


Figure A-3. Slot A

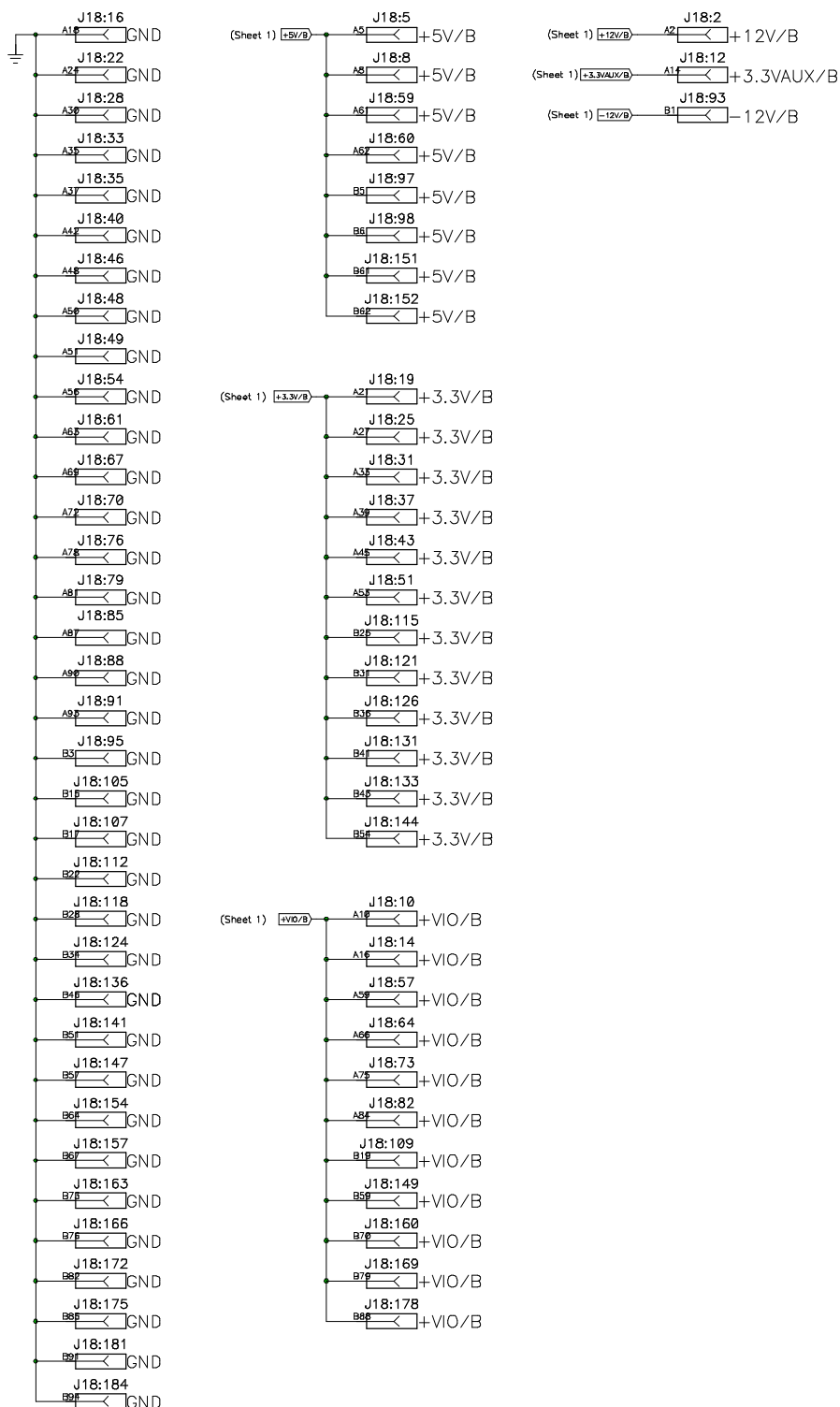


Figure A-4. Slot B

Demo Board Schematic

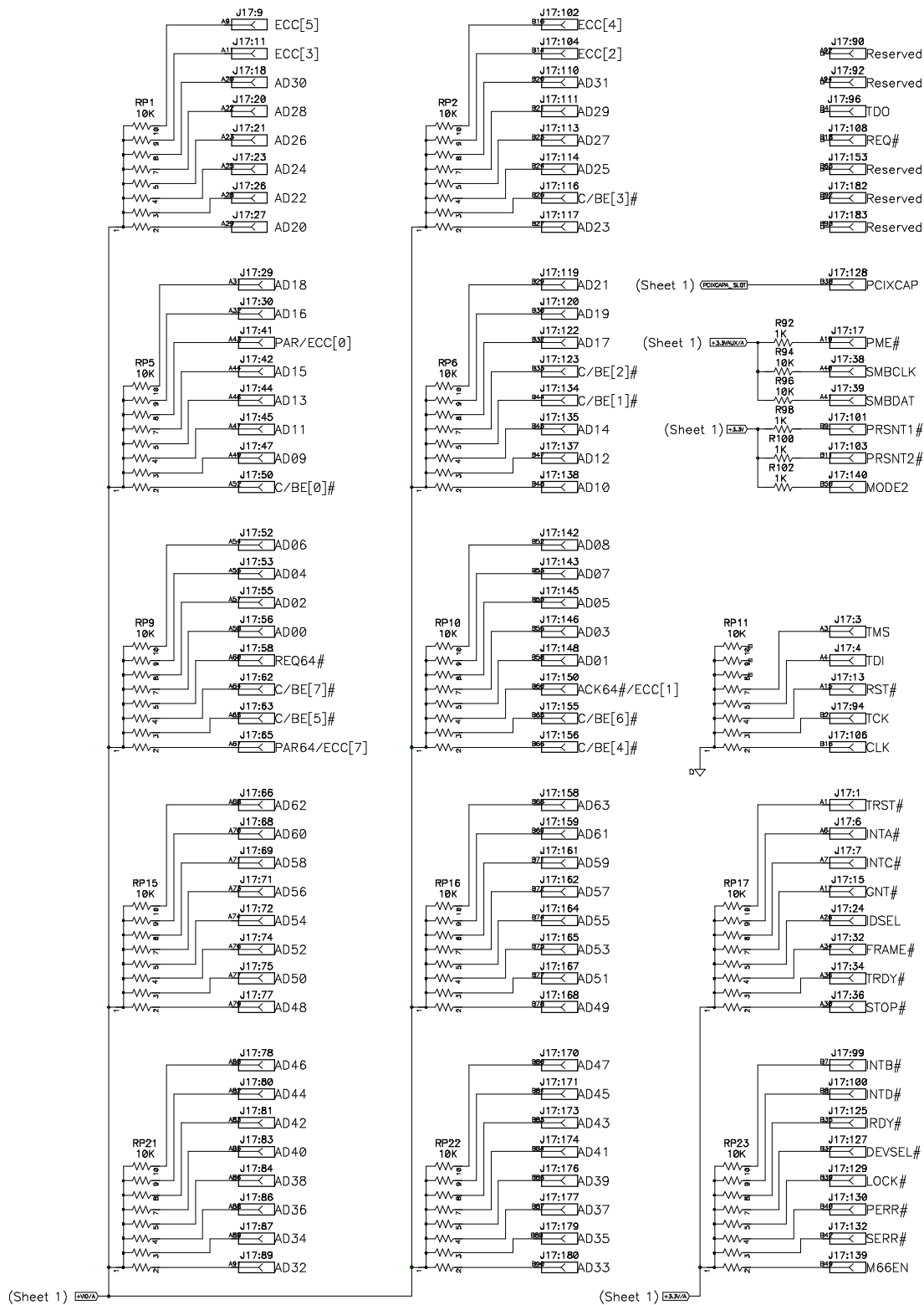


