


# Kneron KL520 series AI SoC

# Development Kit (BGA159, 3.8x3.8)

# Product Information

# Revision History:

| version | description | date |
|---|---|---|
| 0.1 | Initial version | 2019/10/24 |
| | | |
| | | |



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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, 3.8x3.8).

# 2. Hardware description

## 2.1 Product SPEC

| | |
|---|---|
| **Product name** | **Kneron KL520 series AI SoC Development Kit (BGA159, 3.8x3.8)** |
| **Kneron part number** | **KP52B1330-M1** |
| **Main board dimension** | **38(L) x 38(W) x 1.6(H) mm** |
| **Working voltage** | **5V** |
| **DDR memory size** | **64MB** |
| **SPI NOR Flash size** | **32MB** |
| **Switch & button** | **PTN button x 1** |
| **Interface - Power** | **Micro USB (5V) x 1, 1.27 pin conn** |
| **Interface – Fixed I/O** | **UART x 2, micro USB (client) x 1** |
| | **1.27 x 20 conn x 2 (2-lane MIPI camera)** |
| | **1.27 x 20 conn x 1 (SPI,I2S, I2C,SDIO)** |
| | **1.27 x 10 conn x1 (5V, USB, PTN, RESET_N)** |
| **Accessory - Camera sensor** | TBD |
| **Accessory - NIR LED** | TBD |
| **Accessory - LCD Display** | TBD |

