



Kneron KL520 series AI SoC

Development Kit (BGA159, 9x6)

Product Information

Revision History:

version	description	date
0.1	Initial version	2019/08/19
0.2	Increase accessories information	2019/08/27
0.3	Change Picture	2019/10/08
0.4	Change Picture	2020/03/10

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1. Overview

1.1 General description

Kneron KL520 series is an AI SoC targeting smart-home and IoT segment with Kneron NPU core inside to accelerate neural network processing and enabling devices with edge AI ability to achieve Kneron's AI everywhere vision.

This document describes how to use the KL520 AI SoC Development Kit (BGA159, 9x6).

2. Hardware description

2.1 Product SPEC

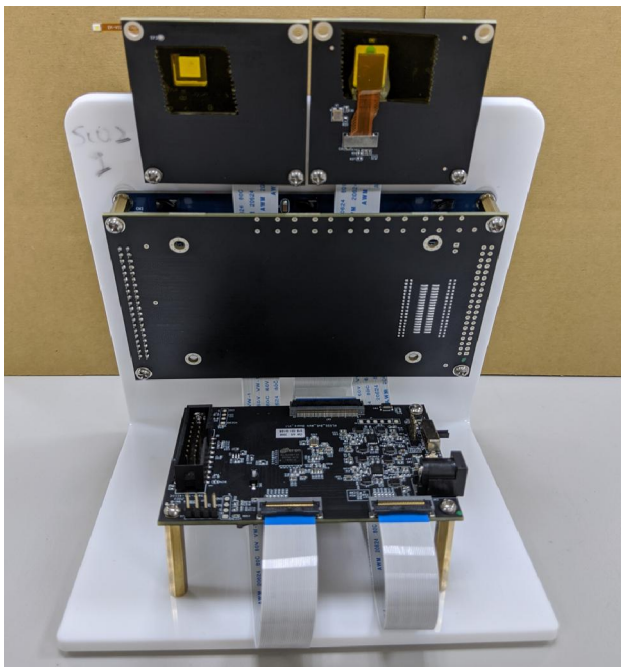
Product name	Kneron KL520 series AI SoC Development Kit (BGA159, 9x6)
Kneron part number	KP52B1330-M1
Main board dimension	90(L) x 60(W) x 1.6(H) mm
Working voltage	5V
DDR memory size	64MB
SPI NOR Flash size	32MB
Switch & button	Power switch x 1, PTN button x 1, Reset button x 1 , Boot Switch X1
Interface - Power	DC Jack (5V) x 1
Interface – Fixed I/O	UART x 2, JTAG x 1, micro USB (client) x 1
	FPC conn x 2 (2-lane MIPI camera)
	FPC conn x 1 (DVP parallel display)
	SDIO x 1
Interface – programmable I/O	Pinmux select (1.27mm pitch)
Accessory - Camera sensor	RGB sensor: GalaxyCore GC2145 2.0M CMOS
	NIR sensor: SmartSens SC132GS 1.3M CMOS (940nm, Global shutter)
Accessory - NIR LED	Lextar PR88F14 940nm NIR LED
Accessory - LCD Display	ARMFLY TR433C1 4.3" 480x272 TFT LCD

2.2 Inside the box

- i. Main board x 1
- ii. Camera & camera daughter board x 2
- iii. LCD panel & LCD daughter board x 1
- iv. FPC x 3
- v. Power adaptor (5V, 4A) x 1
- vi. USB to TTL cable (3.3V) x 2
- vii. Micro USB cable x 1
- viii. Acrylic stand & screw set x 1

