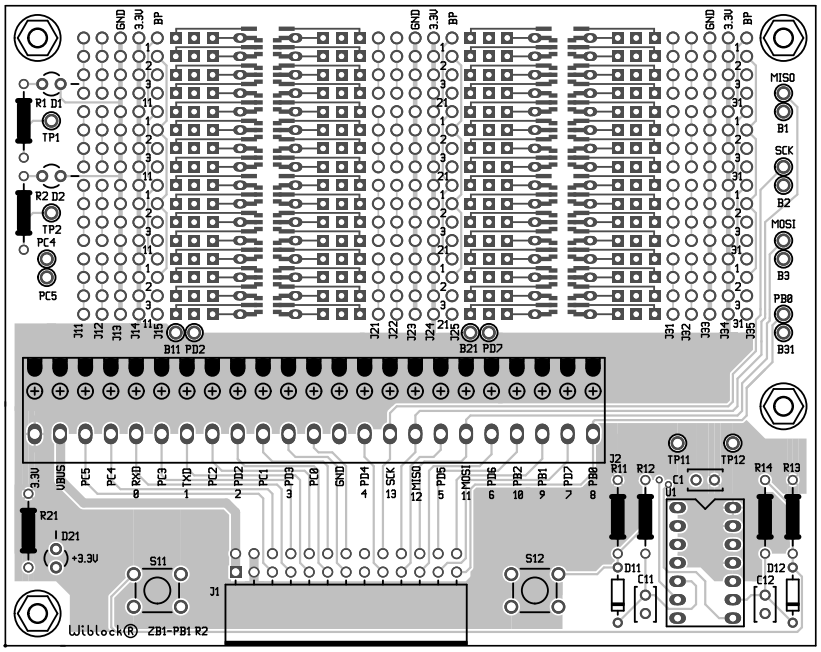
ZB1-PB1 Description

The ZB1-PB1 is a prototyping board that is compatible with the ZB1 development system.



Features

- Compatible with the ZB1 development system.
- All thru-hole components.
- Removable terminal block (3.5mm centers).
- 1.6" x 4" breadboard area with TH and SMD patterns. Pattern features a DIP, SOIC and SOT23-6 pattern overlay.
- Two bounceless push-buttons.
- Three debug LEDs (one for the 3.3V supply, two wired to testpoints)

1 IO Connectors

J1	13x2 receptacle	I/O connections from the ZB1. See Table 2
J2	23x1 terminal block	I/O connections from the ZB1. See Table 3

Table 1: ZB1-PB1 connectors

1.1 J1 Receptacle

ATmega168 Pins (Arduino Pins)		J1 Pin		ATmega168 Pins (Arduino Pins)	
VBUS		1	2	VBUS	
+3.3V		3	4	+3.3V	
PC5/ADC5/SCL (**A5**)	28	5	6	PC4/ADC4/SDA (**A4**)	27
PD0 (**0**)		7	8	PC3/ADC3 (**A3**)	26
PD1 (**1**)		9	10	PC2/ADC2 (**A2**)	25
PD2 (**2**)	4	11	12	PC1/ADC1 (**A1**)	24
PD3 (**3**)	5	13	14	PC0/ADC0 (**A0**)	23
GND		15	16	GND	
PD4 (**4**)	6	17	18	PB5/SCK (**13**)	19
PD5 (**5**)	11	19	20	PB4/MISO (**12**)	18
PD6/AIN0 (**6**)	12	21	22	PB3/MOSI (**11**)	17
PD7/AIN1 (**7**)	13	23	24	PB2 (**10**)	16
PB0 (**8**)	14	25	26	PB1 (**9**)	15

