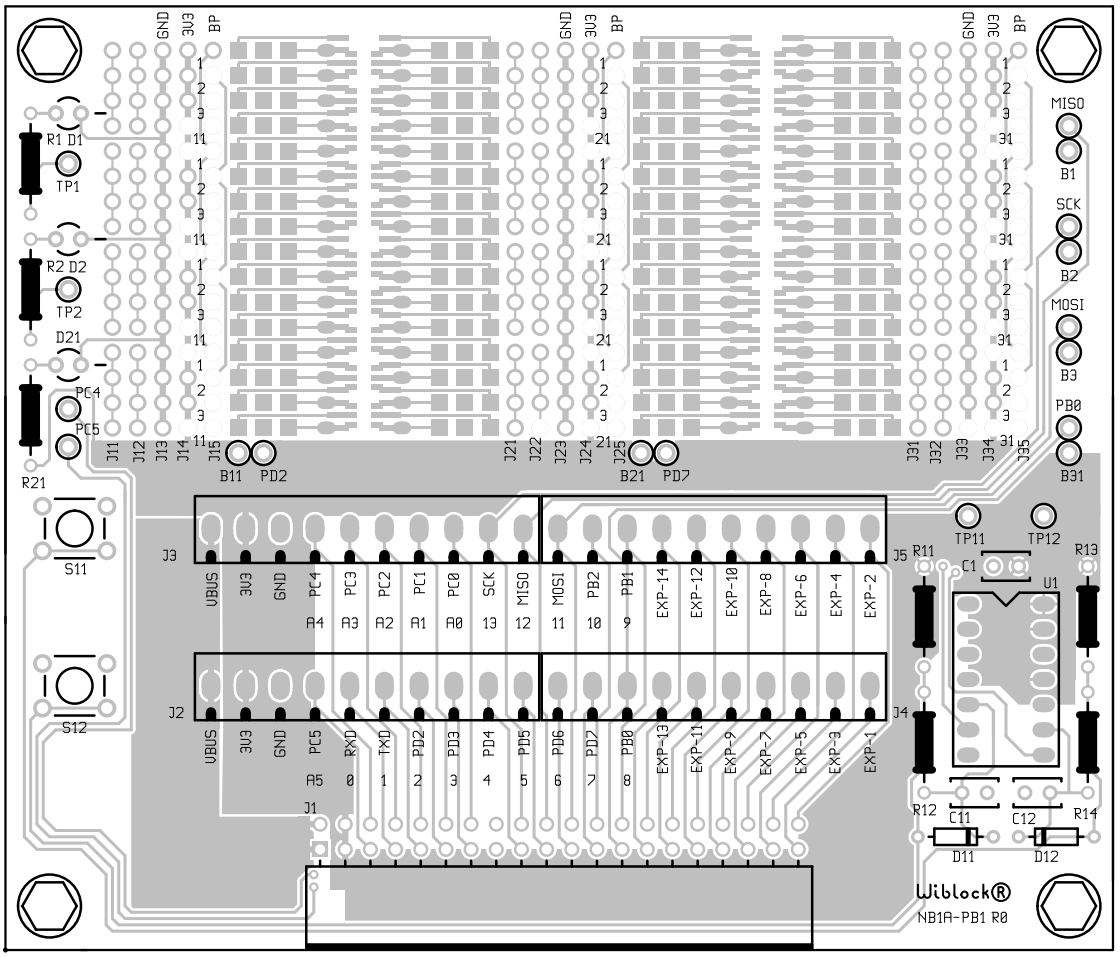

NB1A-PB1 Description

The NB1A-PB1 is a prototyping board that is compatible with the NB1A, NB1 and ZB1 development boards.

Features

- Compatible with the NB1A, NB1 and ZB1 development boards.
- All thru-hole components.
- Two 20x1 terminal blocks with screw terminals (3.5mm centers).
- 1.6” x 4” breadboard area with TH and SMD patterns. Pattern features a DIP (300mil), SOIC and SOT23-6 pattern overlay.
- Two de-bounced push-buttons.
- Three debug LEDs (one for the 3.3V supply, two wired to testpoints)

1 Assembling the NB1A-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 5. 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.