Figure A-5. Slot A

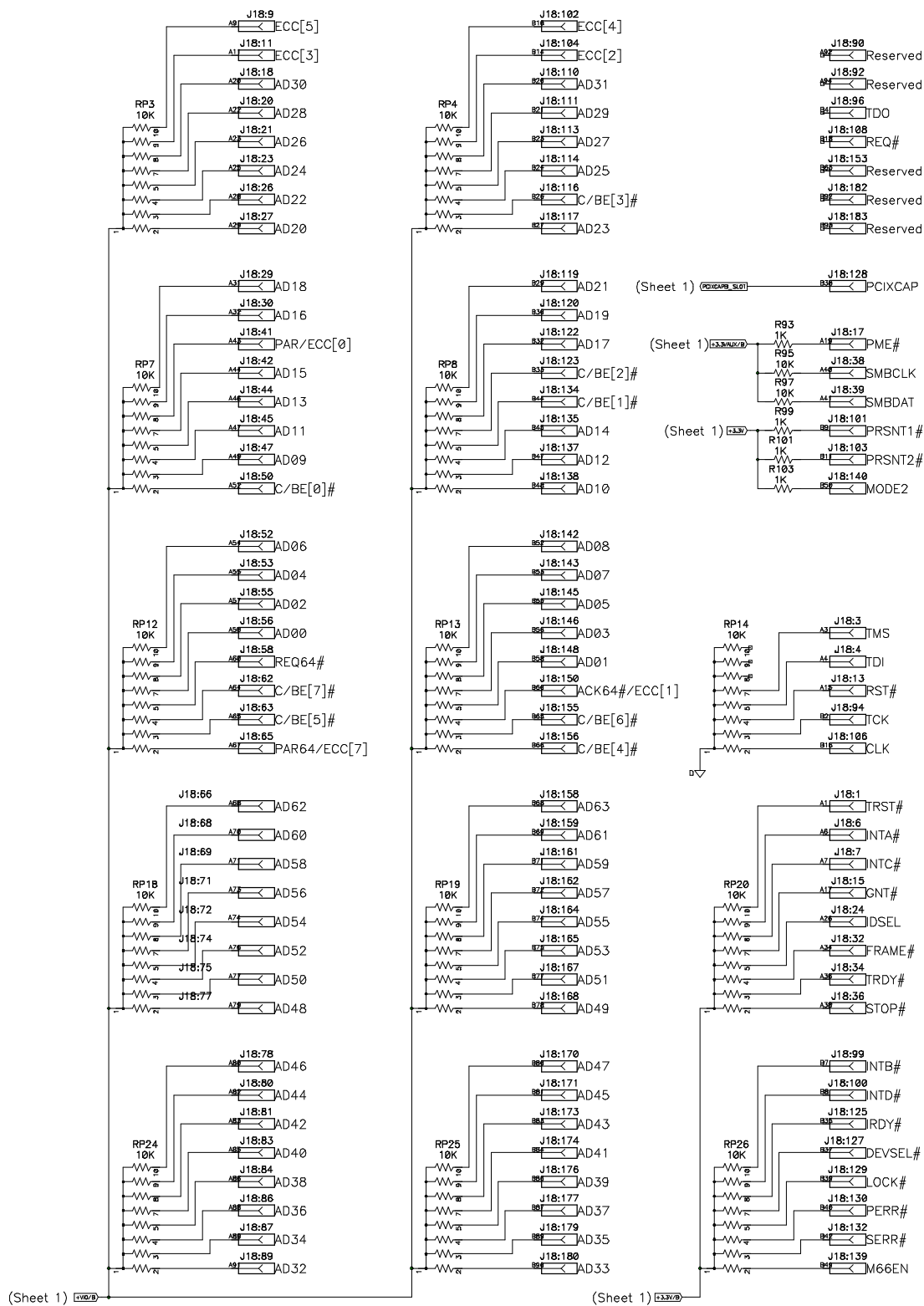


Figure A-6. Slot B

Demo Board Schematic

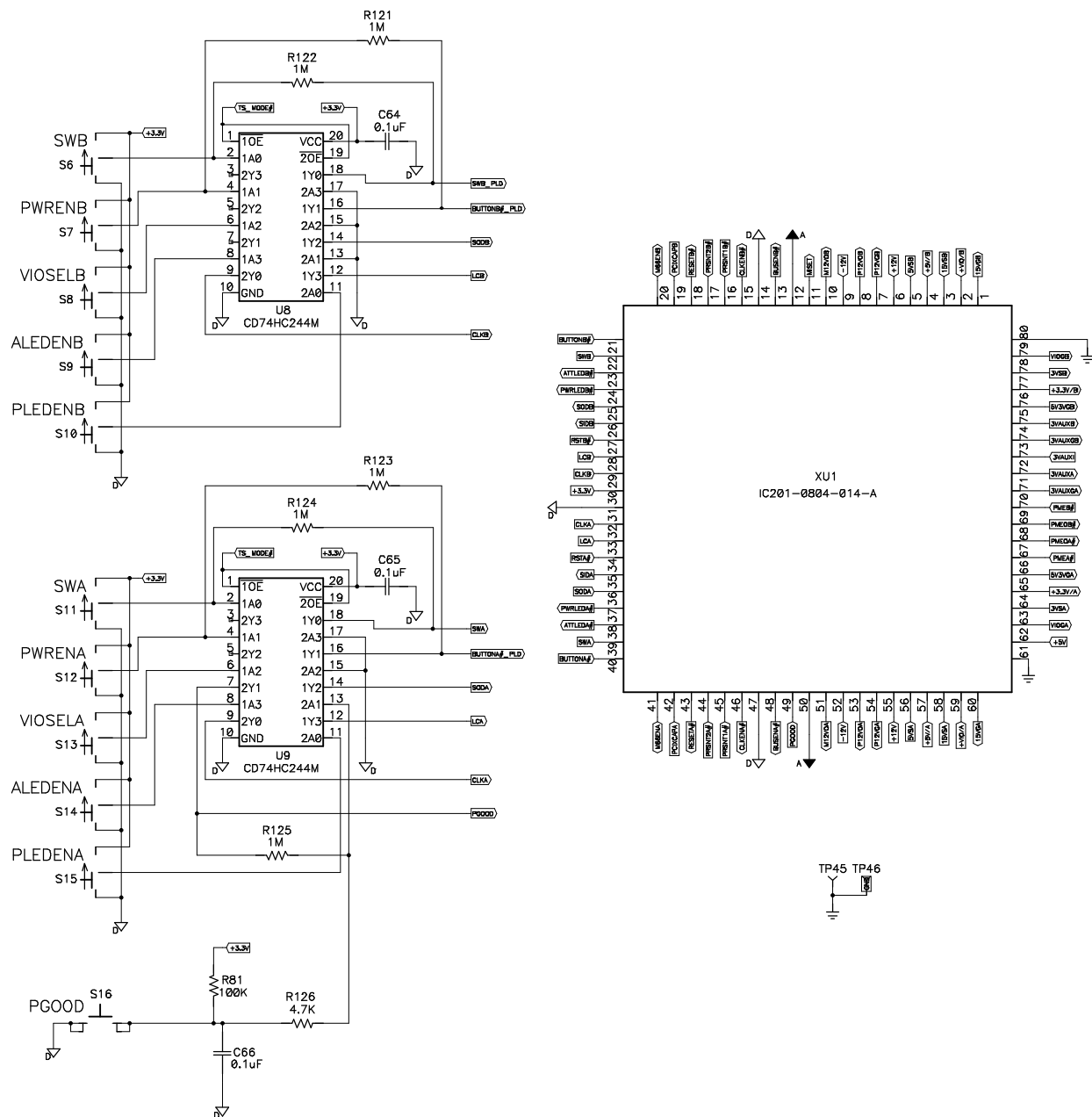


Figure A-7.