Table 2: J1 Pinout

1.2 J2 Terminal Block

ATmega168 Pin (Arduino Pins)		J2 Pin
PB0 (**8**)	14	1
PD7/AIN1 (**7**)	13	2
PB1 (**9**)	15	3
PB2 (**10**)	16	4
PD6/AIN0 (**6**)	12	5
PB3/MOSI (**11**)	17	6
PD5 (**5**)	11	7
PB4/MISO (**12**)	18	8
PB5/SCK (**13**)	19	9
PD4 (**4**)	6	10
GND		11
PC0/ADC0 (**A0**)	23	12
PD3 (**3**)	5	13
PC1/ADC1 (**A1**)	24	14
PD2 (**2**)	4	15
PC2/ADC2 (**A2**)	25	16
TXD		17
PC3/ADC3 (**A3**)	26	18
RXD		19
PC4/ADC4/SDA (**A4**)	27	20
PC5/ADC5/SCL (**A5**)	28	21
VBUS		22
+3.3V		23

Table 3: J2 Pinout (Prototype)

2 Assembling the ZB1-PB1

Semiconductors are electrostatic-sensitive devices. Proper ESD handling precautions need to be taken to avoid damage.

The Bill of Materials (BOM) and Component List is in section 4. For full page assembly drawings see Figure 1

Extra care needs to be taken when soldering the right-angle connector J1. The outer edge of the connector body should be as close to the edge of the board as possible. Slightly over the edge is preferable. The connector body should be flat on the board.

2.1 Assembly

Solder the top side components:

- R1, R2, R21

  The tolerance of R1,R2 and R21 is not critical. Some kits include a 5% resistor others include a 1% resistor. The 5% resistor has four color bands (red, red, brown, gold). The 1% resistor has five color bands (red, red, brown, black, brown).

- D1, D2, D21

  The negative lead of the LED is the short lead. Align the short lead with the negative marking on the PCB.

- R11, R13

  The tolerance of R11 and R13 is not critical. Some kits include a 5% resistor others include a 1% resistor. The 5% resistor has four color bands (brown, black, orange, gold). The 1% resistor has five color bands (brown, black, black, red, brown)

- R12, R14

  The tolerance of R12 and R14 is not critical. Some kits include a 5% resistor others include a 1% resistor. The 5% resistor has four color bands (orange, orange, yellow, gold). The 1% resistor has five color bands (orange, orange, black, orange, brown).

2.5 Debug LEDs

The anode of debug LEDs, D1 and D2, are wired to TP1 and TP2 through a series resistors R1 and R2 (220Ω) respectively.

Debug LED D21 is hardwired to the +3.3V bus through serieas resistor R21 (220Ω).

- D11, D12

  D11 and D12 are polarized. The cathode of the diode is marked with a line. Make sure that the cathode mark on the diode aligns with the cathode mark on the PCB.

- C1, C11, C12

- U1 (socket)

- J1

  The J1 that is included with the ZB1-PB1 Kit is a right angle receptacle for co-planar connection to the ZB1. If your application requires a cable connection then replace J1 with a 13x2 vertical header.

2.2 J4 Terminal Block

J4 consists of four parts, two pin headers and two terminal blocks, that need to be assembled into a single subassembly prior to soldering to the board. Slide the two terminal blocks together to make a single 23 position terminal block. Insert the two pin headers into the 23 position terminal block. With the assembly plugged in and vertical to the board vertical solder it to the board.

2.3 Pushbuttons

The electro-mechanical components are sensitive to washing. Place all of these last and lightly wash afterwards. If water does get into these components let them dry out before applying power.

- S11

- S12

2.4 Mounting Hardware

Space has been provided for four #2 hex standoffs and washers.

2.6 Bounceless Pushbuttons

Since S11 and S12 have a debouncing circuit no software debouncing is required. TP11 and TP12 connect to the debounce circuit outputs for S11 and S12 respectively.

2.7 Jumper Columns

There are 14 vertical jumper columns.

