Winbond Electronics Corp.

23-MEMORY TONE/PULSE DIALER WITH HANDFREE, LOCK AND HOLD FUNCTIONS

GENERAL DESCRIPTION

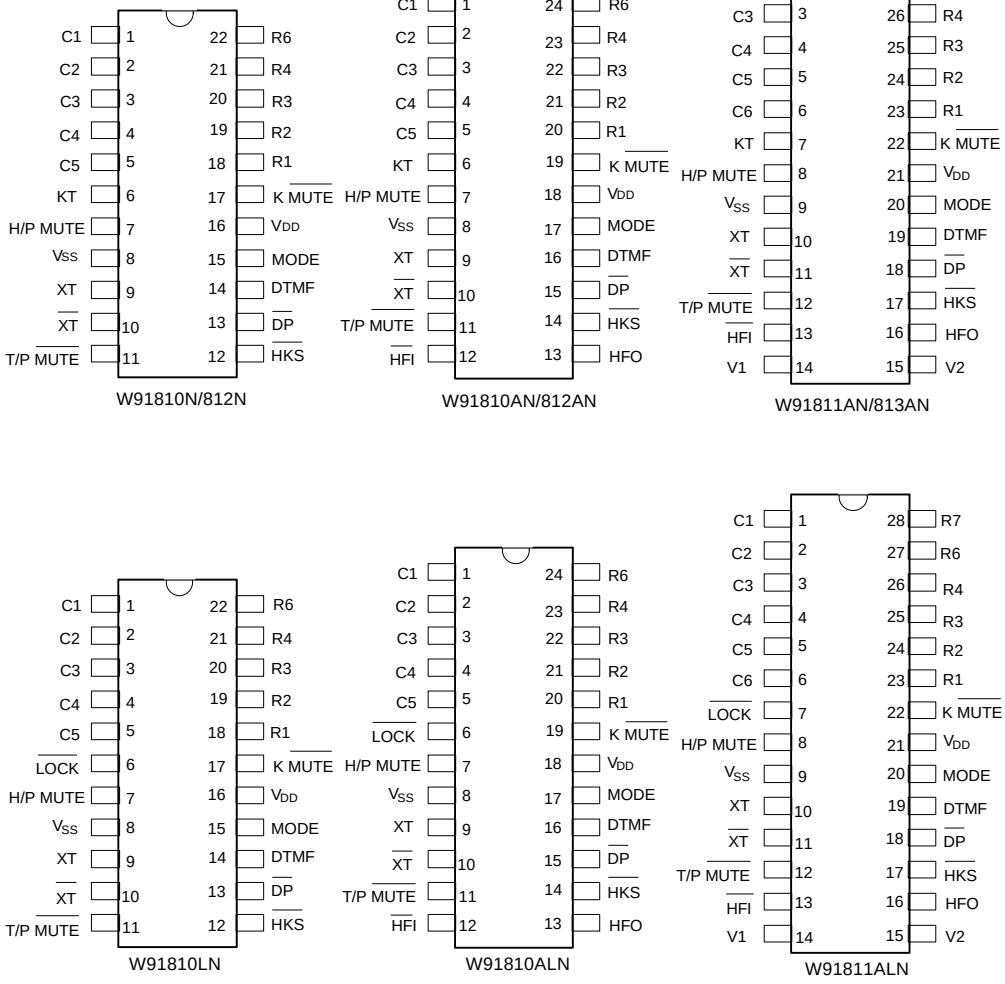
The W91810N is a series of tone/pulse switchable telephone dialers with 23 memory, keytone, hold, lock, mute, volume control and handfree dialing control features. These chips are fabricated using Winbond's high-performance CMOS technology and thus offer good performance in low-voltage, low-power operations.

FEATURES

- Tone/pulse switchable dialer
- Two by 32 digits redial and save memory
- Three by 32 digits one-touch direct repertory memory
- Twenty by 32 digits one-touch direct or two-touch indirect repertory memory
- Pulse-to-tone (*/T) keypad for long distance call operation
- Chain dialing
- Uses 6 × 6 or 7 × 7 keyboard
- Easy operation with redial, flash, pause, and */T keypads
- Pause, P→T (pulse-to-tone) can be stored as a digit in memory
- Dialing rate: 10 or 20 ppS by mask option
- Minimum tone output duration: 93 mS
- Minimum intertone pause: 93 mS
- Pause time: 3.6 sec.
- Flash break time (73 mS, 100 mS, 300 mS, or 600 mS) selectable by keypad; pause time is 1.0 S
- Make/break ratio (2:3 or 1:2) selectable by MODE pin
- Mute key for speech network mute
- No key will be accepted except the "HOLD" key when in the Hold mode
- 4-level volume control by V1 and V2 pin - default value is zero
- Key tone output for valid keypad entry recognition
- On-chip power-on reset
- Uses 3.579545 MHz crystal or ceramic resonator
- 22, 24 or 28-pin dual-in-line plastic package
- The different dialers in the W91810N series are shown in the following table:

TYPE NO.	PULSE (ppS)	MEMORY	LOCK	KEY TONE	HANDFREE DIALING	VOLUME CONTROL	PACKAGE (PINS)
W91810N	10	13 one touch, 10 two touch	-	√	-	-	22
W91810AN	10	13 one touch, 10 two touch	-	√	√	-	24
W91810LN	10	13 one touch, 10 two touch	√	-	-	-	22
W91810ALN	10	13 one touch, 10 two touch	√	-	√	-	24
W91811AN	10	23 one touch	-	√	√	√	28
W91811ALN	10	23 one touch	√	-	√	√	28
W91812N	20	13 one touch, 10 two touch	-	√	-	-	22
W91812AN	20	13 one touch, 10 two touch	-	√	√	-	24
W91813AN	20	23 one touch	-	√	√	√	28

PIN CONFIGURATIONS



PIN DESCRIPTION

SYMBOL	22-PIN	24-PIN	28-PIN	I/O	FUNCTION
Column-Row Inputs	1–5 & 18–22	1–5 & 20–24	1–6 & 23–28	I	The keyboard input is compatible with a standard 6 × 6 or 7 × 7 keyboard, an inexpensive single contact (Form A) keyboard, and electronic input. In normal operation, any single button can be pushed to produce dual tone, pulses, or functions. Activation of two or more buttons will result in no response except for a single tone.
XT	9	9	10	I	A built-in inverter together with an inexpensive 3.579545 MHz crystal supplies the oscillator. The oscillator stops when there is no keypad input. The crystal frequency deviation is 0.02%.
$\overline{XT}$	10	10	11	O	Crystal oscillator output pin.
T/P $\overline{MUTE}$	11	11	12	O	The T/P $\overline{MUTE}$ is a conventional CMOS N-channel open drain output. The output transistor turns on with a low level during a dialing sequence (both pulse and tone mode). Otherwise, it is off.
K $\overline{MUTE}$	17	19	22	O	The K $\overline{MUTE}$ is a conventional CMOS N-channel open drain output. Toggle action speech mute control pin by MUTE key.
MODE	15	17	20	I	Connecting the mode pin to V_{SS} places the dialer in tone mode. Connecting the mode pin to V_{DD} places the dialer in pulse mode with an M/B ratio of 40:60. Leaving the mode pin floating places the dialer in pulse mode with an M/B ratio of 33.3:66.7.
$\overline{HKS}$	12	14	17	I	The $\overline{HKS}$ (hook switch) input is used to sense whether the handset is on-hook or off-hook. In on-hook state, $\overline{HKS}$ = 1: chip is in sleeping mode, no operation. In off-hook state, $\overline{HKS}$ = 0: chip is enabled for normal operation. $\overline{HKS}$ pin is pulled to V_{DD} by internal resistor.