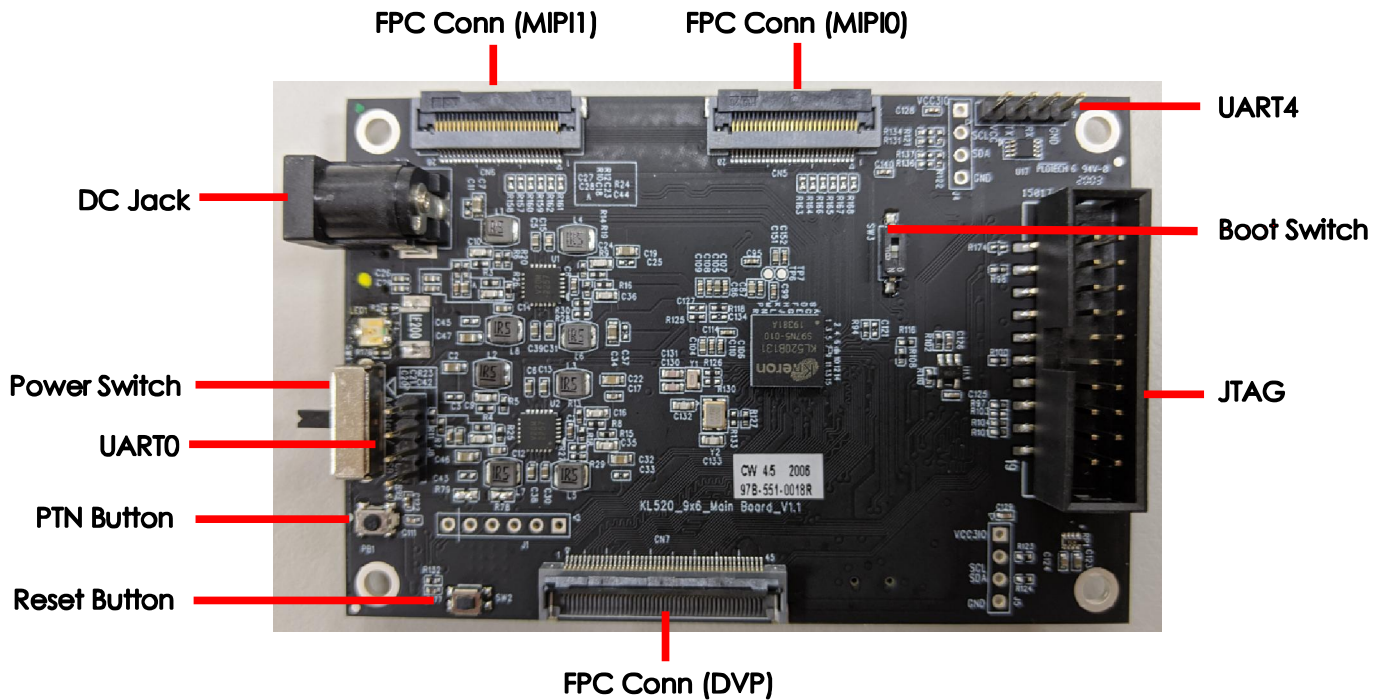


2.3 Assembly

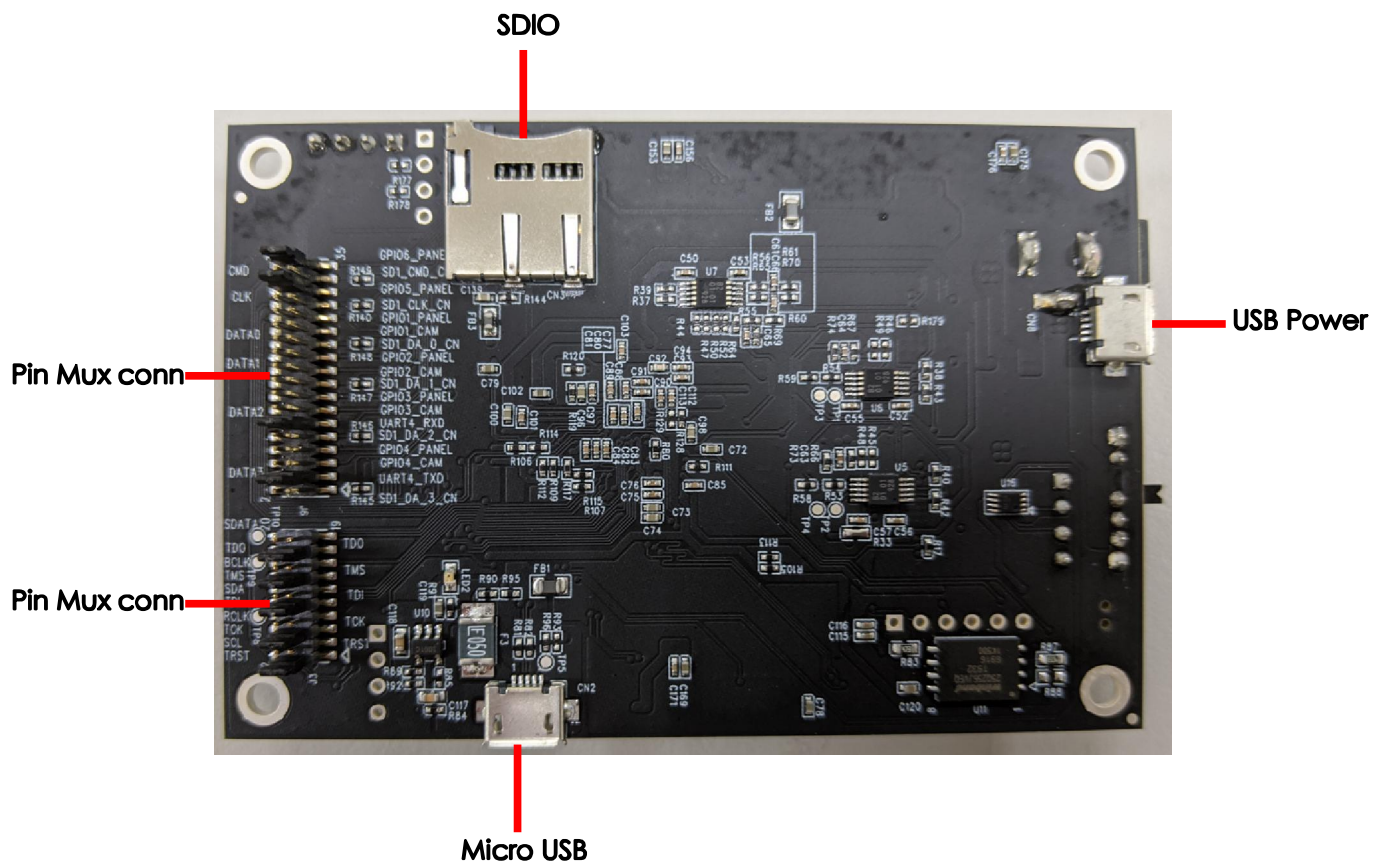


2.4 Main board description

Here's the overview of all functions on the main board.



