
GWK5Mx 2.4GHz Wireless Audio Module

1. General Description

GWK5Mx is the module version of Gigawit GWK5 family wireless digital audio products. GWK5MO is 0dBm and GWK5MP is 18dBm, it can be easily integrate into the audio system to add the wireless audio functions.

Inheriting from its GWK5 family, GWK5Mx features both good wireless performance and audio performance. GWK5Mx has good RF co-existence and robust link quality, can combat the most interference from the crowded 2.4G ISM band. GWK5Mx uses non-compression PCM signal thus delivering very low THD audio. By adopting advance forward error correction and error concealment algorithm, GWK5Mx can reach <15ms latency, this makes it ideal for the Video synchronization, Home Theater applications.

GWK5Mx's built-in high-speed 32bit processor also offers some added value functions such as Volume, Treble/Bass, Balance, 2-way Remote control and etc. It will help customers to reduce the total system cost.

2. Applications

- 5.1 Speakers
- Headphones
- Surround Speakers
- Microphones
- CD Player, DVD Player
- Stereo Audio Dongles

3. Features

- Small RF foot-print (2MHz bandwidth) and frequency agility scheme enables better 2.4GHz co-existence
- Antenna diversity, forward error correction and error concealment for robust audio link
- None-compression wireless audio transmission with very low THD
- <15ms low latency, ideal for video synchronization applications
- Low Power Consumption (GWK5MO and Codec Not Included): 40mA @3.3V for ATX and ARX
- 10+m RF indoor range
- 1 audio transmitter supports 4 receivers
- Dedicated 2-way logical data channel for remote control
- I2S digital audio interface supports 32 / 44.1 / 48 KHz sample rate
- Supports 2.1 Channel and 96 /192 KHz sample rate by a low-cost sample rate converter
- Power management functions for battery powered applications
- Auto muting function when suffering interference or at poor receiving conditions
- Built-in Treble/Bass, Volume, Balance Control
- Flexible design, custom functions supported

