GH3000 Circuit Description

1. Introduction

The model GH3000 is a 40 channel (2.40255-2.47595GHz) cordless telephone. The whole unit is divided into two main parts as follow :

a. A remote Handset.
b. A Base unit.

2. Functional Blocks of the Remote Handset

2.1 Keyboard matrix and function LED
2.2 MCU and MCU interface
2.3 Antenna and RF module
2.4 Compander
2.5 Data shaper
2.6 Charge detector
2.7 Low battery detector
2.8 Buzzer amplifier

3. Circuit Block Description

3.1 Keyboard matrix and function LED

Pin 4 to pin7, pin 10 to pin 11 and pin 25 of the U2 MCU form a keyboard, and the talk LED is controlled by the pin 12 of the MCU.

3.2 MCU and MCU interface

The handset and the base is link up by the pins(9,24 in HS and 21,24 in Base). Besides, the PLL of the RF Module is controlled by the pins 15,17 and 18 of the MCU.

3.3 Antenna and RF module

ANT is the common point for transmitting and receiving through antenna.

MD1 is a RF module which consists of Duplexer, Power amplifier, Mixer & IF, RXVCO, TXVCO, VCC & TXVCC control, Synthesizer and DEMO Audio Output circuits.

RF module circuit can be described as followings:

3.4.1 Power Supply

3.4.2 PLL and MCU Interface

3.4.3 RF Transmitter

3.4.4 RF Receiver

3.4.5 Audio Detector

3.4.1 Power Supply

The RF transmitter receives power from TXVCC. TXVCC is enabled only during TALK mode.The RF receiver receives power from RXVCC. RXVCC is enabled only during TALK or stand-by mode when wake up.

3.4.2 PLL and MCU Interface

The frequencies of the RF transmitter and RF local oscillator are controlled by PLL IC U1. The MCU transmit PLL data through DATA, CLK and CE signal lines. The basic clock frequency of the PLL is derived from an 11.15MHz crystal inside the RF module. The local frequencies to TX and RX are generated and locked at 825MHz and 798MHz respectively.

3.4.3 RF Transmitter

The RF transmitter oscillator frequency 825MHz is controlled by the PLL through Vt. The PLL samples the RF frequency through fin. The audio input signal AFIN is fed to this RF oscillator through the FM modulator.

Fundamental frequency 825MHz is multiplied to 2475MHz and bypass through band pass filter formed by Q7, ML5, C5, C37 and ML4. The filtered 2475MHz is then injected into TX power amplifier Q6 and related passive components. The enlarged 2475MHz rf signal is then input into the 2475MHz TX_FILTER, DF1. The transmitted rf signal is then injected into the ANTENNA and radiated out into air.

3.4.4 RF Receiver

Received rf signal is collected from ANTENNA and passed through 2403MHz filter DF2. The filtered 2403MHz rf signal will then be injected into the LNA Q3 and be enlarged. The amplified 2403MHz signal is then input into the MIXER which is formed by Q4 and related passive components.

Q2 and VD2 with related resistors and capacitors network form the RXVCO **which is fed and locked by the PLL U1. The fundamental 798MHz frequency is multiplied to 2393MHz and bypass the BPF formed by C28, ML11, C26, C25, ML13 and C 50 to the receiver mixer.**

The receiver local oscillator frequency is controlled by the PLL through Vt. The PLL samples the local oscillator RF frequency through fin.

The mixer collects the input from LNA and 2393MHz signal from BPF and then output the IF 10.7MHz into Q5.

3.4.5 Audio Detector

Amplified IF from Q5 is passed into 10.7MHz filter CF1,amplifier Q8 , 10.7MHz filter CF3 and then injected into the IF demodulated IC U4. Detected audio will then be recovered and output at the AFOUT pin of the RF module.

3.4 Compander

A compander U3 is used for improving the S/N of the transmit and receive audio signal.

3.5 Data shaper

The information which sending from base unit, is recovered by the amplifier Q1 and Q2.

3.6 Charge detector

ZD1, D4, D5, D6, D7, D8, R53, C29 form a charge detector to direct the charging signal to the MCU pin 26.

3.7 Low battery detector

A battery low detector is built-in by Q3 which detects the battery dropping and sends a signal to pin 19 of MCU.

