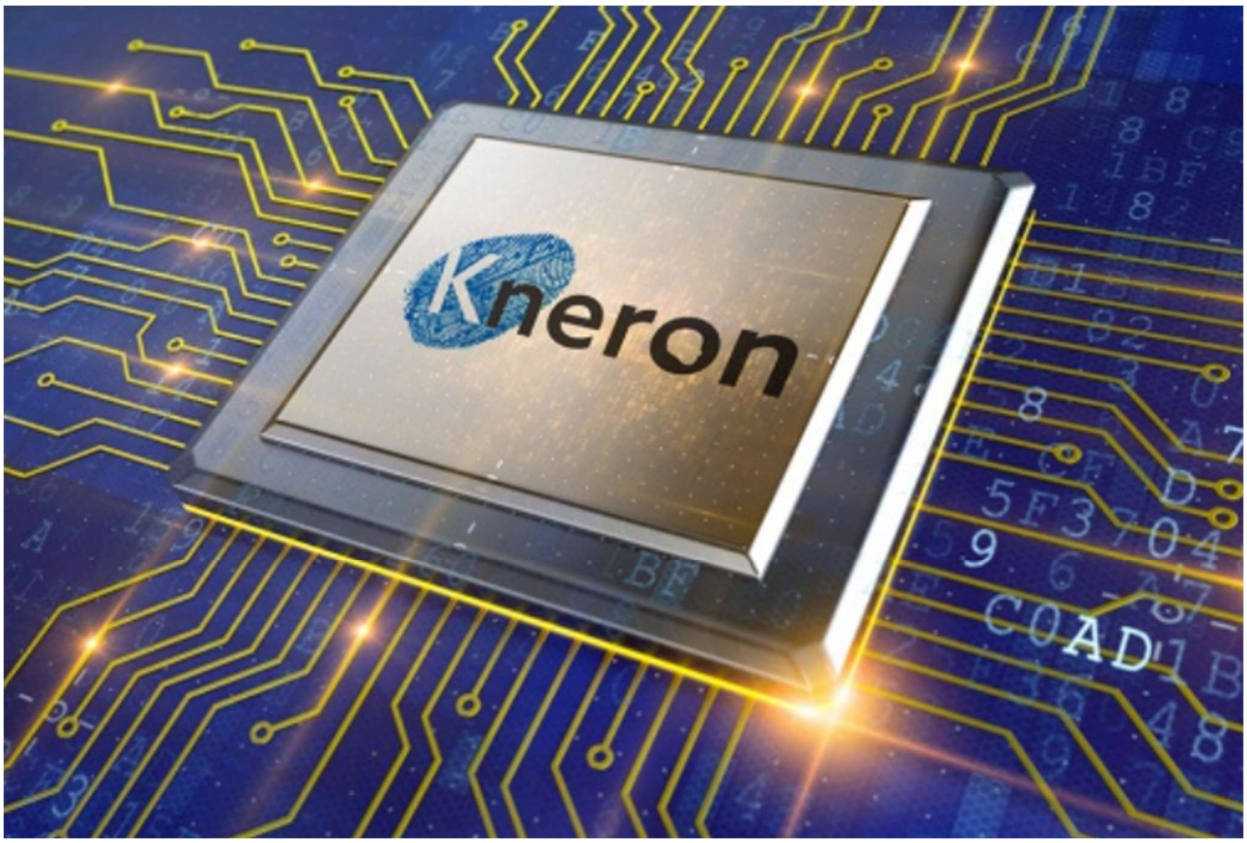

Kneron KL520 LW3D Pro AI Module

Product Information

Revision History:

version	description	date
0.1	Initial version	2021/01/06

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1. Overview

1.1 General description

The KL520 processor is an AI dedicated processor specially designed for terminal equipment. It has low power consumption and small size. It provides powerful computing power and excellent performance per watt. It can be used in smart homes with high power and space requirements, smart security, smart phones and wearable devices.

This document describes how to use the KL520 AI module.

