

TONE/PULSE DIALER WITH FLASH TIME STOREABL AND SAVE FUNCTIONS

GENERAL DESCRIPTION

The W91310N series are monolithic Ics that provide the necessary signals for either pulse or tone dialing. The W91310N series feature a redial memory, Handsfree, auto redial function, and flash time storeable.

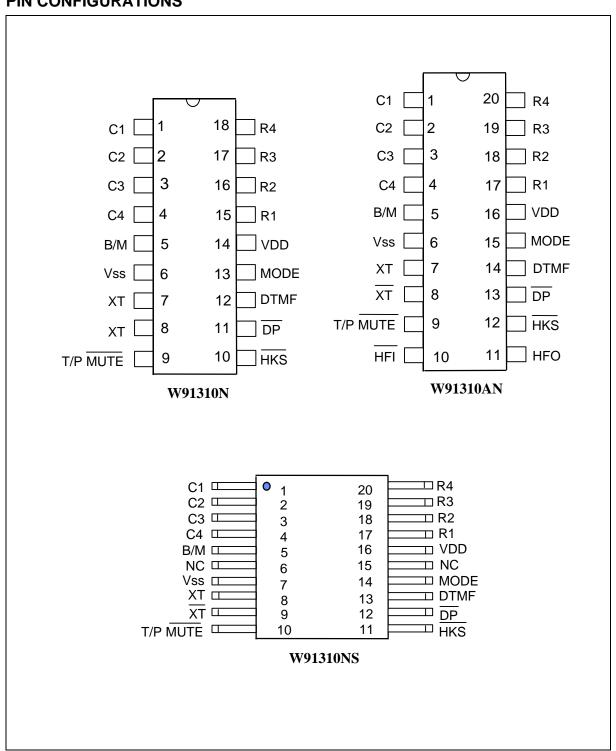
FEATURES

- DTMF/Pulse switchable dialer
- · 32 digits for redial memory
- Pulse-to-tone (P→T) keypad for long distance call operation
- Break/Make ratio is selectable by pin option
- Uses 5 × 5 keyboard
- Easy operation with redial, flash, pause, and P→T keypads
- Flash, pause, P→T (pulse-to-tone) can be stored as a digit in memory
- Minimum tone output duration: 93 mS
- Minimum intertone pause: 93 mS
- On-chip power-on reset
- One flash time storeable
- Uses 3.579545 MHz crystal or ceramic resonator
- Packaged in 18-pin plastic DIP, and 300 mil 20-pin SOP.
- The dialer in the W91310N series are shown in the following table:

TYPE NO.	PULSE (ppS)	FLASH (Ms)	FLASH PAUSE (S)	PAUSE (S)
W91310N	10/20	600/300/100/73	1.0	2.0/3.6
W91310AN	10/20	600/300/100/73	1.0	2.0/3.6



PIN CONFIGURATIONS





PIN DESCRIPTION

SYMBOL	PIN	PIN	I/O		F	UNCTION				
	DIP	SSOP								
Column- Row Inputs	1–4 & 15–18 (17-20)/ (AN)	1–4 & 17–20	I	The keyboard input may be from either the standard 4×4 keyboard or an inexpensive single contact (form A) keyboard. Electronic input from a μ C can also be used. A valid key entry is defined as a single row being connected to a single column.						
XT, XT	7, 8	8, 9	I, O	A built-in inve 3.579545 MH				nexpensive		
T/P MUTE	9	10	0	The T/P MU drain output. pulse and tor Otherwise, it	The outpure mode di	t transistor aling seque	is switched	on during		
MODE	13 15(AN)	14	I	Pulling mode Pulling mode (10 ppS). Lea pulse mode (pin to VDE aving mode	places the	dialer in p	ulse mode		
HKS	10 12(AN)	11	I	Hook switch input. \overline{HKS} = 1: On-hook state. Chip in sleeping mode, no operation. \overline{HKS} = 0: Off-hook state. Chip enabled for normal operation. The \overline{HKS} pin is pulled to VDD by an internal resistor.						
DP	11 13(AN)	12	0	N-channel op Flash key wil and tone mo	I cause DP	. • .				
DTMF	12 14(AN)	13	0	In pulse mod mode, output diagram for t	ts a dual or	single tone	e. Detailed	timing		
					OUTPUT F	REQUENCY]		
					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						
VDD, VSS	14, 6 16, 6 (AN)	16, -7	I	Power input pins.						
B/M	5	5	I	The break make ratio is 60:40 if B/M = 1 and is 66.6:33.3 if B/M = 0. This pin has no function in DTMF mode.						

