

# HT95168 Caller ID Telephone IC

## Introduction

The HT95168 is a high performance and low cost IC specifically designed for Caller ID telephone applications. The device contains FSK/DTMF receiver, tone/pulse dialer, LCD driver, ringer, real time clock and many more essential features. Besides, it has simple and cost-effective external components which are suitable for high volume production.

## Features

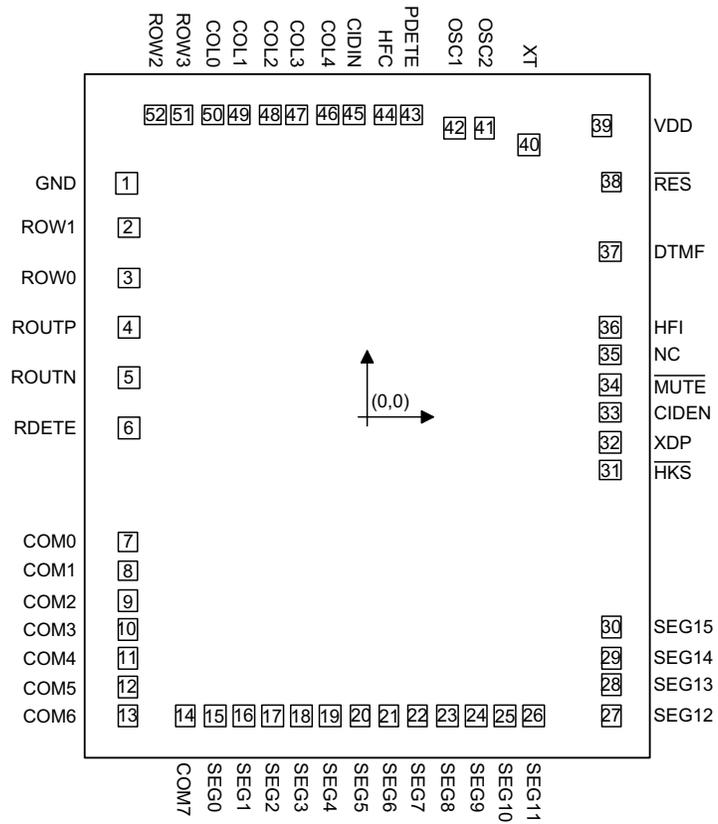
- Operating voltage: 2.4V~5.5V
- DTMF/FSK dual Caller ID standard
- Stores a maximum of 27 incoming calls (date, time, number)
- Stores a maximum of 8 outgoing calls (dialing time, number)
- RTC Indicator (month-day-hour-minute-second)
- Tone/Pulse dialing
- 1~99 hours setting for mute function
- 8-digit area & long distance code screen setting
- Unauthorized-dialing protection
- Four-stage ring sound/speech volume adjustment
- Four-stage LCD brightness adjustment
- Fixed IP number dialing out (defined by hardware option)
- Caller ID records, check/delete/call-back
- Previous edit and immediately dial out
- Hand-free/redial/pause/flash/Add '0' call back/R key functions
- Provides chip and package forms

Pin Assignment

|       |    |    |       |
|-------|----|----|-------|
| COL3  | 1  | 56 | COL4  |
| COL2  | 2  | 55 | CIDIN |
| COL1  | 3  | 54 | HFC   |
| COL0  | 4  | 53 | PDETE |
| ROW3  | 5  | 52 | OSC1  |
| ROW2  | 6  | 51 | OSC2  |
| GND   | 7  | 50 | XT    |
| ROW1  | 8  | 49 | VDD   |
| ROW0  | 9  | 48 | RES   |
| ROUTP | 10 | 47 | DTMF  |
| ROUTN | 11 | 46 | NC    |
| RDETE | 12 | 45 | NC    |
| COM0  | 13 | 44 | HFI   |
| COM1  | 14 | 43 | HFO   |
| COM2  | 15 | 42 | NC    |
| COM3  | 16 | 41 | MUTE  |
| COM4  | 17 | 40 | CIDEN |
| COM5  | 18 | 39 | XDP   |
| COM6  | 19 | 38 | HKS   |
| COM7  | 20 | 37 | NC    |
| SEG0  | 21 | 36 | SEG15 |
| SEG1  | 22 | 35 | SEG14 |
| SEG2  | 23 | 34 | SEG13 |
| SEG3  | 24 | 33 | SEG12 |
| SEG4  | 25 | 32 | SEG11 |
| SEG5  | 26 | 31 | SEG10 |
| SEG6  | 27 | 30 | SEG9  |
| SEG7  | 28 | 29 | SEG8  |

