

## Technical Description

The Equipment Under Test (EUT) is the Soundbar Unit of Sound Bar Speaker System. The EUT has a built-in stereo speaker. It can accept digital audio input from HDMI, optical and Bluetooth device. The EUT can also support Aux (RCA) and Line (3.5mm jack) analog input. The Soundbar features Bluetooth wireless audio playback. The audio signal can be sent from Bluetooth device, such as a mobile phone, when a Bluetooth device is pairing to the System. A separate wireless subwoofer is bundling with the Soundbar in the product package. The audio signal can be sent via the 2.4GHz Digital wireless modules, which are incorporated in both soundbar unit and subwoofer unit. The EUT is powered by 27.5VDC from an AC/DC adaptor which accepts universal input (100-240VAC).

### **2.4GHz Digital Wireless Module:**

**Modulation Type: FSK**

**Antenna Type: Integral, Internal**

**RF output power is set at -12dBm**

**Frequency Range: 2404.5MHz - 2479.5MHz, 5MHz channel spacing, 16 channels**

### **BlueTooth Module**

**Modulation Type: GFSK**

**Antenna Type: Integral, Internal (PCB Trace)**

**RF output power is set at -8dBm**

**Frequency Range: 2402MHz - 2480MHz, 1MHz channel spacing, 79 channels**

**The functions of main ICs are mentioned below.**

#### **1. BlueTooth module:**

- 1) U100 (BCM20771) acts as the 2.4GHz radio core of Bluetooth module (BT3GMD-A03P) which is integrating with audio CODEC.
- 2) C6, C5, L4, C3, L2, C1 and C7 act as antenna matching network.
- 3) Y2 provides system clock (oscillation frequency 26MHz).

#### **2. 2.4GHz Digital Wireless module:**

- 1) U6 (A7125) acts as the FSK transceiver of the digital wireless module.
- 2) U1 (XL9618) is the MCU (RISC) of the digital wireless module.
- 3) Y1 provides system clock (oscillation frequency 16MHz) for U1

#### **3. DSP and analog interface:**

- 1) U302 (MAP5602M) acts as audio DSP core.
- 2) U300 (EN25T80) acts as 8Mbit flash memory for the DSP core (U302).
- 3) U304 (WM8738) acts as analog-to-digital converter.

#### **4. Display and Key module :**

- 1) AIC901 (PT6315) acts as VFD display (VFD901) driver and keyboard control interface.

**5. HDMI module:**

- 1) HIC1 (EP94A3K) acts as HDMI repeater and port switcher.
- 2) HIC2 (EPF021A) acts as the HDMI interface controller.

**6. MCU module:**

- 1) IC302 (LPC1114) acts as the MCU of the Soundbar Unit.

**7. Amplifier Module:**

- 1) TU7 (TAS5352) acts as the power amplifier for the built-in stereo speakers.

**8. AC/DC Adaptor (external):**

The 27.5VDC Output AC/DC adaptor employs switching-mode PWM technology.

- 1) U101 (FAN6921) is a PWM controller.
- 2) T1 (PQ3220) is high frequency transformer.
- 3) Q2 (MDF13N65B) is 650V, 14A, 460mohm power MOSFET as the switching element.
- 4) U201 (EL817C) is an optocoupler providing isolated-ground feedback signal.