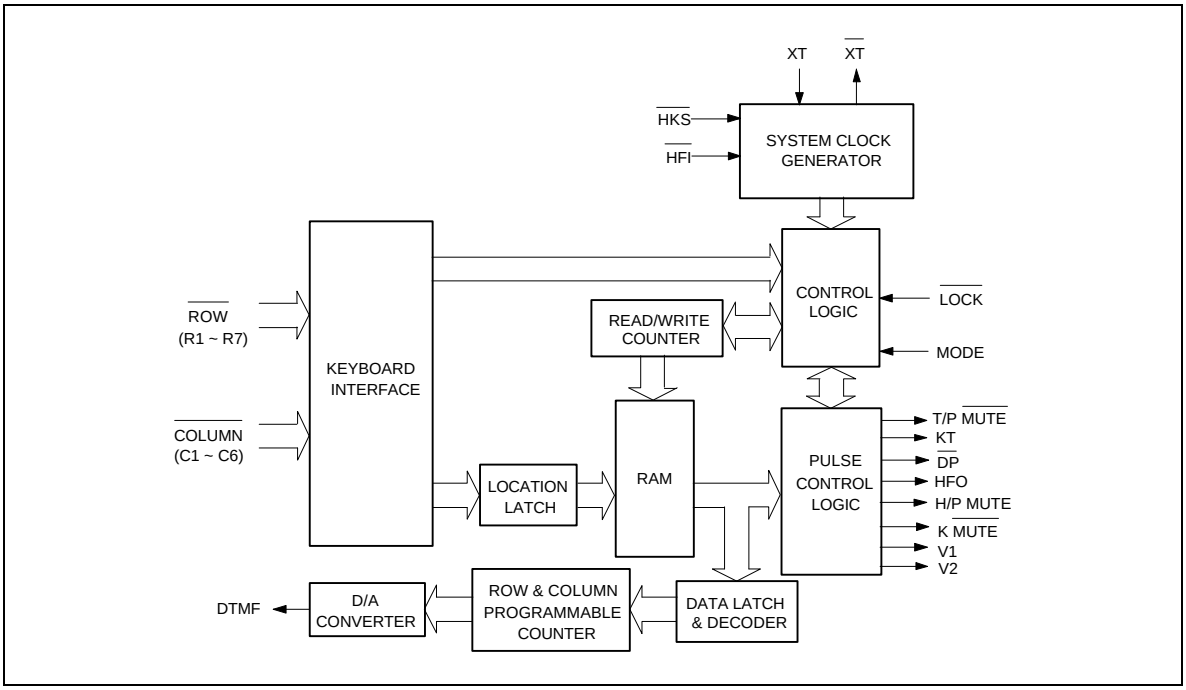
Pin Description, continued

SYMBOL	22-PIN	24-PIN	28-PIN	I/O	FUNCTION
KT (W91810N/810AN/812N/812AN/811AN/813AN only)	6	6	7	O	The key tone output is a conventional CMOS inverter. The key tone is generated when any valid key is pressed; the KT pin generates a 1.2 KHz square wave at 35 mS. When no key is pressed, the KT pin remains in low state.
$\overline{\text{LOCK}}$ (W91810LN/810ALN/811ALN only)	6	6	7	I	The function of this terminal is to prevent "0" dialing and "9" dialing under PABX system long distance call control. When the first key input after reset is 0 or 9, all key inputs, including the 0 or 9 key, become invalid and the chip generates no output. The telephone is reinitialized by a reset. The function of the $\overline{\text{LOCK}}$ pin is shown below: $\overline{\text{LOCK}}$ PIN: V_{DD} — FUNCTION: "0", "9" dialing inhibited $\overline{\text{LOCK}}$ PIN: Floating — FUNCTION: Normal dialing Mode $\overline{\text{LOCK}}$ PIN: V_{SS} — FUNCTION: "0" dialing inhibited
H/P MUTE	7	7	8	I	The H/P MUTE is a conventional inverter output. During pulse dialing, flash break or hold period, this output is active high; otherwise, it remains in low state.
$\overline{\text{DP}}$	13	15	18	O	N-channel open drain dialing pulse output. Flash key will cause $\overline{\text{DP}}$ to be active in either tone mode or pulse mode. In lock mode, the $\overline{\text{DP}}$ remains low for 300 mS during off-hook delay time. The timing diagram for pulse mode is shown in Figure 1(a, b).

Pin Description, continued

<table>
<tr><th>SYMBOL</th><th>22-PIN</th><th>24-PIN</th><th>28-PIN</th><th>I/O</th><th>FUNCTION</th></tr>
<tr><td>DTMF</td><td>14</td><td>16</td><td>19</td><td>O</td><td>During pulse dialing, this pin remains in a low state regardless of the keypad input. In tone mode, it will output a dual or single tone.
A detailed timing diagram for tone mode is shown in Figure 2(a, b).
<table>
<tr><td colspan="4">OUTPUT FREQUENCY</td></tr>
<tr><td></td><td>Specified</td><td>Actual</td><td>Error %</td></tr>
<tr><td>R1</td><td>697</td><td>699</td><td>+0.28</td></tr>
<tr><td>R2</td><td>770</td><td>766</td><td>-0.52</td></tr>
<tr><td>R3</td><td>852</td><td>848</td><td>-0.47</td></tr>
<tr><td>R4</td><td>941</td><td>948</td><td>+0.74</td></tr>
<tr><td>C1</td><td>1209</td><td>1216</td><td>+0.57</td></tr>
<tr><td>C2</td><td>1336</td><td>1332</td><td>-0.30</td></tr>
<tr><td>C3</td><td>1477</td><td>1472</td><td>-0.34</td></tr>
</table></td></tr>
<tr><td>VDD, VSS</td><td>16, 8</td><td>18, 8</td><td>21, 9</td><td>I</td><td>Power input pins for the dialer chip. VDD is the power and VSS is the ground.</td></tr>
<tr><td>V1, V2</td><td>-</td><td>-</td><td>14, 15</td><td>O</td><td>Volume control output pins. These two pins can be toggled by the volume control keys (Vup, Vdown). These two pins output is a conventional CMOS N-channel open drain output.</td></tr>
<tr><td>$\overline{\text{HFI}}$, HFO</td><td>-</td><td>12, 13</td><td>13, 16</td><td>I, O</td><td>Handfree control pins.
A low pulse on the $\overline{\text{HFI}}$ input pin toggles the handfree control state. The status of the handfree control state is listed in the following table:
<table>
<tr><td colspan="2">CURRENT STATE</td><td colspan="3">NEXT STATE</td></tr>
<tr><td>HOOK SW.</td><td>HFO</td><td>INPUT</td><td>HFO</td><td>DIALING</td></tr>
<tr><td>-</td><td>Low</td><td>$\overline{\text{HFI}}$ ↓</td><td>High</td><td>Yes</td></tr>
<tr><td>On Hook</td><td>High</td><td>$\overline{\text{HFI}}$ ↓</td><td>Low</td><td>No</td></tr>
<tr><td>Off Hook</td><td>High</td><td>$\overline{\text{HFI}}$ ↓</td><td>Low</td><td>Yes</td></tr>
<tr><td>On Hook</td><td>-</td><td>Off Hook</td><td>Low</td><td>Yes</td></tr>
<tr><td>Off Hook</td><td>Low</td><td>On Hook</td><td>Low</td><td>No</td></tr>
<tr><td>Off Hook</td><td>High</td><td>On Hook</td><td>High</td><td>Yes</td></tr>
</table>
The $\overline{\text{HFI}}$ pin is pulled to VDD by an internal resistor.
A detailed timing diagram is shown in Figure 3.</td></tr>
</table>

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

Keyboard Operation

C1	C2	C3	C4	C5	Vss	
1	2	3	S	M0	EM1	R1
4	5	6	F4	M1	EM2	R2
7	8	9	Page	M2	EM3	R3
*/T	0	#	R/P	M3	SAVE	R4
F1	F2	F3	H	M4		Vx/R5
M5	M6	M7	M8	M9	MUTE	R6

C1	C2	C3	C4	C5	C6	Vss	
1	2	3	S	M0	M10	EM1	R1
4	5	6	F4	M1	M11	EM2	R2
7	8	9	Page	M2	M12	EM3	R3
*/T	0	#	R/P	M3	M13	SAVE	R4
F1	F2	F3	H	M4	M14		Vx/R5
M5	M6	M7	M8	M9	R	MUTE	R6
M15	M16	M17	M18	M19	Vup	Vdown	R7

- S: Store function key

- Page: Indirect repertory memory dialing function key
- H: Hold function key
- R: One key redial function key
- R/P: Redial and pause function key
- */T: * in tone mode and P→T key in pulse mode
- SAVE: Save function key for one-touch 32-digit memory
- MUTE: Mute function key for speech mute
- M0–M9: One touch memory. The dialing number can be stored in M0–M9 locations by the S key. Note that the two touch memory (Page+ 0... Page+9) share the same memory buffer with M10–M19, respectively
- M10, ..., M19: One touch or two touch memory keys. If there are no M10–M19 keys, Page+(M0–M9) can be used to simulate M10–M19.
- EM1, ..., EM3: Emergency one-touch memory key
- A: Indiect repertory dialing function key
- F1, ..., F4: Flash function keys: F1 = 600 mS, F2 = 300 mS, F3 = 73 mS, F4 = 100 mS; all flash pause time is 1.0 S

Note: D1, ..., Dn, D1`, ..., Dn`, */T, #, Mm: M0, ..., M9, Mn: M0, ..., M19, Ln: 0–9

PAGE + LN = PAGE + Mm = M10–M19

Normal Dialing

OFF HOOK (or ON HOOK & $\overline{HFI}\downarrow$), D1 , D2 , …, Dn

1. D1, D2, …, Dn will be dialed out.
2. Dialing length is unlimited, but redial is inhibited if length oversteps 32 digits in normal dialing.

Redialing Dialing

1. OFF HOOK (or ON HOOK & $\overline{HFI}\downarrow$, D1 , D2 , …, Dn , BUSY

Come ON HOOK , OFF HOOK (or ON HOOK & $\overline{HFI}\downarrow$), R/P

The R/P key can execute redial function only as first key-in after off-hook. Otherwise, it will invoke the pause function.

2. OFF HOOK (or ON HOOK & $\overline{HFI}\downarrow$), D1 , D2 , ..., Dn , R

a. The one-key redial function timing diagram is shown in Figure 5.

b. If dialing of D1 to Dn is finished, pressing R key will cause the pulse output pin to go low for 2.2 seconds break time and a 600ms pause will automatically be added.

c. If the pulses of the dialed number [D1] to [Dn] have not finished, [R] will be ignored.

3. [OFF HOOK] (or [ON HOOK] & [$\overline{HFI}$ ↓]), [D1] , [D2] , ..., [Dn] , Busy [ON HOOK] come, [OFF HOOK] , [OKR] (or [R/P])

If [R] is the first key after OFF HOOK, it only can execute the redialing function but will not cause the pulse output pin to go low for the break time of 2.2 seconds.

Number Store

1. [OFF HOOK] (or [ON HOOK] & [$\overline{HFI}$ ↓]), [D1] , [D2] , ..., [Dn] , [S] , [S] , [Mn] (or [PAGE] , [Ln] or [EMn] or [SAVE] or [PAGE] , [Mm])

a. The dialing out of [D1] to [Dn] must first be finished before the [S] key is pressed.

b. D1, D2, …, Dn will be stored in memory location Mn or saved and then dialed out.

2. [OFF HOOK] (or [ON HOOK] & [$\overline{HFI}$ ↓]), [S] , [D1] , [D2] , ..., [Dn] , [S] , [Mn] (or [Ln] or [EMn] or [SAVE] or [PAGE] , [Mm])

a. D1, D2, …, Dn will be stored in memory location, Mn (or saved), but will not be dialed out.

b. [R/P] and [*/T] keys can be stored as a digit in memory, but the [R/P] key cannot be the first digit. In store mode, [R/P] is the pause function key.

c. The store mode is released after the store function is executed or when the state of the hook switch changes or the flash function is executed.

Save

[OFF HOOK] (or [ON HOOK] & [$\overline{HFI}$ ↓]), [D1] , [D2] , ..., [Dn] , [SAVE]

a. D1, D2, ..., Dn will be dialed out.

b. If the dialing of [D1] to [Dn] is finished, pressing [SAVE] will duplicate D1 to Dn to the save memory.

[OFF HOOK] (or [ON HOOK] & [$\overline{HFI}$ ↓]),

come on [OFF HOOK] (or [ON HOOK] & [$\overline{HFI}$ ↓]), [SAVE]

c. D1 to Dn will be dialed out after the [SAVE] key is pressed.

