



TONE/PULSE SWITCHABLE DIALER WITH REDIAL AND SAVE FUNCTION

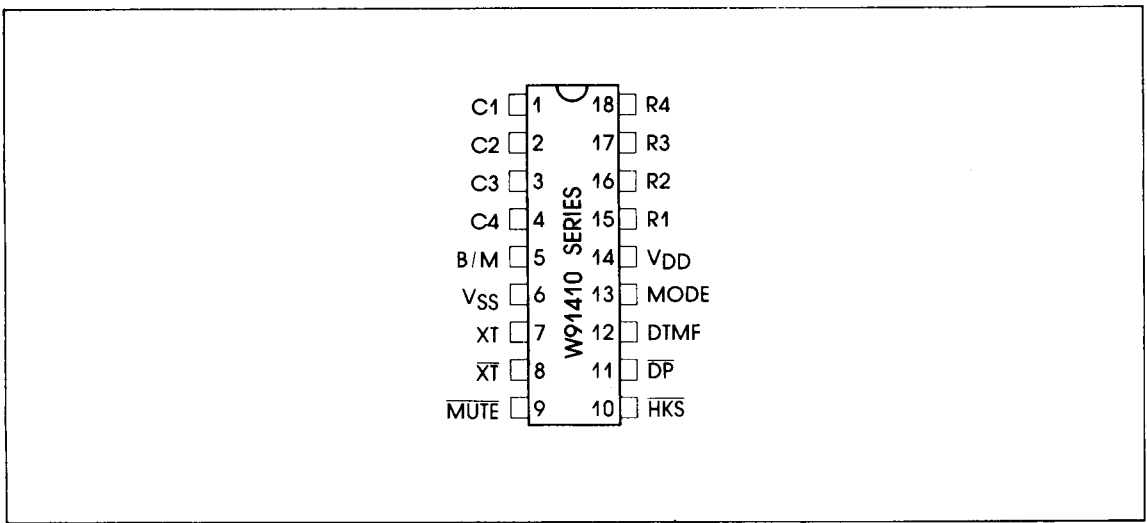
GENERAL DESCRIPTION

The W91410 series are monolithic integrated circuit. It contains Redial and Save memories which can perform Tone/Pulse switchable dialing functions. It is fabricated in CMOS technology thus has good performance in low voltage, low power operations.

FEATURES

- DTMF/PULSE switchable dialer.
- 2 number by 32 digits for Redial and Save memory.
- Pulse to Tone (P-T) keypad for Long Distance Call operation.
- Break/Make ratio is selectable by pin option.
- Fully key-in & key-released debounced 4*4 keyboard.
- Easy operation with Redial, Flash, Pause and P-T keypads.
- Flash, Pause, P-T can be stored as a digit in memory.
- Minimum tone output duration: 100ms.; Minimum inter tone pause: 100ms.
- Tone or Pulse mode is selectable by pin option.
- On chip power on reset.
- Long mute for Redial & Save dialing.
- Uses 3.579545 MHz TV quartz crystal or ceramic resonator.
- 18 pins Dual-in-line plastic package.
- Pulse number, Pause time, Flash time are selected by type number. (TABLE1)

PIN CONFIGURATION



TONE/PULSE
DIALER

TABLE 1

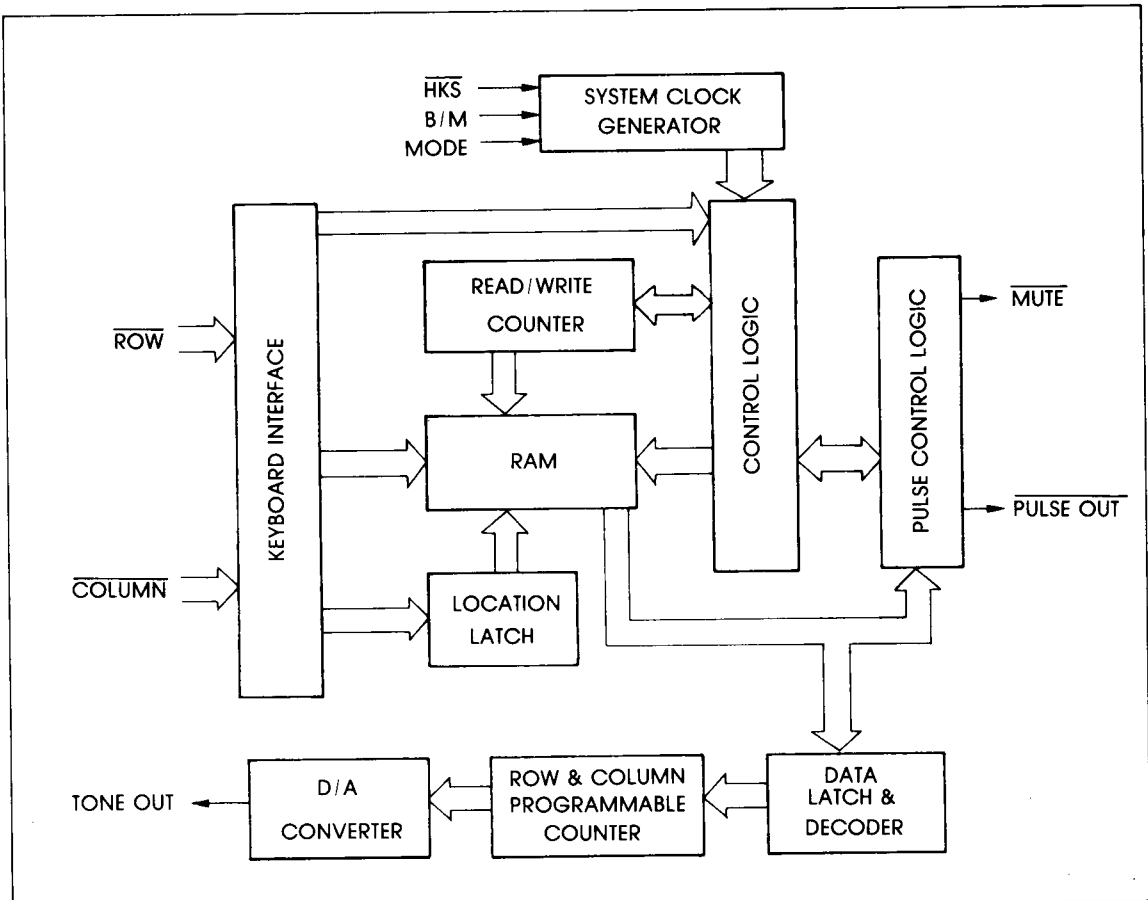
TYPE NO.	DIALING RATE	PAUSE	FLASH	FLASH PAUSE
W91412	10/20 pps (Normal)	2.0 SEC	600 mS	600 mS
W91414/A	10/20 pps (Normal)	3.6 SEC	73/100 mS	140/100 mS
W91416	10/20 pps (Normal)	3.6 SEC	600 mS	600 mS
W91418	10 pps (N+1)	3.6 SEC	73 mS	140 mS
W91419/A	10 pps (10-N)	3.6 SEC	73/600 mS	140/600 mS

