Preliminary

OKI semiconductor

MSM6308

ADPCM SPEECH PROCESSOR FOR SOLID STATE RECORDER DRAM INTERFACE

GENERAL DESCRIPTION

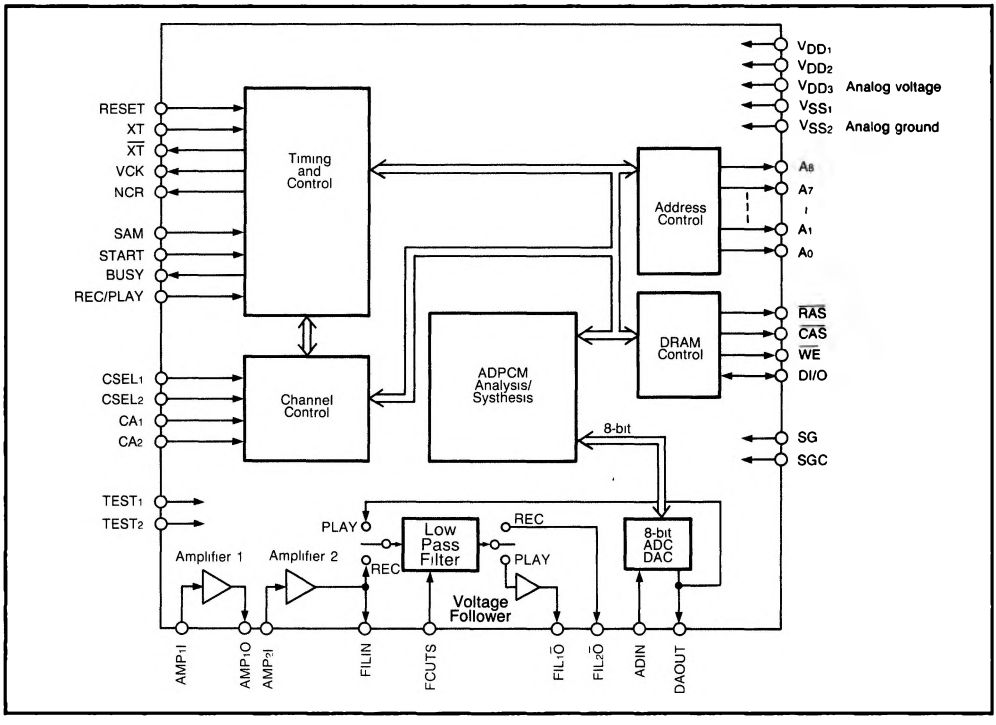
The Oki MSM6308 is a ADPCM speech processor LSI for solid state recording which is manufactured using Oki's low power CMOS silicon gate technology. A maximum of 256K Dynamic RAM is used to store the ADPCM data.

The MSM6308 has internal LPF and amplifier for a microphone. So, by connecting microphone, speaker, speaker driving amplifier and 256K DRAM, recording and playback of voice can be implemented in the same manner as a tape recorder.

