



3-MEMORY TONE/PULSE SWITCHABLE DIALER WITH SAVE FUNCTION

GENERAL DESCRIPTION

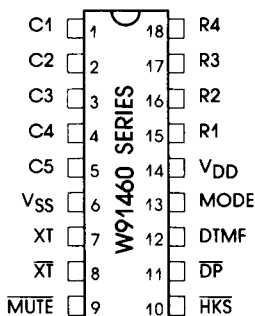
The W91460 series are monolithic integrated circuit. It contains 3 memories which can perform Tone/Pulse switchable dialing functions. It is fabricated in CMOS technology thus has good performance in low voltage, low power operations.

Three 16-digits direct dialing memories and two 32-digits Redial & Save memories are design for convenient operations.

FEATURES

- DTMF/PULSE switchable dialer.
- 2 by 32 digits for Redial and Save memory.
- 3 by 16 digits for one touch direct repository memory.
- Tone key (P→T) for Long Distance Call operation.
- Redial memory can cascaded with normal dialing and dialing length is unlimited, if dialing length over 32 digits the Redial is inhibited.
- Fully key-in & key released debounced 4*5 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.
- Dial rate 10 or 20 pps is selectable by MASK option.

PIN CONFIGURATION



TONE/PULSE
DIALER

- Typical inter digit pause (IDP): 800mS. (10 pps); 500 mS. (20 pps) in Pulse mode.
- Internal power on reset.
- Long mute for Redial & Repertory dialing.
- Uses 3.579545 MHz TV quartz crystal or ceramic resonator.
- DIP plastic 18 PIN package
- Pulse number, Pause time, Flash time are selected by type number. (See TABLE 1)

TABLE 1

TYPE NO.	DIALING SEQ.	PAUSE	B:M	FLASH	FLASH PAUSE
W91462	10 pps	1.6 SEC	3:2	600 mS	600 mS
W91463	(Normal)		2:1		
W91464	10 pps	3.6 SEC	3:2	73 mS	140 mS
W91465	(Normal)		2:1		
W91466	20 pps	3.6 SEC	3:2	600 mS	600 mS
W91467	(Normal)		2:1		
W91468	10 pps (N+1)	3.6 SEC	3:2	73 mS	140 mS
W91469	10 pps (10-N)	3.6 SEC	2:1	73 mS	140 mS

NORMAL

0--10 Pulses
 1--1 Pulses
 2--2 Pulses
 3--3 Pulses
 4--4 Pulses
 5--5 Pulses
 6--6 Pulses
 7--7 Pulses
 8--8 Pulses
 9--9 Pulses
 *-- Ignored
 #-- Ignored

N+1
SWEDISH/DANISH

0--1 Pulses
 1--2 Pulses
 2--3 Pulses
 3--4 Pulses
 4--5 Pulses
 5--6 Pulses
 6--7 Pulses
 7--8 Pulses
 8--9 Pulses
 9--10 Pulses
 *-- Ignored
 #-- Ignored

10-N
NEW ZELAND

0--10 Pulses
 1--9 Pulses
 2--8 Pulses
 3--7 Pulses
 4--6 Pulses
 5--5 Pulses
 6--4 Pulses
 7--3 Pulses
 8--2 Pulses
 9--1 Pulses
 *-- Ignored
 #-- Ignored

ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
DC Supply Voltage	6.0	V
Input Voltage Range	-0.5 ~ $V_{DD} + 0.5V$	V
Power Dissipation Per Package	400	mW
Operation Temperature	-20 ~ +70	°C
Storage Temperature	-55 ~ +125	°C

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	CONDITION	MIN.	TYP.	MAX.	UNIT
OP. Voltage	V_{DD}		-	2.0	-	5.5	V
OP. Current	I_{OP}	A	Tone	-	-	1.0	mA
			Pulse	-	-	0.5	
Sandby Current	I_{SB}	A	HKS=0, No load & No key entry	-	10	15	μA
Memory Retention Current	I_{MR}	B	HKS=1, $V_{DD}=1.0V$	-	-	0.2	μA
Tone Output Voltage	V_{TO}	C	Row Group, $R_L = 10K\Omega$	130	150	170	mVrms
Pre-emphasis		D	Col/Row 2.0-5.5V	1	2	3	dB
DTMF Distortion	THD	D	$R_L = 10K\Omega$ 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	-	-	K Ω