J15		J25		J35	
Bus	**Pin**	**Bus**	**Pin**	**Bus**	**Pin**
B1	1	B1	1	B1	1
B2	2	B2	2	B2	2
B3	3	B3	3	B3	3
B4	4	B5	4	B6	4
B1	5	B1	5	B1	5
B2	6	B2	6	B2	6
B3	7	B3	7	B3	7
B4	8	B5	8	B6	8
B1	9	B1	9	B1	9
B2	10	B2	10	B2	10
B3	11	B3	11	B3	11
B4	12	B5	12	B6	12
B1	13	B1	13	B1	13
B2	14	B2	14	B2	14
B3	15	B3	15	B3	15
B4	16	B5	16	B6	16

Table 4: Bus Pins

2.7.1 Power Columns

+3.3V J14, J24, J34

GND J13, J23, J33

2.7.2 4-connect Columns

J11, J12, J21, J22, J31, J32 have four groups containing four pins each group. All pins in the group are shorted. The groups are (1,2,3,4), (5,6,7,8), (9,10,11,12) and (13,14,15,16).

The pins in the groups are connected with an 9mil trace. Use an X-acto knife to cut the undesired connections.

2.7.3 Bus Connect Columns

There are six buses that in the prototype area. Bus pins B1,B2,B3 connect to J15, J25, and J35 respectively. These pins are useful for connecting the SPI or I^2C port to the entire prototype area. To connect the SPI port – jumper MISO to B1, SCK to B2, and MOSI to B3 using the test points along the right side of the PCB.

Bus pin B11 connects to jumper row J15. Bus pin B21 connects to jumper row J25. Bus pin B31 connects to jumper rown J35.

See Table 4 for the pinout information.

3 Prototype Area

There are two sections in the prototype area that can be used for ICs. Each section consists of an IC pattern with three columns of pads on either side.

The IC pattern can accommodate DIP ICs with 300mil row spacing, SOIC's with 50mil (1.27mm) pin spacing and SOT23's with 0.95mm pin spacing.

The columns of pads are spaced on 100mil centers. 1206 and 0805 components can be soldered across adjacent pads either vertically or horizontally.

4 Assembly Documentation and Schematics

Table 5: Bill of Materials

Qty	Reference	Value	Footprint	Mfg PN	Notes
3	C1, C11, C12	0.1u		Kemet C320C104K5R5TA	
3	D1, D2, D21			Kingbright WP7104LGD	
2	D11, D12			Fairchild 1N4148TA	
1	J1			Sullins PPPC132LJBN-RC	
3	R1, R2, R21	220		Yageo MFR-25FBF-221R	
2	R11, R13	10K		Yageo MFR-25FBF-10K0	
2	R12, R14	330K		Yageo MFR-25FBF-332K	
2	S11, S12			Panasonic EVQ-PAE04M	
1	U1			TI SN74AHC14N	
1				3M 4828-3004-CP	
1				Phoenix 1945232	
1				Phoenix 1945180	
1				Phoenix 1984112	
1				Phoenix 1984109	
1				wiblock ZB1-PB1-PCB	

Table 6: Component List

Reference	Value	Footprint	Mfg PN	Notes
C1	0.1u		Kemet C320C104K5R5TA	
C11	0.1u		Kemet C320C104K5R5TA	
C12	0.1u		Kemet C320C104K5R5TA	
D1			Kingbright WP7104LGD	
D2			Kingbright WP7104LGD	
D11			Fairchild 1N4148TA	
D12			Fairchild 1N4148TA	
D21			Kingbright WP7104LGD	
J1			Sullins PPPC132LJBN-RC	
R1	220		Yageo MFR-25FBF-221R	
R2	220		Yageo MFR-25FBF-221R	
R11	10K		Yageo MFR-25FBF-10K0	
R12	330K		Yageo MFR-25FBF-332K	
R13	10K		Yageo MFR-25FBF-10K0	
R14	330K		Yageo MFR-25FBF-332K	
R21	220		Yageo MFR-25FBF-221R	
S11			Panasonic EVQ-PAE04M	
S12			Panasonic EVQ-PAE04M	
U1			TI SN74AHC14N	
			wiblock ZB1-PB1-PCB	

References

Mancini, R. (2002, February 21). Examing switch-debounce Circuits. *EDN*.