NORMAL	N+1 SWEDISH/DANISH	10-N NEW ZEALAND
0--10 pulses	0--1 pulses	0--10 pulses
1--1 pulses	1--2 pulses	1--9 pulses
2--2 pulses	2--3 pulses	2--8 pulses
3--3 pulses	3--4 pulses	3--7 pulses
4--4 pulses	4--5 pulses	4--6 pulses
5--5 pulses	5--6 pulses	5--5 pulses
6--6 pulses	6--7 pulses	6--4 pulses
7--7 pulses	7--8 pulses	7--3 pulses
8--8 pulses	8--9 pulses	8--2 pulses
9--9 pulses	9--10 pulses	9--1 pulses
*-- Ignored	*-- Ignored	*-- Ignored
#-- Ignored	#-- Ignored	#-- Ignored

KEYBOARD FUNCTION

C1	C2	C3	C4	
1	2	3	SAVE	R1
4	5	6	F	R2
7	8	9	P → T	R3
•	0	#	R/P	R4

BLOCK DIAGRAM



TONE/PULSE
DIALER

PIN/FUNCTIONAL DESCRIPTION

A. ROW-COLUMN inputs (pins 1-4 & 15-18)

The keyboards input is compatible with the standard 2-of-8 keyboard, the inexpensive single contact (Form A) keyboard, and electronic input.

In normal operation, any single button is pushed to produce dual tone, pulses or functions.

B. B/M (Pin 5)

The Break/Make ratio is 60:40 if B/M=1, and is 66.6:33.3 if B/M=0. This pin influences nothing in DTMF mode.

C. XT, $\overline{\text{XT}}$ (Pin 7 & 8)

An built in inverter provides oscillation with an inexpensive 3.579545MHz TV color burst crystal. The oscillator ceases when a keypad input is not sensed.

D. MUTE (Pin 9)

The MUTE is a conventional CMOS N-Channel open drain output. The output transistor is switched on during dialing sequence (both Pulse and Tone mode). Otherwise, it is switched off.

E. MODE (Pin 13)

Pulls pin 13 to V_{DD} , the dialer is in pulse mode, the pulse rate is 10 pps. Pulls pin 13 to V_{SS} , it is in DTMF mode. Pin 13 Floating is 20 pps pulse rate.

F. $\overline{\text{HKS}}$ (Pin 10)

The $\overline{\text{HKS}}$ (HOOK SWITCH) input is used to sense the state of handset in ON HOOK or OFF HOOK. In ON HOOK state, $\overline{\text{HKS}}=1$, or open the keyboard input is disabled, there is not any operation for any keyboard entry, to avoid the energy lose stored in

capacitor. In OFF HOOK state, $\overline{\text{HKS}}=0$, all of the function work.

$\overline{\text{HKS}}$ pin is pulled to V_{DD} by internal resistor.

G. DP (Pin 11)

This pin is an N-channel open drain output. The output is low (switched on) in the dial pulse "Break" operation during Off Hook Pulse. Otherwise, this output is "open" (switched off).

In DTMF mode, the pulse out keeps open (switched off) regardless of keyboard entry. In Pulse mode, the output sends a chain of pulses to correspond the address keypad input, but keep open level for * and # entry. Fig. -1(a,b) shows the timing diagram in pulse mode.

The pulse rate and inter digit pause are fixed, to be 10 pps and 800 mS respectively.