TONE/PULSE
DIALER

A.C. CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Key in Debounce	T _{KID}		-	20	-	mS
Key Release Debounce	T _{KRD}		-	20	-	mS
Pre-digit-pause (1)	T _{PDP1} 10 pps	B/M=3:2	-	40	-	mS
		B/M=2:1	-	33.3	-	
Pre-digit-pause (2)	T _{PDP2} 20 pps	B/M=3:2	-	20	-	mS
		B/M=2:1	-	16.7	-	
Pulse Rate (1)	F _{PR1}	TABLE 1	-	10	-	pps
Pulse Rate (2)	F _{PR2}		-	20	-	
Inter Digit Pause	T _{IDP1}	10 pps	-	800	-	mS
	T _{IDP2}	20 pps	-	500	-	
Break/Make Ratio	B:M	B/M=3:2	-	60:40	-	%
		B/M=2:1	-	67:33	-	
Tone Output Duration	T _{TD}		-	100	-	mS
Inter Tone Pause	T _{ITP}		-	100	-	mS
Flash Time	T _F	TABLE 1	-	600	-	mS
			-	73	-	
Flash Pause	T _{FP}	TABLE 1	-	600	-	mS
			-	140	-	
Pause Time	T _P	TABLE 1	-	1.6	-	S
			-	3.6	-	
Row Group Frequency	F1	ROW 1	-	699	-	Hz
	F2	ROW 2	-	766	-	
	F3	ROW 3	-	848	-	
	F4	ROW 4	-	948	-	
Column Group Frequency	F5	COL 1	-	1216	-	Hz
	F6	COL 2	-	1332	-	
	F7	COL 3	-	1472	-	

PIN/FUNCTION DESCRIPTION

A. ROW-COLUMN INPUTS (pins 1-5 & 15-18)

The keyboards input is compatible with the standard 2-of-9 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. Activation of two or more buttons will result in no response, except for single tone.

B. XT, $\overline{XT}$ (pin 7 & 8)

An built in inverter provides oscillation with an inexpensive 3.579545 MHz TV color burst crystal. The oscillator ceases when a keypad input is not sensed. Most crystals do not vary more than $\pm 0.02\%$.

C. 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.

D. $\overline{HKS}$ (pin 10)

The $\overline{HKS}$ (HOOK SWITCH) input is used to sense the state of handset in ON HOOK or OFF HOOK. In ON HOOK state, $\overline{HKS}=1$, 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, $\overline{HKS}=0$, all of the function work.

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

E. $\overline{DP}$ (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 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 pulses rate and inter digit pause are fixed, either 10 pps (800 mS) or 20 pps (500 mS) respectively.

F. 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).

G. MODE (pin 13)

Pulls pin 13 to V_{DD} , the dialer is in pulse mode. Pulls pin 13 to V_{SS} , it is in DTMF mode see (Table 1).