1.1 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).

- 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 NB1A-PB1 Kit is a right angle receptacle for co-planar connection to the NB1A, NB1 or ZB1. If your application requires a cable connection then replace J1 with a 20x2 vertical header.

- J2, J4, J3, J5

  There are four 10x1 terminal blocks in the kit. Use these to create two 20x1 terminal blocks. On the short side of each block is either a tab or a slot. Slide the tab of one block into the slot of an other. Solder one of the 20x1 blocks into the J2+J4 positions and the other into the J3+J5 positions.

1.2 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

1.3 Mounting Hardware

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

2 IO Connectors

J1	20x2 receptacle	I/O connections from the NB1A, NB1, ZB1. See Table 2
J2	10x1 terminal block	I/O connections from the NB1A, NB1, ZB1. See Table 3
J3	10x1 terminal block	I/O connections from the NB1A, NB1, ZB1. See Table 4
J4	10x1 terminal block	I/O connections from the NB1A, NB1, ZB1. See Table 5
J5	10x1 terminal block	I/O connections from the NB1A, NB1, ZB1. See Table 6

Table 1: NB1A-PB1 connectors

2.1 J1 Receptacle

ATmega328 Pins (Arduino Pins)		J1 Pin		ATmega328 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
J3-13		27	28	J3-14	
J3-11		29	30	J3-12	
J3-9		31	32	J3-10	
J3-7 GND (NB1A)		33	34	J3-8 GND (NB1A)	
J3-5 DACA (NB1A)		35	36	J3-6 DACB (NB1A)	
J3-3 DACC (NB1A)		37	38	J3-4 DACD (NB1A)	
J3-1 RTC INTA (NB1A)		39	40	J3-2 RTC INTB (NB1A)	

Table 2: J1 Pinout

2.2 J2 Terminal Block

ATmega328 Pins (Arduino Pins)		J2 Pin
VBUS		1
+3.3V		2
GND		3
PC5/ADC5/SCL (**A5**)	28	4
PD0 (**0**)		5
PD1 (**1**)		6
PD2 (**2**)	4	7
PD3 (**3**)	5	8
PD4 (**4**)	6	9
PD5 (**5**)	11	10

Table 3: J2 Pinout

2.3 J3 Terminal Block

ATmega328 Pins (Arduino Pins)		J3 Pin
VBUS		1
+3.3V		2
GND		3
PC4/ADC4/SDA (**A4**)	27	4
PC3/ADC3 (**A3**)	26	5
PC2/ADC2 (**A2**)	25	6
PC1/ADC1 (**A1**)	24	7
PC0/ADC0 (**A0**)	23	8
PB5/SCK (**13**)	19	9
PB4/MISO (**12**)	18	10

Table 4: J3 Pinout

2.4 J4 Terminal Block

ATmega328 Pins (Arduino Pins)		J4 Pin
PD6/AIN0 (**6**)	12	1
PD7/AIN1 (**7**)	13	2
PB0 (**8**)	14	3
J3-13		4
J3-11		5
J3-9		6
J3-7 GND (NB1A)		7
J3-5 DACA (NB1A)		8
J3-3 DACC (NB1A)		9
J3-1 RTC INTA (NB1A)		10

Table 5: J4 Pinout

2.5 J5 Terminal Block

ATmega328 Pins (Arduino Pins)		J5 Pin
PB3/MOSI (**11**)	17	1
PB2 (**10**)	16	2
PB1 (**9**)	15	3
J3-14		4
J3-12		5
J3-10		6
J3-8 GND (NB1A)		7
J3-6 DACB (NB1A)		8
J3-4 DACD (NB1A)		9
J3-2 RTC INTB (NB1A)		10

Table 6: J5 Pinout

3 Circuitry

3.1 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).

3.2 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.

