
GWK5Nx 2.4GHz Wireless Audio Transmitter / Receiver

1. General Description

GWK5Nx is the digital audio interface version of Gigawit GWK5 family wireless digital audio products. It is designed to interface with the DSP or digital amplifiers directly. GWK5Nx supports most of I2S format and sample rates.

Inheriting from its GWK5 family, GWK5Nx features both good wireless performance and audio performance. GWK5Nx has good RF co-existence and robust link quality, can combat the most interference from the crowded 2.4G ISM band. GWK5Nx uses non-compression PCM signal thus delivering very low THD audio. By adopting advance forward error correction and error concealment algorithm, GWK5Nx can reach <15ms latency, this makes it ideal for the Video synchronization, Home Theater applications.

GWK5Nx'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(Codec not Included)
- 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. GWK5Nx Form Factor



5. Electrical Specification

	Description	Typical
General	Operation voltage	+3.3V DC
	Supply current	TX: 60mA RX: 60mA (GWK5NO) TX: 69mA RX: 63mA (GWK5NQ)
	Operation temperature	-10 ~ +60°C
RF	RF Frequency	2400 ~ 2483MHZ
	Modulation	GFSK
	Data rate	2M bps
	TX Power	+0dBm (GWK5NO) +10dBm (GWK5NQ)
	RX Sensitivity	-90dBm (GWK5NO) -88dBm (GWK5NQ)
	RF Range (indoor)	10m (GWK5NO) 15m (GWK5NQ)
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
	Sample Rate Support	32KHz, 44.1KHz, 48KHz
	Latency	Fixed 15ms or application dependent

Table [1]: Electrical Specification

6. GWK5Nx Pin Assignment



Pin #	Pin name	Type	Description
1	GND	P	Ground
2	3.3V	P	+3.3V Power Input
3	MFB	I/O	Power or pairing key input, press long than 3s to turn on or off the module, press long than 10s to enter pairing mode.
4	LED	I/O	Status LED output
5	MCLK	O	I2S Master Clock Output, NC when I2S is in slave mode
6	I2SMOSI	I/O	I2S Data Master Output / Slave Input
7	I2SMISO	I/O	I2S Data Master Input / Slave Output
8	SCLK	I/O	I2S Bit Clock Input / Output
9	LRCK	I/O	I2S Left and Right Clock Input / Output
10	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.
11	SCL /MUTE	I/O	I2C Clock or MUTE Control, firmware configurable. When used as I2C, External 4.7K pull-up resistor required.
12	GND	P	Ground
13	NC	NA	Not Connected
14	GP5	P	General purpose IO
15	GP4	I/O	General purpose IO
16	GP3	I/O	General purpose IO
17	GP2	I/O	General purpose IO

18	GP8	I/O	General purpose IO
19	TXD	I/O	UART TX
20	RXD	I/O	UART RX
21	RST	I	Reset input, active low
22	KEY	I/O	Built-in ADC for KEY
23	NC	NA	Not Connected
24	NC	NA	Not Connected

Table [2]. GWK5Nx Pin Description

7. Application Schematic

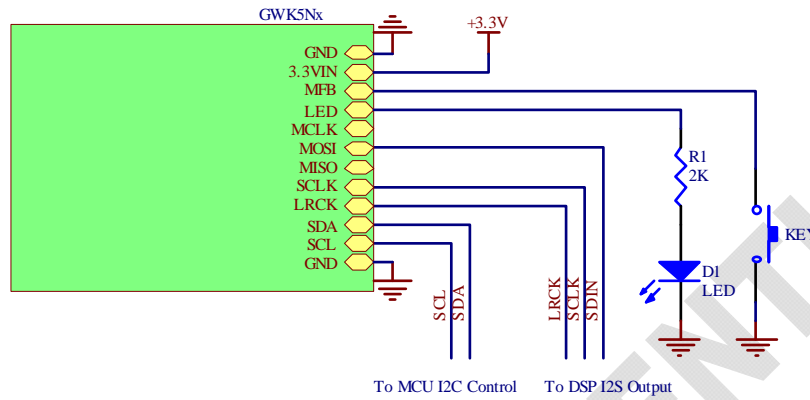


Figure [1]: GWK5Nx Interfacing with DSP (I2S Slave Input Mode)

