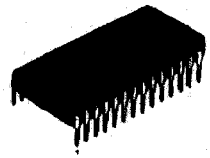
INTRODUCTION

KS58536 is a 20 number by 16 digit repertory memory dialer with 32 digit redial memory. Through pin selection, switching from pulse to tone mode, on hook store, off hook store and make/break ratio can be done.

28-DIP-600A



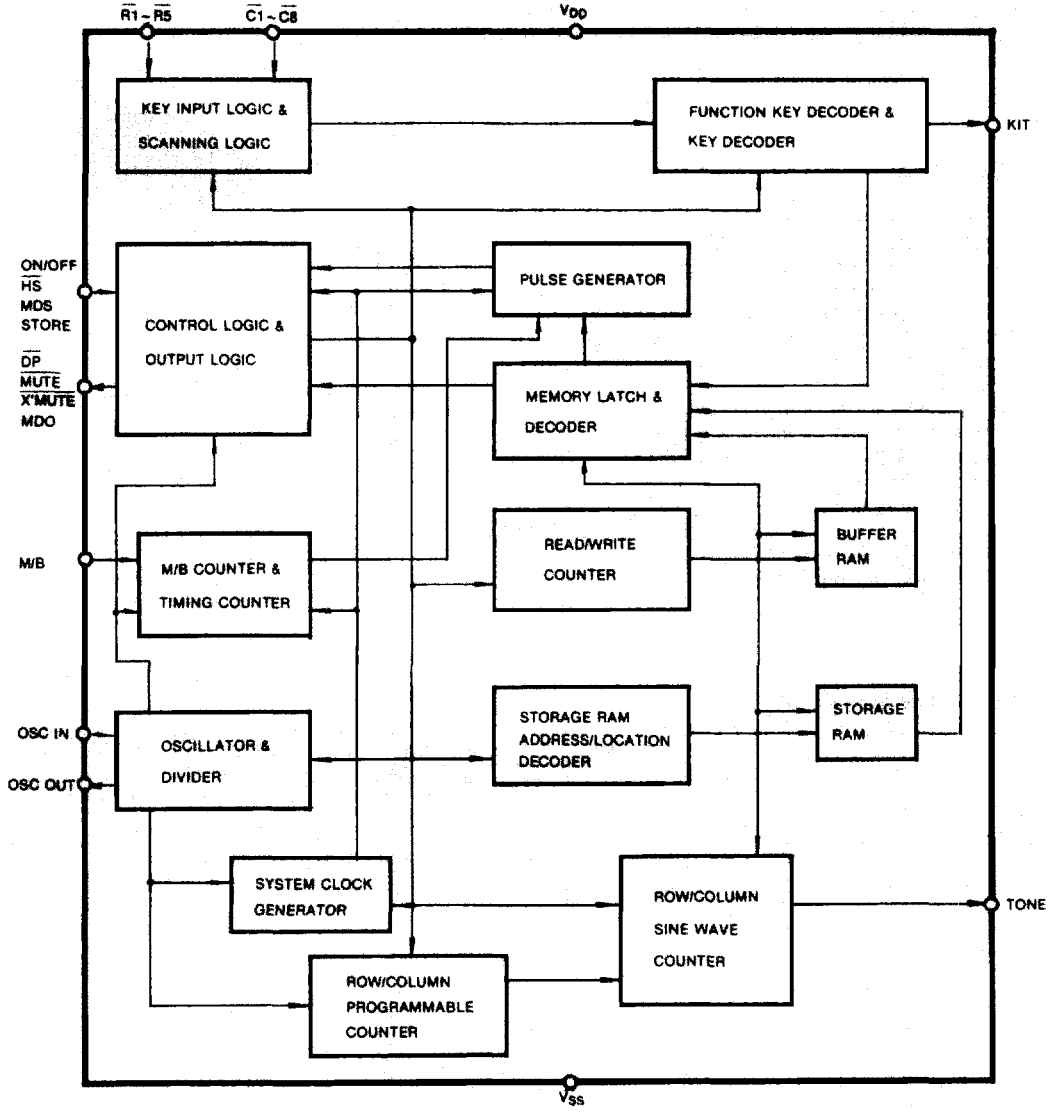
FEATURES

- 32digit redial memory with buffer
- 20 No × 16 digit repertory memery
- Pulse to DTMF dialing mode is selected by touch key or slide switch
- Uses inexpensive 3.579545MHz crystal or resonator.
- Manually dialing numbers after redialing are stored and cascaded in redial memory as additional numbers for next redialing
- Make/Break ratio (1/2, 2/3) pin selectable
- Two key single tone operation in test mode
- Repertory dialing is accessed by direct key or indirect key
- Flash function can be stored in memory
- Low operating current : 500μA (max) at V_{DD} = 3.5V, pulse mode
  1.0mA (max) at V_{DD} = 3.5V, DTMF mode
- Low memory retention voltage : 1.0V (min)
- Low memory retention current : 0.7μA (typ)

ORDERING INFORMATION

Devic	Pacage	Flash Time			Pause		PPS		Operating Temperature
		100ms	300ms	600ms	2Sec	3.6Sec	10	20	
KS58531	28-DIP-600A	0			0		0		- 20 ~ + 70℃
KS58535				0	0		0		
KS58536				0		0	0		

BLOCK DIAGRAM



PIN CONFIGURATION

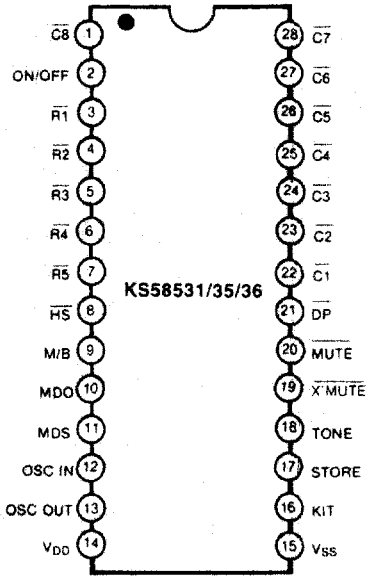


Fig. 2

ARRANGEMENT OF KEYBOARD

t1	ST	t2	DTMF	M1	M6	M11	M16	R1
1	2	3	F	M2	M7	M12	M17	R2
4	5	6	REC	M3	M8	M13	M18	R3
7	8	9	CL	M4	M9	M14	M19	R4
*	0	#	RD/P	M5	M10	M15	M20	R5
C1	C2	C3	C4	C5	C6	C7	C8	

TONE DURATION & PAUSE

Characteristic	Symbol	Typ	Unit
Tone Duration	t_{TD}	98	mS