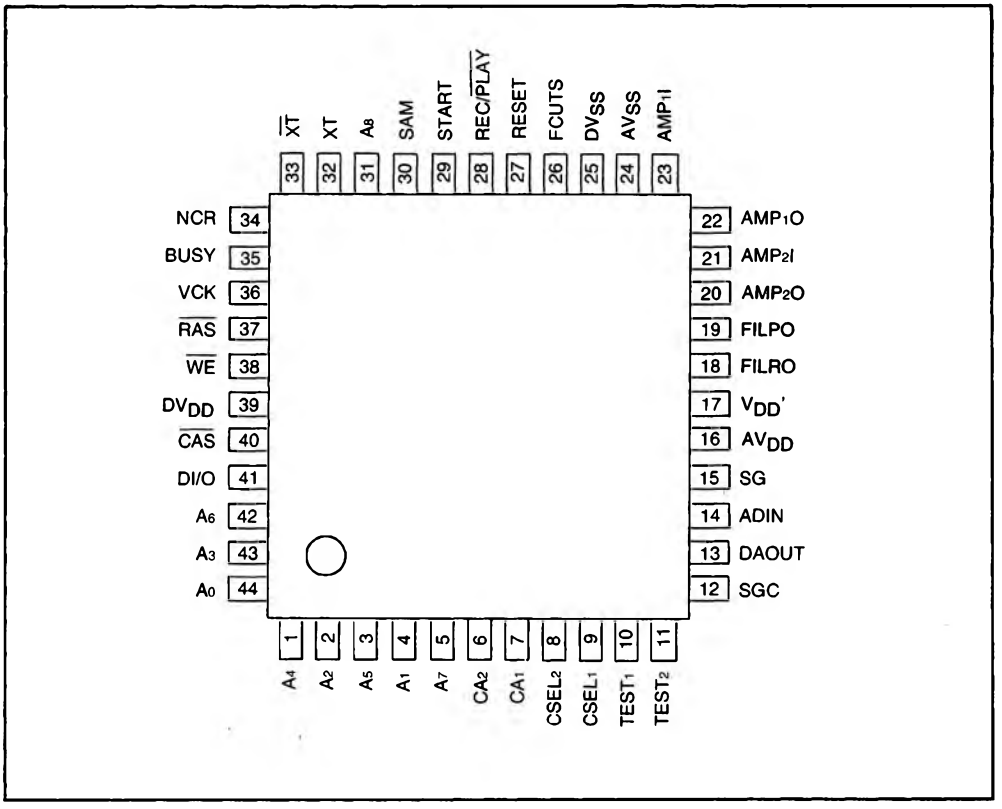
FEATURES

- 4-bit ADPCM algorithm
- Built-in 8-bit AD converter
- Built-in 8-bit DA converter
- Amplifier for microphone on chip
- LPF (Low Pass Filter) on chip
- 256K DRAM direct drive capability
- Oscillation frequency: 4 MHz ~ 6 MHz
- Sampling frequency: 4 kHz, 8 kHz (@ 4 MHz)
- Recording phrase: 1, 2, 4 selectable
- Vocalization time: 16 sec. maximum (@ 4 kHz)
- Supply voltage: +5 V
- 44 pin plastic flat package

BLOCK DIAGRAM



PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

(V_{SS1} = V_{SS2} = 0V)

Parameter	Symbol	Conditions	Value	Unit
Power Supply Voltage	V_{DD}	Ta = 25°C	−0.3 to 7.0	V
Input Voltage	V_{IN}	Ta = 25°C	−0.3 to V_{DD} + 0.3	V
Storage Temperature	T_{stg}	—	−55 to + 150	°C

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Conditions	Value	Unit
Power Supply Voltage	V_{DD}	V_{SS1} = V_{SS2} = 0V	+4.0 to +6.0	V
Operating Temperature	T_{op}	—	−40 to +85	°C
Oscillation Frequency	f_{osc}	—	4.0 to 6.0	MHz

DC CHARACTERISTICS

V_{DD} = 4.5 to 5.5 $V_{SS1} = V_{SS2}$ = 0V TA = −30 to 70°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
"H" Input Voltage *1	V_{IH}	—	3.6	—	—	V
"H" Input Voltage *1	V_{IH}	—	0.8 × V_{DD}	—	—	V
"L" Input Voltage	V_{IL}	—	—	—	0.8	V
"H" Output Voltage	V_{OH}	I_{OH} = −40μA	4.2	—	—	V
"L" Output Voltage	V_{OL}	I_{OL} = 2mA	—	—	0.45	V
"H" Input Current *3	I_{IH1}	$I_{IH} = V_{DD}$	1	—	100	μA
"H" Input Current *4	I_{IH2}	$I_{IH} = V_{DD}$	—	—	10	μA
"L" Input Current	I_{IL}	$V_{IL} = V_{SS}$	−10	—	—	μA

Note: *1 Apply to input terminals except XT
*2 Apply to XT terminal
*3 Apply to start terminal
*4 Apply to terminal without pull down resistors

PIN DESCRIPTION

Pin Symbol	Pin No.	I/O	Function
DV_{DD}	39	I	Digital power supply terminal
V_{DD}'	17	I	Digital power supply terminal
AV_{DD}	16	I	Analog power supply terminal
DV_{SS}	25	I	Digital ground terminal
AV_{SS}	24	I	Analog ground terminal
SG	15	I	Signal ground terminal Connect condenser for stabilization
SGC	12	I	Connect condenser for stabilization
$AMP_{1}I$	23	I	Input terminal for amplifier 1
$AMP_{1}O$	22	O	Output terminal for amplifier 1

PIN DESCRIPTION (continued)

