

W91080 SERIES



STONE/PULSE DIALER WITH HANDFREE AND KEYTONE FUNCTIONS AND ONE MEMORY

GENERAL DESCRIPTION

The W91080 series dialers are Si-gate CMOS ICs that provide the necessary signals for either pulse or tone dialing. The W91080 series feature handfree dialing and redial functions and one number memory.

FEATURES

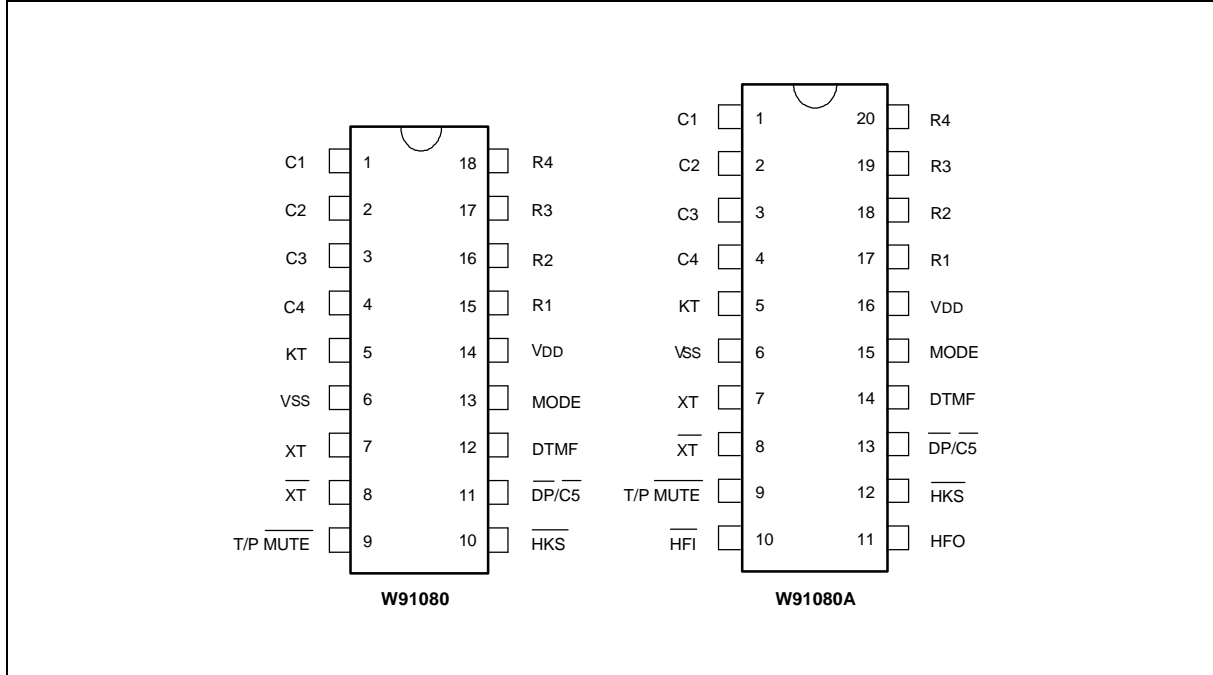
- DTMF/Pulse switchable dialer
- Two by 32 digits for redial memory and one number memory
- Pulse-to-tone (*T) keypad for long distance call operation
- Uses 4 × 5 keyboard
- Easy operation with redial, flash, pause, and */T keypads
- Pause, P→T (pulse-to-tone) can be stored as a digit in memory
- Minimum tone output duration: 100 msec
- Minimum intertone pause: 100 msec
- On-chip power-on reset
- Uses 3.579545 MHz crystal or ceramic resonator
- Packaged in 18 or 20-pin plastic DIP
- The different dialers in the W91080 series are described in the following table:

TYPE NO.	PULSE (ppS)	FLASH (mS)	M/B	HANDFREE DIALING	PACKAGE (PINS)
W91080	10	600/98	Pin	-	18
W91080A	10	600/98	Pin	Yes	20

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PIN CONFIGURATIONS



PIN DESCRIPTION

SYMBOL	18-PIN	20-PIN	I/O	FUNCTION
Column-Row Inputs	1-4 & 15-18	1-4 & 17-20	I	The keyboard input may be from either the standard 4 × 5 keyboard or an inexpensive single contact (form A) keyboard. Electronic input from a μC can also be used. A valid key entry is defined by a single row being connected to a single column.
XT, $\overline{\text{XT}}$	7, 8	7, 8	I, O	A built-in inverter provides oscillation with an inexpensive 3.579545 MHz crystal or ceramic resonator.
$\overline{\text{T/P MUTE}}$	9	9	O	The $\overline{\text{T/P MUTE}}$ is a conventional CMOS N-channel open drain output. The output transistor is switched on during pulse and tone mode dialing sequences and flash break. Otherwise, it is switched off.
MODE	13	15	I	Pulling mode pin to VSS places the dialer in tone mode. Pulling mode pin to VDD places the dialer in pulse mode (10 ppS, M/B = 2:3). If the mode pin is left floating, the dialer is in pulse mode (10 ppS, M/B = 1:2).