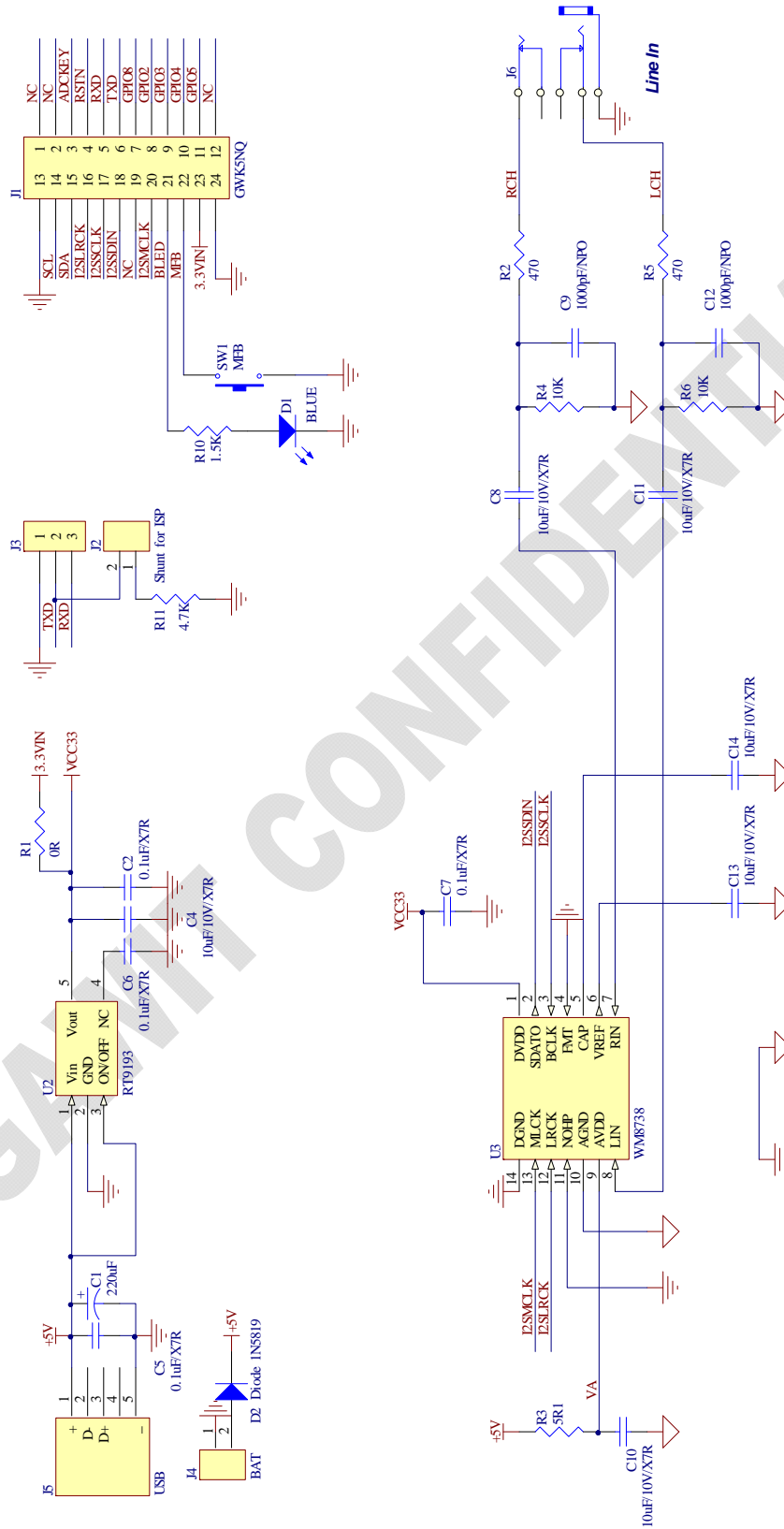


Figure [2]: GWK5Nx Interfacing with ADC

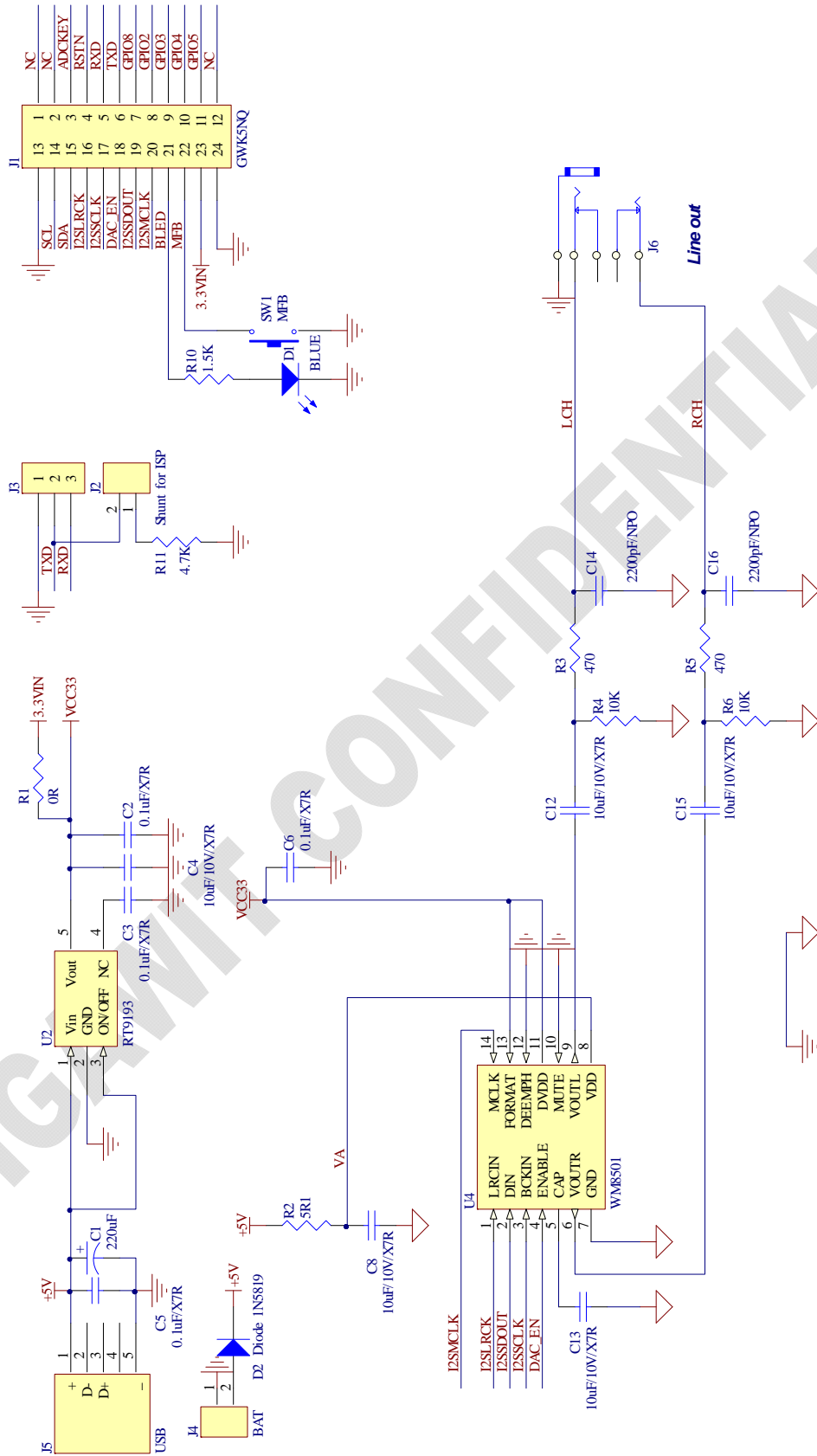


Figure [3]: GWK5Nx Interfacing with DAC

8. I2S Digital Audio Interface

GWK5Nx supports 3 digital audio interface modes: Left justify mode, I2S mode and Right justify mode.

