

User Manual

SKA2P1 – 60G mmW RF stamp hole module

1. Overview

This document guides users how to use the SKA2P1 modules. SKA2P1 is a RF stamp hole modules with one patch antenna. SKA2P1 need to be used in pairs. The module has a built-in PCB antenna. The pair of modules can transmit data at a rate of 6Gbps over a distance of a few centimeters in a non-contact manner. SKA2P1 provides a new scheme for short distance high speed communication.

2. Block

The following figure shows the block diagram and main functions of SKA2P1 module.

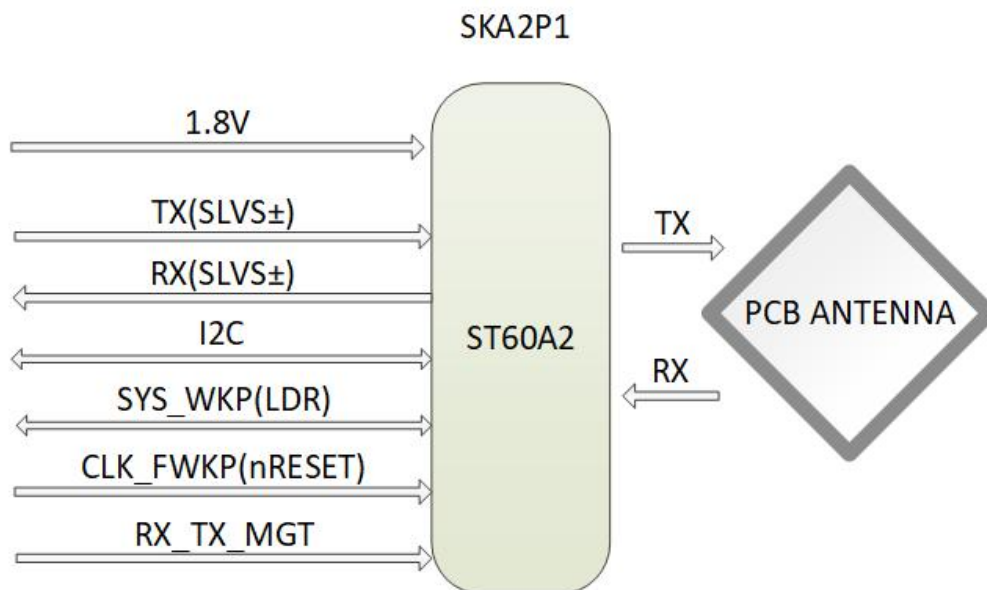


Figure 1. Internal block diagram of SKA2P1

3. Interface application

Pin distribution

The following figure shows the pin assignment position of the SKA2P1 module.