Figure, Top overview



Figure, Bottom overview

As you can see in the picture, here's the major component you must know before you start your design:

- KL520: AI SoC.
- 5V Power (DC Jack): 5V input for the development board, used a 5V/4A adaptor.
- USB Power: 5V input for the Power bank.
- Power Switch: a switch for the adapter or power bank, you can see LED on when you turn on the switch.
- UART0/UART4: a connector that uses a TTL to USB cable for developing.
- JTAG: a connector that uses JTAG/ICE cable for developing.
- PTN: a button that used to turn on the KL520.
- Reset BTN: a button that used to reset the KL520.
- USB connector: a micro USB connector that used USB connector for developing.
- Boot Switch: Selection for boot from SPI or boot from UART.

2.5 Pin mux and Jumpers

To make some flexibility for the developers, the development board has made some jumper options. Most IOs has series jumper on it. If users want to do some other thing that do not include in development board, he can just take off the jumper and jump to other peripherals or even scope for debugging. Some IOs also offers different functionality, users can simply choose different functions by choosing different jumper location. Bellowing table shows the hardware setting on the development board. Please also be aware of that the content has the “/” word means that it has multiple functions and can be configured by choosing different jumper locations.

KL520 Pin Number	Default state	Evaluation Board Hardware Setting
E11	X_JTAG_TRST_N	JTAG_TRST_N/排針(I2C)
C15	X_JTAG_TDI	JTAG_TDI/排針(I2C)
E15	X_JTAG_SWDITMS	JTAG_SWDITMS
F14	X_JTAG_SWCLKTCK	JTAG_SWCLKTCK
B15	X_JTAG_TDO	JTAG_TDO
B11	X_LC_PCLK	LC_PCLK
E7	X_LC_VS	LC_VS
E8	X_LC_HS	LC_HS
A11	X_LC_DE	LC_DE
A12	X_LC_DATA[0]	LC_DATA[0]
E9	X_LC_DATA[1]	LC_DATA[1]
B12	X_LC_DATA[2]	LC_DATA[2]
B13	X_LC_DATA[3]	LC_DATA[3]
A13	X_LC_DATA[4]	LC_DATA[4]
B14	X_LC_DATA[5]	LC_DATA[5]
D14	X_LC_DATA[6]	LC_DATA[6]
D15	X_LC_DATA[7]	LC_DATA[7]
F11	X_LC_DATA[8]	LC_DATA[8]
E14	X_LC_DATA[9]	LC_DATA[9]
F15	X_LC_DATA[10]	LC_DATA[10]
H11	X_LC_DATA[11]	LC_DATA[11]
G14	X_LC_DATA[12]	LC_DATA[12]
G11	X_LC_DATA[13]	LC_DATA[13]
G15	X_LC_DATA[14]	LC_DATA[14]
H15	X_LC_DATA[15]	LC_DATA[15]
K11	X_SD_CLK	LC_DATA[16]/SD_CLK
J15	X_SD_CMD	LC_DATA[17]/SD_CMD
L10	X_SD_DAT[0]	X_SD_DAT[0]/GPIO1_CAM/GPIO1_PANEL
K14	X_SD_DAT[1]	X_SD_DAT[1]/GPIO2_CAM/GPIO2_PANEL
K15	X_SD_DAT[2]	X_SD_DAT[2]/GPIO3_CAM/GPIO3_PANEL/UART4_RX
L11	X_SD_DAT[3]	X_SD_DAT[3]/GPIO3_CAM/GPIO3_PANEL/UART4_TX
E6	X_UART0_RX	UART0_RX
B10	X_UART0_TX	UART0_TX
E10	X_I2C0_SCL	SCL0/I2C0_SCL_MIPI0/I2C0_SCL_MIPI1
A15	X_I2C0_SDA	SCL0/I2C0_Sda_MIPI0/I2C0_SDA_MIPI1

Table, Development board HW setting

Below picture shows the jumper option. These jumpers enable you to select between SDIO and others.

