

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

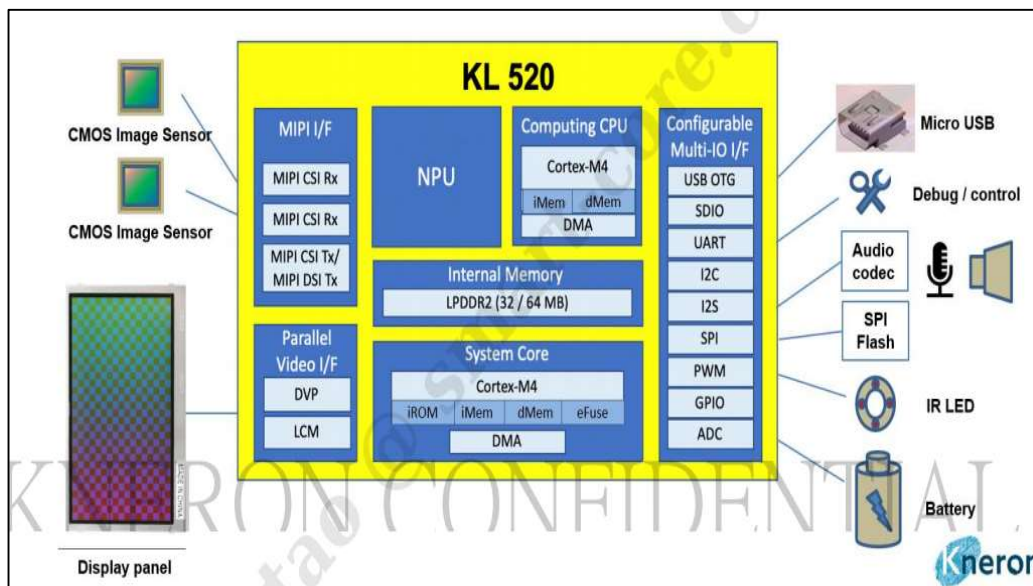


Figure Block diagram

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

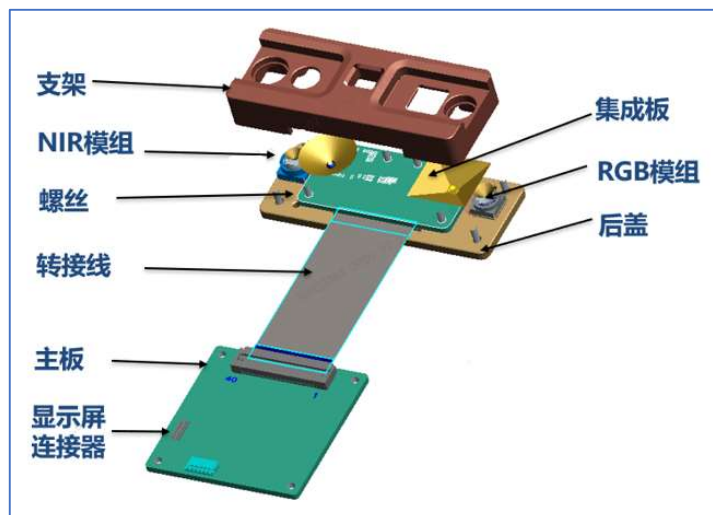
2. Hardware description

2.1 Product SPEC

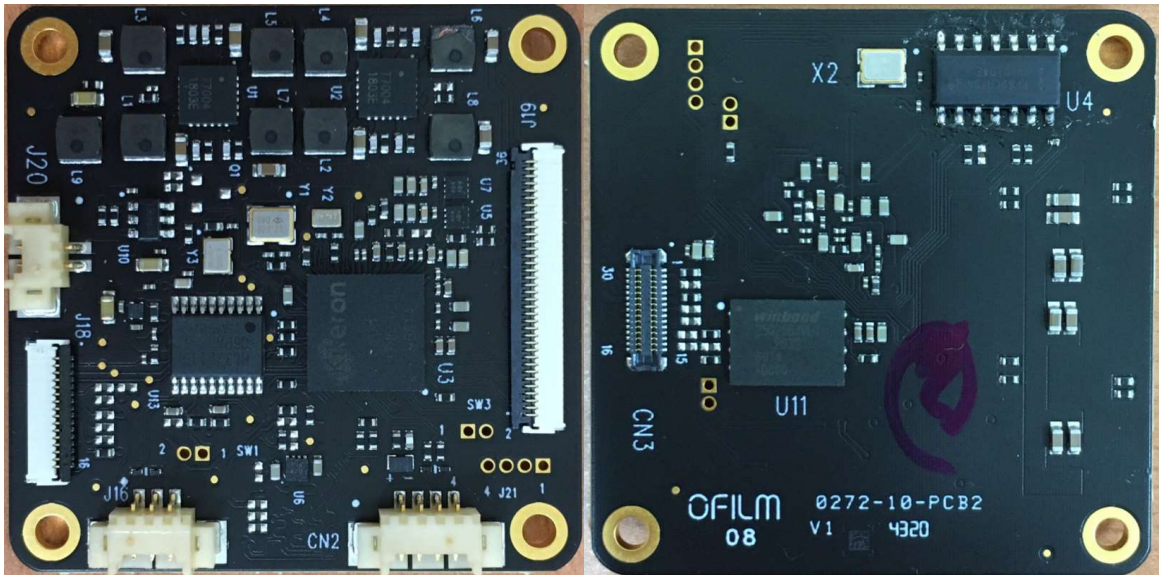
Product name	KNERON KL520 AI module
Main board dimension	40(L) x 40(W) x 1.47(H) mm
Working voltage	5V
Power off current	< 10uA, in RTC mode
DDR memory size	64MB
SPI NOR Flash size	32MB (W25Q256JVEIQ)
Interface - Power	Adapter output 5V
Interface – Fixed I/O	UART x 2, micro USB (client) x 1
	ZIF x 40 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