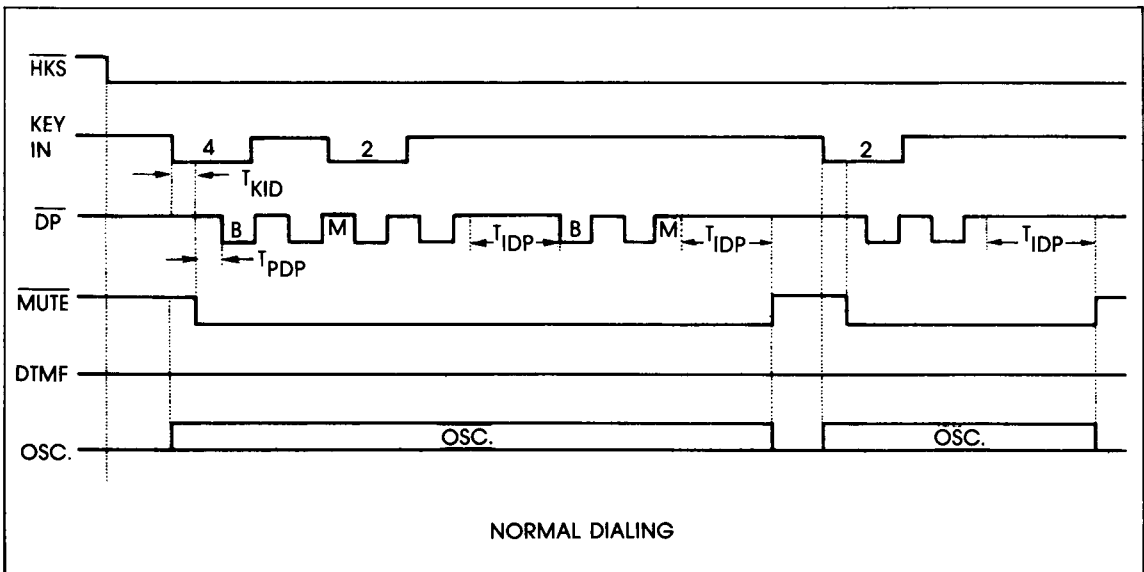
H. DTMF (Pin 12)

This pin is used to output DTMF address signals. During pulse dialing, it always keep at low state regardless of keypad input. In tone mode, it will output dual or single tone. The detail timing diagram of tone mode is shown in Fig. -2(a,b).

I. V_{DD} , V_{SS} (Pin 14, 6)

These are the power input pins for the Tone/Pulse dialer.

OUTPUT FREQUENCY (Hz)		% ERROR
SPECIFIED	ACTUAL	
R1	697	+0.28
R2	770	-0.52
R3	852	-0.47
R4	941	+0.74
C1	1209	+0.57
C2	1336	-0.30
C3	1477	-0.34