3.3 Jumper Columns

There are 14 vertical jumper columns.

3.3.1 Power Columns

+3.3V J14, J24, J34

GND J13, J23, J33

3.3.2 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.

3.3.3 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 7 for the pinout information.

4 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.

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 7: Bus Pins

References

Mancini, R. (2002, February 21). Examining switch-debounce Circuits. *EDN*. (Retrieved May 20, 2010, from http://www.edn.com/article/490931-Examining_switch_debounce_circuits.php)

5 Assembly Documentation and Schematics

Table 8: Bill of Materials

Kit: NB1A-PB1-KIT

Qty	Reference	Part Number	Description
3	C1, C11, C12	CAPR-0U10-50V-X7R-100M	capacitor, ceramic, 0.1uF, 10%, 50V, X7R
3	D1, D2, D21	LEDR-1T-GRN-2M00	LED, T1, Green
2	D11, D12	DIOA-1N4148	diode, 1N4148
1	J1	HDRF_RA-20x2-100M	header, female, RA, 20x2, 100mils
4	J2, J3, J4, J5	CON_TB-10x1-3MM5	connector, terminal block, 10x1, 3.5mm centers
3	R1, R2, R21	RES-220R-0W25-1T00	resistor, 220 Ohm, 1/4W
2	R11, R13	RES-10K0-0W25-1T00	resistor, 10K, 1/4W
2	R12, R14	RES-330K-0W25-1T00	resistor, 330K, 1/4W
2	S11, S12	SW__Panasonic_EVQ-PAE04M	pushbutton
1	U1	IC_LOGIC__TI_SN74AHC14N	IC, logic, hex inverter, schmitt, DIP
1		wiblock_NB1A-PB1-PCB	

Table 9: Component List

Kit: NB1A-PB1-KIT

Reference	Part Number	Description
C1	CAPR-0U10-50V-X7R-100M	capacitor, ceramic, 0.1uF, 10%, 50V, X7R
C11	CAPR-0U10-50V-X7R-100M	capacitor, ceramic, 0.1uF, 10%, 50V, X7R
C12	CAPR-0U10-50V-X7R-100M	capacitor, ceramic, 0.1uF, 10%, 50V, X7R
D1	LEDR-1T-GRN-2M00	LED, T1, Green
D2	LEDR-1T-GRN-2M00	LED, T1, Green
D21	LEDR-1T-GRN-2M00	LED, T1, Green
D11	DIOA-1N4148	diode, 1N4148
D12	DIOA-1N4148	diode, 1N4148
J1	HDRF_RA-20x2-100M	header, female, RA, 20x2, 100mils
J2	CON_TB-10x1-3MM5	connector, terminal block, 10x1, 3.5mm centers
J3	CON_TB-10x1-3MM5	connector, terminal block, 10x1, 3.5mm centers
J4	CON_TB-10x1-3MM5	connector, terminal block, 10x1, 3.5mm centers
J5	CON_TB-10x1-3MM5	connector, terminal block, 10x1, 3.5mm centers
R1	RES-220R-0W25-1T00	resistor, 220 Ohm, 1/4W
R2	RES-220R-0W25-1T00	resistor, 220 Ohm, 1/4W
R21	RES-220R-0W25-1T00	resistor, 220 Ohm, 1/4W
R11	RES-10K0-0W25-1T00	resistor, 10K, 1/4W
R13	RES-10K0-0W25-1T00	resistor, 10K, 1/4W
R12	RES-330K-0W25-1T00	resistor, 330K, 1/4W
R14	RES-330K-0W25-1T00	resistor, 330K, 1/4W
S11	SW__Panasonic_EVQ-PAE04M	pushbutton
S12	SW__Panasonic_EVQ-PAE04M	pushbutton
U1	IC_LOGIC__TI_SN74AHC14N	IC, logic, hex inverter, schmitt, DIP
	wiblock_NB1A-PB1-PCB	