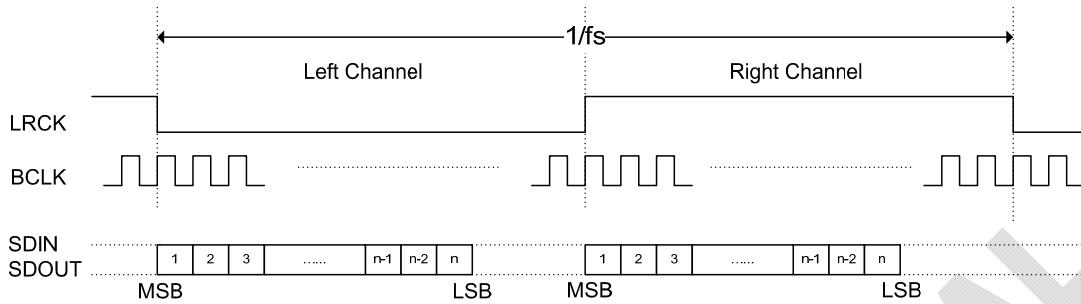


Figure [4]. Left Justify Mode

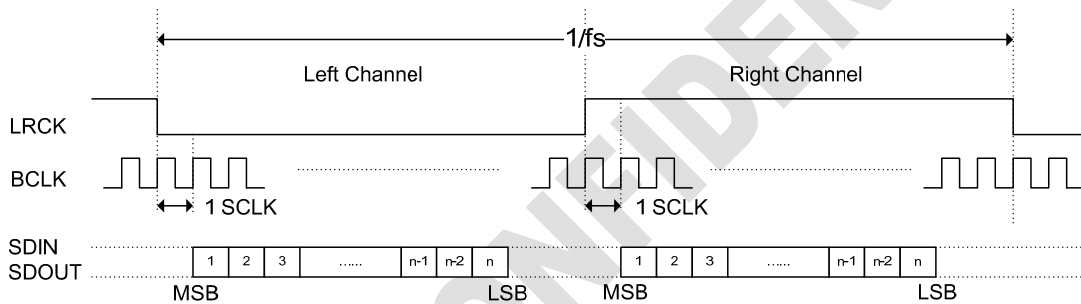


Figure [5]. I2S Mode

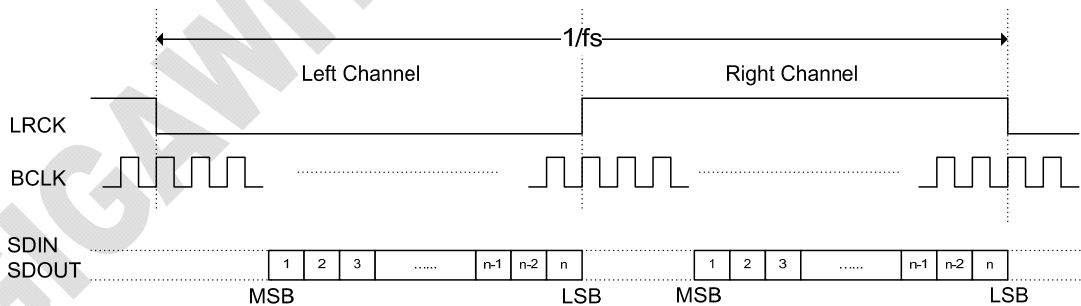


Figure [6]. Right Justify Mode

GWK5Nx I2S interface can work as master or slave mode, the IO pin function is described below. The default configuration is GWK5Nx Tx in I2S slave mode, and GWK5Nx RX in left justify master mode. Other configurations are available upon customer request.