H. V_{DD} , V_{SS} (pin 14, 6)

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

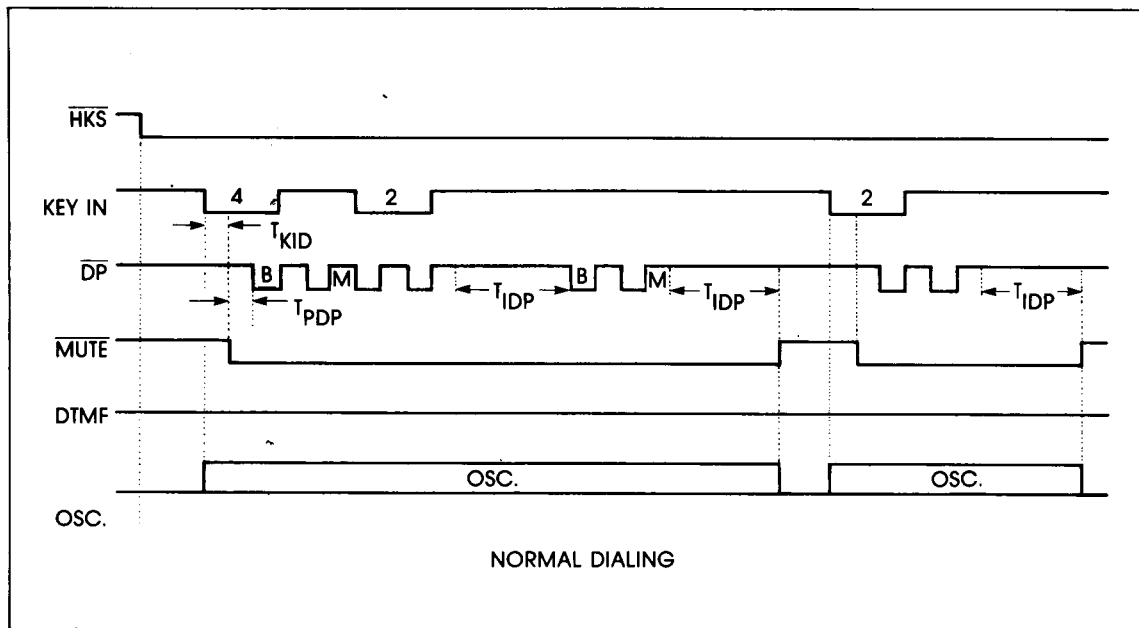


Figure.1-(a) Pulse Mode Timing Diagram

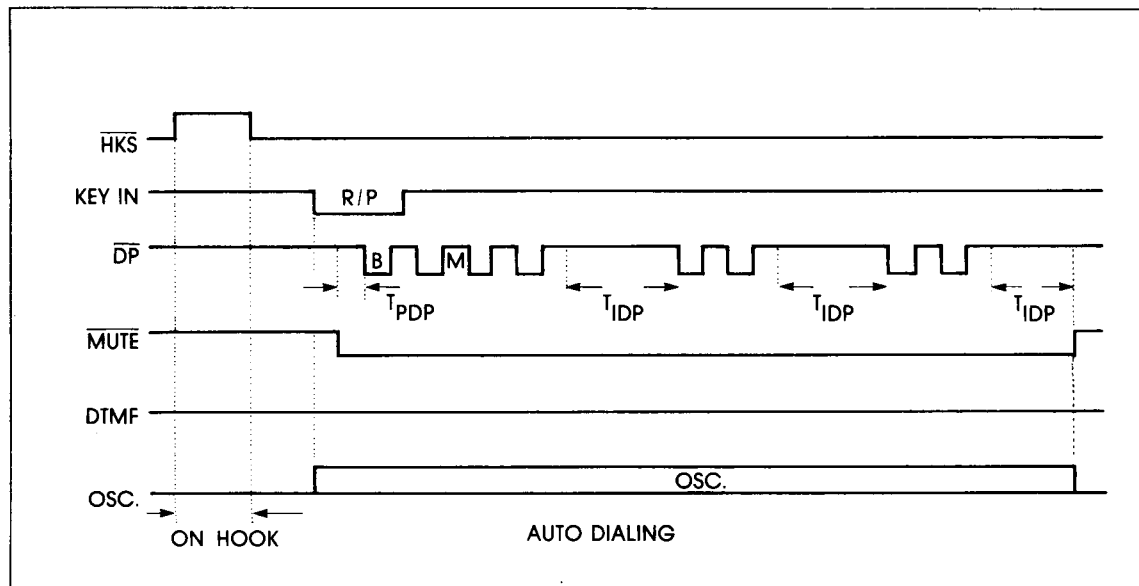


Figure.1-(b) Pulse Mode Timing Diagram

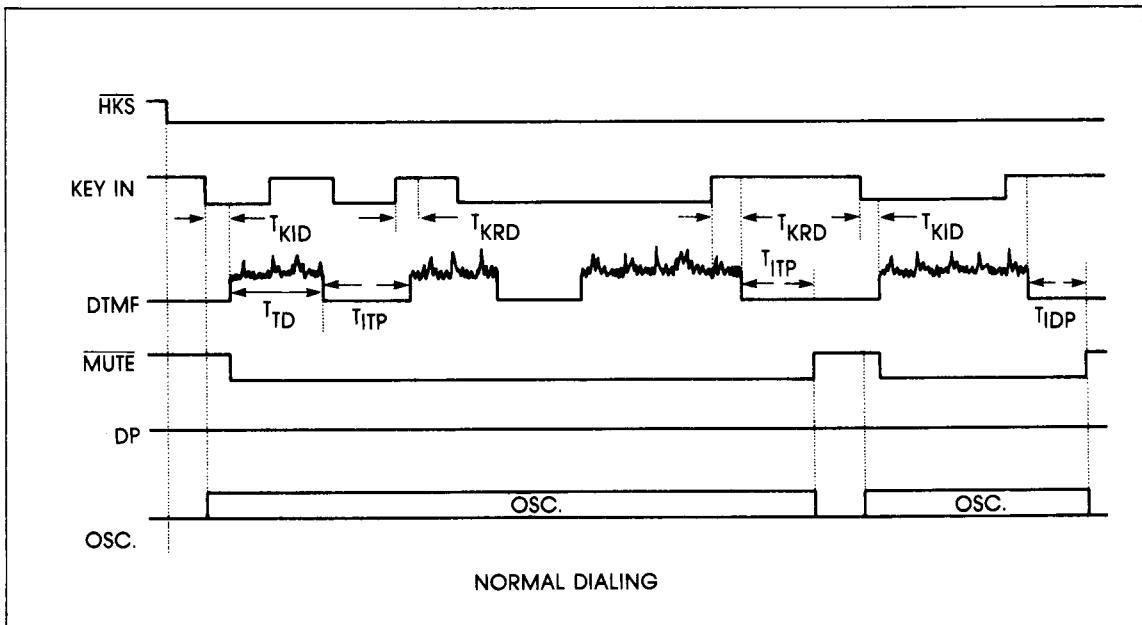


Figure.2(a) Tone Mode Timing Diagram

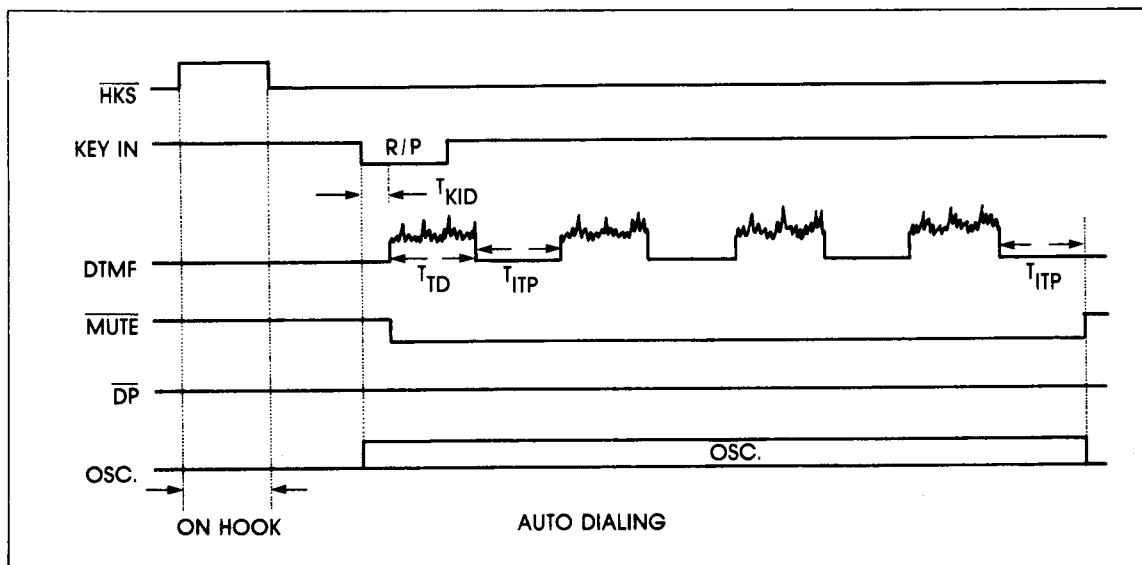


Figure.2(b) Tone Mode Timing Diagram

KEYBOARD FUNCTION

C1	C2	C3	C4	C5	
1	2	3	SAVE	M1	R1
4	5	6	F	M2	R2
7	8	9	P→T	M3	R3
*	0	#	R/P	STR	R4

KEYBOARD OPERATION

A. NORMAL DIALING

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

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

Dialing length is unlimit, but if dialing length overstep 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, otherwise will be Pause function.

C. NUMBER STORE

1. [OFF HOOK] [D1] [D2] ... [Dn] [S] [Mn]
[ON HOOK]

D1, D2, ..., Dn will be stored in Mn memory location and they will be dialed out.