4. GWK5Mx Form Factor

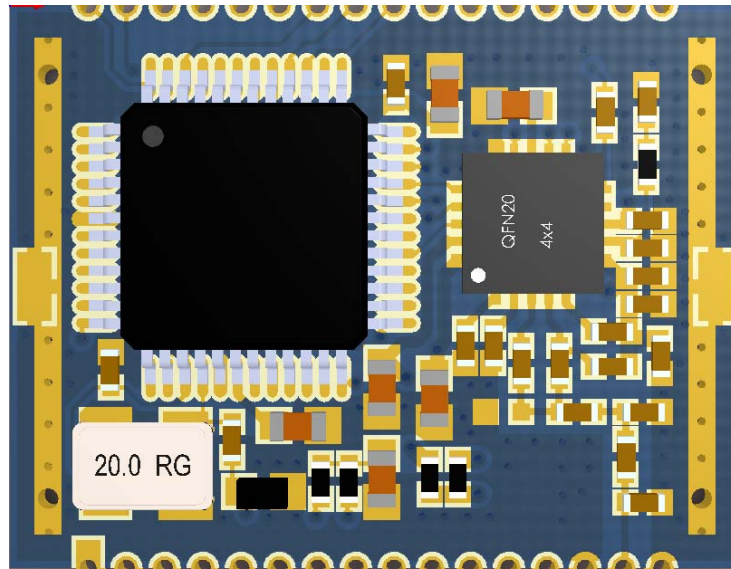


Figure [1]: GWK5MO

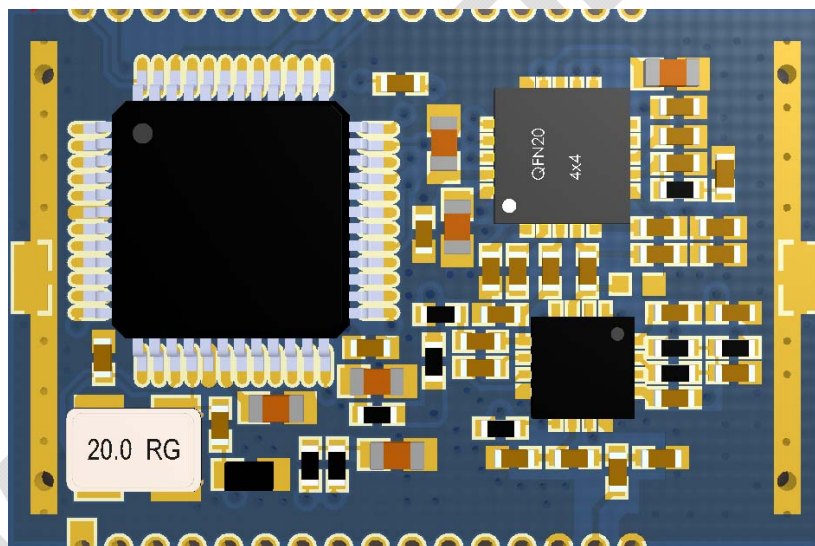


Figure [2]: GWK5MP

5. Block Diagram

There are 2 RF power versions for GWK5Mx: GWK5MO and GWK5MP. GWK5MO is 0dBm and GWK5MP is 18dBm for extended range. GWK5Mx incorporates most of the components and made it a plug and play solution for wireless digital audio.

