PDK3S-I-002/003

Multi-Core Emulator
User Manual

Version 0.02 – Nov. 13, 2018

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Revision History:

Revision	Date	Description
0.01	2017/8/22	1st version
0.02	2018/11/13	1. Updated company address & Tel No. 2. Amend section 1.3 3. Amend section 1.5 4. Amend section 1.7 5. Amend section 2.3 6. Amend section 3.1 7. Amend section 3.3

1. PDK3S-I-00x emulator

1.1. Foreword

PADAUK Technology launch the simulation tools of PDK3S-I-00x emulator to support multi-core parallel processing IC simulation. PDK3S-I-00x emulator should be combined with IDE software which is also produced by PADAUK Technology for normal simulation. This user manual introduces two kinds of multi-core emulators: PDK3S-I-002 and PDK3S-I-003.

1.2. Support IC series

PDK3S-I-00x support simulating the following IC series:

- P2XXX series multi-core products
- PDK82C / PDK22C series multi-core products
- PMC series multi-core products
- PMC/PMS series single-core products partial functions (when multi-core emulator does single-core simulation, the system main frequency may be a difference between the emulator and the actual IC).

1.3. Accessories in PDK3S-I-00x

(1) PDK3S-I-002 emulator and its accessories:

- PDK3S-I-002 ICE(In-Circuit Emulator) * 1
- USB cable * 1
- Power adapter * 1
- Flat cable interface of various specifications * 10

Fig.1: Accessories in PDK3S-I-002

(2) PDK3S-I-003 emulator and its accessories:

- PDK3S-I-003 ICE(In-Circuit Emulator) * 1
- USB cable * 1
- Power adapter * 1

Fig.2: Accessories in PDK3S-I-003

1.4. Downloading and using FPPA IDE software

The PDK3S-I-00x application software FPPA IDE can be downloaded from the following PADAUK Technology website:

http://www.padauk.com.tw/tw/technical/index.aspx?kind=13

When the PDK3S-I-00x application software FPPA IDE has been downloaded, Please unzip it and install it in the computer. Use USB cable to connect the PDK3S-I-00x and the USB interface of the computer. Connect the power adapter to PDK3S-I-00x, then open FPPA IDE to start simulation.

Fig.3: FPPA IDE software

1.5. Notes for using PDK3S-I-00x

(1) PDK3S-I-00x must be connected to the DC9V power adapter for power supply, and the USB interface is only used for data transmission with PC signals.

(2) When simulating PMxxx series IC, the minimum internal operating power (VDD) of ICE can be adjusted to 2.56V, but ICE simulation may be unstable under such low voltage. Therefore, please try not to perform high-speed calculations under low voltage.

(3) The electronic switch of PA6/PA7 on ICE will be automatically connected to:

(3.a) external Crystal: User must connect the external crystal oscillator to the corresponding position. If the external capacitance is needed, it should also be connected to the corresponding position.

(3.b) 32KHz Crystal built in the ICE board.

(3.c) external IO pins.

(4) PA0 connect a button on ICE (connect to GND when pressing the button). PA1 output high will drive NPN-BJT to lighten the LED.

(5) PDK3S-I-002 provides flat cable. However, PDK3S-I-003 does not provide it, and each IO Pin provides 4 sets of junctions for connection conveniently.

(6) ICE can calculate the program's checksum with the look-up table instruction (LDTABx), but this calculation result will be different from exactly checksum that the actual IC calculated , and it may be different every time when ICE calculation. Therefore, the value of checksum is subject to the actual IC, and the checksum data calculated by the emulator is only for reference.

1.6. PDK3S-I-00x simulation power setting

The operating power supply of PDK3S-I-00x has three Settings:

(1) ICE internal setting

(2) ICE internal setting and output to external VDD

(3) Take ICE external VDD input voltage as ICE reference power.

When the IDE detects a new ICE connection, the ICE power switch can be controlled in the way of the following picture shows:

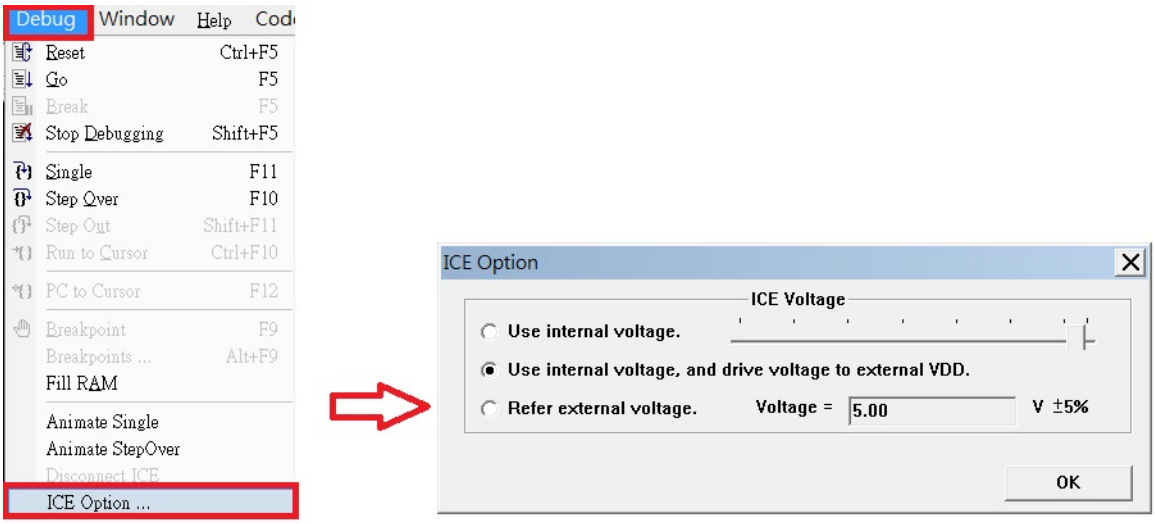


Fig.4: ICE simulation power setup menu

1.7. Simulation compatibility

(1) Register of PxDIER(Port X Digital Enable Register):

It is recommended to use the following syntax when set the PxDIER register of PMx271, PMx251, PMx232, PMx234 during simulation.

```
$ PADIER      0xhh;
```

(2) EOSCR.0 is not supported to be set to 1 during emulation.

(3) LVR Reset / WatchDog Reset：

The LVR voltage of ICE is different from the actual IC. After ICE Reset, there are a lot of steps need to do. It is not recommended to use ICE Reset as a standard function.

(4) WatchDog & ILRC：

ICE WatchDog timeout time is fixed at 512 ILRC, but IC can use MISC[1:0] to adjust the WatchDog time. And ILRC frequency is also different between ICE and IC. Because of that, please make decision whether to open the WatchDog by yourself when simulation.

(5) STOPEXE / STOPSYS instruction:

ICE simulation will be problematic when SYSCLK = IHRC/64 but ILRC is disabled and "$ MISC Fast_Wake_Up,.." instruction is used.

Users can turn on CLKMD.En_ILRC to avoid this problem:

```
$ MISC    Fast_Wake_up, ..
  ...
//  CLKMD    =    0x98;    //   IHRC/64;              ×
    CLKMD    =    0x9C;    //   IHRC/64 + En_ILRC;    √
  ...
  STOPSYS / STOPEXE;
```

In addition, STOPxxx will have no function when ICE executes to the STOPSYS/STOPEXE instruction in a single step mode.