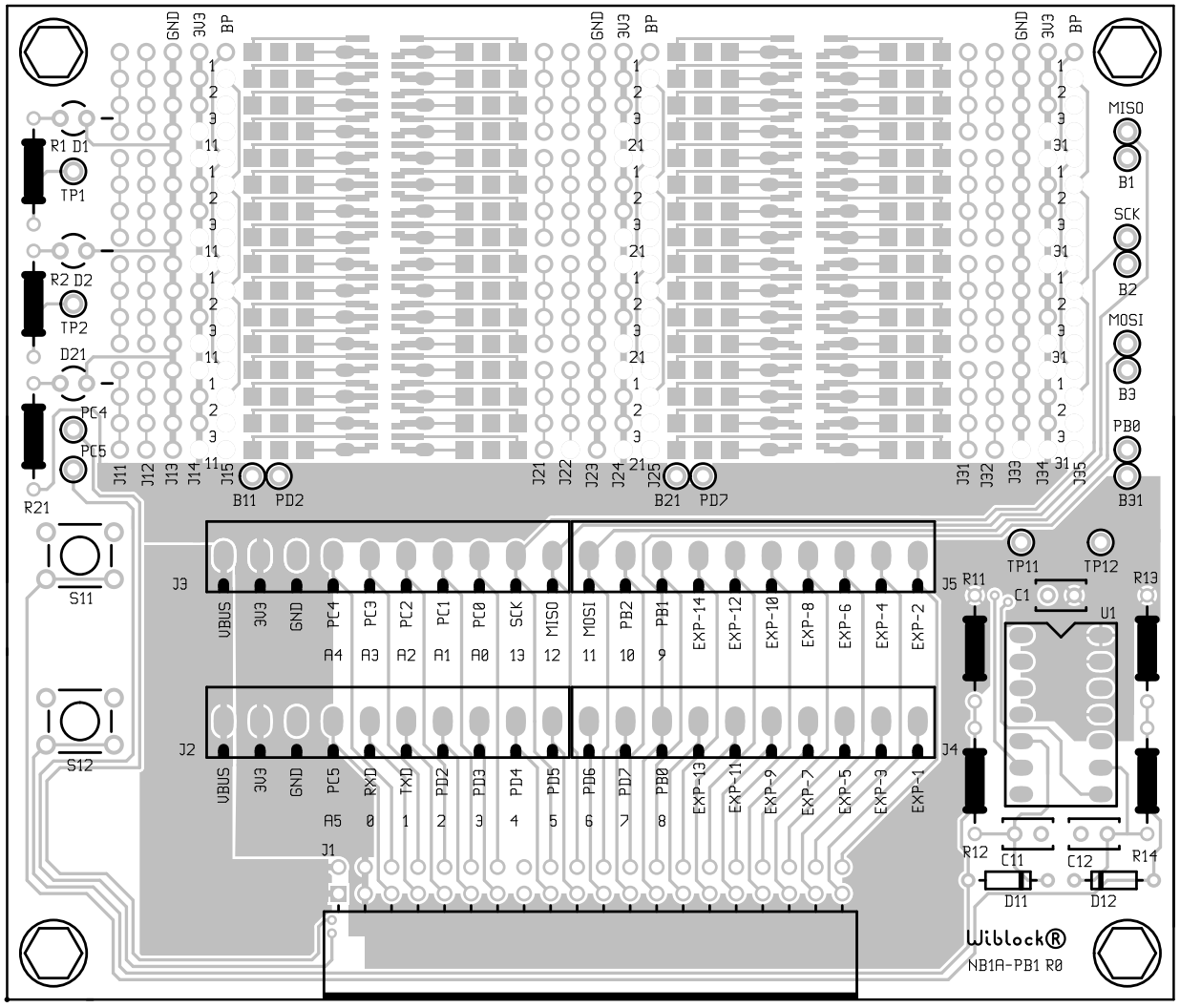

Figure 1: NB1A-PB1 Top Side Assembly Drawing (Rev 0)