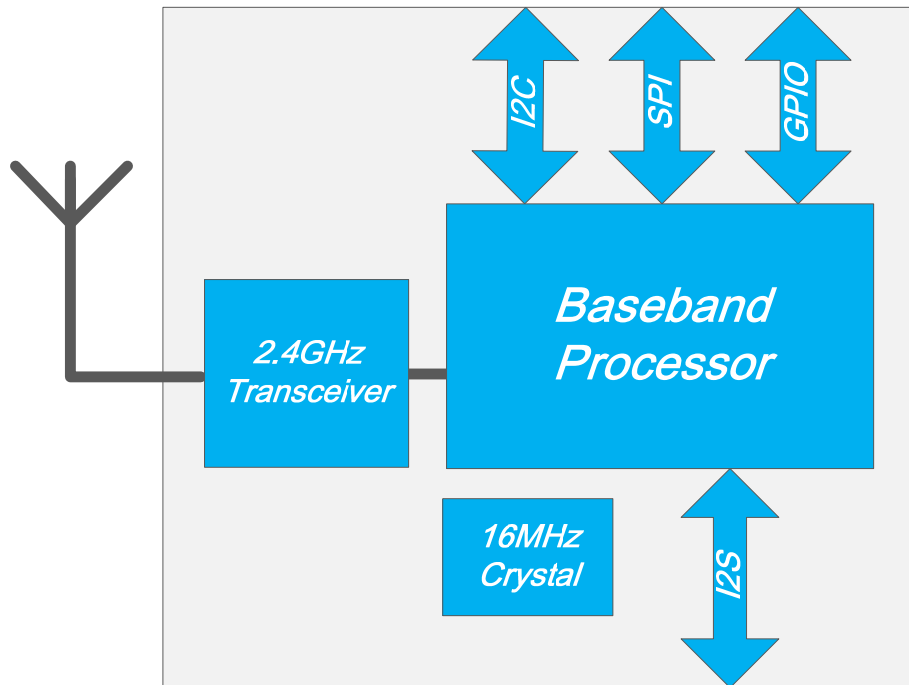


Figure [3]: GWK5MO Block Diagram

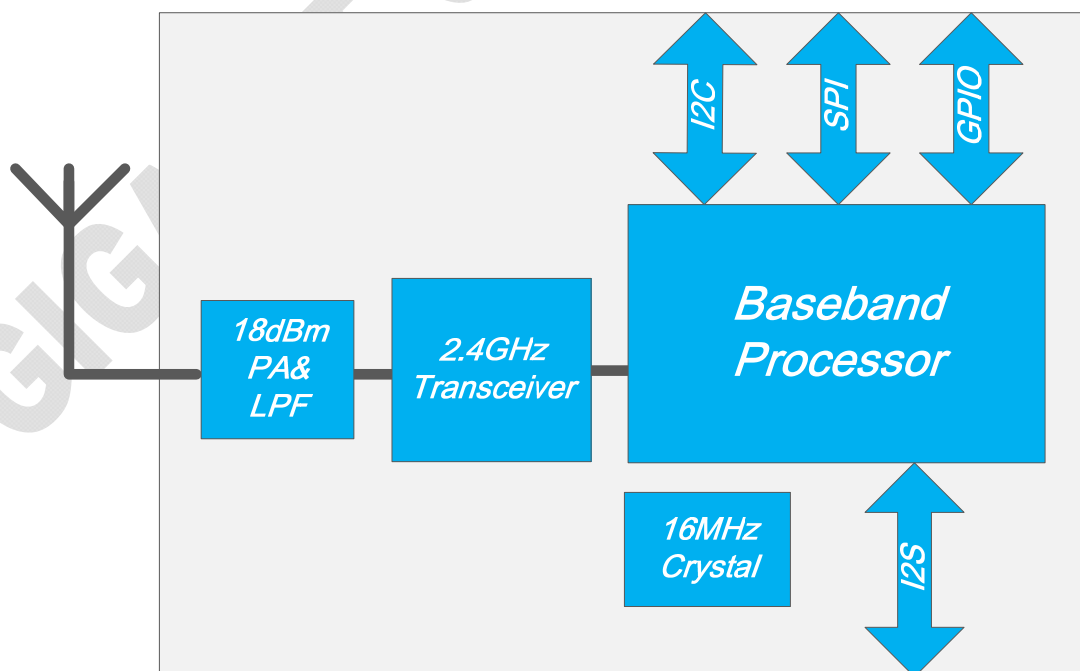


Figure [4]: GWK5MP Block Diagram

6. Electrical Specification

| | Description | Typical |
|----------------|--|---|
| General | Operation voltage | +3.3V DC |
| | Supply current (Codec not Included) | TX: 100mA (GWK5MP), 55mA (GWK5MO) RX: 55mA |
| | Operation temperature | -10 ~ +60°C |
| RF | RF Frequency | 2400 ~ 2483MHZ |
| | Modulation | GFSK |
| | Data rate | 2M bps |
| | TX Power | +0dBm (GWK5MO) +18dBm (GWK5MP) |
| | RX Sensitivity | -90dBm (GWK5MO) -92dBm (GWK5MP) |
| | RF Range (indoor) | 15m (GWK5MO) 30m (GWK5MP) |
| Audio | Frequency Response | 20~20KHz |
| | S/N | 85dB @ 20~20KHz |
| | THD+N | < 0.01% @ 20~20KHz |
| | Dynamic range | 80dB |
| | Digital Audio Format | I2S, Left Justify, Right Justify |
| | Latency | Fixed 15ms or application dependent |

Table [1]: Electrical Specification

7. Pin Assignment

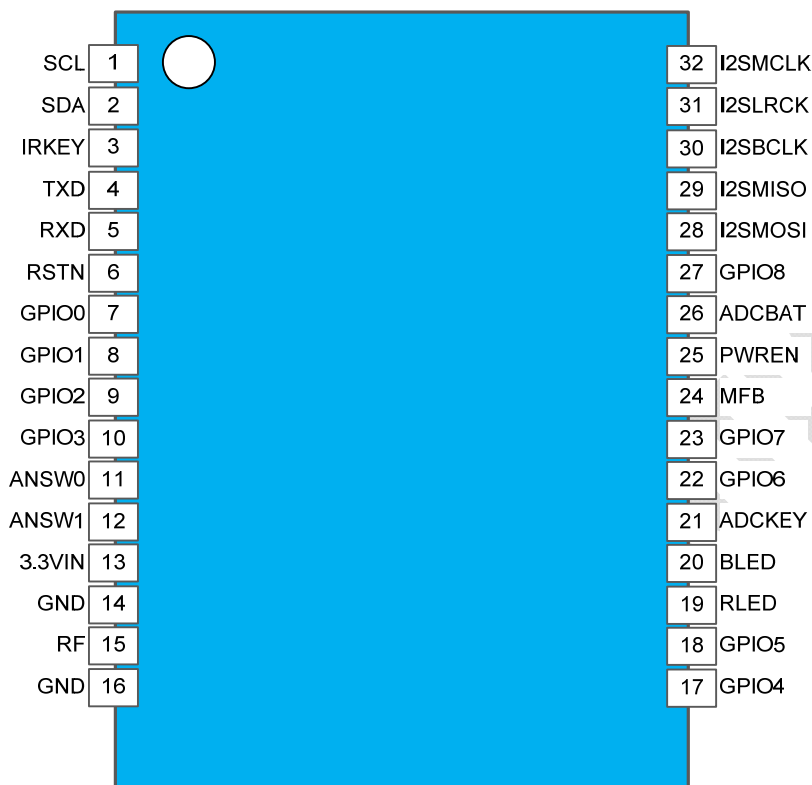


Figure [5]: GWK5Mx Pin Assignment

| Pin # | Pin name | Type | Description |
|-------|-----------------|------|---|
| 1 | SCL /MUTE | I/O | I2C Clock or MUTE Control, firmware configurable. When used as I2C, External 4.7K pull-up resistor required. |
| 2 | SDA /STANDBY | I/O | I2C Data or Standby Control, firmware configurable. For Standby mode, A high level will be asserted when no TX signal >5s. When used as I2C, External 4.7K pull-up resistor required. |
| 3 | IRKEY | I/O | Infrared input |
| 4 | TXD | I/O | UART TX |
| 5 | RXD | I/O | UART RX |
| 6 | RSTN | I | Reset input, active low |
| 7 | GPIO0 | I/O | General purpose IO |
| 8 | GPIO1 | I/O | General purpose IO |
| 9 | GPIO2 | I/O | General purpose IO |
| 10 | GPIO3 | I/O | General purpose IO |
| 11 | ANSW0 | I/O | Antenna switch control pin |