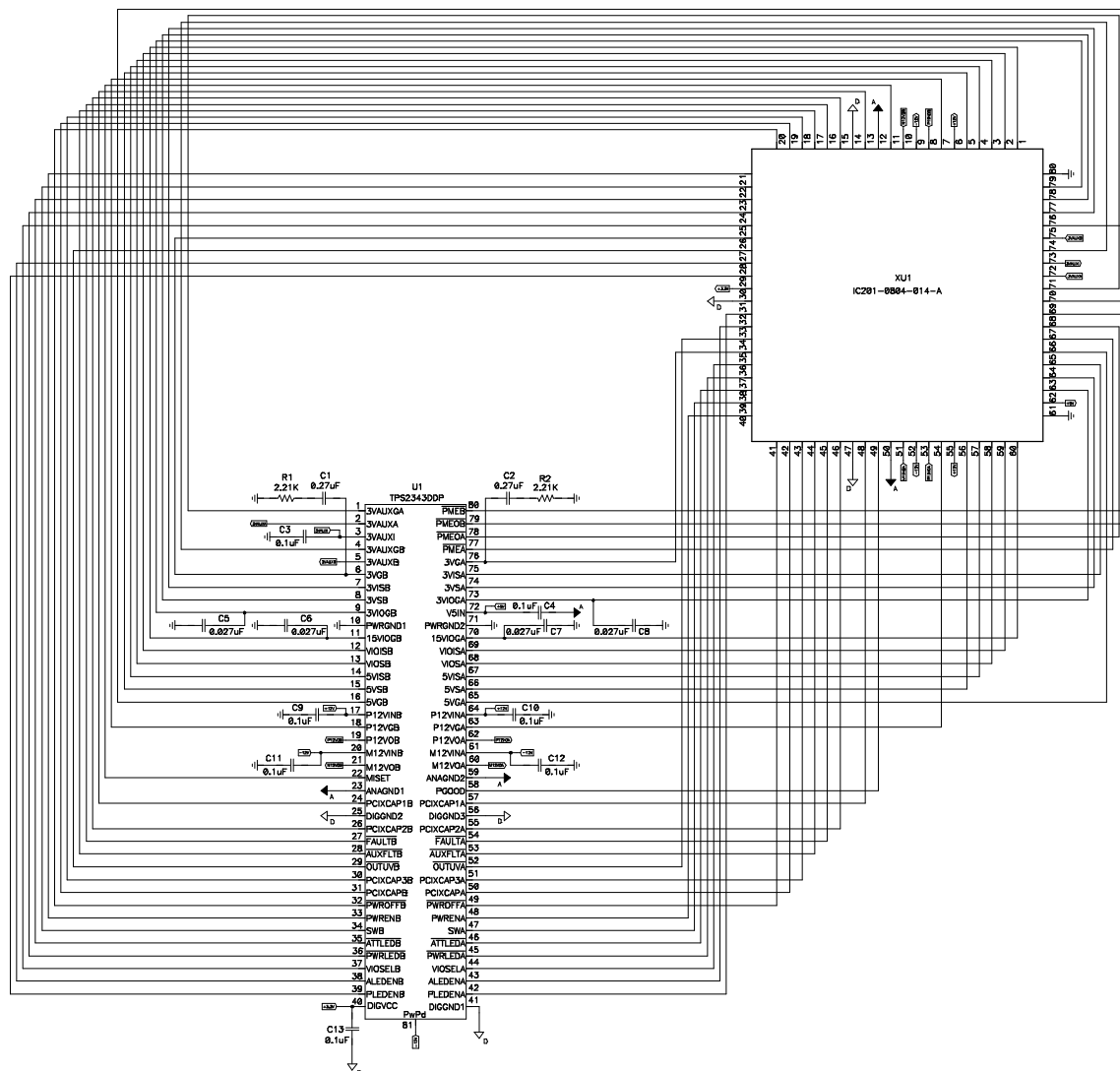


Figure A-8.

Demo Board Top Assembly

A.2 Demo Board Top Assembly

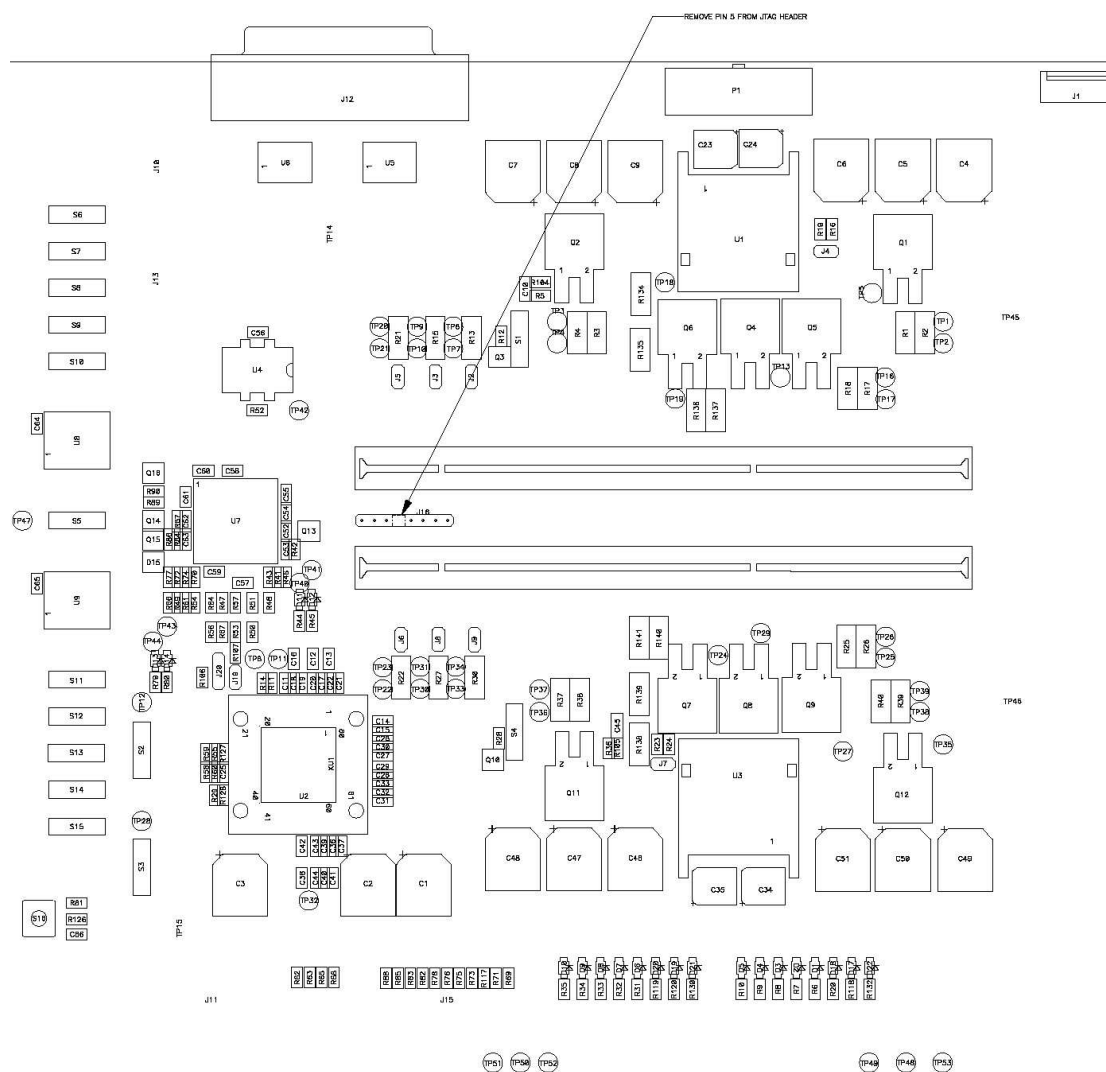


Figure A-9. Top Assembly

A.3 Demo Board

Table A-1. PR164 List of Materials

Reference Designator	QTY	Reference Designator	QTY	Description	MFR	Part Number
TPS2342		TPS2343				
C1, C4, C5, C6, C7, C8, C9, C46, C47, C48, C49, C50, C51	13	C1, C4, C5, C6, C7, C8, C9, C46, C47, C48, C49, C50, C51	13	Capacitor, aluminum, 1000 μ F, 20%, 6.3 V, FC series, G case	Panasonic	EEV-FC0J102P
C10, C45	2	C10, C45	2	Capacitor, ceramic, 0.27 μ F, 16 V, X7R, 10%, 1206	Panasonic	ECJ-3VB1C274K

Table A-1. PR164 List of Materials (continued)

Reference Designator	QTY	Reference Designator	QTY	Description	MFR	Part Number
TPS2342		TPS2343				
C11, C19, C20, C25, C27, C31, C42, C43, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66	23	C11, C19, C20, C25, C27, C31, C42, C43, C64, C65, C66	10	Capacitor, ceramic, 0.1 μ F, 50 V, X7R, 10%, 0805	Panasonic	ECJ-2YB1H104K
C12, C13, C14, C15, C17, C18, C21, C22, C26, C28, C29, C30, C32, C33, C36, C37, C38, C39, C40, C41	20	C12, C13, C14, C15, C17, C18, C21, C22, C26, C28, C29, C30, C32, C33, C36, C37, C38, C39, C40, C41	20	Capacitor, ceramic, 0.01 μ F, 50 V, X7R, 10%, 0805	Panasonic	ECU-V1H103KBG
C16, C44	2	C16, C44	2	Capacitor, ceramic, 0.033 μ F, 50 V, X7R, 10%, 0805	Panasonic	ECJ-2VB1H333K
C2, C3	2	C2, C3	2	Capacitor, aluminum, 470 μ F, 20%, 16 V, FC series, G case	Panasonic	EEV-FC1C471P
C23, C24, C34, C35	4	C23, C24, C34, C35	4	Capacitor, aluminum, 100 μ F, 20%, 6.3 V, FC Series, D case	Panasonic	EEV-FC0J101P
D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D17, D18, D19, D20, D21, D22	20	D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D17, D18, D19, D20, D21, D22	16	Diode, LED, green, 20 mA, 0.9 mcd, 0.068 x 0.049	Panasonic	LN1371G-(TR)
D15, D16	2	D15, D16	0	Diode, schottky, 200 mA, 30 V, SOT23	Vishay-Liteon	BAT54
J1	1	J1	1	Connector, header, vertical, 6 pin with lock, 0.600 x 0.250	Molex	22-23-2061
J10, J13, J16	3	J10, J13, J16	0	Header, 8 pin, 100-mil spacing, (36-pin strip), 0.100 x 8"	Sullins	SAAN
J11	1	J11	1	Header, 1 pin, 100-mil spacing, (36-pin strip), 0.100 x 14	Sullins	PTC36SAAN
J12	1	J12	0	Connector, D sub, 25-pin male, right angle, 2.088 x 0.500"	Norcomp	182-025-112-531
J15	1	J15	1	Header, 12 pin, 100-mil spacing, (36-pin strip), 0.100 x 12"	Sullins	PTC36SAAN
J17, J18	2	J17, J18	2	Connector, PCI card, 64 bit, 188 pin, 3.3 V, 5.040 x 0.355"	Framatone	CEE2X92SCV53Z14W
J19	1	J19	1	Header, 2 pin, 100-mil spacing, (36-pin strip), 0.100 x 2	Sullins	PTC36SAAN
J2, J3, J4, J5, J6, J7, J8, J9	8	J2, J3, J4, J5, J6, J7, J8, J9	8	Header, 2 pin, 100-mil spacing, (36-pin strip), 0.100 x 2"	Sullins	PTC36SAAN
J20	1	J20	1	Header, 3 pin, 100-mil spacing, (36-pin strip), 0.100 x 3	Sullins	PTC36SAAN
P1	1	P1	1	Connector, header, 14 pin, dual row, vertical, 1.200 x 0.378	Molex	39-28-1143
Q1, Q2, Q4, Q5, Q6, Q7, Q8, Q9, Q11, Q12	10	Q1, Q2, Q4, Q5, Q6, Q7, Q8, Q9, Q11, Q12	10	MOSFET, N-channel, 20 V, 174 A, 4 m Ω , SMD-220	International Rectifier	IRF1302S
Q13, Q15, Q16	3	Q13, Q15, Q16	0	MOSFET, N-channel, 50V, 0.17A, 3.5 Ω , SOT23	Zetex	BSS138
Q14	1	Q14	0	Bipolar, PNP, 40 V, 200 mA, 225 mW, SOT23	On Semi	MMBT3906LT1