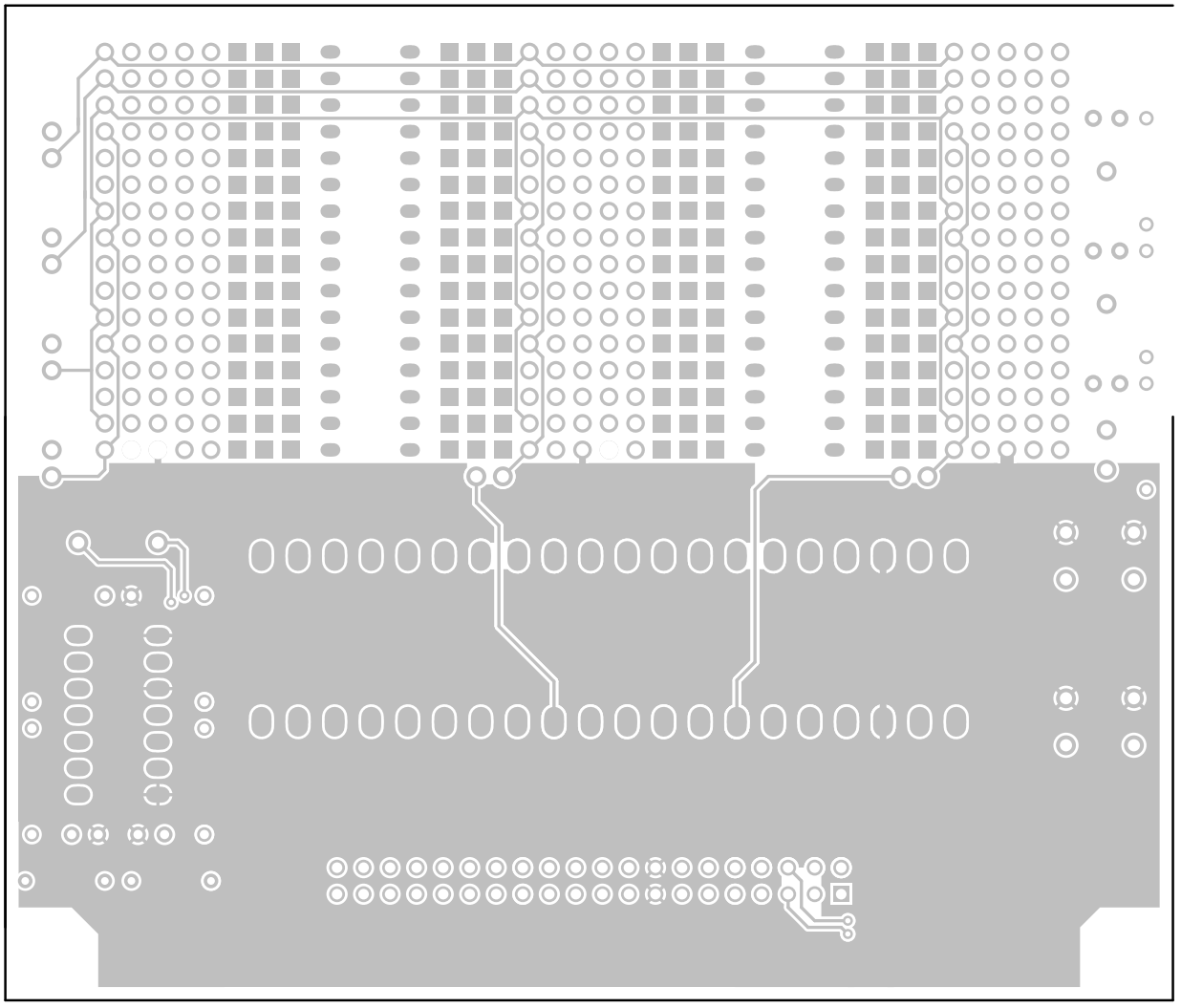

Figure 2: NB1A-PB1 Bottom Side Assembly Drawing (Rev 0)

