

**BATT SECTION**

EXT\_3V3\_IN

TP1

0E

BT1

BC-2003

4.7u

GND

**PUSH BTN SECTION**

LG\_T\_ON\_BTN

10k

C1

0.1u

GND

connector signaling to be changed to 1&3 rather than 2&4

UP\_BTN

10k

C2

0.1u

GND

DWN\_BTN

10k

C3

0.1u

GND

**MCU SECTION**

U1

ATmega328PB-MU

Pinout:

PB0	12	C1	PC0	23	C4
PB1	13	C2	PC1	24	C5
PB2	14	C3	PC2	25	C6
PB3	15	ICSP_MOSI	PC3	26	R1_R29
PB4	16	ICSP_MISO	PC4	27	RTC_SDA
PB5	17	ICSP_SCK	PC5	28	RTC_SCL
PB6	7	PB6	PC6	29	MCU_RSTn
PB7	8	PB7	PC7	30	R2_R
XTAL1/PB6			PC8	31	R3_R
XTAL2/PB7			PC9	32	LG_T_ON_BTN
			PC10	1	RTT_INT0
			PC11	2	UP_BTN
			PC12	9	DWN_BTN
			PC13	10	R4_RR30
			PC14	11	R5_RR31
			PC15		
			PC16		
			PC17		
			PC18		
			PC19		
			PC20		
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			PC63		
			PC64		
			PC65		
			PC66		
			PC67		
			PC68		
			PC69		
			PC70		
			PC71</		

This is a detailed PCB schematic for the Project OAK MAIN BRD V0.1. The schematic is organized into several functional sections, each with its own title and components.

### BATT SECTION

This section shows the power input and regulation. It includes an external 3V3 input (EXT\_3V3\_IN) connected to a 0E resistor (R1) and a BC-2003 transistor (BT1) configured as a switch. The output is connected to a 4.7uF capacitor (C4) and a 3V0 supply. A TP1 test point is also shown.

### PUSH BTN SECTION

This section shows three push buttons: LGT\_ON\_BTN, UP\_BTN, and DWN\_BTN. Each button is connected to a 10k resistor (R2, R3, R4) and a 0.1uF capacitor (C1, C2, C3) to ground. The buttons are connected to the MCU pins PE1, PE2, and PE3 respectively. The schematic also shows the internal structure of the EVQ-P7A01P components.

### MCU SECTION

This section shows the ATmega328PB-MU microcontroller. It includes the power pins (VCC, AVCC, GND), reset pin (RESET/PC6), and various I/O pins. The MCU is connected to the BATT SECTION, PUSH BTN SECTION, RTC SECTION, and LED MATRIX CONTROL SECTION. The schematic also shows the internal structure of the ATmega328PB-MU.

### RTC SECTION

This section shows the RV-8263-C7-32.768KHZ-20PPM-TA-QC real-time clock. It includes the power pins (VDD, VSS, GND), clock pins (CLKOE, CLKOUT, CLKIN), and data pins (SCL, SDA, INT). The RTC is connected to the MCU pins. The schematic also shows the internal structure of the RV-8263-C7-32.768KHZ-20PPM-TA-QC.

### LED MATRIX CONTROL SECTION

This section shows the LED matrix control circuit. It includes six BC547 transistors (Q1-Q6) connected to the MCU pins. Each transistor is connected to a 10k resistor (R1-R6) and a 120E resistor (R7-R12). The transistors are connected to the LED matrix. The schematic also shows the internal structure of the BC547 transistors.

### RST & BATT MON SECTION

This section shows the reset and battery monitoring circuit. It includes a 10k resistor (R14) connected to the MCU RSTn pin and a 0.1uF capacitor (C13) connected to the MCU RSTn pin. The schematic also shows the internal structure of the MCU RSTn pin.

### LED MATRIX

The LED matrix is a 6x6 grid of LEDs. Each LED is connected to a 10k resistor (R1-R6) and a 120E resistor (R7-R12). The LEDs are connected to the MCU pins. The schematic also shows the internal structure of the LEDs.