**HT95168**  
**- 56 SSOP-A**

Pad Assignment



\* The IC substrate should be connected to VSS in the PCB layout artwork.

### Pad Description

| Pad No. | Pad Name   | I/O | Configuration Option     | Description  |
|---------|------------|-----|--------------------------|--|
| 1       | GND        | —   | —                        | Power ground                                       |
| 2, 3    | ROW1, ROW0 | I   | Pull-high Resistor Input | Key matrix row lines                               |
| 4       | ROUTP      | I/O | Positive                 | Ring sound output, volume control                  |
| 5       | ROUTN      | I/O | Negative                 | Ring sound output, volume control                  |
| 6       | RDETE      | I   | —                        | On-hook ring detector, off-hook lock '0' detection |
| 7~14    | COM0~COM7  | O   | —                        | LCD common pins                                    |
| 15~30   | SEG0~SEG15 | O   | —                        | LCD segment pins                                   |
| 31      | HKS        | I   | Low Active               | Hook detection                                     |
| 32      | XDP        | O   | High Active              | Off-hook control                                   |
| 33      | CIDEN      | O   | —                        | Initial state is low                               |
| 34      | MUTE       | O   | Low Active               | Mute function                                      |
| 35      | NC         | —   | —                        | No connection                                      |
| 36      | HFI        | I   | Rising Edge Trigger      | Hand-free trigger input                            |
| 37      | DTMF       | O   | —                        | DTMF generator output                              |
| 38      | RES        | I   | Low Active               | Reset pin  |
| 39      | VDD        | —   | —                        | Power VDD  |
| 40      | XT         | —   | —                        | Loop filter pin                                    |
| 41      | OSC2       | O   | —                        | 32768kHz crystal output                            |
| 42      | OSC1       | I   | —                        | 32768kHz crystal input                             |
| 43      | PDETE      | I   | —                        | Unauthorized-dialing detection                     |
| 44      | HFC        | O   | Rising Edge Trigger      | Hand-free control pin                              |
| 45      | CIDIN      | I   | —                        | Caller ID signal input                             |
| 46~50   | COL4~COL0  | O   | —                        | Key matrix column lines                            |
| 51, 52  | ROW3, ROW2 | I   | Pull-high Resistor Input | Key matrix row lines                               |

### Key Matrix Description

|           | COL4 (46)        | COL3 (47) | COL2 (48) | COL1 (49) | COL0 (50)         |
|-----------|------------------|-----------|-----------|-----------|-------------------|
| ROW3 (51) | 1                | 2         | 3         | Up        | Pause             |
| ROW2 (52) | 4                | 5         | 6         | Down      | Set               |
| ROW1 (2)  | 7                | 8         | 9         | Delete    | R Key             |
| ROW0 (3)  | *                | 0         | #         | Check     | Add '0' Call back |
| GND       | Call back/Redial | Flash/ADJ | Volume    | IP        | Hand-free         |

## Functional Description

### Ring Sound/Speech Volume Control

- At On-hook state, press the [Volume] key to adjust the ring sound and each key for changes in the sound volume from loud, medium, low to soft.
- At Off-hook state, press the [Volume] key to adjust the speech volume and each key for changes in the volume from loud, medium, low to soft.

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**Note** The initial setting for ring sound/speech volume is loud.