## 2.2 Inside the box

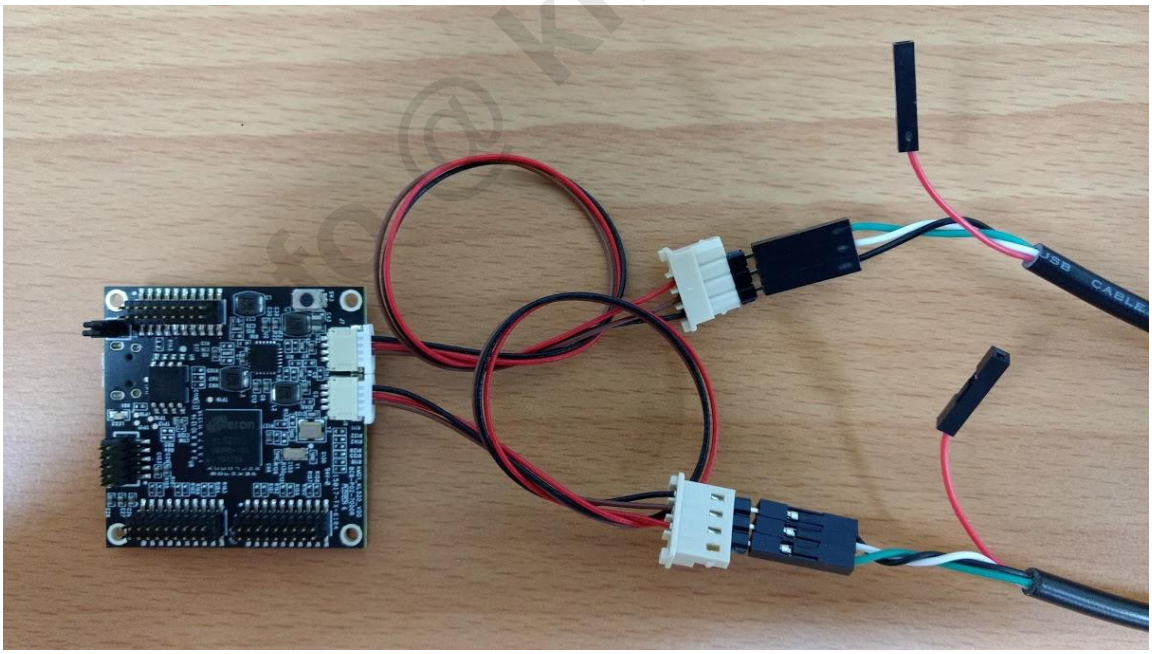
Main board x 1

UART cable (1.27 to 2.54) x 2

USB to TTL cable (3.3V) x 2

Micro USB cable x 1

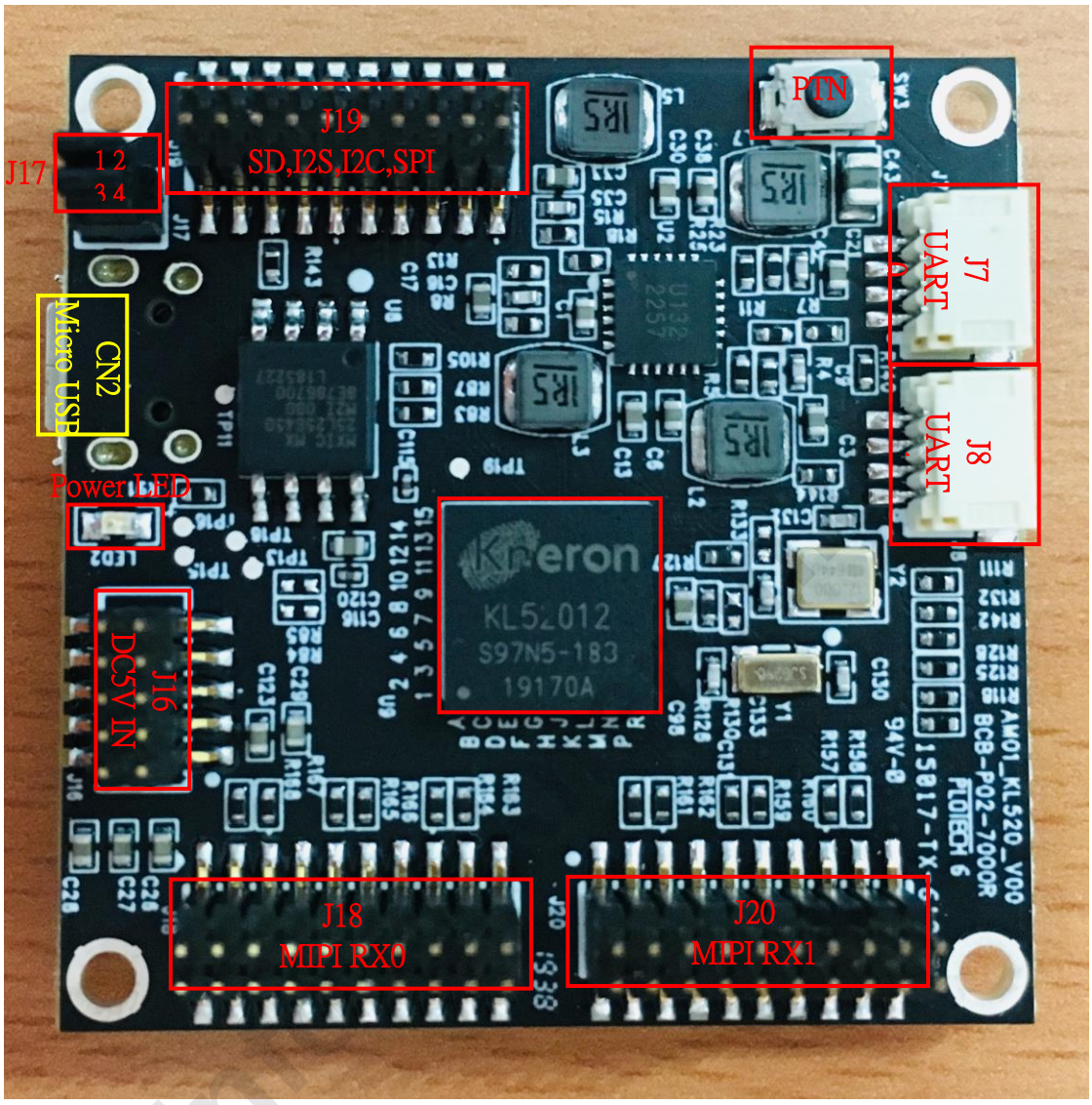

## 2.3 Assembly



## 2.4 Main board description

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

Here's the overview of how EVB looks like:




Figure, Top 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 (J16): 5V input for the development board, used a 5V/2A adaptor.
- Micro USB connector: Supply 5V input, also used the USB interface for developing.
- UART0/UART4: a connector that uses a TTL to USB cable for developing.
- PTN: a button that used to turn on the KL520.
- Micro USB connector: Supply 5V input also used it for developing.