1.8. Simulator troubleshooting

(1) When ICE and USB are not stable online, “Storage fail from XXX” messages appears on the computer frequently. Please check whether the USB Cable is too long.

(2) Please remove all ICE and Writer and close the IDE when ICE and USB are connected abnormal and retry is invalid, then reconnect. If it still does not work, please shut it down and start again.

(3) When ICE detects instability in use, FreeRun is found frequently to stop automatically, or other abnormal conditions, please check:

A. Whether the operating power of ICE is too low but SYSCLK is too fast.

B. Whether the IO pin has negative voltage or higher than VDD voltage input.

2. PDK3S-I-002 Standard multi-core emulator

2.1. Introduction of PDK3S-I-002 emulator

PDK3S-I-002 is the second generation standard multi-core emulator produced by PADAUK Technology.

As the standard multi-core emulator, PDK3S-I-002 is built with a variety of protective circuits (output over-current detection, negative voltage detection, over-voltage detection, output voltage abnormality detection) to detect ICE internal damage due to abnormal external connection.

The PDK3S-I-002 must be powered through a DC9V power adapter and connected to computer via a USB cable for simulation.

2.2. Appearance of PDK3S-I-002

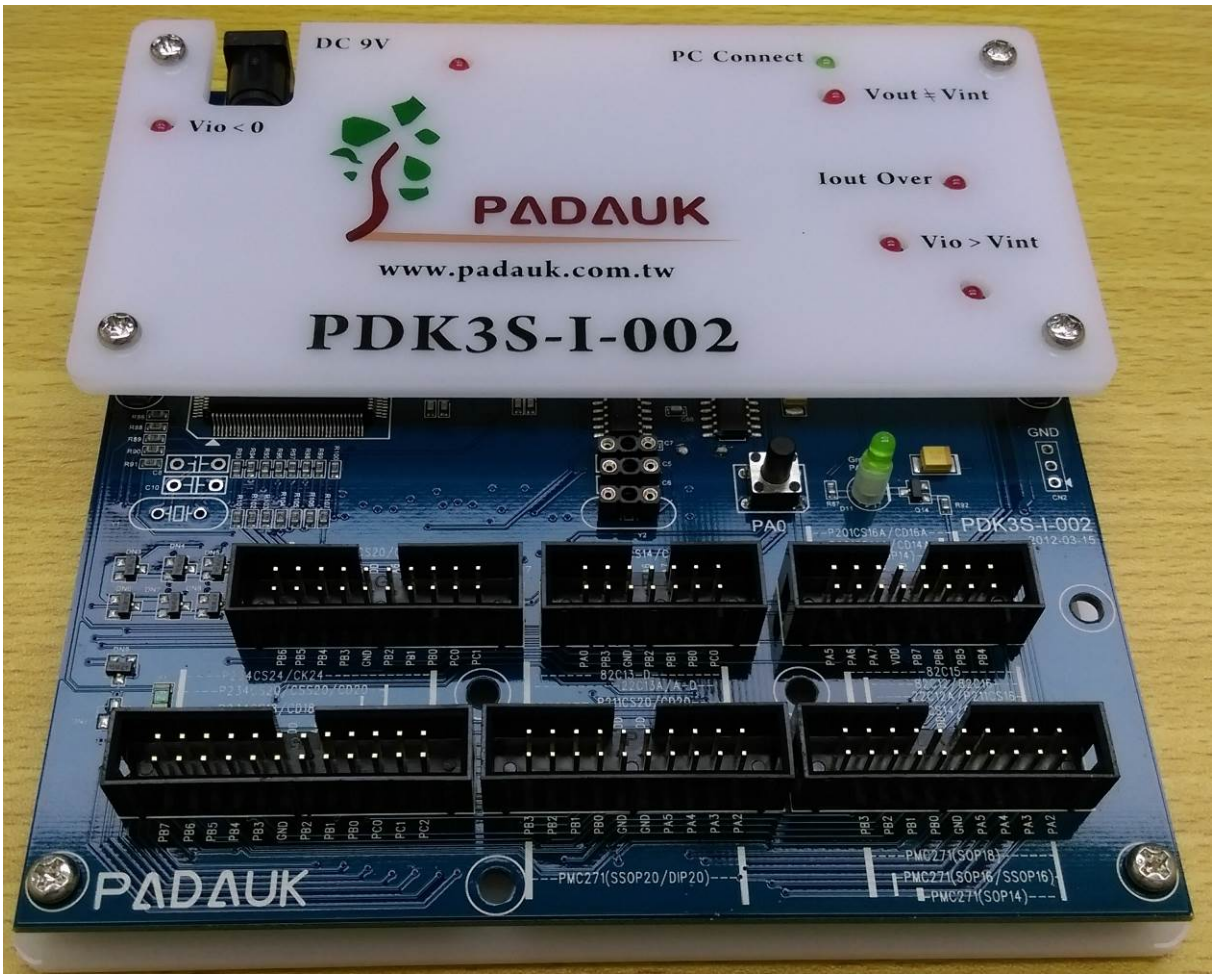
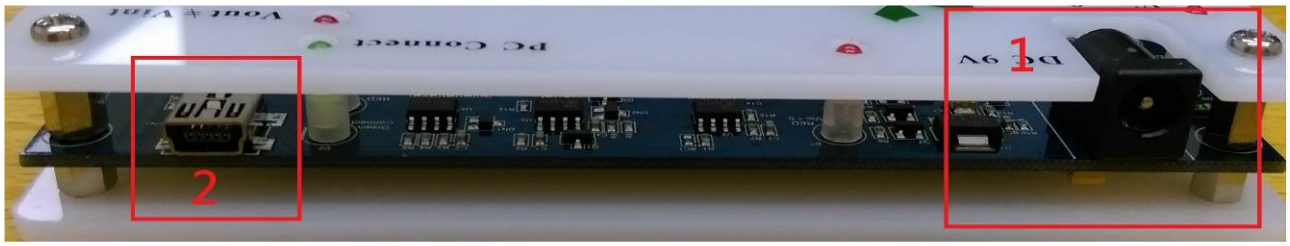
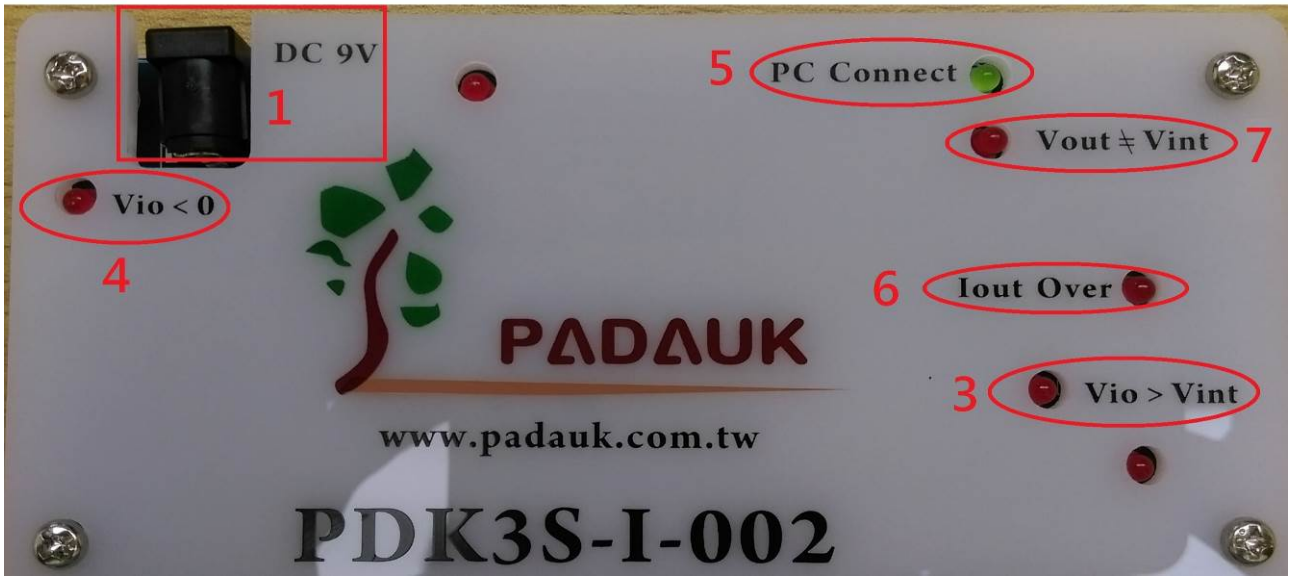