| | | | |
|----|---------|-----|---|
| 12 | ANSW1 | I/O | Antenna switch control pin |
| 13 | 3.3VIN | P | +3.3V Power Input |
| 14 | GND | P | Ground Power |
| 15 | RF | A | RF |
| 16 | GND | P | Ground Power |
| 17 | GPIO4 | I/O | General purpose IO |
| 18 | GPIO5 | I/O | General purpose IO |
| 19 | RLED | I/O | External red LED Output |
| 20 | BLED | I/O | External blue LED Output |
| 21 | ADCKEY | I/O | Connect the built-in ADC for KEY |
| 22 | GPIO6 | I/O | General purpose IO |
| 23 | GPIO7 | I/O | General purpose IO |
| 24 | MFB | I/O | Main Function button input |
| 25 | PWREN | I/O | Power Enable Output |
| 26 | ADCBAT | I/O | Battery check input |
| 27 | GPIO8 | I/O | General purpose IO |
| 28 | I2SMOSI | I/O | I2S Data Master Output / Slave Input |
| 29 | I2SMISO | I/O | I2S Data Master Input / Slave Output |
| 30 | I2SBCLK | I/O | I2S Bit Clock Input / Output |
| 31 | I2SLRCK | I/O | I2S Left and Right Clock Input / Output |
| 32 | I2SMCLK | I/O | I2S Master Clock Input / Output |

Table [2]: GWK5Mx Pin Description

8. I2S Digital Audio Interface

GWK5Mx supports 3 digital audio interface modes: I2S mode, Left justify mode and Right justify mode. The default is I2S mode, Other configurations are available upon customer request.

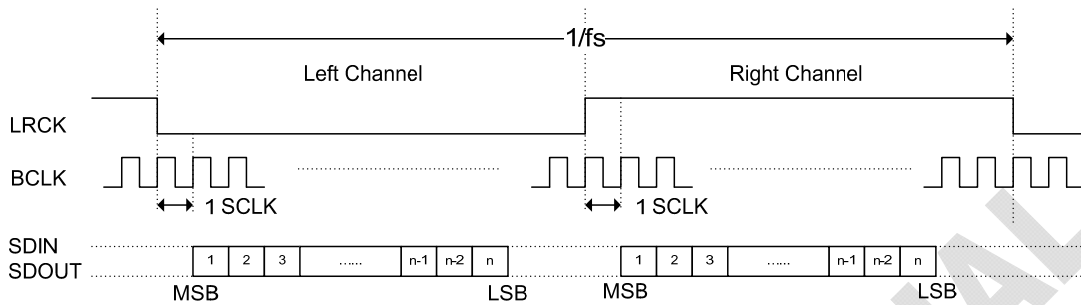


Figure [6]: I2S Mode (Default)

