

DC Power regulation Circuit

This circuit regulates the input voltage (Vin) to a stable +3.3V supply. It features a voltage divider (J1, C1) and a feedback loop (U1, R13) to maintain the output voltage. A PWR_FLAG pin is used for status indication, and a +3.3V LED is connected to the output.

Microcontroller Interface

The microcontroller interface consists of two sets of pins (J3, J4) for digital signals (CH1_DS, CH2_DS, CH3_DS, CH4_DS) and a ZC_SW pin for zero-crossing detection. These are connected to the microcontroller's GND.

Zero Cross Switching

This circuit uses a zero-crossing detector (U2, MOC3062M) to switch the AC load (CH1_SW1, CH1_SW2) at the zero-crossing point. It includes a PZT3904 optocoupler (Q1) and a T1635-600G diode (D4) for protection.

Random Phase Switching

This circuit uses a random phase detector (U3, MOC3052M) to switch the AC load (CH3_SW1, CH3_SW2) at a random phase. It includes a PZT3904 optocoupler (Q2) and a T1635-600G diode (D5) for protection.

AC switch terminals

The AC switch terminals are labeled CH1_SW1, CH1_SW2, CH2_SW1, CH2_SW2, CH3_SW1, CH3_SW2, CH4_SW1, and CH4_SW2. They are connected to the AC load through a series of resistors (R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25) and capacitors (C1, C2, C3, C4, C5, C6).

Compadable with 100V systems.
Maximum current 8A.
Capable of switching Inductive loads and Resistive loads.
Depending on the load Heat sinks may be required.

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 KiCad E.D.A. 9.0.0 Id: 1/1

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Random Phase Switching

This circuit uses a random phase detector (U3, MOC3052M) to switch the AC load (CH3_SW1, CH3_SW2) at a random phase. It includes a PZT3904 optocoupler (Q2) and a T1635-600G diode (D5) for protection.

AC switch terminals

The AC switch terminals are labeled CH1_SW1, CH1_SW2, CH2_SW1, CH2_SW2, CH3_SW1, CH3_SW2, CH4_SW1, and CH4_SW2. They are connected to the AC load through a series of resistors (R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25) and capacitors (C1, C2, C3, C4, C5, C6).

Component List

- U1: NCP1117-3.3_SOT223
- U2: MOC3062M
- U3: MOC3052M
- U4: MOC3062M
- U5: MOC3052M
- Q1: PZT3904
- Q2: PZT3904
- Q3: PZT3904
- Q4: PZT3904
- D1: LED
- D2: LED
- D3: LED
- D4: T1635-600G
- D5: T1635-600G
- D6: LED
- D7: LED
- D8: T1635-600G
- D9: T1635-600G
- R1: 270
- R2: 270
- R3: 180
- R4: 180
- R5: 180
- R6: 180
- R7: 150
- R8: 150
- R9: 50
- R10: 50
- R11: 390
- R12: 390
- R13: 180
- R14: 270
- R15: 270
- R16: 180
- R17: 180
- R18: 180
- R19: 180
- R20: 150
- R21: 150
- R22: 50
- R23: 50
- R24: 390
- R25: 390
- C1: 10u
- C2: 10u
- C3: 22n
- C4: 22n
- C5: 22n
- C6: 22n
- J1: Vin
- J2: 3.3V
- J3: ZC_SW
- J4: RP_SW
- J5: CH1_SW
- J6: CH2_SW
- J7: CH3_SW
- J8: CH4_SW

Compadable with 100V systems.
Maximum current 8A.
Capable of switching Inductive loads and Resistive loads.
Depending on the load Heat sinks may be required.

MountingHole_Pad (H1, H2, H3, H4, H5, H6)

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This circuit regulates the input voltage (Vin) to a stable +3.3V supply. It features a voltage divider (J1, C1, U1, C2) and a feedback loop (R13, D3 LED) to maintain the output voltage. The output is connected to the microcontroller interface.

Microcontroller Interface

The interface shows the connection of the microcontroller's digital output pins (CH1_DS, CH2_DS, CH3_DS, CH4_DS) to the switching circuit's control inputs (J3, J4, J5, J6, J7, J8).