3.8 Buzzer amplifier

Q11 is a buzzer amplifier driven directly by the MCU pin 21,22 and 23.

4. Functional Blocks of the Base unit

4.1 Power supply
4.2 MCU and MCU interface
4.3 Antenna and RF module

4.4 Compander
4.5 Data shaper
4.6 Charge detector
4.7 Line audio interface
4.8 Ring detector
4.9 Led function board
4.10 Noise detector and carrier detector

5. Circuit Block Description

5.1 Power supply

BQ4 8050 regulateS the input DC 9V to 5V which provides power to every part of the circuit.

5.2 MCU and MCU interface

The heart of the base is BU5 MCU that communicates with the PLL of BMD1 through pins 5,6 and 7. Transmitter is controlled by the signal TX_DC which output from MCU via pin 20. MCU pins 6 to 11 consist of a resistor ladder for generating DTMF signal. The communication between Handset and Base is via the pin 24 and pin 26 through the RF link.

5.3 Antenna and RF modulator

ANT is antenna transmit and receive signal. BMD1 is a RF modulator which consist of Duplexer, Power amplifier, Mixer & IF, RXVCO, TXVCO, VCC & TXVCC control, Synthesizer and DEMO Audio Output circuits.

The block diagram of RF Module is as shown below. It is made up of the following parts:

5.4.1 Power Supply
5.4.2 PLL and MCU Interface
5.4.3 RF Transmitter
5.4.4 RF Receiver
5.4.5 Audio Detector

5.4.1 Power Supply

The RF transmitter receives power from TXVCC. TXVCC is enabled only during TALK mode or Ring mode. The RF receiver receives power from RXVCC. RXVCC is enabled when **BASE plug in DC adapter.**

5.4.2 PLL and MCU Interface

The frequencies of the RF transmitter and RF local oscillator are controlled by PLL IC U1. The MCU transmit PLL data through DATA, CLK and CE signal lines. The basic clock frequency of the PLL is derived from an 11.15MHz crystal inside the RF module. The local frequencies to TX and RX are generated and locked at 801MHz and 828MHz respectively.

5.4.3 RF Transmitter

The RF transmitter oscillator frequency 801MHz is controlled by the PLL through Vt. The PLL samples the RF frequency through fin. The audio input signal AFIN is fed to this RF oscillator through the FM modulator.

Fundamental frequency 801MHz is multiplied to 2403MHz and bypass through band pass filter formed by Q7, ML5, C5, C37 and ML4. The filtered 2403MHz is then injected into TX power amplifier Q6 and related passive components. The enlarged 2403MHz rf signal is then input into the 2403MHz TX_FILTER, DF1. The transmitted rf signal is then injected

into the ANTENNA and radiated out into air.

5.4.4 RF Receiver

Received rf signal is collected from ANTENNA and passed through 2475MHz filter DF2. The filtered 2475MHz rf signal will then be injected into the LNA Q3 and be enlarged. The amplified 2475MHz signal is then input into the MIXER which is formed by Q4 and related passive components. The mixer collects the input from LNA and 2485MHz signal from BPF and then output the IF 10.7MHz into Q5.

Q2 and VD2 with related resistors and capacitors network form the RXVCO **which is fed and locked by the PLL U1. The fundamental 828MHz frequency is multiplied to 2485MHz and bypass the BPF formed by C28, ML11, C26, C25, ML13 and C 50 to the receiver mixer.**

The receiver local oscillator frequency is controlled by the PLL through Vt. The PLL samples the local oscillator RF frequency through fin.

5.4.**5 Audio Detector**

Amplified IF from Q5 is passed into 10.7MHz filter CF1,amplifier Q8, 10.7MHz filter CF3 and then injected into the IF demodulated IC U4. Detected audio will then be recovered and output at the AFOUT pin of the RF module.

5.4 Compander

A compander BU1 is used for improving the S/N of the transmit and receive audio signal.

5.5 Data shaper

The information which sending from handset unit, is recovered by the amplifier BQ1 and BQ2.

5.6 Charge detector

BQ7 is a charge detector to direct the charging signal to the MCU pin 25.