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Pin Description, continued

SYMBOL	18-PIN	20-PIN	I/O	FUNCTION																																				
$\overline{\text{HKS}}$	10	12	I	<p>Hook switch input.</p> <p>$\overline{\text{HKS}} = 1$: On-hook state. Chip in sleeping mode, no operation.</p> <p>$\overline{\text{HKS}} = 0$: Off-hook state. Chip enabled for normal operation.</p> <p>This pin must be set in conjunction with $\overline{\text{HFI}}$, HFO.</p> <p>Refer to description of $\overline{\text{HFI}}$, HFO pins. $\overline{\text{HKS}}$ pin is pulled to VDD by internal resistor.</p>																																				
$\overline{\text{DP}}/\overline{\text{C5}}$	11	13	O	<p>N-channel open drain dialing pulse output (Figure 1). Flash key will cause $\overline{\text{DP}}$ to be active in either tone mode or pulse mode.</p>																																				
DTMF	12	14	O	<p>In pulse mode, remains in low state.</p> <p>In tone mode, outputs a dual or single tone.</p> <p>Detailed timing diagram for tone mode is shown in Figure 2 (a, b).</p> <table border="1" style="margin: 10px auto;"> <thead> <tr> <th colspan="4">OUTPUT FREQUENCY</th> </tr> <tr> <th></th> <th>Specified</th> <th>Actual</th> <th>Error %</th> </tr> </thead> <tbody> <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> </tbody> </table>	OUTPUT FREQUENCY					Specified	Actual	Error %	R1	697	699	+0.28	R2	770	766	-0.52	R3	852	848	-0.47	R4	941	948	+0.74	C1	1209	1216	+0.57	C2	1336	1332	-0.30	C3	1477	1472	-0.34
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VDD , VSS	14, 6	16, 6	I	Power input pins.																																				

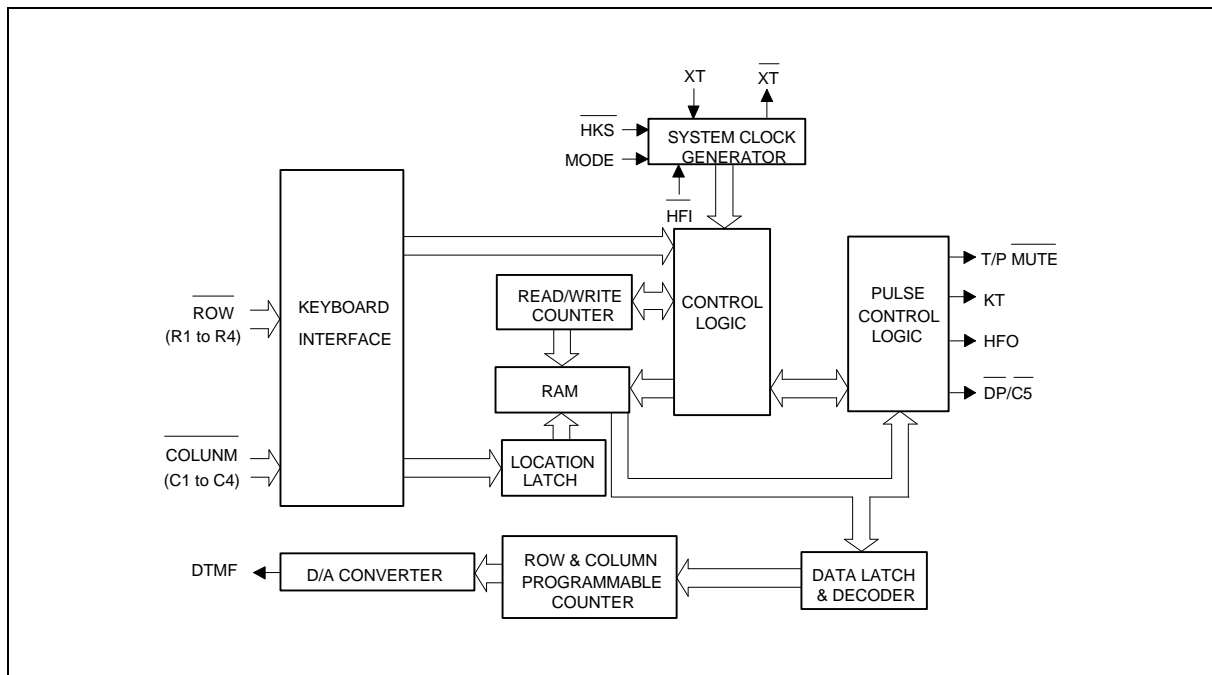
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Pin Description, continued