## 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.

| KL520 pin number | Default state | EVB H/W setting |
|---|---|---|
| H14 | SPI_WP_N | SPI_WP_N |
| J11 | SPI_HOLD_N | SPI_HOLD_N |
| E11 | X_JTAG_TRST_N | X_JTAG_TRSTn, Pull Low |
| C15 | X_JTAG_TDI | X_JTAG_TDI |
| E15 | X_JTAG_SWDITMS | ***X_JTAG_TMS*** |
| F14 | X_JTAG_SWCLKTCK | ***X_JTAG_TCK*** |
| B15 | X_JTAG_TDO | X_JTAG_TDO,floating |
| B11 | X_LC_PCLK | GPIO1_CAM |
| E7 | X_LC_VS | GPIO4_CAM |
| E8 | X_LC_HS | GPIO3_CAM |
| A11 | X_LC_DE | GPIO2_CAM |
| A12 | X_LC_DATA[0] | I2S0_BCLK |
| E9 | X_LC_DATA[1] | I2S0_RCLK |
| B12 | X_LC_DATA[2] | I2S0_SDATA |
| B13 | X_LC_DATA[3] | Reserve |
| A13 | X_LC_DATA[4] | Reserve |
| B14 | X_LC_DATA[5] | Reserve |
| D14 | X_LC_DATA[6] | I2C1_CLK |
| D15 | X_LC_DATA[7] | I2C1_DATA |
| F11 | X_LC_DATA[8] | Reserve |
| E14 | X_LC_DATA[9] | Reserve |
| F15 | X_LC_DATA[10] | UART4_RX |
| H11 | X_LC_DATA[11] | UART4_TX |
| G14 | X_LC_DATA[12] | SPI1_CLK |
| G11 | X_LC_DATA[13] | SPI1_CS |
| G15 | X_LC_DATA[14] | SPI1_DI |
| H15 | X_LC_DATA[15] | SPI1_DO |
| K11 | X_SD_CLK | SD_CLK |
| J15 | X_SD_CMD | SD_CMD |
| L10 | X_SD_DAT[0] | SD_DAT[0] |
| K14 | X_SD_DAT[1] | SD_DAT[1] |
| K15 | X_SD_DAT[2] | SD_DAT[2] |
| L11 | X_SD_DAT[3] | SD_DAT[3] |
| E6 | X_UART0_RX | UART0_RX |
| B10 | X_UART0_TX | UART0_TX |
| E10 | X_I2C0_SCL | I2C0_SCL |
| A15 | X_I2C0_SDA | I2C0_SDA |
| C14 | X_PWM0 | Reserve |

Table, Development board HW setting

Boot strap setting ( J17 )

- Pin 1-2 : Boot_IPL_SEL, default short
- Pin 3-4 : Boot_SPL_SEL
  - Short: SPL is specified by UART
  - Open: SPL is located in SPI flash

# 3. Peripherals

Here list the peripherals you need for the board development.

## 3.1 5V adaptor

A 5V/2A micro USB is needed to provide the power of evaluation board. The package only have USB-A male to micro USB cable but not power adaptor

