

DALLAS

SEMICONDUCTOR

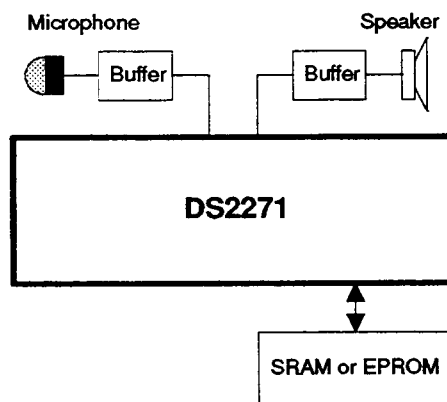
DS2271

Speech Stik

FEATURES

- Adds speech recording and playback to any system without any moving parts
- Any sound can be recorded and recreated
- Words can easily be concatenated to form sentences, which lowers the cost of storing the recorded speech
- Telephone-grade speech can be recorded at rates as low as 8Kbps
 - recording capacity of over 8 minutes with external memory
 - 21 seconds of capacity with on-Stik memory
- Can be controlled via switch closures (hardware mode) or via an external controller (software mode)
- New words can be downloaded into the Stik via software
- A kit designed to aid in speech development is available (DS2271DK)

EVALUATION BOARD



DESCRIPTION

The DS2271 Speech Stik is a complete solid-state audio recording/reproducing subsystem that replaces mechanical tape-based recording for embedded applications. With the Speech Stik, equipment can coach novice users on its operation or it can inform nontechnical users of malfunctions. The DS2271 Speech Stik digitizes speech and automatically stores the speech in external memory. With external EPROM, the DS2271 becomes a voice annunciator. With external SRAM, the DS2271 becomes a voice recorder with the ability to both record and play back speech. The DS2271 has been designed to allow the user to easily integrate it into

existing systems. The Stik has the unique ability to allow the user to customize each unit with different words and phrases. With the separate speech development kit (DS2271DK), the user has the ability to "edit" the recorded speech to create smooth sounding sentences out of discrete words.

FUNCTIONAL DESCRIPTION

The DS2271 samples an analog signal at the AIN pin and digitize it. It then stores the digitized speech in external memory under a message number. Up to 254 messages can be recorded. Each message can be of any length. The DS2271 has four speech compression rates available: 8Kbps, 12Kbps, 16Kbps, and 24Kbps. The 24Kbps algorithm has the highest sound quality but it also uses the most memory (see Table 4). The user can choose the trade off between sound quality and memory usage that best fits their needs. The recorded speech is stored in either external SRAM or EPROM, or in 23K bytes of internal SRAM. SRAM is used when it is necessary to record speech but EPROM can be used in applications that just need to play messages (such as annunciators). The DS2271 interfaces to the offboard memory via a standard 8-bit parallel interface. There are 19 address lines, which means the Stik can address up to 512K bytes.

Note: all of the references to message number in this data sheet follow a 3-digit decimal convention. For instance, message numbers will be referred to as 000 or 123 for message number 0 or message number 123 respectively.

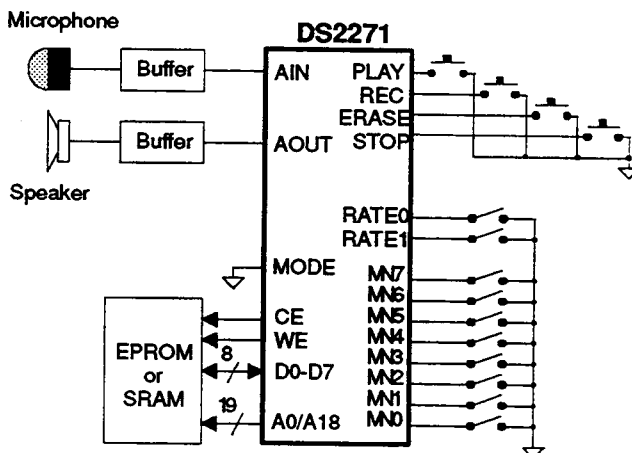
Hardware Mode

The DS2271 has two operating modes, a hardware mode and a software mode. On power up, the DS2271 will sense the MODE pin to determine which operating mode it should come up in. The default is the software mode. The hardware mode requires no external micro-controller for operation. Control of the DS2271 in this

mode is achieved by toggling pins on the Stik. In the hardware mode, the user has access to all of the basic functions in the DS2271. (See Figure 1.) The hardware mode is especially useful in applications where simple phrases must be recorded and played back. To record and play back a message, the following steps are needed:

1. Before the SRAM attached to the DS2271 can be used to record speech, it must first be formatted. Use Table 6 as a guide to determine how to set the MN0 to MN4 pins. Once the MN0 to MN4 pins are properly set, then the FORMAT pin can be toggled low. This will fully format the attached SRAM and recording can begin.
2. Select the proper speech compression rate via the RATE0 and RATE1 pins, see Table 2 and Table 4 for more details. The 24Kbps rate will sound better than the 8Kbps rate but the 24Kbps rate will use three times as much memory.
3. Choose the appropriate message number via the MN0 to MN7 pins. Use Table 5 as a guide.
4. To record a phrase, simply toggle the RECORD pin low. The DS2271 will begin recording the analog signal at the AIN pin and storing it in the attached SRAM under the message number chosen.
5. To stop recording a message, toggle the STOP pin low.
6. To hear the recorded message, toggle the PLAY pin low. The recorded message will begin being output at the AOUT pin.
7. To erase the recorded message, toggle the ERASE pin low.