Fig.5: Front of PDK3S-I-002

2.3. Description for PDK3S-I-002 appearance





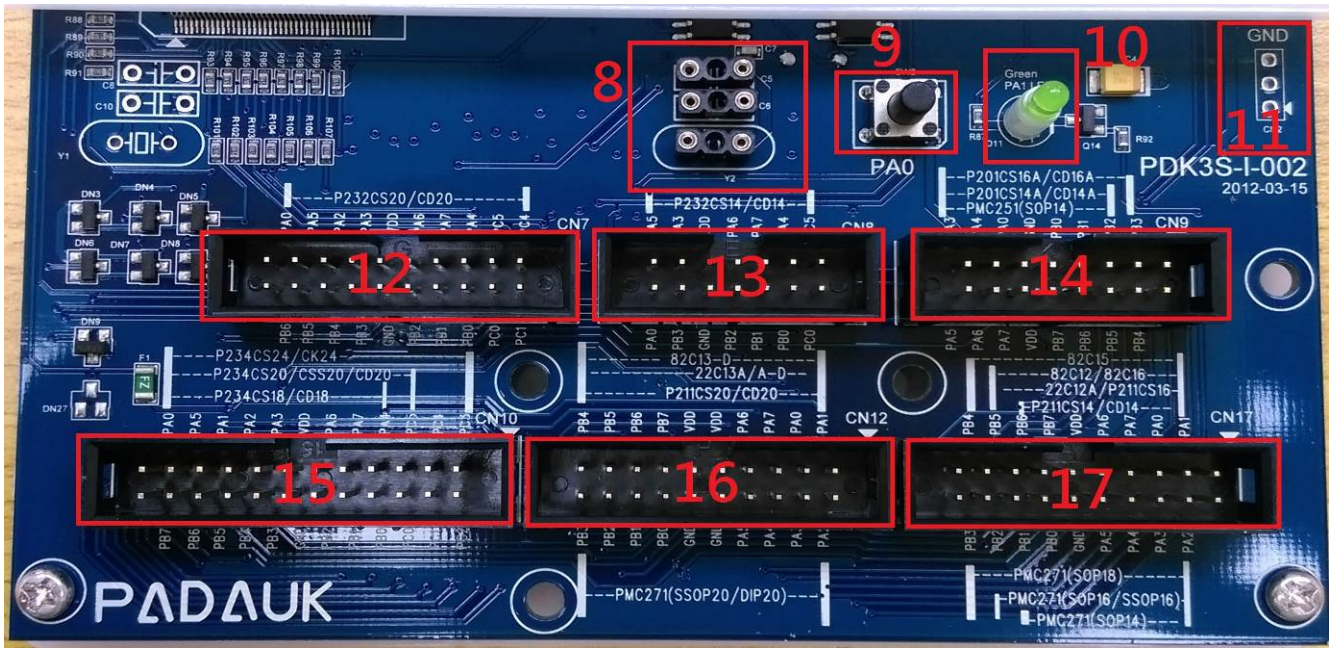


Fig.6: Connection instructions of PDK3S-I-002 parts

(1) Power interface:

DC9V power adapter interface.

(2) Mini-USB connector:

Connect to PC; provide ICE and PC simulation data transmission and reception.

(3) Abnormal LED indicator (Vio > VDD):

When the IO pin detects an input voltage exceeding VDD, the LED will be on. Please check the external signal.

(4) Abnormal LED indicator (Vio < 0):

When the IO pin detects a negative input voltage, the LED will be on. Please check the external signal.

(5) PC Connect LED indicator (PC Connect):

ICE state	PC Connect LED indicator
ICE powered on and failed to test the USB driver	LED off
ICE powered on and test the USB driver successfully	LED Flicker in 0.5Hz frequency
ICE is powered on and has downloaded emulation programs through IDE software	LED Flicker in 1.5Hz frequency

(6) Abnormal LED indicator (Iout Over):

This LED will be on when ICE output power consumes more than 50~60mA. Please check the external signal.

(7) Abnormal LED indicator (Vout != VDD):

When the dropout voltage between ICE internal output power and external input power is too large, this LED will be lighten. Please check the external signal.

(8) External Crystal Oscillator (Y2) and external capacitance interface(C5 & C6) :

When an external crystal oscillator is used in the simulation Chip, the crystal must be connected to this interface (Y2).

When the external crystal oscillator is used in the simulation Chip, the external capacitances are connected to this two interface (C5 & C6).

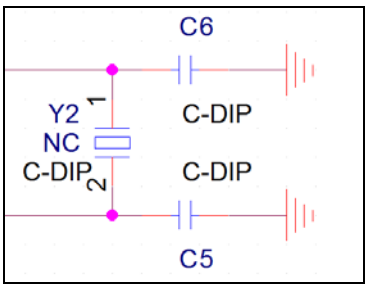


Fig.7: External Crystal, capacitor: Y2, C5 & C6

(9) Test button(SW2):

There is a built-in test button (SW2) on the PDK3S-I-002 board, which is convenient to users to do simple test verification. SW2 connects to PA0.

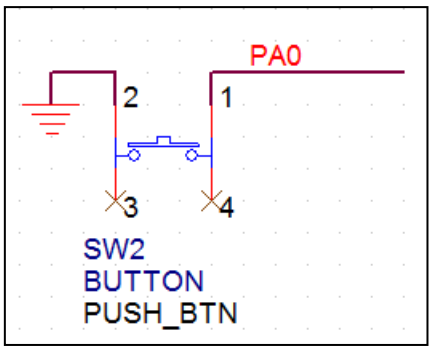


Fig.8: schematic diagram of SW2

(10) Test LED (D11) :

A test LED (D11) is built in the PDK3S-I-002 board, which is convenient to users to do simple test verification. D11 is driven by PA1.