TONE/PULSE
DIALER

Figure 1-(a) Pulse Mode Timing Diagram

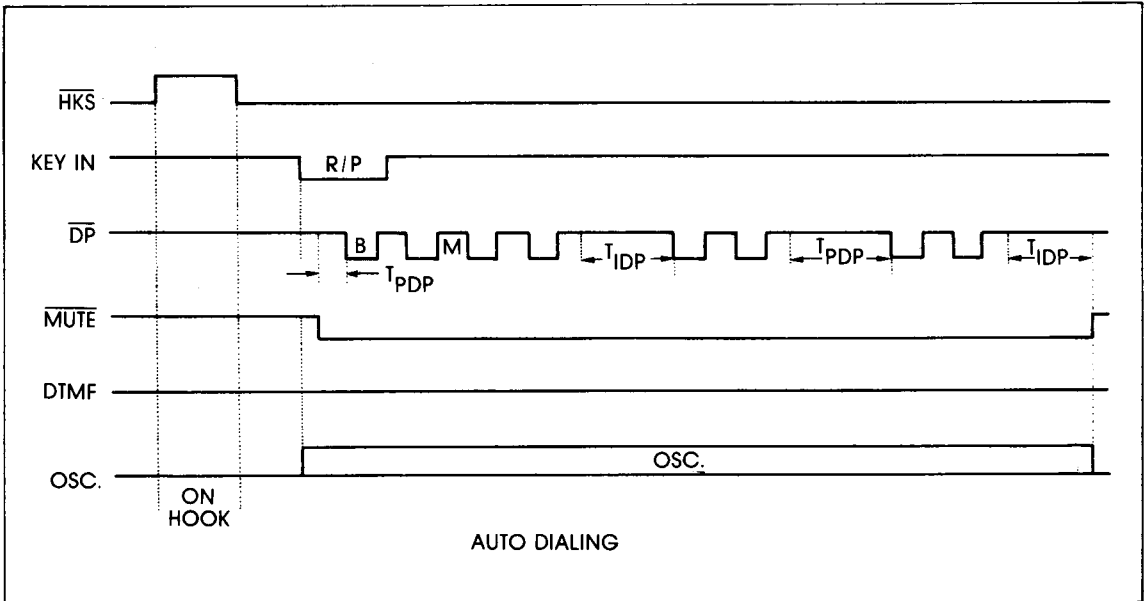


Figure 1-(b) Pulse Mode Timing Diagram

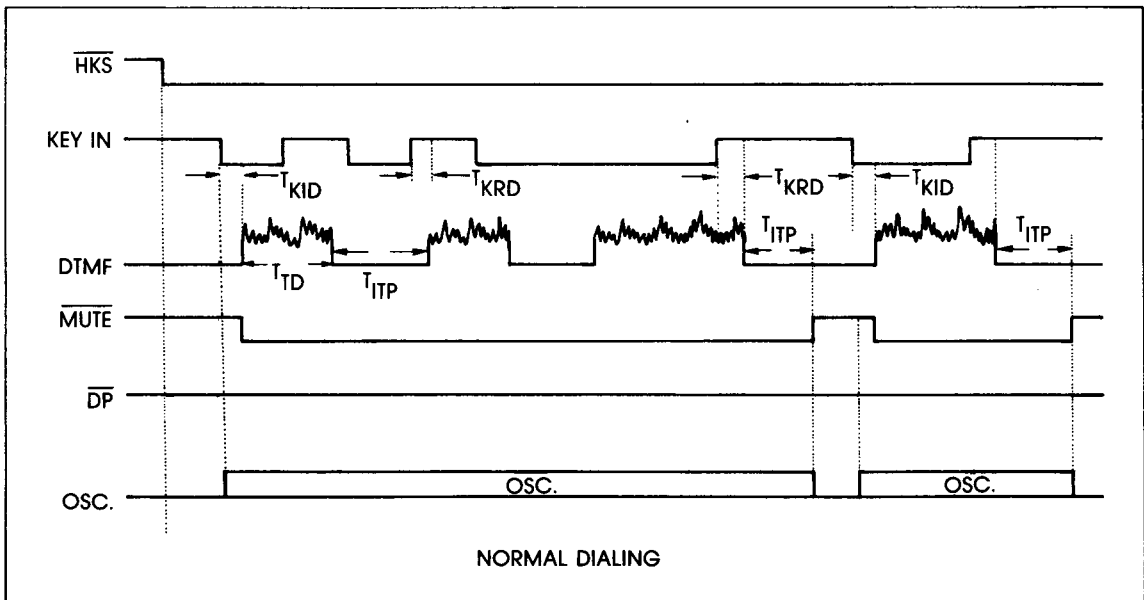


Figure 2-(a) Tone Mode Timing Diagram

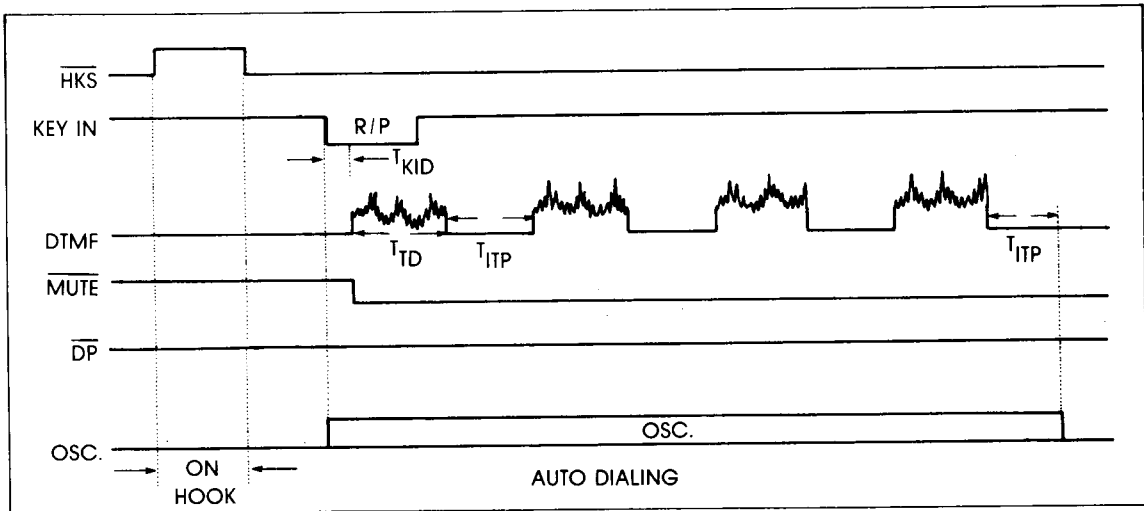


Figure 2-(b) Tone Mode Timing Diagram

KEY BOARD OPERATION

NOTE:

- All the keyboard operations should be under OFF HOOK condition.
- D1-Dn: 0-9, *, #.
- The number D1, D2, ..., Dn will be dialed out in Pulse or Tone mode as mode selected.

A. NORMAL DIALING

OFF HOOK [D1], [D2], ..., [Dn]

- D1, D2, ..., Dn will be dialed out.
- Dialing length is unlimit, if dialing length over 32 digits the Redial is inhibited.

B. REDIALING

- OFF - HOOK [R/P] The [R/P] key can execute Redial function only in first key in after OFF HOOK, other- wise will be Pause function.

C. ACCESS PAUSE

OFF HOOK [D1], [D2], [R/P], [D3], ..., [Dn],

- The Pause function is executed in Normal dialing or Memory dialing.
- Auto Access Pause, that selects by type number.
- The pause function timing diagram is shown in Fig. -3.

D. PULSE TO TONE (P-T)

OFF HOOK [D1], [D2], ..., [Dn], [P-T], [D1'], [D2'], ..., [Dn']

- If the mode switch is set in Pulse mode, then the output signal will be:
D1, D2, ..., Dn, Pause, D1', D2', ..., Dn'
(Pulse) (Tone)
- If the mode switch is set in Tone mode, then the output signal will be:
D1, D2, ..., Dn, Pause, D1', D2', ..., Dn'
(Tone) (Tone)
- It can be reset to Pulse mode only in operation of ON HOOK, because it's still in Tone mode when the digits have been dialed out.
- The P-T function timing diagram is shown in Fig. -4.