**Note:** Make sure that no more than 2LEDs should glow in a junction.  
**Note:** Current series resistor changed to 100E

**Note:** Place the caps near to the LED junction

**Note:** Transistor symbol need to be changed to SOT23 type

**Note:** connector signaling to be changed to 1&3 rather than 2&4

**Note:** connect CLKOE, CLKOUT to MCU pins. This will be helpful in performing frequency compensation.

**Slave Address: A3h (Read)**  
**Slave Address: A2h (write)**

**Sheet: /**  
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**Title: Project OAK MAIN BRD V0.1**  
**Size: USLegal** | **Date: 2024-07-21** | **Rev: A**  
**KiCad E.D.A. eeschema (5.1.6)-1** | **Id: 1/1**

This is a detailed PCB schematic for the Project OAK MAIN BRD V0.1. The schematic is organized into several functional sections, each with its own title and components.

### BATT SECTION

This section shows the power input and regulation. It includes a 3V3 input (TP1) connected to a 0.1uF capacitor (C4) and a 3V3 regulator (BT1) with a 4.7uF output capacitor (C4). The output is connected to the +3V0 rail.

### PUSH BTN SECTION

This section shows three push buttons (LGT\_ON\_BTN, UP\_BTN, DWN\_BTN) connected to the MCU. Each button is connected to a 10k resistor (R2, R3, R4) and a 0.1uF capacitor (C1, C2, C3) to ground. The buttons are connected to the MCU pins PE1, PE2, and PE3.

### MCU SECTION

This section shows the ATmega328PB-MU microcontroller (U1). It includes the power pins (VCC, AVCC, GND), reset pin (RESET/PC6), and various I/O pins (PB0-PB7, PC0-PC5, PD0-PD7). The MCU is connected to the BATT, PUSH BTN, RTC, and LED MATRIX sections.

### RTC SECTION

This section shows the Real Time Clock (RTC) module (U2). It includes the power pins (VDD, VSS, GND), clock pins (CLKOE, CLKOUT, INT), and data pins (SCL, SDA). The RTC is connected to the MCU and has a 32.768KHz crystal (C12) and a 4.7k resistor (R12) for frequency compensation.

### RST & BATT MON SECTION

This section shows the reset and battery monitoring circuit. It includes a 10k resistor (R14) connected to the +3V0 rail, a 0.1uF capacitor (C13) to ground, and a 10k resistor (R15) connected to the MCU RSTn pin. The battery monitoring is connected to the +3V0 VOL\_MON pin (TP12).

### LED MATRIX CONTROL SECTION

This section shows the LED matrix control circuit. It includes six BC547 transistors (Q2-Q7) connected to the +3V0 rail and the LED matrix. The transistors are connected to the MCU pins PC4, PC5, PC6, PC7, PC8, and PC9. The LED matrix is a 6x6 grid of LEDs (D1-D36) with current series resistors (R1-R6) connected to the +3V0 rail. The LED matrix is connected to the MCU pins PC4, PC5, PC6, PC7, PC8, and PC9.

**Note:** Make sure that no more than 2LEDs should glow in a junction.  
**Note:** Current series resistor changed to 100E

**Note:** Place the caps near to the LED junction

**Note:** Transistor symbol need to be changed to SOT23 type

**Note:** connector signaling to be changed to 1&3 rather than 2&4

**Note:** connect CLKOE, CLKOUT to MCU pins. This will be helpful in performing frequency compensation.

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This is a detailed PCB schematic for the Project OAK MAIN BRD V0.1. The schematic is organized into several functional sections, each with its own title and components.

### BATT SECTION

This section shows the power input and regulation. It includes a 3V3 input (TP1) connected to a 0.1uF capacitor (C4) and a 3V3 regulator (BT1) with a 4.7uF output capacitor (C4). The output is connected to the +3V0 rail.

### PUSH BTN SECTION

This section shows three push buttons (LGT\_ON\_BTN, UP\_BTN, DWN\_BTN) connected to the MCU. Each button is connected to a 10k resistor (R2, R3, R4) and a 0.1uF capacitor (C1, C2, C3) to ground. The buttons are connected to the MCU pins PE1, PE2, and PE3.

### MCU SECTION

This section shows the ATmega328PB-MU microcontroller (U1). It includes the power pins (VCC, AVCC, GND), reset pin (RESET/PC6), and various I/O pins (PB0-PB7, PC0-PC5, PD0-PD7). The MCU is connected to the BATT, RTC, and LED sections.