2. [OFF HOOK] [S] [D1] [D2] ... [Dn] [S] [Mn]
[ON HOOK]

D1, D2, ..., Dn will be stored in Mn memory location but they will not be dialed out. [F] [R/P] and [P→T] keys can be stored as a digit in memory, but [R/P] key can not be occupied in first digit. The store mode can

be released after the store function is executed or the present state of hook switch is changed.

D. MEMORY DIALING

[OFF HOOK] [Mn]

E. ACCESS PAUSE

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

Come [OFF HOOK] [R/P]

The Pause function is executed in Normal dialing or Memory dialing. Auto Pause 2.0 or 3.6 sec per Pause, that selects by type number. Pause function timing diagram is shown in Fig. - 3.

F. PULSE TO TONE

[OFF HOOK] [D1] [D2] ..., [Dn] [P→T] [Di],
[Dj] [P→T] [D1'] [D2'] ..., [Dn']

If the mode switch is set in Pulse mode, then the output signal will be:

D1, D2 ..., Dn, (Pulse) Pause (2.0s/3.6s), Di, Dj, DTMF, D1', D2', ..., Dn' (Tone)

If the mode switch is set in Tone mode, then

the output signal will be:

D1, D2, ... Dn, (Tone) DTMF, Di, Dj, DTMF, D1', D2', ..., Dn' (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. P-T function timing diagram is shown in Fig-4.

G. FLASH

OFF HOOK [F]

It will execute ON HOOK 600 ms (or 73 msec), and pause for 600 ms (or 140 ms) 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.

H. SAVE KEY

1. OFF HOOK [D1] [D2] ..., [Dn] [SAVE]
ON HOOK Come OFF HOOK [SAVE]
D1, D2, ..., Dn will be dialed out after SAVE key is keyined.
2. OFF HOOK [D1] [D2], ..., [Dn] or [Mn]
CONVERSATION

[S] [D1'] [D2'] ..., [Dn'] [SAVE]

D1', D2', Dn' will be stored in SAVE memory, but they will not be dialed out.

I. MIX DIALING

1. Normal dialing + Memory dialing + Normal dialing
2. Memory dialing + Normal dialing + Memory dialing
3. Redialing + Normal dialing + Memory dialing

Redialing and Save dialing valid just for first key-in.

Note:

- a. All the keyboard operations should be under OFF HOOK condition.
- b. D1-Dn: 0-9, *, #.
- c. Mn: M1-M3
- d. The number D1, D2, ..., Dn will be dialed out in Pulse or Tone mode as mode selected.