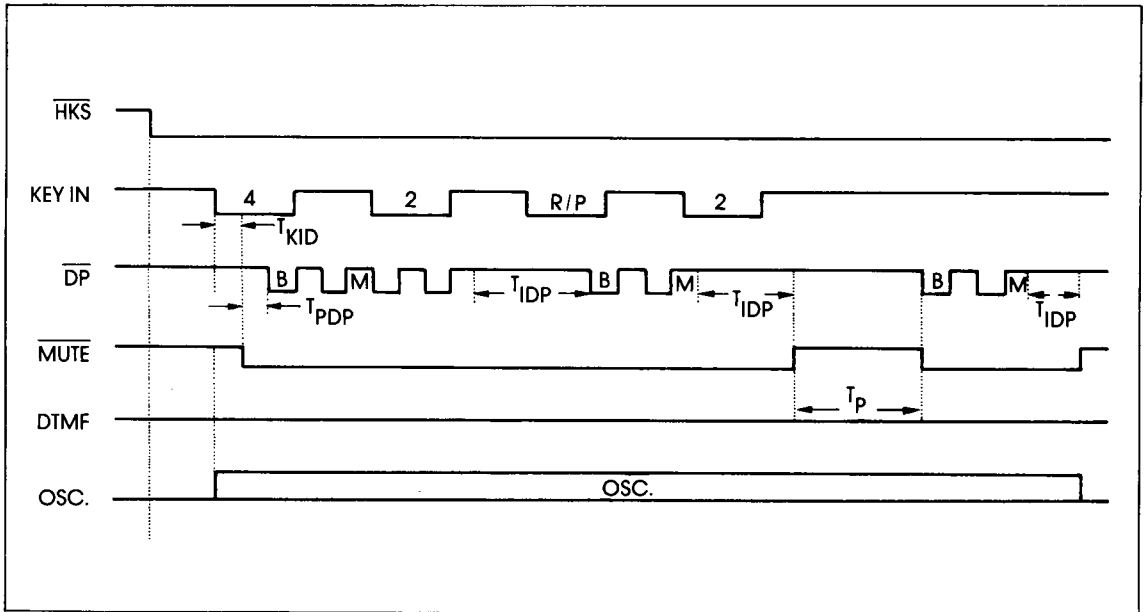


Figure -3 Pause Function Timing Diagram

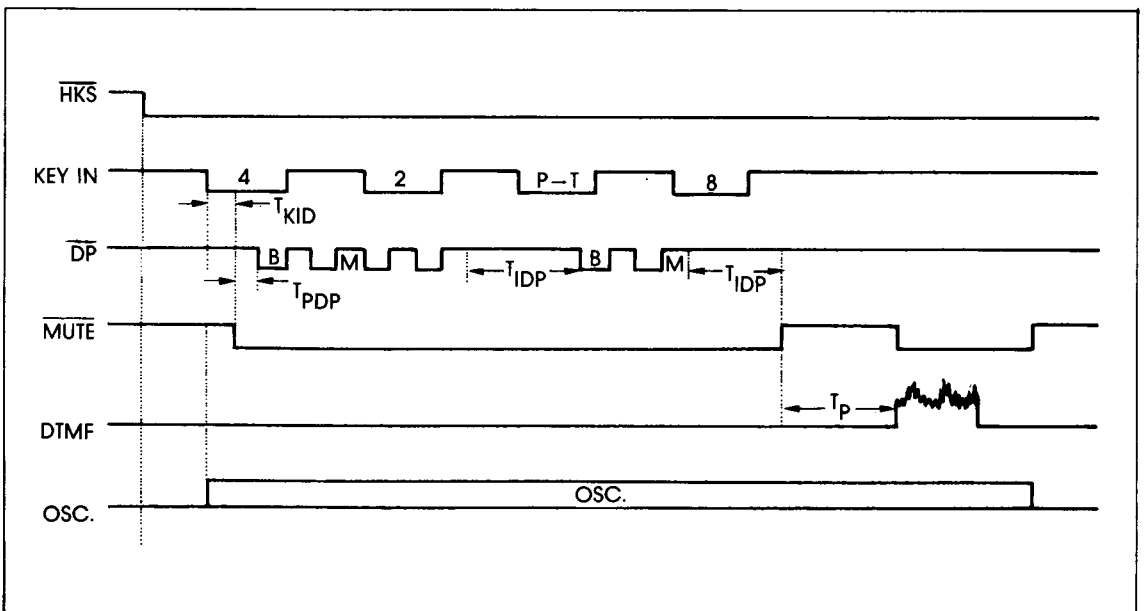


Figure -4 Pulse To Tone Function Timing Diagram

E. FLASH

OFF HOOK [F]

- It will execute ON HOOK 600 ms (or 73 ms), and pause for 600 ms (or 140ms) before the next digit is dialed out.
- Flash key can be stored as a digit in memory.
- The Flash function timing diagram is shown in Fig. -5.

F. SAVE

OFF HOOK [D1], [D2], ..., [Dn], [SAVE]

ON HOOK Come OFF HOOK [SAVE]

- D1, D2, - - -, Dn will be stored in SAVE memory, if SAVE key is keyed after Dn is dialed out.
- The SAVE key entry as first key after going OFF HOOK for SAVE dialing, otherwise it will be executed SAVE storing.
- If key in sequence - - D1", D2", D3", SAVE, SAVE. D1", D2", D3" will be stored to SAVE memory and dialed out twice.

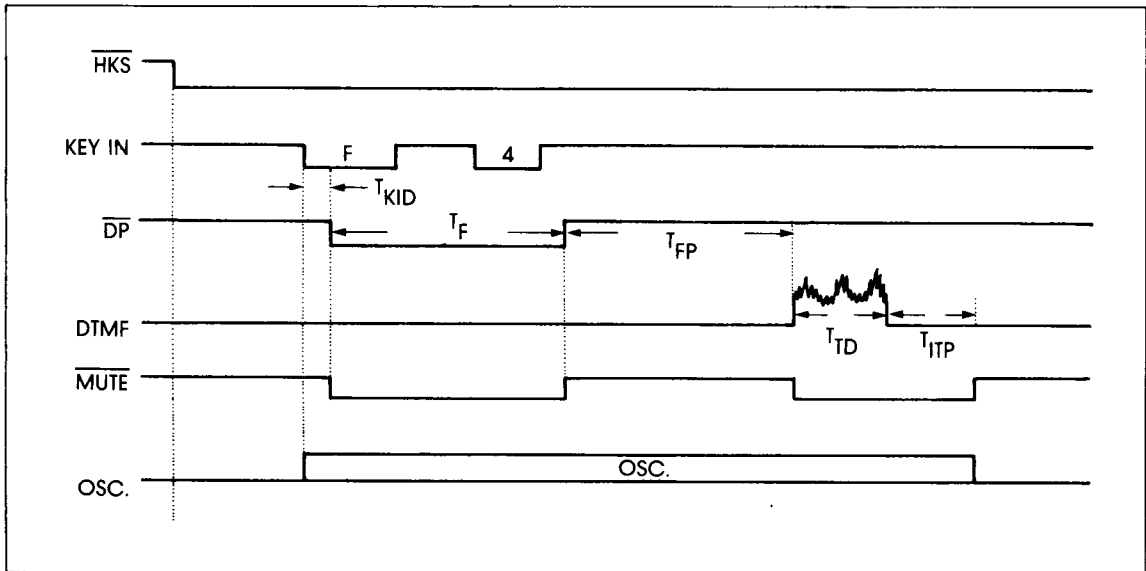


Figure -5 Flash Function Timing Diagram

ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
DC Supply Voltage	-0.3 ~ +70	V
Input Voltage Range	-0.3 ~ V _{DD} + 0.3	V
Power Dissipation per Package	120	mW
Operation Temperature	0 ~ +70	°C
Storage Temperature	-55 ~ +125	°C