Channel Frequency Table of Bluetooth Module

CH. NO.	FRE.	Hex Value		CH. NO.	FRE.	Hex Value		CH. NO	FRE.	Hex Value		CH. NO	FRE.	Hex Value
CH0	2402MHz	0		CH26	2428MHz	1A		CH52	2454MHz	34		CH78	2480MHz	4E
CH1	2403MHz	1		CH27	2429MHz	1B		CH53	2455MHz	35				
CH2	2404MHz	2		CH28	2430MHz	1C		CH54	2456MHz	36				
CH3	2405MHz	3		CH29	2431MHz	1D		CH55	2457MHz	37				
CH4	2406MHz	4		CH30	2432MHz	1E		CH56	2458MHz	38				
CH5	2407MHz	5		CH31	2433MHz	1F		CH57	2459MHz	39				
CH6	2408MHz	6		CH32	2434MHz	20		CH58	2460MHz	3A				
CH7	2409MHz	7		CH33	2435MHz	21		CH59	2461MHz	3B				
CH8	2410MHz	8		CH34	2436MHz	22		CH60	2462MHz	3C				
CH9	2411MHz	9		CH35	2437MHz	23		CH61	2463MHz	3D				
CH10	2412MHz	A		CH36	2438MHz	24		CH62	2464MHz	3E				
CH11	2413MHz	B		CH37	2439MHz	25		CH63	2465MHz	3F				
CH12	2414MHz	C		CH38	2440MHz	26		CH64	2466MHz	40				
CH13	2415MHz	D		CH39	2441MHz	27		CH65	2467MHz	41				
CH14	2416MHz	E		CH40	2442MHz	28		CH66	2468MHz	42				
CH15	2417MHz	F		CH41	2443MHz	29		CH67	2469MHz	43				
CH16	2418MHz	10		CH42	2444MHz	2A		CH68	2470MHz	44				
CH17	2419MHz	11		CH43	2445MHz	2B		CH69	2471MHz	45				
CH18	2420MHz	12		CH44	2446MHz	2C		CH70	2472MHz	46				
CH19	2421MHz	13		CH45	2447MHz	2D		CH71	2473MHz	47				
CH20	2422MHz	14		CH46	2448MHz	2E		CH72	2474MHz	48				
CH21	2423MHz	15		CH47	2449MHz	2F		CH73	2475MHz	49				
CH22	2424MHz	16		CH48	2450MHz	30		CH74	2476MHz	4A				
CH23	2425MHz	17		CH49	2451MHz	31		CH75	2477MHz	4B				
CH24	2426MHz	18		CH50	2452MHz	32		CH76	2478MHz	4C				
CH25	2427MHz	19		CH51	2453MHz	33		CH77	2479MHz	4D				

## 2.4GHz Digital wireless module (channel table)

Channel	Frequency
1	2.4045GHz
2	2.4095GHz
3	2.4145GHz
4	2.4195GHz
5	2.4245GHz
6	2.4295GHz
7	2.4345GHz
8	2.4395GHz
9	2.4445GHz
10	2.4495GHz
11	2.4545GHz
12	2.4595GHz
13	2.4645GHz
14	2.4695GHz
15	2.4745GHz
16	2.4795GHz



**Features:**

**Bluetooth 3.0 Audio Module, Class 2**



**Version: V1.0**

The BT3GMD-A30P offers the following features:

- A2DP1.2 using SBC decoder for streaming audio over

Bluetooth and AVRCP 1.4 for remote control functionality

Mar 2012

- Configurable seven-band speaker equalization as well as ten

presets allowing multiple music listening styles

- High quality 96 dB SNR DACs with 44.1 and 48 kHz sample rates for high-fidelity playback

- Single-chip Bluetooth 3.0 transceiver supporting

Bluetooth 2.1 + Enhanced Data Rate (EDR) and Bluetooth 2.0, 1.2, and 1.1 backward compatibility

- Best-in-class Bluetooth radio with up to 8 dBm transmit power and -91dBm receive sensitivity

- Support for side tone and digital microphones

- Supports microphone and speaker HW equalization

- automatic volume control (AVC)

- Switching regulator, battery charger, and power management unit

- Supports fast charging, power dissipation monitoring, and optional charger voltage regulation

- Dual high quality 8 kHz and 16 kHz audio MIC inputs

- Multilanguage voice prompt

- Voice command recognition

**Product Description:**

The BT3GMD-A30P is a Bluetooth 3.0 Module solution integrating common components required for cost and performance-optimized stereo headset designs.

The BT3GMD-A30P also delivers differentiating features including enhanced audio quality, reduced charging times, A2DP, and multipoint connections through the integration of various noise suppression technologies, noise and echo reduction headset, for high-end



and cost and performance-optimized stereo headsets.

The BT3GMD-A30P supports Bluetooth SIG-compliant wideband speech implementation to greatly enhance the audio quality with both PCs and cell phones.

The BT3GMD-A30P supports the Bluetooth 3.0 standard, adding enhanced power control, simple and secure pairing, and enhanced inquiry response as value-added features for Bluetooth headsets. All major functional blocks required for a Bluetooth stereo headset, including switcher, charger, and stereo audio codec are

The module includes EEPROM, crystal, and PCB antenna.

