

UM5506

6 Sec. Recording/Playback IC

Features

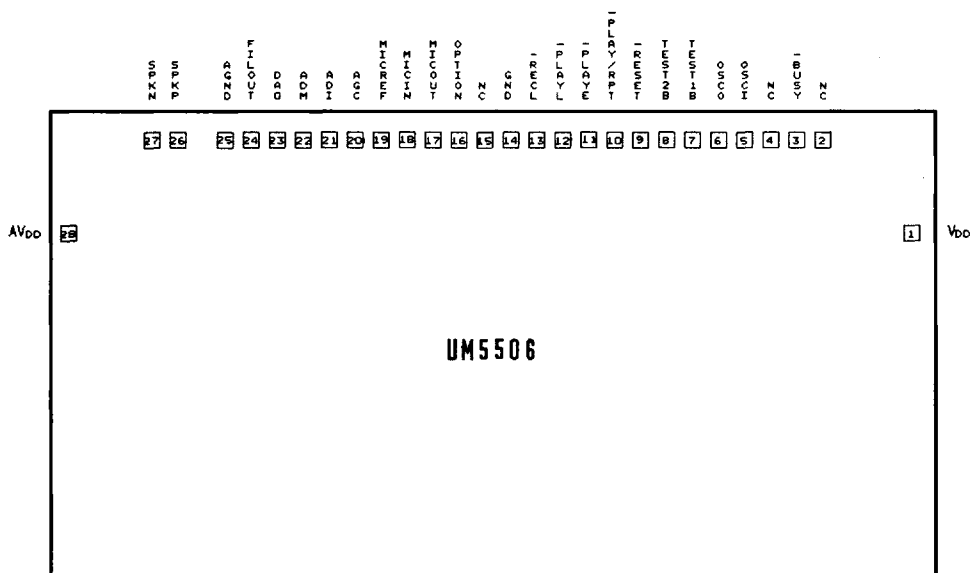
- Operating voltage 4.0 - 6.0 V
- Built-in 96K bit SRAM
- Recording length: 6 sec
- AGC (Automatic Gain Control) to enlarge input dynamic range
- Push-button interface, play cycle can be edge- or level-activated
- On-chip amplifier for sound recording
- On-chip low pass filter
- Direct speaker drive capability
- Built-in oscillator with one external resistor
- BUSY signal drives LED
- Looping play capability
- "BEEP" to indicate record cycle start and memory full

General Description

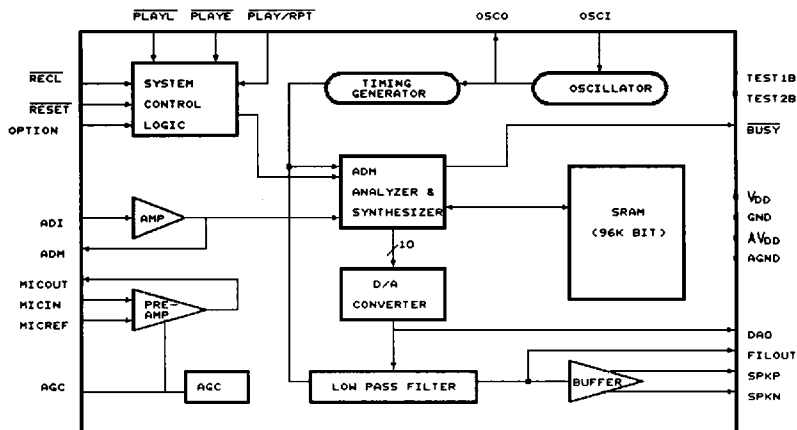
The UM5506 is a highly integrated CMOS ADM speech processor with low power consumption. The chip integrates an analog comparator, 10-bit D/A converter, low pass filter, operational amplifier

and static RAM, making it highly self-contained. The UM5506 greatly reduces the number of external components needed for applications such as greeting cards, toys and announcing phones.