Table A-1. PR164 List of Materials (continued)

Reference Designator	QTY	Reference Designator	QTY	Description	MFR	Part Number
TPS2342		TPS2343				
Q3, Q10	2	Q3, Q10	2	MOSFET, P-ch, 60 V, 90 mA, 14 Ω , SOT23	Zetex	ZVP3306F
R1, R2, R3, R4, R17, R18, R25, R26, R37, R38, R39, R40	12	R1, R2, R3, R4, R17, R18, R25, R26, R37, R38, R39, R40	12	Resistor, chip, 12 m Ω , 1 W, 1%, 2512	Panasonic	ERJ-M1WSF12MU
R104, R105	2	R104, R105	2	Resistor, chip, 2.21 k Ω , 1/10 W, 1%, 0805	Std	Std
R11	1	R11	1	Resistor, chip, 6.04 k Ω , 1/10 W, 1%, 0805	Std	Std
R12, R28	2	R12, R28	2	Resistor, chip, 475 k Ω , 1/10 W, 1%, 0805	Std	Std
R121, R122, R123, R124, R125	5	R121, R122, R123, R124, R125	5	Resistor, chip, 1 M, 1/10 W, 1%, 0805	Std	Std
R127, R128, R131, R133	4	R127, R128, R131, R133	4	Resistor, chip, TBD Ω , 1/10 W, 1%, 0805	Std	Std
R13, R15, R21, R22, R27, R30	6	R13, R15, R21, R22, R27, R30	6	Resistor, chip, 100 m Ω , 1 W, 1%, 2512	Panasonic	ERJ-L1WKF10CU
R134, R135, R136, R137, R138, R139, R140, R141	8	R134, R135, R136, R137, R138, R139, R140, R141	8	Resistor, chip, 0 Ω , 1 W, 2512	Vishay	CRCW251200 0ZZ
R14, R29	2	R14, R29	2	Resistor, chip, 3.32 k Ω , 1/10 W, 1%, 0805	Std	Std
R16, R23	2	R16, R23	2	Resistor, chip, 13.7 k Ω , 1/10 W, 1%, 0805	Std	Std
R19, R24	2	R19, R24	2	Resistor, chip, 102 k Ω , 1/10 W, 1%, 0805	Std	Std
R41, R42, R74, R77, R89, R94, R95, R96, R97, R106, R107	11	R94, R95, R96, R97, R106, R107	6	Resistor, chip, 10 k Ω , 1/10 W, 1%, 0805	Std	Std
R43, R72	2	R43, R72	0	Resistor, chip, 3.16 k Ω , 1/10 W, 1%, 0805	Std	Std
R46, R70	2	R46, R70	0	Resistor, chip, 1.02 k Ω , 1/10 W, 1%, 0805	Std	Std
R47, R49, R50, R51, R52, R53, R55, R56, R57, R58, R59, R60, R62, R63, R64, R65, R66, R67, R68, R69, R71, R73, R75, R76, R78, R82, R83, R85, R88, R112, R113, R114, R115, R117	34	R47, R49, R51, R53, R56, R58, R60, R62, R63, R65, R68, R69, R71, R73, R75, R76, R78, R82, R83, R85, R88, R113, R114, R117	24	Resistor, chip, 33 Ω , 1/10 W, 1%, 0805	Std	Std
R48, R54, R61, R87, R91, R116, R126	7	R126	1	Resistor, chip, 4.7 k Ω , 1/10 W, 5%, 0805	Std	Std
R5, R36, R129	3	R5, R36, R129	3	Resistor, chip, 0 Ω , 805	Std	Std

Table A-1. PR164 List of Materials (continued)

Reference Designator	QTY	Reference Designator	QTY	Description	MFR	Part Number
TPS2342		TPS2343				
R6, R7, R8, R9, R10, R20, R31, R32, R33, R34, R35, R44, R45, R79, R80, R118, R119, R120, R130, R132	20	R6, R7, R8, R9, R10, R20, R31, R32, R33, R34, R35, R118, R119, R120, R130, R132	16	Resistor, chip, 130 Ω , 1/10 W, 1%, 0805	Std	Std
R81	1	R81	1	Resistor, chip, 100 k Ω , 1/10 W, 1%, 0805	Std	Std
R84	1		0	Resistor, chip, 2 k Ω , 1/10 W, 1%, 0805	Std	Std
R86	1		0	Resistor, chip, 20 k Ω , 1/10 W, 1%, 0805	Std	Std
R90	1		0	Resistor, chip, 33.2 k Ω , 1/10 W, 1%, 0805	Std	Std
R92, R93, R98, R99, R100, R101, R102, R103, R108, R109, R110, R111	12	R92, R93, R98, R99, R100, R101, R102, R103	8	Resistor, chip, 1 k Ω , 1/10 W, 1%, 0805	Std	Std
RP1, RP2, RP3, RP4, RP5, RP6, RP7, RP8, RP9, RP10, RP11, RP12, RP13, RP14, RP15, RP16, RP17, RP18, RP19, RP20, RP21, RP22, RP23, RP24, RP25, RP26	26	RP1, RP2, RP3, RP4, RP5, RP6, RP7, RP8, RP9, RP10, RP11, RP12, RP13, RP14, RP15, RP16, RP17, RP18, RP19, RP20, RP21, RP22, RP23, RP24, RP25, RP26	26	Resistor pack, 10 k Ω , 62 mW, 5%, 8X, 0.083 x 0.158	Panasonic	EXB-E10C103J
S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15	15	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15	15	Switch, SPDT, slide, PC mount, 500 mA, 0.400 x 0.100"	EAO	09-03201-02
S16	1	S16	1	Switch, 1P1T, 20 mA, 15 V, 0.240 x 0.256	Panasonic	EVQPAD04M
SH1	1					
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP16, TP17, TP18, TP19, TP20, TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP30, TP31, TP32, TP33, TP34, TP35, TP36, TP37, TP38, TP39, TP40, TP41, TP42, TP43, TP44, TP47, TP48, TP49, TP50, TP51, TP52, TP53	49	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP16, TP17, TP18, TP19, TP20, TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP30, TP31, TP32, TP33, TP34, TP35, TP36, TP37, TP38, TP39, TP40, TP41, TP42, TP43, TP44, TP47, TP48, TP49, TP50, TP51, TP52, TP53	49	Test point, 0.062" hole, 0.25	Keystone	5012
TP14, TP15, TP45, TP46	4	TP14, TP15, TP45, TP46	4	Test point, SM, 0.150 x 0.090", 0.185 x 0.135"	Keystone	5016
U1, U3	2	U1, U3	2	Module, dc-dc converter, 3.3 V/5 V, 1.5 V _{OUT} , 0.950 X 0.900	TI	PT5405A
U2	1	U2	1	IC, PCI-X 2.0 dual slot power controller, PFP80	TI	TPS2342PFP

Table A-1. PR164 List of Materials (continued)