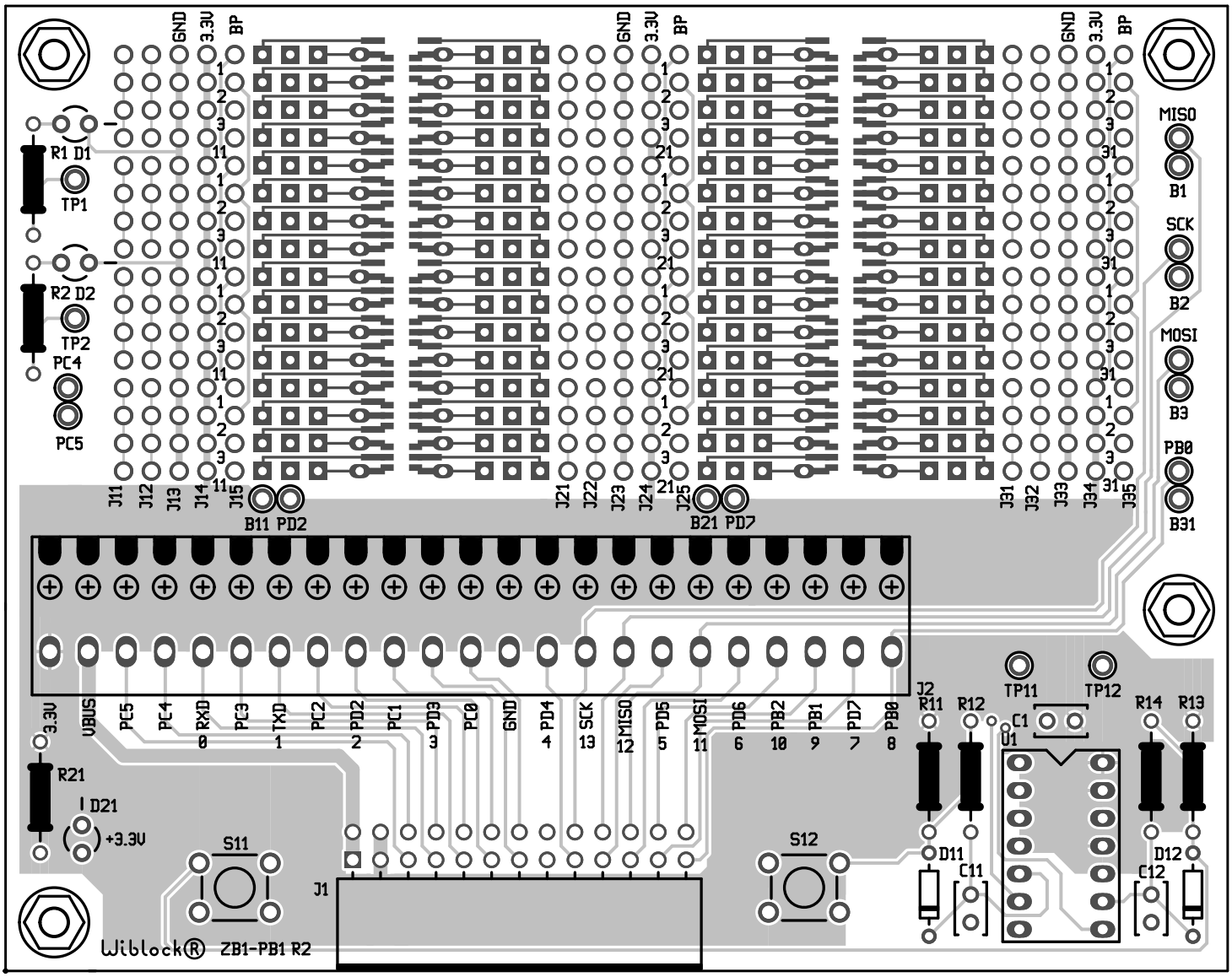


Figure 1: ZB1 Top Assembly Drawing