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### LCD Brightness Adjustment

At On-hook state, press the [Flash/ADJ] key to adjust the LCD brightness and each key for changes in the state from dim, slightly bright, average to bright.

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**Note** The initial setting for LCD brightness is slightly bright.

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### Time Setting

- At On-hook state, press the [Set] key for 2 seconds, the LCD then shows the [Month-Day-Hour-Min-Sec], first the (Month) remains in a flashing state and waiting for adjustments, then press the [Up] or [Down] key to increase or decrease the month from 1 to 12.
- Press the [Set] key again, the (Day) remains in a flashing state and waiting for adjustments, then press the [Up] or [Down] key to increase or decrease the day from 1 to 31.
- Press the [Set] key again, the (Hour) remains in a flashing state and waiting for adjustments, then press the [Up] or [Down] key to increase or decrease the hour from 0 to 23.
- Press the [Set] key again, the (Min) remains in a flashing state and waiting for adjustments, then press the [Up] or [Down] key to increase or decrease the minute from 0 to 59 and the second will be set to zero at the same time.

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**Note** The initial time setting is [01-01 00-00-00].

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### Tone/Pulse Mode Setting

The HT95168 provides two kinds of dialing modes, tone mode and pulse mode. At On-hook state, press the [\*] key for 2 seconds to select the dialing mode.

- Tone Mode

| Key Name | DTMF Output Frequency (Hz) |        | %Error |
|----------|----------------------------|--------|--------|
|          | Specified                  | Actual |        |
| ROW3     | 697                        | 698.8  | +0.2%  |
| ROW2     | 770                        | 766.4  | -0.5%  |
| ROW1     | 852                        | 847    | -0.5%  |
| ROW0     | 941                        | 947.8  | +0.6%  |
| COL4     | 1209                       | 1214.4 | +0.4%  |
| COL3     | 1336                       | 1331   | -0.3%  |
| COL2     | 1477                       | 1470   | -0.4%  |

- Pulse Mode: Pulse rate: 10pps, M/B ratio: 40:60, Pulse to Tone duration: 3.6 seconds

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**Note** The initial dialing mode setting is tone mode.

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### Previous Edit and Immediately Dial Out

The HT95168 provides previous edit for dialing convenience and the maximum edit length is 32-digit, once off-hook or hand-free the edited number will be dialed out immediately. Besides, pressing the [Call back/Redial] key or the [Add '0' Call back] key can also be dialed out directly.

### Unauthorized-dialing Protection Setting

The meaning of [Unauthorized-dialing] is that the telephone line was illegally shunted by another phone and making the line dial out.

- When the protection function is enabled, the HT95168 generates an interference signal to protect the line from being illegally used.
- At On-hook state, press the [#] key for 2 seconds, then turn on the LCD [Protection] icon to enable the protection function.
- Pressing again the [#] key for 2 seconds, turn off the icon to disable the function.

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**Note** The initial setting of this function is disabled.  
To ensure that this function works normally for long distance conditions, fill-in or re-charge the battery.

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### Mute Function

Sometimes we need quiet and don't want to hear the ring sound at some situations such as during sleeping, meeting or resting.

- The HT95168 provides the [Mute] function to stop the ring sound at a certain desired period.
- At On-hook state, press the [\*], [2], [\*], [four-digit number], [#] to set the ring sound mute period.
- [Four-digit number] expresses 2-digit hour with 2-digit minute, the setting range is from 99 hours with 99 minutes to 0 hour with 1 minute.
- After setting, if the timer counts down to zero, the ring sound function is enabled.

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**Note** It can receive Caller ID data normally during mute period. The initial setting of this function is disabled.

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### Area & Long Distance Code Screen Setting

At On hook state, press the [\*], [3], [\*], [1~8 digits number], [#] to set the local area code or long distance code to store the caller ID phone number.

- For example, when pressing the [\*] [3] [\*] [0755] [#], if there's an incoming call with a number 075527089253, then it will automatically screen the 0755 phone number prefix and it only stores the 27089253.
- Press the [\*], [3], [\*], [#] to disable the screen function and the LCD shows [Loc off].