HARDWARE MODE Figure 1



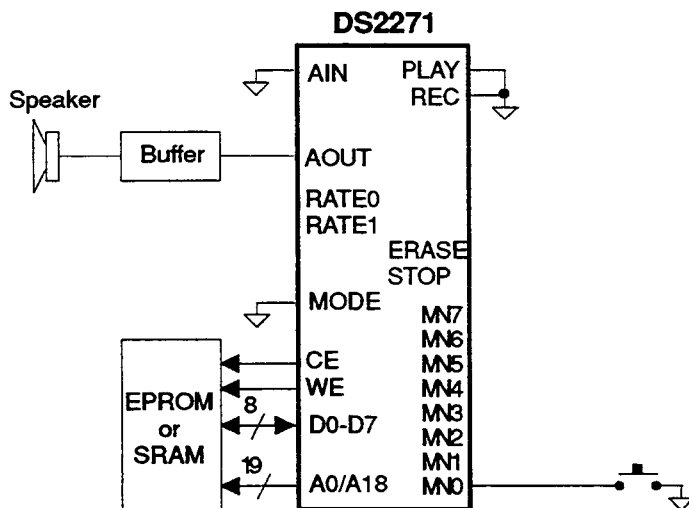
Special Playback Mode

In the hardware mode, the DS2271 has a special playback mode that will allow it to play messages with a minimum of external stimulus and hardware. (See Figure 2.) If both the **RECORD** and **PLAY** pins are tied permanently low, then the DS2271 will scan the MN pins for a valid message number (which is between 001 and 254). If it detects that a valid message number has been placed on the MN pins for a least 50ms, it will begin playing that message.

There is no need to hold the message number on the MN pins for the entire message. It is acceptable to allow

the MN pins to return to a high state after 50ms. The DS2271 will continue playing the message until either the **STOP** pin is toggled low or a new valid message number is placed on the MN pins for at least 50ms. The DS2271 will repeat a message continuously if the MN pins are permanently configured for a valid message number. An example of this mode is shown below. A single message has been recorded at 8Kbps with the number of 001. To playback this message, the MN0 pin needs only to be toggled low for 50ms.

SPECIAL PLAYBACK MODE Figure 2

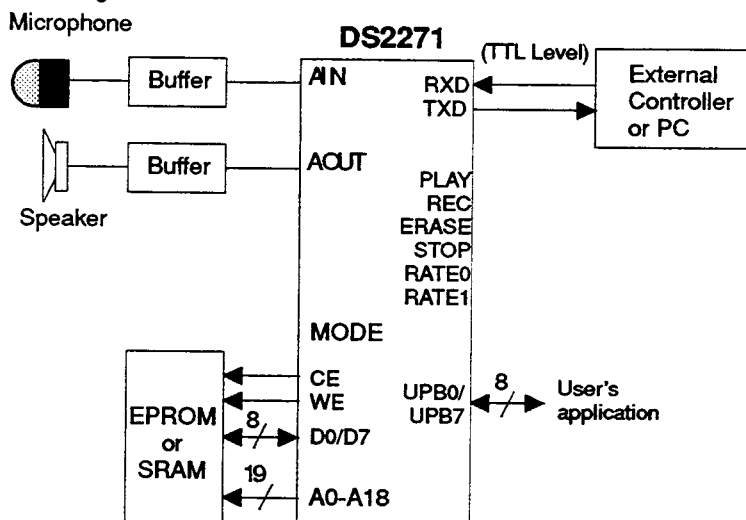


Software Mode

In the software mode, an external controller or PC is used to control the DS2271. (See Figure 3.) Commands are sent to the Stik via an asynchronous serial port that exists on the **RXD** and **TXD** pins. The various available software commands are listed later in this data sheet. The serial communications between the DS2271 and the controller follow a standard 8-bit protocol with one stop bit and no parity bit. The DS2271 will strobe the **RATE0** and **RATE1** pins on power-up to determine at which rate the serial port should operate. (See Table 2.) The available communication rates are 1200, 2400, 9600, and 57.6K baud. The default is 1200 baud. Even

though the DS2271 operates within the RS-232 protocol, RS-232 level voltages should not be applied to the DS2271. Such levels can destroy the Stik. Hence, a RS-232 to TTL level converter such as the DS1275 Line Powered Transceiver should be used when connecting the Stik to a controller that supplies RS-232 level signals. To record and play back phrases in the software mode, the user should follow the same steps that are outlined in the "Hardware Mode" section. Before any messages can be recorded, the external speech memory must be formatted and the proper compression rate (8, 12, 16, or 24Kbps) must be selected.

SOFTWARE MODE Figure 3



Format of the External Speech Memory

The digitized compressed recorded speech is stored in external memory as shown in Figure 4. All of the available memory is broken into 128-byte speech records. A phrase that is recorded by the DS2271 will be made up of an integral number of these speech records. The first byte of each speech record contains the message number. The second byte of each speech record contains a control byte which contains three pieces of information (see Figure 5):