Pin Symbol	Pin No.	I/O	Function
AMP2I	21	O	Input terminal for amplifier 2
AMP2O	20	O	Output terminal for amplifier 2 This terminal is connected to built-in LPF.
ADIN	14	I	Voice input terminal
DAOUT	13	O	Output of DA converter This terminal is connected to built-in LPF.
FILPO	19	O	Output of LPF Synthesized sound is output from this terminal.
FILRO	18	O	Output of LPF Analyzed sound is output from this terminal. Connect this terminal to ADIN
RESET	27	I	By inputting "H" level, the inside of the circuit returns to the early stage.
REC/$\overline{\text{PLAY}}$	28	I	Selection terminal for recording or playback "H" = recording
START	29	I	By inputting "H" level, recording or playback is started.
BUSY	35	O	This terminal outputs "H" level while recording or playback.
CSEL1	9	I	Terminal for selecting number of recording words
CSEL2	8	I	Same as above
CA1	7	I	Terminal for specifying channels when selecting 2 words or 4 words
CA2	6	I	Terminal for specifying channels when selecting 4 words
SAM	30	I	Terminal for determining the sampling frequency
D I/O	41	I/O	Input/output terminal for 4 bit ADPCM data
A0	44	O	Address terminals of 256K DRAM
A1	4	O	
A2	2	O	
A3	43	O	
A4	1	O	
A5	3	O	
A6	42	O	
A7	5	O	
A8	31	O	
$\overline{\text{RAS}}$	37	O	Row address strobe for a 256K DRAM
$\overline{\text{CAS}}$	40	O	Column address strobe for a 256K DRAM
$\overline{\text{WE}}$	38	O	Write enable signal to the DRAM device

PIN DESCRIPTION (continued)

Pin Symbol	Pin No.	I/O	Function
XT	32	I	Crystal oscilliator connector terminal
$\overline{XT}$	33	O	Same as above
VCK	36	O	Outputs sampling frequency
NCR	34	O	This terminal is used when playbacks contents of different channels continuously.
F_{CUTS}	26	I	Terminal for selecting the cut-off frequency of the built-in LPF
TEST 1	10	I	Terminal for inhouse testing
TEST 2	11	I	Same as above

FUNCTIONAL DESCRIPTION

The number of recording words of MSM6308 is selectable either a single word, 2 words or 4 words. When selecting 1 word, the maximum memory capacity will be 256K bits. When selecting 2 words, 128K bits are allocated to each channel. When selecting 4 words, 64K bit are allocated to each channel. So each recording length is limited depending on the capacity of each DRAM.

1. Selection of the Number of Recording Words and the Way to Specify Channel ($CSEL_1$, $CSEL_2$, CA_1, CA_2)

$CSEL_1$	$CSEL_2$	Number of Words	CA_1	CA_2	Channel	Capacitance of Channel
L	—	4	L L H H	L H L H	CH1 CH2 CH3 CH4	64K bit
H	L	2	— —	L H	CH1 CH2	128K bit
H	H	1	—	—	CH1	256K bit

2. How to Select the Sampling Frequency (SAM)

Following is the relationship between oscillation frequency and sampling frequency.

SAM	L	H
f_{samp}	$f_{osc}/1024$ (4 kHz)*	$f_{osc}/512$ (8 kHz)*

* When oscillation frequency is 4.096 kHz.

3. How to Select the Cut-off Frequency of LPF

The cut-off frequency of LPF is controlled by F_{CUTS} terminal. Please refer to the following chart.

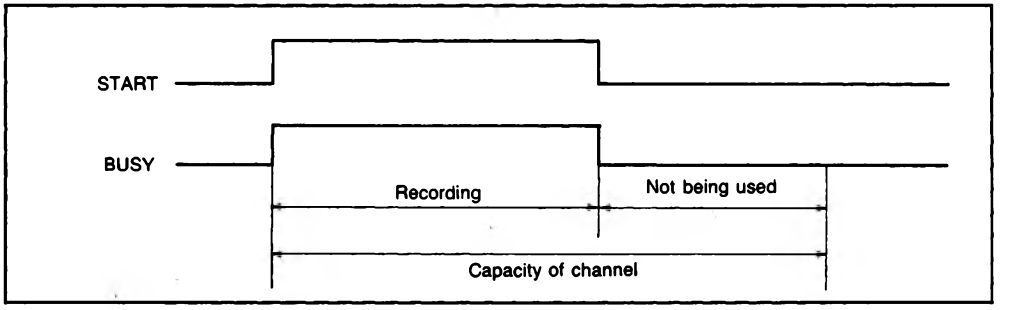
Voice Sampling		F_{CUTS}	
SAM	VCK (Hz)	"H"	"L"
L	4 K	2.3 K	1.95 K
H	8 K	3.8 K	2.9 K

When oscillation frequency is 4.096 kHz.