TONE/PULSE
DIALER

D.C. CHARACTERISTICS

($V_{DD}-V_{SS}=2.5V$, $F_{osc}=3.58\text{ MHz}$, $T_a=25^\circ\text{C}$ All output unloaded)

PARAMETER	SYM.	TEST	CONDITIONS	MIN.	TYP.	MAX.	UNIT
OP. Voltage	VDD		—	2.0	—	5.5	V
OP. Current	I _{OP}	A	Tone	—	—	1.0	mA
			Pulse	—	—	0.5	
Standby Current	I _{SB}	A	HKS=0, No Load & No Key Entry	—	10	15	μA
Memory Retention Current	I _{MR}	B	HKS=1, VDD=1.0V	—	—	0.2	μA
Tone Output Voltage	V _{TO}	C	Row Group, R _L =10KΩ	130	150	170	mVrms
Pre-emphasis		D	Col/Row 2.0-5.5V	1	2	3	dB
DTMF Distortion	THD	D	R _L =10KΩ 2.0-5.5V	-	-30	-23	dB
Tone Output DC Level	V _{TDC}	D	2.0-5.5V	1.1	—	2.8	V
Tone Output Sink Current	I _{TL}	F	V _{TO} =0.5V	0.2	—	—	mA
Pulse Output Sink Current	I _{PL}	E	V _{PO} =0.5V	0.5	—	—	mA
Mute Output Sink Current	I _{ML}	E	V _{MO} =0.5V	0.5	—	—	mA
HKS Pull High Resistor	R _{KH}			300	—	—	KΩ

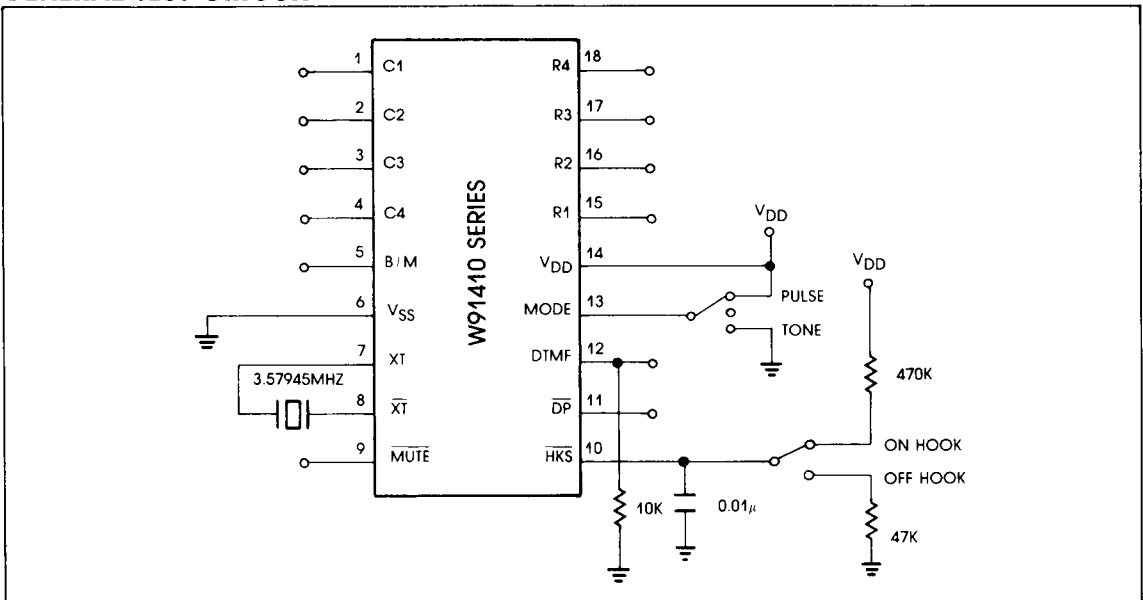
A.C. CHARACTERISTICS

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Key in Debounce	T _{KID}		—	20	—	mS
Key Release Debounce	T _{KRD}		—	20	—	mS
Pre-digitpause MODE=1	T _{PDP1}	B/M=1	—	40	—	mS
		B/M=0	—	33.3	—	