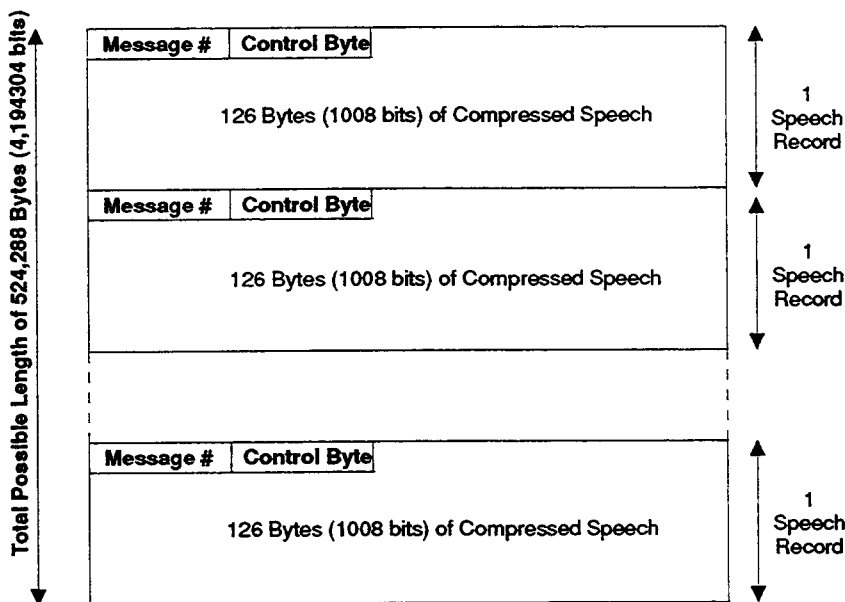
1. Bits R0 and R1 indicate the compression rate at which the speech was recorded (see Table 2).

2. If bit RST is set to a one, then this speech record is the first record in a phrase.

3. Bits L0 and L1 indicate the highest recorded level in the previous speech record as shown below. This information is useful in speech editing;

L1 = 0, L0 = 0, AIN > -15dBm0
 L1 = 0, L0 = 1, -15dBm0 > AIN > -25dBm0
 L1 = 1, L0 = 0, -25dBm0 > AIN > -40dBm0
 L1 = 1, L0 = 1, -40dBm0 > AIN

The remaining 126 bytes in each speech record are filled with compressed speech data.

SPEECH MEMORY FORMAT Figure 4**CONTROL BYTE** Figure 5

(msb)				(lsb)			
L1	L0	X	X	RST	R1	R0	X

PIN DESCRIPTION Table 1

PIN	SYMBOL	TYPE	DESCRIPTION
1	AIN	I	Analog Input. Audio signals that are to be recorded are applied at this pin.
2	AGND	-	Analog Ground Reference. 0.0 volts. Can be tied to DGND or used as an analog ground reference for external amplifier circuits.
3	AOUT	O	Analog Output. Audio signals that have been previously recorded are output on this pin.
4	AVDD	-	Analog Positive Supply. 5.0 volts. Can be tied to DVDD.
5	AVSS	-	Analog Negative Supply. -5.0 volts.
6	DGND	-	Digital Ground. 0.0 volts. Power supply ground.
7	DVDD	-	Digital Positive Supply. 5.0 volts. Can be tied to AVDD.
8	N/C	-	No Connect. Do not connect any signal to this pin.

PIN	SYMBOL	TYPE	DESCRIPTION
9	CLK	O	Clock Output. A 11.0592MHz clock is output at this pin.
10 11 12 13 14 15 16 17	MN0 / UPB0 MN1 / UPB1 MN2 / UPB2 MN3 / UPB3 MN4 / UPB4 MN5 / UPB5 MN6 / UPB6 MN7 / UPB7	I/O	Message Number / User Port Bit. These pins describe which of the 254 messages in the speech memory are to be either played, recorded, or erased. Message numbers 000 and 255 are not valid. The Message Number pins follow inverted logic (see Table 5). These pins become a user-programmable I/O port in the software mode.
18	PLAY	I	Play Command. If this pin is toggled low for at least 20 ms, then the message called out via the Message Number pins will be retrieved from the speech memory and output at the AOUT pin. This pin should be left open in the software mode.
19	RECORD	I	Record Command. If this pin is toggled low for at least 20ms, then the message called out via the Message Number pins will be recorded from the AIN pin into the speech memory. This command should not be used if EPROM is attached to the DS2271. This pin should be left open in the software mode.
20	ERASE	I	Erase Command. If this pin is toggled low for at least 20ms, then the message called out via the Message Number pins will be erased from the speech memory. This command should not be used if EPROM is attached to the DS2271. This pin should be left open in the software mode.
21	STOP	I	Stop Command. If this pin is toggled low for at least 20ms, then the DS2271 will stop either playing or recording the current message. This pin should be left open in the software mode.
22	FORMAT	I	Format Command. If this pin is toggled low for at least 20ms, then the DS2271 will scan MN4 to MN0 for the size of the speech memory (see Table 6) and organize the internal or external SRAM for speech storage. Any currently recorded messages in the SRAM will be erased. This command should not be used if EPROM is attached to the DS2271. This pin should be left open in the software mode.
23	BUSY / INT	O	DS2271 Busy / Interrupt. This pin will transition low while a command is being processed in either hardware or software mode. It will return high as soon as the command has completed executing.
24 25	RATE0 RATE1	I	Speech Compression Rate Select. These pins select the rate at which the DS2271 will compress or expand speech data. (See Table 2.) In the software mode, these pins will be sampled at power up to determine the baud rate of the serial port.