	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]: GWK5Nx I2S Interface

9. I2C Control Interface

GWK5Nx 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.

GWK5Nx 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

GWK5Nx support ISP firmware updating through UART, When TXD pin connected with a 4.7K resistor to the GND, GWK5Nx will enter the ISP mode.

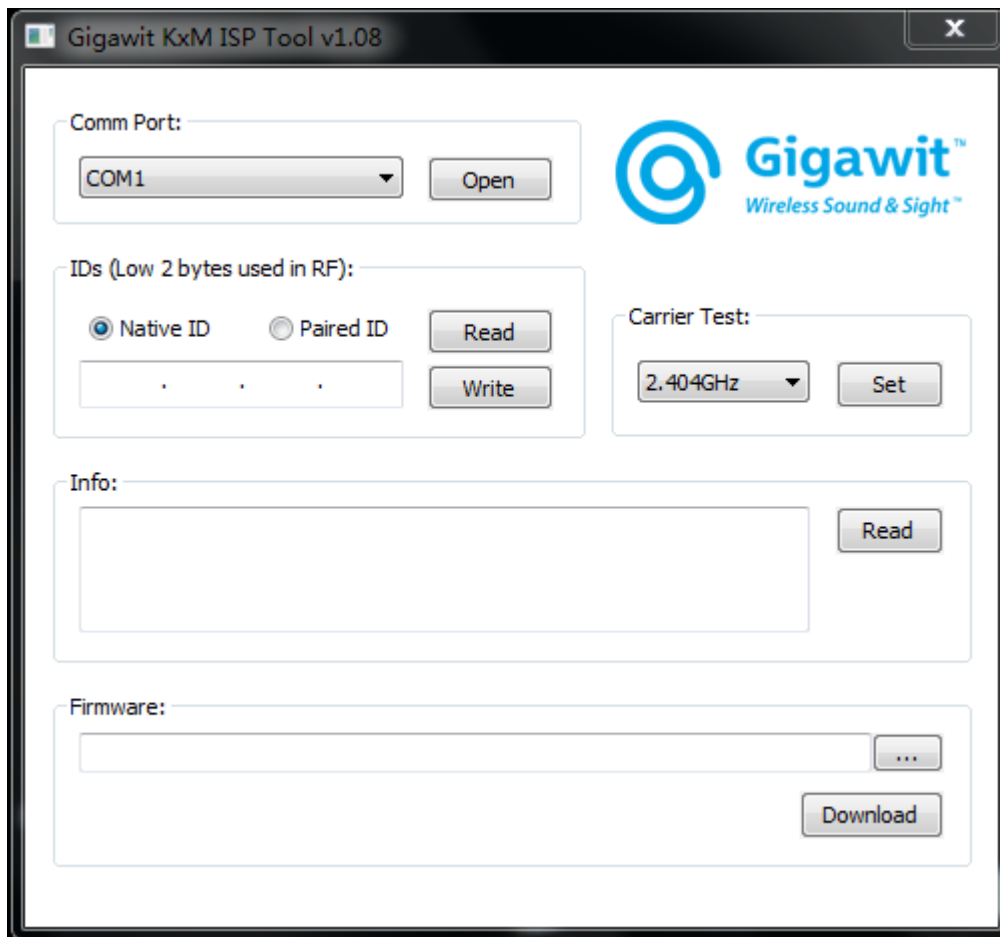


Figure [7]: Gigawit ISP tool

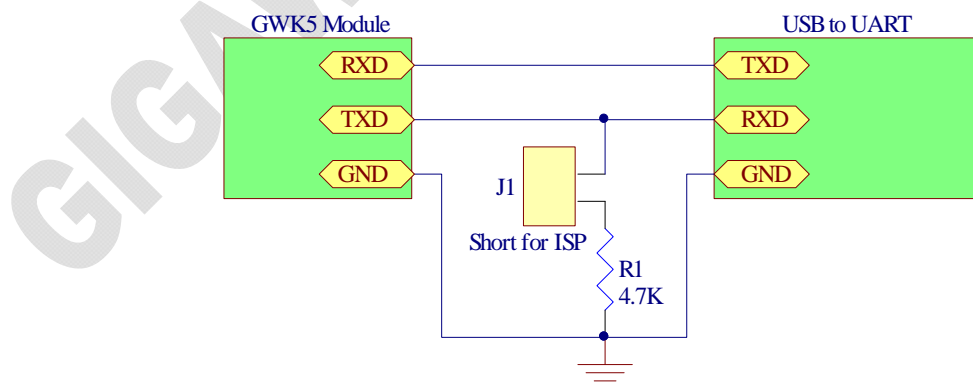


Figure [8]: Gigawit ISP Connection

11. Pairing

GWK5Nx 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.