Reference Designator	QTY	Reference Designator	QTY	Description	MFR	Part Number
TPS2342		TPS2343				
U4	1		0	IC, oscillator, 16.000 MHz, 5 V, 0.551 x 0.464"	Citizen	CMX309FLC16.000MT
U5, U6	2		0	IC, 8-line unidirectional transorb, 5 V, SO16	Microsemi	SM16LC05
U7	1		0	IC, TQFP-128	Lattice	ISPLSI5256VE-HPQ1
U8, U9	2	U8, U9	2	Octal buffers/drivers with 3-state outputs, SOIC-20	TI	CD74HC244M
XU1	1	XU1	1	Socket, open top, 80 pin QFP, without center mounting hole, 1.14 x 1.14	Yamaichi	IC201-0804-014-A
	1		1	PCB, 8 in x 8.75 in x 0.062 I		Any
	1		1	PR176B load board	TI	PR176B
	4		4	Rubber bumpers	SPC Technology	2567
Current-Sense Loop Assembly (6 per Demo Board)						
N/A	1	N/A	1	Terminal housing, 2 circuit N/A		Molex
N/A	2	N/A	2	Terminal, socket N/A		Molex
N/A		N/A		Wire, insulated	#22AWG	
N/A		N/A		Drawing, CBL001		
High-Power Cable Assembly (1 per Demo Board)						
N/A	1	N/A	1	Receptacle, housing	Mini-Fit Jr	14-ckt
N/A	14	N/A	14	Terminal, socket, copper plating, high current capable, #16 AWG, N/A	Molex	4476-3112
N/A	4	N/A	4	Spade lug	Voltrex	CSS-TO-1010-HT
N/A		N/A		Wire, insulated, green	Std	#16AWG
N/A		N/A		Wire, insulated, white	Std	#16AWG
N/A		N/A		Wire, insulated, black	Std	#16AWG
N/A		N/A		Tubing, heat shrinkable, flexible, 2:1 shrink ratio, 3/8 inch, diameter x 1 inch		Std
N/A		N/A		Drawing, CBL 002		
Low-Power Cable Assembly (1 per Demo Board)						
N/A	1	N/A	1	Terminal housing, locking ramp	6-ckt	N/A
N/A	6	N/A	6	Terminal, socket	tin/copperplating	#22AWG-#30AWG
N/A		N/A		Wire, insulated, black	Std	#22AWG
N/A		N/A		Wire, insulated, green	Std	#22AWG
N/A		N/A		Wire, insulated, orange	Std	#22AWG
N/A		N/A		Wire, insulated, red	Std	#22AWG
N/A		N/A		Tubing, heat shrinkable, flexible, 2:1 shrink ratio, 1/4 inch diameter x 1 inch		Std
N/A		N/A		Drawing CBL 003		Ref

Appendix B Board Layouts

B.1 Load Board

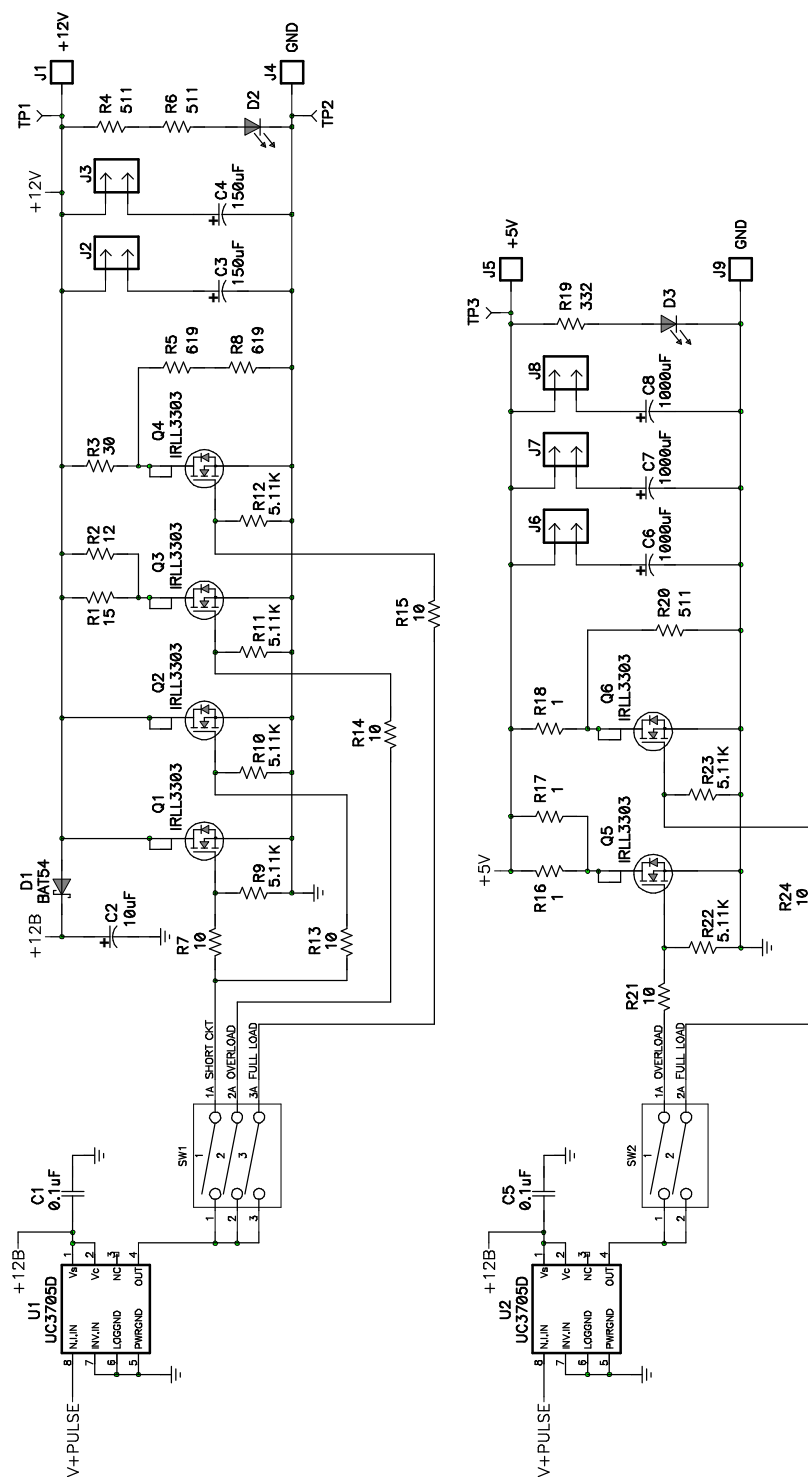


Figure B-1.

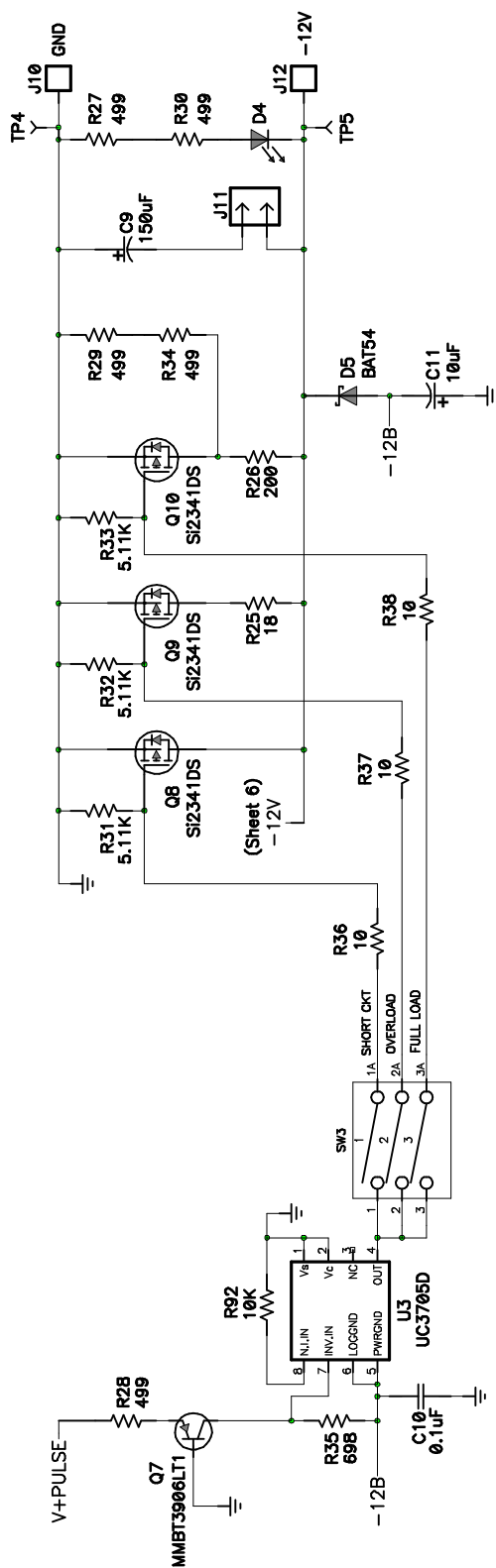


Figure B-2.