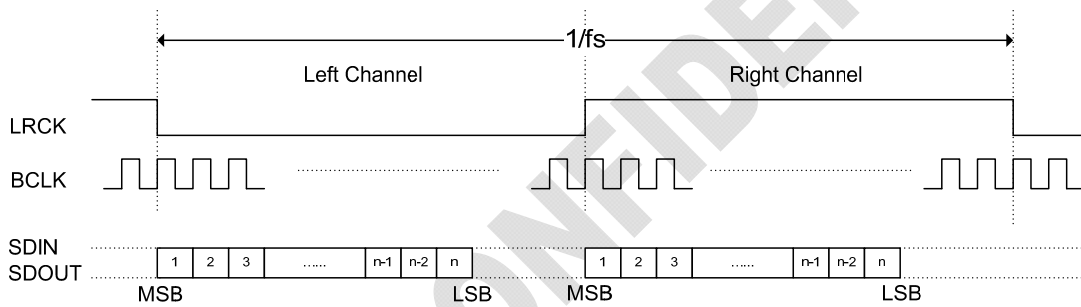


Figure [7]: Left Justify Mode

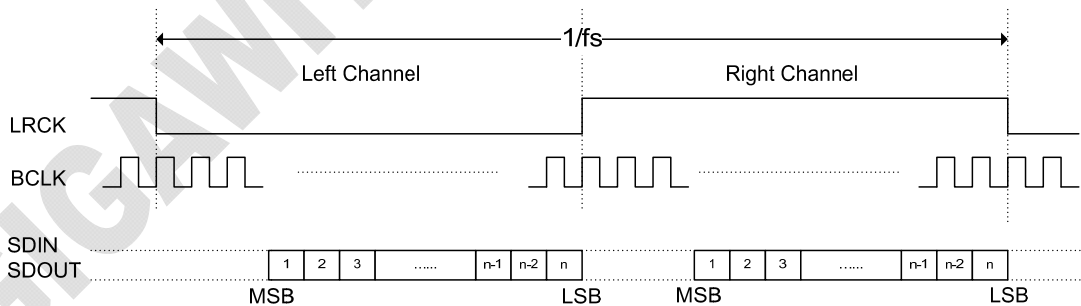


Figure [8]: Right Justify Mode

GWK5Mx I2S interface can work as master or slave mode, the IO pin function is described below.

| | Master Mode | Slave Mode |
|-------|---|--|
| MCLK | Output, Driving the external DSP or Codec | Non function, can be left open |
| BCLK | Output, Driving the external DSP or Codec | Input, Driven by the external DSP or Codec |
| LRCK | Output, Driving the external DSP or Codec | Input, Driven by the external DSP or Codec |
| SDIN | PCM Data Input | PCM Data Input |
| SDOUT | PCM Data Output | PCM Data Output |

Table [3]: GWK5Mx I2S Interface

9. I2C Control Interface

GWK5Mx features a standard I2C Control interface. The I2C can work as a master or a slave, It can be used to control the peripheral devices or be controlled by the external MCU / DSP.

GWK5Mx features a two way wireless logical data channel; The I2C can also be used to exchange the control information between the TX and RX side.

I2C Address is 0x0e, it is configurable by firmware.

| Register | Bit | R/W | Reset | Description |
|------------------|-------------------|-----|-------|---|
| 0x00: Control | 0: Mute | R/W | 0 | 0: Mute off 1: Mute on |
| | 1: Power | R/W | 1 | 0: Power Off 1: Power On |
| | 2; Link Status | R | 0 | 0: Not Linked 1: Linked |
| | 3: Standby | R/W | | 0: Standby off 1: Standby on |
| | 4-5: Pairing | R/W | 0 | Write 1 to Enter pairing mode Read back: 0: Normal Mode 1: Pairing in progress, pairing will be timeout in 30 seconds. 2: Paired with success 3: Pairing failed, time is out |
| | 6-7: Reserved | R/W | 0 | |
| 0x01: Volume | 0-7 | R/W | 0 | Volume 0dB to -48dB 0x00: 0dB 0xd0: -48dB |
| 0x02: Treble | 0-7 | R/W | 0 | Treble -14dB to + 14dB 0xf2: -14dB 0x00: 0dB 0x0e: +14dB |
| 0x03: Bass | 0-7 | R/W | 0 | Bass -14dB to + 14dB 0xf2: -14dB 0x00: 0dB 0x0e: +14dB |
| 0x04: Balance | 0-7 | R/W | 0 | Balance -12dB to + 12dB 0xf4: -12dB 0x00: 0dB 0x0c: +12dB |

Table[4] I2C Registers

10. ISP Firmware Updating

GWK5Mx support ISP firmware updating through UART, When TXD pin connected with a 4.7K resistor to the GND, GWK5Mx will enter the ISP mode.