Minimum Pause	t_{PA}	104	mS

TONE FREQUENCIES

Input	Specified	Actual	% Error
R2	697	699.1	+ 0.31
R3	770	766.2	- 0.49
R4	852	847.4	- 0.54
R5	941	948.0	+ 0.74
C1	1,209	1,215.9	+ 0.57
C2	1,336	1,331.7	- 0.32
C3	1,477	1,471.8	- 0.35

PIN DESCRIPTION

Pin No	Symbol	Description
3 - 7 22 - 28, 1	$\overline{R1}$ - $\overline{R5}$ $\overline{C1}$ - $\overline{C8}$	Keyboard Input Pins. As $\overline{HS}$ pin is high (ON HOOK), all these pins become TRI-STATE. When $\overline{HS}$ pin goes low and one key is pressed, the corresponding ROW and COLUMN will be low.
2	ON/OFF	ON HOOK/OFF HOOK Store Enable – ON HOOK store can be done if this pin is high. – OFF HOOK store can be done if this pin is low.
8	$\overline{HS}$	HOOK Switch Input V_{DD} = ON HOOK, V_{SS} = OFF HOOK
9	M/B	Make/Break Ratio Select V_{DD} = 1:2 (M/B), V_{SS} = 2:3 (M/B)
10	MDO	Tone/Pulse Mode Indicator This pin is high in pulse mode and goes low in tone mode.
11	MDS	Tone/Pulse Mode select Pin. V_{DD} = Pulse mode, V_{SS} = Tone mode
12, 13	OSC IN OSC OUT	Oscillator Input/Output
14, 15	V_{DD} V_{SS}	Power
16	KIT	Key In Tone Key in tone output for any valid key data in pulse mode and function key data in tone mode.
17	STORE	Store Switch Input V_{DD} = Store mode, V_{SS} = Normal mode
18	TONE	DTMF Tone Output
19	$\overline{XTMUTE}$	$\overline{XTMUTE}$ Output Pin This is a CMOS output and is switching on digit dialing and flash dialing in both mode.
20	$\overline{MUTE}$	$\overline{MUTE}$ Output Pin This is a CMOS output and is switching on digit dialing and flash dialing in pulse mode.
21	$\overline{DP}$	Dial pulse output (CMOS output)