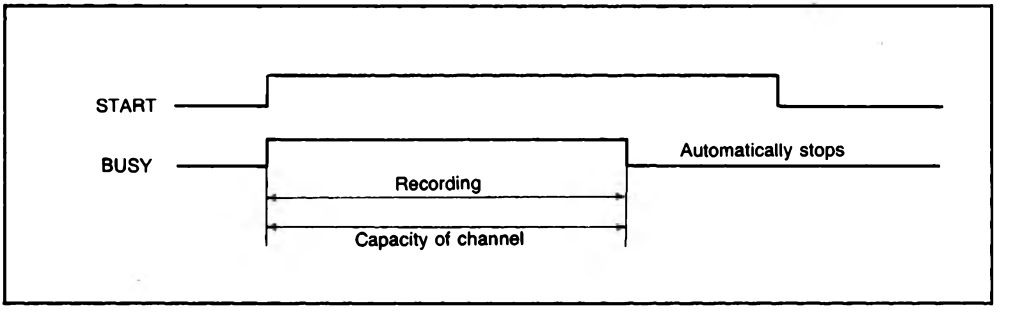
4. Function of REC/PLAY and Start Terminals

RECORDING

1. REC/$\overline{\text{PLAY}}$ = "H" When Recording Using Partial Memory Capacity of the Channel

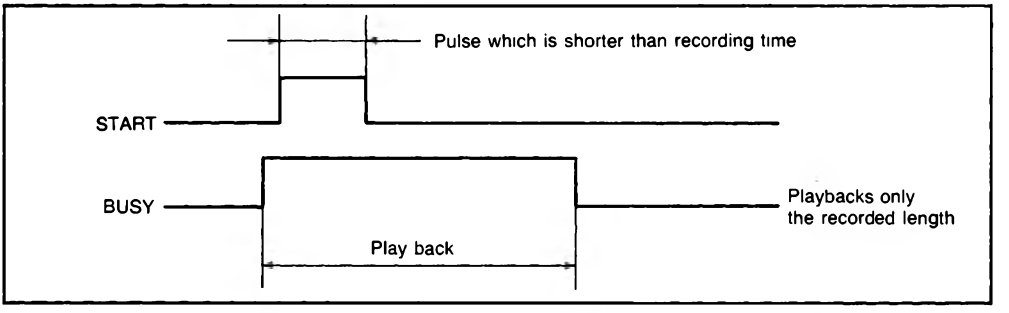


2. REC/$\overline{\text{PLAY}}$ = "H" When Recording Using Entire Memory Capacity of the Channel

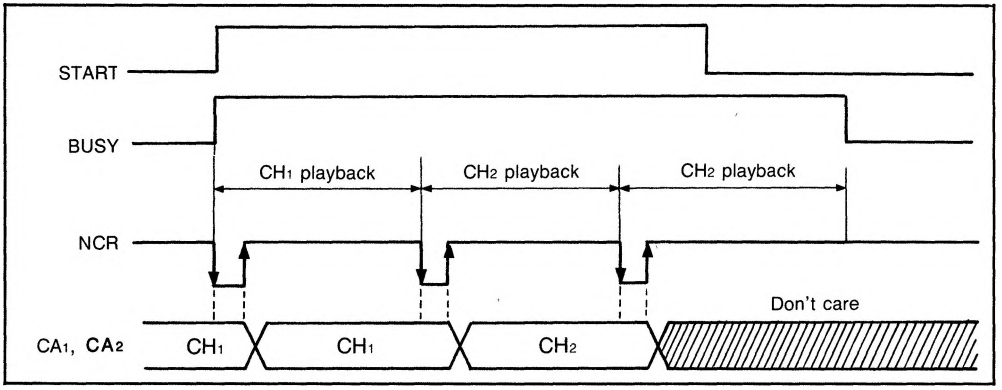


PLAYBACK

3. REC/$\overline{\text{PLAY}}$ = "L" to Playback the Recorded Contents Once



4. REC/$\overline{\text{PLAY}}$ = "L" to Playback the Recorded Content Repeatedly and Continuously



Continuous playback and repeated playback are acheived by maintaining Start terminal at "H" level. Writing to channel is done when NCR goes low, or when starts playinh back each word. So chennels will be changed, if "START" is high, when NCR goes from low to high.