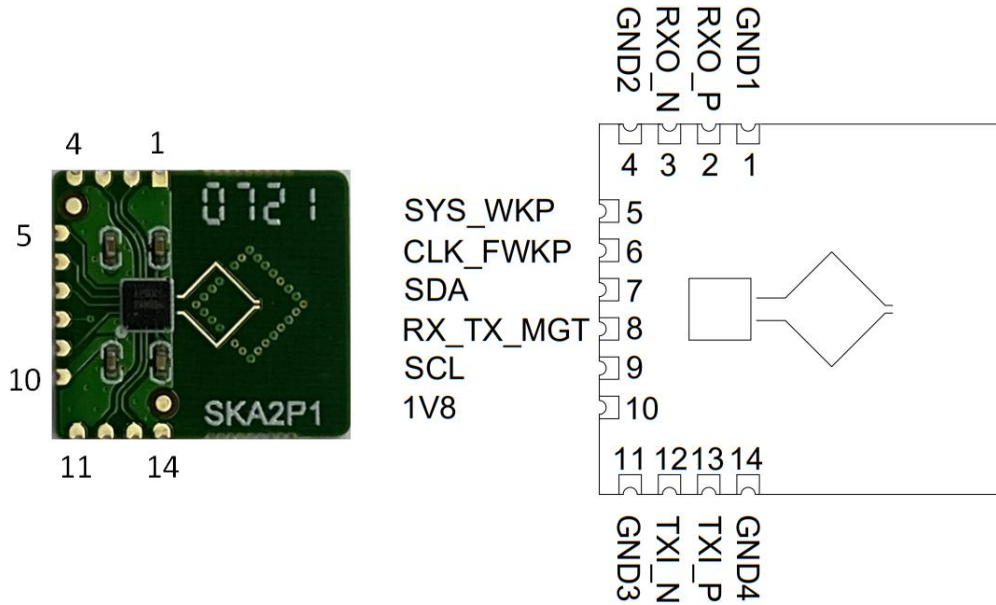


Figure 2. Physical picture & Pin distribution diagram of SKA2P1

Pin definition

| Pin Number | Signal Name | Description |
|------------|-------------|---|
| 1 | GND1 | Ground |
| 2 | RXO_P | SERDES data for reception from the air |
| 3 | RXO_N | |
| 4 | GND2 | Ground |
| 5 | SYS_WKP | LDR data in/out, Boot Strap pin, 1.8V level |
| 6 | CLK_FWKP | Reset signal, low active, Keep low at least 10ms after 1.8V stabilization |
| 7 | SDA | SDA of I2C, Boot Strap pin |
| 8 | RX_TX_MGT | High for TX, Low for RX, 1.8V level |
| 9 | SCL | SCL of I2C, Boot Strap pin, 1.8V level |
| 10 | 1V8 | Power supply, 1.8V |
| 11 | GND3 | Ground |
| 12 | TXI_N | SERDES data for transmission the air |
| 13 | TXI_P | |
| 14 | GND4 | Ground |

4. Connection method

Single pair of SKA2P1 modules is half-duplex communication. But you can achieve simplex, half-duplex, and full-duplex communication with SKA2P1 in different connection modes.

Simplex :

If you only need simplex communication, you can only connect a pair of

differential signal lines of RX or TX. Please pay attention to choose the correct RX_TX_MGT configuration, High for TX and Low for RX.

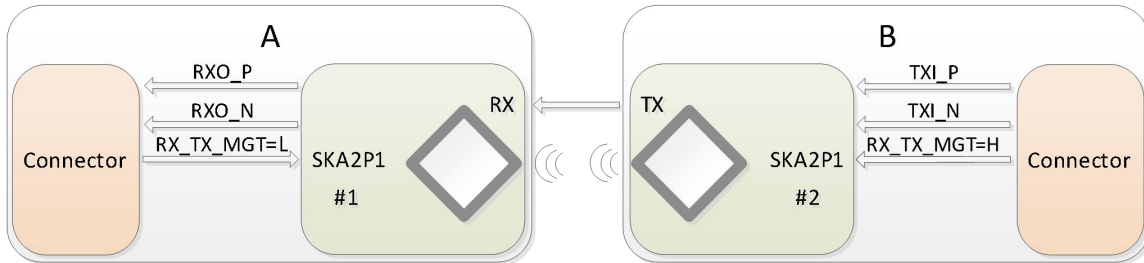


Figure 3. Connection Schematic diagram of using SKA2P1 for simplex communication

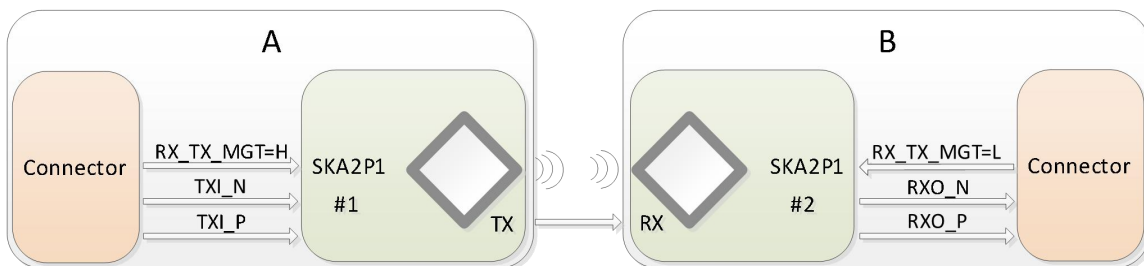


Figure 4. Connection Schematic diagram of using SKA2P1 for simplex communication

Half Duplex :

Single pair of SKA2P1 can also achieve half duplex communication. You need to connect the differential signal lines of Rx and TX. And also, you need to change the state of RX_TX_MGT according to the direction of the signal.