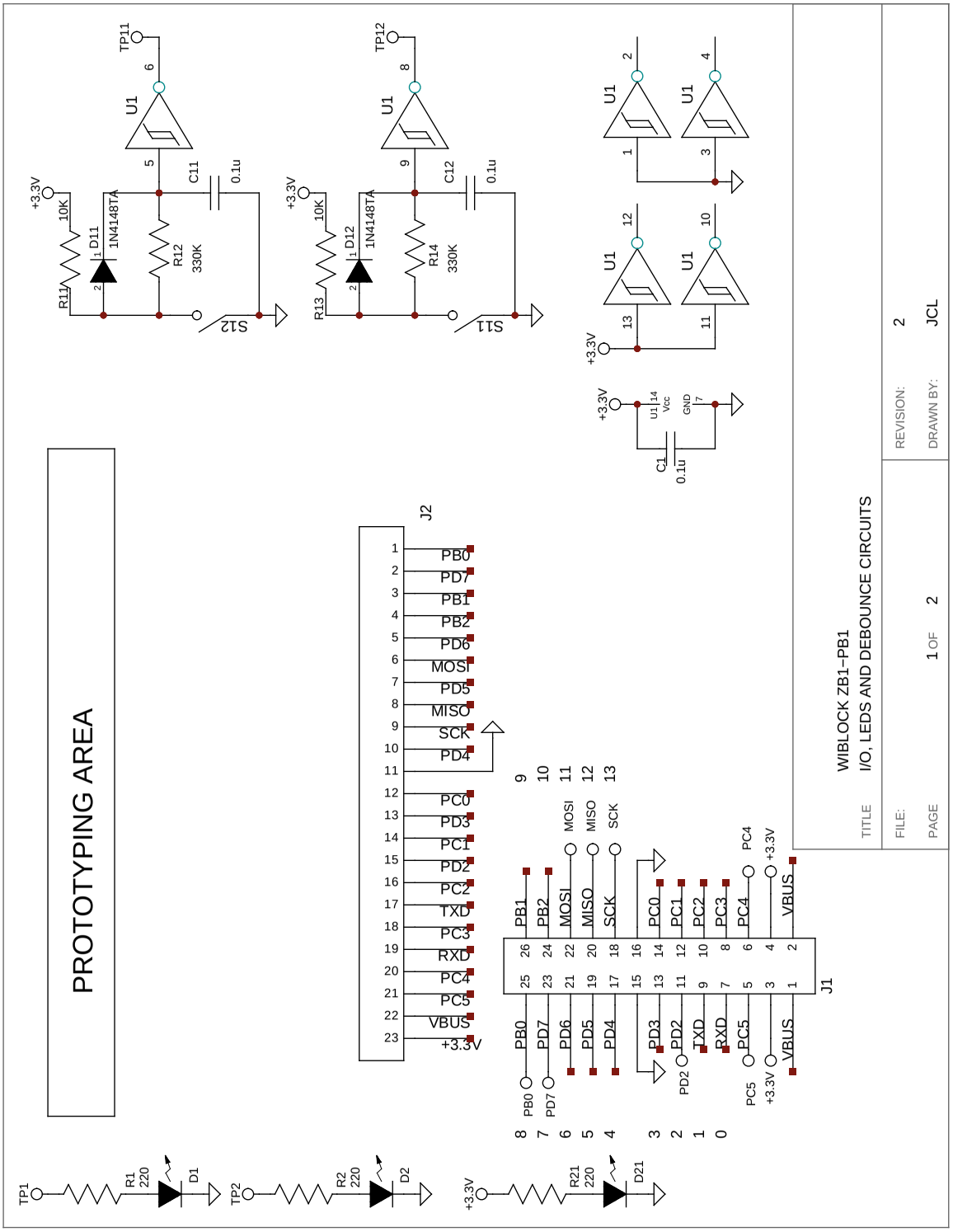


Figure 2: ZB1-PB1 Top-Level Schematic