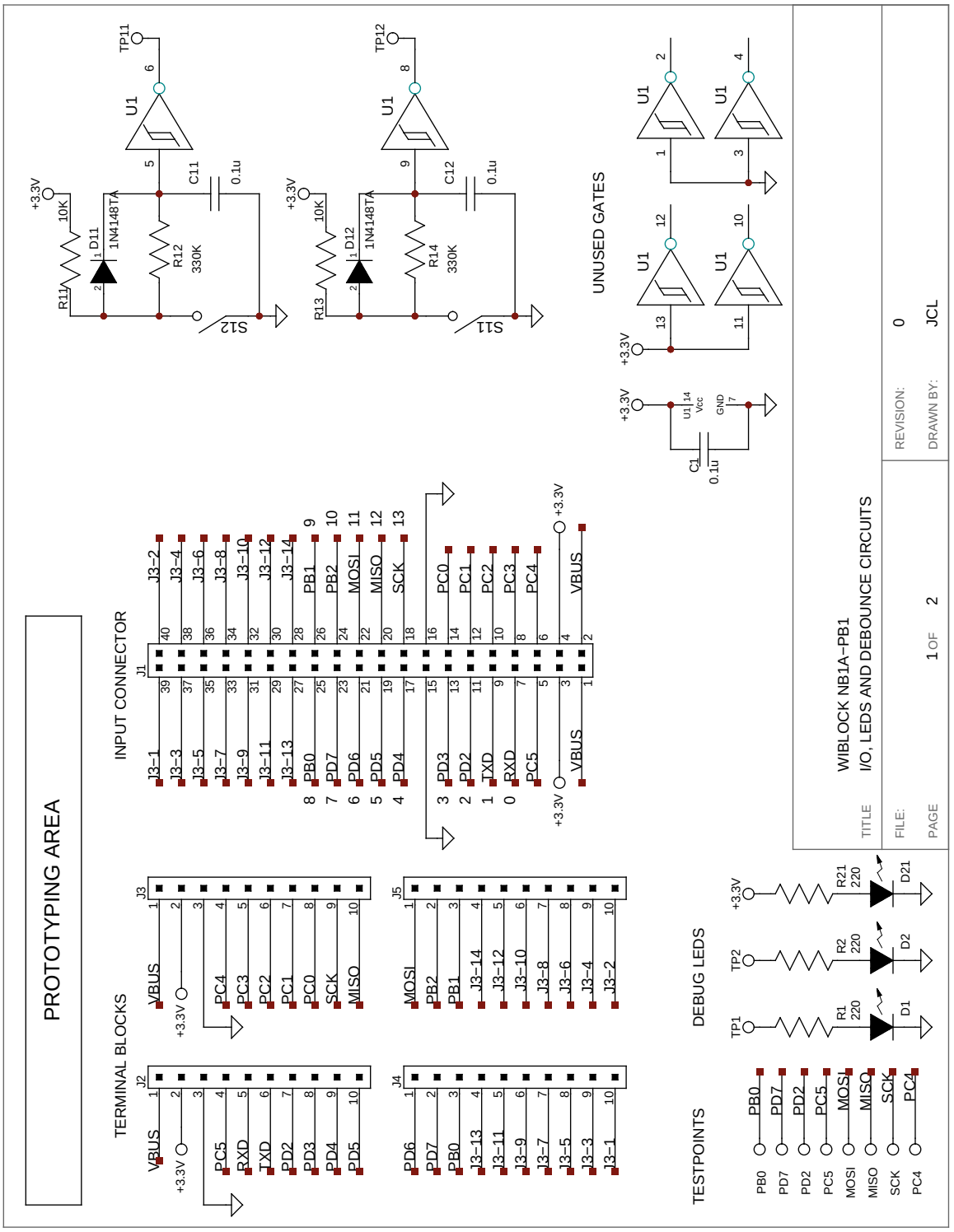

Figure 3: NB1A-PB1 Top Schematic (Rev 0)