SYMBOL	18-PIN	20-PIN	I/O	FUNCTION																																								
$\overline{\text{HFI}}$, HFO	-	10, 11	I, O	<p>Handfree control pins. Handfree control state is toggled by a low pulse on the $\overline{\text{HFI}}$ input pin. Status of the handfree control state is described in the following table:</p> <table border="1"> <thead> <tr> <th colspan="2">CURRENT STATE</th> <th colspan="3">NEXT STATE</th> </tr> </thead> <tbody> <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>$\overline{\text{HFI}} \downarrow$</td> <td>High</td> <td>Yes</td> </tr> <tr> <td>On Hook</td> <td>High</td> <td>$\overline{\text{HFI}} \downarrow$</td> <td>Low</td> <td>No</td> </tr> <tr> <td>Off Hook</td> <td>High</td> <td>$\overline{\text{HFI}} \downarrow$</td> <td>Low</td> <td>Yes</td> </tr> <tr> <td>On Hook</td> <td>-</td> <td>Off Hook</td> <td>-</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> </tbody> </table> <p>$\overline{\text{HFI}}$ is pulled to VDD by an internal resistor.</p>	CURRENT STATE		NEXT STATE			Hook SW.	HFO	Input	HFO	Dialing	-	Low	$\overline{\text{HFI}} \downarrow$	High	Yes	On Hook	High	$\overline{\text{HFI}} \downarrow$	Low	No	Off Hook	High	$\overline{\text{HFI}} \downarrow$	Low	Yes	On Hook	-	Off Hook	-	Yes	Off Hook	Low	On Hook	Low	No	Off Hook	High	On Hook	High	Yes
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On Hook	-	Off Hook	-	Yes																																								
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KT	5	5	O	<p>Key-tone signal output. The key tone will be generated in pulse mode and when operation and function keys (R/P, S, F1, F2, */T) are pressed in tone mode. Frequency is 600 Hz and duration is 35 mS.</p>																																								

BLOCK DIAGRAM





FUNCTIONAL DESCRIPTION

Keyboard Operation

C1	C2	C3	C4	$\overline{DP/C5}$	
1	2	3		MEM	R1
4	5	6	F1	S	R2
7	8	9	F2		R3
*/T	0	#	R/P		R4

- S: Store function key
- */T: * & P→T key
- R/P: Redial and pause function key
- F1, F2: Flash keys
- MEM: Memory function key

Normal Dialing

(or &), , , ...,

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

Redialing

, , , ..., BUSY, Come ,
 (or &) ,

or & , , , ..., , BUSY, , Come
,

The key can execute the redial function only as the first key-in after off-hook; otherwise, it executes the pause function.

Number Store

, , , ..., , , ,

1. D1, D2, ..., Dn will be stored in memory and will be dialed out.

, , , , ..., , ,

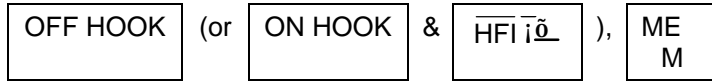
2. D1, D2, ..., Dn will be stored in memory but will not be dialed out.



3. **R/P** and **P→T** keys can be stored as a digit in memory, but **R/P** key cannot be the first digit.

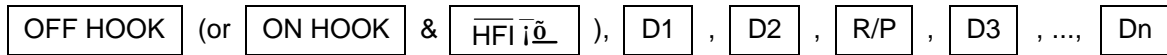
The store mode is released after the store function is executed or the state of the hook switch changes.

Repertory Dialing



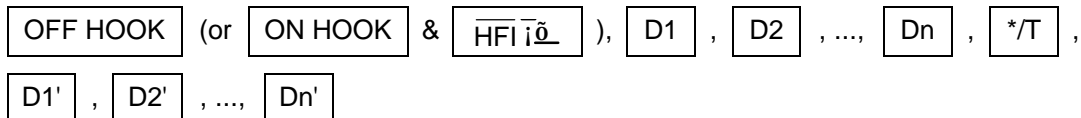
The contents of MEM will be dialed out.