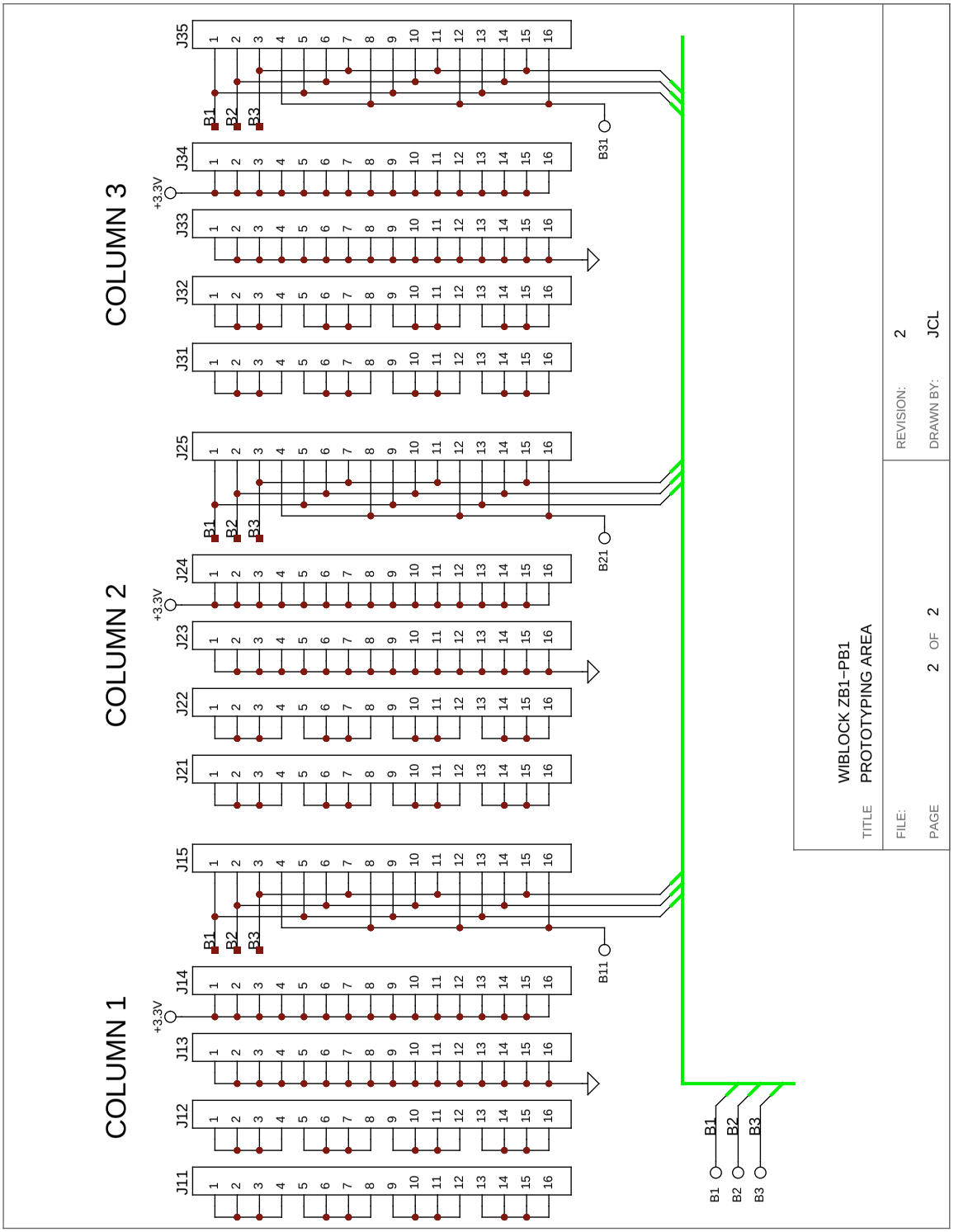


Figure 3: ZB1-PB1 Protoyping Area