ABSOLUTE MAXIMUM RATINGS (Ta = 25℃)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{DD}	- 0.3 ~ 6.0	V
Input Voltage	V_I	- 0.3 ~ V_{DD} + 0.3	V
Output Voltage	V_O	- 0.3 ~ V_{DD} + 0.3	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{OPR}	- 20 ~ + 70	℃
Storage Temperature	T_{STG}	- 55 ~ + 150	℃

ELECTRICAL CHARACTERISTICS

(V_{DD} = 3.5V, V_{SS} = 0V, f_{OSC} = 3.579545MHz, Ta = 25℃ unless otherwise noted)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Operating Voltage	V_{DD}	—	2.0	—	5.5	V
Memory Retention Voltage	V_{MR}	—	1.0	—	—	V
Memory Retention Current	I_{MR}	—	—	0.7	—	μA
Operating Current	$I_{DD\ (PULSE)}$	Pulse Mode, all outputs unloaded	—	—	0.5	mA
	$I_{DD\ (TONE)}$	Tone Mode, all outputs unloaded	—	—	1.0	mA
Standby Current	I_{SB1}	$\overline{HS}$ = V_{DD} = 1.0V, all outputs unloaded	—	0.03	0.05	μA
	I_{SB2}	$\overline{HS}$ = V_{SS}, all outputs unloaded	—	30	50	μA
Output Sink Current ($\overline{DP}$, X'$\overline{MUTE}$, $\overline{MUTE}$)	$I_{O\ (SINK)1}$	V_{OL} = 0.4V	1.7	5.0	—	mA
	$I_{O\ (SINK)2}$	V_{OH} = 3.0V	1.8	5.2	—	mA
Key In Tone Current	I_{KIT}	V_{OL} = 0.4V	1.7	5.0	—	mA
Input Voltage	V_{IH}	—	0.8V_{DD}	—	V_{DD}	V
	V_{IL}	—	V_{SS}	—	0.2V_{DD}	V
Input Current (R1-R5, C1-C8)	I_{I1}	V_{IN} = V_{SS}	—	—	116	μA
	I_{I2}	V_{IN} = V_{SS}, V_{DD} = 2.5V	—	—	50	μA
Row Tone Level	$V_{OH\ (TONE)}$	V_{DD} = 3.5V, R_L = 5kΩ	-14	—	-11	dBV
	$V_{OL\ (TONE)}$	V_{DD} = 2.5V, R_L = 5kΩ	-16	—	-12	
Ratio of Column to Row Tone	dB_{CR}	—	1	2	3	dB
distortion	THD	—	—	—	7	%
Valid Key Entry Time	t_{KD}	—	—	33	—	mS
Key Tone Duration	t_{KIT}	—	—	33	—	mS
Key Tone Frequency	t_{KIT}	—	-	1.2	—	KHz

ELECTRICAL CHARACTERISTICS (Countinued)