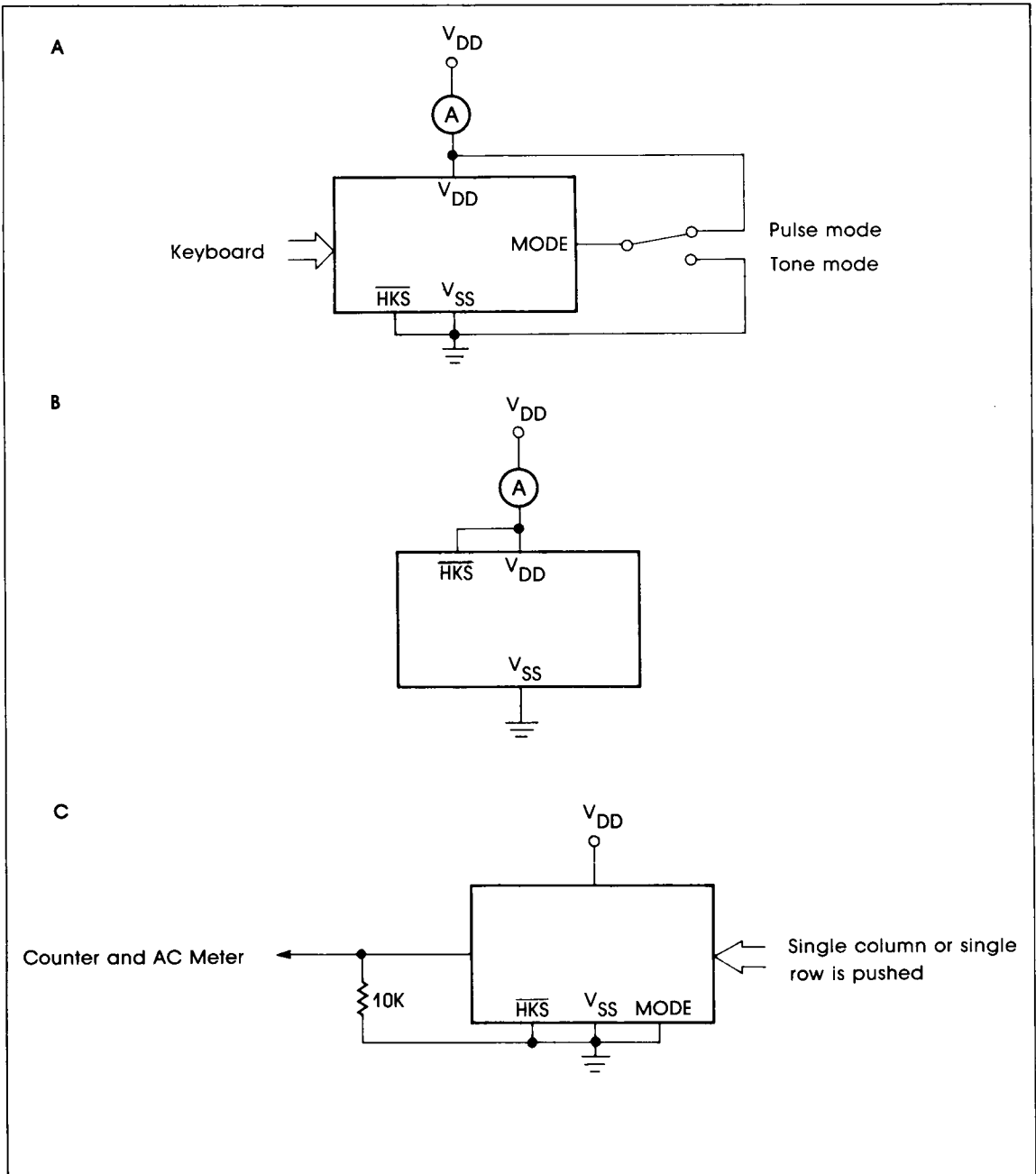
(Continued)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Pulse Rate	FPR1	MODE = 1	—	10	—	pps
	FPR2	MODE=Open	—	20	—	
Inter Digit Pause	T _{IDP1}	10 PPS	—	800	—	mS
	T _{IDP2}	20 PPS	—	500	—	
Break/Make Ratio	B/M	B/M=1	—	60:40	—	%
		B/M=0	—	67:33	—	
Tone Output Duration	T _{TD}		—	100	—	mS
Inter Tone Pause	T _{ITP}		—	100	—	mS
Flash Time	T _F	Table 1	—	600	—	mS
		Table 1	—	73/100	—	
Flash Pause	T _{FP}	Table 1	—	600	—	mS
		Table 1	—	140/100	—	
Pause Time	T _p	Table 1	—	2.0	—	S
		Table 1	—	3.6	—	