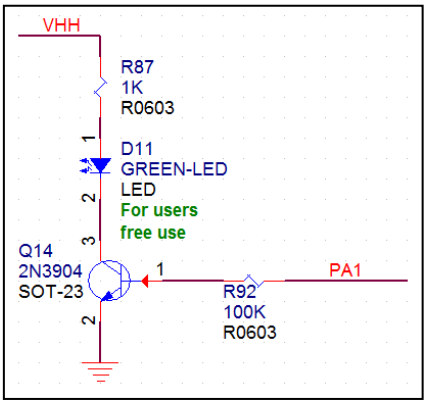


Fig.9: schematic diagram of D11

(11) ICE power ground output interface (CN2):

CN2 is a common connection pin of 3Pin, which is powered by ICE (0V) output interface (external common ground interface). The text is marked as GND.

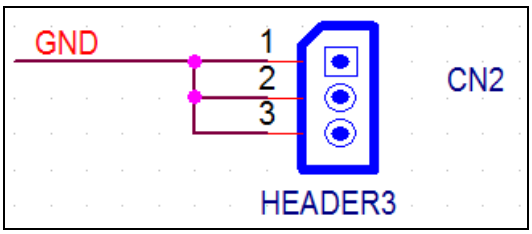


Fig.10: CN2 schematic diagram

(12) Simulation IO output flat cable interface (CN7) :

CN7 is P232CS20/CD20 simulation IO output flat cable interface.

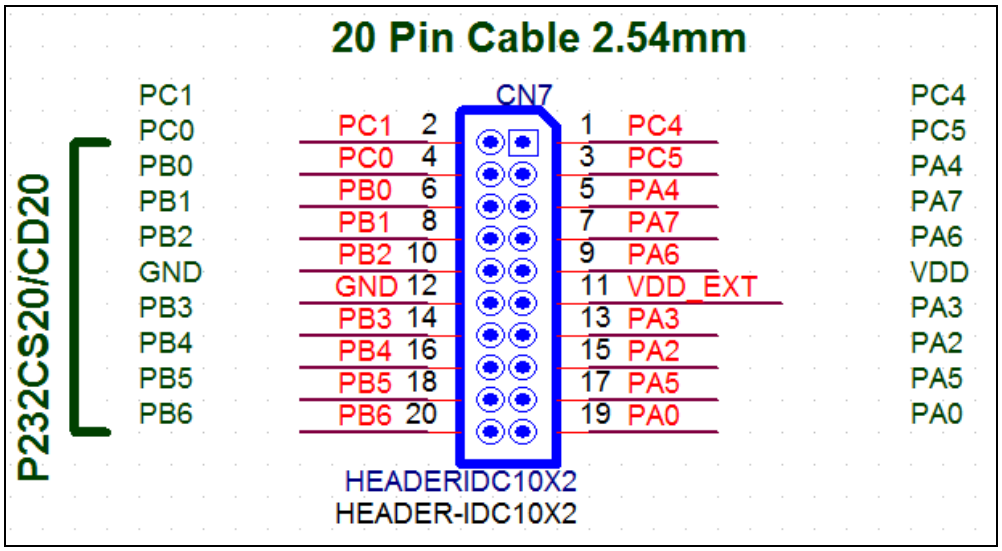


Fig.11: Schematic diagram of CN7

(13) Simulation IO output flat cable interface (CN8) :

CN8 is P232CS14/CD14 simulation IO output flat cable interface.

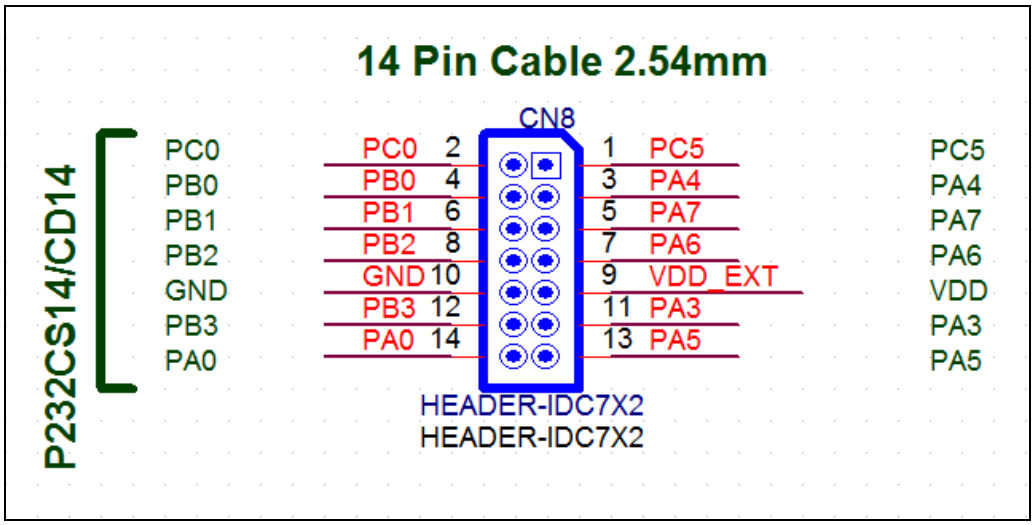


Fig.12: Schematic diagram of CN8

(14) Simulation IO output flat cable interface (CN9) :

CN9 is P201CS16A/CD16A, P201CS14A/CD14A, and PMC251(SOP14) simulation IO output flat cable interface.

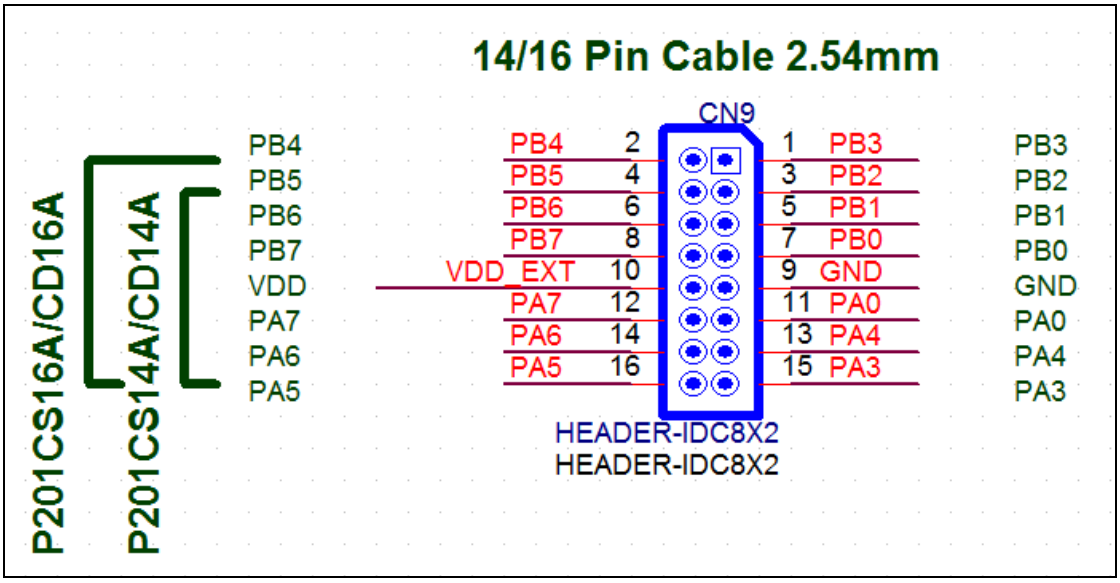


Fig.13: Schematic diagram of CN9

(15) IO output flat cable interface (CN10) :

CN9 is P234CS24/CK24, P234CS20/CSS20/CD20, and P234CS18/CD18 simulation IO output flat cable interface.