5.7 Line audio interface

BR20, BD9, BD10, BD11, BD12, BC40, BU5, BD13 and BTR1 line transformer are the audio interface to the telephone line. The transformer is also used for telephone isolation.

5.8 Ring detector

BC41, BR11, BZD3, BZD2, BD8, BU4(K817P or LTV817) and BR44 form a ring detector which feed the signal through pin 26 of MCU.

5.9 LED function board

BLED1 is used for indicating ?IN USE? OR ?CHARGING? when handset is on cradle.

5.10 Carrier detector

The RF Module BMD1 pin 10 is an output pin of the carrier detector signal , it is sent to BU3 pin 23.When there is carrier, it is Low; when there is noise, it is High.

BU5 finds the clear channel by this pin 23.

CH	HANDSET		BASE	
	TX	RX	TX	RX
1	2,474,000,000	2,391,850,000	2,402,550,000	2,484,700,000
2	2,474,050,000	2,391,900,000	2,402,600,000	2,484,750,000
3	2,474,100,000	2,391,950,000	2,402,650,000	2,484,800,000
4	2,474,150,000	2,392,000,000	2,402,700,000	2,484,850,000
5	2,474,200,000	2,392,050,000	2,402,750,000	2,484,900,000
6	2,474,250,000	2,392,100,000	2,402,800,000	2,484,950,000
7	2,474,300,000	2,392,150,000	2,402,850,000	2,485,000,000
8	2,474,350,000	2,392,200,000	2,402,900,000	2,485,050,000
9	2,474,400,000	2,392,250,000	2,402,950,000	2,485,100,000
10	2,474,450,000	2,392,300,000	2,403,000,000	2,485,150,000
11	2,474,500,000	2,392,350,000	2,403,050,000	2,485,200,000
12	2,474,550,000	2,392,400,000	2,403,100,000	2,485,250,000
13	2,474,600,000	2,392,450,000	2,403,150,000	2,485,300,000
14	2,474,650,000	2,392,500,000	2,403,200,000	2,485,350,000
15	2,474,700,000	2,392,550,000	2,403,250,000	2,485,400,000
16	2,474,750,000	2,392,600,000	2,403,300,000	2,485,450,000
17	2,474,800,000	2,392,650,000	2,403,350,000	2,485,500,000
18	2,474,850,000	2,392,700,000	2,403,400,000	2,485,550,000
19	2,474,900,000	2,392,750,000	2,403,450,000	2,485,600,000
20	2,474,950,000	2,392,800,000	2,403,500,000	2,485,650,000
21	2,475,000,000	2,392,850,000	2,403,550,000	2,485,700,000
22	2,475,050,000	2,392,900,000	2,403,600,000	2,485,750,000
23	2,475,100,000	2,392,950,000	2,403,650,000	2,485,800,000
24	2,475,150,000	2,393,000,000	2,403,700,000	2,485,850,000
25	2,475,200,000	2,393,050,000	2,403,750,000	2,485,900,000
26	2,475,250,000	2,393,100,000	2,403,800,000	2,485,950,000
27	2,475,300,000	2,393,150,000	2,403,850,000	2,486,000,000
28	2,475,350,000	2,393,200,000	2,403,900,000	2,486,050,000
29	2,475,400,000	2,393,250,000	2,403,950,000	2,486,100,000
30	2,475,450,000	2,393,300,000	2,404,000,000	2,486,150,000
31	2,475,500,000	2,393,350,000	2,404,050,000	2,486,200,000
32	2,475,550,000	2,393,400,000	2,404,100,000	2,486,250,000
33	2,475,600,000	2,393,450,000	2,404,150,000	2,486,300,000
34	2,475,650,000	2,393,500,000	2,404,200,000	2,486,350,000
35	2,475,700,000	2,393,550,000	2,404,250,000	2,486,400,000
36	2,475,750,000	2,393,600,000	2,404,300,000	2,486,450,000
37	2,475,800,000	2,393,650,000	2,404,350,000	2,486,500,000
38	2,475,850,000	2,393,700,000	2,404,400,000	2,486,550,000
39	2,475,900,000	2,393,750,000	2,404,450,000	2,486,600,000
40	2,475,950,000	2,393,800,000	2,404,500,000	2,486,650,000