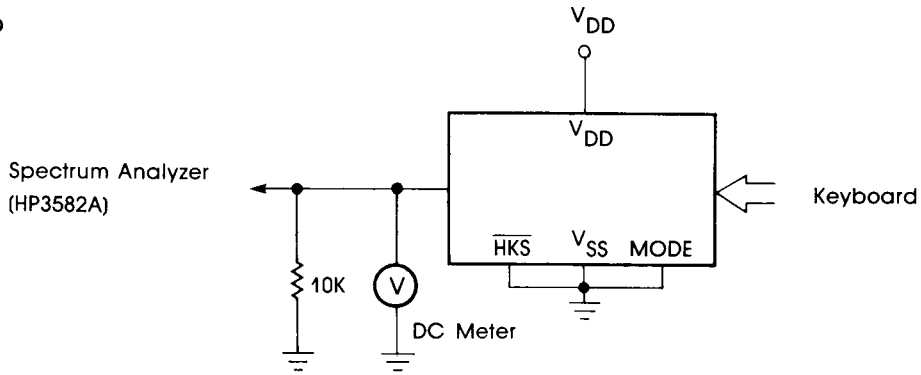
GENERAL TEST CIRCUIT



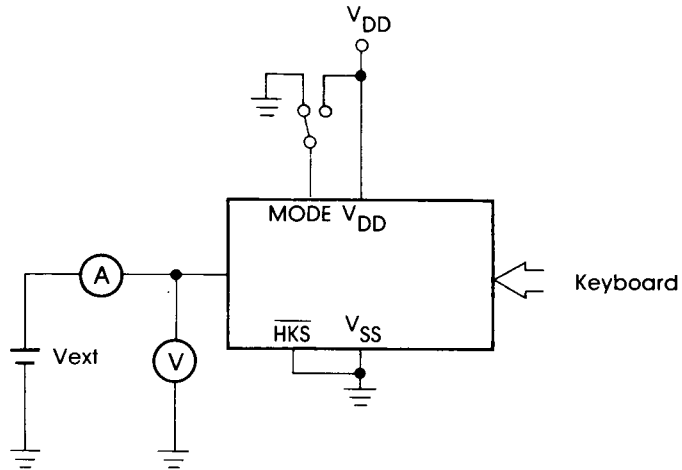
**TONE/PULSE
DIALER**

TEST CIRCUIT


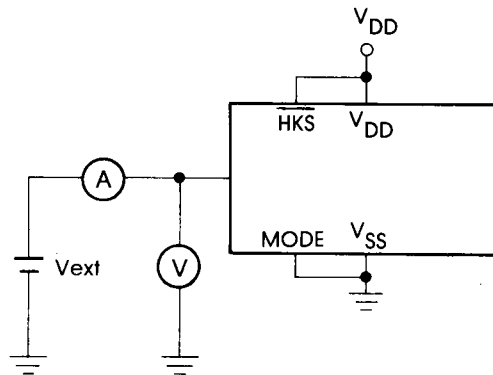
D



E

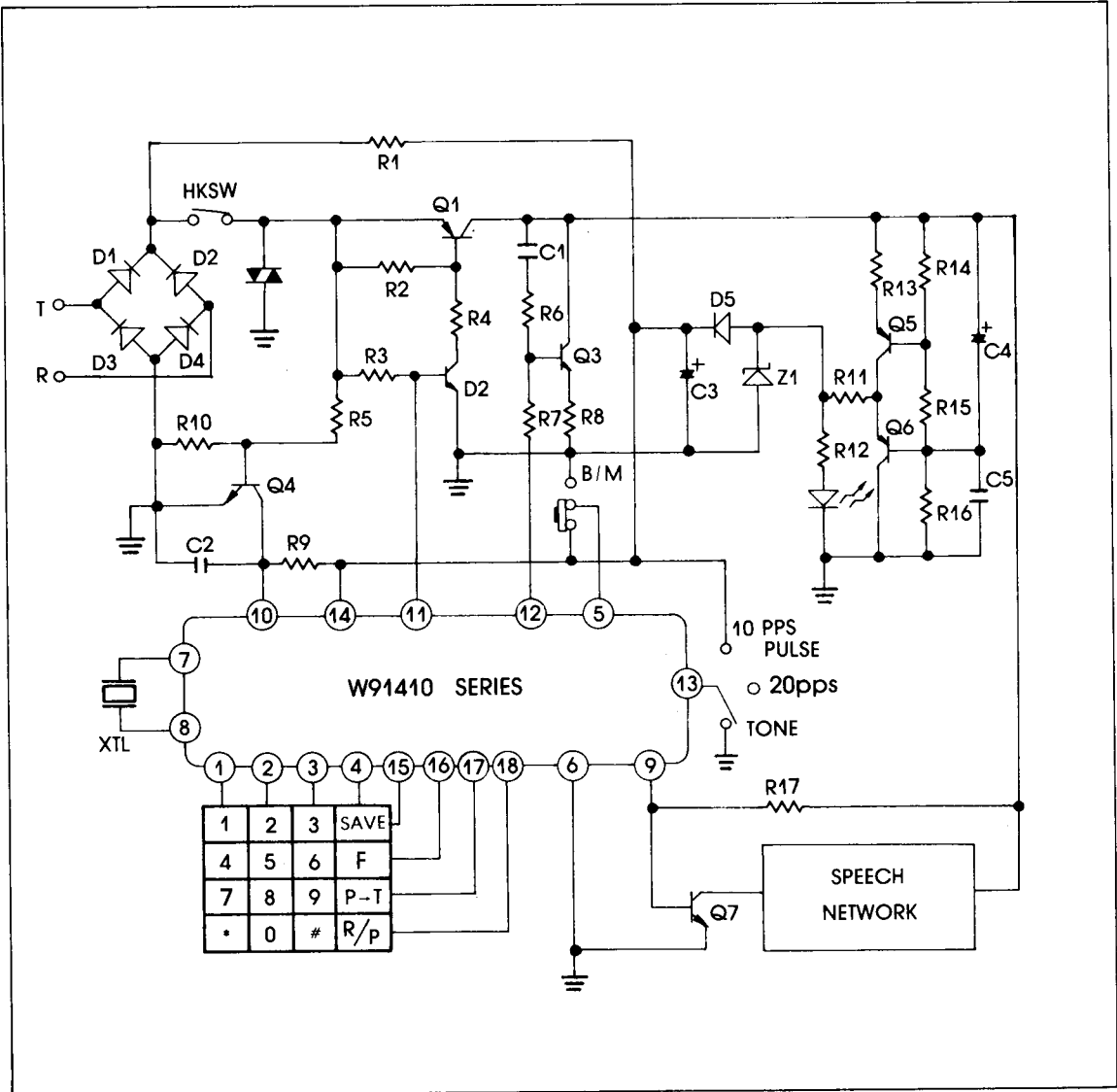


F



TONE/PULSE
DIALER

APPLICATION CIRCUIT DIAGRAM



COMPONENT SELECTION TABLE

R1	20M Ω	R13	10 Ω	D4	1N4002
R2	33K Ω	R14	1.5K Ω	D5	1N4148
R3	220K Ω	R15	1.2K Ω	TNR	TNR680K
R4	3.9K Ω	R16	4.7K Ω	Z1	1N4731
R5	1M Ω	R17	220K Ω	Q1	MPSA92
R6	100K Ω	C1	0.01 μ F	Q2	2N5551
R7	10K Ω	C2	0.1 μ F	Q3	2N5551
R8	68 Ω	C3	100 μ F / 10V	Q4	2N9014
R9	470K Ω	C4	2.2 μ F / 10V	Q5	2N4403
R10	100K Ω	C5	0.01 μ F	Q6	2N4403
R11	100 Ω	D1	1N4002	Q7	MPSA13
R12	100 Ω	D2	1N4002	XTL	3.579545MHz
R12b	180 Ω	D3	1N4002		