### RTC SECTION

This section shows the Real Time Clock (RTC) module (U2). It includes the power pins (VDD, VSS, GND), clock pins (CLKOE, CLKOUT, INT), and data pins (SCL, SDA). The RTC is connected to the MCU and has its own power and clock lines.

### LED MATRIX CONTROL SECTION

This section shows the LED matrix control circuit. It includes six BC547 transistors (Q1-Q6) connected to the MCU pins. Each transistor is connected to a 10k resistor (R1-R6) and a 0.1uF capacitor (C1-C6) to ground. The transistors are connected to the LED matrix pins.

### RST & BATT MON SECTION

This section shows the reset and battery monitoring circuit. It includes a 10k resistor (R14) connected to the MCU reset pin (RSTn) and a 0.1uF capacitor (C13) connected to the battery monitoring pin (BATT\_MON).

### LED MATRIX

The LED matrix is a 6x6 grid of LEDs. Each LED is connected to a 10k resistor (R1-R6) and a 0.1uF capacitor (C1-C6) to ground. The LEDs are connected to the LED matrix control circuit.

**Notes:**

- Transistor symbol need to be changed to SOT23 type
- Note: Place the caps near to the LED junction
- Note: Make sure that no more than 2LEDs should glow in a junction
- Note: Current series resistor changed to 100E

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**BATT SECTION**

EXT\_3V3\_IN

TP1

0E

BT1

BC-2003

4.7u

3V0

GND

**PUSH BTN SECTION**

3V0

R2

10k

C1

0.1u

GND

LGT\_ON\_BTN

S1

NO\_1

COM\_1

NO\_2

COM\_2

EVQ-P7A01P

connector signaling to be changed to 1&3 rather than 2&4

3V0

R3

10k

C2

0.1u

GND

UP\_BTN

S2

NO\_1

COM\_1

NO\_2

COM\_2

EVQ-P7A01P

3V0

R4

10k

C3

0.1u

GND

DWN\_BTN

S3

NO\_1

COM\_1

NO\_2

COM\_2

EVQ-P7A01P

**MCU SECTION**

3V0

C6

4.7u

C7

0.1u

C8

0.1u

GND

AREF

C9

0.1u

GND

Q1

BC547

D1

TP2

PE1

R6

R28

0E

R6\_R

22

3V0

MON\_LED

10K

U1

ATmega328PB-MU

AREF

20

VCC

4

AVCC

18

3V0

TP3

TP4

TP5

TP6

TP7

TP9

TP10

TP11

TP12

TP13

TP14

TP15

TP16

TP17

TP18

TP19

TP20

TP21

TP22

TP23

TP24

TP25

TP26

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TP87

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TP90

TP91

TP92

TP93

TP94

TP95

TP96

TP97

TP98

TP99

TP100

**LED MATRIX CONTROL SECTION**

3V0

C6

10K

R13

Q2

BC547

C6\_T

3V0

C4

10K

R19

Q4

BC547

C4\_T

3V0

C2

10K

R25

Q6

BC547

C2\_T

3V0

C1

10K

R26

Q7

BC547

C1\_T

3V0

C3

10K

R22

Q5

BC547

C3\_T

3V0

C5

10K

R18

Q3

BC547

C5\_T

3V0

C14

4.7u

C15

4.7u

C16

4.7u

C17

4.7u

C18

4.7u

C19

4.7u

GND

Note: Place the caps near to the LED junction

12

1

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100

**RTC SECTION**

3V0

C12

0.1u

GND

R12

4.7K

TP11

U2

RV-8263-C7-32.768KHZ-20PPM-TA-QC

VDD

5

CLKOUT

6

RTC\_CLKO

INT

4

RTC\_INT0

VSS

2

CLKOE

3

CLKOE\_EN

7

RTC\_SCL

8

RTC\_SDA

NC

1

TP8

TP9

TP10

TP11

TP12

TP13

TP14

TP15

TP16

TP17

TP18

TP19

TP20

TP21

TP22

TP23

TP24

TP25

TP26

TP27

TP28

TP29

TP

This is a detailed PCB schematic for the Project OAK MAIN BRD V0.1. The schematic is organized into several functional sections, each with its own title and components.