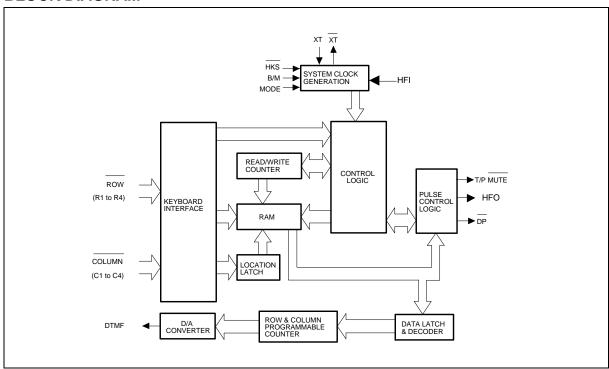
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Pin Description, continued

SYMBOL	PIN	PIN	I/O	FUNCTION					
	DIP	SSOP							
HFI, HFO	11, 12	-	I, O	Handfree o	contro	l pins.			
	(AN Only)			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:					
				CURRENT	STATE	NE	EXT ST	ATE	
				HOOK SW.	HFO	INPUT	HFO	DIALING	
				-	Low	HFI ₹	High	Yes	
				On Hook	High	HFI ₹	Low	No	
				Off Hook	High	HFI	Low	Yes	
				On Hook	-	Off Hook	Low	Yes	
				Off Hook	Low	On Hook	Low	No	
				Off Hook	High	On Hook	High	Yes	
				The HFI pin is pulled to VDD by an internal resistor.					
				A detailed	timing	diagram	ı is sh	own in F	igure 3.

BLOCK DIAGRAM





FUNCTIONAL DESCRIPTION

Keyboard Operation

C1	C2	C3	C4	$\overline{DP}/\overline{C5}$	
1	2	3	SAVE	MEM	R1
4	5	6	F1		R2
7	8	9	F2		R3
*/T	0	#	R/P1	RD	R4
R/P2	RD	F3	F4		VDD

- R/P: Redial and pause function key
- */T: * in tone mode and P→T: Pulse mode to tone mode
- S: Store function
- MEM: With the same memory location as SAVE memory
- SAVE: Save function memory
- R/P1, R/P2: Redial and pause function key, P1 is 3.6 sec, and P2 is 2.0 sec.
- F1, .,.F4: Flash key
- · RD: One key redial.

Normal Dialing

OFF HOOK	, (or	ON HOOK	&	HFI Ī_Ĉ),	D1	,	D2	,,	Dn
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- 1. D1, D2, ..., Dn will be dialed out.
- 2. Dialing length is unlimited, but redial is inhibited if length oversteps 32 digits.

Redialing

1.
$$\overline{OFFHOOK}$$
, (or \overline{ONHOOK} & $\overline{\overline{HFI}}$ $\overline{\underline{i}}$ $\underline{\hat{c}}$), $\overline{D1}$, $\overline{D2}$, ..., \overline{Dn} Busy, come \overline{ONHOOK} , $\overline{OFFHOOK}$ (or \overline{ONHOOK} & $\overline{\overline{HFI}}$ $\overline{\underline{i}}$ $\underline{\hat{c}}$), $\overline{R/P}$

- 1. The redial memory content will be D1, D2, .,.Dn.
- b. The R/P key can execute the redial function only as the first key-in after off-hook; otherwise, it will invoke the pause function.
- c. If redialing length oversteps 32 digits, the redialing function will be inhibits.

Save

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



2. If the sequence of the dialed digits D1, D2, ..., Dn has not finished, SAVE will be ignored; otherwise, D1, D2, ..., Dn will be duplicated to SAVE memory.

Repertory Dialing

One-touch direct repertory dialing:

1. OFF HOOK (or ON HOOK ,
$$\overline{\text{HFI }\overline{\text{i}}_\hat{\text{c}}}$$
 , MEN .

Press MEM will dial out the same as pressing SAVE

Access Pause

- 1. The pause function can be stored in memory.
- 2. The pause function is executed in normal dialing or memory dialing.
- 3. The pause function timing diagram is shown in Figure 5.