Access Pause



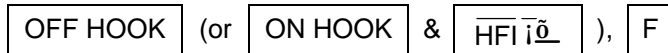
1. The pause function can be stored in memory.
2. The pause function is executed in normal dialing, redialing, or memory dialing.
3. The pause function timing diagram is shown in Figure 3.

Pulse to Tone (* / T)



1. If the mode switch is set to pulse mode, then the output signal will be: D1, D2, ..., Dn, Pause (3.6s), D1', D2', ..., Dn'
(Pulse) (Tone)
2. If the mode switch is set to tone mode, then the output signal will be: D1, D2, ..., Dn, *, D1', D2', ..., Dn'
(Tone) (Tone) (Tone)
3. The dialer remains in tone mode when the digits have been dialed out and can be reset to pulse mode only by going on-hook.
4. The P→T function timing diagram is shown in Figure 4.

Flash (F = F1 or F2)



1. The flash key cannot be stored as a digit in memory. The flash key has first priority among keyboard functions.
2. The system will return to the initial state after the break time is finished.
3. The flash function timing diagram is shown in Figure 5.

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ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
DC Supply Voltage	VDD-VSS	-0.3 to +7.0	V
Input/Output Voltage	VIL	VSS -0.3	V
	VIH	VDD +0.3	V
	VOL	VSS -0.3	V
	VOH	VDD +0.3	V
Power Dissipation	PD	120	mW
Operating Temperature	TOPR	-20 to +70	°C
Storage Temperature	TSTG	-55 to +125	°C

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

DC CHARACTERISTICS

(VDD-VSS = 2.5V, FOSC. = 3.58 MHz, TA = 25° C, all outputs unloaded)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX .	UNIT
Operating Voltage	VDD	-	2.0	-	5.5	V
Operating Current	IOP	Tone	-	0.4	0.6	mA
		Pulse	-	0.2	0.4	mA
Standby Current	ISB	$\overline{\text{HKS}} = 0$, No load & No key entry	-	-	15	μA
Memory Retention Current	IMR	$\overline{\text{HKS}} = 1$, VDD = 1.0V	-	-	0.2	μA
DTMF Output Voltage	VTO	Row group, RL = 5 KΩ	130	150	170	mVrms
Pre-emphasis		Col/Row, VDD = 2.0 to 5.5V	1	2	3	dB
DTMF Distortion	THD	RL = 5 KΩ, VDD = 2.0 to 5.5V	-	-30	-23	dB
DTMF Output DC Level	VTDC	RL = 5 KΩ, VDD = 2.0 to 5.5V	1.0	-	3.0	V
DTMF Output Sink Current	ITL	VTO = 0.5V	0.2	-	-	mA
$\overline{\text{DP}}$ Output Sink Current	IPL	VPO = 0.5V	0.5	-	-	mA

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DC Characteristics, continued

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
T/P MUTE Output Sink Current	IML	VMO = 0.5V	0.5	-	-	mA
HKS I/P Pull-High Resistor	RKH		-	300	-	KΩ
KT Drive/Sink Current	IKTH	VKTH = 2.0V	-0.5	-	-	mA
	IKTL	VKTL = 0.5V	0.5	-	-	mA
HFO Drive/Sink Current	IHFH	VHFH = 2.0V	-0.5	-	-	mA
	IHFL	VHFL = 0.5V	0.5	-	-	mA
Keypad Input Drive Current	IKD	VI = 0V	30	-	-	μA
Keypad Input Sink Current	IKS	VI = 2.5V	200	400	-	μA
Keypad Resistance			-	-	5.0	KΩ

AC CHARACTERISTICS

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Keypad Active in Debounce	TKID		-	20	-	mS
Key Release Debounce	TKRD		-	20	-	mS
Pre-digit Pause	TPDP 10 ppS	Mode Pin = 1	-	40	-	mS
		Mode Pin = Floating	-	33.3	-	mS
Interdigit Pause (Auto dialing)	TIDP	10 ppS	-	800	-	mS
Make/Break Ratio	M/B	Mode Pin = 1	-	40:60	-	%
		Mode Pin = Floating	-	33:67	-	%
DTMF Output Duration	TTD	Auto Dialing	-	100	-	mS
Intertone Pause	TITP	Auto Dialing	-	100	-	mS
Flash Break Time	TFB	F2	-	98	-	mS
		F1	-	600	-	mS
KT Duration Time	TKT		-	35	-	mS

Notes:

- 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%.
- Crystal oscillator accuracy directly affects these times.