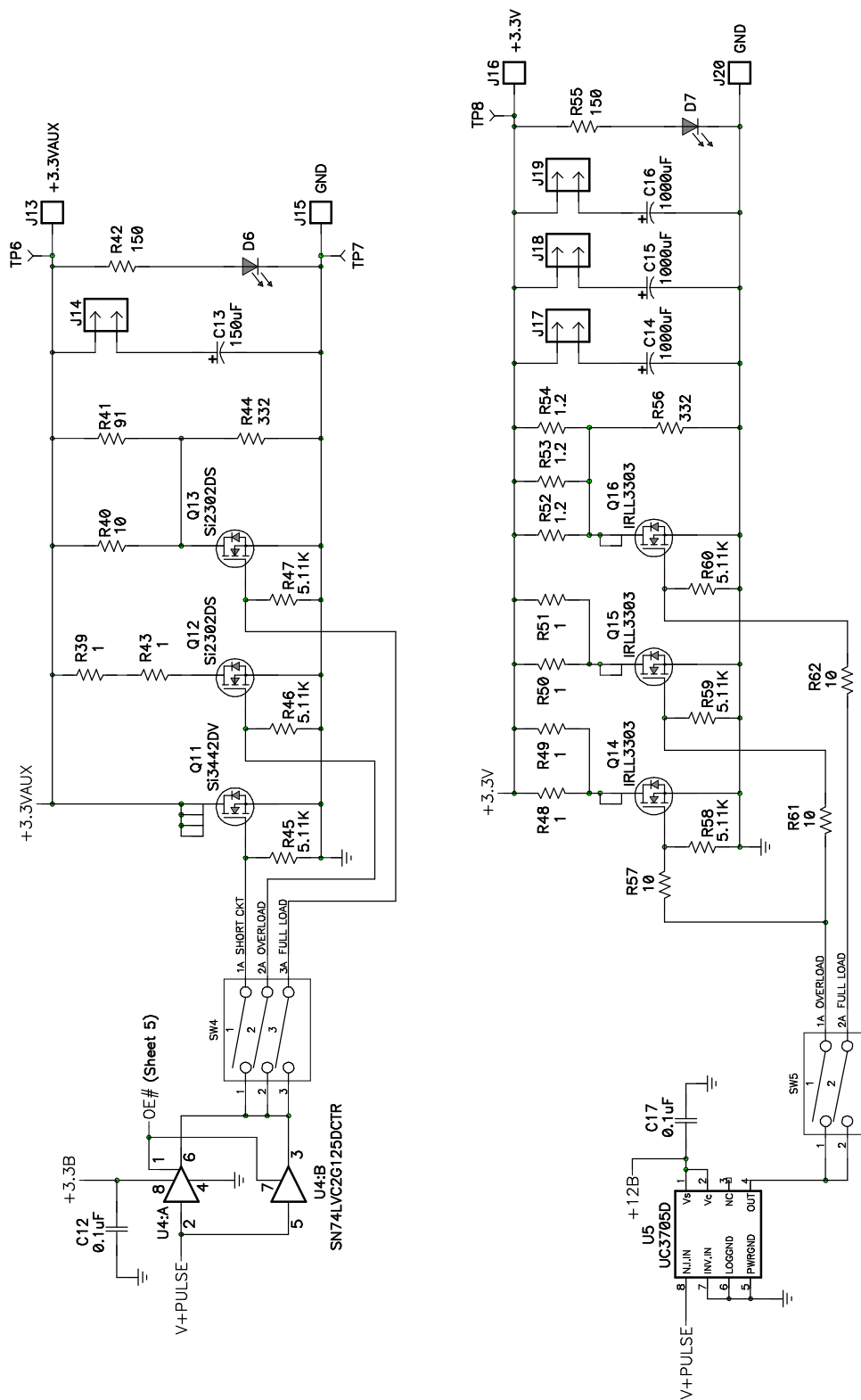


Figure B-3.

Load Board

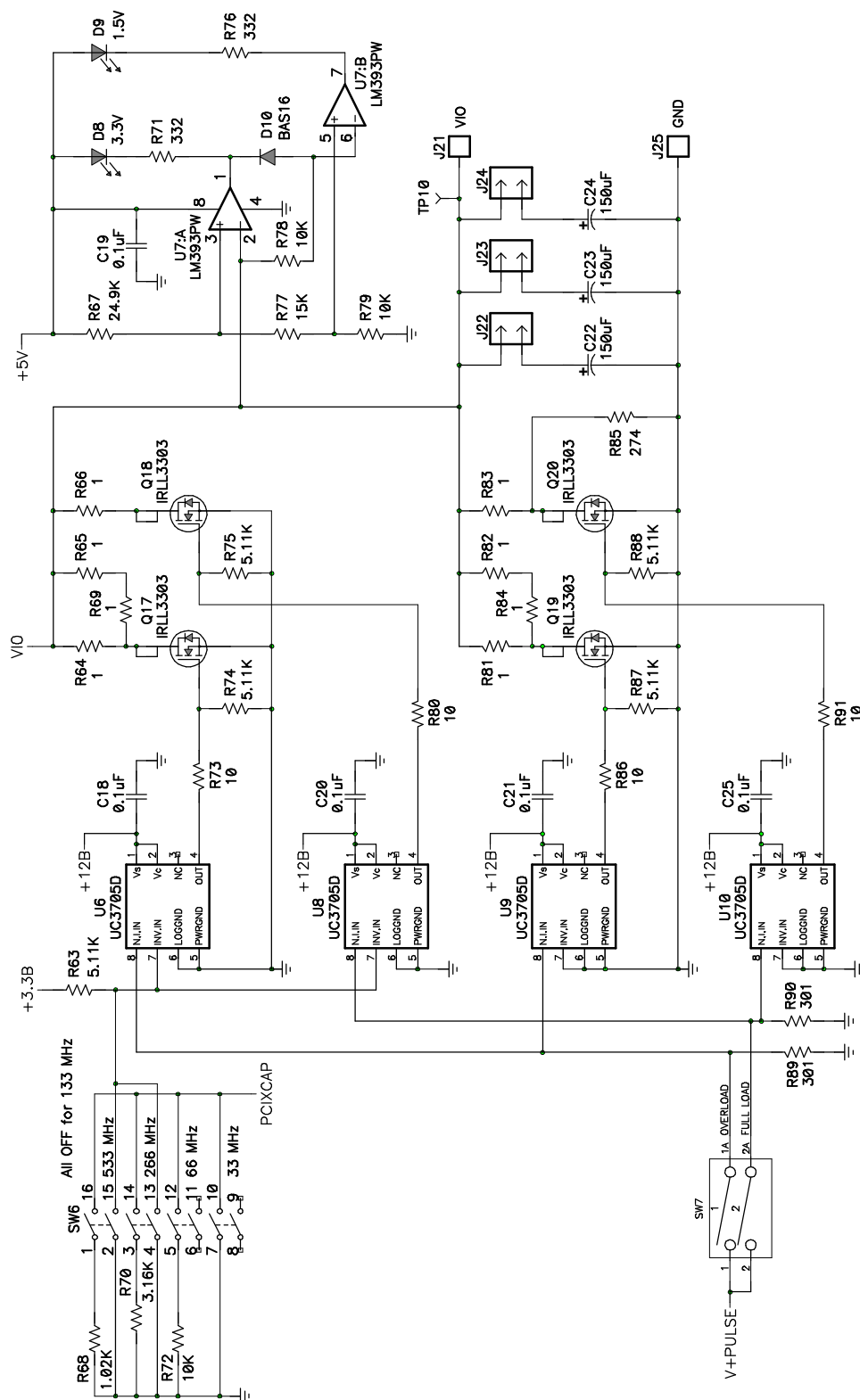


Figure B-4.