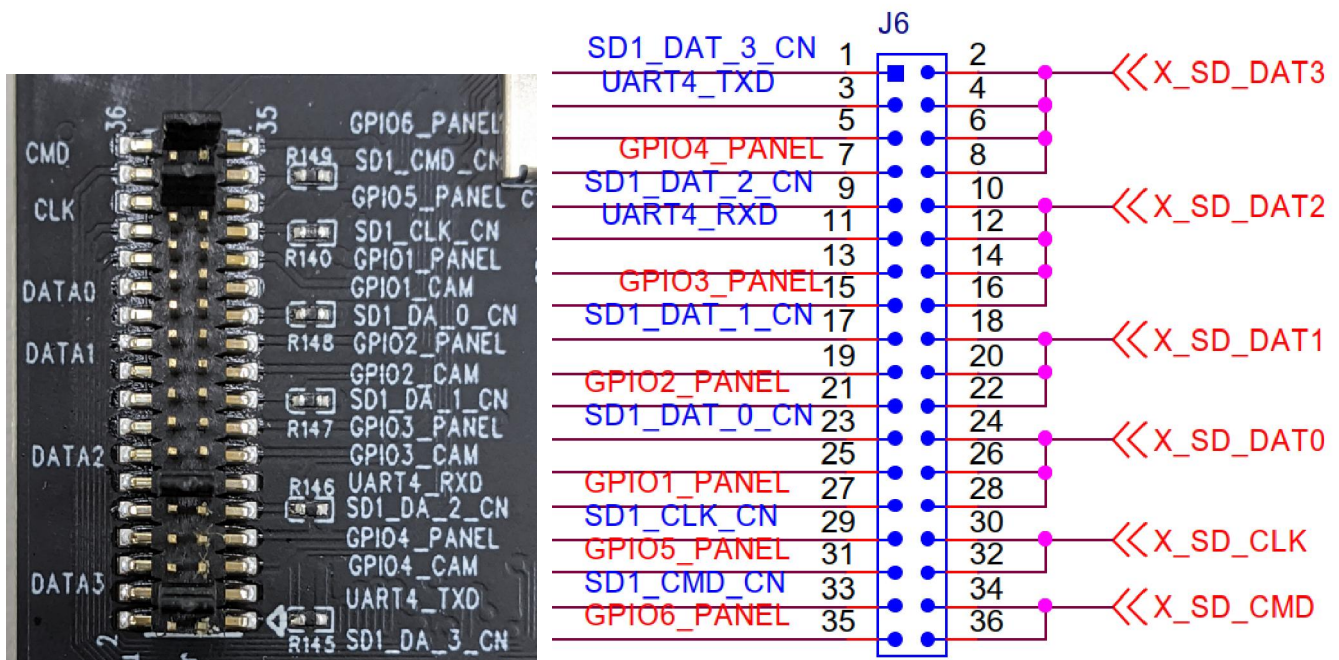
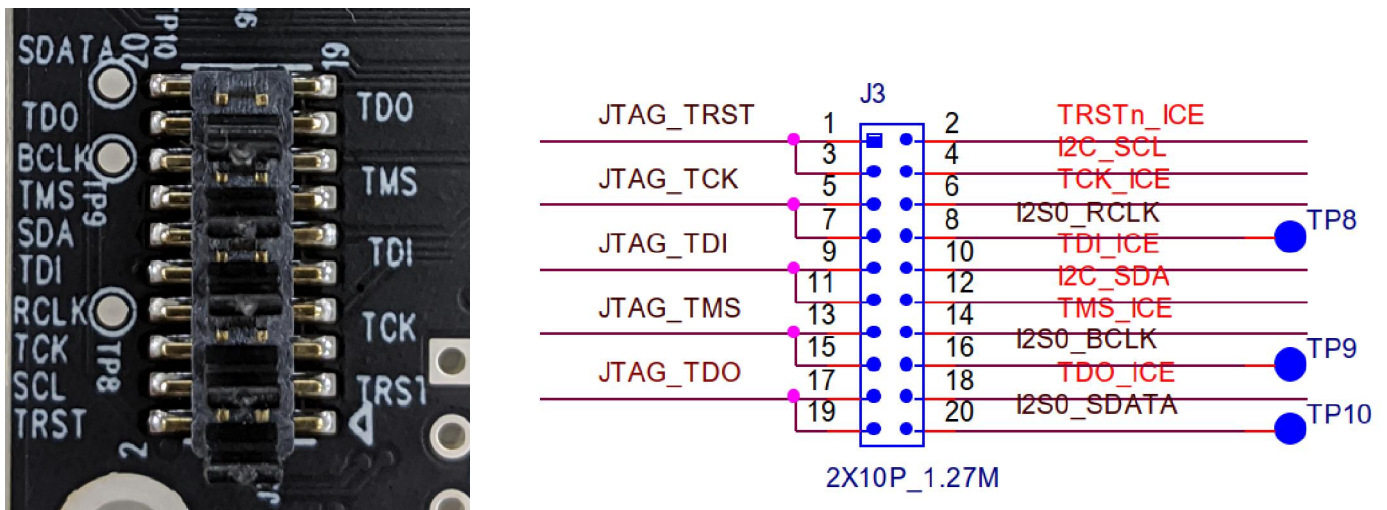


Figure. Jumpers to switch SDIO or GPIO.

KL520 pin number	Default state	Development Board hardware Setting
K11	X_SD_CLK	LC_DATA[16]/SD_CLK
J15	X_SD_CMD	LC_DATA[17]/SD_CMD
L10	X_SD_DAT[0]	X_SD_DAT[0]/GPIO1_CAM/GPIO1_PANEL
K14	X_SD_DAT[1]	X_SD_DAT[1]/GPIO2_CAM/GPIO2_PANEL
K15	X_SD_DAT[2]	X_SD_DAT[2]/GPIO3_CAM/GPIO3_PANEL/UART4_RX
L11	X_SD_DAT[3]	X_SD_DAT[3]/GPIO3_CAM/GPIO3_PANEL/UART4_TX

Table, equivalent table for Figure above.

