GH3040(XXXXX) Circuit Description

1. Introduction

The model GH3040(XXXXX) is a 40 channel (2.40255-2.47595GHz) Caller ID 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 LCD

2.3 MCU and MCU interface

2.4 Antenna and RF module

2.5 Compander

2.6 Data shaper

2.7 Charge detector

2.8 Low battery detector

2.9 Buzzer amplifier

3. Circuit Block Description of the remote Handset

3.1 Keyboard matrix and function LED

Pin 41 to pin 49 of the MCU:U2 NT93420 form a keyboard, and the new call LED is controlled by the pin 59 of the MCU.

3.2 LCD

LCD1 is controlled by the MCU: U1 NT93420 pin 1 to pin 29, pin 74 to pin 100.

3.3 MCU and MCU interface

The handset and the base is link up by the pins(40,63 in Handset and 43,78 in Base).

Besides, the PLL of the RF Module is controlled by the pins 35 to 37 of the MCU .

3.4 Antenna and RF module

Antenna used in handset, which are soldered on the RF module of PCB board, is soft wire. In addition, it is integral.

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

MD1 is a RF module, which consists of Filter, 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 PLL operation

U1 PLL IC gets data from cpu through pins: DATA, CLK and STB. The generated local frequency is driven by crystal 11.15MHz. The local frequencies to TX and RX are generated and locked at 825MHz and 798MHz respectively.

3.4.2 RX VCO and 2393MHz BPF

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.

3.4.3 TX VCO and modulator with 2475MHz BPF

Audio from base band circuit is fed into modulator formed by VD1. Modulated signal is fed into TX VCO, which is formed by Q1 and related RC network. The TX VCO is fed and locked by the PLL U1. 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.

3.4.4 RF receiving parts

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

3.4.5 Receiving IF and DEMODULATED parts

Amplified IF from Q5 is passed into 10.7MHz filter CF1 and then injected into the IF demodulated IC U2. 10.7MHz signal is then mixed with the 11.15MHz frequency in the 2nd mixer in the IC and then a 450kHz IF is then input into the 450kHz ceramic IF filter CF2. Filtered 450kHz IF is then passed back into the FM detector of the IC U2. Detected audio will then be recovered out from the demodulated IC U2 and output at the AUDIO OUTPUT pin of the RF module.

3.4.6 RF Transmission part

2475MHz filtered signal from 2475MHz filter is input into the TX power amplifier which formed by 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.

3.5 Compander

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

3.6 Data shaper

The information which sending from base unit, is recovered by the amplifier Q1 and Q4, Q5.

3.7 Chargier detector

ZD1, R33, C14 and R33 form a charge detector to direct the charging signal to the MCU pin 31.

3.8 Low battery detector

A battery low detector is built-in by the Q7, R27, R28, R29 and D3 which detects the battery dropping and sends a signal to pin 32 of MCU.

3.9 Buzzer amplifier

Q9 is a buzzer amplifier driven directly by the MCU pin 61.

4. Functional Blocks of the Base unit

4.1 Power supply
4.2 MCU and MCU interface
4.3 Calling line identifier
4.4 Antenna and RF module
4.5 Compander
4.6 Data Shaper
4.7 Charge detector
4.8 Line audio interface
4.9 Ring detector
4.10 LCD
4.11 Carrier detector

5. Circuit Block Description of Base Unit

5.1 Power supply

BU5 7805 regulate 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 MCU BMU1: NT93423 that communicates with the
PLL of BMD1 through pins 39,40 and 41. Transmitter is controlled by the signal TX_DC which output from MCU via pin 53. MCU pin 95 is for generating DTMF signal. The communication between Handset and Base is via the pin 43 and
pin 78 through the RF link.

5.3 Calling line identifier

MCU pin 87 to pin 88, when receiving caller ID data, MCU controls the LCD to display the correct information.

5.4 Antenna and RF modulator

Antenna used in base unit, which are soldered on the RF module of PCB board, is soft wire. In addition, it is integral.
ANT is antenna transmit and receive signal. BMD1 is a RF modulator which consist of Filter, Power amplifier, Mixer & IF, RXVCO, TXVCO, VCC & TXVCC control, Synthesizer and DEMO Audio Output circuits.

5.4.1 PLL operation

U1 PLL IC gets data from cpu through pins: DATA, CLK and STB. The generated local frequency is driven by crystal 11.15MHz. The local frequencies to TX and RX are generated and locked at 801MHz and 828MHz respectively.

5.4.2 RX VCO and 2485MHz BPF

Q2 and VD2 with related resistors and capacitors network form the RXVCO which is fed and locked by the PLL U1. The fundamental 8281MHz frequency is multiplied to 2485MHz and bypass the BPF formed by C28, ML11, C26, C25, ML13 and C50 to the receiver mixer.

5.4.3 TX VCO and modulator with 2403MHz BPF

Audio from base band circuit is fed into modulator formed by VD1. Modulated signal is fed into TX VCO which is formed by Q1 and related RC network. The TX VCO is fed and locked by the PLL U1. 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.

5.4.4 RF receiving parts

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.

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5.4.6 RF Transmission part

2403MHz filtered signal from 2403MHz filter is input into the TX power amplifier which is formed by 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.

5.5 Compander

A compander BU2 is used for improving the S/N of the transmit and receive audio signal.

5.6 Data shaper

The information which sending from handset unit, is recovered by the amplifier BQ2, BQ3.

5.7 Charge detector

BQ6 is a charge detector to direct the charging signal to the MCU pin 80.

5.8 Line audio interface

BR84, BC39, BD8 to BD11, BD7 and BT1 line transformer are the audio interface to the telephone line. The transformer is also used for telephone isolation.

5.9 Ring detector

BR56, BC52, BZD2, BZD3, BD12, BU3(LTV817) form a ring detector which feed the signal through pin 93 of MCU.

5.10 LCD

BMLCD1 is controlled by the MCU: U1 NT93423 pin 1 to pin 32, pin 99 to pin 128.

5.11 Carrier detector

The RF Module BMD1 pin 10 is an output pin of the carrier detector signal to MCU pin79.

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