Pulse-to-tone (P®T)

1. If the mode switch is set to pulse mode, then the output signal will be:

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

D1, D2, ..., Dn,
$$P \rightarrow T$$
 D1, D2, ..., Dn, (Tone) (Pause) (Tone)

1. 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 6.

Flash

OFF HOOK , (or ON HOOK ,
$$\overline{\text{HFI}} \ \overline{i} \ \hat{c}$$
), Fn

- 1. Flash key can be stored as a digit in memory.
- 2. Only one flash key can be released to end user.
- 3. The system will return to the initial state after the break time is finished.

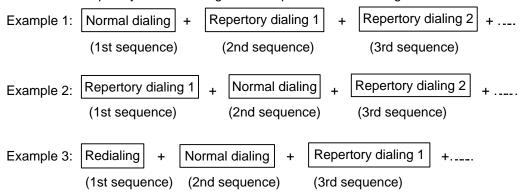


- 4. If the mode switch is set in pulse mode, after the dialing sequence D1, D2. */T, D3, Fn, D4, the dialer will keep in tone mode.
- 5. The flash function timing diagram is shown in Figure 7.

Mixed Dialing

1. Definition of mixed dialing:

In mixed dialing, a new sequence may be accepted only when the previous sequence has been dialed out completely. The following are examples of mixed dialing:



- 2. There is no limitation on the number of digits and sequences in the mixed dialing.
- 3. The content of mixed dialing may be a combination of normal dialing, memory dialing, or one-key redialing.
- 4. If ON HOOK , OFF HOOK (or ON HOOK & $\overline{\text{HFI }\overline{i}_\hat{c}}$), RD is entered,

then the mixed dialing sequence described in the above examples will be dialed out only if the total number of digits does not exceed 32.

If the total exceeds 32 digits, then redialing is inhibited.



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
	Voн	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, Unloaded	-	0.4	0.6	mA
		Pulse, Unloaded	-	0.2	0.4	mA
Standby Current	ISB	HKS = 0, No load, & No key entry	-	-	15	μΑ
Memory Retention Current	IMR	HKS = 1, VDD = 1.0V	-	1	0.2	μΑ
DTMF Output Voltage	Vто	Row group, RL = $5 \text{ K}\Omega$	130	150	170	mVrms
Pre-emphasis		Col/Row, VDD = 2.0 to 5.5V	1	2	3	dB
DTMF Distortion	THD	RL = 5 K Ω , VDD = 2.0 to 5.5V	-	-30	-23	dB
DTMF Output DC Level	VTDC	RL = 5 K Ω , VDD = 2.0 to 5.5V	1.0	-	3.0	V
DTMF Output Sink Current	ltl	VTO = 0.5V	0.2	-	-	mA
DP Output Sink Current	IPL	VPO = 0.5V	0.5	-	-	mA
T/P MUTE Output Sink Current	IML	VMO = 0.5V	0.5	-	-	mA
HKS I/P Pull-high Resistor	Rĸн		-	300	-	ΚΩ
HFO Drive/Sink Current	IHFH	VHFH = 2.0 V	0.5	-	-	mA
	IHFL	VHFL = 0.5 V	0.5	-	-	mA



DC Characteristics, continued

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Keypad Input Drive Current	lkd	VI = 0V	30	•	-	μΑ
Keypad Input Sink Current	lks	VI = 2.5V	200	400	-	μΑ
Keypad Resistance			-	-	5.0	ΚΩ

AC CHARACTERISTICS

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Keypad Active in Debounce	TKID		-	20	-	mS
Key Release Debounce	TKRD		-	20	-	mS
Pre-digit Pause ¹	TPDP1	B/M = 1	-	40	-	mS
	10 ppS	B/M = 0	-	33.3	-	
Pre-digit Pause ²	TPDP2	B/M = 1	-	20	-	mS
	20 ppS	B/M = 0	-	16.7	-	
Interdigit Pause (Auto dialing)	TIDP	10 ppS	-	800	-	mS
		20 ppS	-	500	-	
Make/Break Ratio	M/B	B/M = 1	-	40:60	-	%
		B/M = 0	-	33:67	-	
DTMF Output Duration	TTD	Auto Dialing	-	93	-	mS
Intertone Pause	TITP	Auto Dialing	-	93	-	mS
Flash Break Time	Тғв	F1	-	600	-	mS
		F2	-	100	-	
		F3	-	300	-	
		F4	-	73	-	
Flash Pause Time	TFP	F1, F2, F3, F4	-	1.0	-	S
One Key Redial Break Time	TRB	-	-	2.2	-	S
One Key Redial Pause Time	TRP	-		0.6	-	S
Pause Time	ТР	R/P1	-	3.6	-	S
		R/P2	-	2.0	-	

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 $\pm 0.02\%$.
- 2. Crystal oscillator accuracy directly affects these times.
- 1. Pause Time selectable.
- 2. Flash time only can be use any one in any same time.