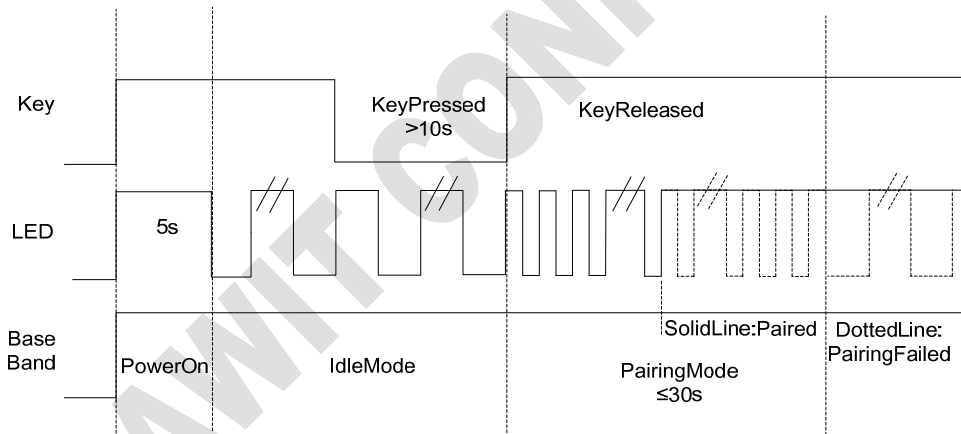


Figure [9]: Key and LED Timing at pairing mode

12. Mounting Requirements

GWK5Nx is a 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.**

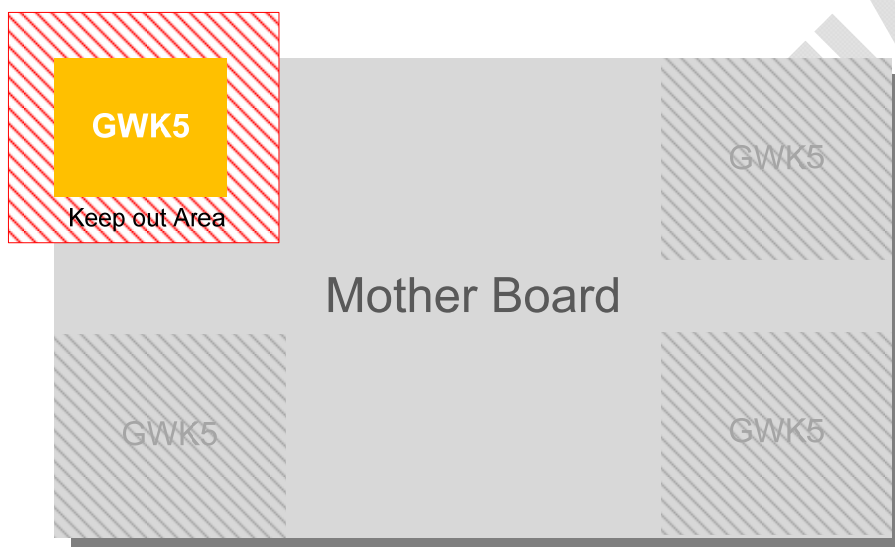


Figure [10]: GWK5Nx Mounting Rule

13. GWK5Nx Physical Dimension

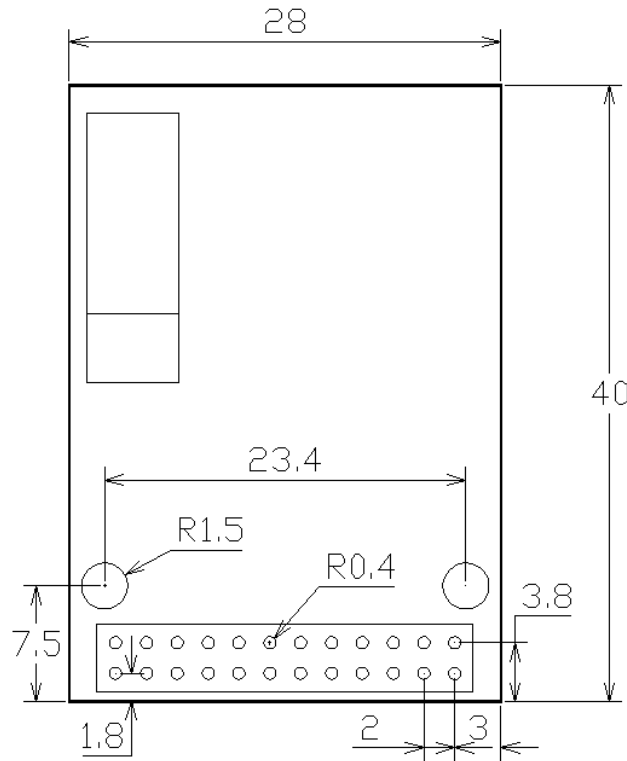