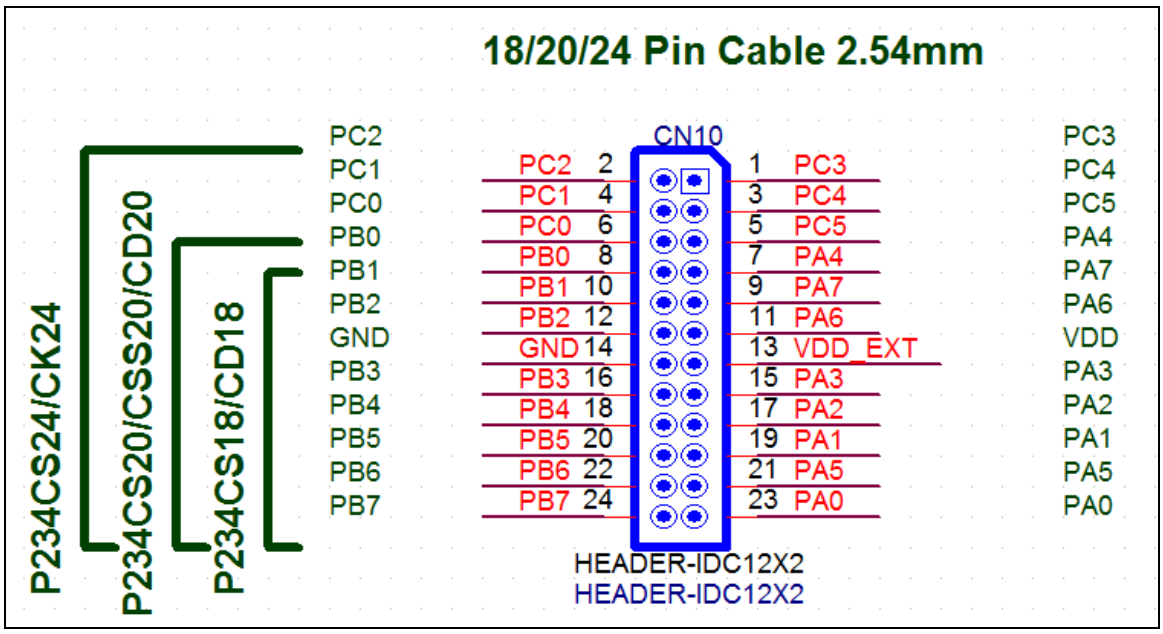


Fig.14: Schematic diagram of CN10

(16) Simulation IO output flat cable interface (CN12) :

CN12 is 82C13-D, 22C13A/A-D, P211CS20/CD20, PMC271 (SSOP20/DIP20) simulation IO output flat cable interface.

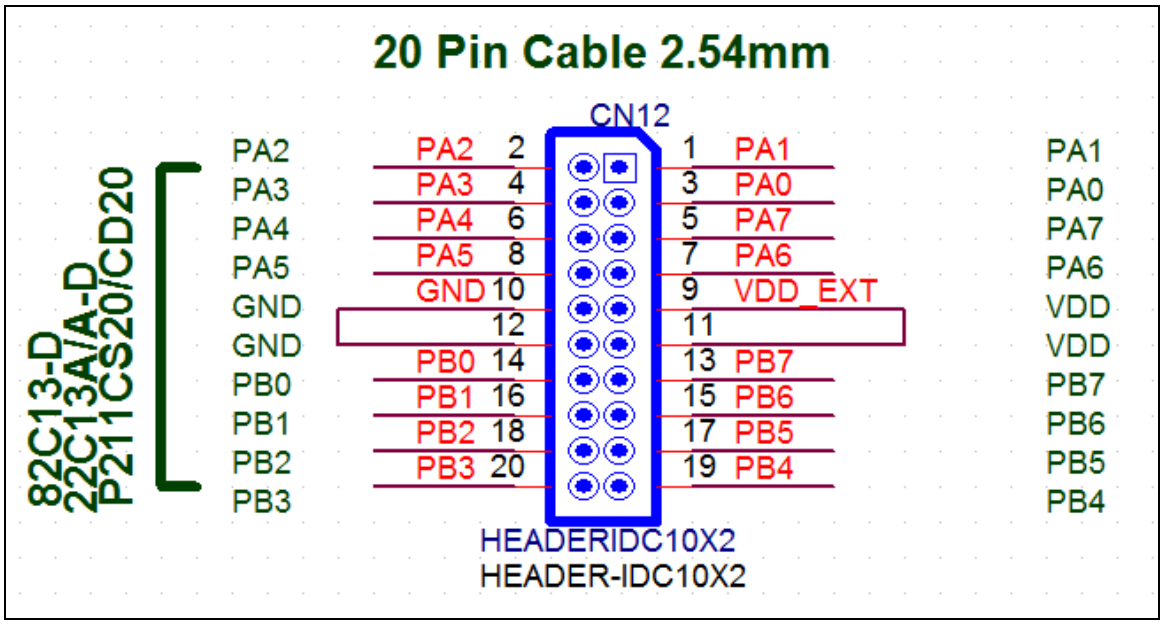


Fig.15: Schematic diagram of CN12

(17) Simulation IO output flat cable interface (CN17) :

CN17 is 82C15, 82C12/82C16, 22C12A/P211CS16, P211CS14/CD14, PMC271(SOP8), PMC271(SOP16/SSOP16), PMC271(SOP14) simulation IO output flat cable interface.

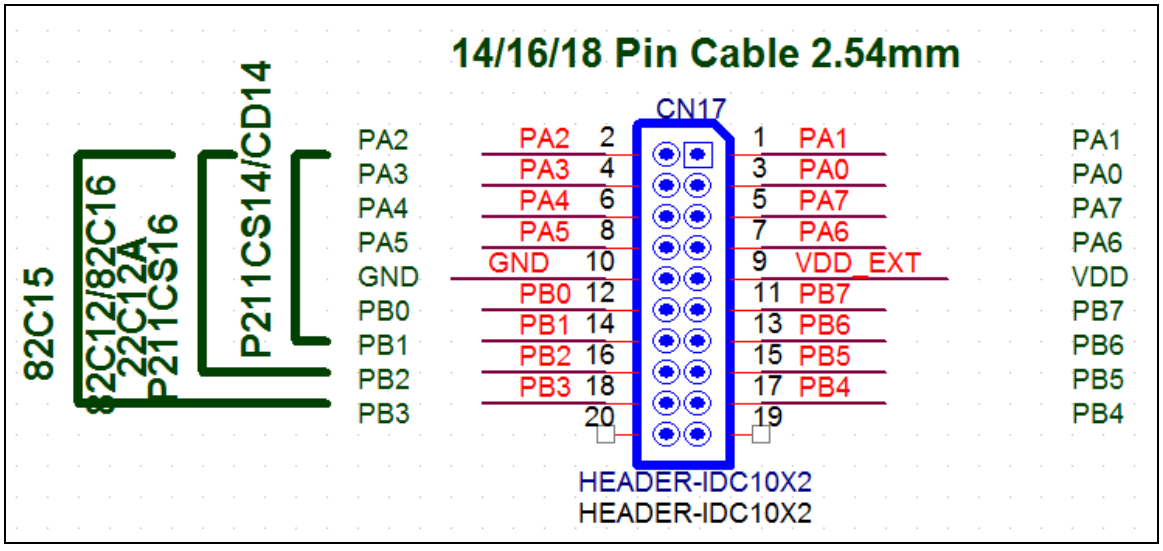


Fig.16: Schematic diagram of CN17

3. PDK3S-I-003 Standard multi-core emulator

3.1. Introduction of PDK3S-I-003 emulator

PDK3S-I-003 is the third generation standard multi-core emulator produced by PADAUK Technology. As the standard multi-core emulator, PDK3S-I-003 is built with a variety of protective circuits (output ver-current detection, negative voltage detection, over-voltage detection, output voltage abnormality detection and circuit disconnection protection) to detect ICE internal damage due to abnormal external connection.