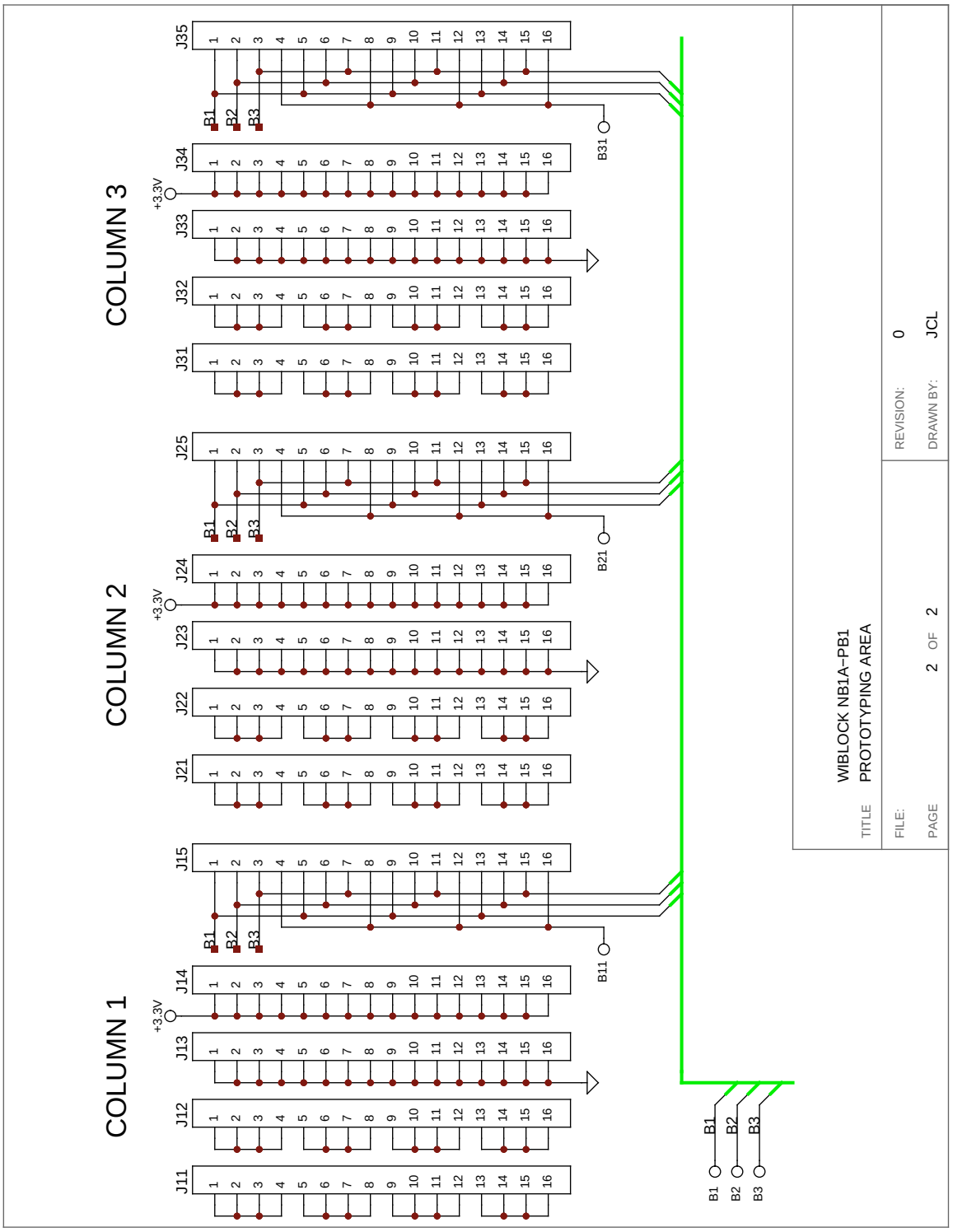

Figure 4: NB1A-PB1 Prototyping Area (Rev 0)