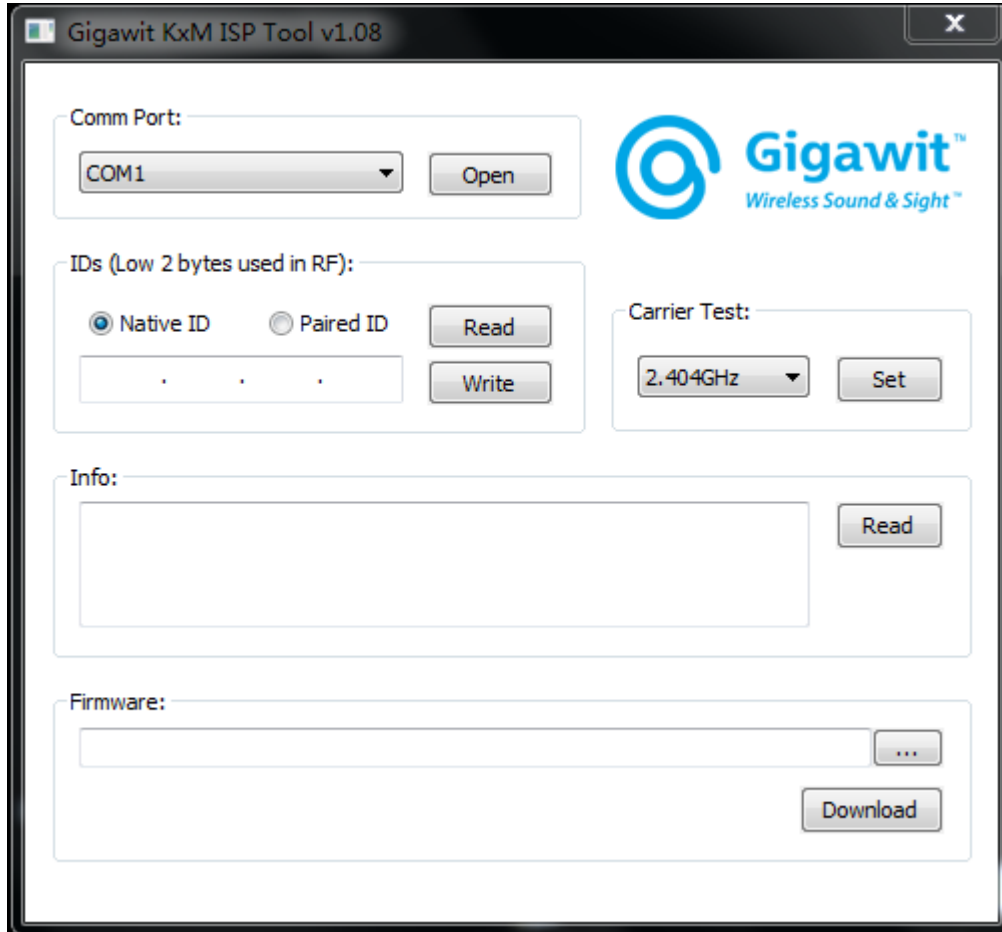


Figure [9]: Gigawit ISP tool

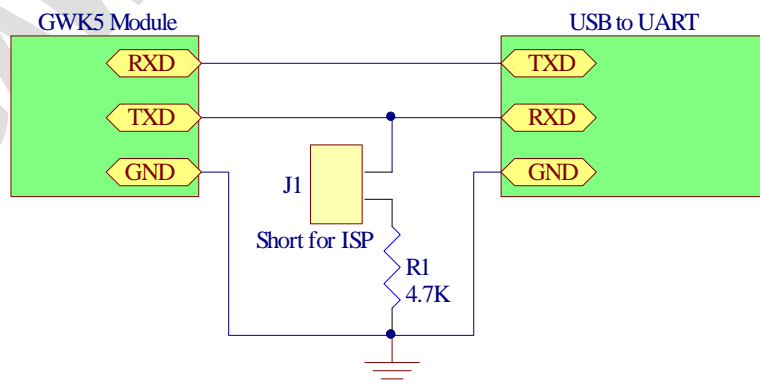


Figure [10]: Gigawit ISP Connection

11. Pairing

GWK5Mx support ID matching to enable multi TX/RX operating in a same area. The RX will only receive the paired TX audio signals. To pair the TX and RX module, follow the below steps:

- 1) Power on the TX and RX Module. The TX/RX LED will keep solid for 5 seconds, and then turn into Idle Mode and flash slowly.
- 2) Press the TX key long than 10 seconds Until the LED change into flashing fast. Release the key. After this, The TX Module will stay into Pairing Mode for 30 seconds until it find the RX (the RX must be in Pairing Mode in 30 seconds, see Step 3). If the TX found the RX in 30 seconds and paired, the LED will turn to solid and quit the Pairing Mode, or it will be time out after 30 seconds and turn the Pairing Mode into the Idle Mode.
- 3) Press the RX key long than 10 seconds Until the LED change into flashing fast. Release the key. After this, The RX Module will stay into Pairing Mode for 30 seconds until it find the TX (the TX must be in Pairing Mode, see Step 2) If the RX found the RX in 30 seconds and paired, the LED will turn to solid and quit the Pairing Mode, or it will be time out after 30 seconds and turn the Pairing Mode into the Idle Mode.
- 4) When the TX and the RX are paired, The TX/RX LED will stay in solid .the RX can receive the TX signal.