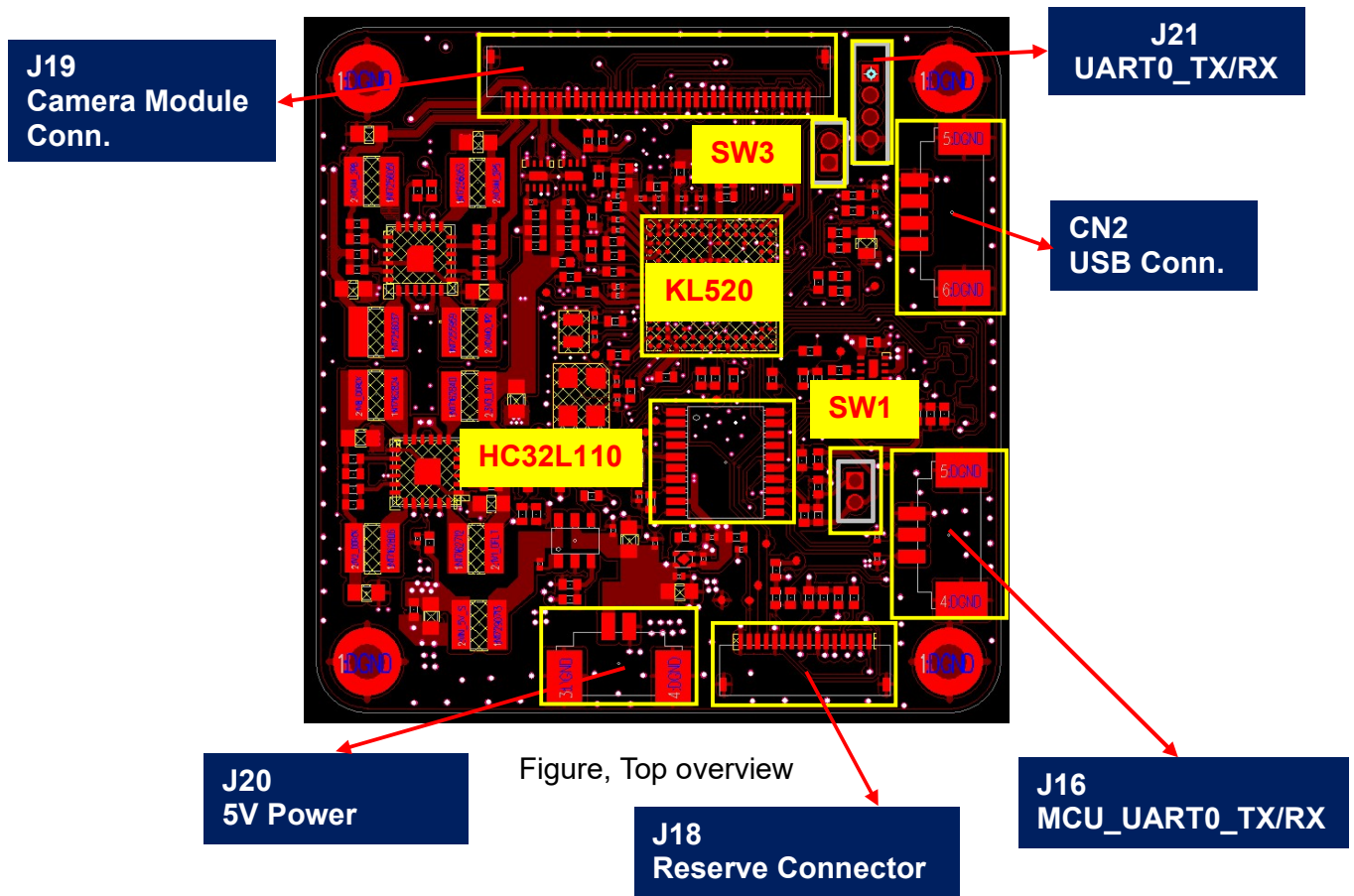


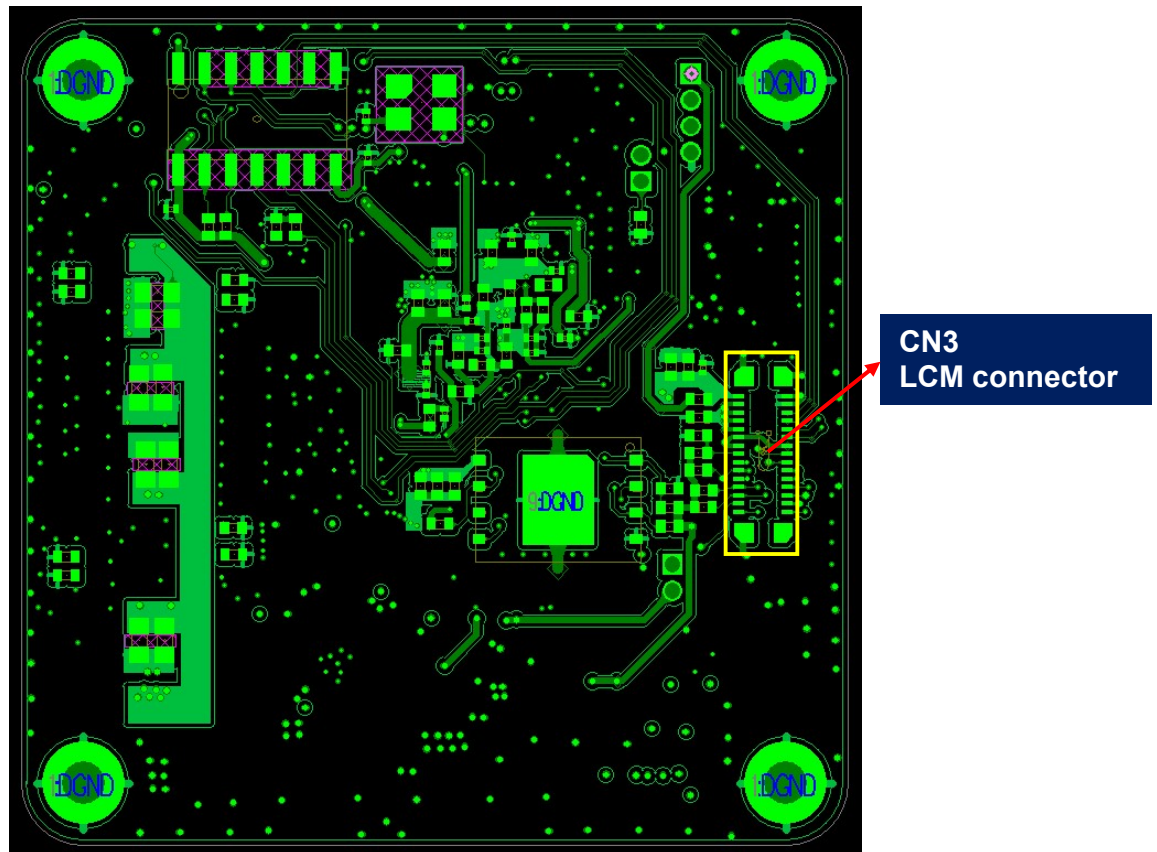
2.2.2 Main board



2.3 Main board description

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





Figure, 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.

