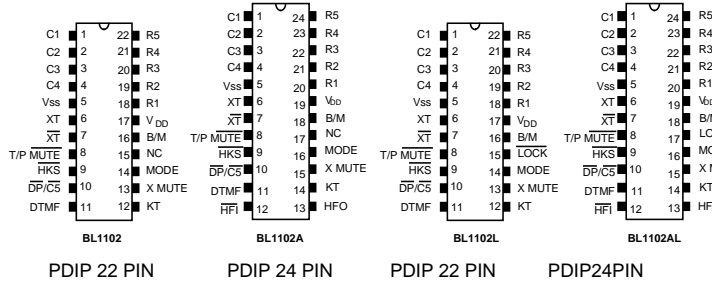


### Description

BL1102 Series is a single chip dialer IC using Si-gate CMOS process, it can provide signal for either Pulse or double Tone with multi-frequency dialing. It features key tone and hands-free dialing, "0,"9" dialing latch with first number, 2-array 32-digit number memory re-dialing, and 13-array 16-digit number memory etc.



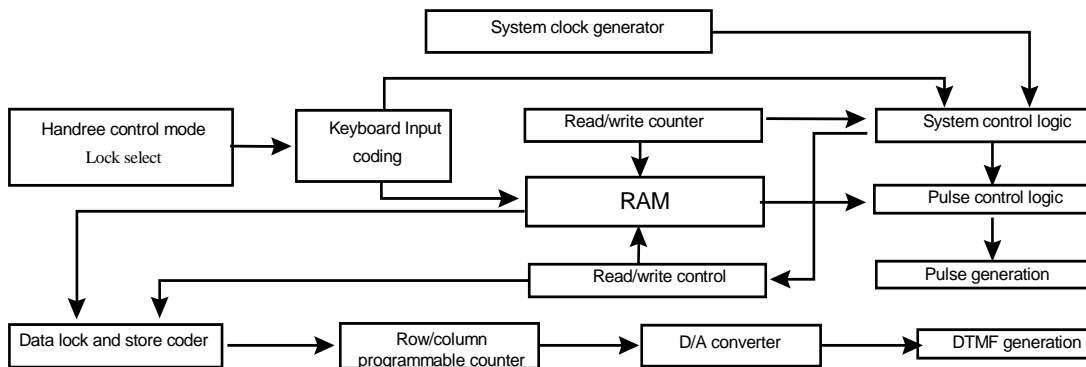
### Features

- Operating voltage : 2.0 ~ 5.5V
- Double Tone/Pulse selection with switch, pulse can be switched to double tone by pressing \*/T key.
- 3.579545MHz crystal or ceramic resonator is used
- Power on reset on chip
- Minimum tone output duration : 100 ms
- 2 arrays of 32-digit number memory used for re-dialing and memory dialing respectively
- 3 arrays of 16-digit number single key dialing memory
- 10 arrays of 32-digit number double key dialing memory
- pulse break/make ratio can be 3/2 or 2/1, both alternative, and pulse speed is 10PPS
- Flash Time: 98ms, 305ms, 6000ms
- Minimum tone output width: 93ms, minimum tone interval:93ms
- Key tone output used for confirming the key pressed is right
- Pulse, P T (Pulse to Tone) can be stored as a digit in memory
- Easy operation with one-key redial, memory, pause and etc.
- Standard 5 × 5 keyboard used
- Key "Mute" used for mute talking
- The dial-out starting with number "0" or "9" can be locked and chosen by pin.
- CD-operating key
- 20 and 24 PDIP plastic Package

### Application

Used as dialing circuit in telephone, complete relevant functions.

### Block Diagram



Known from the above block diagram, it mainly made up of system clock generator, keyboard interface, data code, random storing, read/write counter, address lock and storing, system control logic, pulse generator, data/mode converter and double tone generator and other circuits.