### Dual System Caller ID Setting

- When you plug the phone line into RJ11 jack to power-on reset the telephone, once a first caller ID incoming call occurs, the HT95168 can automatically fix the caller ID receiving format whether FSK or DTMF standard.
- You can alternately change the caller ID receiving format by pressing the [\*] [\*] [#] input.
- Each incoming call can be stored with a maximum of 14-digit phone number including one of the digits with automatically added '0' when the phone number length is more than 9-digit, except for area code set to screen '0' and mobile phone number with '13' prefix.

### Incoming Call Check and Call Back

The HT95168 stores 27-set incoming calls and each call with 8-digit length or 21-set with 12-digit or 19-set with 14-digit length.

- When the [Up] key is pressed, the LCD shows the [Incoming] icon and incoming call records through last in first out, LIFO rule from latest record to earliest record until the end pointer. Each incoming call is divided into two records, first is [Pointer-Date-Time], last is [Incoming phone number which has a maximum of 14-digit].
- Oppositely, when the [Down] key is pressed, it shows first is [Incoming phone number], last is [Pointer-Date-Time] through LIFO rule from the earliest record to the latest record until the end pointer.
- Each incoming call record can be erased by pressing the [Delete] key.
- Each incoming call record can be dialed out by pressing the [Call back/Redial] key or the [Add '0' Call back] key.

### **Outgoing Call Check and Call Back**

The HT95168 stores 8-set outgoing calls and each call with 14-digit maximum length.

- When the [Check] key is pressed, the LCD shows the [Outgoing] icon and outgoing call records through LIFO rule from the latest record to the earliest record until the end pointer. Each outgoing call is divided into two records, first is [Pointer-dialing time], last is [outgoing phone number which has a maximum of 14 digits].
- Each outgoing call record can be erased by pressing the [Delete] key.
- Each outgoing call record can be dialed out by pressing the [Call back/Redial] key or the [Add '0' Call back] key.

### **Redial**

The Redial memory stores the latest phone called and the maximum digits are 32. When you press the [Redial] key at off-hook state then the latest number will be dialed out immediately.

### **Add '0' Call Back**

For convenience on having long distance calls, when you press the [Add '0' call back] key , it will automatically dial out and add '0' prefix number before the phone numbers which are incoming call or outgoing call or previous edit call.

### **Flash**

When the [Flash] key is pressed, it will generate a 600ms break time.

### **R Key**

When the [R] key is pressed, it will generate a 95ms break time.

### **Pause Key**

When the [Pause] key is pressed, it will generate a 3.6 sec stop timing during Tone/Pulse dialing.

### **Long Distance Call Lock Function**

When PDETE (Pad 43) is high at off-hook state, all the '0' prefixed phone numbers are inhibited to be dialed out including recently dialed, previously dialed, incoming call call-back, outgoing call call-back and add '0' call back, which means that long distance call function is locked.

### **Hand-free**

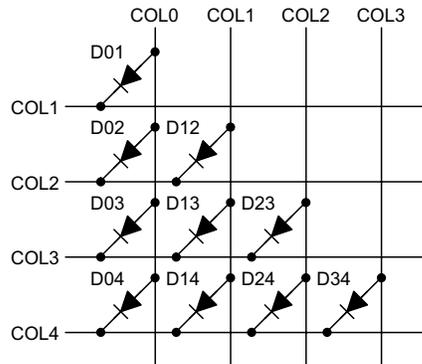
The HT95168 provides hand-free function for talking convenience, which replaced the earpiece with a speaker phone.

### Fixed IP Number Dialing Out Setting

The [IP] is abbreviation of Internet Phone, which is serviced by ISP vendors. The ISP vendors provide customers with different specific prefix phone number (namely IP number) to dial the international call or long distance call from PSTN through their dedicated Internet to PSTN for the purpose of reducing long distance cost.