Bellowing picture shows the jumper option which enable user to select between JTAG and I2C or I2S.



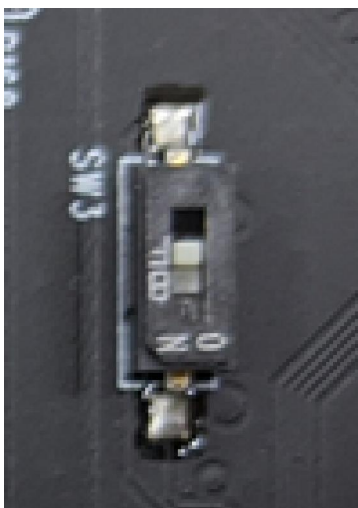
Figure, Jumpers to switch JTAG / I2C / I2S.

KL520 pin number	Default state	Development Board hardware Setting
E11	X_JTAG_TRST_N	JTAG_TRST_N/camera1(I2C)
C15	X_JTAG_TDI	JTAG_TDI/camera1(I2C)
E15	X_JTAG_SWDTMS	JTAG_SWDTMS/I2S0_BCLK
F14	X_JTAG_SWCLKTCK	JTAG_SWCLKTCK/I2S0_RCLK
B15	X_JTAG_TDO	JTAG_TDO/I2S0_SDATA

Table, equivalent table for the Figure above

Boost jumper, SW3, a jumper that can helps user to config boot mode.

When SW3=0, it's boot from UART. When SW3=1, it's boot from JTAG



3. Peripherals

Here list the peripherals you need for the board development.

3.1 5V adaptor

A 5V/4A 2.5mm DC adaptor is needed to provide the power of development board.