Characteristic	Symbol	Test Conditions		Min	Typ	Max	Unit
Pause Time	t_{PA}	2 sec	MDS = H	—	2.04	—	sec
			MDS = L	—	2.12	—	
		3.6 sec	MDS = H	—	3.64	—	
			MDS = L	—	3.72	—	
Auto-Access Pause Time	t_{AP}	—		—	1.009	—	sec
Pulse Interdigit Pause Time	t_{PIDP1}	20 pps	MDS = H	—	419.0	—	mS
			MDS = L	—	422.4	—	
	t_{PIDP2}	10 pps	MDS = H	—	838.1	—	
			M/B = L	—	844.9	—	
Tone Interdigit Pause Time	t_{TIDP}	—		—	103.5	—	mS
Tone Minimum Duration	t_{TD}	—		—	97.64	—	mS
Flash Time	t_{FL}	—		—	600	—	mS
Flash Pause Time	t_{FP}	—		—	1.0	—	sec
Make/Break Time	$t_{M/B}$	10 pps	M/B = H	—	33.5 67.0	—	mS
			M/B = L	—	40.2 60.3	—	
		20 pps	M/B = H	—	16.7 33.5	—	
			M/B = L	—	20.1 30.2	—	

APPLICATION INFORMATION
KEYBOARD DESCRIPTION

- 1, 2, 3, 4, 5, 6, 7, 8, 9, 0
  Dialing signal keys

- *, #
  Dialing signal keys at tone mode only

- M1, M2, ..., M20
  1) In normal dialing or repertory dialing mode, pressing MX (X = 1, ..., 20) key, the first two cascaded memories will cascade the corresponding repertory memory to redial buffer immediately. However, when cascaded memories exceed three, the exceeded cascaded memories should enter after all the digits in buffer has dialed out otherwise they will be ignored.
  2) In store mode, pressing MX(X = 1, ..., 20) key will cause the 16 digits of redial buffer storing to corresponding repertory memory.

- DTMF
  1) In pulse mode, pressing this key will cause the T code is written to redial buffer and it will remain auto-access pause time in redialing or repertory dialing. If this key is pressed several times, only the first key-in is effective.
  2) In redialing or repertory dialing, pressing this key will cause cancel of pause and auto-access pause time.

- F
  A flash code will store to redial buffer and storage RAM if this key is pressed. During the execution of flash code, $\overline{DP}$, $\overline{XMUTE}$ and $\overline{MUTE}$ will be forced to low for t_{FL} (flash time) and then, pause for t_{FP} (flash pause time) before the next dialing digit.

- RD/P
  This key will be allowed as redial key if it is the first key-in after off hook. Otherwise, it will be allowed as a pause key.

- STORE
  This key is effective when the dialing sequence has completed and it is the first key-in after off hook. Pressing this key once will enter the store mode. The store mode will be released by pressing this key again or on-hook once.

- REC
  Repertory dialing can carry out indirectly by using this key. The indirect memory location is same as the direct memory location (Pressing REC 0 1 is equal to pressing M1)

- t1, t2
  Test 1 and Test 2 are used for the testing. User is not recommended to use these keys.

- CL
  In store mode, pressing this key will cause the memory clear and the memory revision.

KEYBOARD AND SWITCHES OPERATION MANUAL

- SYMBOL DEFINITION
  Dp = Pulse Data : 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, F, Pause
  Dt = Tone Data : 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, *, #, F, Pause
  Mx = REPERTORY MEMORY : M1, M2, ..., M20
  LOC = 01, 02, ..., 20
  ZiZiZi = Conversation Mode
  OFF = OFF HOOK
  ON = ON HOOK
  ⎍ = Input level from low to high
  ⎎ = Input level from high to low
  Dg = Storing data

- NORMAL DIALING IN PULSE MODE
  OFF ; Dp, ..., Dp ; ZiZiZi ; ON ;

- NORMAL DIALING IN TONE MODE
  OFF ; Dt, ..., Dt ; ZiZiZi ; ON ;

- NORMAL DIALING FROM PULSE TO TONE VIA DTMF KEY
  OFF ; Dp, ..., Dp, DTMF, Dt, ..., Dt; ZiZiZi ; ON ;

- NORMAL DIALING FROM PULSE TO TONE VIA MDS PIN
  OFF ; Dp, ..., Dp, MDS ⎎ , Dt, ..., Dt; ZiZiZi ; ON ;

- REDIAL
  OFF ; RD/P : ZiZiZi ; ON ;

  Note : 1) In normal dialing mode, the dialing digit is unlimited. However, if the dialing digits exceed 32 digit, the redialing operation will be inhibited.
  2) All key input will be ignored during the redialing and repertory dialing but pressing the DTMF key during the time of pause and auto-access pause operation, the pause and auto-access pause time are canceled and next data will send out.