For dialing out convenience, the HT95168 provides 11-set popular IP numbers defined by hardware as shown below in the diode connection figure. By means of diode connection placement between COL0~COL3 and COL1~COL4, it can define 11 kinds of IP numbers as shown in the table below.

| Dnm    | —     | D01   | D02   | D12   | D03   | D13   | D23   | D04   | D14   | D24   | D34 |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| IP No. | 17909 | 17920 | 17931 | 17930 | 17921 | 17951 | 17950 | 17908 | 17911 | 17910 | 193 |



- At On-hook state, press the [IP on/off] key for 2 seconds, then the LCD shows [IP on] and enable the fixed IP dialing out function. Oppositely, pressing again the [IP on/off] key for 2 seconds, the LCD shows [IP off] and disable this function.
- When the IP function is enabled, all long distance phone number prefixed with "0" are automatically dialed out with a specific IP number before the original phone numbers.
- For example 1, if no diode connects to Columns and IP function is enabled, checking an incoming call [02152204293] then call back this number. What is the number dialed out? The correct answer is [1790902152204293].
- For example 2, if the diode is crossed to COL1 and COL3 namely D13 and IP function is enabled, checking an outgoing call 07522829029 then call back this number. What is the number dialed out? The correct answer is 1795107522829029.

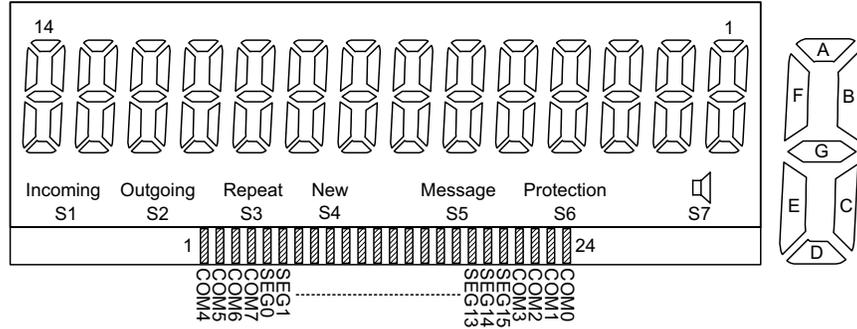
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**Note** The initial setting is IP off.

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### LCD Panel Configuration

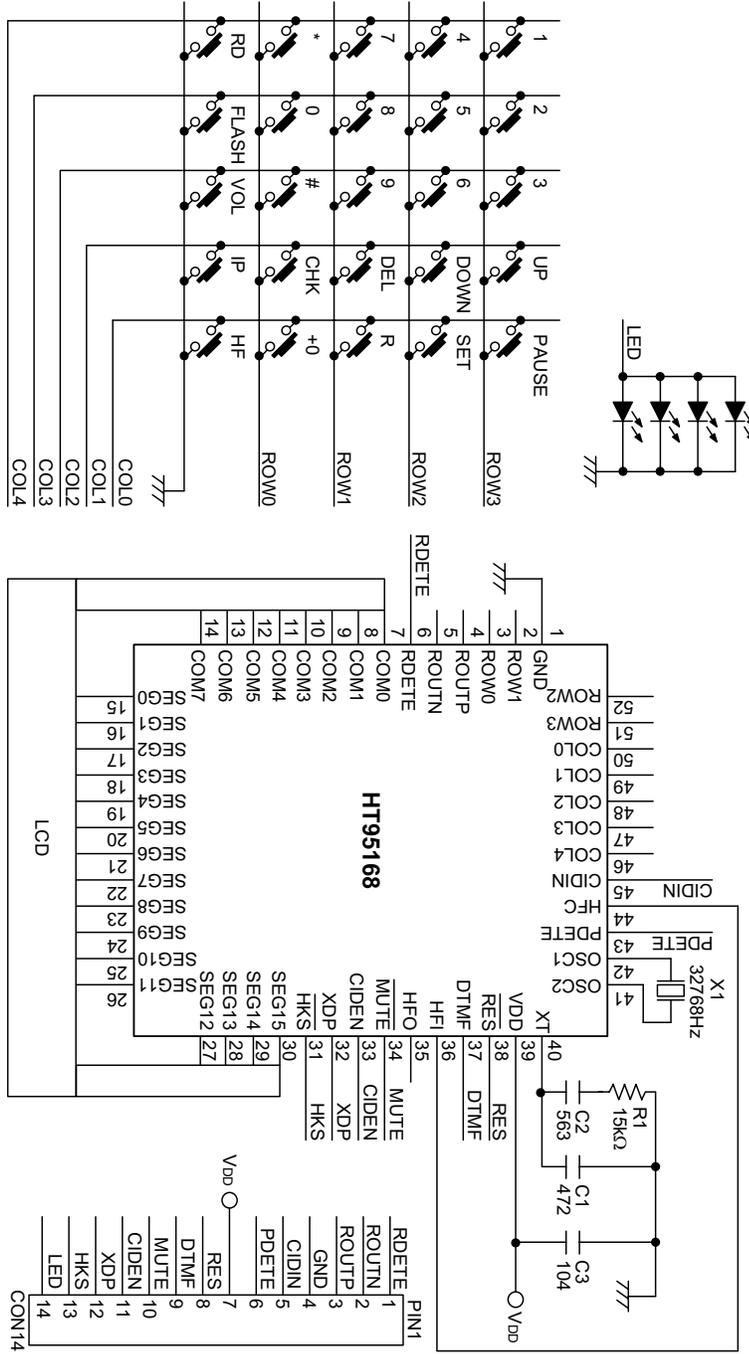
The advantages of the LCD panel shown below are bigger display and having a simple-clear feeling.