Figure, 5V/4A adaptor

3.2 UART cable



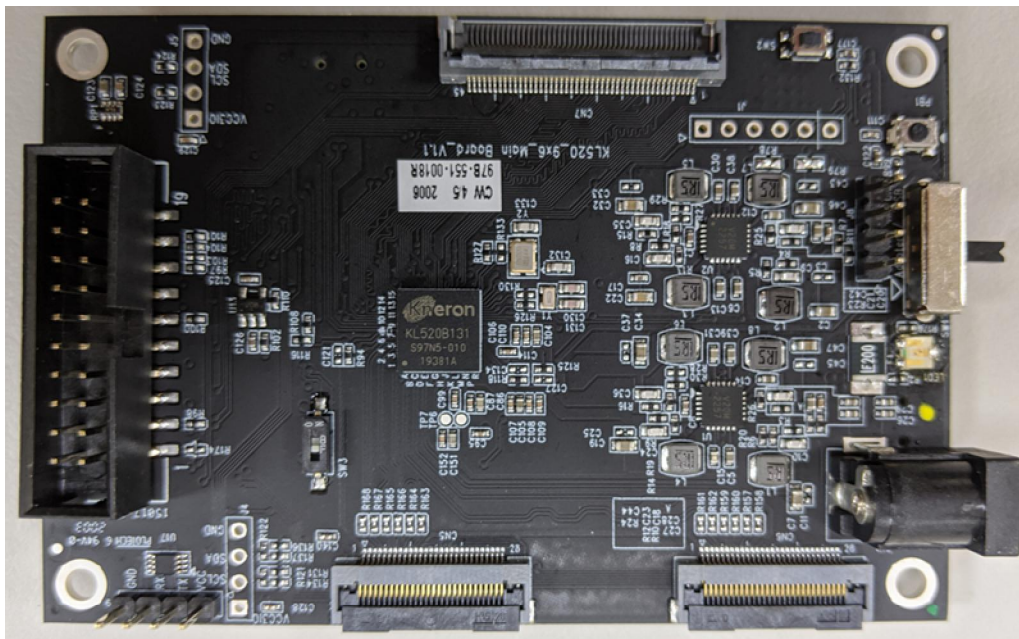
Figure, USB to TTL(3.3V) cable

3.3 JTAG cable (not included in Kneron shipping box)



Figure, JTAG cable

3.4 Connecting UART



UART 0 pin define

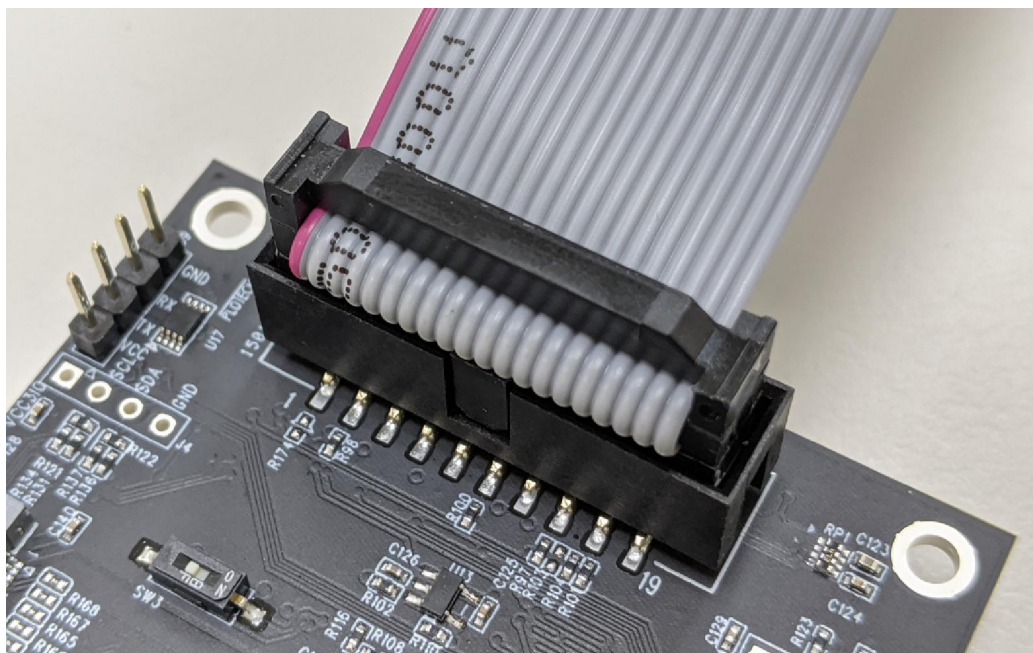
- GND
- Rx
- Tx
- VCC

UART 4 pin define

- GND
- Rx
- Tx
- VCC

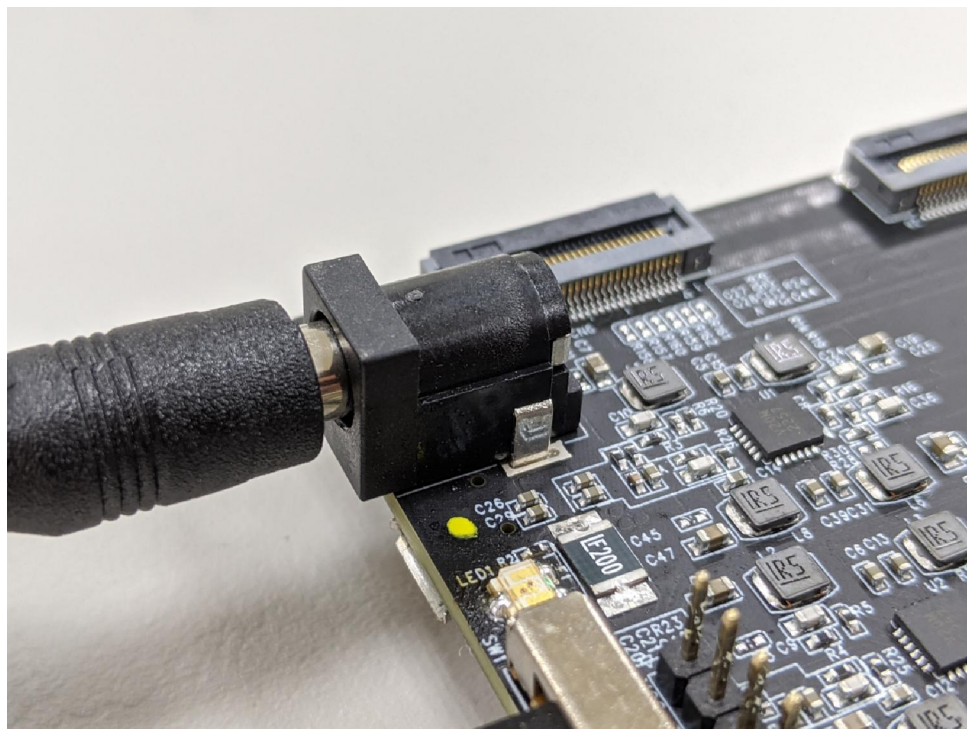
3.5 Connecting JTAG

Connecting JTAG cable like picture shown below:

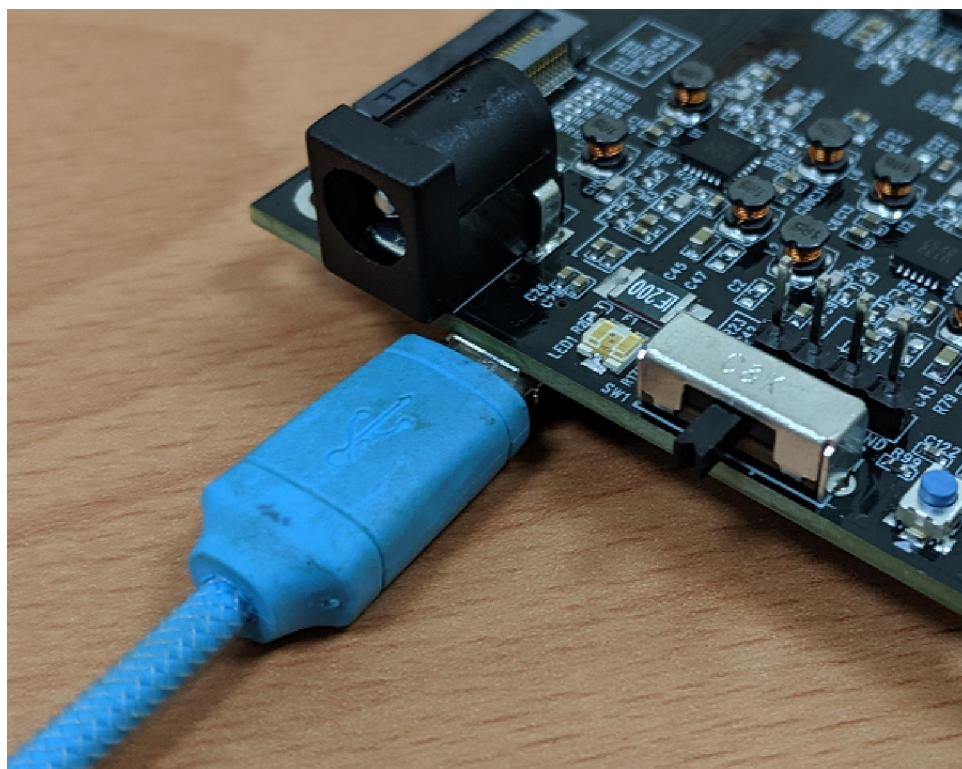


Figure, connecting JTAG cable

3.6 Connecting 5V Power



Figure, connecting 5V power

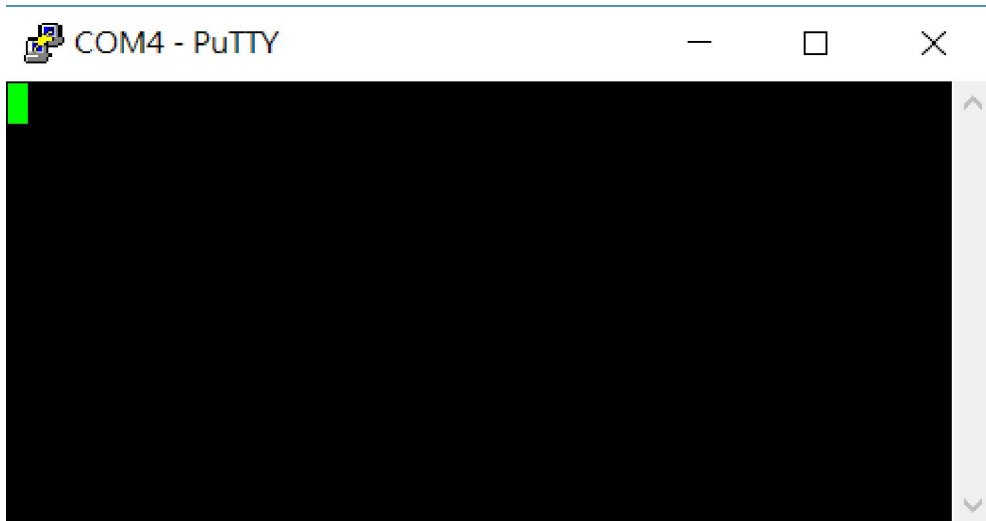


Figure, connecting USB5V power

4. KL520 Power on and System

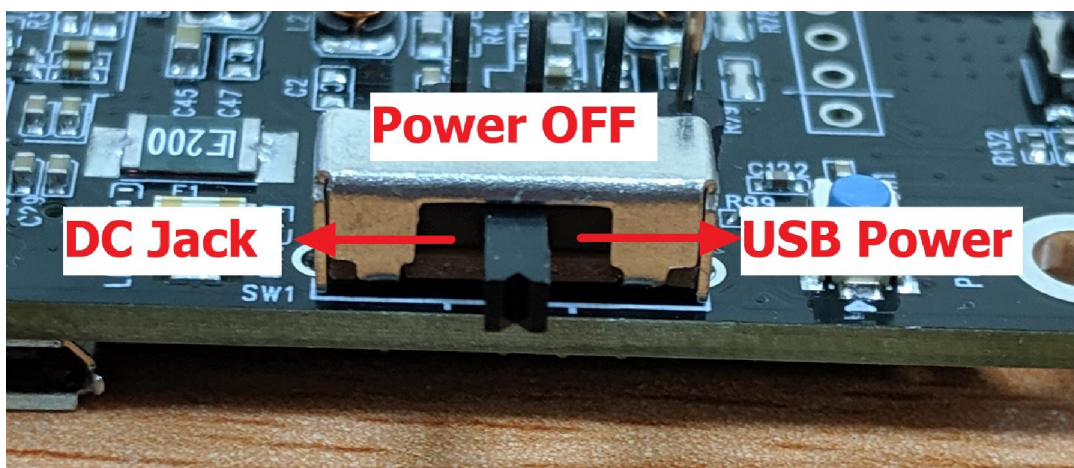
4.1 Bring Up procedure

1. Open UART COM port debug windows (Teraterm or Putty) /UART0: Baud rate: 115200



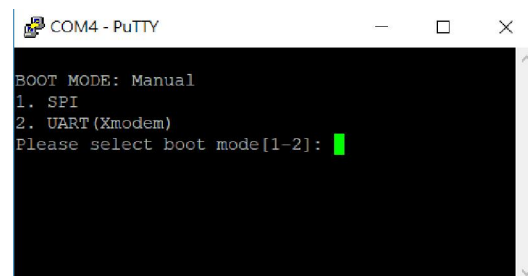
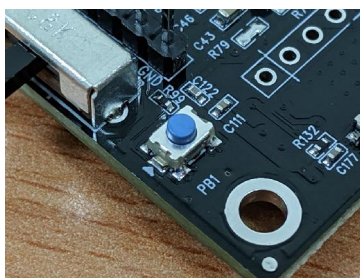