### BATT SECTION

This section shows the power input and regulation. It includes an external 3V3 input (EXT\_3V3\_IN) connected to a 0E resistor (R1) and a BC-2003 transistor (BT1) configured as a switch. The output is connected to a 4.7uF capacitor (C4) and a 3V0 supply. A TP1 test point is also shown.

### PUSH BTN SECTION

This section shows three push buttons: LGT\_ON\_BTN, UP\_BTN, and DWN\_BTN. Each button is connected to a 10k resistor (R2, R3, R4) and a 0.1uF capacitor (C1, C2, C3) to ground. The buttons are connected to the MCU pins PE1, PE2, and PE3 respectively. The schematic also shows the internal structure of the EVQ-P7A01P components.

### MCU SECTION

This section shows the ATmega328PB-MU microcontroller (U1). It includes various pins connected to other sections, such as PB0-PB7, PC0-PC7, PD0-PD7, and PE0-PE3. The MCU is powered by a 3V0 supply and has a 0.1uF capacitor (C9) connected to its AREF pin. The schematic also shows the internal structure of the MCU.

### RTC SECTION

This section shows the RV-8263-C7-32.768KHZ-20PPM-TA-QC real-time clock (U2). It is connected to the MCU pins CLKOE, CLKOUT, SCL, SDA, and INT. The RTC is powered by a 3V0 supply and has a 0.1uF capacitor (C12) connected to its VDD pin. The schematic also shows the internal structure of the RTC.

### RST & BATT MON SECTION

This section shows the reset and battery monitoring circuit. It includes a 10k resistor (R14) connected to the MCU RSTn pin and a 0.1uF capacitor (C13) connected to the MCU RSTn pin. The schematic also shows the internal structure of the MCU.

### LED MATRIX CONTROL SECTION

This section shows the LED matrix control circuit. It includes six BC547 transistors (Q2-Q7) connected to the MCU pins PC0-PC5. Each transistor is connected to a 10k resistor (R13-R18) and a 120E resistor (R16-R21). The transistors are connected to the LED matrix pins C1\_T, C2\_T, C3\_T, C4\_T, C5\_T, and C6\_T. The schematic also shows the internal structure of the transistors.

### LED MATRIX

The LED matrix is a 6x6 grid of LEDs. Each LED is connected to a 10k resistor (R1-R6) and a 120E resistor (R16-R21). The LEDs are labeled D1-D37. The schematic also shows the internal structure of the LEDs.

**Note:** Make sure that no more than 2LEDs should glow in a junction.  
**Note:** Current series resistor changed to 100E

**Note:** Place the caps near to the LED junction

**Note:** Transistor symbol need to be changed to SOT23 type

**Note:** connector signaling to be changed to 1&3 rather than 2&4

**Note:** connect CLKOE, CLKOUT to MCU pins. This will be helpful in performing frequency compensation.

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This is a detailed PCB schematic for the Project OAK MAIN BRD V0.1. The schematic is organized into several functional sections, each with its own title and components.

### BATT SECTION

This section shows the power input and regulation. It includes a 3V3 input (TP1) connected to a 0.1uF capacitor (C4) and a 3V3 regulator (BT1) with a 4.7uF output capacitor (C4). The output is connected to the +3V0 rail.

### PUSH BTN SECTION

This section shows three push buttons (LGT\_ON\_BTN, UP\_BTN, DWN\_BTN) connected to the MCU. Each button is connected to a 10k resistor (R2, R3, R4) and a 0.1uF capacitor (C1, C2, C3) to ground. The buttons are connected to the MCU pins PE1, PE2, and PE3.

### MCU SECTION

This section shows the ATmega328PB-MU microcontroller (U1). It includes the power pins (VCC, AVCC, GND), reset pin (RESET/PC6), and various I/O pins (PB0-PB7, PC0-PC5, PD0-PD7). The MCU is connected to the BATT, PUSH BTN, RTC, and LED MATRIX sections.

### RTC SECTION

This section shows the Real Time Clock (RTC) module (U2). It includes the power pins (VDD, VSS, GND), clock pins (CLKOE, CLKOUT, INT), and data pins (SCL, SDA). The RTC is connected to the MCU and has a 32.768KHz crystal (C12) and a 4.7k resistor (R12) for frequency compensation.