Pad Configuration



Block Diagram



Absolute Maximum Ratings*

DC Supply Voltage	-0.3V to +7V
Input Voltage	GND - 0.3V to VDD + 0.3V
Operating Ambient Temperature	-10°C to +60°C
Storage Temperature	-50°C to +125°C

*Comments

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC Electrical Characteristics (VDD = 4.5V, Temp. = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input Low Voltage	Vil	0		0.3*VDD	V	
Input High Voltage	Vih	0.7*VDD		VDD	V	
Operation Voltage	VDD	4.0	4.5	6.0	V	
Standby Current	Istb		1	5	μA	
Preamp Gain 1	Apri1		24		dB	AGC = 0.0V
Preamp Gain 2	Apri2		-45	-15	dB	AGC = 2.5V
Fixed Gain Amplifier	Aarp		26		dB	

DC Electrical Characteristics (continued)

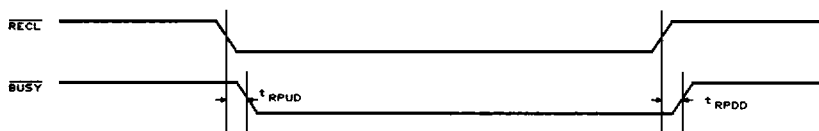
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
AGC Output Resistance	R _{agc}		5		K Ω	
Operation Current	I _{op}		5	15	mA	Output floating
Output Load Impedance	R _{ext}	16			Ω	
BUSY Sink Current	I _L	6	8		mA	V _{out} = 2.5V

AC Characteristics

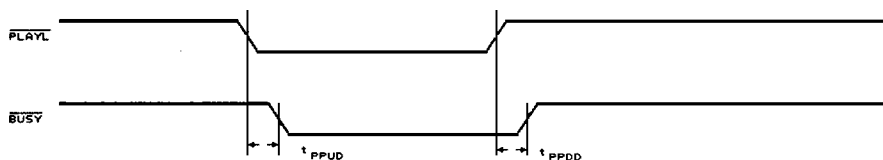
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Record Power Up Delay	t _{RPUD}		30	50	msec	
Record Power Down Delay	t _{RPDD}		30	50	msec	
Play Power Up Delay	t _{PPUD}		30	50	msec	
Play Power Down Delay	t _{PPDD}		30	50	msec	
Sampling Frequency	f _s		16		KHz	R _{osc} = 390K Ω
Bandwidth	BW		1.5		KHz	f _s = 16 KHz
Total Harmonic Distortion	THD		2		%	1 KHz sine wave input
Speaker Power	P _{spk}			50	mW	R _{ext} = 16 Ω
Speaker Voltage	V _{spk}			2.5	V	R _{ext} = 600 Ω
Input Range of Microphone	V _{mi}			20	mV	Peak to peak
Frequency Stability	$\Delta F/F$			5	%	$\frac{F(4.5V)-F(4.0V)}{F(4.5V)}$
Frequency Variation	$\Delta F/F$			15	%	V _{DD} = 4.5V
Microphone Output	V _{mo}			50	mV	Peak to peak

Timing Waveforms

RECORD



PLAY



Pad Description

Pad No.	Designation	I/O	Description
1	VDD	P	Digital power supply
2	NC		No Connection
3	BUSY	O	Indicates chip is busy processing speech data during recording; can also be configured by metal option to indicate chip busy during both recording and playback
4	NC		No Connection
5	OSCI	I	Oscillator input
6	OSCO	O	Oscillator output
7, 8	TEST1B, TEST2B	I	Used for testing only, normally left floating

Pad Description (continued)