Repertory Dialing Procedure

One-touch direct repertory dialing:

OFF HOOK (or ON HOOK & $\overline{HFI}\downarrow$), Mn (or EMn or SAVE)

Two-touch direct repertory dialing:

OFF HOOK (or ON HOOK & $\overline{HFI}\downarrow$), Page , Ln (or Mn)

Access Pause

OFF HOOK (or ON HOOK & $\overline{HFI}\downarrow$), D1 , D2 , R/P , D3 , ..., Dn

1. The pause function can be stored in memory.
2. The pause function is executed with normal dialing, redialing or memory dialing.
3. The pause function timing diagram is shown in Figure 6.

Pulse-to-tone (*/T)

OFF HOOK (or ON HOOK & $\overline{HFI}\downarrow$), D1 , D2 , ..., Dn , */T , D1' ,

, D2' , ..., Dn'

1. If the mode switch is set in pulse mode, then it will perform

   D1, D2, ---, Dn, Pause, (3.6 sec), D1', D2', ---, Dn'
   (Pulse) (Tone)

2. If the mode switch is set in tone mode, then the output signal will be:

   D1, D2, ---, Dn, * , D1', D2', ---, Dn'
   (Tone) (Tone)

3. It can be reset to pulse mode only if ON HOOK is active. This is because it remains in tone mode when the digits have been dialed out.
4. The function timing diagram is shown in Figure 7.

Flash

OFF HOOK (or ON HOOK & $\overline{HFI}\downarrow$), Fn

1. Fn = F1–F4. If Fn is pressed, the dialer will execute a flash break time of 600 mS (F1), 300 mS (F2), 73 mS (F3) or 100 mS (F4) and a pause time of 1.0 second, after which the next digit is dialed out.
2. The flash key has the first priority of the keyboard function only one flash key will be released to the user.
3. When the flash key is key in, the system will return to the initial state after the flash pause time is finished.
4. The flash function timing diagram is shown in Figure 8.

Cascaded Dialing

OFF HOOK (or ON HOOK & $\overline{HFI}$ ↓)

1. Normal Dialing + Repertory Dialing + Normal Dialing
   (1st sequence) (2nd sequence)
2. Repertory Dialing + Normal Dialing + Repertory Dialing
   (1st sequence) (2nd sequence)
3. Redialing + Normal Dialing + Repertory Dialing
   (1st sequence) (2nd sequence)

Redialing is valid only for the first key-in.

The second sequence should not be operated until the first sequence is dialed out completely.

Mute

OFF HOOK , MUTE

MUTE has an on/off toggle function.

ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}-V_{SS}	-0.3 to +7.0	V
Input/Output Voltage	V_{IL}	V_{SS} -0.3	V
	V_{IH}	V_{DD} +0.3	V
	V_{OL}	V_{SS} -0.3	V
	V_{OH}	V_{DD} +0.3	V
Power Dissipation	P_D	120	mW
Operation Temperature	T_{OPR}	-20 to +70	°C
Storage Temperature	T_{STG}	-55 to +150	°C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

DC CHARACTERISTICS

(V_{DD}–V_{SS} = 2.5V, Fosc. = 3.58 MHz, T_A = 25° C, all outputs unloaded)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V_{DD}	-	2.0	-	5.5	V
Operating Current	I_{OP}	Tone	-	0.4	0.6	mA
		Pulse	-	0.2	0.4	mA
Standby Current	I_{SB}	$\overline{HKS}$ = 0, No load & No key entry	-	-	15	µA
Memory Retention Current	I_{MR}	$\overline{HKS}$ = 1, V_{DD} = 1.0V	-	-	0.2	µA
Tone Output Voltage	V_{TO}	Row group, R_L = 5 KΩ	130	150	170	mVrms
Pre-emphasis		Col/Row, V_{DD} = 2.0–5.5V	1	2	3	dB
DTMF Distortion	THD	R_L = 5 KΩ, V_{DD} = 2.0–5.5V	-	-30	-23	dB
DTMF Output DC Level	V_{TDC}	R_L = 5 KΩ, V_{DD} = 2.0–5.5V	1.0	-	3.0	V
DTMF Output Sink Current	I_{TL}	V_{TO} = 0.5V	0.2	-	-	mA
$\overline{DP}$ Output Sink Current	I_{PL}	V_{PO} = 0.5V	0.5	-	-	mA
T/P $\overline{MUTE}$ Output Sink Current	I_{ML}	V_{MO} = 0.5V	0.5	-	-	mA
KT Drive/Sink Current	I_{KTH}	V_{KTH} = 2.0V	0.5	-	-	mA
	I_{KTL}	V_{KTL} = 0.5V	0.5	-	-	mA
HFO Drive/Sink Current	I_{HFH}	V_{HFH} = 2.0V	0.5	-	-	mA
	I_{HFL}	V_{HFL} = 0.5V	0.5	-	-	mA
K $\overline{MUTE}$ Sink Current	I_{KML}	V_{KML} = 0.5V	0.5	-	-	mA
H/P MUTE	I_{HPH}	V_{HPH} = 2.0V	0.5	-	-	mA
Drive/Sink Current	I_{HPL}	V_{HPL} = 0.5V	0.5	-	-	mA
Keypad Input Drive Current	I_{KD}	V_I = 0V	4	-	-	µA
$\overline{HKS}$ Pull High Resister	RHKS		300	500	-	KΩ
Keypad Input Sink Current	I_{KS}	V_I = 2.5V	200	400	-	µA
Keypad Resistance			-	-	5.0	KΩ

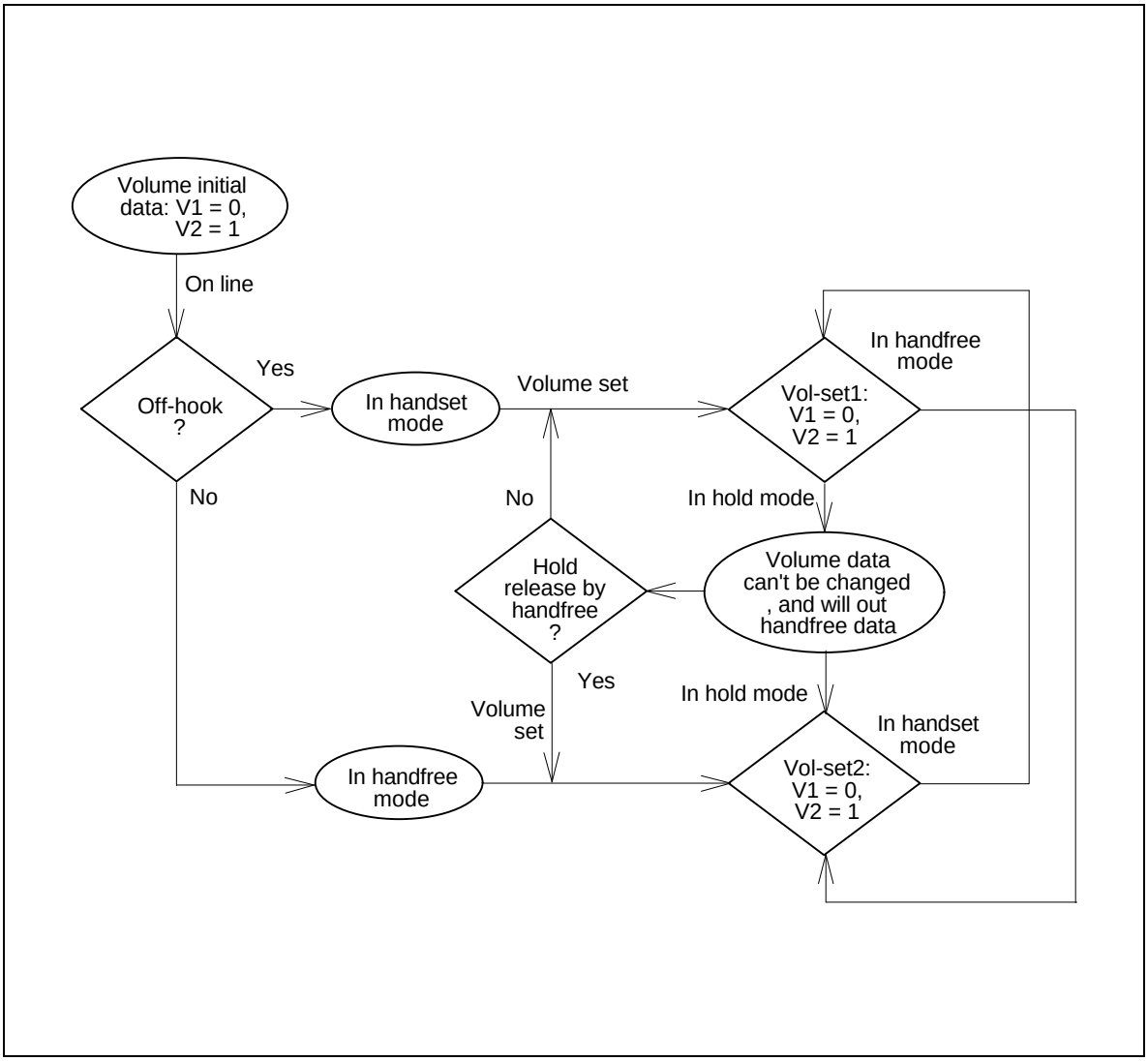
AC CHARACTERISTICS

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Key-in Debounce	TKID	-	-	20	-	mS
Key Release Debounce	TKRD	-	-	20	-	mS
On-hook Debounce	TOHD	Lock Mode	-	20	-	mS
		Unlock Mode	-	150	-	mS
Pre-digit Pause[1]	TPDP1	Mode Pin = VDD	-	40	-	mS
	10 ppS	Mode Pin = Floating	-	33.3	-	mS
Pre-digit Pause[2]	TPDP2	Mode Pin = VDD	-	20	-	mS
	20 ppS	Mode Pin = Floating	-	16.7	-	mS
Inter Digit Pause (Auto Dialing)	TIDP	10 ppS (Unless W91810N/ W91810AN/ 810LN/810ALN/811AN/811ALN only)	-	800	-	mS
		20 ppS (W91812N/812AN/813AN only)	-	500	-	mS
Interdigit Pause (Auto dialing)	TIDP	10 ppS	-	800	-	mS
		20 ppS	-	500	-	mS
Make/Break Ratio	M:B	Mode Pin = VDD	-	40:60	-	%
		Mode Pin = Floating	-	33.3:66.7	-	%
Tone Output Duration	TTD	-	-	93	-	mS
Intertone Pause	TITP	-	-	93	-	mS
Flash Break Time	TFB	F1	-	600	-	mS
		F2	-	300	-	
		F3	-	73	-	
		F4	-	100	-	
Flash Pause Time	TFP	-	-	1.0	-	S
Pause Time	TP	-	-	3.6	-	S
Key Tone Frequency	FKT	-	-	1.2	-	KHz
Key Tone Duration	TKTD	-	-	35	-	mS
One-key Redialing Pause Time	TRP	-	-	600	-	mS
One-key Redialing Break Time	TRB	-	-	2.2	-	S
First Key-in Delay	TFKD	Lock only	-	300	-	mS