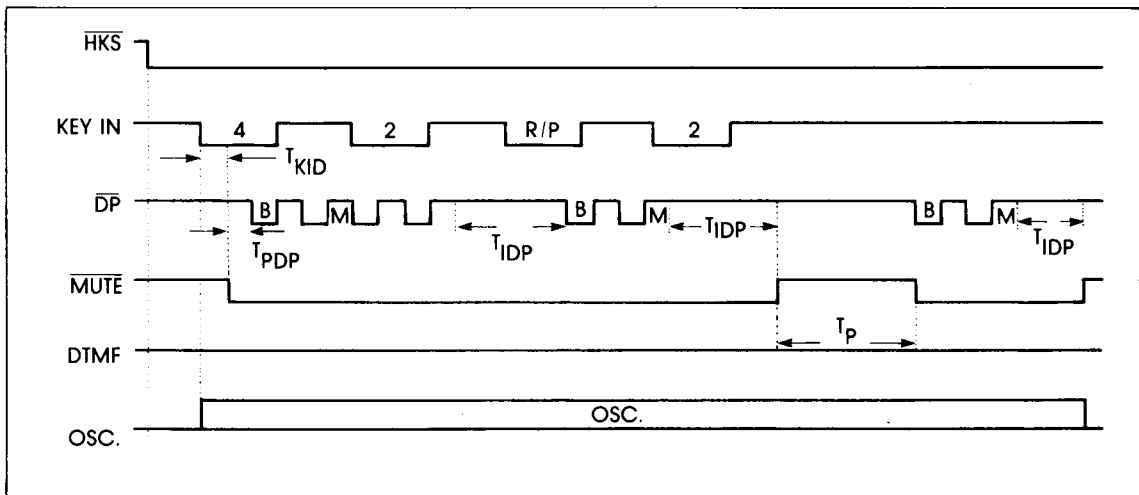


Figure-3 Pause Function Timing Diagram

TONE/PULSE
DIALER

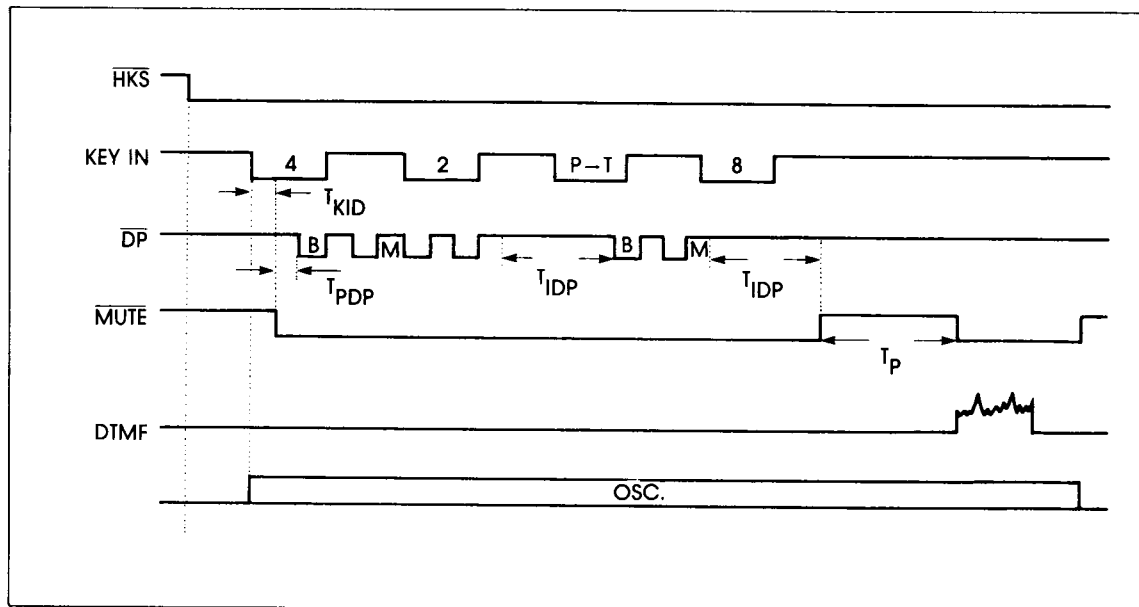


Figure-4 Pulse To Tone Function Timing Diagram

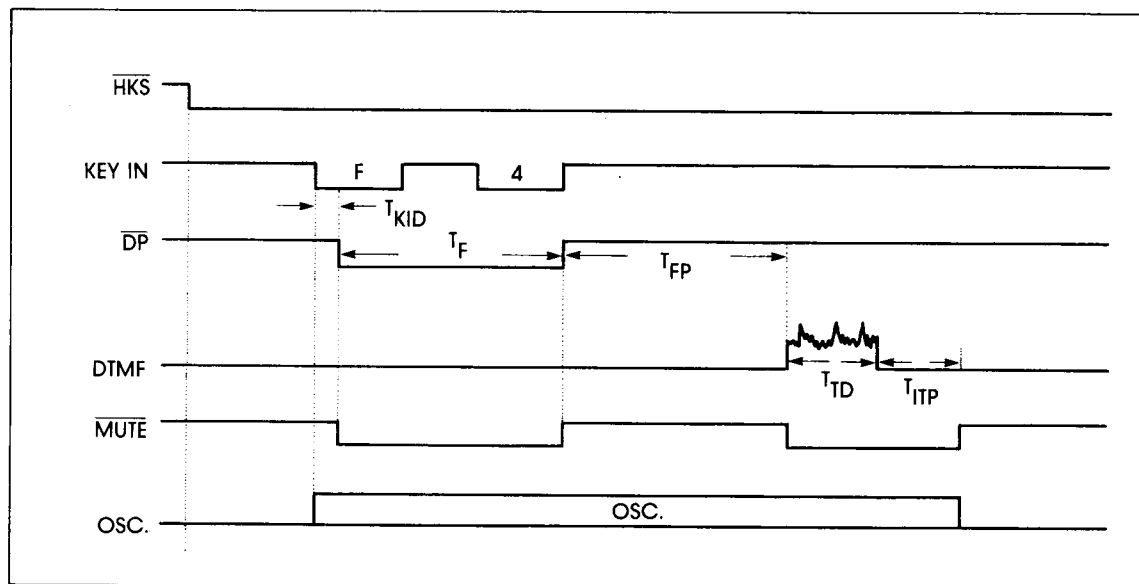
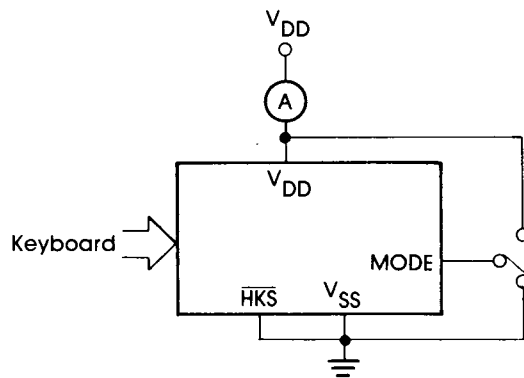