### Pin Description

Symbol	22 Pin	24 Pin	I/O	Function								
Row/column input	1-4, 18-22	1-4, 20-24	I	A valid key entry is defined by a single row being connected to a single column								
X T, X T	6, 7	6, 7	I/O	Oscillation I/O								
T/P MUTE	8	8	O	The T/P MUTE is a conventional CMOS N-channel open drain output. When dialing and flash, the output is and will turn down the talking network.								
MODE	1 4	1 6	I	Dialing mode selection.. When pin is connected to $V_{SS}$ , it is double tone multi-frequency mode when it is connected to $V_{DD}$ , it is pulse mode (10ppS).								
HKS	9	9	I	The pin is the hook switch input HKS =1, on HOOK state, chip in sleeping mode, no operation. HKS =0, on HOOK state, enable chip on normal operation..								
B/M	1 6	1 8	I	Break/make ratio, pin selection. B/M=1, ratio is 60/40; B/M=0, ratio is 66/33.								
$V_{DD}$ , $V_{SS}$	1 7, 5	1 9, 5	I	Power and power ground input								
X MUTE	1 3	1 5	O	Inverter output. Dialing under double tone mode, pin is high voltage; if dialing under pulse mode, the pin is low voltage.								
HFI, HFO	--	12, 13	I/O	Hands-free control. details can be seen in table2.								
KT	12	14	O	Key tone signal output. The frequency is 1.2KHz.								
LOCK	15 (BL1102L)	17 (BL1102AL)	I	Once the pin is locked, dialing starting with "0" or "9" and all the key input afterwards will become invalid. It will recover the original state after on hook.. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>LOCK Pin</th> <th>function</th> </tr> </thead> <tbody> <tr> <td><math>V_{DD}</math></td> <td>"0" 和 "9" dialing limit</td> </tr> <tr> <td>floating</td> <td>normal</td> </tr> <tr> <td><math>V_{SS}</math></td> <td>"0" dialing limit</td> </tr> </tbody> </table>	LOCK Pin	function	$V_{DD}$	"0" 和 "9" dialing limit	floating	normal	$V_{SS}$	"0" dialing limit
LOCK Pin	function											
$V_{DD}$	"0" 和 "9" dialing limit											
floating	normal											
$V_{SS}$	"0" dialing limit											
NC	15 (BL1102)	17 (BL1102A)	I	Not available								

DP / C5	10	10	0	The DP/C5 is a conventional CMOS N-channel open drain output. Under tone state. Output will keep high; Under pulse state, output dialing pulse.
DTMF	11	11	0	Double tone multifrequency signal output

Table1. Circuit Function

Type	Pulse (PPS)	Flash (ms)	Break/Make Ratio (B/M)	Hands-free	Lock Control	Assembly (PDIP)
BL1102	10	98 / 305 / 600	Pin Selection	N	N	22
BL1102A	10	98 / 305 / 600	Pin Selection	Y	N	24
BL1102L	10	98 / 305 / 600	Pin Selection	N	Y	22
BL1102AL	10	98 / 305 / 600	Pin Selection	Y	Y	24

Table 2

Current State		Next State		
Hook switch	HFO	input	Hands-free output (HFO)	dialing
-	Low	$\overline{\text{HFI}} \downarrow$	High	Y
On hook (HKS=1)	High	$\overline{\text{HFI}} \downarrow$	Low	-
Off hook (HKS=0)	High	$\overline{\text{HFI}} \downarrow$	Low	Y
On hook (HKS=1)	-	Off hook	Low	Y
off hook (HKS=0)	Low	on hook	Low	-
off hook (HKS=0)	High	On hook	High	Y

## Function Description

### Keyboard Operation

C C2 C3 C4  $\overline{\text{DP/C5}}$  MUTE: mute on/off

A: auto-dialing

R1	1	2	3	EM1	MUTE	P: pause
R2	4	5	6	EM2	CD	CD: Call disconnect

\* /T: \* & P T key

EM1-EM3: 16 digit emergency number store

R3	7	8	9	EM3	F1	RD: one-key redial	SAVE: 32 digit save memory
R4	*	0	#	SAVE	F2	S: double-key store	F1, F2, F3: flash time 98/305/600ms
R5	R D	S	A	P	F3	#: invalid under pulse state while refer to double tone multi-frequency of the corresponding row and column	

- General Dialing

(or  $\overline{\text{HF1}}\downarrow$ ),  $\text{D1}$ ,  $\text{D2}$ , ...  $\text{Dn}$

a.  $\text{D1}$ ,  $\text{D2}$ , ...  $\text{Dn}$  will be dialed out.

b. Dialing length is unlimited, but the re-dial is inhibited if it oversteps 32 digits