Zero Cross Switching

This circuit uses a zero-crossing detector (U2, MOC3062M) to switch the AC load (CH1_SW1, CH1_SW2) at the zero-crossing point. It includes a diode (D1 LED) and a resistor (R3, R5, R7, R9) to protect the microcontroller and the switching transistor (Q1, PZT3904).

Random Phase Switching

This circuit uses a random phase detector (U3, MOC3052M) to switch the AC load (CH3_SW1, CH3_SW2) at a random phase. It includes a diode (D2 LED) and a resistor (R4, R6, R8, R10) to protect the microcontroller and the switching transistor (Q2, PZT3904).

AC switch terminals

The AC switch terminals are labeled CH1_SW1, CH1_SW2, CH2_SW1, CH2_SW2, CH3_SW1, CH3_SW2, CH4_SW1, and CH4_SW2. They are connected to the AC load through a series of resistors (R22, R24, R23, R25) and a diode (D8, D9, T1635-600G).

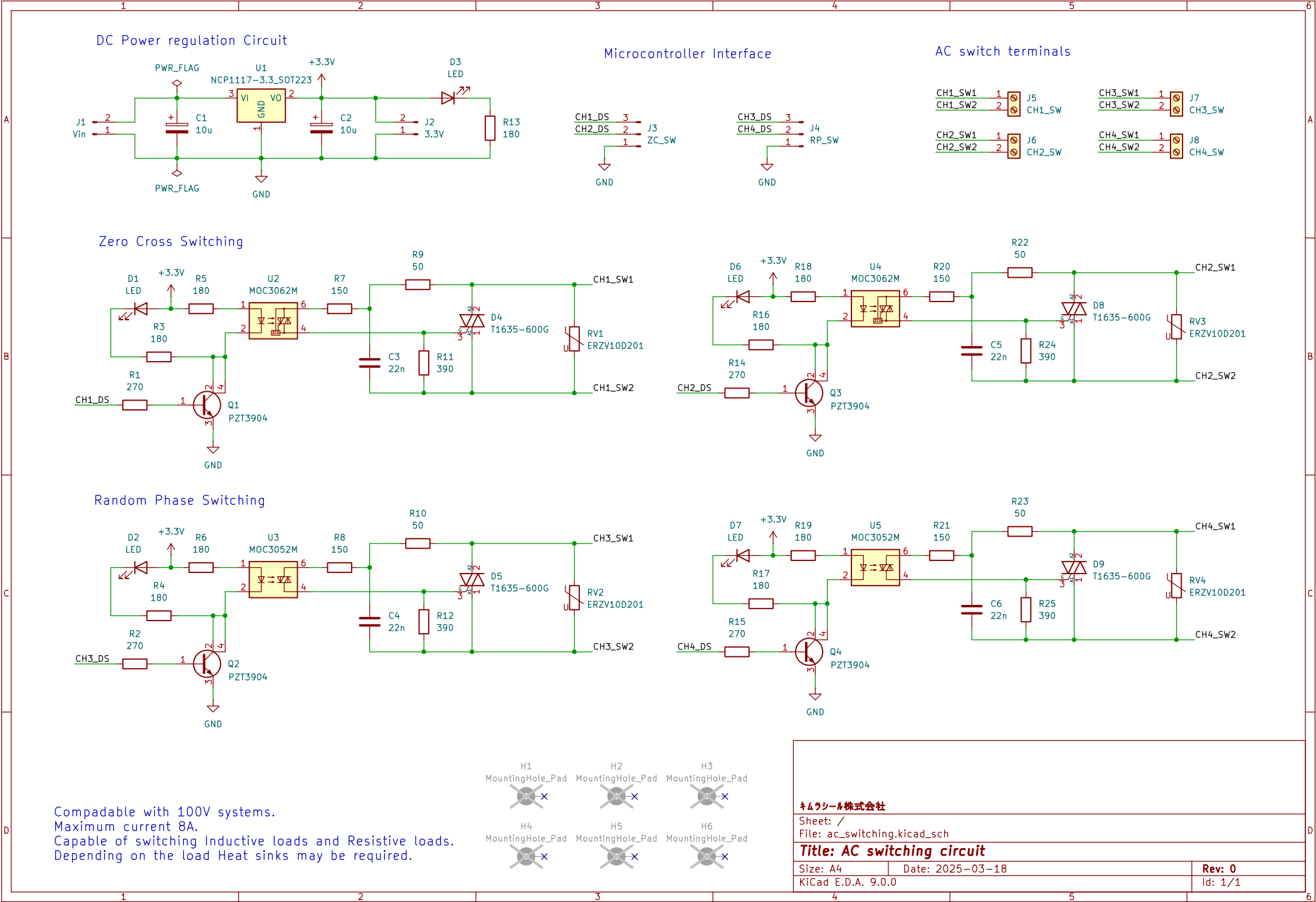
Component List

- U1: NCP1117-3.3_SOT223
- U2: MOC3062M
- U3: MOC3052M
- U4: MOC3062M
- U5: MOC3052M
- Q1, Q2, Q3, Q4: PZT3904
- D1, D2, D3, D4, D5, D6, D7, D8, D9: T1635-600G
- R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25: Various resistors
- C1, C2, C3, C4, C5, C6: Various capacitors

Compadable with 100V systems.
Maximum current 8A.
Capable of switching Inductive loads and Resistive loads.
Depending on the load Heat sinks may be required.

MountingHole_Pad (H1, H2, H3, H4, H5, H6)