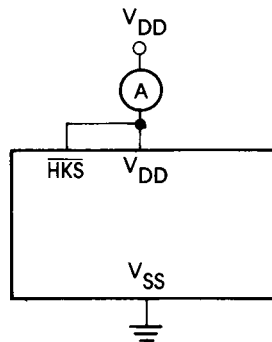
Figure-5 Flash Function Timing Diagram

TEST CIRCUIT

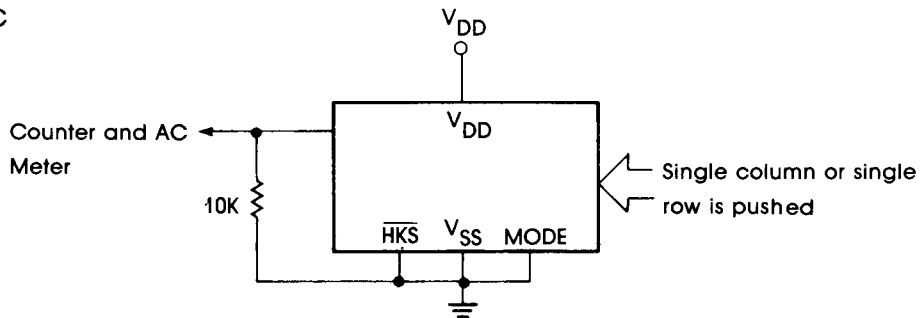
A



B

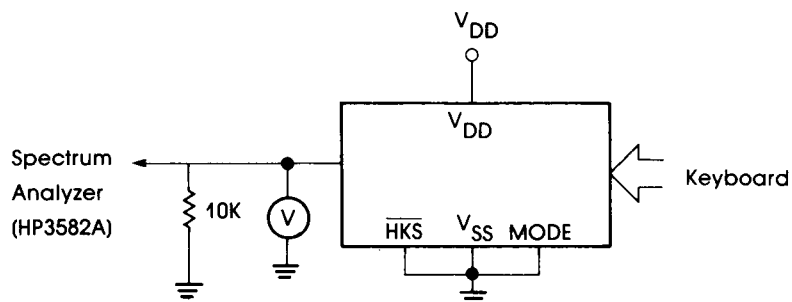


C

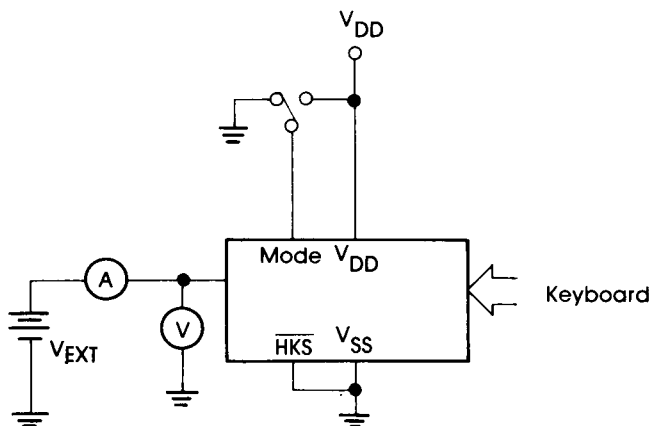