- Re-dialing

a. on-hook and re-dial:  $\overline{\text{off-hook}}$ ,  $\text{D1}$ ,  $\text{D2}$ , ...,  $\text{Dn}$ , busy, then  $\overline{\text{on-hook}}$ ,  $\overline{\text{off-hook}}$  (or  $\overline{\text{hook}}$  and  $\overline{\text{HF1}}\downarrow$ )  $\text{RD}$

or ( $\overline{\text{on-hook}}$  and  $\overline{\text{HF1}}\downarrow$ ),  $\text{D1}$ ,  $\text{D2}$ , ...,  $\text{Dn}$ , busy, then,  $\overline{\text{HF1}}\downarrow$ ,  $\text{RD}$

$\overline{\text{off-hook}}$  (or  $\overline{\text{on-hook}}$  and  $\overline{\text{HF1}}\downarrow$ ),  $\text{D1}$ ,  $\text{D2}$ , ...,  $\text{Dn}$ , busy,  $\text{RD}$

b. direct re-dial:  $\overline{\text{off-hook}}$  or ( $\overline{\text{on-hook}}$  and  $\overline{\text{HF1}}\downarrow$ ),  $\text{D1}$ ,  $\text{D2}$ , ...,  $\text{Dn}$ , busy,  $\overline{\text{on-hook}}$ ,  $\text{RD}$ . If the dialing from D1 to Dn is finished, press  $\text{RD}$ , the pulse output pin will become low voltage for 2.2 minutes, and automatically insert 600ms for pause.. If press  $\text{RD}$  before finish dialing from D1 to Dn, there will be no pulse output.

- "Pause" key operation

$\overline{\text{off-hook}}$  (or  $\overline{\text{on-hook}}$  and  $\overline{\text{HF1}}\downarrow$ ),  $\text{D1}$ ,  $\text{D2}$ ,  $\text{P}$ ,  $\text{D3}$ , ...,  $\text{Dn}$

a. pause function can be stored in memory storage.

b. pause function can be performed when general dialing or re-dial or memory dialing.

- pulse  $\rightarrow$  tone mode convert (\* / T)

$\overline{\text{off-hook}}$  (or  $\overline{\text{on-hook}}$  and  $\overline{\text{HF1}}\downarrow$ ),  $\text{D1}$ ,  $\text{D2}$ , ...,  $\text{Dn}$ ,  $\text{* / T}$ ,  $\text{D1}'$ ,  $\text{D2}'$ , ...,  $\text{Dn}'$

a. If mode switch is set as pulse, output signal will be :

$\text{D1}$ ,  $\text{D2}$ , ...,  $\text{Dn}$ , pause(3.1 minutes),  $\text{D1}'$ ,  $\text{D2}'$ , ...,  $\text{Dn}'$   
 ( pulse ) ( tone )

b. If the mode switch is set as tone, output signal will be :

D1, D2, ..., Dn, \* / T, D1', D2', ..., Dn'  
(tone) (tone) (tone)

c. If the tone mode remains since the number is dialed out, pulse mode can be recovered as long as do on-hook operation.

• FLASH

[OFF-hook] (or [On-hook] and [HFI↓]), [F]

a. "flash" key can not be stored in the memory, but it enjoys the most high priority in all keyboard functions.

b. after pressing "flash" key, dialer will recover to the original status.

• Number Storage

[OFF-hook] (or [On-hook] and [HFI↓]), [D1], [D2], ..., [Dn], [S], [S]  
[Mn] or [Ln], [On-hook], (or [On-hook] and [HFI↓]).

a. Dialing out D1, D2, ... Dn first, then press the storage key [S]

b. D1, D2, ..., Dn numbers are stored in the position "Mn or Ln" and dialed out.

c. Mn = M1~ M3; Ln = 0 ~ 9; \*, #, pause key ([P])

[OFF-hook] (or [On-hook] and [HFI↓]), [S], [D1], [D2], ..., [Dn], [S],  
[Mn] or [Ln], [On-hook], (or [On-hook] and [HFI↓]).

a. D1, D2, ..., Dn are stored in Mn or Ln but will not be dialed out.

b. P and \* / T key can be stored in the memory as one digit, [P] key indicates "pause".

c. Once the storage function is finished or the state of hook switch changes, the storage mode will be released.