The PDK3S-I-003 must be through a DC9V power adapter to power on and connected to computer via a USB cable for simulation.

3.2. Appearance of PDK3S-I-003

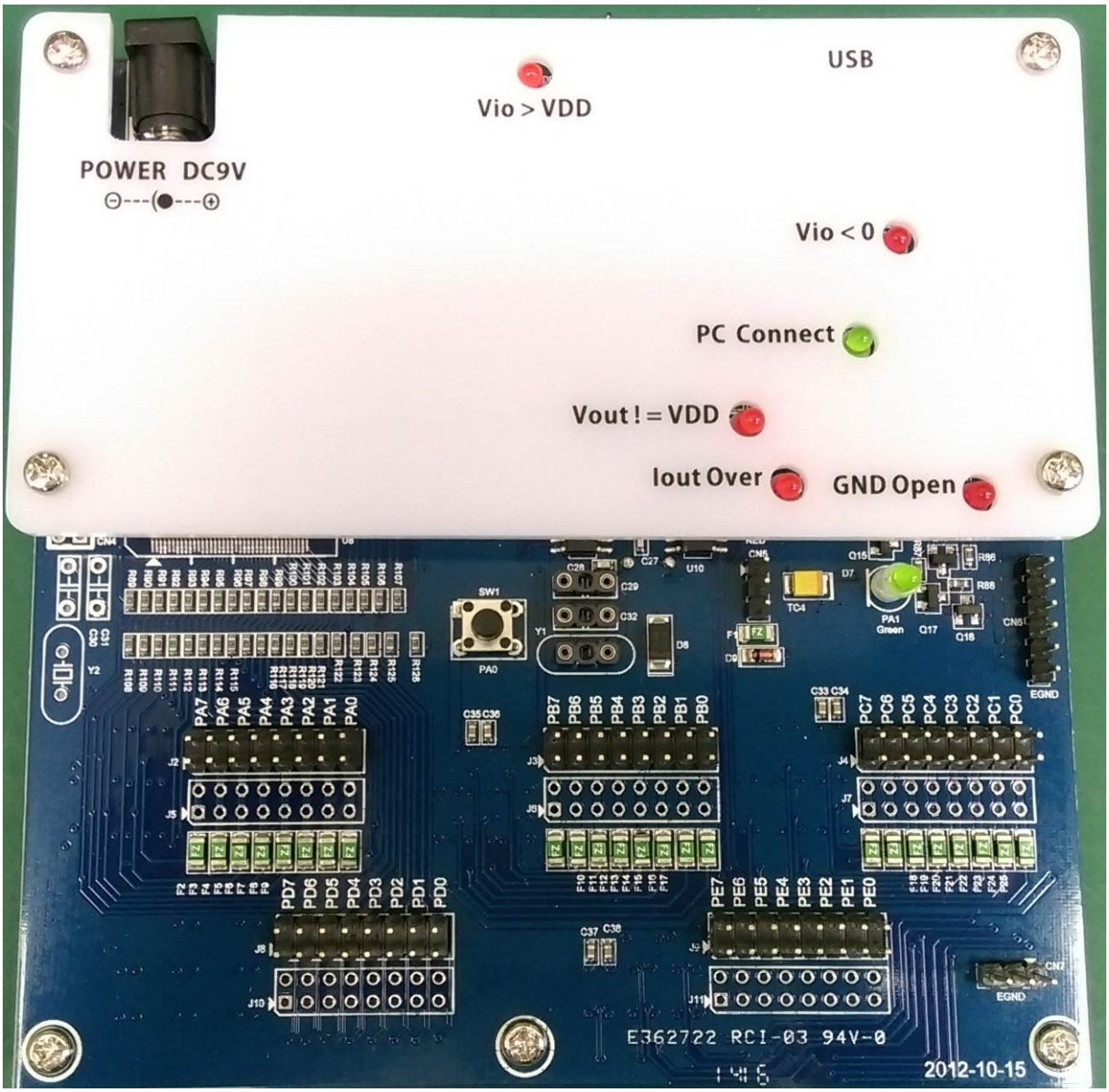


Fig.17: front of PDK3S-I-003

3.3. Description for PDK3S-I-003 appearance

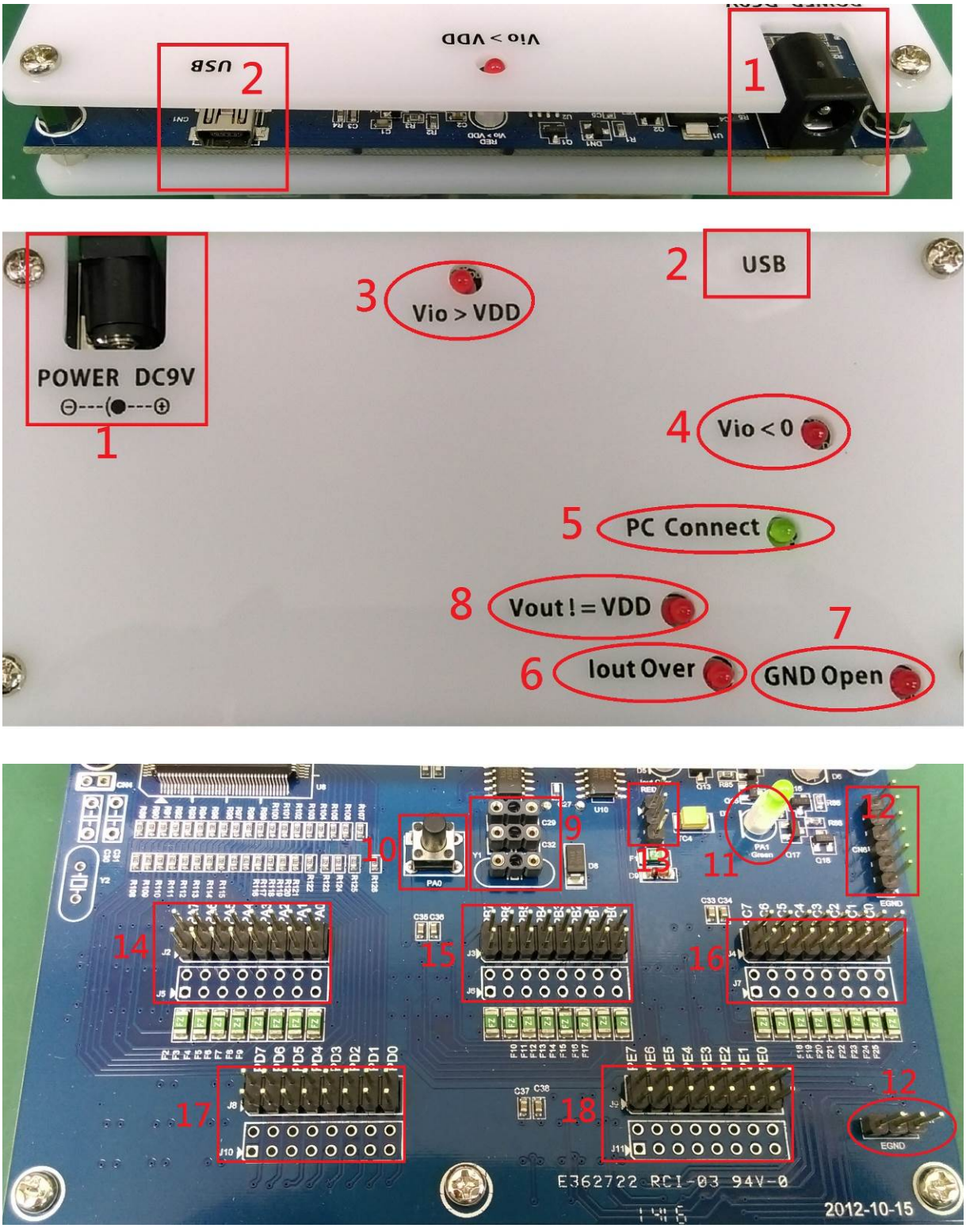


Fig.18: Connection instructions of PDK3S-I-003 parts

(1) Power interface:

DC9V power adapter interface.

(2) Mini-USB connector:

Connect to PC; provide ICE and PC simulation data transmission and reception.

(3) Abnormal LED indicator (Vio > VDD):

When the IO pin detects an input voltage exceeding VDD, the LED will be on. Please check the external signal.

(4) Abnormal LED indicator (Vio < 0):

When the IO pin detects a negative input voltage, the LED will be on. Please check the external signal.

(5) PC Connect LED indicator (PC Connect):

ICE state	PC Connect LED indicator
ICE powered on and failed to test the USB driver	LED off
ICE powered on and test the USB driver successfully	LED flicker in 0.5Hz frequency
ICE is powered on and has downloaded emulation programs through IDE software	LED flicker in 1.5Hz frequency

(6) Abnormal LED indicator (Iout Over):

This LED will be on when ICE output power consumes more than 50~60mA. Please check the external signal.

(7) Abnormal LED indicator (GND Open):

When the GND of ICE has a large current passing by, the duplex fuse on ICE will jump off the GND line and this LED will be turn on. Please check the external signal.

(It usually occurs on AC resistance/capacitance circuit, the current loop is from AC circuit board ➔ ICE ➔ USB ➔ PC ➔ GND ➔ AC circuit board)