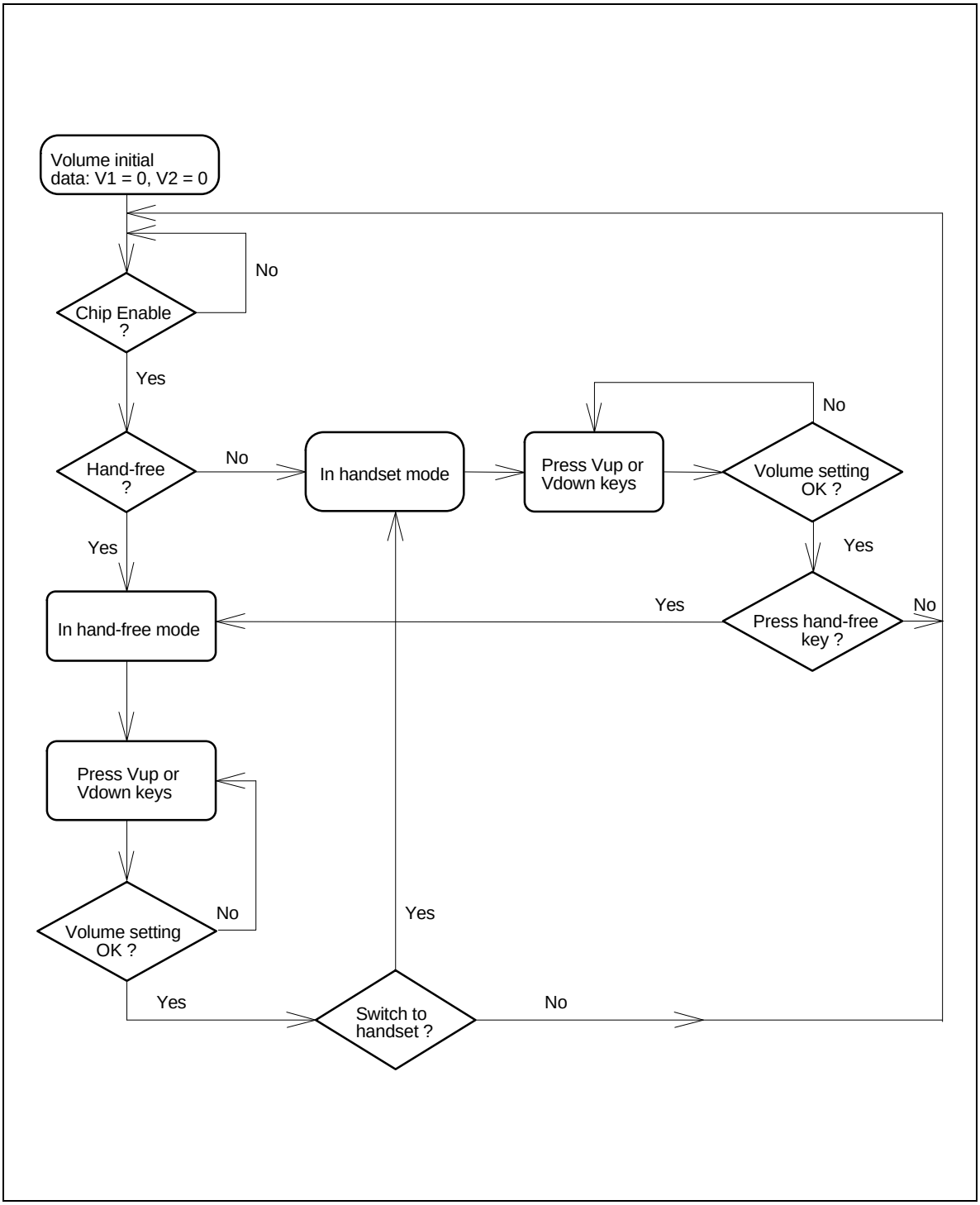
Notes:

1. Crystal parameters suggested for proper operation are Rs < 100 Ω, Lm = 96 mH, Cm = 0.02 pF, Cn = 5 pF, Cl = 18 pF, Fosc. = 3.579545 MHz ±0.02%.
2. Crystal oscillator accuracy directly affects these times.

VOLUME CONTROL FLOW CHART



Volume Control Flow Chart, continied



TIMING WAVEFORMS

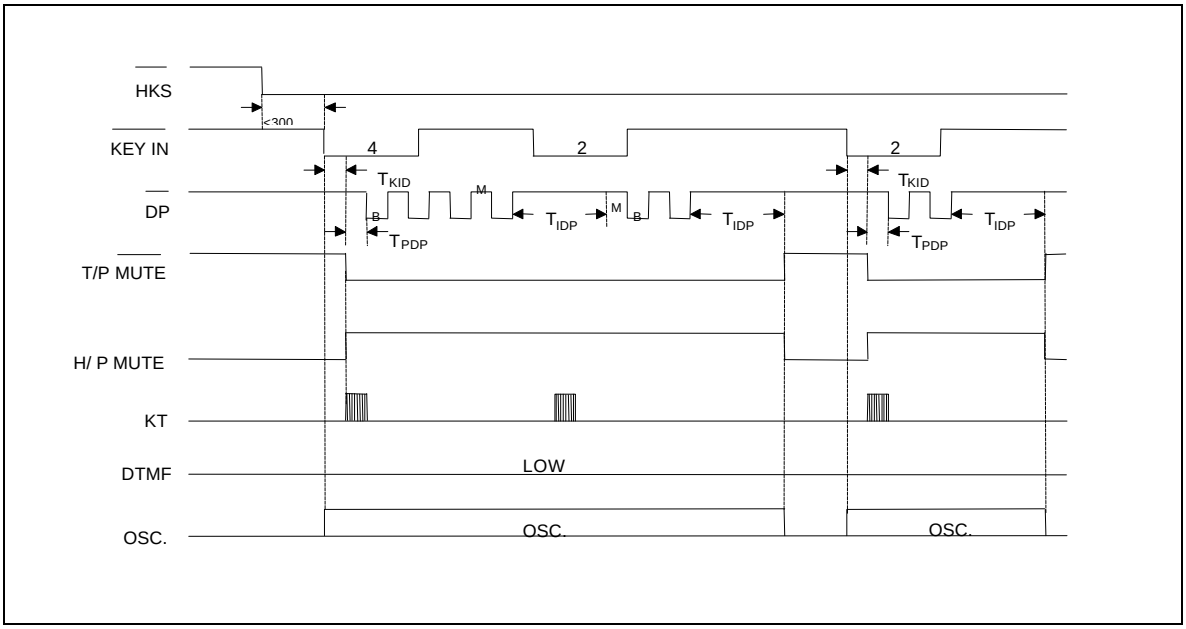


Figure 1(a) Pulse Mode Tming Diagram (Normal dialing without lock)

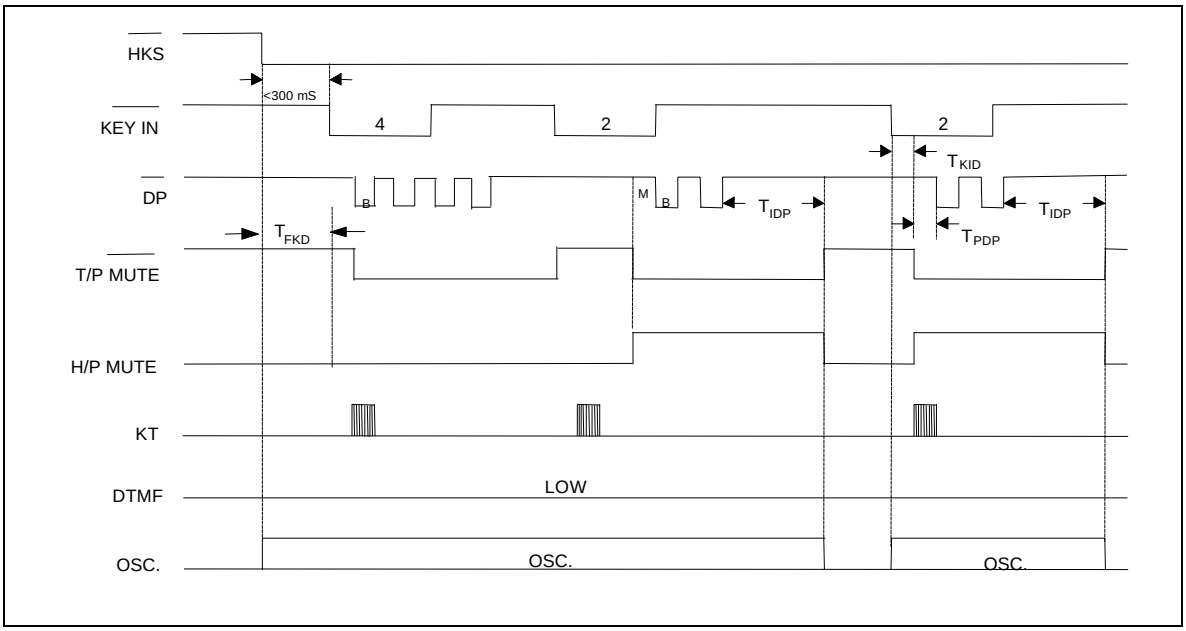


Figure 1(b) Pulse Mode Timing Diagram (Normal dialing with lock function)