PIN	SYMBOL	TYPE	DESCRIPTION
26	NC	-	No Connect. Do not connect any signal to this pin.
27	RST	I	Reset. Used to control and load the onboard processor. In normal applications, do not connect any signal to this pin.
28	TXD	O	Transmit Data. Asynchronous serial control port. No RS-232 level signals should be applied to this pin. Leave this pin open in the hardware mode.
29	RXD	I	Receive Data. Asynchronous serial control port. No RS-232 level signals should be applied to this pin. Leave this pin open in the hardware mode.
30	MODE	I	Hardware / Software Mode Select. Tie this pin low to select the hardware mode; leave this pin open to select the software mode.
31 32 33 34	DTMF0 DTMF1 DTMF2 DTMF3	O	DTMF Detect Outputs. These pins report incoming DTMF tones and signal levels. (See Table 3.) Incoming DTMF tones are also reported via the serial port in the software mode.
35	DGND	-	Digital Ground. 0.0 volts.
36	D3	I/O	Compressed Speech Storage Data 3.
37	D2	I/O	Compressed Speech Storage Data 2.
38	D4	I/O	Compressed Speech Storage Data 4.
39	D1	I/O	Compressed Speech Storage Data 1.
40	D5	I/O	Compressed Speech Storage Data 5.
41	D0	I/O	Compressed Speech Storage Data 0. LSB of the data byte.
42	D6	I/O	Compressed Speech Storage Data 6.
43	A0	O	Compressed Speech Storage Address Select 0. LSB of the address.
44	D7	I/O	Compressed Speech Storage Data 7. MSB of the data byte.
45	A1	O	Compressed Speech Storage Address Select 1.
46	$\overline{\text{CE}}$	O	Chip Enable for Speech Storage.
47	A2	O	Compressed Speech Storage Address Select 2.
48	A10	O	Compressed Speech Storage Address Select 10.
49	A3	O	Compressed Speech Storage Address Select 3.
50	DGND	-	Digital Ground. 0.0 volts.
51	A4	O	Compressed Speech Storage Address Select 4.
52	A11	O	Compressed Speech Storage Address Select 11.
53	A5	O	Compressed Speech Storage Address Select 5.

PIN	SYMBOL	TYPE	DESCRIPTION
54	A9	○	Compressed Speech Storage Address Select 9.
55	A6	○	Compressed Speech Storage Address Select 6.
56	A8	○	Compressed Speech Storage Address Select 8.
57	A7	○	Compressed Speech Storage Address Select 7.
58	A13	○	Compressed Speech Storage Address Select 13.
59	A12	○	Compressed Speech Storage Address Select 12.
60	A14	○	Compressed Speech Storage Address Select 14.
61	A15	○	Compressed Speech Storage Address Select 15.
62	A17	○	Compressed Speech Storage Address Select 17.
63	A16	○	Compressed Speech Storage Address Select 16.
64	A18	○	Compressed Speech Storage Address Select 18. MSB of the address.
65	$\overline{WE}$	○	Write Enable for Speech Storage.
66	DVDD	-	Digital Positive Supply. 5.0 Volts.
67	N/C	-	No Connect.
68	N/C	-	No Connect.

Note:

1. Pins $\overline{MN0}$ to $\overline{MN7}$, $\overline{PLAY}$, $\overline{RECORD}$, $\overline{ERASE}$, $\overline{STOP}$, $\overline{RATE0}$, $\overline{RATE1}$, $\overline{FORMAT}$, and $\overline{MODE}$ all have internal pull-ups.

RATE SELECT PINS Table 2

Speech Algorithm Rate Selected (hardware mode)	Serial Port Baud Rate (software mode)	RATE1	RATE0
8Kbps	57600	0	0
12Kbps	9600	0	1
16Kbps	2400	1	0
24Kbps	1200	1	1

DTMF DETECT OUTPUT CODING Table 3

Digit / Level Detected	DTMF3	DTMF2	DTMF1	DTMF0
DTMF digit zero (0)	0	0	0	0
DTMF digit one (1)	0	0	0	1
DTMF digit two (2)	0	0	1	0
DTMF digit three (3)	0	0	1	1
DTMF digit four (4)	0	1	0	0
DTMF digit five (5)	0	1	0	1
DTMF digit six (6)	0	1	1	0
DTMF digit seven (7)	0	1	1	1
DTMF digit eight (8)	1	0	0	0
DTMF digit nine (9)	1	0	0	1
DTMF digit asterisk (*)	1	0	1	0
DTMF digit pound (#)	1	0	1	1
AIN > -15dBm0	1	1	0	0
-15 > AIN > -25dBm0	1	1	0	1
-25 > AIN > -40dBm0	1	1	1	0
-40 > AIN	1	1	1	1

AVAILABLE RECORDING CAPACITY Table 4

Amount of Speech Storage in Bits	Algorithm Selected			
	8Kbps	12Kbps	16Kbps	24Kbps
64K	8	5	4	3
128K	16	11	8	5
256K	32	21	16	11
512K	64	43	32	21
1024K	128	85	64	43
2048K	256	171	128	85
4096K	512	341	256	171

Notes:

1. All capacity times are in seconds.
2. Values have been rounded off to the nearest second.

MESSAGE CONVERSION CHART (PARTIAL) Table 5

Message Number	Hex	ASCII	BCD	M N 7	M N 0	Comments
000	00	000	00	11111111		not a valid number
001	01	001	01	11111110		
002	02	002	02	11111101		
003	03	003	03	11111100		
004	04	004	04	11111011		
005	05	005	05	11111010		
006	06	006	06	11111001		
007	07	007	07	11111000		
008	08	008	08	11110111		
248	F8	248	NA	00000111		
249	F9	249	NA	00000110		
250	FA	250	NA	00000101		
251	FB	251	NA	00000100		
252	FC	252	NA	00000011		
253	FD	253	NA	00000010		
254	FE	254	NA	00000001		
255	FF	255	NA	00000000		not a valid number