TIMING WAVEFORMS

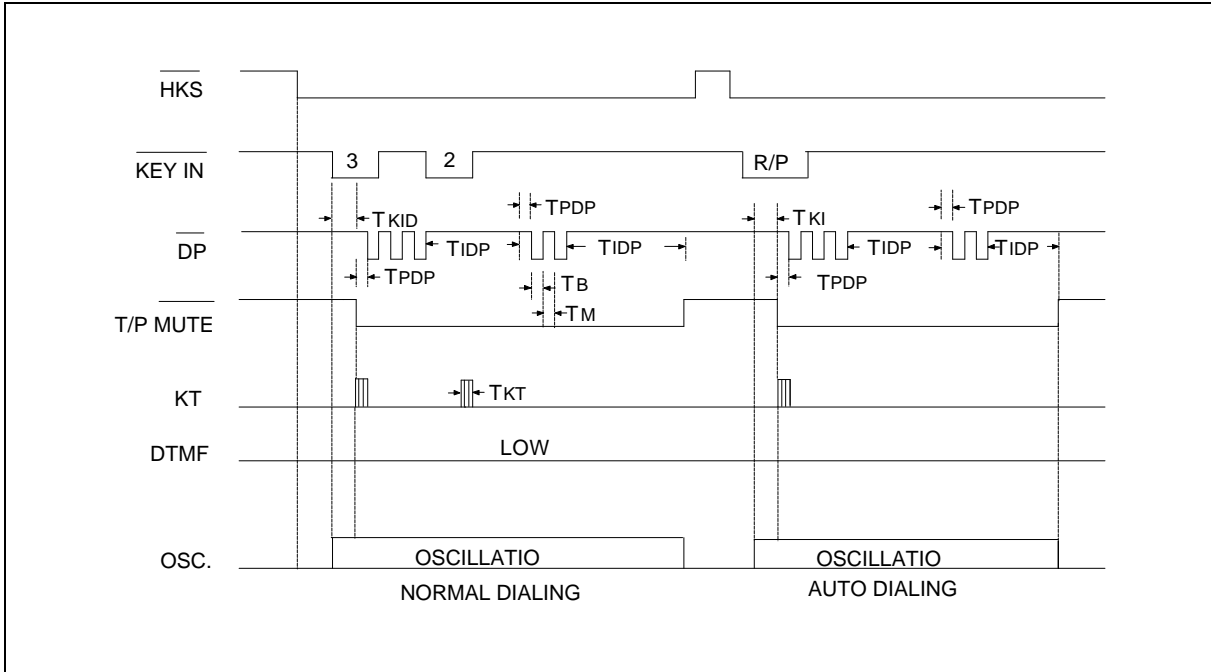


Figure 1. Pulse Mode Timing Diagram

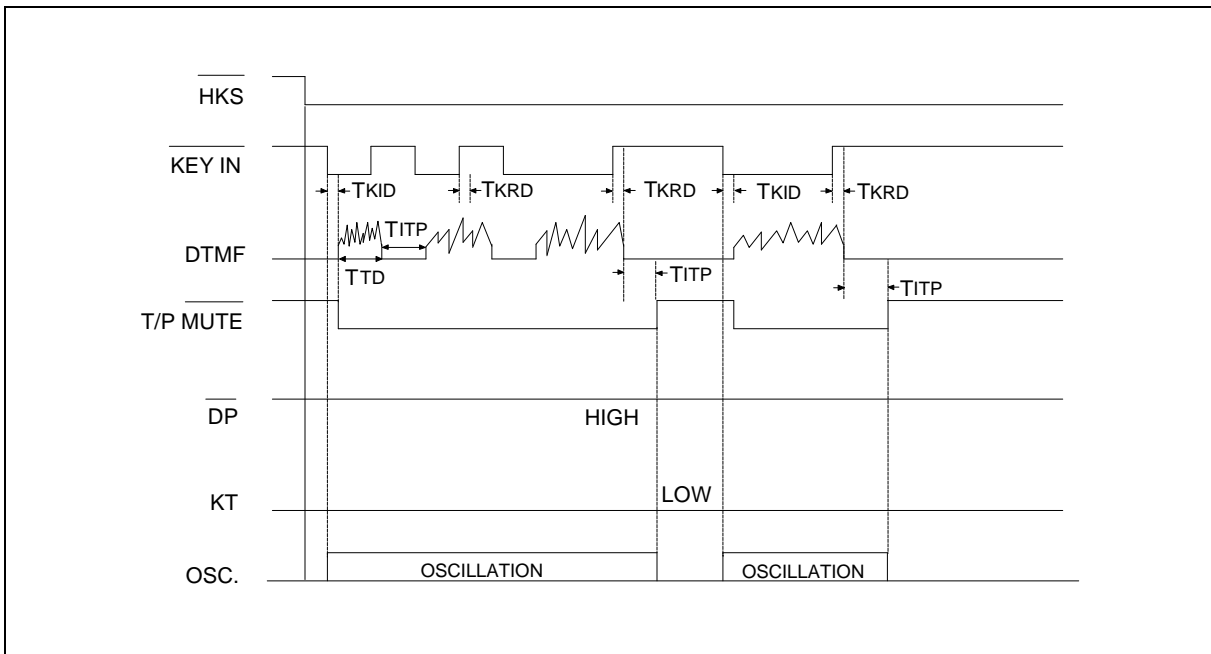


Figure 2(a). Tone Mode Normal Dialing Timing Diagram