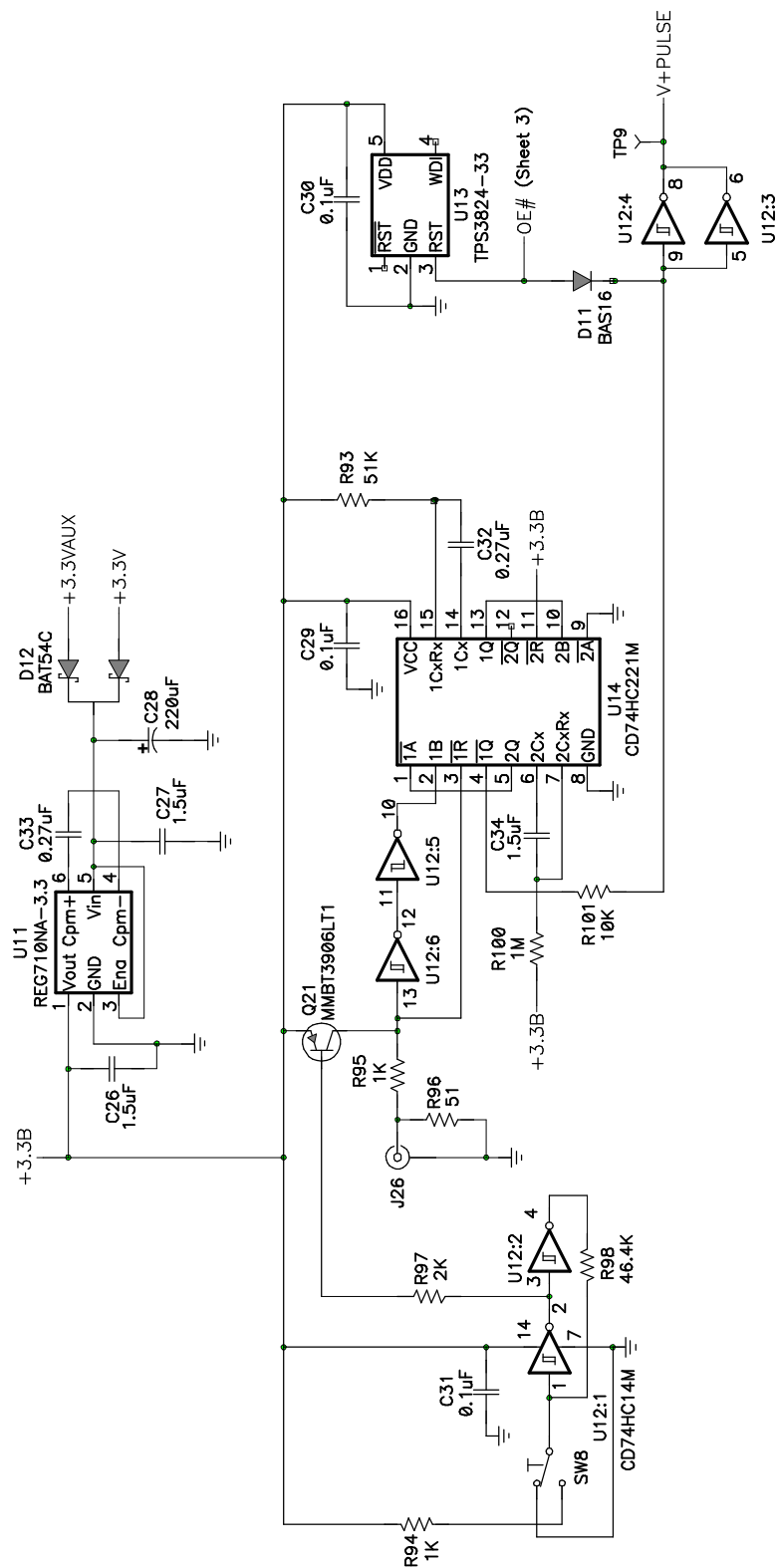


Figure B-5.

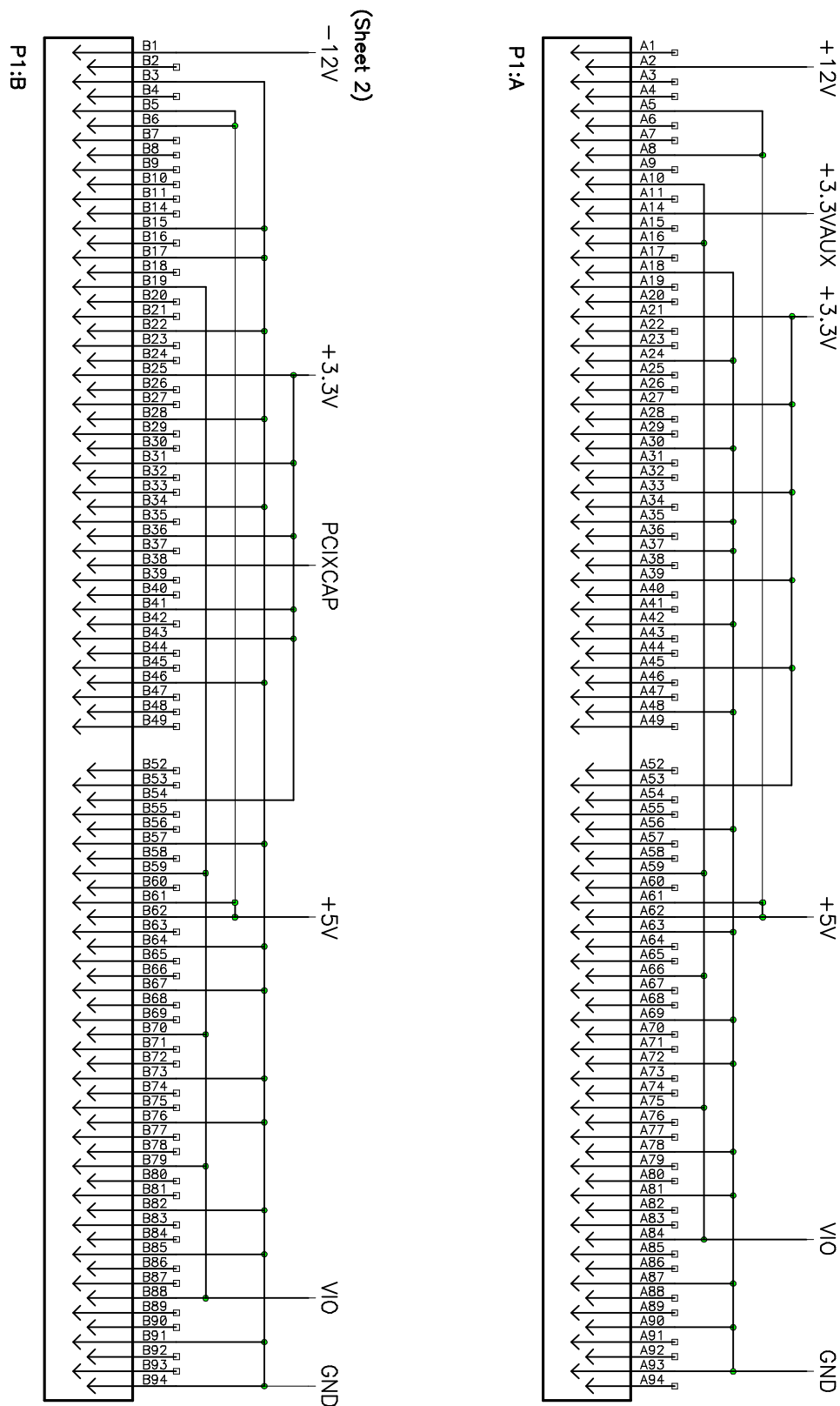


Figure B-6.

B.2 Load Board Top Assembly

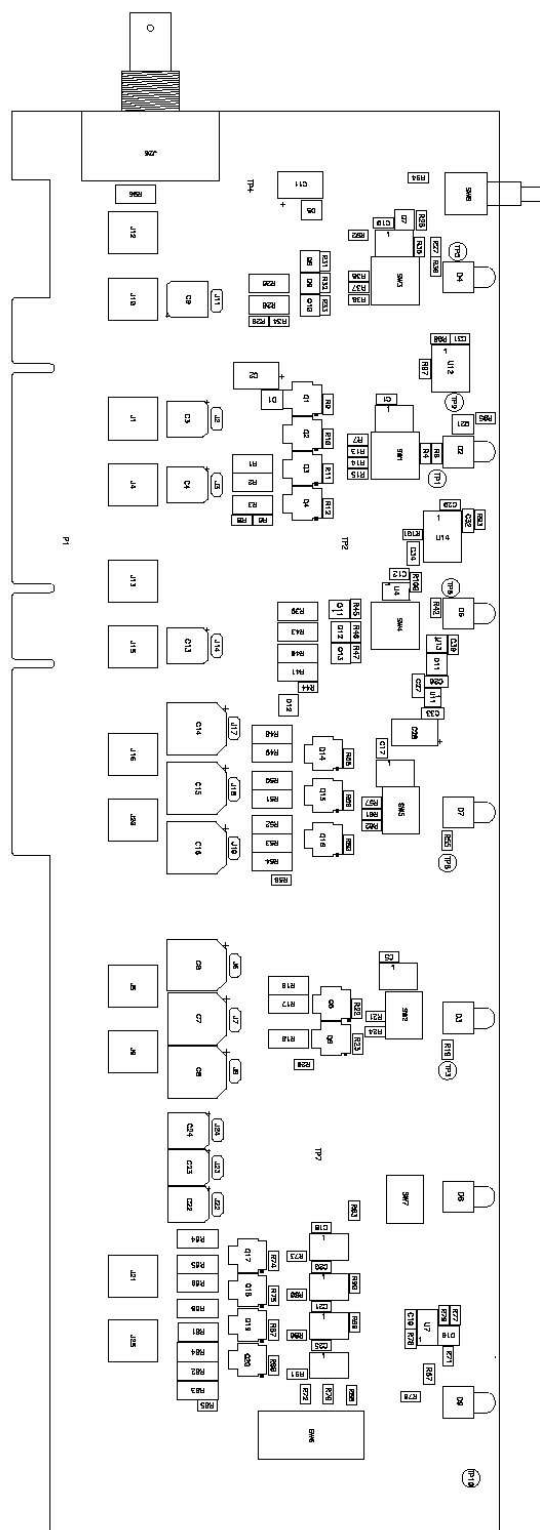


Figure B-7. Top Assembly

B.3 Load Board

Table B-1. PR176 List of Materials⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾