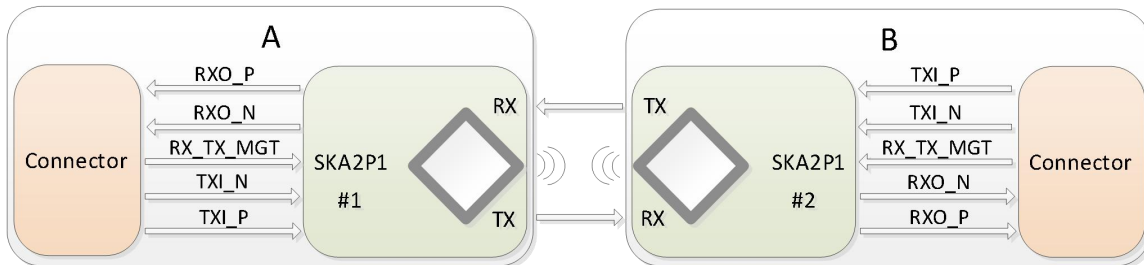


Figure 5. Connection Schematic diagram of using SKA2P1 for half duplex communication

Full duplex :

If you want to achieve full duplex communication, you can connect two pairs of SKA2P1 modules for simplex communication. The communication directions of the two pairs of modules are opposite.

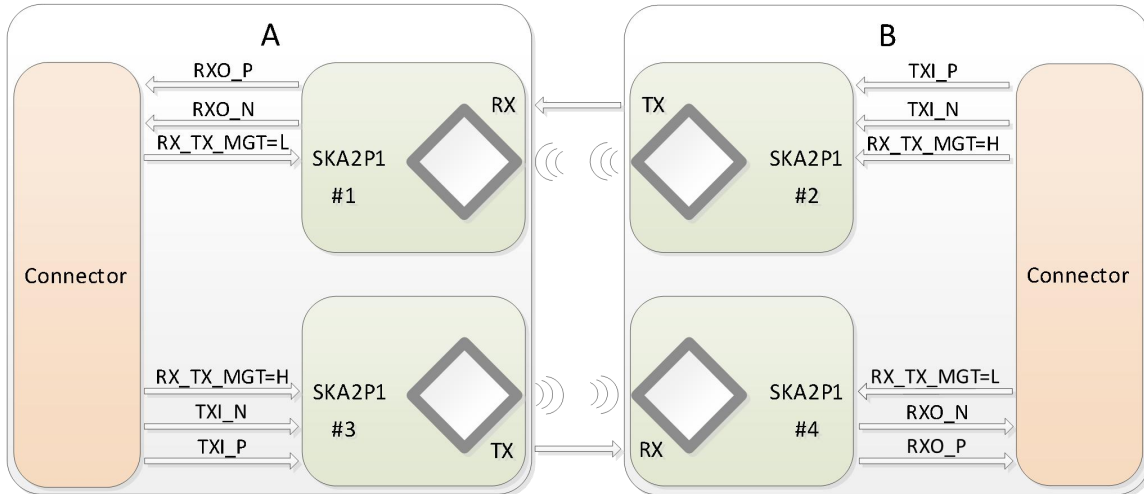


Figure 6. Connection Schematic diagram of using SKA2P1 for full duplex communication

5. Mode configuration

Different rate mode configurations can be selected according to different scene requirements. The mode configuration table is as follows.

| SCL | SDA | SYS_WKP | Mode | Date Rate |
|-----|------------|------------|-----------|--------------------|
| 0 | 0 | Don't care | HW forced | LDR-SE |
| 0 | 1 | 1 | HW forced | FDR-DIFF |
| 0 | 1 | 0 | HW forced | HDR DIFF |
| 1 | Don't care | Don't care | I2C | All rates possible |

LDR: low Date Rate - Single Ended, from 1Mbit/s to 100Mbit/s, with input/output on SYS_WKP digital pin;

FDR: Full Date Rate - Differential, from 1Mbit/s up to 5Gbit/s with input/output on differential SLVS pair.

HDR: High Date Rate - Differential, from 500Mbit/s up to 6Gbit/s, with signal input/output on different SLVS pair.

For example, serial port applications can choose LDR mode, SYS-WKP Pin transmits serial port data. If you choose HDR or FDR mode, you can use SKA2P1 to transmits Gigabit Ethernet signals.