Timing Waveforms, continued

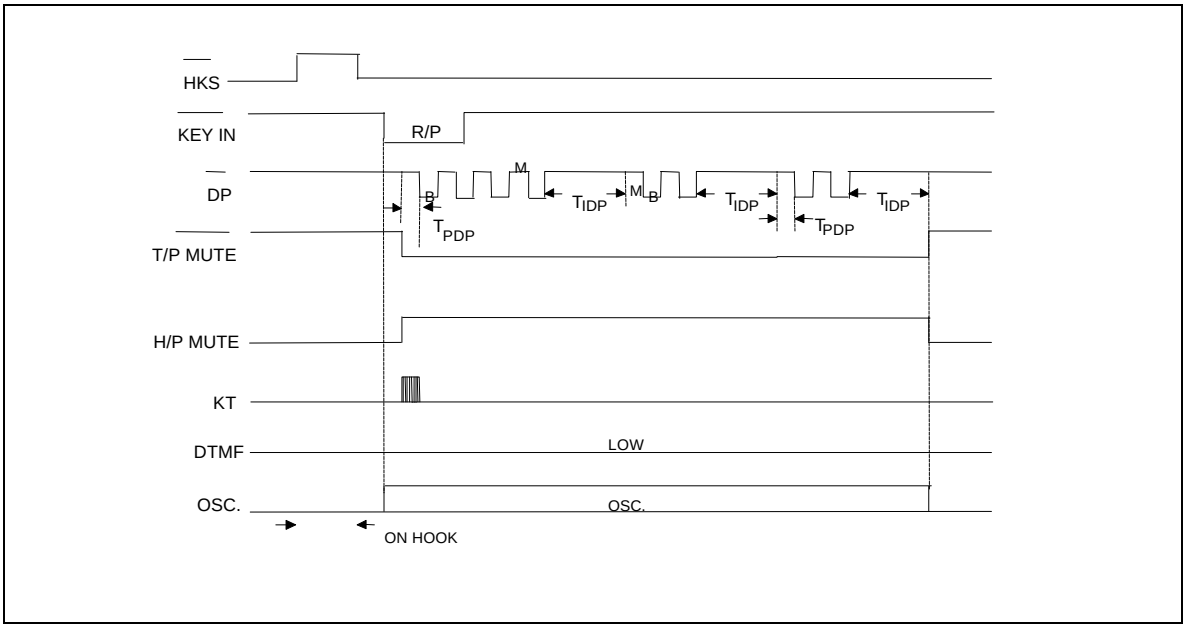


Figure 1(c) Pulse Mode Timing Diagram (Auto dialing without lock)

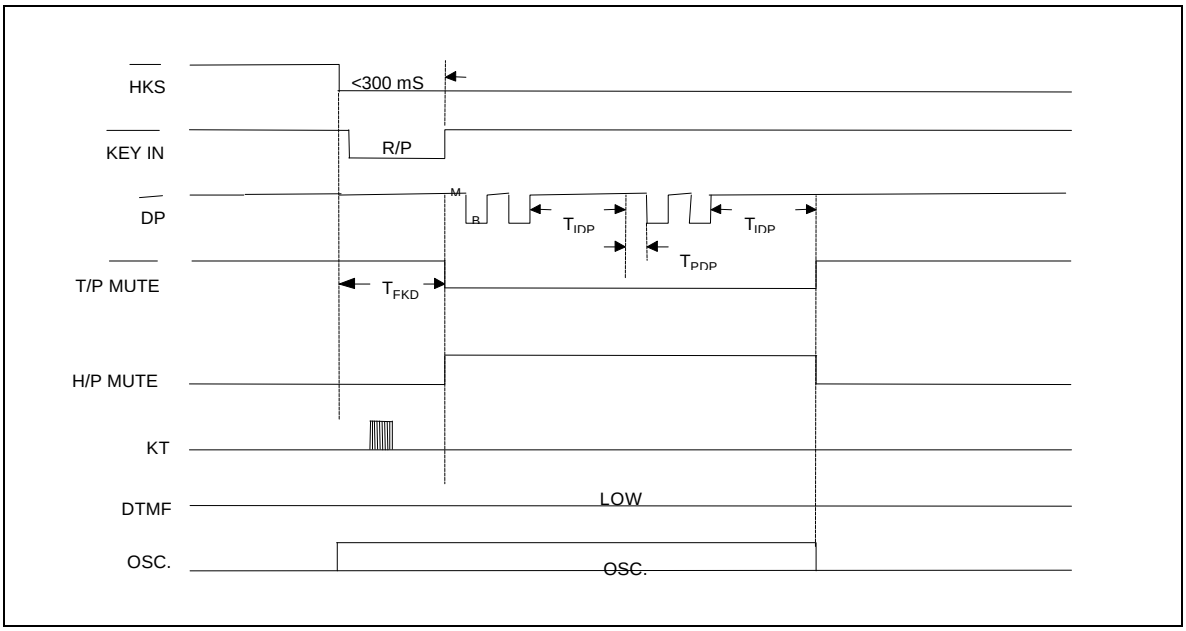


Figure 1(d) Pulse Mode Timing Diagram (Auto dialing with lock function)

Timing Waveforms, continued

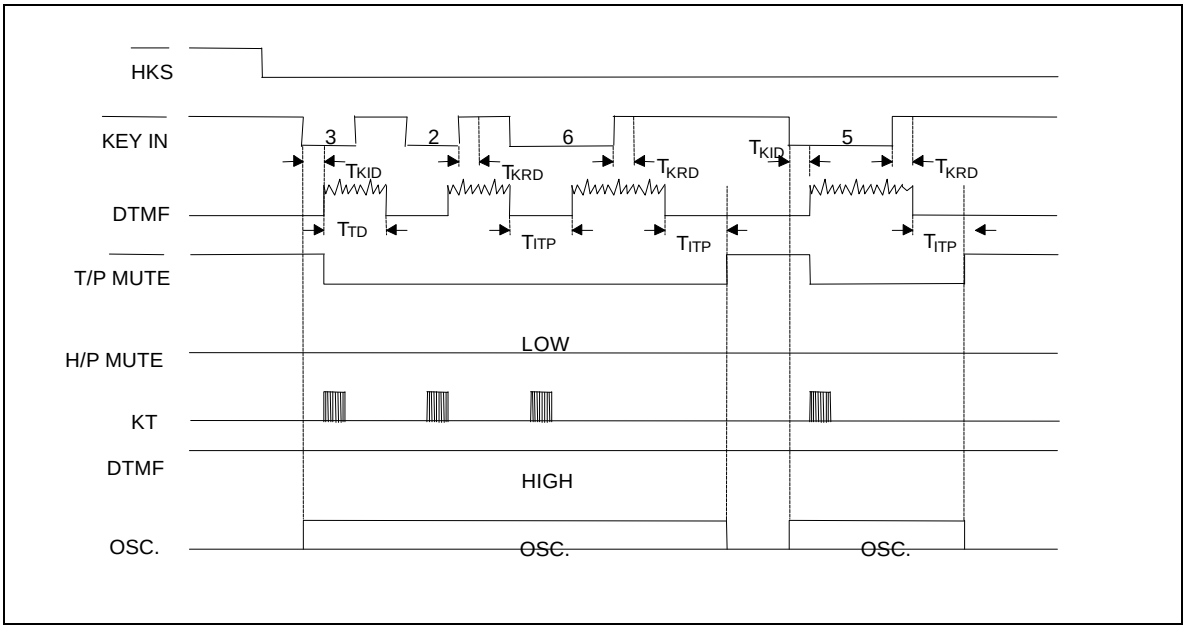


Figure 2(a) Tone Mode Timing Diagram (Normal dialing without lock)

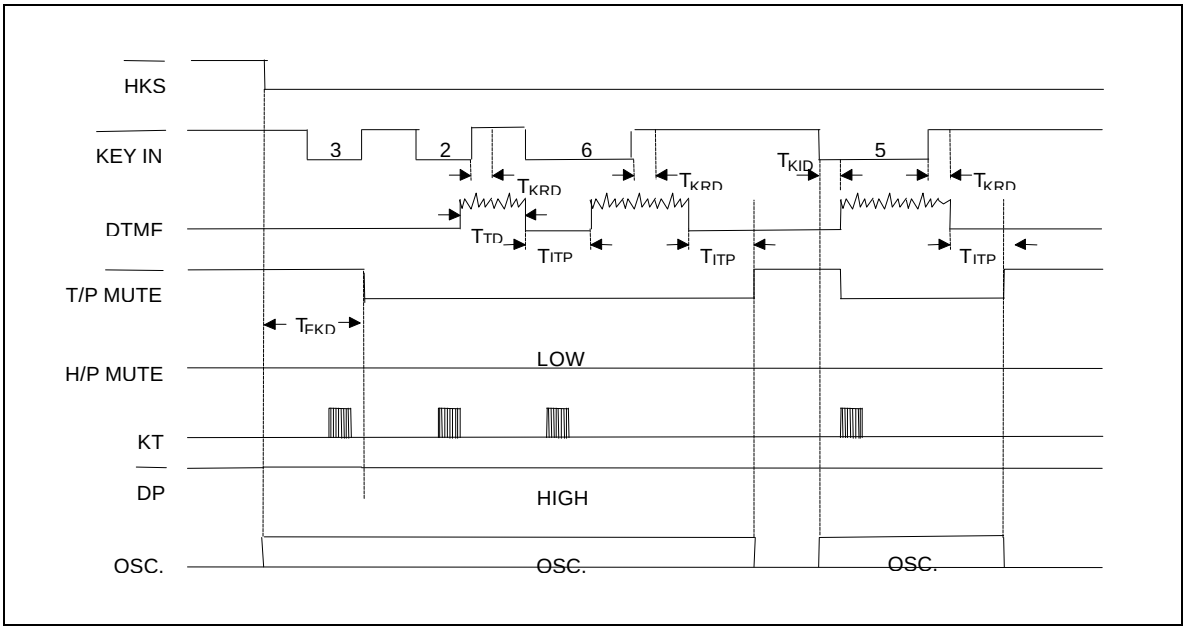


Figure 2(b) Tone Mode Timing Diagram (Normal dialing with lock function)