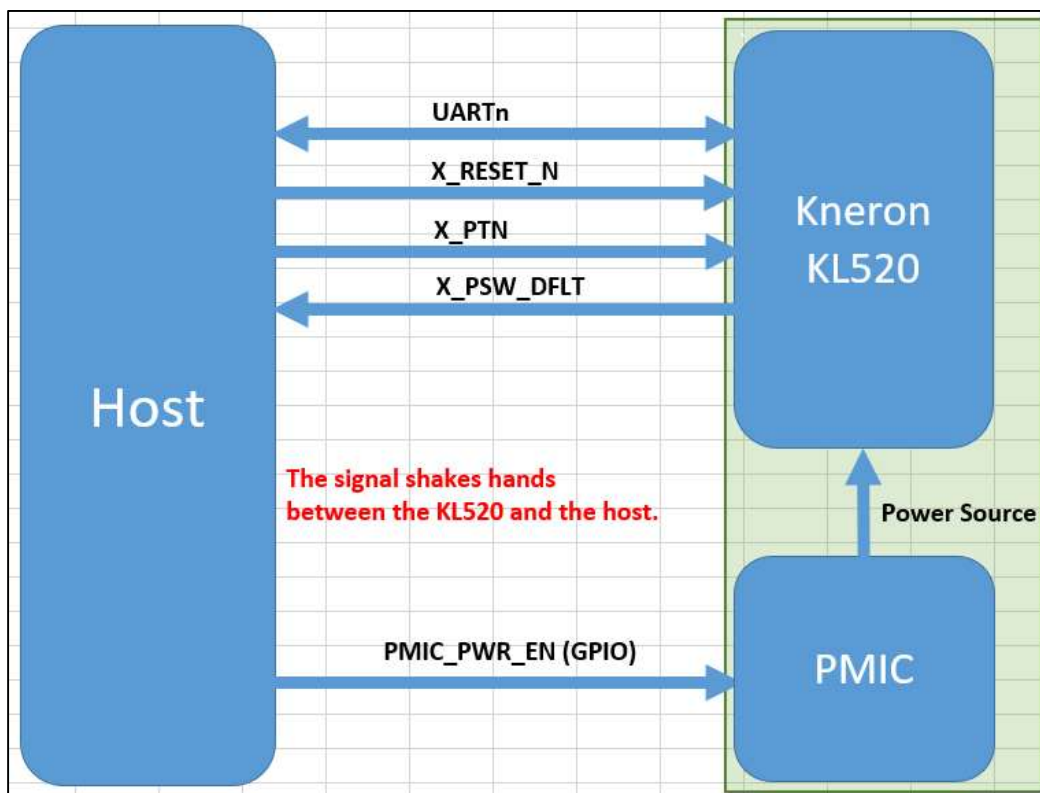


Figure 1

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.

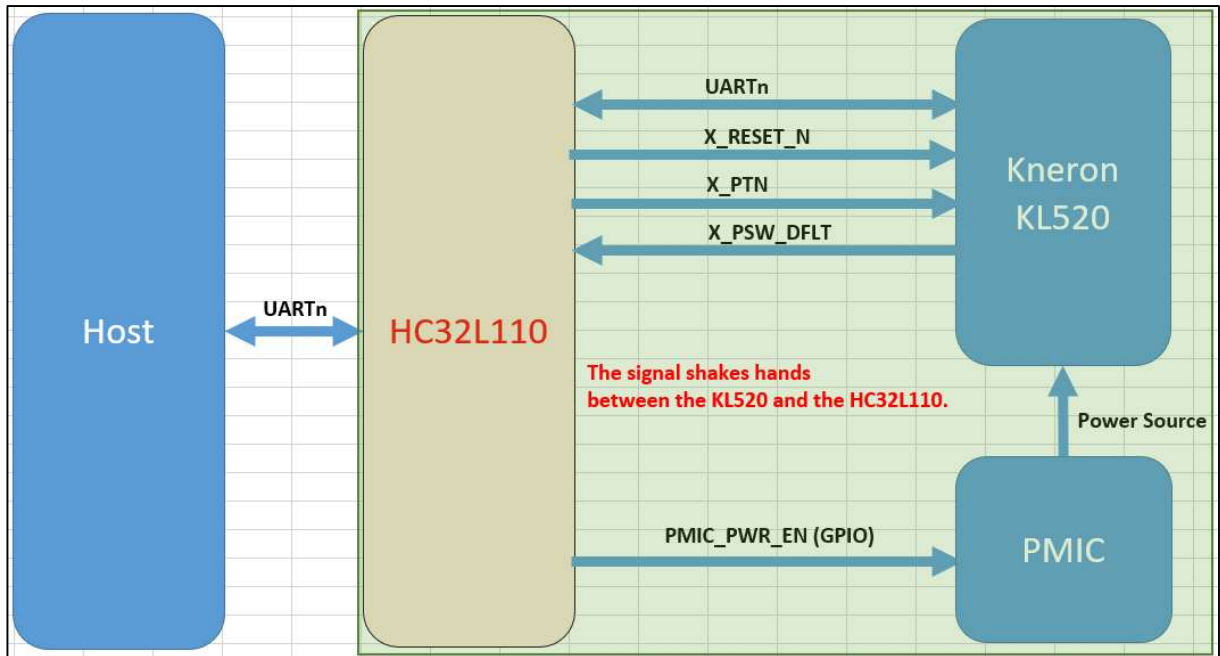


Figure 2

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