FORMAT MEMORY SIZE CONVERSION Table 6

Amount of External Speech Memory	MN4	MN3	MN2	MN1	MN0
None (On-Stik Memory)	0	0	0	0	0
32K Bytes	0	0	0	0	1
64K Bytes	0	0	0	1	0
96K Bytes	0	0	0	1	1
128K Bytes	0	0	1	0	0
160K Bytes	0	0	1	0	1
192K Bytes	0	0	1	1	0
224K Bytes	0	0	1	1	1
256K Bytes	0	1	0	0	0
288K Bytes	0	1	0	0	1
320K Bytes	0	1	0	1	0

Amount of External Speech Memory	MN4	MN3	MN2	MN1	MN0
352K Bytes	0	1	0	1	1
384K Bytes	0	1	1	0	0
416K Bytes	0	1	1	0	1
448K Bytes	0	1	1	1	0
480K Bytes	0	1	1	1	1
512K Bytes	1	0	0	0	0

DS2271 SOFTWARE COMMANDS

If the MODE pin on the DS2271 is tied high or left open, then on power-up, the DS2271 will enter into the software mode. In the software mode, the DS2271 is controlled via a set of software commands which are described below. The DS2271 has the ability to echo back (or not) the commands that are sent to it. The echo mode is helpful in applications where the DS2271 is connected to a dumb terminal.

The Play, Record, and Stop commands have a special attribute that is not shared by the other software commands. Certain commands (Current Status, User Port Read, User Port Write, and Stop) can be sent to the Stik while these three commands are still being executed. With all other commands, the user should wait for the current command to finish executing before new commands are issued.

In the echo mode, the user can determine when a command has finished executing by waiting for the greater than (>) prompt. In the non-echo mode, the user can

send the Current Status command to determine when a command has finished executing. Except for the Play, Record, and Stop commands, the Current Status command will wait for the currently executing command to finish before returning its information bytes. For example, if the user sent the Format command followed by a Current Status command, when the DS2271 is done formatting the external memory, it will return the status bytes informing the user that the Stik is idle and ready to accept a new command.

In both the echo and non-echo modes, all of the commands issued to the DS2271 are activated by a carriage return [CR]. If an invalid command is sent to the DS2271, such as a PLAY command without any message number attached, the Stik will ignore the command and wait for a valid command to be issued. In echo mode, [LF][h][u][h][?][CR][LF][>] will also be returned.

All of the characters between brackets (i.e. [and]) are ASCII characters.

Command Name: **ECHO MODE SELECT**

Command Code: ? (ascii)

Function: This command will cause the DS2271 to echo back (or not) all of the commands that are sent to it. The DS2271 always powers up in echo mode.

Option Byte(s): 1 = echo on / 0 = echo off

Returned Byte(s): none

Example 1: The echo is off, the user wishes to turn the echo on.

Send: [?][1][CR]

Receive: [CR][LF][>]

Example 2: The echo is on, the user wishes to turn the echo off.

Send: [?][0][CR]

Receive: [?][0][CR][LF]

Command Name: RECORD A MESSAGE

Command Code: R (ascii)

Function: If this command is issued to the DS2271, the Stik will begin recording the analog signal present at the AIN pin. The DS2271 will continue to record until either a STOP command is issued, or the speech memory fills, or a DTMF digit is received. The compression algorithm should be selected via the ALGORITHM SELECT command before the recording is initiated.

Option Byte(s): Three bytes that describe the message number (001 to 254 inclusive). The hundredths order is sent first and the ones order is sent last.

Returned Byte(s): none

Example: Record message number 7.

Non-Echo Mode: Send: [R][0][0][7][CR]
Receive: nothing

Echo Mode: Send: [R][0][0][7][CR]
Receive: [R][0][0][7][CR][LF][>]

Command Name: PLAY A MESSAGE

Command Code: P (ascii)

Function: If this command is issued to the DS2271, the Stik will begin playing the pre-recorded message contained in the speech memory at the AOUT pin. The DS2271 will continue playing until a STOP command is issued, a DTMF digit is received, or the message is done playing.

Option Byte(s): Three bytes that describe the message number (001 to 254 inclusive). The hundredths order is sent first and the ones order is sent last.

Returned Byte(s): none

Example: Play message number 161.

Non-Echo Mode: Send: [P][1][6][1][CR]
Receive: nothing

Echo Mode: Send: [P][1][6][1][CR]
Receive: [P][1][6][1][CR][LF][>]

Command Name: ERASE A MESSAGE

Command Code: E (ascii)

Function: If this command is issued to the DS2271, the Stik will delete the message from the speech memory. The DS2271 will reorganize the external memory so that no "holes" are left and the maximum recording time will be available.

Option Byte(s): Three characters that described the message number (001 to 254 inclusive). The hundredths order is sent first and the ones order is sent last.

Returned Byte(s): none

Example: Erase message number 26.

Non-Echo Mode: Send: [E][0][2][6][CR]
Receive: nothing

Echo Mode: Send: [E][0][2][6][CR]
Receive: [E][0][2][6][CR][LF][>]

Command Name: **FORMAT THE SPEECH MEMORY**

Command Code: Z (ascii)

Function: This command operates much like the DOS Format command. It will erase all current information in the internal and external speech memory and create a data structure that will be used when messages are recorded.