Reference Designator	Count	Description	MFR	Part Number
C1, C5, C10, C12, C17, C18, C19, C20, C21, C25, C29, C30, C31	13	Capacitor, ceramic, 0.1 μ F, 50 V, X7R, 10%, 805	Panasonic	ECJ-2YB1H104K
C2, C11, C28	3	Capacitor, tantalum, 10 μ F, 35 V, 20%, 7343 (D)	Panasonic	ECS-T1VD106R
C26, C27, C34	3	Capacitor, ceramic, 1.5 μ F, 16 V, X7R, 10%, 1206	Panasonic	ECJ-3YB1C155K
C3, C4, C9, C13, C22, C23, C24	7	Capacitor, aluminum, 150 μ F, 16 V, 20%, FK series, 0.268 x 0.307 (D case)	Panasonic	EEV-FK1C151XP
C32	1	Capacitor, ceramic, 0.015 μ F, 50 V, X7R, 10%, 1206	Kemet	C1206C153K5RACTU
C33	1	Capacitor, ceramic, 0.27 μ F, 16 V, X7R, 10%, 1206	Panasonic	ECJ-3VB1C274K
C6, C7, C8, C14, C15, C16	6	Capacitor, aluminum, SM, 1000 μ F, 6.3 V, 150 m Ω , FC series, 10x12mm (G case)	Panasonic	EEV-FC0J102P
D1, D5	2	Diode, schottky, 200 mA, 30 V, SOT23	Vishay-Liteon	BAT54
D10, D11	2	Diode, switching, 10 mA, 85 V, 350 mW, SOT23	Vishay-Liteon	BAS16
D12	1	Diode, dual schottky, 200 mA, 30 V, SOT23	Vishay-Liteon	BAT54C
D2, D3, D4, D6, D7, D8, D9	7	Diode, LED, red, 2.1 V, 10 mA to 25 mA, 0.250 x 0.250"	Lumex	SSF-LXH101ID-01
J1, J4, J5, J9, J10, J12, J13, J15, J16, J20, J21, J25	12	Screw terminal, 0.310 x 0.310	Keystone	7693
J2, J3, J6, J7, J8, J11, J14, J17, J18, J19, J22, J23, J24	13	Header, 2 pin, 100-mil spacing, (36-pin strip), 0.100 x 2"	Sullins	PTC36SAAN
J26	1	Connector, right angle BNC, PCB mount, 1.15 x 0.56	AMP	226978-1
Q1, Q2, Q3, Q4, Q5, Q6, Q14, Q15, Q16, Q17, Q18, Q19, Q20	13	MOSFET, N-channel, 30 V, 4.6 A, 31 m Ω , SOT223	International Rectifier	IRLL3303
Q11	1	MOSFET, N-channel, 20 V, 4 A, 70 m Ω , TSOP-6	Vishay	Si3442DV
Q12, Q13	2	MOSFET, N-channel, 20 V, 2.8 A, 85 m Ω , SOT23	Vishay	Si2302DS
Q7, Q21	2	Bipolar, PNP, 40 V, 200 mA, 225 mW, SOT23	On Semi	MMBT3906LT1
Q8, Q9, Q10	3	MOSFET, P-channel, 30 V, 2.8 A, 72 m Ω , SOT23	Vishay	Si2341DS
R1	1	Resistor, chip, 15 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-150J
R100	1	Resistor, chip, 1 M Ω , 1/10 W, 1%, 805	Std	Std
R16, R17, R18, R39, R43, R48, R49, R50, R51, R64, R65, R66, R69, R81, R82, R83, R84	17	Resistor, chip, 1 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-1R0J
R19, R44, R56, R71, R76	5	Resistor, chip, 332 Ω , 1/10 W, 1%, 805	Std	Std
R2	1	Resistor, chip, 12 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-120J
R25	1	Resistor, chip, 18 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-180J
R26	1	Resistor, chip, 200 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-201J
R27, R28, R29, R30, R34	5	Resistor, chip, 499 Ω , 1/10 W, 1%, 805	Std	Std
R3	1	Resistor, chip, 30 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-300J

(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 MFG's components.

Table B-1. PR176 List of Materials (continued)

Reference Designator	Count	Description	MFR	Part Number
R35	1	Resistor, chip, 698 Ω , 1/10 W, 1%, 805	Std	Std
R4, R6, R20	3	Resistor, chip, 511 Ω , 1/10 W, 1%, 805	Std	Std
R40	1	Resistor, chip, 10 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-100J
Reference Designator	Count	Description	MFR	Part Number
R41	1	Resistor, chip, 91 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-910J
R42, R55	2	Resistor, chip, 150 Ω , 1/10 W, 1%, 805	Std	Std
R5, R8	2	Resistor, chip, 619 Ω , 1/10 W, 1%, 805	Std	Std
R52, R53, R54	3	Resistor, chip, 1.2 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-1R2J
R67	1	Resistor, chip, 24.9 k Ω , 1/10 W, 1%, 805	Std	Std
R68	1	Resistor, chip, 1.02 k Ω , 1/10 W, 1%, 805	Std	Std
R7, R13, R14, R15, R21, R24, R36, R37, R38, R57, R61, R62, R73, R80, R86, R91	16	Resistor, chip, 10 Ω , 1/10 W, 1%, 805	Std	Std
R70	1	Resistor, chip, 3.16 k Ω , 1/10 W, 1%, 805	Std	Std
R72, R78, R79, R92, R93, R101	6	Resistor, chip, 10 k Ω , 1/10 W, 1%, 805	Std	Std
R77	1	Resistor, chip, 15 k Ω , 1/10 W, 1%, 805	Std	Std
R85	1	Resistor, chip, 274 Ω , 1/10 W, 1%, 805	Std	Std
R89, R90	2	Resistor, chip, 301 Ω , 1/10 W, 1%, 805	Std	Std
R9, R10, R11, R12, R22, R23, R31, R32, R33, R45, R46, R47, R58, R59, R60, R63, R74, R75, R87, R88	20	Resistor, chip, 5.11 k Ω , 1/10 W, 1%, 805	Std	Std
R94, R95	2	Resistor, chip, 1 k Ω 1/10 W, 1%, 805	Std	Std
R96	1	Resistor, chip, 51 Ω , 1 W, 5%, 2512	Vishay	CRCW2512-510J
R97	1	Resistor, chip, 2 k Ω , 1/10 W, 1%, 805	Std	Std
R98	1	Resistor, chip, 46.4 k Ω , 1/10 W, 1%, 805	Std	Std
SW1, SW3, SW4	3	SWITCH, 3 POS, SPST, DIP6, 0.380 * 0.385"	CTS	206-3
SW2, SW5, SW7	3	Switch, low profile 2 POS, SPST, 0.280 * 0.380	CTS	206-2
SW6	1	Switch, DPST, 4 position, 0.385 x 0.886	CTS	206-214
SW8	1	Switch, SPDT, pushbutton, momentary, 400 mA, 0.270 x 0.800	C & K	8121SD9AV2GE
TP1, TP3, TP5, TP6, TP8, TP9, TP10	7	Test point, 0.062 hole, 0.25	Keystone	5012
TP2, TP4, TP7	3	Test point, SM, 0.150 x 0.090", 0.185 x 0.135"	Keystone	5016
U1, U2, U3, U5, U6, U8, U9, U10	8	IC, high speed power driver, SO8	TI	UC3705D
U11	1	IC, switched cap, buck boost converter 1.8 V to 5.5 V in 65 μ A, SOT23-6	TI	REG710NA-3.3
U12	1	IC, high-speed CMOS logic hex inverting schmitt trigger, SO14	TI	CD74HC14M
U13	1	IC, voltage supervisor, SOT23-5	TI	TPS3824-33QDBVRQ1
U14	1	IC, high-speed CMOS dual monostable multivibrator with reset, SO16	TI	CD74HC221M
U4	1	IC, dual buffer/driver with 3 state outputs, SSOP8	TI	SN74LVC2G125DCT R
U7	1	IC, dual differential comparators, 2 to 36 V_{IN} , TSSOP-8 (PW)	TI	LM393PW
	1	PCB, 12.25 in x 4.25 in x 0.062 in	Any	PR176B

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 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.

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.

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
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265

Copyright © 2005, Texas Instruments Incorporated