| PIN  | 1    | 2    | 3    | 4    | 5 | 6   | 7   | 8   | 9   | 10  | 11  | 12 | 13 | 14 | 15 | 16  | 17  | 18  | 19  | 20 | 21 | 22   | 23   | 24   |
|------|------|------|------|------|---|-----|-----|-----|-----|-----|-----|----|----|----|----|-----|-----|-----|-----|----|----|------|------|------|
| COM0 |      |      |      |      |   |     | 2A  | 2F  | 3A  | 3F  | 7F  | 7A | 6F | 6A | 5F | 5A  | 4F  | 4A  | 1F  | 1A |    |      |      | COM0 |
| COM1 |      |      |      |      |   |     | 2B  | 2G  | 3B  | 3G  | 7G  | 7B | 6G | 6B | 5G | 5B  | 4G  | 4B  | 1G  | 1B |    |      | COM1 |      |
| COM2 |      |      |      |      |   |     | 2C  | 2E  | 3C  | 3E  | 7E  | 7C | 6E | 6C | 5E | 5C  | 4E  | 4C  | 1E  | 1C |    |      | COM2 |      |
| COM3 |      |      |      |      |   |     |     |     | 2D  | S6  | 3D  | 7D |    | 6D |    | 5D  | S5  | 4D  |     | 1D | S7 | COM3 |      |      |
| COM4 | COM4 |      |      |      |   | 14F | 14A | 13F | 13A | 12F | 12A | 8A | 8F | 9A | 9F | 10A | 10F | 11A | 11F |    |    |      |      |      |
| COM5 |      | COM5 |      |      |   | 14G | 14B | 13G | 13B | 12G | 12B | 8B | 8G | 9B | 9G | 10B | 10G | 11B | 11G |    |    |      |      |      |
| COM6 |      |      | COM6 |      |   | 14E | 14C | 13E | 13C | 12E | 12C | 8C | 8E | 9C | 9E | 10C | 10E | 11C | 11E |    |    |      |      |      |
| COM7 |      |      |      | COM7 |   | 14D | S1  | 13D | S2  | 12D |     |    | 8D | S4 | 9D | S3  | 10D | 11D |     |    |    |      |      |      |

**Note** The recommended optimal operating voltage for the LCD panel is 0.93VDD and choose 3V/4.5V LCD panel to fit 2-pcs or 3-pcs battery where VDD is 3.2V/4.8V.





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