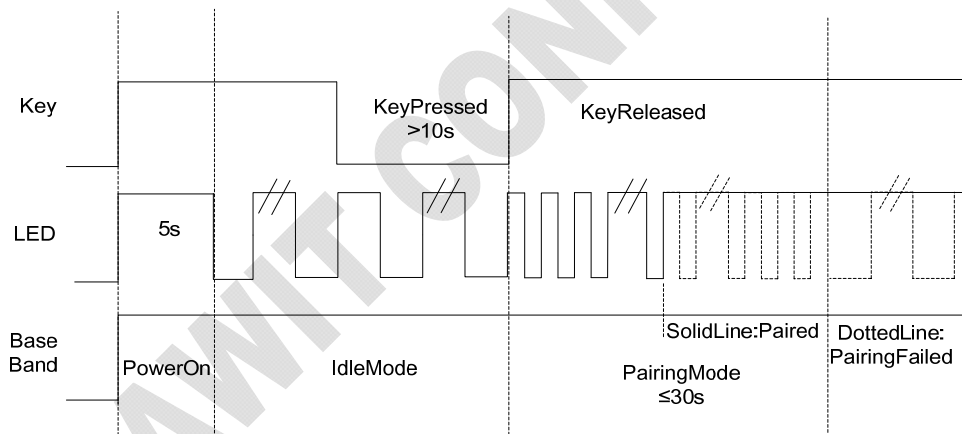


Figure [11]: Key and LED Timing at pairing mode

12. Mounting Requirements

GWK5Mx is the sensitive RF part. Need to mount them at the corner of the mother circuit board and reserve some keep out space to the components on the mother board. Try to keep them away with metal components like Speakers, Transformers, Batteries, Big Aluminum Capacitors, Heat Sinks and Metal Panels.

The figure below illustrates how to mount the GWK5 module. **Improper mounting will decrease the RF performance dramatically.**