Timing Waveforms, continued

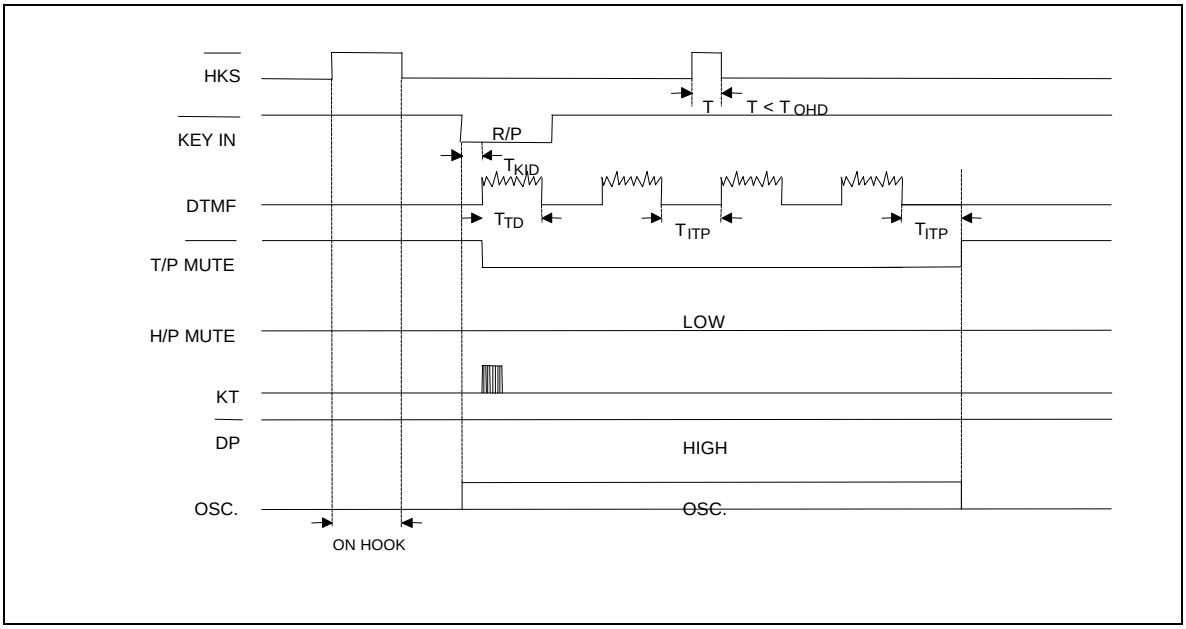


Figure 2(c) Tone Mode Timing Diagram (Auto dialing without lock)

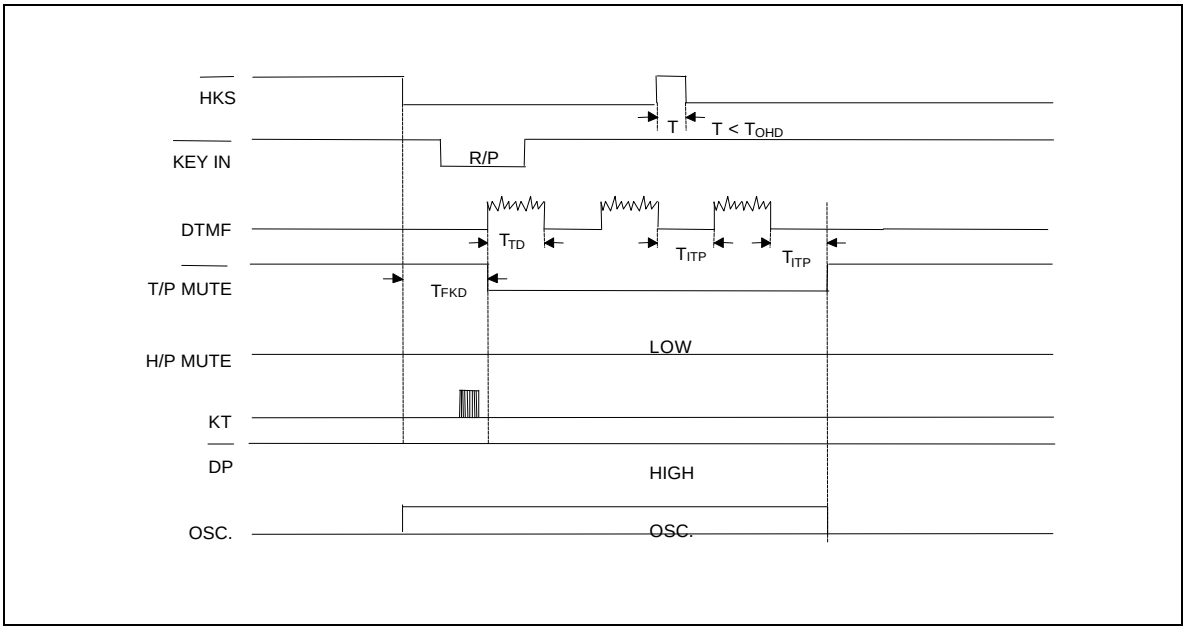


Figure 2(d) Tone Mode Timing Diagram (Auto dialing with lock function)

Timing Waveforms, continued

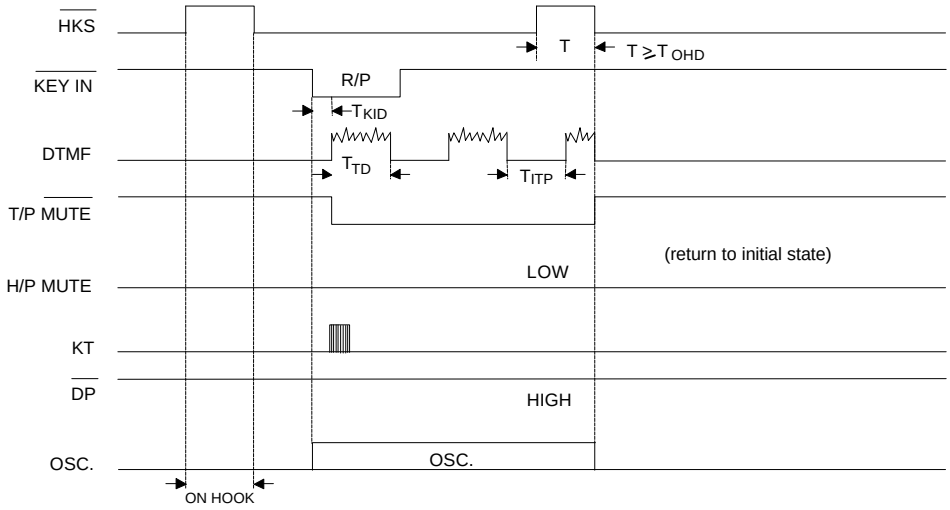
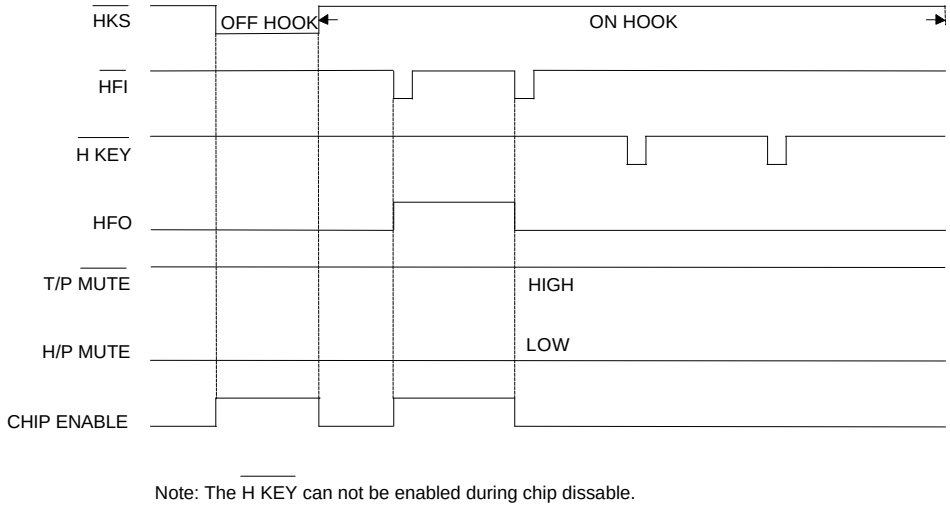


Figure 2(e) Tone Mode Timing Diagram with On-hook Debounce (Auto dialing)



Note: The H KEY can not be enabled during chip dissable.

Figure 3(a)

Timing Waveforms, continued

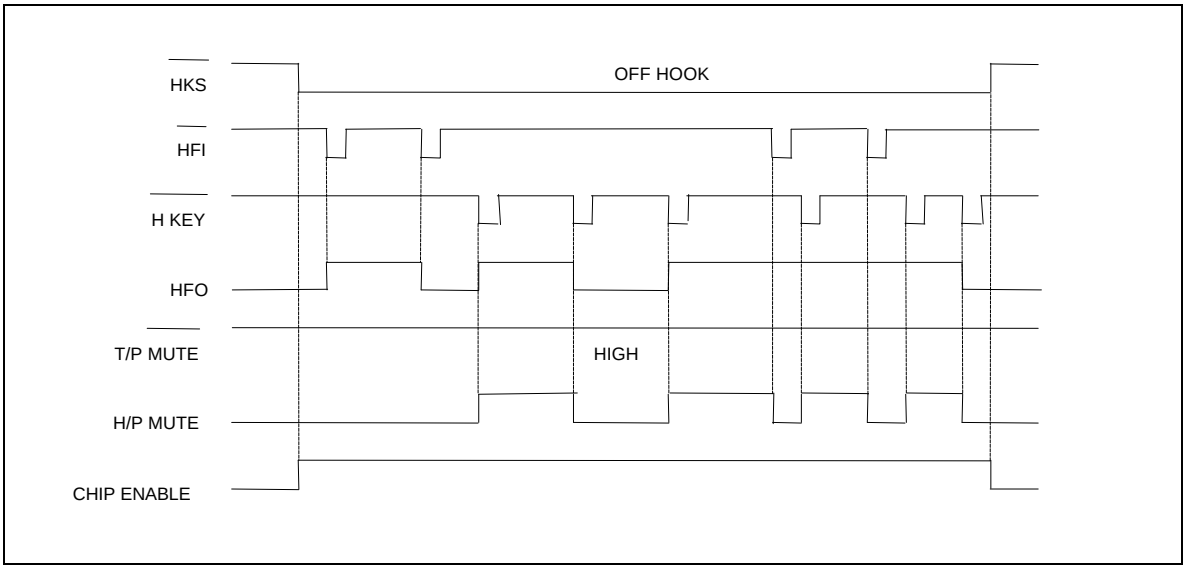


Figure 3(b)

Note: The H KEY and HFI inputs will toggle the HFO signal. The first time HFI or H KEY are activated, the HFO signal will go high and the previous active input will be neglected.