(8) Abnormal LED indicator (Vout != VDD):

When the dropout voltage between ICE internal output power and external input power is too large, this LED will be on. Please check the external signal.

(9) External Crystal Oscillator (Y1) and external capacitance interface(C29 & C32) :

When an external crystal oscillator is used in the simulation Chip, the crystal must be connected to this interface (Y1).

When the external crystal oscillator is used in the simulation Chip, the external capacitance is connected to this interface (C29 & C32).

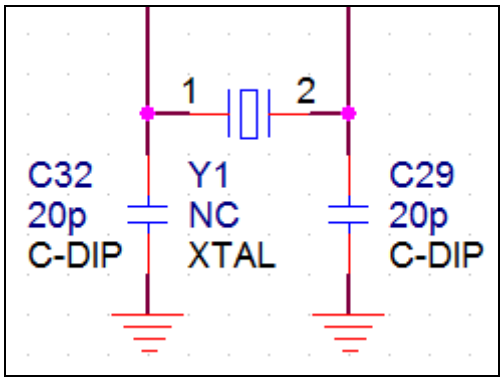


Fig.19: External Crystal& capacitor: Y1, C29 & C32

(10) Test button (SW1) :

There is a built-in test button (SW1) on the PDK3S-I-003 board, which is convenient for users to do simple test verification. SW1 connects to PA0.

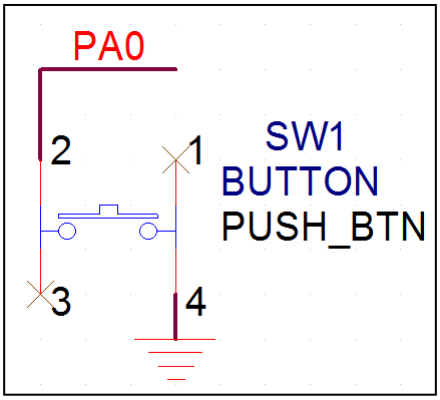


Fig.20: schematic diagram of SW1

(11) Test LED (D7) :

A built-in test LED (D7) is on the PDK3S-I-003 board, which is convenient to users to do simple test verification. D7 is driven by PA1.

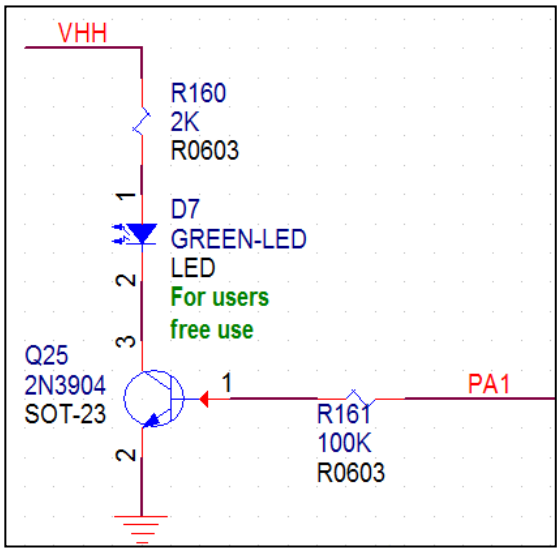


Fig.21: schematic diagram of D7

(12) ICE power ground output interface (CN6, CN7):

CN6 and CN7 are 6Pin and 3Pin common connection pin, which are powered by ICE (0V) output interface (external common ground interface). The text is marked as EGND.

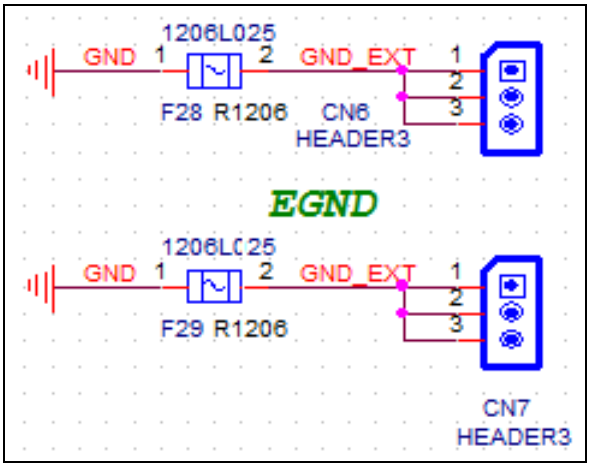


Fig.22: schematic diagram of CN6, CN7

(13) ICE power output interface (CN5):

CN5 is a common connection pin of 3Pins, which is provided by ICE with a positive power (+V) output interface.