**Applications:**

- High-End Stereo Wireless Headsets
- High-END Mono Headsets
- Hands-Free Car Kits
- Wireless Speakers

**Functional Block Diagram:**

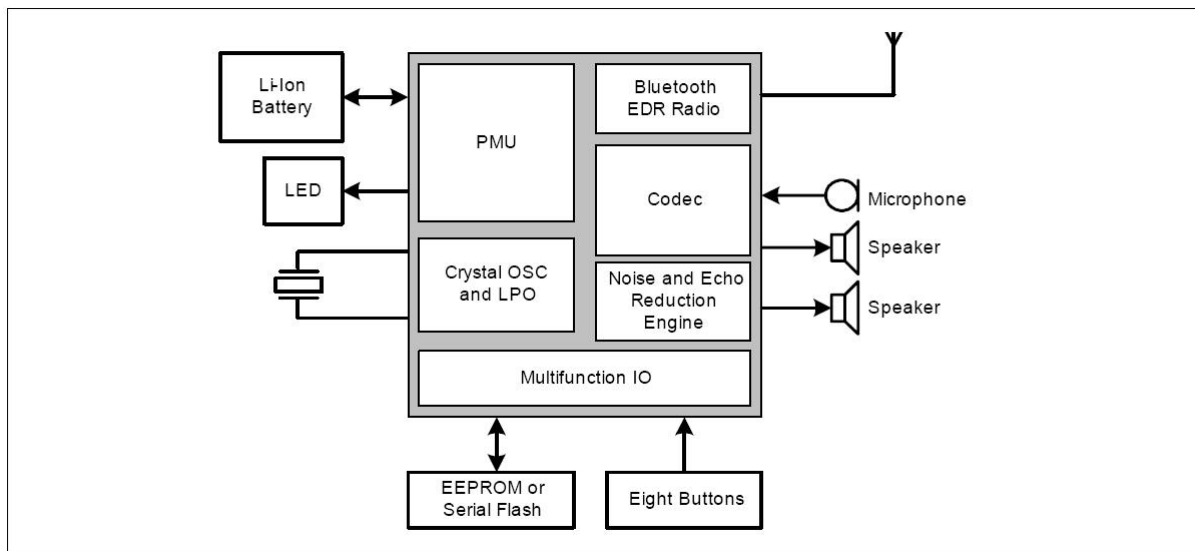


Figure 1: BT30MD-A30P Block Diagram

## GWK5NO\_SW 2.4GHz Wireless Subwoofer Module

### 1. General Description

GWK5NO\_SW is the optimized module dedicated for the wireless subwoofer application, it balance well between the cost and performance by utilizing the fact of subwoofer limited frequency response bandwidth. The narrow bandwidth enables GWK5NO\_SW to transmit enough redundant data to combat with the 2.4GHz interference thus maintain the good co-existence performance in the 2.4GHz ISM band.

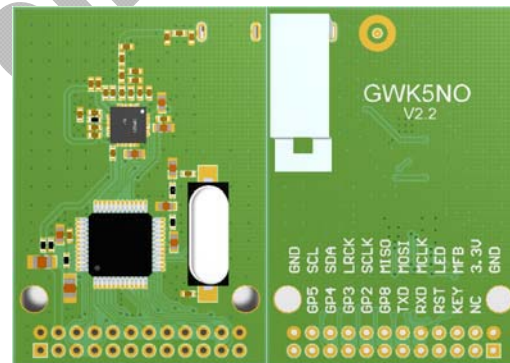
Inheriting from its GWK5 family, GWK5NO\_SW features both good wireless performance and audio performance. GWK5NO\_SW has good RF co-existence and robust link quality, can combat the most interference from the crowded 2.4G ISM band.

GWK5NO\_SW uses non-compression PCM signal and 24bit high precision thus delivering very low THD audio. By adopting advance forward error correction and error concealment algorithm, GWK5NO\_SW can reach <15ms latency, this makes it ideal for the Video synchronization, Home Theater applications.

GWK5NO\_SW is ideal for the subwoofer application not only by its competitive cost, but also by its flexibility for customized functions. The SW crossover frequency can be adjusted easily by the digital filter, and the general purpose I2C can be used to control customer peripheral unit to eliminate an extra microcontroller.