Figure, 5V/2A Micro USB cable

## 3.2 UART cable

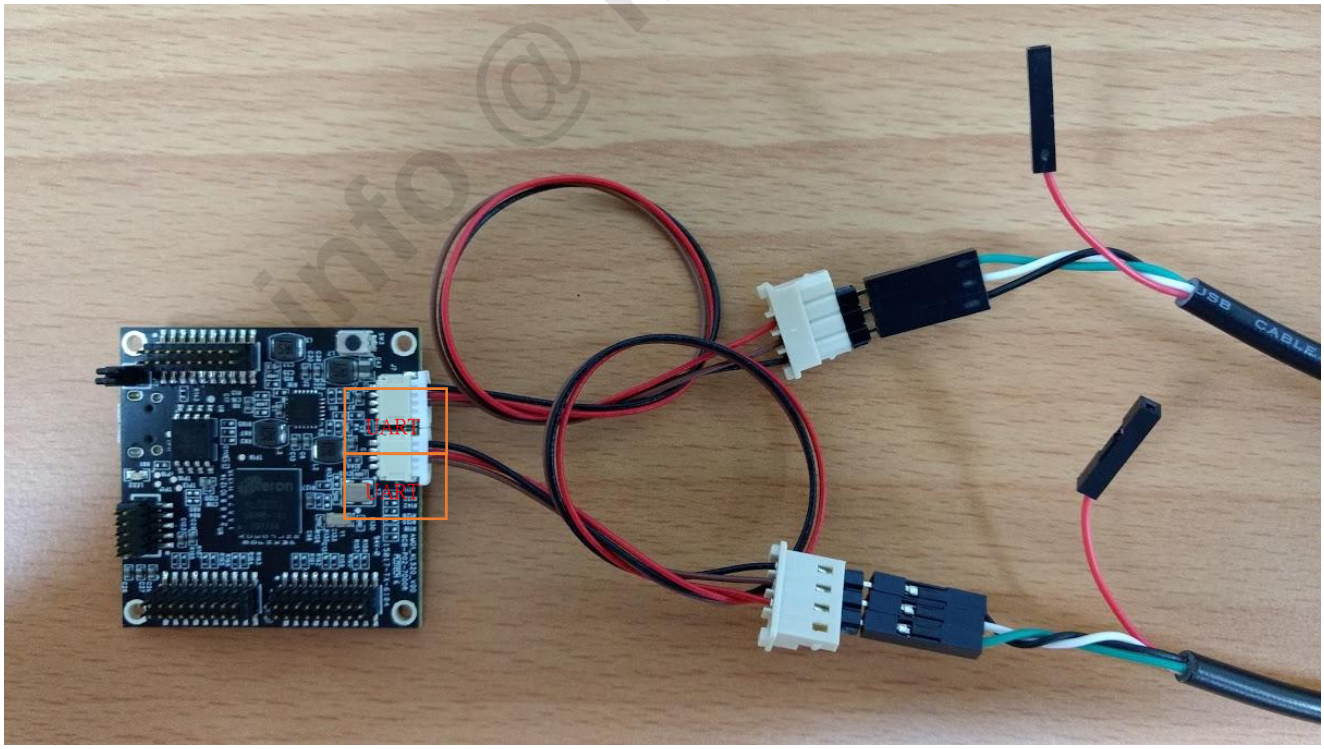
Figure, USB to TTL (3.3V) cable

## 3.3 JTAG cable (not included in Kneron shipping box)


Figure, JTAG cable

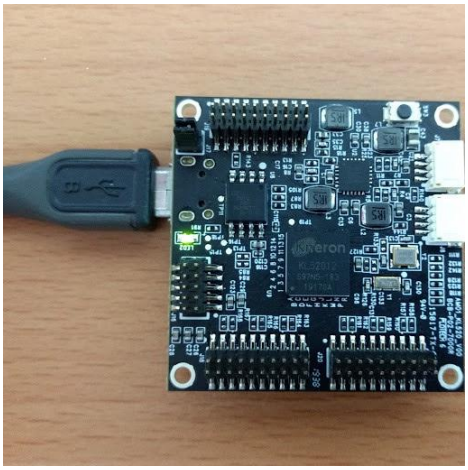
## 3.4 Connecting UART

Please connect the TX, RX and GND signal of UART cable to evaluation board as shown below.