TIMING WAVEFORMS

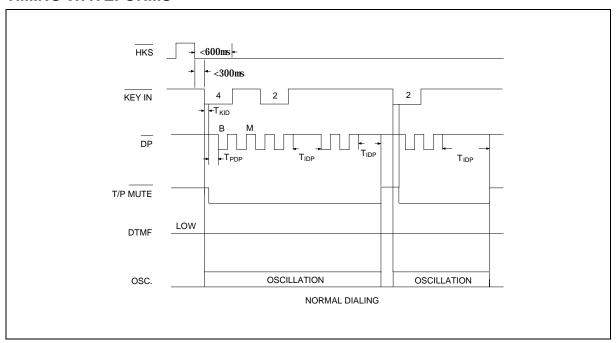


Figure 1(a). Normal Dialing Timing Diagram (Pulse Mode Timing Diagram)

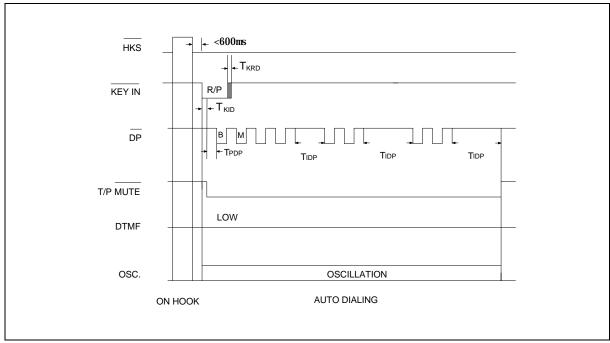


Figure 1(b). Auto Dialing Timing Diagram (Pulse Mode Timing Diagram)



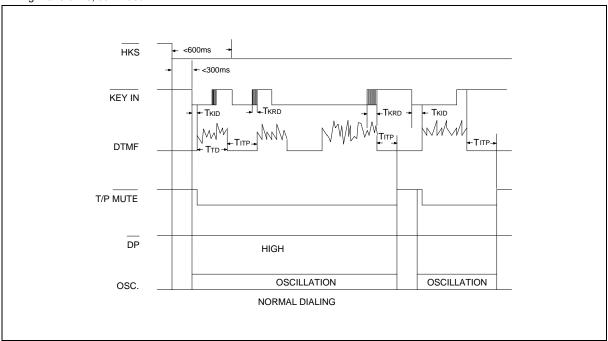


Figure 2(a). Normal Dialing Timing Diagram (Tone Mode Timing Diagram)

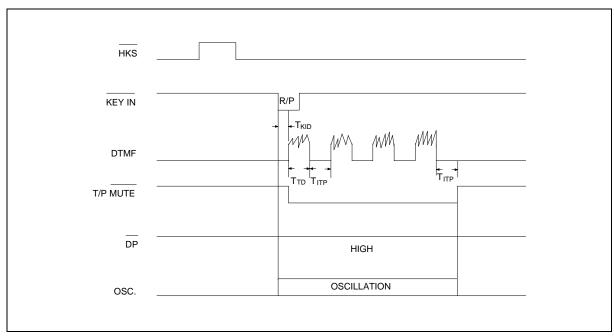


Figure 2(b). Auto Dialing Timing Diagram (Tone Mode Auto Dialing Timing Diagram)