1.2 SOC Structure

1. Dual cortex M4(200MHz for sys & 250MHz for AI)
2. 512 KB SRAM
3. 32MB / 64MB DRAM
4. Process: 40nm
5. Die size: 4000 x 4000
6. Power: 500mW

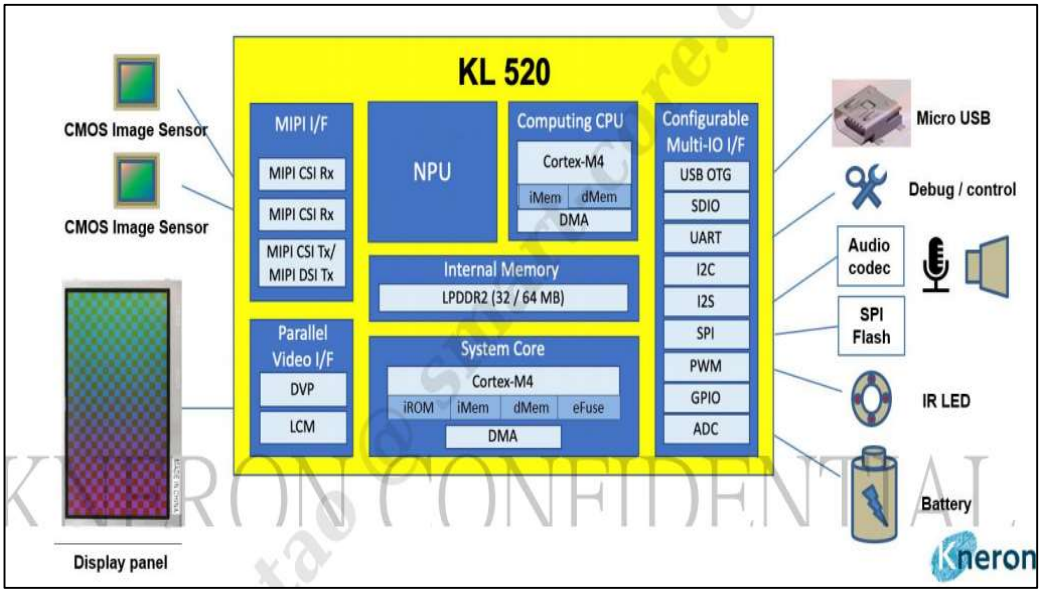

Figure Block diagram

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1.3 Application field

1.3.1 3D perception (with third-party 3D camera module)

Features:

1. Body/gesture/object detection
2. Distance / depth recognition
3. 3D face recognition
4. Living body detection

Application areas: smart phones, smart door locks, IoT devices

1.3.2 Low-cost 3D face recognition solution (with mainstream RGB + NIR camera)

Features:

1. Face detection
2. 3D face recognition
3. Living body detection

Application field: smart door lock/access control/smart phone

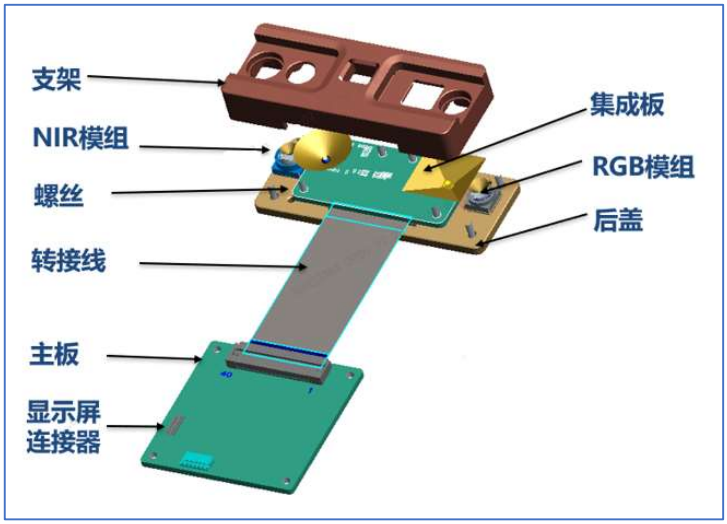
2. Hardware description

2.1 Product SPEC

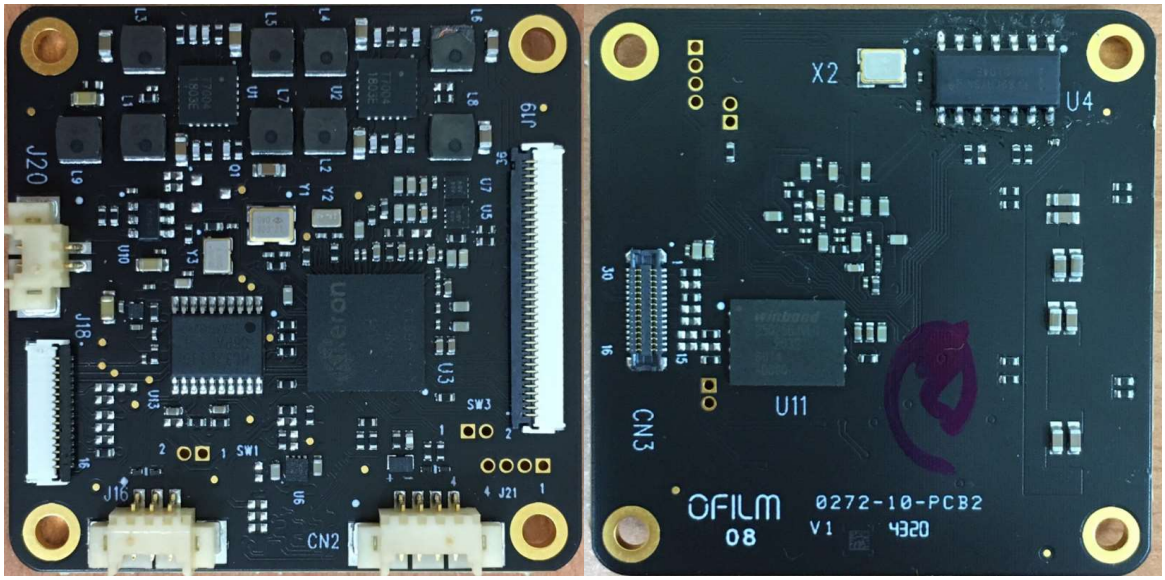
Product name	**KNERON KL520 AI module**
Main board dimension	**40(L) x 40(W) x 1.47(H) mm**
Working voltage	**5V**
Power off current	**< 10uA, in RTC mode**
DDR memory size	**64MB**
SPI NOR Flash size	**32MB (W25Q256JVEIQ)**
Interface - Power	**Adapter output 5V**
Interface – Fixed I/O	**UART x 2, micro USB (client) x 1**
	ZIF x 40 conn x 1 (2-lane MIPI camera)
	ZIF x 12 conn x 1 (SPI, RESET, PTN, X_PSW_DFLT, UART0, GPIO)
	B2B 15x2 conn x1 (LCM)
Accessory - Camera sensor	**NIR: TF1T09A** **RGB: TF2G17A**
Accessory - NIR LED	**FM-C3535F9C**
Accessory - LCD Display	**R280112T01**