Pad No.	Designation	I/O	Description
9	$\overline{\text{RESET}}$	I	Power-on reset, used to initialize chip
10	$\overline{\text{PLAY/RPT}}$	I	Pulling this pin low will end power-down mode and initiate a play cycle. The chip will play the complete message and continue to repeat the message until this pin is released, at which time it will enter power-down mode
11	$\overline{\text{PLAYE}}$	I	Pulling this pin low will end power-down mode and initiate a play cycle. The rising edge of this pin has no effect on operation. The chip enters power-down mode from play mode when a subsequent falling edge occurs or when message is finished
12	$\overline{\text{PLAYL}}$	I	Pulling this pin low will end power-down mode and initiate a play cycle. The chip continues to play until the message is finished or this pin goes to high, then it enters power-down mode
13	$\overline{\text{RECL}}$	I	Pulling this pin low will end power-down mode and initiate a record cycle. Recording continues only as long as this pin remains low. The UM5506 ends the recording cycle and enters power-down mode if memory is full or $\overline{\text{RECL}}$ returns to high
14	GND	P	Digital ground
15	NC		No Connection
16	OPTION	I	Pulling OPTION high or leaving it floating causes the chip to produce a "BEEP" sound when recording starts and 3 beeps when the internal memory is full. Pulling this pin low deactivates the "beep" sound. The beep is 2KHz square wave with 8Hz and 50% duty envelope
17	MICOUT	O	Output terminal of the built-in pre-amplifier
18	MICIN	I	Input terminal of the built-in operational amplifier
19	MICREF	I	Connected to a capacitor to reduce recording noise level
20	AGC	I	The attack time and release time of the Automatic Gain Control are determined by an external resistor and capacitor which are connected to ground in parallel
21	ADI	I	Input terminal of the built-in amplifier
22	ADM	O	Amplifier output monitor pin

Pad Description (continued)

Pad No.	Designation	I/O	Description
23	DA0	O	The synthesized speech output of the D/A converter. This pin is biased to 1/2 V _{DD} and pulled to ground in standby state
24	FILOUT	O	Output terminal of the built-in low pass filter. This pin is connected to the internal operational amplifier
25	AGND	P	Analog ground
26	SPKP	O	Output terminal of the built-in operational amplifier. The output, ranges from 1/4 V _{DD} to 3/4 V _{DD} , is used to drive speaker
27	SPKN	O	Connected to negative terminal of speaker
28	AVDD	P	Analog power supply

Functional Description

The UM5506 is a voice recording and playback chip. In record mode, the input voice signals are processed into digital signals using the ADM (Adaptive Delta Modulation) algorithm and stored in an internal SRAM. In play mode, the digital data are transformed into analog signals and sent to the output pin.

TRIGGER MODE

The priority of the four pads is as follows:

RECL > PLAYL > PLAYE > PLAYL/RPT

AGC (Automatic Gain Control)

AGC (Automatic Gain Control) has been built-in to enlarge the dynamic range of the input signal, whose attack time and release time can be adjusted by an external resistor and capacitor. The input analog signal is subjected to two stages of amplification — the pre-amplifier and amplifier — and passed through the AGC block to fulfill the complete AGC function. The gain of the pre-amplifier is dynamically adjusted by the AGC level, while the amplifier has a fixed gain whose output is fed back to adjust the AGC level, as shown in Fig. 1.

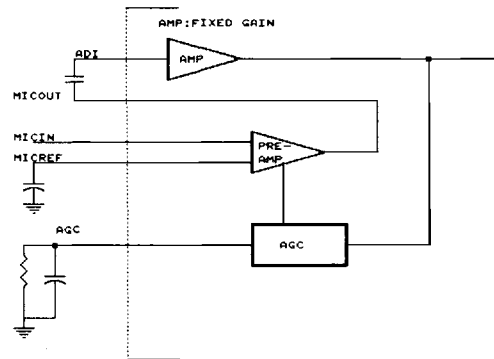
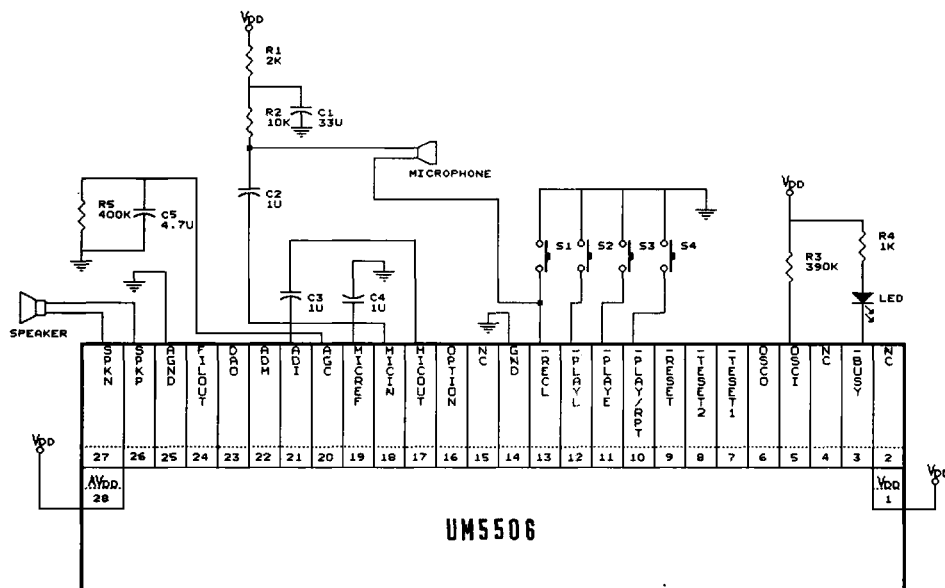