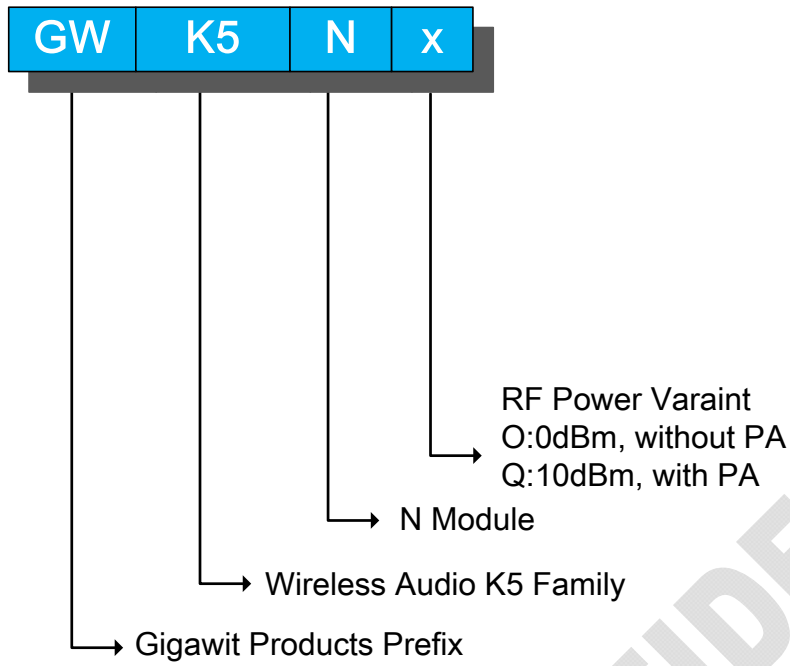


Figure [11]: GWK5Nx Dimension

14. Naming Rule



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15. Ordering Information

Gigawit ID.	Description
GWK5NO	0dBm RF Power module
GWK5NQ	10dBm RF Power module

16. Contact

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17. Revision History

2011-8-22 Version 1.0, Original version