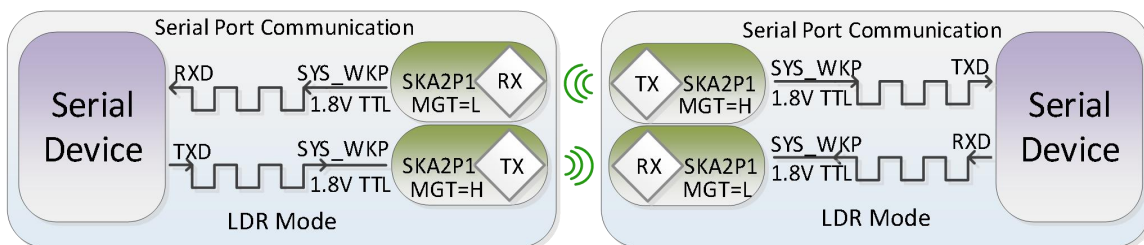


Figure 7. LDR mode application - serial port communication

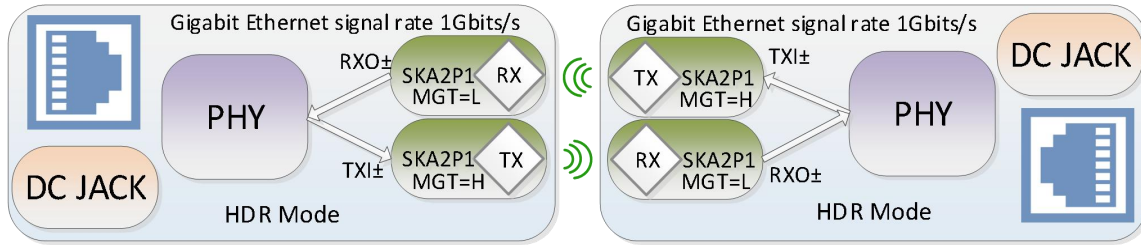


Figure 8. HDR mode application - Contactless Gigabit Ethernet communication

6. Environment constraints

For the RF waves to propagate correctly from one module to the other, care must be taken not to introduce any metallic obstacle in a PCB Keep Out Area(PKOA), in green on the figures below. This PKOA is a parallelepiped of 16 mm width and 28mm length. The height being the distance between the antennae, usually 20 mm. The elements present in this area may have an impact on the millimeter waves propagation.

In case an electronic component, a metal part, a fastener, a screw, some metal paint or any sort of reflective surface resides in this volume, its impact must be analyzed.

The modules are designed to be soldered onto PCB master plates. When the module is soldered on the PCB mother board, the antenna side must face up and the chip side face down. The area of the PCB master soldering module is the PCB Cut Out Area, in red on the figures below.

In order to ensure the signal quality, the distance between the module antennas should be less than 15mm.

This is summarized in the figure below:

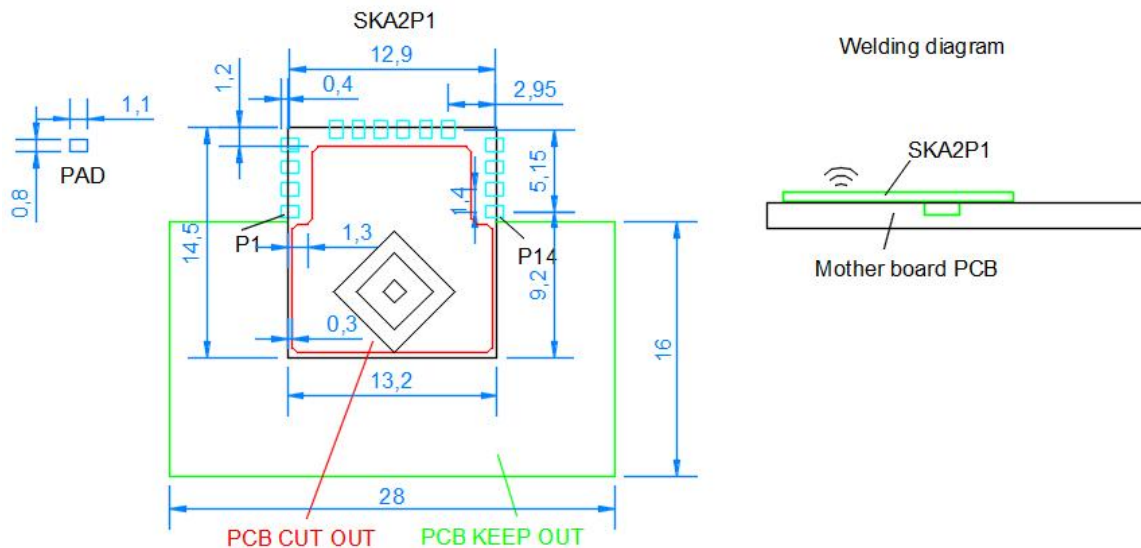


Figure 9. PCB cut out & PCB keep out & Welding diagram (Unit: mm)