TEST CIRCUIT

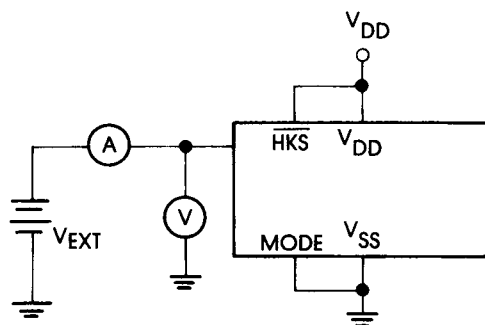
D



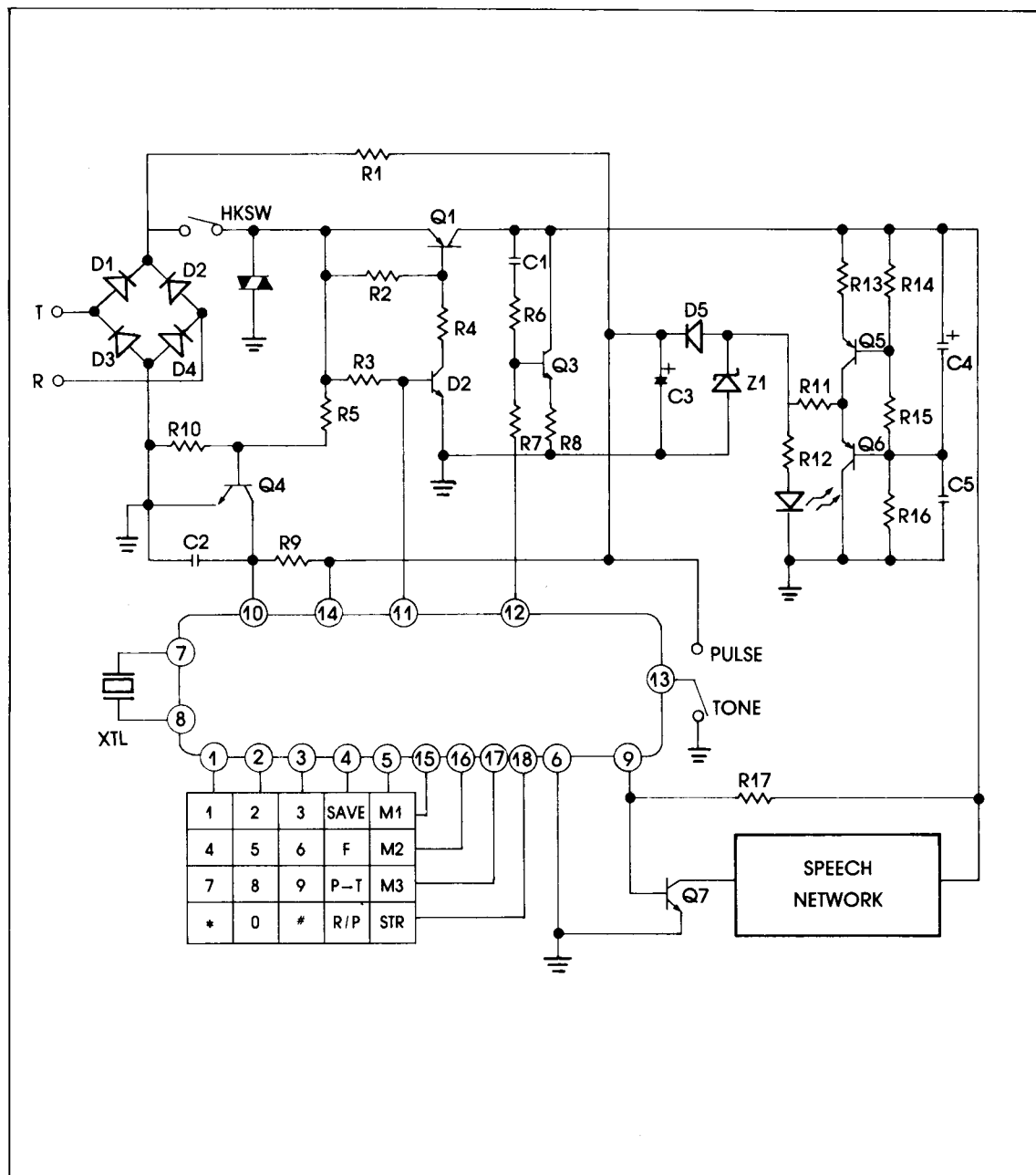
E



F



TYPICAL APPLICATION


TONE/PULSE
DIALER

COMPONENT SELECTION TABLE

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