- REPERTORY DIALING FOR ONE MEMORY
  OFF ; Mx (x = 1, 2, ..., 20) ; ZiZiZi ; ON ; or
  OFF ; REC, LOCx (x = 01, 02, ..., 20) ; ZiZiZi ; ON ;

- REPERTORY DIALING FOR CASCADED MEMORIES
  1) Cascaded memories are two memories.
  OFF ; Mi, Mj (i, j = 1, ..., 20) ; ZiZiZi ; ON ; or
  OFF ; REC, LOCi, REC, LOCj (i, j = 01, ..., 20); ZiZiZi; ON;
  2) Cascaded memories are exceed two memories.
  OFF ; Mi, Mj; All the digits have dialed out; Mk;
  All the digits have dialed out ; Ml (i, j, k, l = 01, ..., 20) ; ZiZiZi ; ON ; or
  OFF ; REC, LOCi, REC, LOCj ; All the digits have dialed
  out ; REC, LOCk, All the digits have dialed out; REC, LOCl (i, j, k, l = 01, ..., 20) ; ZiZiZi ; ON ;

- STORING REPERTORY MEMORIES VIA STORE KEY
  OFF ; ST, Dg, ..., Dg; Mi (I = 01, ..., 20) or REC LOCi (i = 01, ..., 20); Dg, ..., Dg; Mj (j = 01, ..., 20) or REC LOC) (j = 01, ..., 20) store mode will be released by pressing store key again or ON HOOK once.

- STORING REPERTORY MEMORIES VIA STORE PIN
  OFF ; Store Pin ↑ ; Dg, ..., Dg; Mi (i = 1, ..., 20) or REC LOCi (i = 01, ..., 20); Dg, ..., Dg; Mj (j = 1, ..., 20) or REC LOCj (j = 01, ..., 20); store pin ↓ ; (Return to normal mode)

- MEMORY CLEAR FUNCTION VIA CLEAR KEY
  OFF ; ST; CL; Mx (x = 01, ..., 20) or REC LOCx (x = 01, ..., 20): ON;

- MEMORY DATA CHANGE VIA CLEAR KEY
  OFF ; ST; Dg, ..., Dg, CL, Dg, ..., Dg; Mx (x = 01, ..., 20) or REC LOCx (x = 01, ..., 20)
  (the digits after CL are memorized at Mx or LOCx)

- F KEY FUNCTION
  1) Repertory Dialing
     - In store mode, pressing F, 1, 2, 3, 4, 5, 6 and then pressing Mx or REC LOCx; In normal mode pressing Mx or REC LOCx, the output data is F, 1, 2, 3. 4, 5, 6.
     - In store mode, pressing 1, 2, 3, F, 4, 5, 6 and then pressing Mx or REC LOCx; In normal mode pressing Mx or REC LOCx, the output data is 1,2,3,4,5,6. In store mode, the F key is effective only when it is the first key.
  2) Normal Dialing and Redialing
     - The input digits are 1, 2, 3, F, 4, 5, 6 in normal dialing, and then ON HOOK; OFF HOOK; RD/P; the output data is 1, 2, 3.
     - The input digits are 1, 2, 3, 4, 5, 6 in normal dialing and then ON HOOK; OFF HOOK; pressing F, 7, 8, 9; ON HOOK; OFF HOOK; RD/P; the output data is 1, 2, 3, 4, 5, 6.
     - In other word, the flash data and the following digits will be discarded.

TONE GENERATION

This device is well designed with 14-level, 28 segment. The COLOMN TONE is pre-emphasized 2dB than the ROW TONE. In order to single tone generation, push the same COLUMN or ROW keys more than 2 keys at same time.