Figure, using teraterm or putty to see the UART message

2. Turn ON power switch.



Figure, turn on power switch

3. Wake up chip from RTC power domain.
You will see boot message when you press PTN button



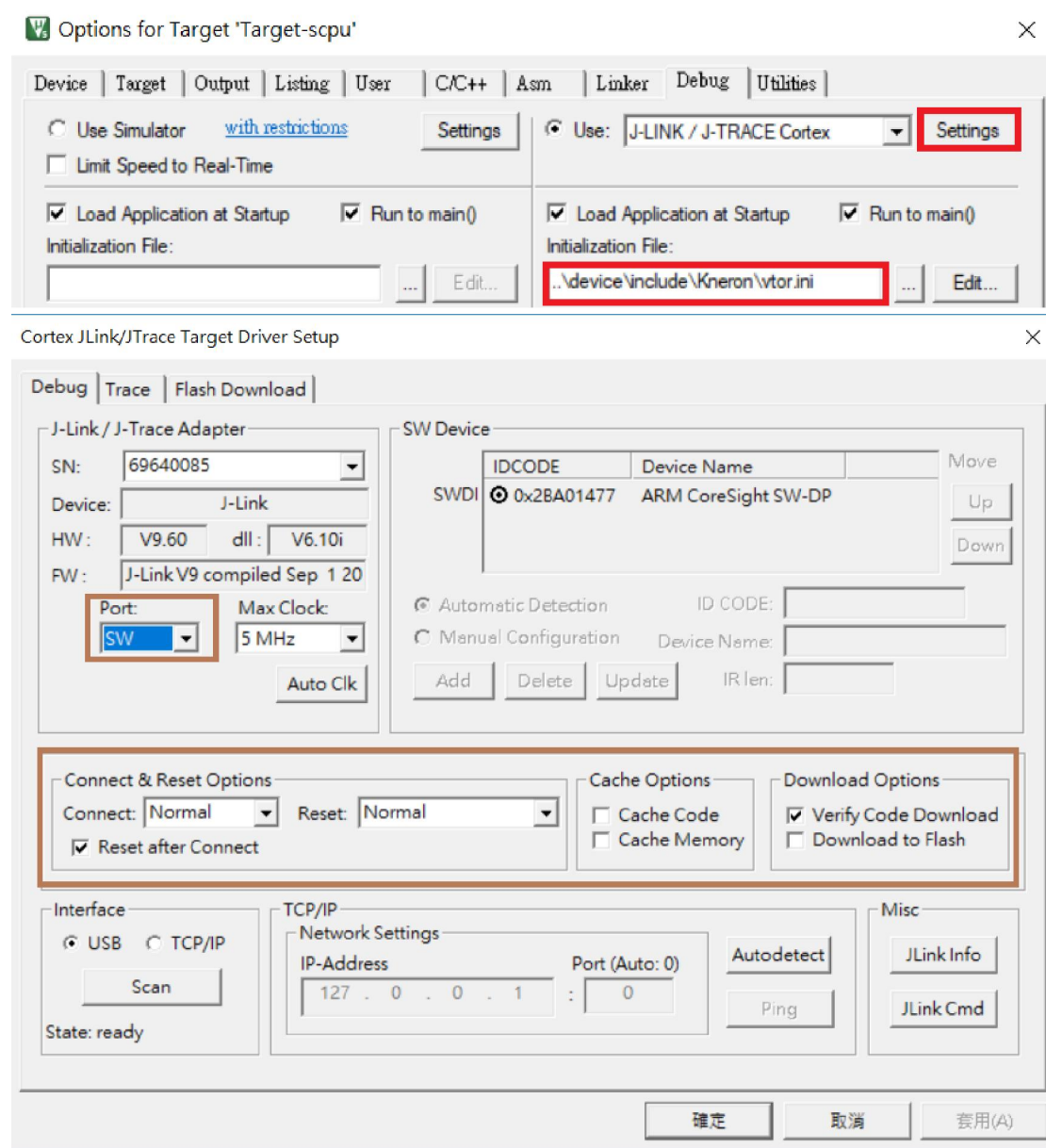
Figure, press the PTN and the message you'll see

4.2 Connecting JTAGs

Open KL520 Daisy-chain project.

On SCPU JLink Setting

Edit SCPU JTAG JLink Setting



Figure, SCPU JTAG JLink Setting