Memory dialing

a. One-key dial: [OFF-hook] (or [On-hook] and [HFI↓]), [Mn]

b. Two-key dial: [OFF-hook] (or [On-hook] and [HFI↓]), [A], [Ln]

• "Save" Key

a. [OFF-hook] (or [On-hook] and [HFI↓]), [D1], [D2], ..., [Dn], SAVE

If dialing from [D1] to [D2] is over, press [SAVE], the numbers from [D1] to [Dn] will be stored in the memory.

b. [On-hook] then [OFF-hook], [SAVE], press [SAVE], then [D1] to [Dn] will be dialed out.

• CD

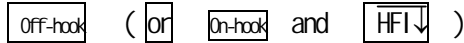
Press **CD** , one pulse output will make call disconnected , and make the system recover to the original status.

- MUTE



Press “ MUTE”, mute output will be generated.

- Mixed dialing



- a . **general dial** + **memory dial** + **general dial**
- b . **memory dial** + **general dial** + **memory dial**
- c . **re-dial** + **general dial** + **memory dial**

Dialing with “Save”key is valid only being first pressed after off hook, and the second serial numbers can be dialed after the number is sent out.

#### Absolute Maximum Rating

Parameter	Symbol	Rating	Unit
DC Supply Voltage	$V_{DD} \sim V_{SS}$	-0.3 ~ +7.0	V
input / output Voltage	$V_{IL}$	$V_{SS}-0.3$	V
	$V_{IH}$	$V_{DD}+0.3$	V
	$V_{DL}$	$V_{SS}-0.3$	V
	$V_{DH}$	$V_{DD}-0.3$	V
Power-Dissipation	$P_D$	120	mW
Operating Temperature	$T_{OPR}$	-20 ~+70	°C
Storage Temperature	$T_{STG}$	-55 ~+150	°C

#### DC Characteristic

(  $V_{DD} -V_{SS}=2.5V$  ,  $F_{osc}=3.58MHz$  ,  $T_a=25$  °C, all output unloaded except for being indicated.)

Parameter	Symbol	Test Condition	Min.	Typical	Max.	Unit
Operating voltage	$V_{DD}$	tone	2.0	--	5.5	V
		pulse	2.0	--	5.5	
		memory	1.0	--	5.5	
Operating current	$I_{OPT}$ $I_{OPP}$	tone	--	0.6	2.0	mA
		pulse	--	0.2	0.5	
Memory retention current	$I_{MR}$	HKS = 1 , $T_a=450$ °C $V_{DD} = 1.0V$	--	0.1	0.2	μA
Standby current	$I_{SB}$	HKS = 0 , N loaded and N	--	0.1	5	μA

		i nput				
DTMF output vol tage	V <sub>to</sub>	Row group , R <sub>L</sub> =5KΩ	130	150	170	mVrms
Pre-emphasis		Column/row group V <sub>DD</sub> = 2.0 ~ 5.5V	1	2	3	dB
DTMF distortion	T <sub>Hd</sub>	R <sub>L</sub> =5KΩ	--	-30	-23	dB
tone output outer loading resistance	R <sub>L</sub>	T <sub>MD</sub> (-23dB)	5	--	--	KΩ
tone output DC vol tage	V <sub>DC</sub>	V <sub>DD</sub> = 2.5~5.5V	1.1	--	2.8	V
tone output sink current	I <sub>TC</sub>	V <sub>TO</sub> = 0.5V	0.2	--	--	mA
pulse output drive current	I <sub>PC</sub>	V <sub>PO</sub> = 0.5V	0.5	--	--	mA
T/P mute output drive /sink current	I <sub>MH</sub> I <sub>ML</sub>	V <sub>MO</sub> = 2.0V V <sub>MO</sub> = 0.5V	-0.5 0.5	-- --	-- --	mA
mute output drive / sink current	I <sub>KH</sub> I <sub>KL</sub>	V <sub>KO</sub> = 2.5V V <sub>KO</sub> = 0.5v	-0.5 0.5	-- --	-- --	mA
XMT T/P mute drive/sink current	I <sub>LH</sub> I <sub>LL</sub>	V <sub>LO</sub> = 2.0V V <sub>LO</sub> = 0.5V	-0.5 0.5	-- --	-- --	mA
vol tage i nput low level	V <sub>IL</sub>		GND	--	0.3V <sub>DD</sub>	V
vol tage i nput high level	V <sub>IH</sub>		0.7V <sub>DD</sub>	--	V <sub>DD</sub>	
key i nput drive/sink current	I <sub>KD</sub> I <sub>KS</sub>	V <sub>I</sub> = 0V V <sub>I</sub> = 0V	10 200	30 400	80 --	μA
Pin control i nput	I <sub>IS</sub>	HKS , MODE , M/B	--	--	±2.5	μA