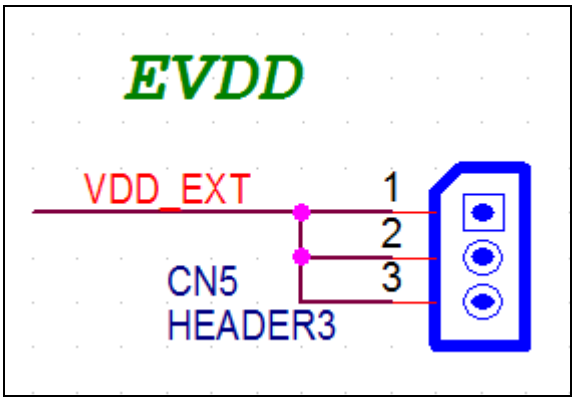


Fig.23: schematic diagram of CN5

(14) Simulation PA IO output interface (J2, J5) :

J2 and J5 are PA IO output interfaces in simulation, including PA0~PA7 interfaces. J2 is the connection pin, and J5 is reserved for user to perform signal measurement.

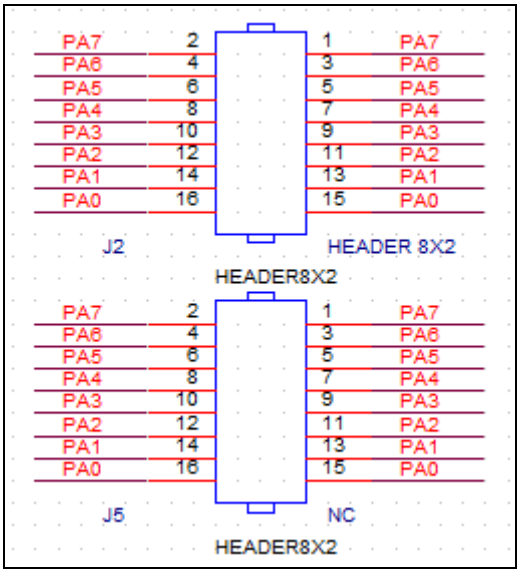


Fig.24: schematic diagram of J2, J5

(15) Simulation PB IO output interface (J3, J6) :

J3 and J6 are PB IO output interfaces in simulation, including PB0~PB7 interfaces. J3 is the connection pin, and J6 is reserved for user to perform signal measurement.

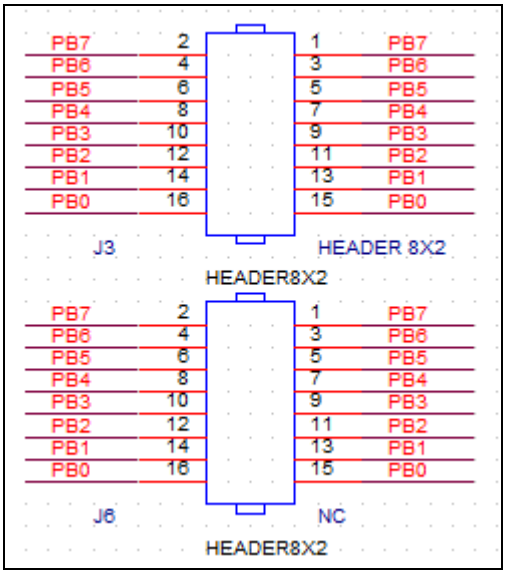


Fig.25: schematic diagram of J3, J6

(16) Simulation PC IO output interface (J4, J7) :

J4 and J7 are PC IO output interfaces in simulation, including PC0~PC7 interfaces. J4 is the connection pin, and J7 is reserved for user to perform signal measurement.

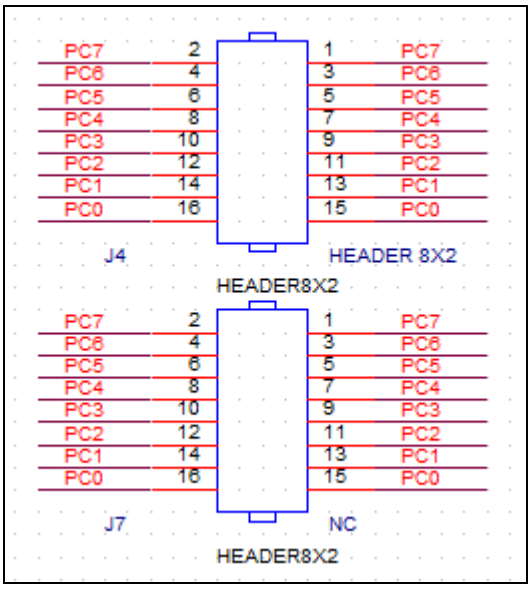


Fig.26: schematic diagram of J4, J7

(17) Simulation PD IO output interface (J8, 10) :

J8 and J10 are PD IO output interfaces in simulation, including PD0~PD7 interfaces. J8 is the connection pin, and J10 is reserved for user to perform signal measurement.

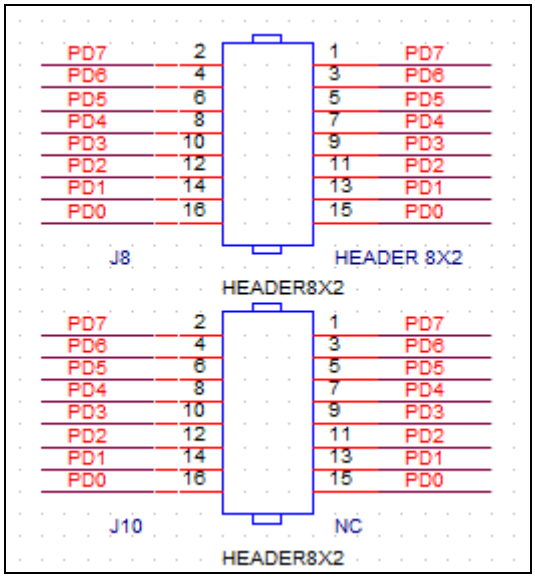


Fig.27: schematic diagram of J8, J10

(18) Simulation PE IO output interface (J9, J11) :

J9 and J11 are PE IO output interfaces in simulation, including PE0~PE7 interfaces. J9 is the connection pin, and J11 is reserved for user to perform signal measurement.

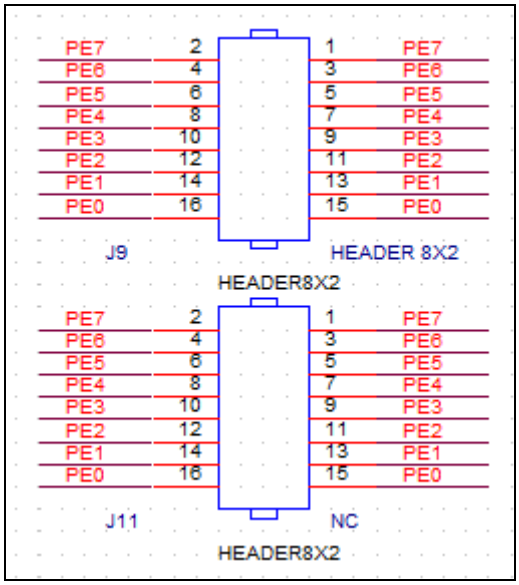


Fig.28: schematic diagram of J9, J11