### RST & BATT MON SECTION

This section shows the reset and battery monitoring circuit. It includes a 10k resistor (R14) connected to the +3V0 rail, a 0.1uF capacitor (C13) to ground, and a 10k resistor (R15) connected to the MCU RSTn pin (TP12). The battery monitoring pin (TP13) is also shown.

### LED MATRIX CONTROL SECTION

This section shows the LED matrix control circuit. It includes six BC547 transistors (Q2-Q7) connected to the +3V0 rail and the LED matrix. Each transistor is connected to a 10k resistor (R13-R18) and a 120uF capacitor (C6, C4, C2, C1, C5, C3). The transistors are connected to the LED matrix pins (C1\_T, C2\_T, C3\_T, C4\_T, C5\_T, C6\_T).

### LED MATRIX

The LED matrix is a 6x6 grid of LEDs (D1-D36). Each LED is connected to a 10k resistor (R1-R6) and a 120uF capacitor (C1\_T-C6\_T). The matrix is controlled by the LED MATRIX CONTROL SECTION.

**Note:** Make sure that no more than 2LEDs should glow in a junction.  
**Note:** Current series resistor changed to 100E

**Note:** Place the caps near to the LED junction

**Note:** Transistor symbol need to be changed to SOT23 type

**Note:** connector signaling to be changed to 1&3 rather than 2&4

**Note:** connect CLKOE, CLKOUT to MCU pins. This will be helpful in performing frequency compensation.

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This is a detailed PCB schematic for the Project OAK MAIN BRD V0.1. The schematic is organized into several functional sections, each with its own title and components.

### BATT SECTION

This section shows the power input and regulation. It includes a 3V3 input (TP1) connected to a 0.1uF capacitor (C4) and a 3V3 regulator (BT1) with a 4.7uF output capacitor (C4). The output is connected to the +3V0 rail.

### PUSH BTN SECTION

This section shows three push buttons (LGT\_ON\_BTN, UP\_BTN, DWN\_BTN) connected to the MCU. Each button is connected to a 10k resistor (R2, R3, R4) and a 0.1uF capacitor (C1, C2, C3) to ground. The buttons are connected to the MCU pins PE1, PE2, and PE3.

### MCU SECTION

This section shows the ATmega328PB-MU microcontroller (U1). It includes the power pins (VCC, AVCC, GND), reset pin (RESET/PC6), and various I/O pins (PB0-PB7, PC0-PC5, PD0-PD7). The MCU is connected to the BATT, PUSH BTN, RTC, and LED MATRIX sections.

### RTC SECTION

This section shows the Real Time Clock (RTC) module (U2). It includes the power pins (VDD, VSS, GND), clock pins (CLKOE, CLKOUT, INT), and data pins (SCL, SDA). The RTC is connected to the MCU and has a 32.768KHz crystal (C12) and a 4.7k resistor (R12) for frequency compensation.

### RST & BATT MON SECTION

This section shows the reset and battery monitoring circuit. It includes a 10k resistor (R14) connected to the +3V0 rail, a 0.1uF capacitor (C13) to ground, and a 10k resistor (R15) connected to the MCU RSTn pin (TP12). The battery monitoring pin (TP13) is also shown.

### LED MATRIX CONTROL SECTION

This section shows the LED matrix control circuit. It includes six BC547 transistors (Q2-Q7) connected to the +3V0 rail and the LED matrix. Each transistor is connected to a 10k resistor (R13-R18) and a 120uF capacitor (C6, C4, C2, C1, C5, C3). The transistors are connected to the LED matrix pins (C1\_T, C2\_T, C3\_T, C4\_T, C5\_T, C6\_T).

### LED MATRIX

The LED matrix is a 6x6 grid of LEDs (D1-D36). Each LED is connected to a 10k resistor (R1-R6) and a 120uF capacitor (C1\_T-C6\_T). The matrix is controlled by the LED MATRIX CONTROL SECTION.

**Note:** Make sure that no more than 2LEDs should glow in a junction.  
**Note:** Current series resistor changed to 100E

**Note:** Place the caps near to the LED junction

**Note:** Transistor symbol need to be changed to SOT23 type

**Note:** connector signaling to be changed to 1&3 rather than 2&4

**Note:** connect CLKOE, CLKOUT to MCU pins. This will be helpful in performing frequency compensation.

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