Option Byte(s): Two characters that describe the number of 32K byte blocks available in the external speech memory. Maximum number of blocks is 16. The speech memory on the DS2271 will be formatted and all external SRAM erased if the option byte is 0.

Returned Byte(s): none

Example: Format a 64K x 8 SRAM.

Non-Echo Mode: Send: [Z][0][2][CR]
Receive: nothing

Echo Mode: Send: [Z][0][2][CR]
Receive: [Z][0][2][CR][LF][>]

Command Name: **STOP**

Command Code: S (ascii)

Function: This command will force the DS2271 to halt either playing or recording a message.

Option Byte(s): none

Returned Byte(s): none

Example: Stop playing a message.

Non-Echo Mode: Send: [S][CR]
Receive: nothing

Echo Mode: Send: [S][CR]
Receive: [S][CR][LF][>]

Command Name: **TONE GENERATION**

Command Code: T (ascii)

Function: This command will cause the DS2271 to generate either a DTMF tone or single frequency tone at the AOUT pin. The tone will be generated continuously until a tone value of 0 is sent to the DS2271. All of the DTMF tones are transmitted at a level of -3dBm0. The 350Hz and 620 Hz tones are transmitted at -12dBm0 and the 1004 Hz tone is transmitted at 0dBm0 (0dbm0 = 1.231Vrms).

Option Byte(s): A byte that describes the DTMF or single tone that is to be generated:

0 = DTMF digit zero	8 = DTMF digit eight
1 = DTMF digit one	9 = DTMF digit nine
2 = DTMF digit two	# = DTMF digit pound
3 = DTMF digit three	* = DTMF digit asterisk
4 = DTMF digit four	T = 1004Hz single tone
5 = DTMF digit five	D = 350Hz single tone
6 = DTMF digit six	B = 620Hz single tone
7 = DTMF digit seven	0 = terminate tone generation (off state)

Returned Byte(s): none

Example: Generate DTMF digit number 3.

```
Non-Echo Mode:      Send: [T][3][CR]
                   Receive: nothing

Echo Mode:          Send: [T][3][CR]
                   Receive: [T][3][CR][LF]>]
```

Command Name:	ALGORITHM SELECT		
Command Code:	A (ascii)		
Function:	This command selects the algorithm rate at which the DS2271 will either compress (for recording) or expand (for playback).		
Option Byte(s):	Two bytes that describe the algorithm to be used for either playback or recording: 08 = 8Kbps 16 = 16Kbps 12 = 12Kbps 24 = 24Kbps		
Returned Byte(s):	none		
Example:	Set to the 12Kbps algorithm.		
Non-Echo Mode:	Send: [A][1][2][CR] Receive: nothing		
Echo Mode:	Send: [A][1][2][CR] Receive: [A][1][2][CR][LF][>]		

Command Name:	DIRECTORY OF SPEECH MESSAGES
Command Code:	D (ascii)
Function:	This command will cause the DS2271 to return a list of the current messages stored in the external memory and their respective length measured in records.
Option Byte(s):	none
Returned Byte(s):	Each currently stored message will return a total of seven digits. The first three digits will be the message number and the next four digits will be the message size in number of records (a record = 128 bytes). The message number and the message size are separated by an ASCII space.
Example:	Message numbers 5 and 14 are 49 and 122 records in length, respectively.
Non-Echo Mode:	Send: [D][CR] Receive: [0][0][5][][0][0][4][9][CR][0][1][4][][0][1][2][2][CR][CR]
Echo Mode:	Send: [D][CR] Receive: [D][CR][LF][0][0][5][][0][0][4][9][CR][LF][0][1][4][][0][1][2][2][CR][LF][CR][LF]>]

Command Name:	MEMORY FREE
Command Code:	M (ascii)
Function:	This command will cause the DS2271 to return the amount of free speech memory (in number of records) that is currently available. A record is 128 bytes long.
Option Byte(s):	none
Returned Byte(s):	The DS2271 will return a four digit number describing the available memory.
Example:	2034 records (2034 x 128 = 260K bytes) of memory space are available.
Non-Echo Mode:	Send: [M][CR] Receive: [2][0][3][4][CR]

Echo Mode: Send: [M][CR]
 Receive: [M][CR][LF][2][0][3][4][CR][LF][>]

Command Name: **CURRENT STATUS**

Command Code: C (ascii)

Function: This command will cause the DS2271 to return the current status of the Stik.

Option Byte(s): none

Returned Byte(s): The DS2271 will return two pieces of information describing the current status.
 1. B = busy / I = idle (1 character); the DS2271 will return a busy indication if it is currently
 executing either a Play, Record, or Stop command.
 2. the DTMF digit or input level that is being currently reported as detailed below (one char-
 acter):

0 = DTMF digit zero	8 = DTMF digit eight
1 = DTMF digit one	9 = DTMF digit nine
2 = DTMF digit two	# = DTMF digit pound
3 = DTMF digit three	* = DTMF digit asterisk
4 = DTMF digit four	H = AIN > -15dBm0
5 = DTMF digit five	M = -15 > AIN > -25dBm0
6 = DTMF digit six	L = -25 > AIN > -40dBm0
7 = DTMF digit seven	O = -40 > AIN

Example: A message is being played and the DTMF digit number 6 is being received.