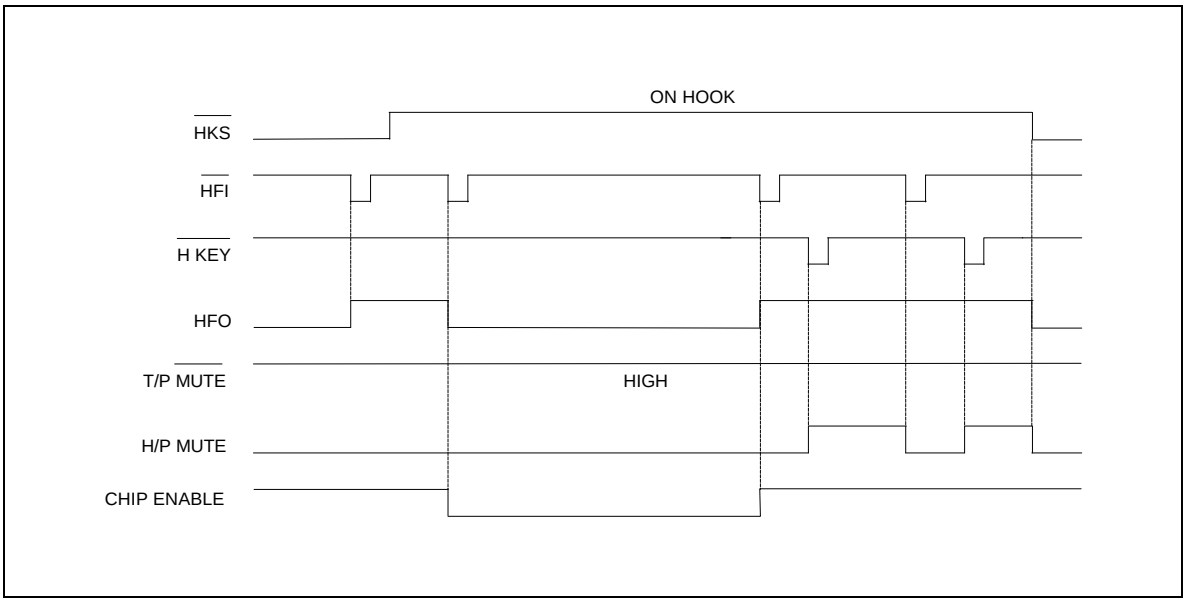


Figure 3(c)

Note: The HKS signal change of state from high to low will initialize both the HFO and H/P MUTE signals.