2.2 Assembly

2.2.1 Camera module

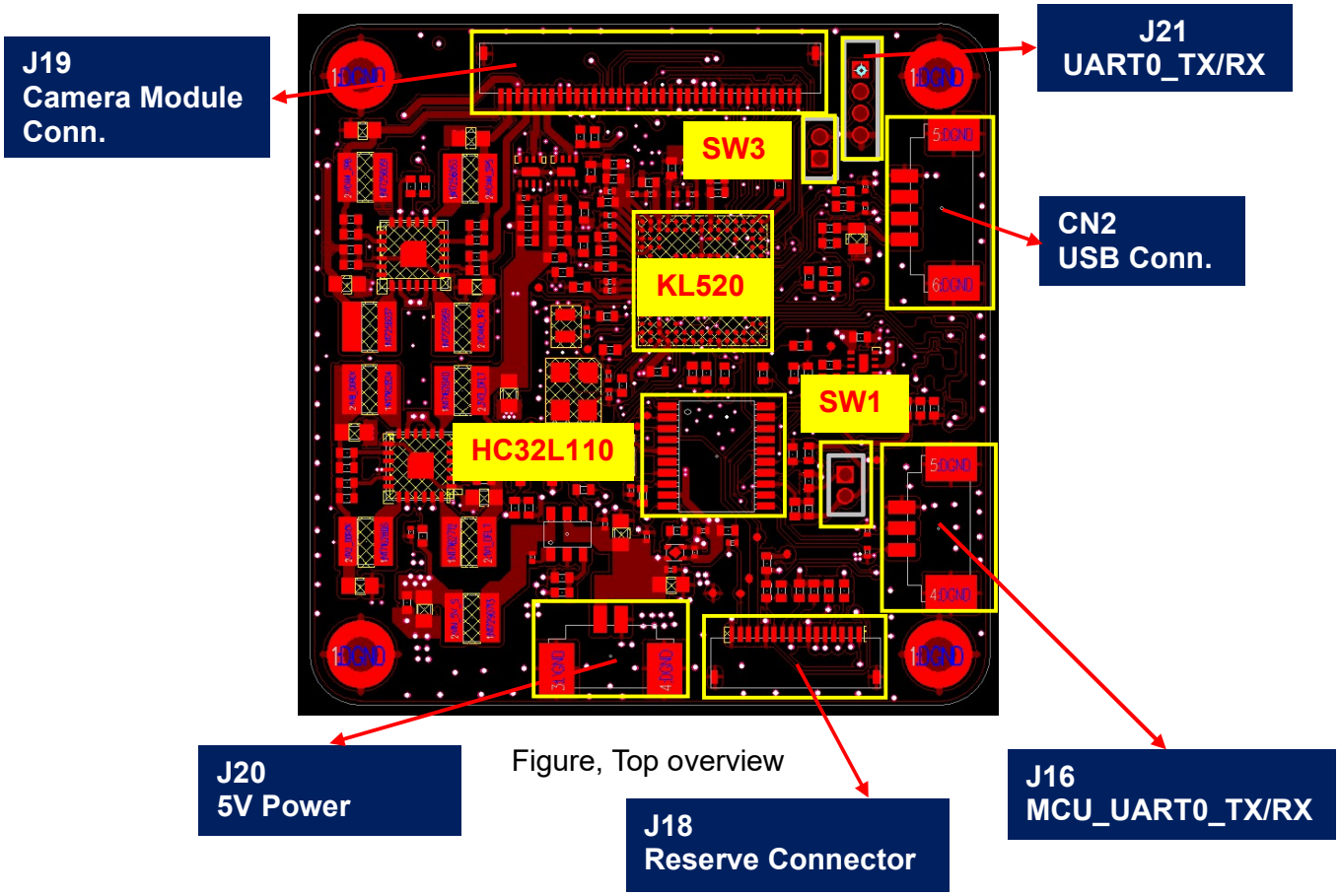


2.2.2 Main board

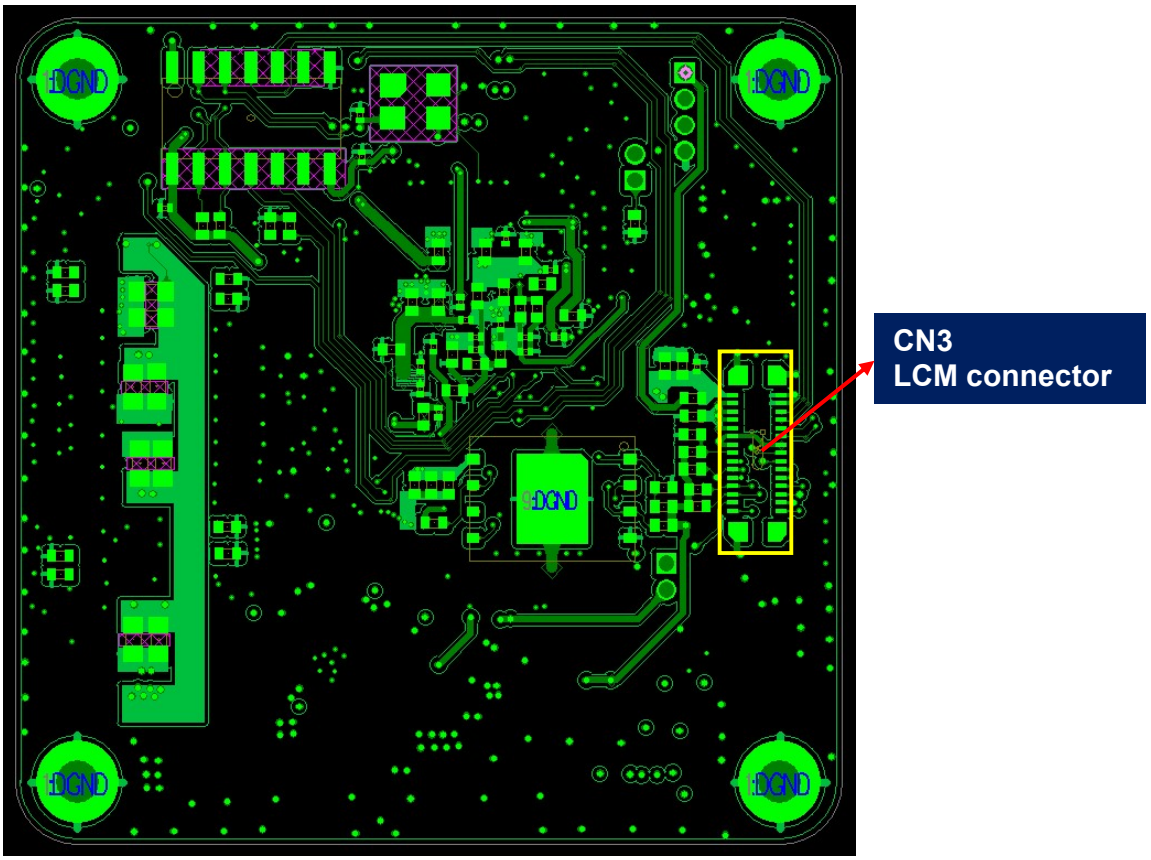


2.3 Main board description

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



Figure, Top overview



Figure, Bottom overview

The major component you must know before you start your design:

- KL520: AI SoC.
- HC32L110: Micro controller unit (Cortex M0)
- 5V Power (J20): 5V input for the development board, used a 5V/2A adaptor.
- Micro USB connector (CN2): Transfer images to KL520 for development. Should be changed to standard Micro USB connector
- UART0_TX/RX (J21): A connector that uses a TTL to USB cable for development.
- Camera module connector (J19): Connect to camera module
- LCM connector (CN3): Connector to LCM
- Reserve connector (J18): It contain the SWD, reserve SPI and control signal
  - SWD: FW download for KL520
  - Reserve SPI: host or peripherals can use SPI to communication with KL520
  - Control signal pin: used for power on/off sequence when we don't use HC32L110
- SW3: Decide the boot mode. If SW3 is short, the system will boot from menu. If SW3 is open, the system will boot from SPI.
- SW1: System wake up pin. It will be controlled by the host normally.

3. Does the system include HC32L110?

We can design circuits in two different ways. One contains HC32L110 and the other does not contain HC32L110. Customers can decide which structure to use according to the number of GPIOs in the host and system application. HC32L110 makes the system design more flexible.

If we don't use the HC32L110 we still reserve the related control signal pins in connector.

3.1 KL520 system does not include HC32L110

See the Figure 1, the host connect to the KL520 through the UART and control signal pins such as X_PTN, X_RESET_N, X_PSW_DFLT and PMIC_PWR_EN. Host need number of control I/Os to finish the power on/off sequence of the KL520. This structure will increase the number of GPIOs of the host, but can reduce the cost.