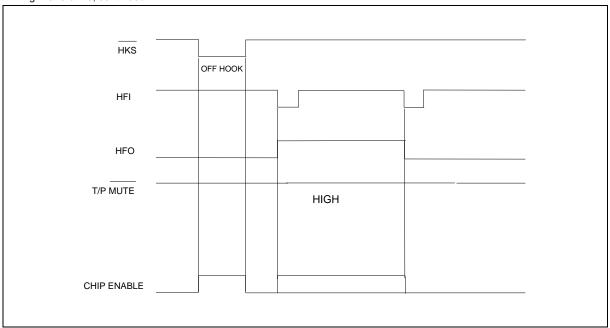


Figure 3. Handfree Timing Diagram

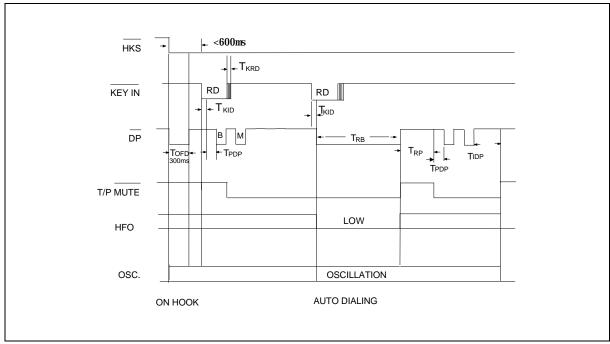


Figure 4 One -key redial Timing Diagram (Pulse mode)



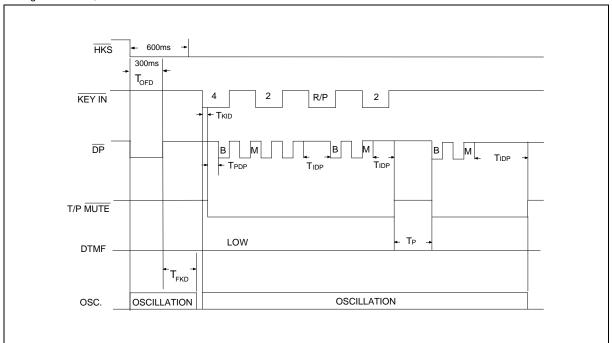


Figure 5. Pause Function Timing Diagram

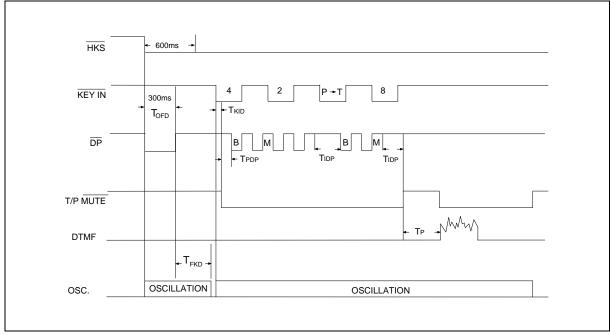


Figure 6. Pulse-to-tone Function Timing Diagram



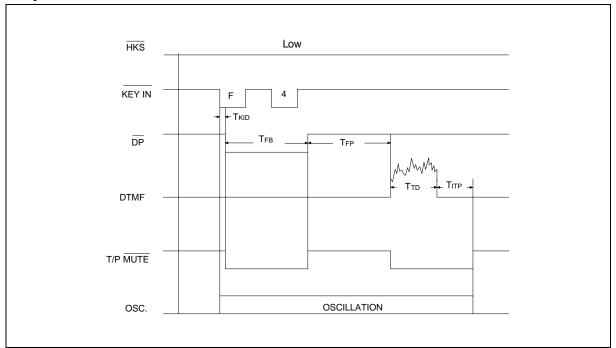
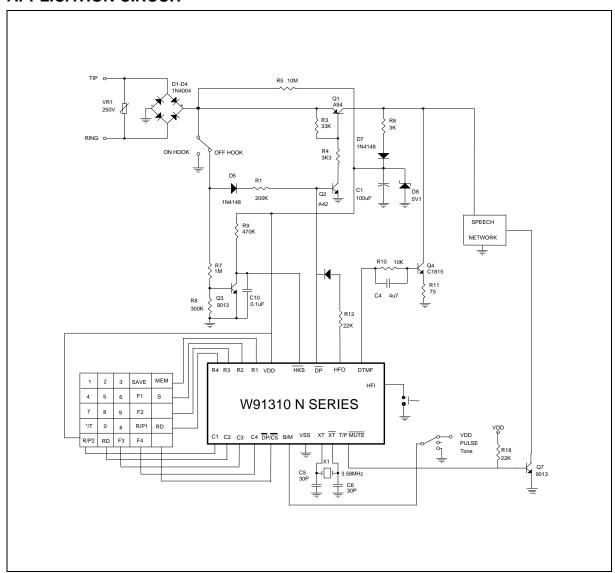


Figure 7. Flash Function Timing Diagram



APPLICATION CIRCUIT







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Note: All data and specifications are subject to change withou t notice.