Figure, UART0 and UART4 connection

## 3.5 Connecting 5V Power

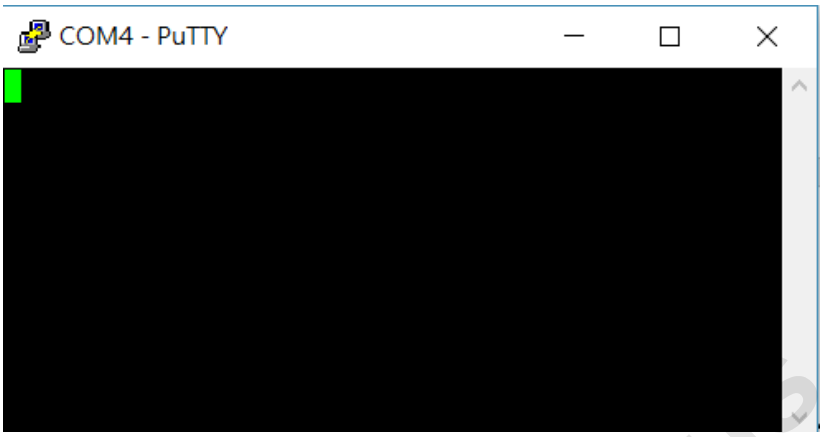


Figure, connecting 5V power

# 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. Plug Micro USB then power on.

Figure, turn on power switch

3. Wake up chip from RTC power domain.

   You will see boot message when you press PTN button

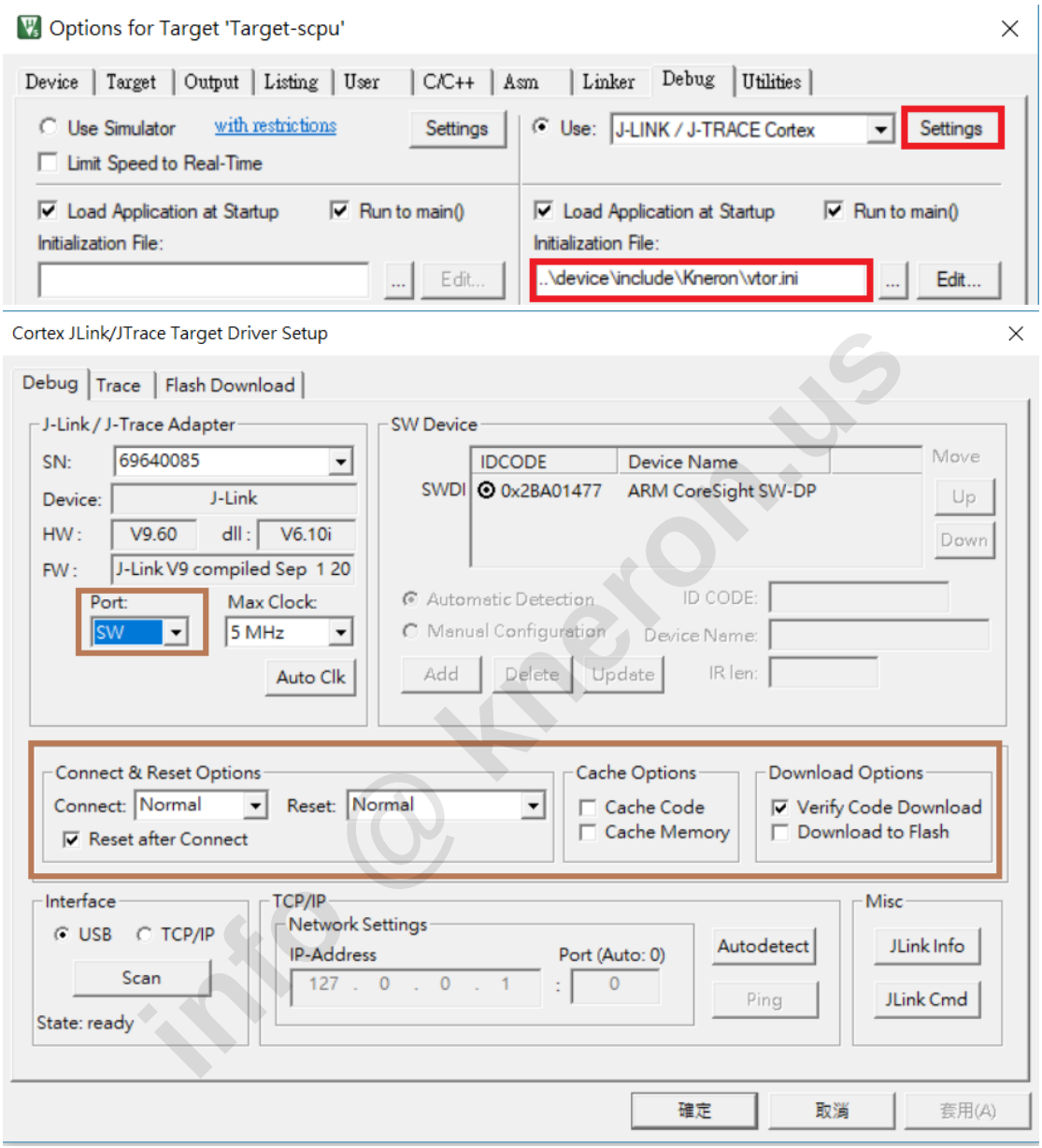

Figure, press the PTN and the message you'll see

## 4.2 Connecting JTAGs

Open KL520 Daisy-chain project.

**On SCPU JLink Setting**

Edit SCPU JTAG JLink Setting




Figure, SCPU JTAG JLink Setting