Timing Waveforms, continued

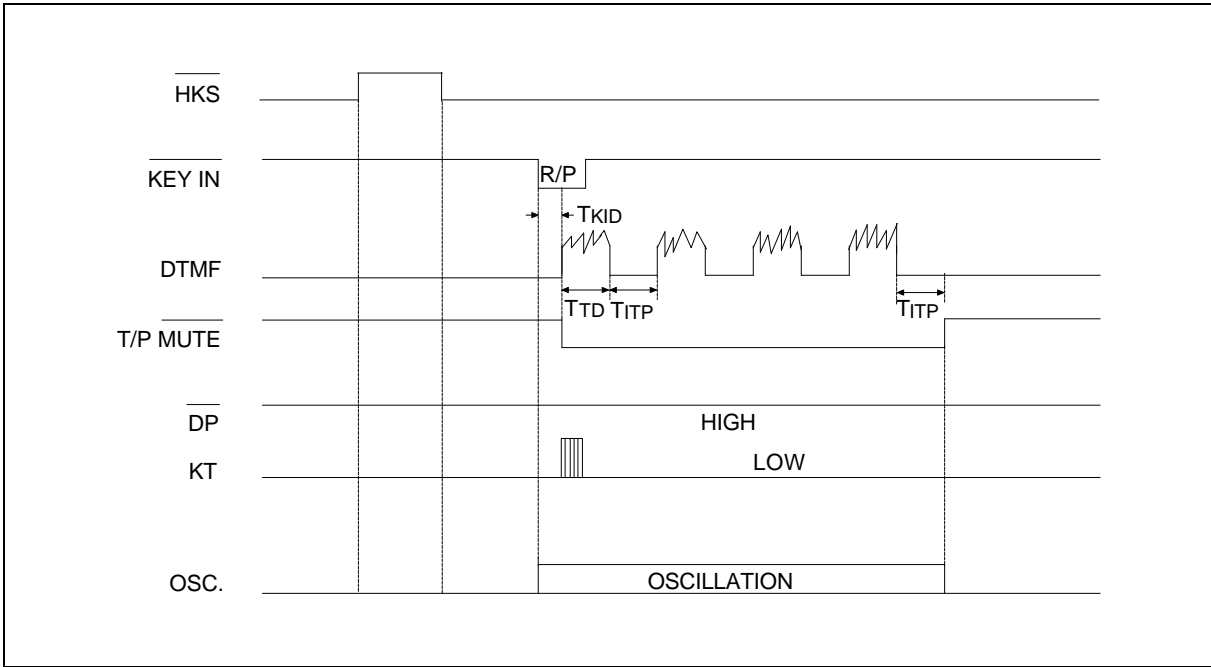


Figure 2(b). Tone Mode Auto Dialing Timing Diagram

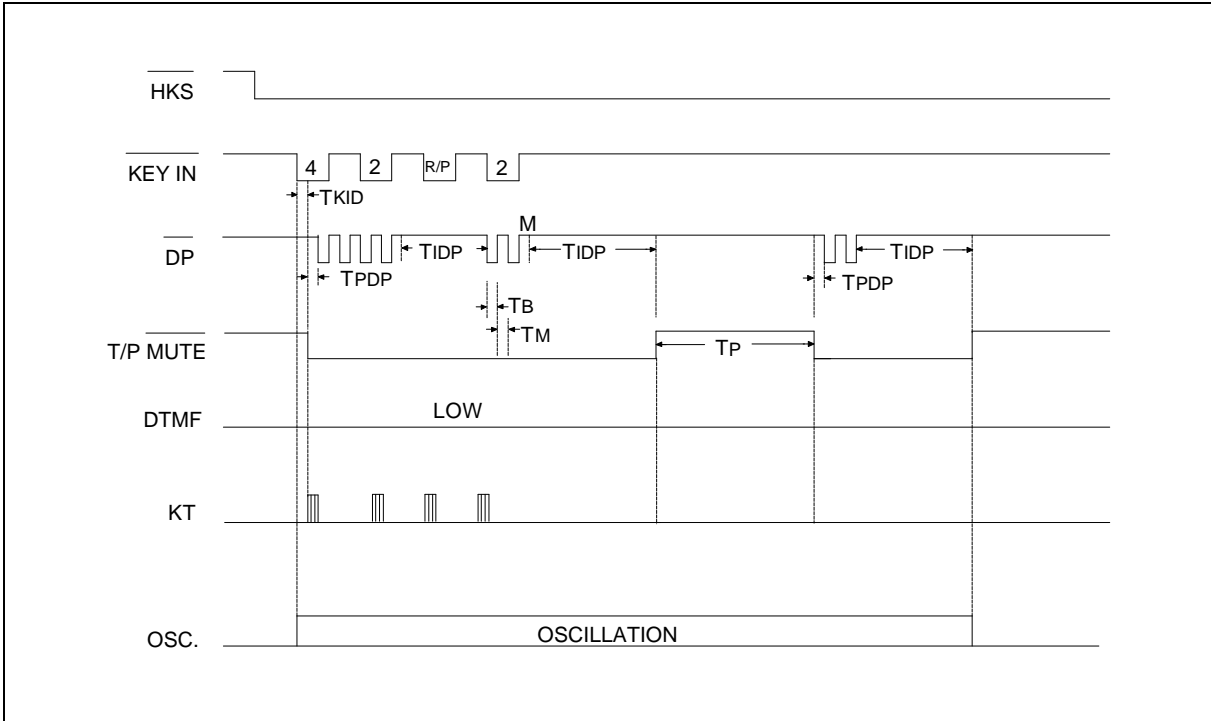