### AC characteristic

Parameter	Symbol	Test Condi tion	Min.	Typical	Max.	Uni t
Time of key i n debounce	T <sub>KID</sub>		--	20	--	ms
Time of key rel ease debounce	T <sub>KRD</sub>		--	20	--	ms
Time of key tone defer	T <sub>KD</sub>		--	20	--	ms
Time of One-key re-dial "pause"	T <sub>RB</sub>		--	2.2	--	s
Time of pulse T/P mute defer	T <sub>MD</sub>	B/M=1 B/M=0	-- --	40 33.3	-- --	ms
Pre-di gi t pause	T <sub>PDP</sub>	B/M=1 B/M=0	-- --	40 33.3	-- --	ms
pulse speed	F <sub>PR</sub>		--	10	--	pps
Time in data pace (auto-	T <sub>TD</sub>			800		ms

dial)						
Break/make ratio	B/M	B/M=1	--	60:40	--	%
		B/M=0	--	66.6:33.3	--	
Tone width	T <sub>TD</sub>	Automatic dialing	--	93	--	ms
Inter tone pace	T <sub>TD</sub>	Automatic dialing	--	93	--	ms
Time of flash pause	T <sub>FB</sub>		--	98	--	ms
			--	305	--	
			--	600	--	
Time of Pause	T <sub>P</sub>		--	3.1	--	s
Row-group frequency	F1	row1		699		Hz
	F2	row2		766		
	F3	row3		848		
	F4	row4		948		
Column-group frequency	F5	column1		1216		Hz
	F6	column2		1332		
	F7	column3		1472		
Key tone frequency	F <sub>kt</sub>			1.2	--	kHz
Time of one-key re-dial pause	T <sub>PR</sub>		--	600	--	ms

NB:

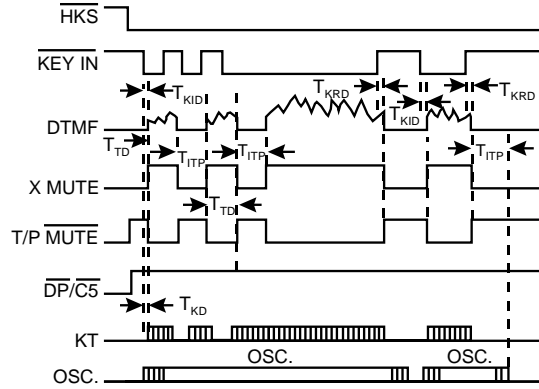
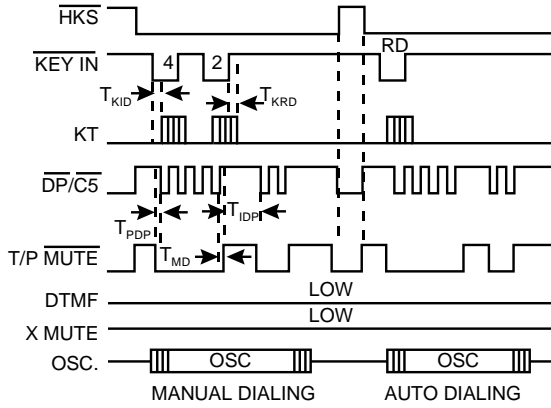
- If it is operated on the following normal situation, the oscillation parameters are recommended as: :  
 $R_s < 100\Omega$ ,  $L_m: 96mH$ ,  $C_m: 0.02pF$ ,  $C_n: 5pF$ ,  $C_1: 18pF$   
 $F_{osc}: 3.57945\text{ Mhz} \pm 0.02\%$
- the accuracy of oscillator frequency will effect the above-mentioned times.