Non-Echo Mode: Send: [C][CR]
 Receive: [B][][6][CR]

Echo Mode: Send: [C][CR]
 Receive: [C][CR][LF][B][][6][CR][LF][>]

Command Name: **USER PORT WRITE**

Command Code: V (ascii)

Function: This command will cause the DS2271 to configure one of the eight user port bits (UPB0 to UPB7) either high or low. The user should configure a port bit high if it is intended to be used as an input. The default value for all of the user port bits is the high state (or input state).

Option Byte(s): Two bytes. The first one contains the number of the user port bit that is to be written to and the second byte is the value (either a 1 or a 0).

Returned Byte(s): none

Example: UPB6 should be driven high.

Non-Echo Mode: Send: [V][6][1][CR]
 Receive: nothing

Echo Mode: Send: [V][6][1][CR]
 Receive: [V][6][1][CR][LF][>]

Command Name: **USER PORT READ**

Command Code: U (ascii)

Function: This command will cause the DS2271 to read one of the eight available user port bits (UPB0 to UPB7). The port bit to be read should have been configured high by the User Port Write command before it is read.

Option Byte(s): A byte that contains the number of the user port bit to be read.
 Returned Byte(s): A byte that will return the value at the user port (either a 1 or a 0).
 Example: User port bit 4 is tied low.
 Non-Echo Mode: Send: [U][4][CR]
 Receive: [0][CR]
 Echo Mode: Send: [U][4][CR]
 Receive: [U][4][CR][LF][0][CR][LF][>]

Command Name: **GET DTMF DIGITS**

Command Code: G (ascii)

Function: This command is used to obtain DTMF digits that are received by the Stik. The DS2271 contains a 16-digit buffer. This buffer is cleared each time the Get DTMF Digits command is issued. The DTMF digits will be returned in the order that they are received (i.e., first one received is the first one returned).

Option Byte(s): none
 Returned Byte(s): Sixteen characters that contain the first DTMF digits received after previous Get DTMF command was executed.
 Example: The DTMF digits 3, 6, and # have been received.
 Non-Echo Mode: Send: [G][CR]
 Receive: [3][6][#][CR]
 Echo Mode: Send: [G][CR]
 Receive: [G][CR][LF][3][6][#][CR][LF][>]

Command Name: **SOFTWARE VERSION QUERY**

Command Code: Q (ascii)

Function: This command will cause the DS2271 to return the version of software that it contains. The software versions in the DS2271 are organized by date code with two digits for the year and two digits for the week.

Option Byte(s): none
 Returned Byte(s): Four characters that describe the version.
 Example: A DS2271 contains software version 9106.
 Non-Echo Mode: Send: [Q][CR]
 Receive: [9][1][0][6][CR]
 Echo Mode: Send: [Q][CR]
 Receive: [Q][CR][LF][9][1][0][6][CR][LF][>]

Command Name: **FETCH SPEECH DATA**

Command Code: F (ascii)

Function: This command is used to obtain speech data from the speech memory. If the invalid message number of 255 is used, then the DS2271 will dump all of the messages contained in the speech memory.

Option Byte(s): Three bytes describe the message number (001 to 254 inclusive). The hundredths order is sent first and the ones order is sent last.

Returned Byte(s): Speech data is fetched from the DS2271 on a record by record basis.

Example: Fetch message number 27 from the speech memory. Message number 27 was recorded at 12Kbps and is two records long.

Non-Echo Mode: Send: [F][0][2][7][CR]
Receive:
[1][B][][4][A][]...126 bytes of speech data...[CR]
[1][B][][4][2][]...126 bytes of speech data...[CR][CR]

Echo Mode: Send: [F][0][2][7][CR]
Receive: [F][0][2][7][CR][LF]
[1][B][][4][A][]...126 bytes of speech data...[CR][LF]
[1][B][][4][2][]...126 bytes of speech data...[CR][LF][CR][LF][>]

Command Name: **LOAD SPEECH DATA**

Command Code: L (ascii)

Function: This command is used to load prerecorded digital speech data into the speech memory. The loaded prerecorded speech will be tagged with the message number that is sent along with this command (i.e., the first byte of each speech record is replaced with the value sent along with the Load command). The Load command will add speech data to what already exists in the memory. Hence, the user should use the Memory Free command to insure that there is enough free space available before loading new data. Also, since the Load command will not overwrite current messages, the user should use the Directory command to insure that a message is not loaded with a message number that already exists in the speech memory. If the invalid message number of 255 is used, then the DS2271 will expect to load multiple speech messages at once. In this application, the loaded speech keeps the message number that is contained in the first byte of each speech record.

Option Byte(s): Three bytes describe the message number (001 to 254 inclusive). The hundredths order is sent first and the ones order is sent last. Speech data is loaded to the DS2271 on a record-by-record basis.

Returned Byte(s): none

Example: To load message number 6 into the speech memory. Message number 6 was recorded at 16Kbps and is three records long.