Figure 3. Pause Function Timing Diagram

Timing Waveforms, continued

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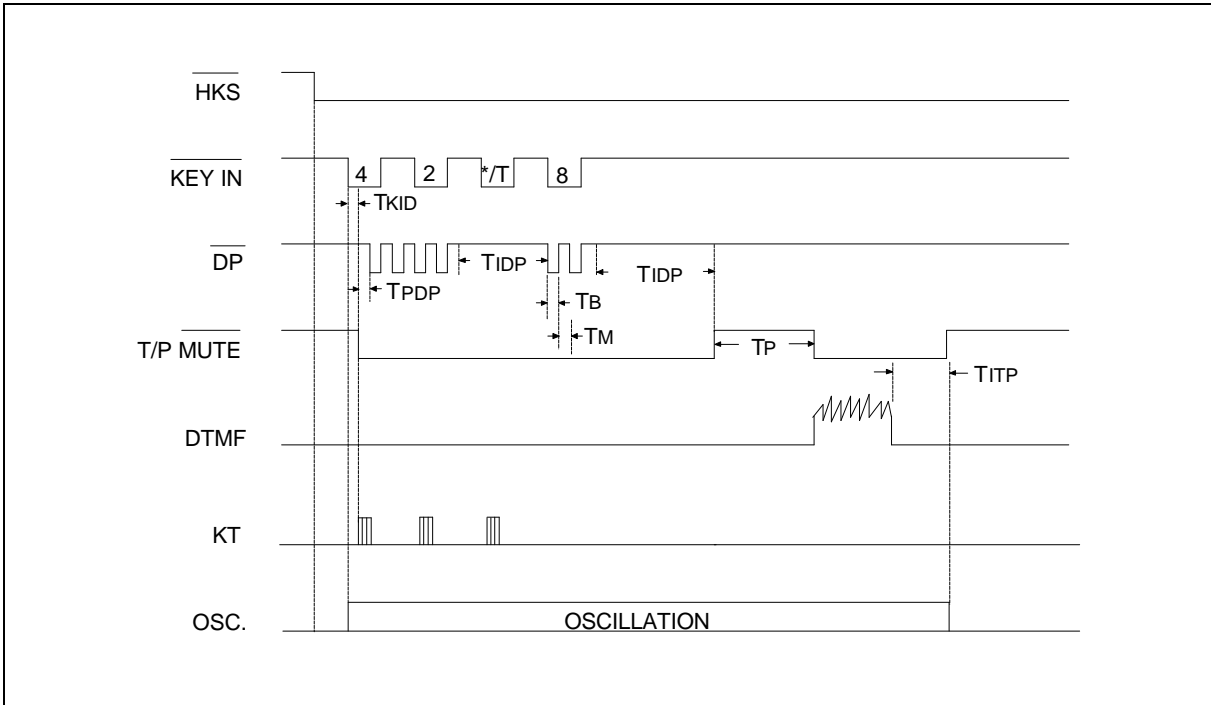