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1 2 3 4 5

DC Power regulation Circuit

Microcontroller Interface

AC switch terminals

Zero Cross Switching

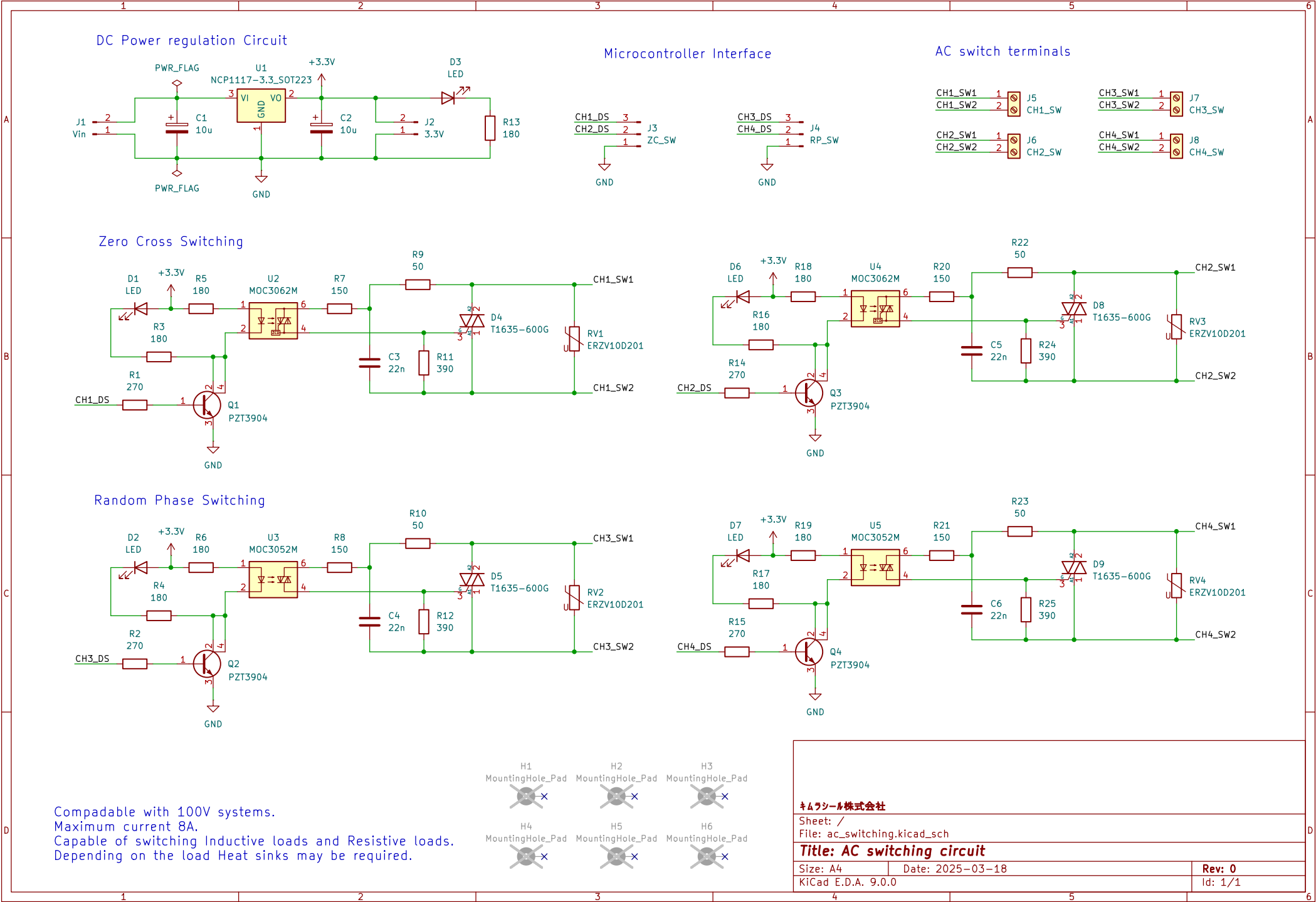
Random Phase Switching

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H1 MountingHole_Pad H2 MountingHole_Pad H3 MountingHole_Pad
H4 MountingHole_Pad H5 MountingHole_Pad H6 MountingHole_Pad

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Detailed description: This is a KiCad schematic for an AC switching circuit. It is divided into several functional blocks: 1. DC Power regulation: A voltage divider (J1, R1, R2) feeds an NCP1117-3.3 regulator (U1). The output is a +3.3V supply (J2) used for a PWR_FLAG LED (D3) and a 180Ω resistor (R13). 2. Microcontroller Interface: Two sets of pins (J3, J4) for digital signals (CH1_DS, CH2_DS, CH3_DS, CH4_DS) and a zero-cross signal (ZC_SW) are shown connected to ground. 3. AC switch terminals: Four terminal pairs (J5-J8) are labeled for CH1_SW, CH2_SW, CH3_SW, and CH4_SW. 4. Zero Cross Switching: A PZT3904 piezo transducer (Q1) is connected to a +3.3V supply via a 270Ω resistor (R1) and to a 180Ω resistor (R3) leading to a 1635-600G diode (D1). The other side of the diode is connected to a 150Ω resistor (R7) and a 22nF capacitor (C3) to ground. The output is CH1_SW1. 5. Random Phase Switching: Similar to the zero-cross circuit, but using a MOC3052M optocoupler (U3) and a 1635-600G diode (D5). The output is CH3_SW1. 