Timing Waveforms, continued

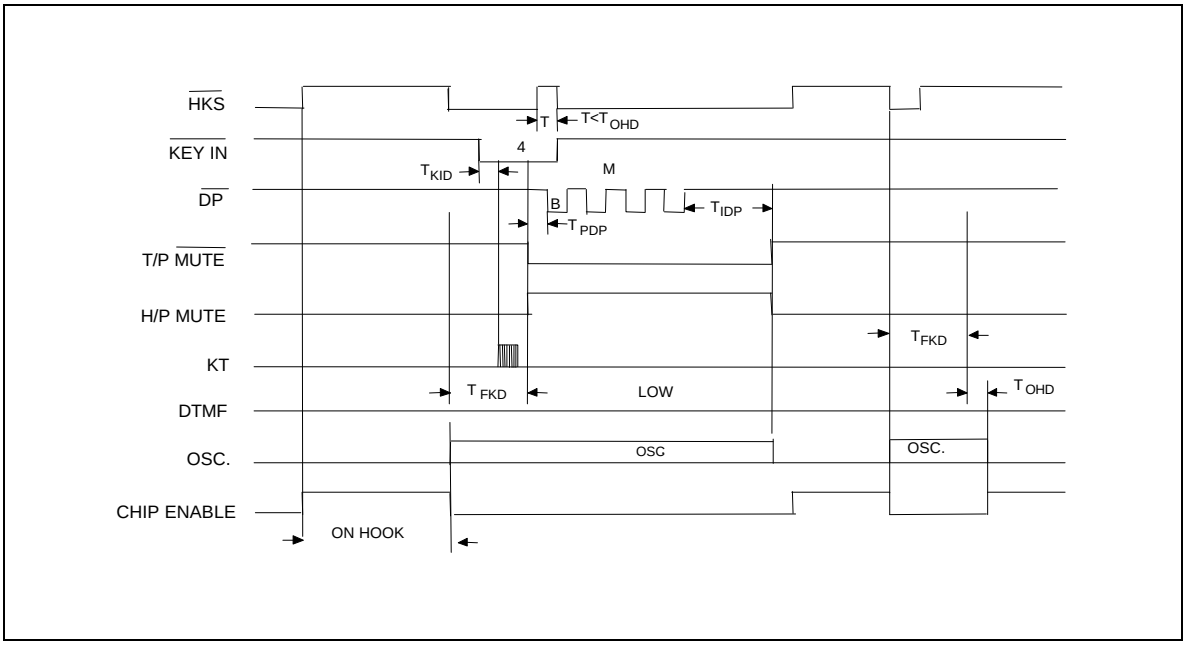


Figure 4 Lock Function Timing Diagram

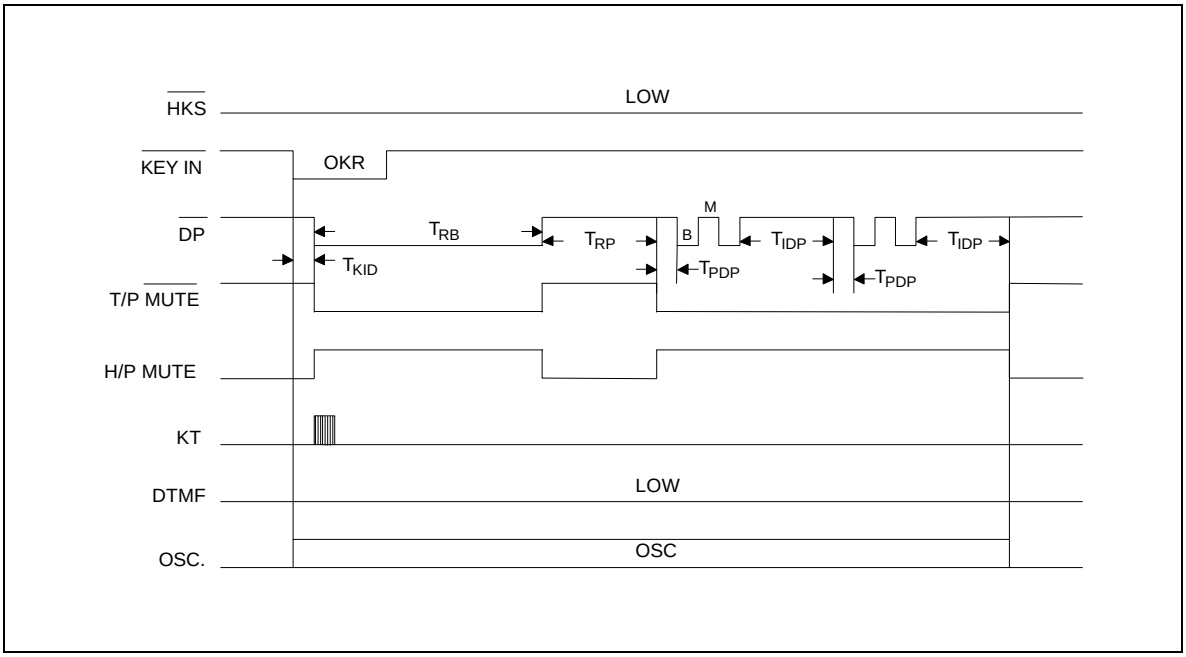


Figure 5 Pulse Mode One-key Dedialing Timing Diagram

Timing Waveforms, continued

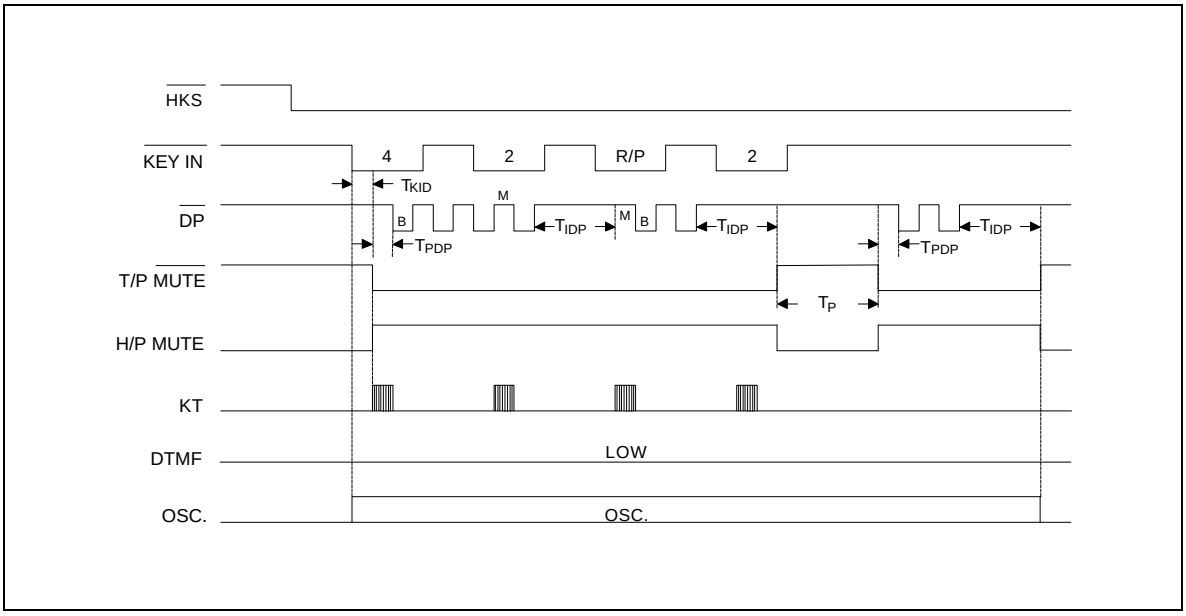


Figure 6 Pause Function Timing Diagram

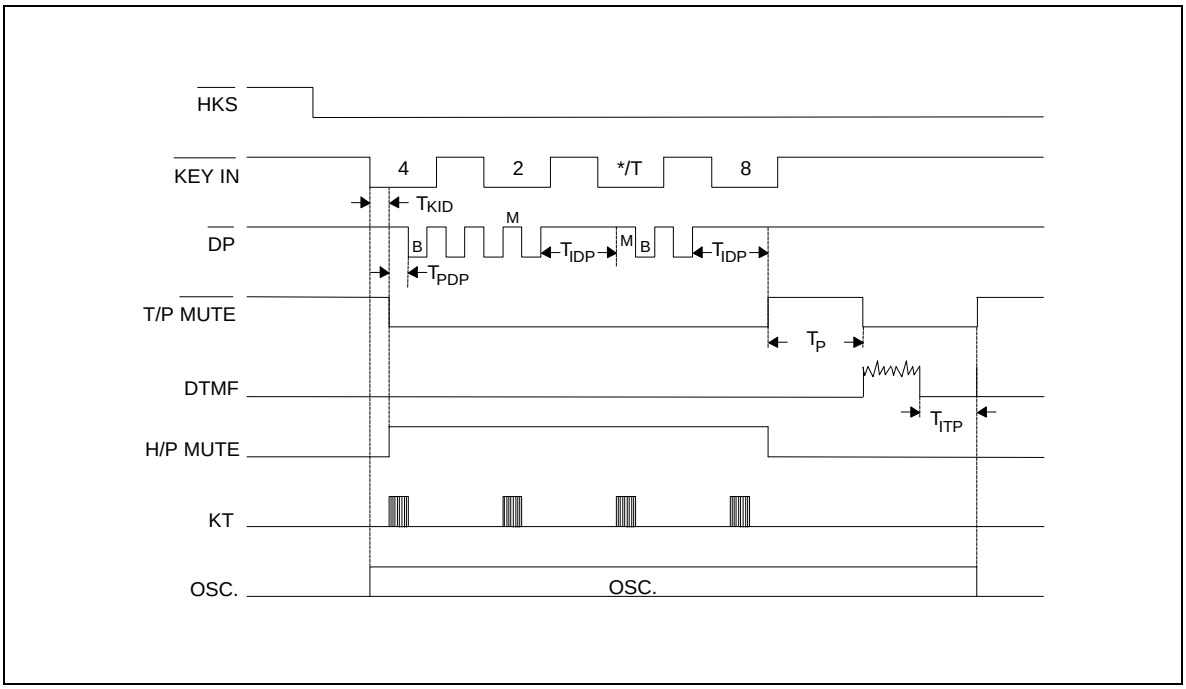


Figure 7. Pulse to Tone Function Timing Diagram

Timing Waveforms, continued

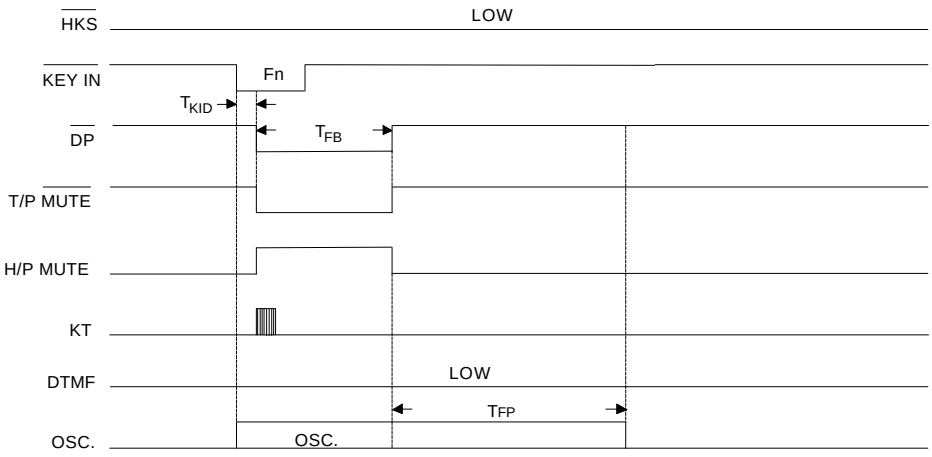


Figure 8 Flash Operation Timing Diagram

PAD LIST

PAD NO.	PAD NAME	PIN NAME	X	Y	PAD NO.	PAD NAME	PIN NAME	X	Y
1	COL 1	1	-441.50	987.80	17	VOL<2>	15	172.70	-1008.00
2	COL 2	2	-606.50	987.80	18	HF0	16	355.20	-1008.00
3	COL 3	3	-787.00	987.80	19	HKSB	17	520.20	-1008.00
4	COL 4	4	-952.00	987.80	20	DPS	18	702.80	-1008.00
5	COL 5	5	-928.00	703.60	21	DTMF	19	914.60	-1027.60
6	COL 6	6	-928.00	538.60	22	MODE	20	942.60	-732.40
7	LOCK		-928.00	345.00	23	V_{DD}	21	942.60	-532.70
8	KT	7	-928.00	180.00	24	KMUTEB	22	961.80	-341.80
9	HPMUTE	8	-928.00	-10.00	25	ROW 1	23	968.40	975.30
10	OPTION		-928.00	-175.00	26	ROW 2	24	790.60	995.80
11	V_{SS}	9	-928.00	-379.20	27	ROW 3	25	610.10	995.80
12	OSCIN	10	-936.00	-880.70	28	ROW 4	26	445.10	995.80
13	OSCOUT	11	-866.50	-1055.20	29	ROW 5	27	264.60	995.80
14	TPMUTE	12	-647.50	-1055.00	30	ROW 6	28	99.60	995.80
15	HF1	13	-456.50	-1055.00					
16	VOT<1>	14	-190.50	-1055.00					

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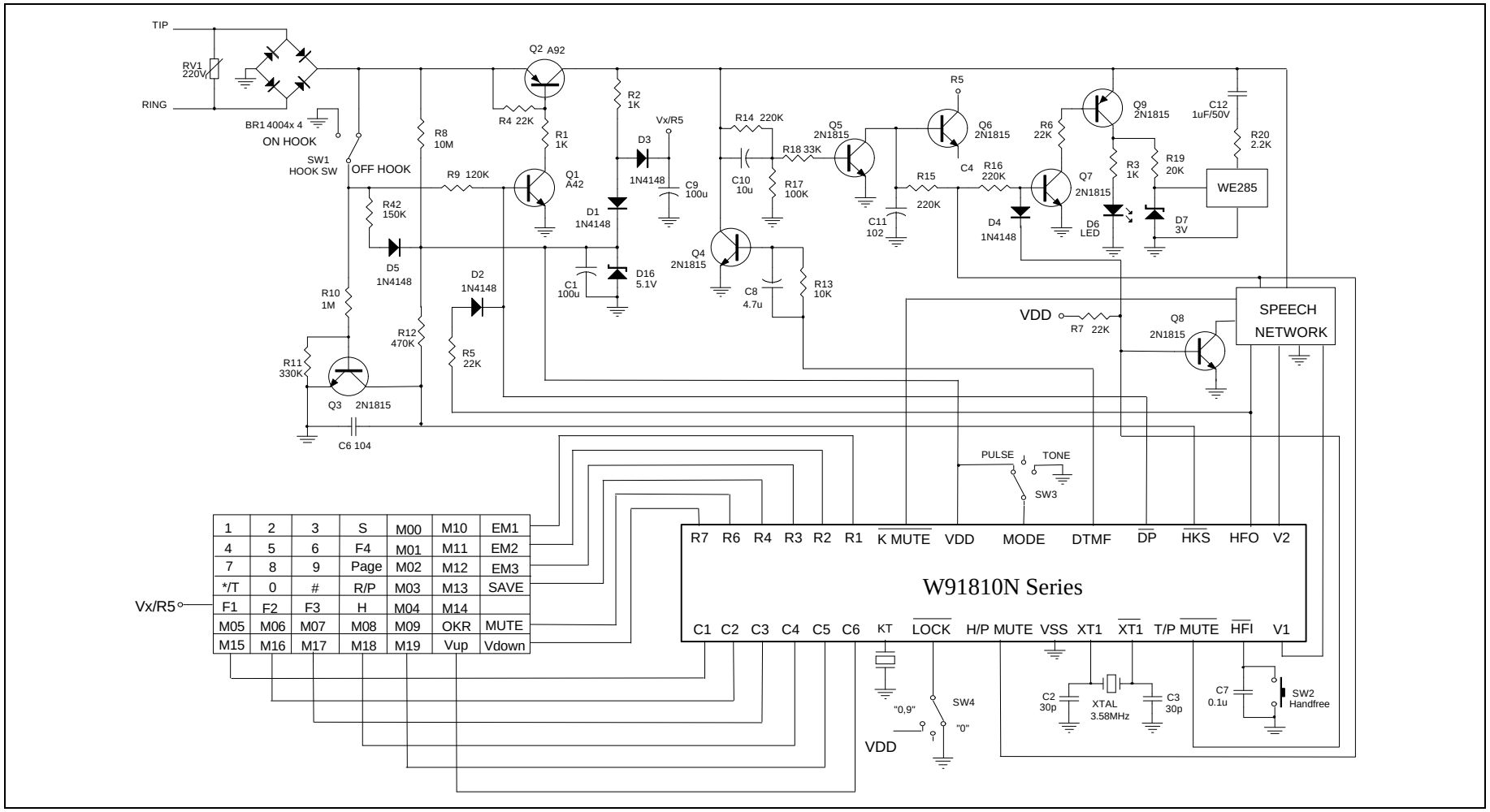
Note: All data and specifications are subject to change without notice.

TYPICAL APPLICATION CIRCUIT