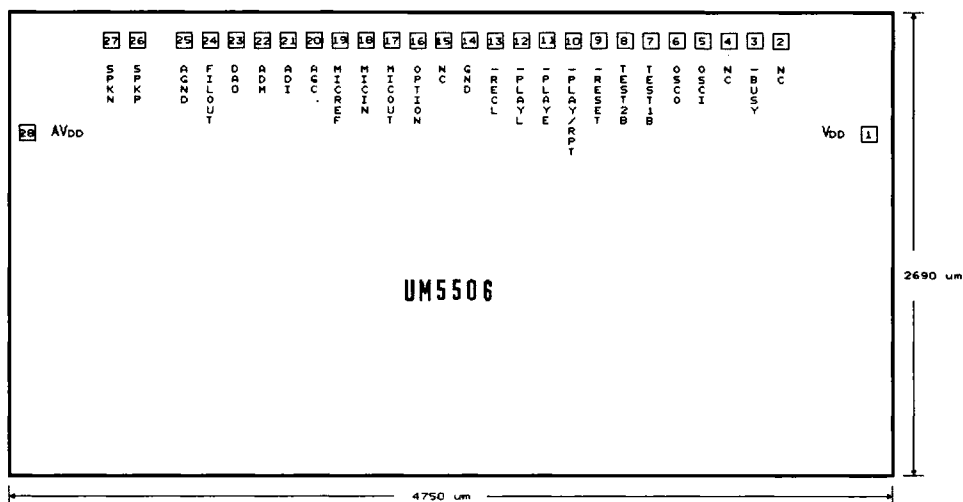
Fig. 1. AGC Response to Different Input Levels

The internal resistance is 5K Ω . The AGC pin should be connected to an external resistor and capacitor in parallel to set up the appropriate attack time and release time. The recommended value of the external capacitor is 4.7 μ F and that of the resistor is 400K Ω . The equation is as follows:

$$\text{Attack time} = 5K \times 4.7\mu = 23.5\text{msec}$$

$$\text{Release time} = 400K \times 4.7\mu = 1.88\text{sec}$$

Application Circuit (for reference only)


Bonding Diagram


* Substrate connect to VDD.

unit: μm

Pad No.	Designation	X	Y	Pad No.	Designation	X	Y
1	VDD	2224	840	15	NC	263	1181
2	NC	2202	1148	16	OPTION	134	1181
3	BUSY	2040	1148	17	MICOUT	-76	1172
4	NC	1896	1181	18	MICIN	-289	1181
5	OSCI	1758	1181	19	MICREF	-441	1181
6	OSCO	1606	1181	20	AGC	-593	1181
7	TEST1B	1454	1181	21	ADI	-745	1181
8	TEST2B	1302	1181	22	ADM	-875	1181
9	RESET	1150	1181	23	DAO	-982	1181
10	PLAY/RPT	998	1181	24	FILOUT	-1111	1181
11	PLAYE	846	1181	25	AGND	-1271	1142
12	PLAYL	694	1181	26	SPKP	-1657	1100
13	RECL	542	1181	27	SPKN	-1945	1100
14	GND	392	1141	28	AVDD	-2218	813



UM5506

Ordering Information

Part No.	Package
UM5506	CHIP FORM