6. Additional Switching: Two more identical random phase switching circuits are shown for CH2 and CH4, using MOC3062M (U4) and MOC3052M (U5) optocouplers respectively. Each circuit includes a 270Ω resistor (R14, R16, R18, R20), a 180Ω resistor (R15, R17, R19, R21), a 150Ω resistor (R22, R24), a 22nF capacitor (C5, C6), and a 390Ω resistor (R25) to ground. The outputs are CH2_SW1, CH2_SW2, CH3_SW2, and CH4_SW2. 7. Components: The schematic uses various standard components: resistors (R1-R25), capacitors (C1-C6), diodes (D1-D5), LEDs (D3), and optocouplers (U1-U5). 8. Footnote: A note states the circuit is compatible with 100V systems, has a maximum current of 8A, and can handle inductive and resistive loads, though heat sinks may be needed. 9. Title Block: The bottom right contains a title block with the company name 'キムラシール株式会社', sheet number, file name 'ac_switching.kicad_sch', title 'AC switching circuit', size 'A4', date '2025-03-18', revision 'Rev: 0', and KiCad version '9.0.0'.



DC Power regulation Circuit

This circuit regulates the input voltage (Vin) to a stable +3.3V supply. It features a voltage divider (J1, C1, U1, C2) and a feedback loop (R13, D3, LED) to maintain the output voltage. The output is connected to the microcontroller interface.

Microcontroller Interface

The interface shows the connection of the microcontroller's digital output pins (CH1_DS, CH2_DS, CH3_DS, CH4_DS) to the switching circuit's control inputs (J3, J4, J5, J6, J7, J8).

Zero Cross Switching

This circuit uses a zero-crossing detector (U2, MOC3062M) to switch the AC load (RV1, ERZV10D201) at the zero-crossing point of the AC waveform. It includes a diode (D1, LED) and a resistor (R3, 180Ω) for the detector's input.