### 2. Applications

- 5.1 Subwoofer Speaker
- 2.1 Subwoofer Speaker
- Soundbar Subwoofer
- DVD



### 3. Features

- 2.4GHz AFH Solution
- 24bit high precision digital audio, SNR>115dB
- I2S digital audio interface support most audio ADCs, DACs, DSPs. Supporting Sample rate 32/44.1/48/88.2/96KHz
- Optimized for subwoofer application, 20~600Hz bandwidth
- Co-existence: small foot-print(2MHz bandwidth) enabling better 2.4GHz co-existence
- Low Power: TX: 55mA/3.3V @ +5dBm RF Output, RX: 55mA/3.3V
- RF Range: 20m+ indoor
- Pairing function to support multi TX/RX operating simultaneously
- Power management function and control for green power policy
- General purpose I2C for digital amplifier control
- Flexible design, custom functions supported

### 1. Typical Application

- 2.4GHz ISM band Communication System
- 2.4GHz Remote Control
- Wireless Keyboard and Mouse
- Wireless Intelligent sports
- Wireless Toy and Gaming
- Wireless Audio/Video Streaming

### 2. General Description

A7125 is a high performance and low cost 2.4GHz ISM band wireless transceiver. It integrates high sensitivity receiver (-90dBm @2Mbps), high efficiency power amplifier (up to 3dBm), frequency synthesizer and base-band modem. In typical system, A7125 is used together with MCU (microcontroller) with very few external passive components. A7125 supports both FIFO mode and direct mode that contains clock recovery circuit CKO pin to MCU.

A7125 supports very fast settling time (90 us) for frequency hopping system. For packet handling, A7125 has built-in separated 64-bytes TX/RX FIFO (could be extended to 256 bytes) for data buffering and burst transmission, CRC for error detection, FEC for 1-bit data correction per code word, RSSI for clear channel assessment, data whitening for data encryption/decryption, thermal sensor for monitoring relative temperature. Those functions are very easy to use while developing a wireless system. All features are integrated in a small QFN 4X4 20 pins package.

A7125's data rate is up to 2Mbps and can be easily programmed to 1Mbps or 2 Mbps via 3-wire or 4-wire SPI bus. For power saving, A7125 supports sleep mode, idle mode, standby mode. For easy-to-use, A7125 has an unique SPI command set called **Strobe command** that are used to control A7125's state machine. Based on Strobe commands, from power saving, TX delivery, RX receiving, channel monitoring, frequency hopping to auto calibrations, MCU only needs to define A7125's control registers and send Strobe commands via SPI bus. In addition, A7125 supports two general purpose I/O pins, GIO1 and GIO2, to inform MCU its status so that MCU could use either polling or interrupt scheme to do radio control. Therefore, it is very easy to monitor transmission between MCU and A7125 because of its digital interface.

### 3. Feature

- Small size (QFN 4X4, 20 pins).
- Support 2400 ~ 2483.5 MHz ISM band.
- FSK modulation.
- Programmable data rate to 1Mbps or 2Mbps.
- Low current consumption: RX 17mA, TX 15.7mA (at 0dBm output power).
- Low sleep current (1.5uA).
- Programmable RF output power -20dBm ~ 3dBm.
- Very High sensitivity (-90dBm@2Mbps, -92dBm@1Mbps).
- On chip regulator, supports input voltage 2.0 ~ 3.6V.
- Easy to use
  - ◆ Support 3-wire or 4-wire SPI.
  - ◆ Unique Strobe command via SPI.
  - ◆ Change frequency channel by ONE register setting.
  - ◆ 8-bits Digital RSSI for clear channel indication.
  - ◆ Fast exchange mode during TRX role switching.
  - ◆ Auto RSSI measurement.
  - ◆ Auto Calibrations.
  - ◆ Auto IF function.
  - ◆ Auto CRC Check.
  - ◆ Auto FEC by (7, 4) Hamming code (1 bit error correction / code word).
  - ◆ Data Whitening for encryption and decryption.
  - ◆ Separated 64 bytes RX and TX FIFO.
  - ◆ Easy FIFO / Segment FIFO / FIFO Extension (up to 256 bytes).
  - ◆ Support direct mode with recovery clock output to MCU.
  - ◆ Support direct mode with frame sync signal to MCU.
- Support low cost crystal (6 / 8 / 12 / 16MHz).
- Support low accuracy crystal within  $\pm 50$ ppm.
- Support Auto Frequency Compensation.
- Support crystal sharing, (1 / 2 / 4 / 8MHz) to MCU.
- Fast settling time synthesizer for frequency hopping system.
- Built-in thermal sensor for monitoring relative temperature.
- Built-in Battery Detector.