5. Interval of Recording Time

As described up to now, by maintaning REC/$\overline{\text{PLAY}}$ terminal high, recording is achieved for the length of time of Start terminal is high. Recording time could be longer because the interval of recording time is for 4K bit.
The interval of recording time can be figured out by the following formula.

(The interval of recording time) = 4K bit/(bit rate [Kbit/sec])[sec]

EXAMPLE

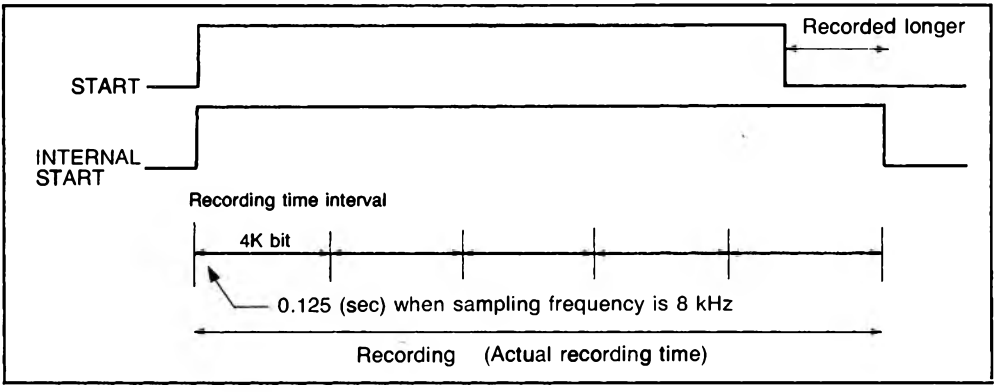
When sampling frequency is 8 kHz, bit rate is

4 bit × 8 kHz = 32K bit/sec.

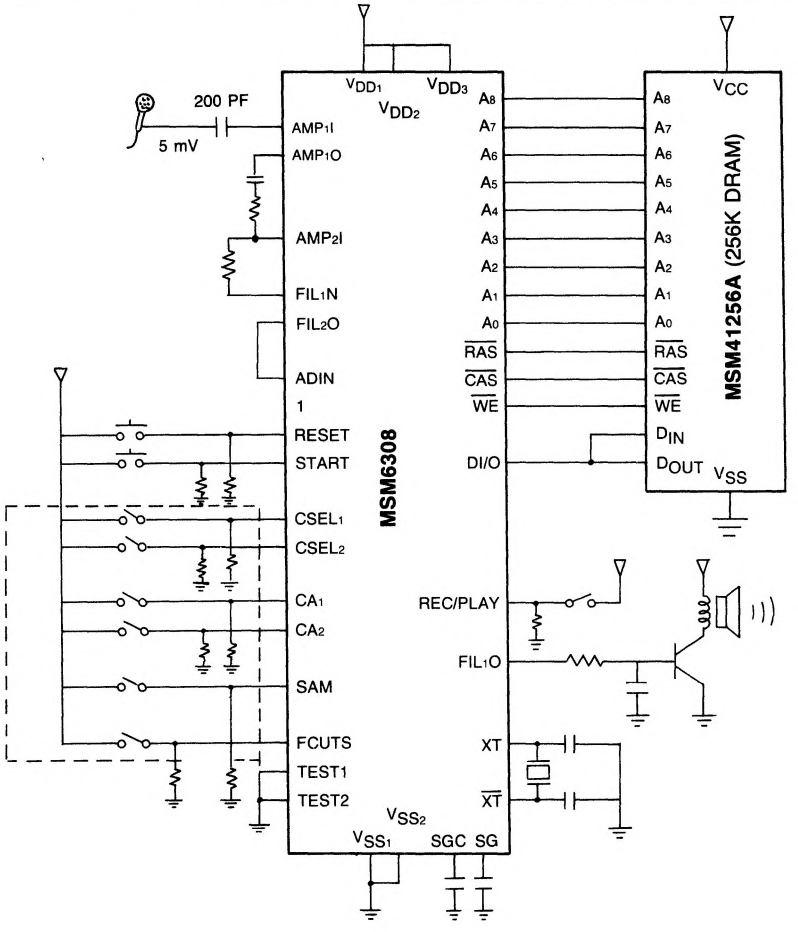
The interval of recording time is

4 bit/32K bit/sec = 0.125 (sec)

So, the recording time becomes a maximum of 0.125 msec.



APPLICATION CIRCUIT



Fixing "L" or "A" level determins
Sampling frequency, number of words and cut-off frequency.