Figure 4. P → T Operation Timing Diagram in Normal Dialing

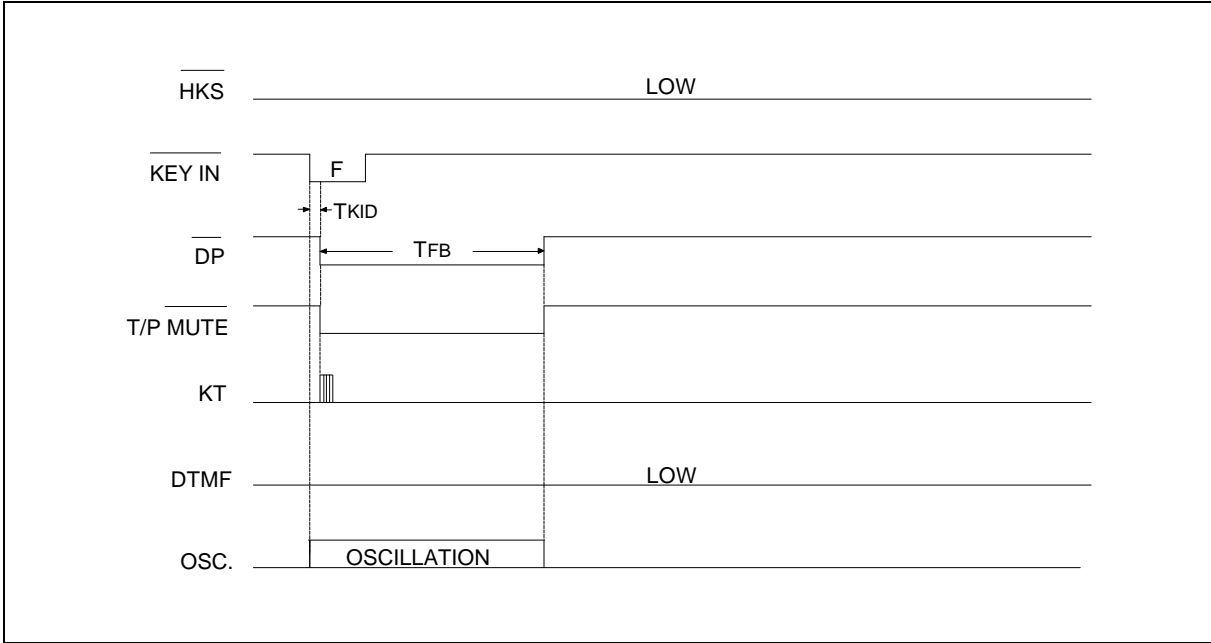


Figure 5. Flash Operation Timing Diagram

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Headquarters

No. 4, Creation Rd. III,
Science-Based Industrial Park,
Hsinchu, Taiwan
TEL: 886-3-5770066
FAX: 886-3-5792697
<http://www.winbond.com.tw/>
Voice & Fax-on-demand: 886-2-7197006

Taipei Office

11F, No. 115, Sec. 3, Min-Sheng East Rd.,
Taipei, Taiwan
TEL: 886-2-7190505
FAX: 886-2-7197502

Winbond Electronics (H.K.) Ltd.

Rm. 803, World Trade Square, Tower II,
123 Hoi Bun Rd., Kwun Tong,
Kowloon, Hong Kong
TEL: 852-27516023
FAX: 852-27552064

Winbond Electronics North America Corp.

Winbond Memory Lab.
Winbond Microelectronics Corp.
Winbond Systems Lab.
2730 Orchard Parkway, San Jose,
CA 95134, U.S.A.
TEL: 1-408-9436666
FAX: 1-408-9436668

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