## Timing Diagram

Pulse mode normal dialing timing diagram

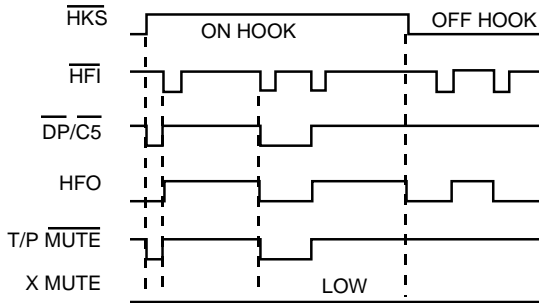
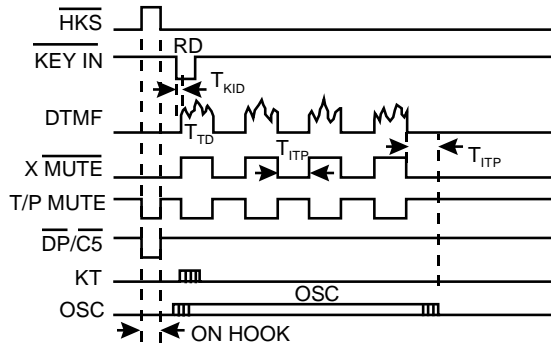
Tone mode normal timing diagram





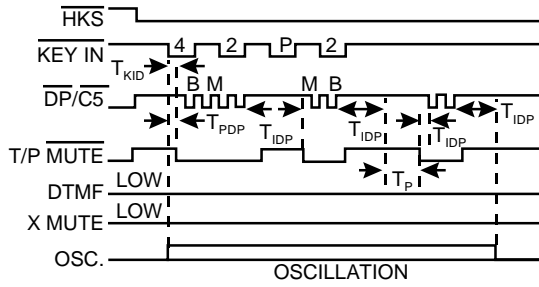
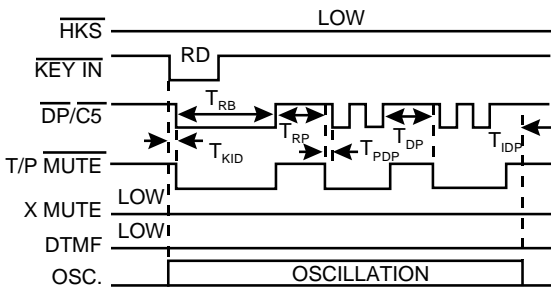
tone mode re-dial timing diagram

hands-free control function timing diagram



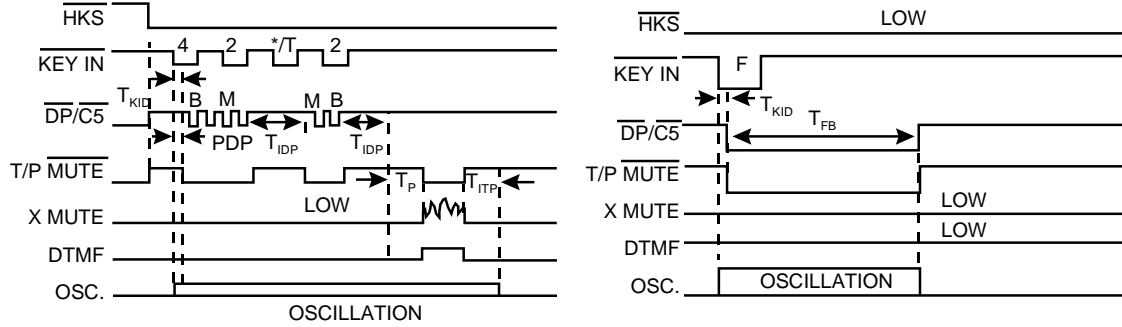
Pulse mode timing diagram

Pause function timing diagram

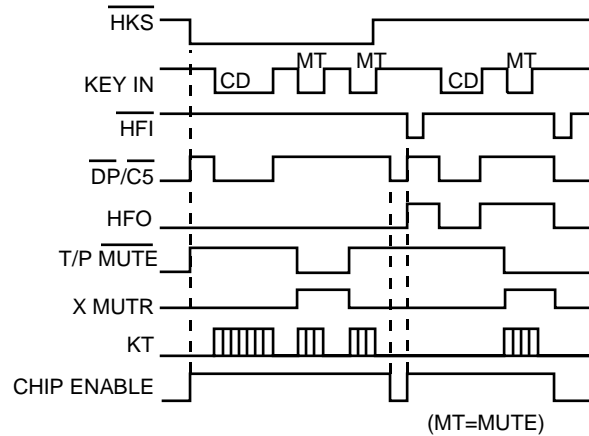


General dial : pulse → tone ( P → T ) transfer timing diagram

flash function operation timing diagram



'Mute'key function operation timing diagram



Application Circuit