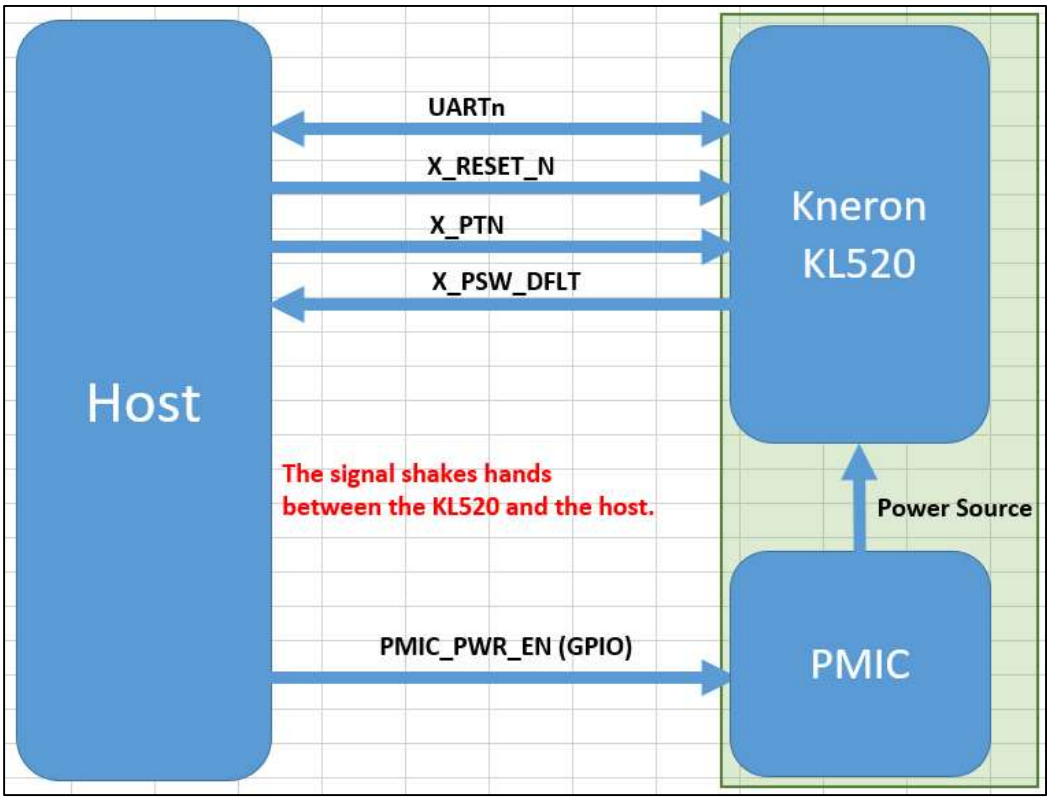


Figure 1

3.2 KL520 system includes HC32L110

See the figure 2. The host connect to the system through the UART only. HC32L110 likes a bridge between the host and KL520. It will help to finish the power on/off sequence of the KL520 and reduce the number of control I/Os of the host.

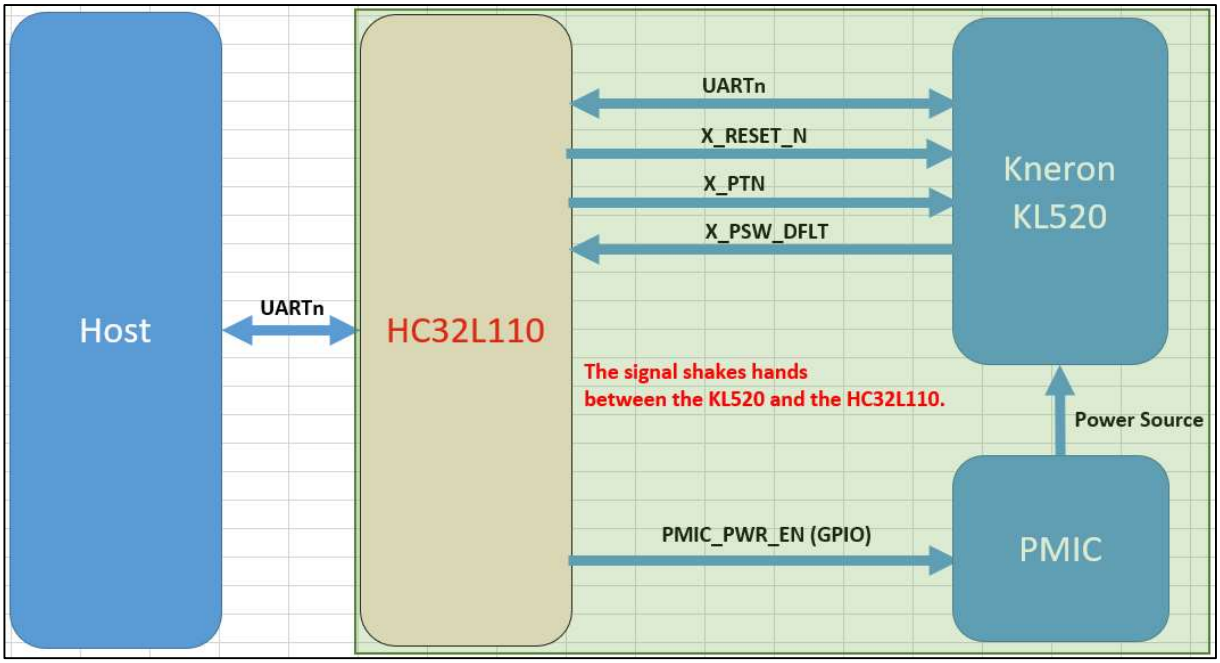


Figure 2