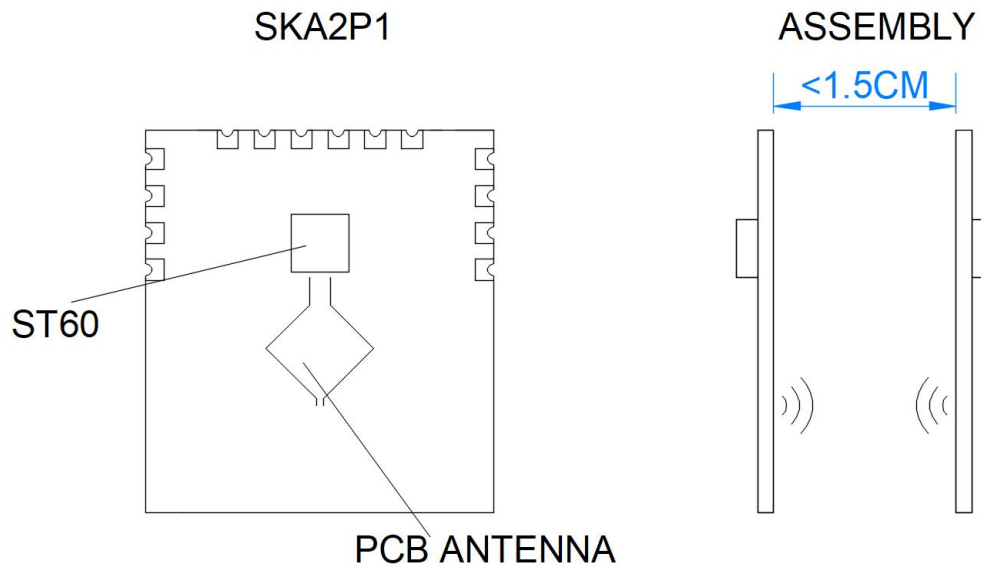


Figure 10. Installation distance (Unit: mm)

7. Characteristics

Recommended operating conditions and electrical characteristics

| Symbol | Description | Minimum | Typical | Maximum | Unit |
|------------|-------------------------------|---------|---------|---------|----------|
| V_{IN} | Power supply | 1.7 | 1.8 | 1.98 | V |
| C_{IN} | Input current(*) | - | 30 | - | mA |
| P | Total Power consumption | - | 0.054 | - | W |
| T_A | Ambient Operating Temperature | -20 | - | 85 | °C |
| T_J | Maximum Junction Temperature | - | - | 125 | °C |
| T_{STG} | Storage Temperature | -40 | | 105 | °C |
| V_{IH} | High level input voltage | 1.2 | 1.3 | | V |
| V_{OH} | High level output voltage | 1.6 | | | V |
| V_{IL} | Low level input voltage | | 0.5 | 0.6 | V |
| V_{OL} | Low level output voltage | | | 0.2 | V |
| RX_IN_N/P | SLVS common mode level | 80 | 200 | 300 | mV |
| | Output differential impedance | | 100 | | Ω |
| TX_OUT_N/P | SLVS common mode level | 100 | 200 | 300 | mV |
| | Output differential impedance | 87 | 92 | 97 | Ω |
| Fosc | Carrier Frequency | 60.3 | 60.4 | 60.5 | GHz |

* when the module is transceiving at 5Gbps .

IMPORTANT:

The SKA2P1 module is a low-power product based on 60G millimeter wave communication. It is very sensitive to its application environment. Customers must confirm with the supplier whether the installation environment is suitable

Revision History

| Date | Version | Changes |
|-------------|---------|----------------------------------|
| Jun 02 2023 | 1.0 | Fixed block diagram naming error |
| Apr 20 2021 | 0.9 | First Draft |