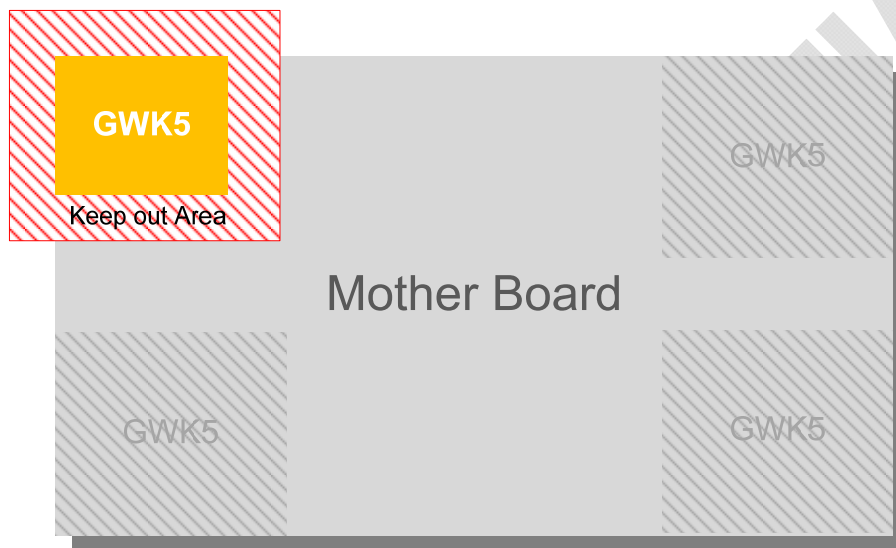


Figure [12]: GWK5Mx Mounting Rule

13. Physical Dimension

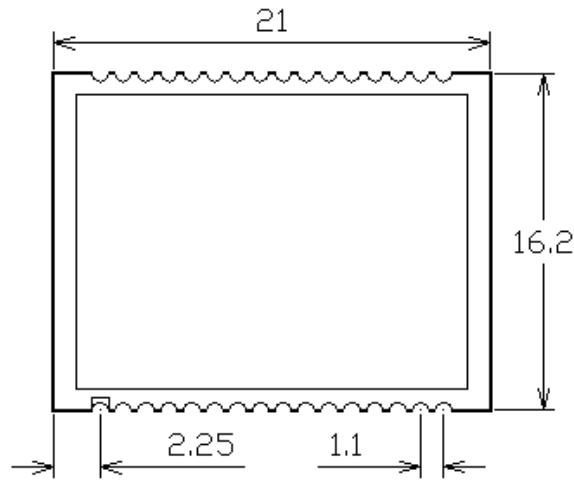


Figure [13]: GWK5MO Dimension

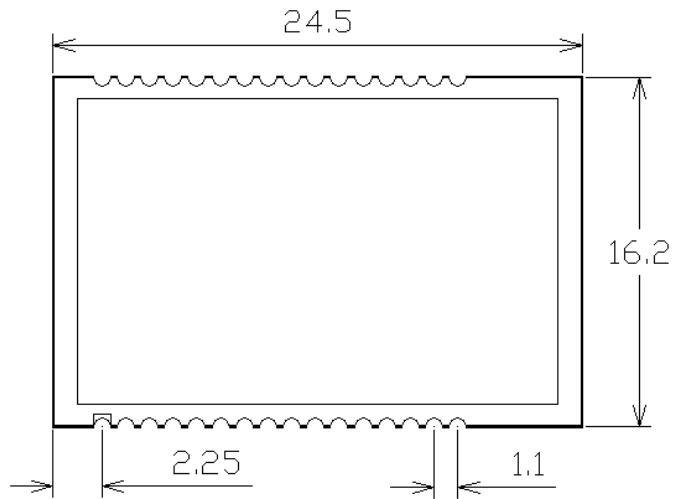


Figure [14]: GWK5MP Dimension

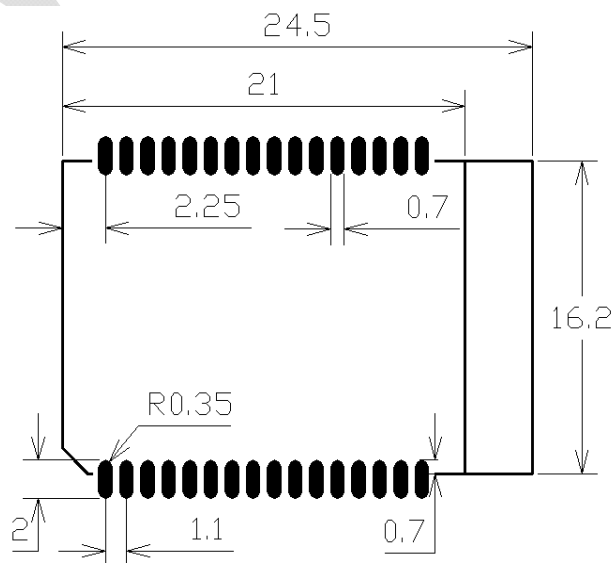
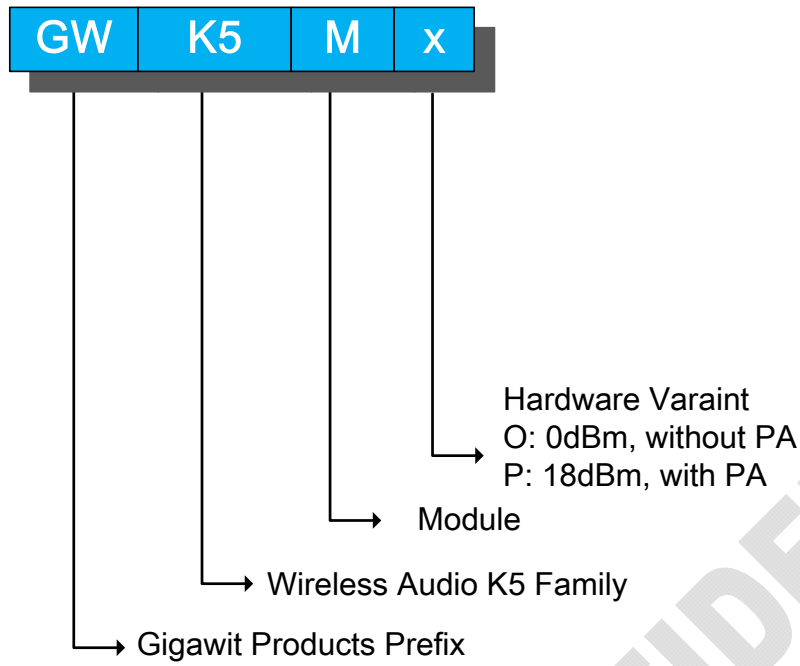


Figure [15]: PCB Land Pattern

14. Naming Rule



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15. Ordering Information

| Gigawit ID. | Description |
|-------------|-----------------------|
| GWK5MO | 0dBm RF Power module |
| GWK5MP | 18dBm RF Power module |

16. Contact

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17. Revision History

2011-01-12 Version 1.0, Original version
2011-03-09 Version 1.01, Add I2C Interface and ISP firmware update