TIMING DIAGRAM

PULSE MODE

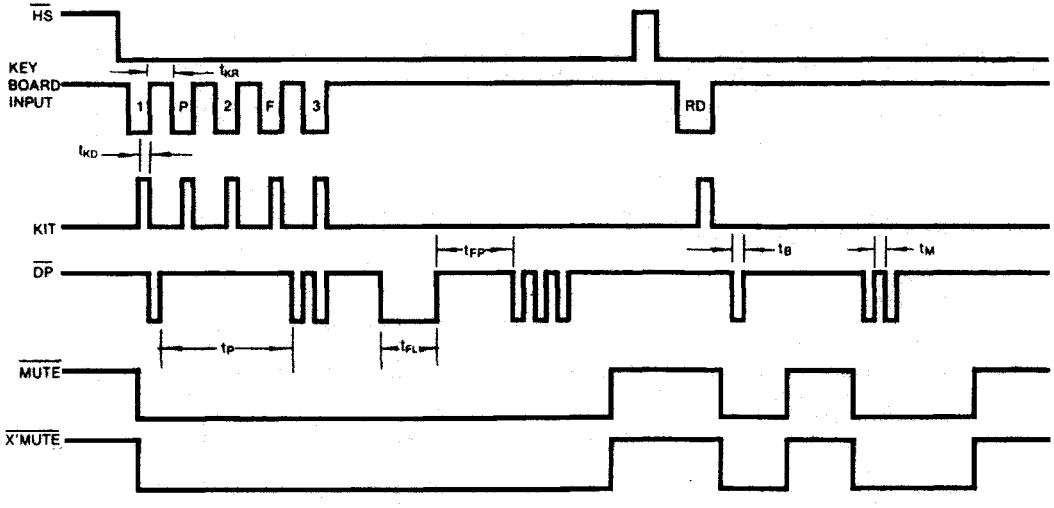


Fig. 3

PULSE ⟶ TONE MODE

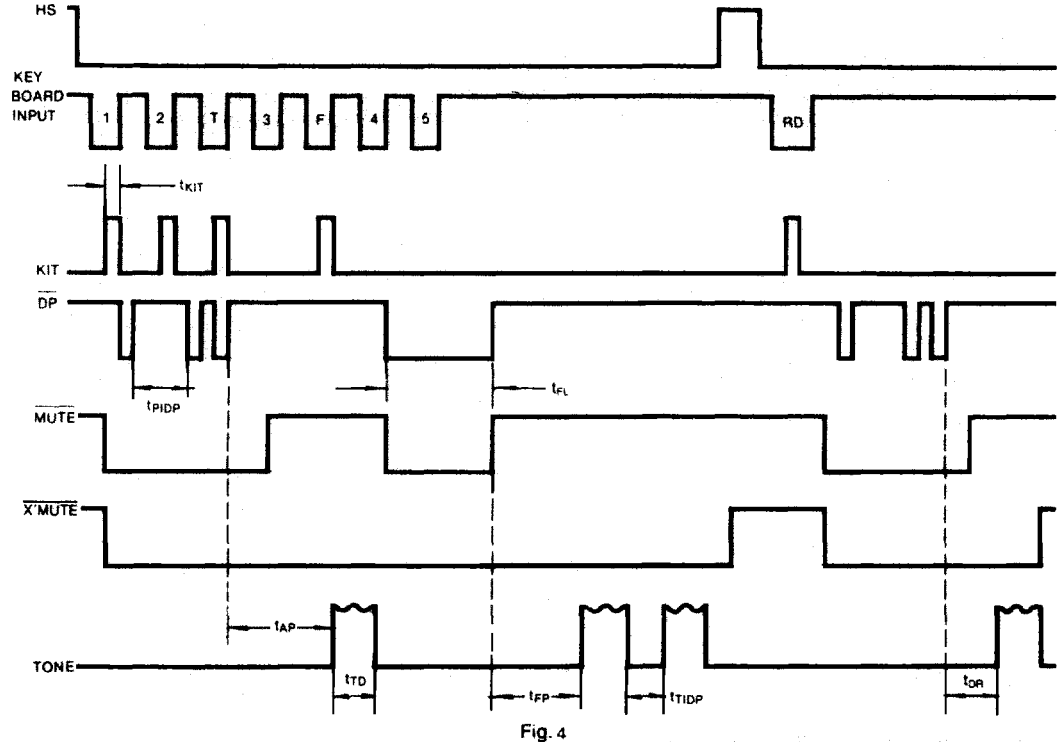


Fig. 4