Random Phase Switching

This circuit uses a random phase detector (U3, MOC3052M) to switch the AC load (RV2, ERZV10D201) at a random phase. It includes a diode (D2, LED) and a resistor (R4, 180Ω) for the detector's input.

AC switch terminals

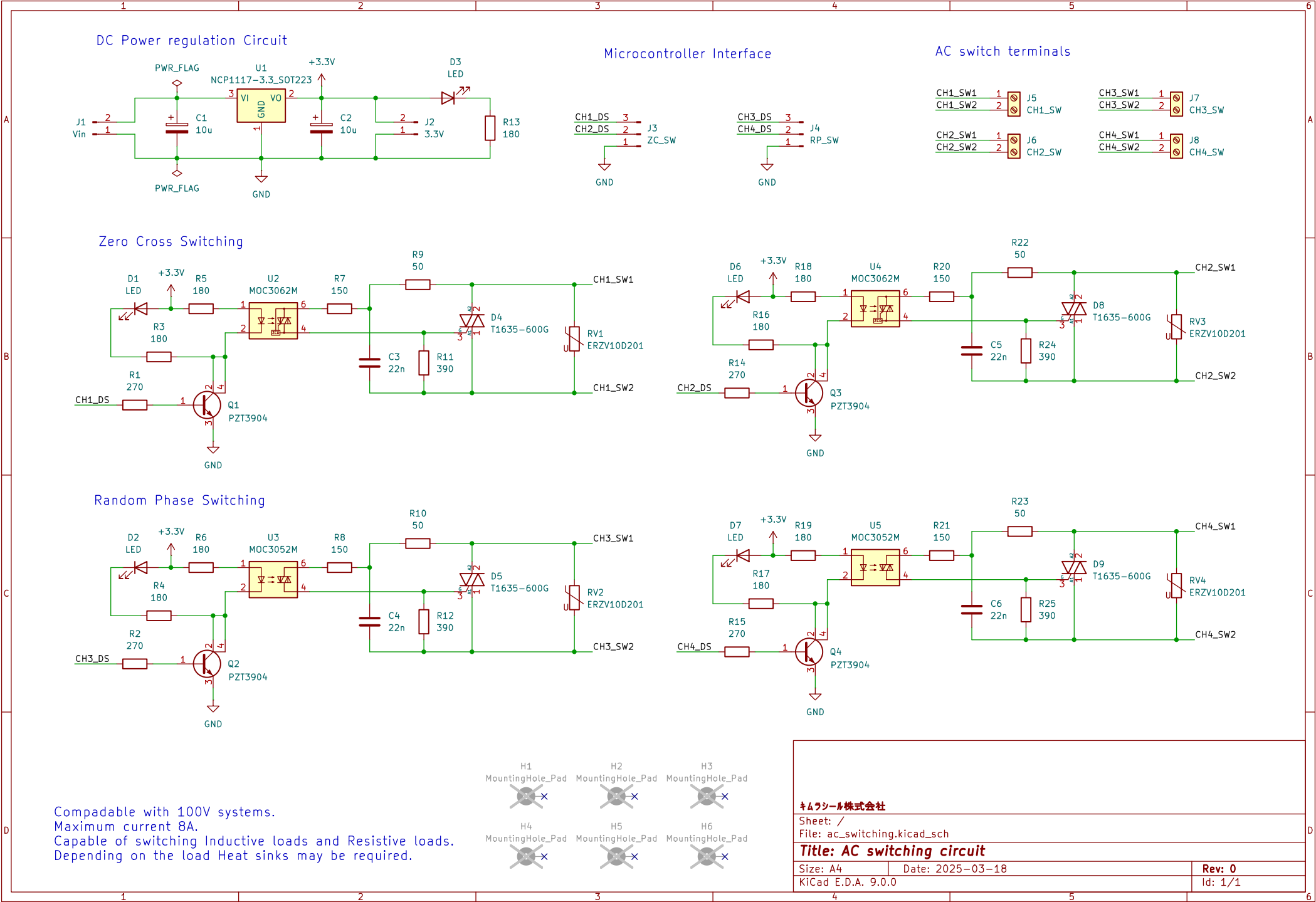
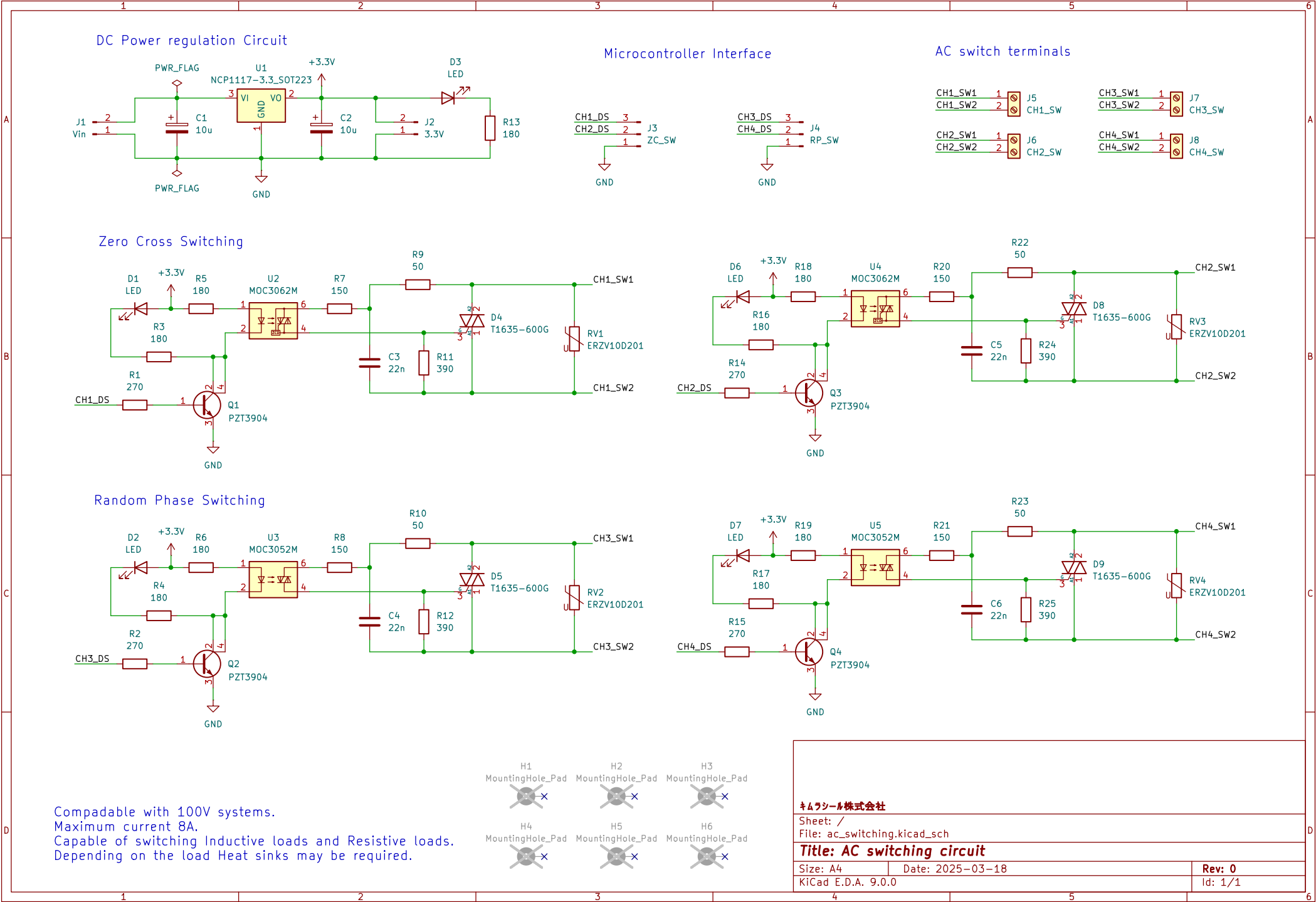
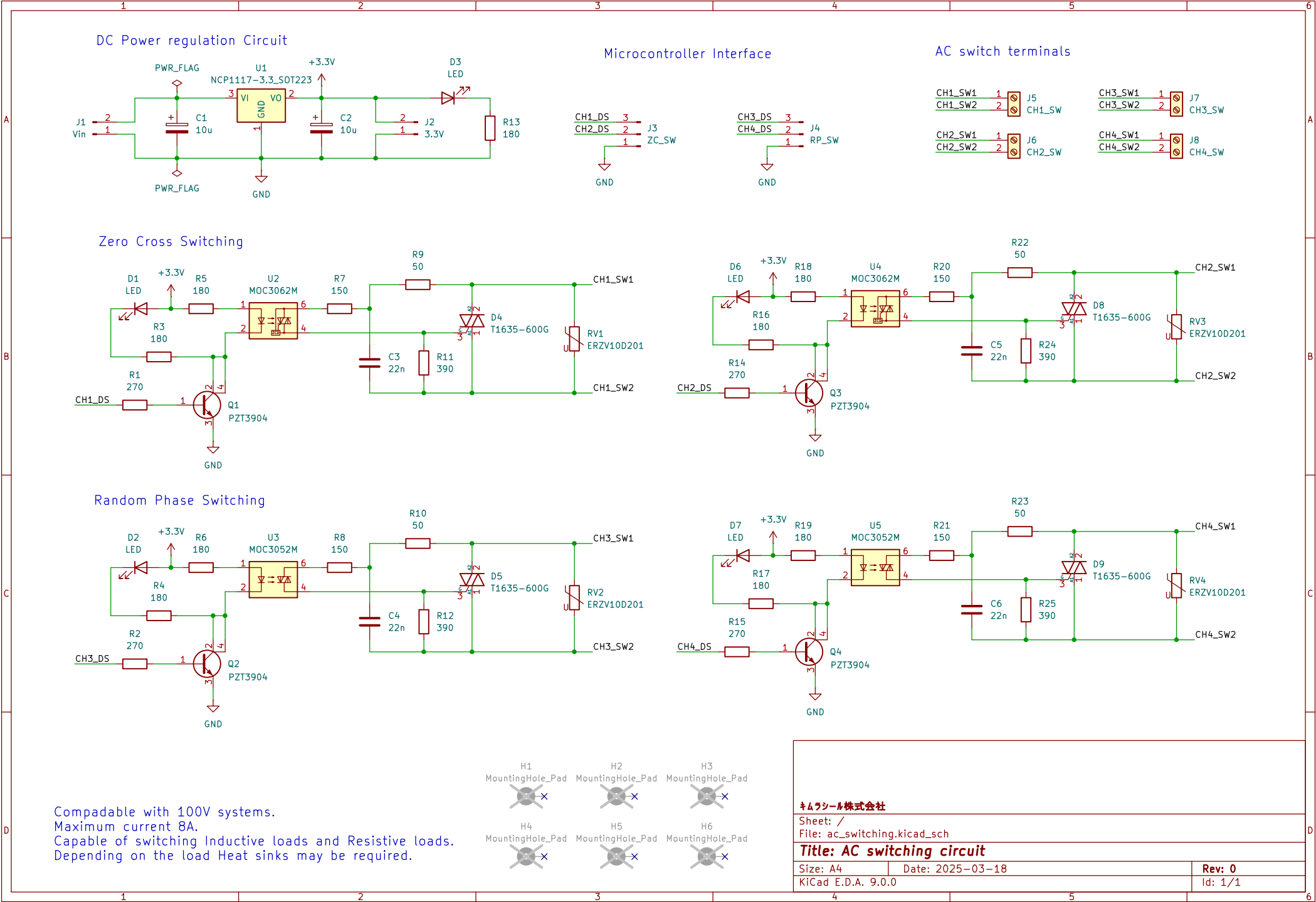
The terminals for the AC switches are labeled: CH1_SW1, CH1_SW2, CH2_SW1, CH2_SW2, CH3_SW1, CH3_SW2, CH4_SW1, and CH4_SW2. They are connected to the AC load (RV3, ERZV10D201) and the AC source (C5, 22nF).

Random Phase Switching

This circuit uses a random phase detector (U5, MOC3052M) to switch the AC load (RV4, ERZV10D201) at a random phase. It includes a diode (D7, LED) and a resistor (R17, 180Ω) for the detector's input.

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Maximum current 8A.
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Microcontroller Interface

The microcontroller interface consists of two sets of pins (J3, J4) for digital signals (CH1_DS, CH2_DS, CH3_DS, CH4_DS) and a ZC_SW pin for zero-crossing detection. These are connected to the microcontroller's GND.

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AC switch terminals

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