Non-Echo Mode: Send: [L][0][0][6][CR]
[0][6][][4][C][]...126 bytes of speech data...[CR]
[0][6][][4][4][]...126 bytes of speech data...[CR]
[0][6][][4][4][]...126 bytes of speech data...[CR][CR]
Receive: nothing

Echo Mode: Send: [L][0][0][6][CR]
[0][6][][4][C][]...126 bytes of speech data...[CR]
[0][6][][4][4][]...126 bytes of speech data...[CR]
[0][6][][4][4][]...126 bytes of speech data...[CR][CR]
Receive: [L][0][0][6][CR][LF]
[0][6][][4][C][]...126 bytes of speech data...[CR][LF]
[0][6][][4][4][]...126 bytes of speech data...[CR][LF]
[0][6][][4][4][]...126 bytes of speech data...[CR][LF][CR][LF][>]

ABSOLUTE MAXIMUM RATINGS*

Voltage on Any Pin Relative to Ground

-1.0V to 7.0V

Voltage on AIN and AOUT

-7.0V to +7.0V

Voltage on AVSS

-7.0V to +0.3V

Operating Temperature

0°C to +70°C

Storage Temperature

-40°C to +70°C

* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

RECOMMENDED DC OPERATING CONDITIONS

(0°C to 70°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Logic 1	V_{IH}	3.5		$V_{DD}+0.3$	V	
Logic 0	V_{IL}	-0.3		+0.8	V	
Digital Positive Supply	V_{DVDD}	4.75		5.25	V	
Analog Positive Supply	V_{AVDD}	4.75		5.25	V	
Analog Negative Supply	V_{AVSS}	-4.75		-5.25	V	

DC CHARACTERISTICS(0°C to 70°C; $AVDD = DVDD = 5V \pm 5\%$; $AVSS = -5V \pm 5\%$)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
DVDD Supply Current	I_{DVDD}		50		mA	
AVDD Supply Current	I_{AVDD}		6		mA	
AVSS Supply Current	I_{AVSS}		5		mA	

ANALOG CHARACTERISTICS(0°C to 70°C; $AVDD = DVDD = 5V \pm 5\%$; $AVSS = -5V \pm 5\%$)

PARAMETER	MIN	TYP	MAX	UNITS	NOTES
AIN Input Range	-2.5		2.5	V_{peak}	
AIN Input Resistance		10		Kohms	
AOUT Output Range	-2.5		2.5	V_{peak}	
AOUT Output Resistance		0.5	1	Kohm	
AOUT Offset Voltage	-50		50	mV	

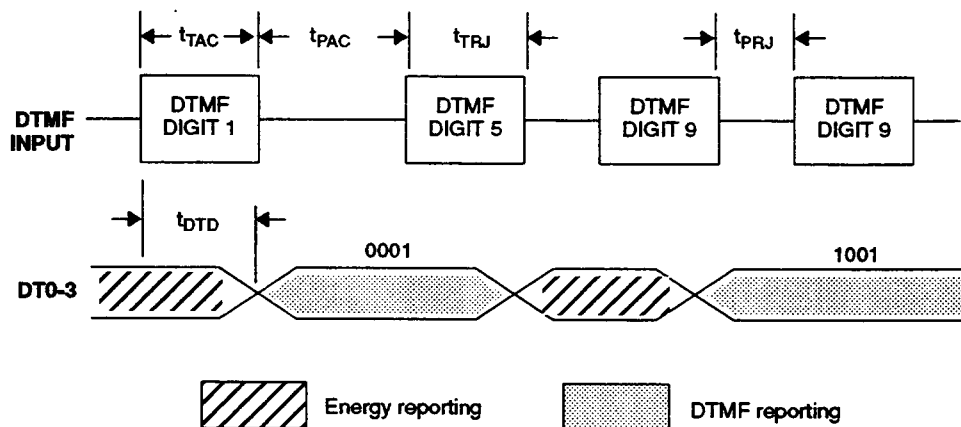
DTMF RECEIVER TIMING

(0°C to 70°C; AVDD=DVDD = 5V ± 5%; AVSS = -5V ± 5%)

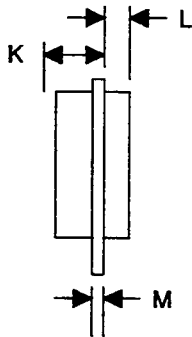
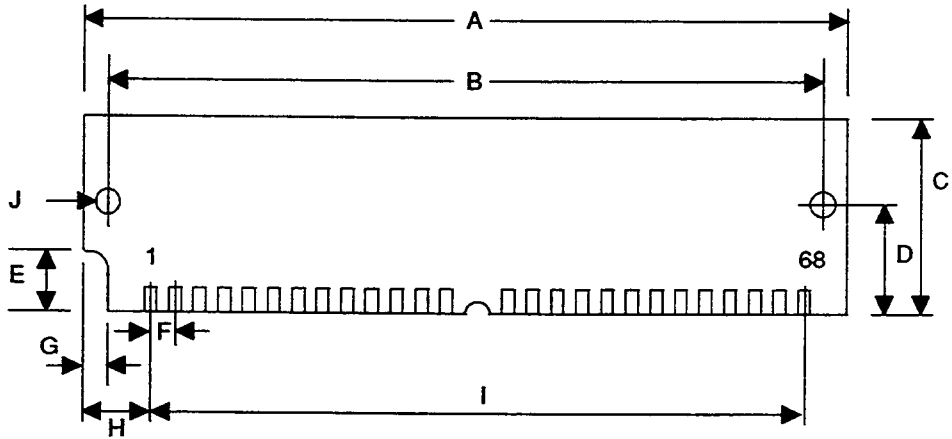
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Tone Duration Accept	t_{TAC}	40			msec	1
Tone Duration Reject	t_{TRJ}			20	msec	1
Interdigit Pause Accept	t_{PAC}	40			msec	1
Interdigit Pause Reject	t_{PRJ}			20	msec	1
Detect Delay	t_{DTD}	25		45	msec	1

NOTE:

1. See Figure 6.

DTMF RECEIVER TIMING Figure 6

DS2271 SPEECH STIK



DIMENSION	INCHES
A	4.050
B	3.784
C	1.000
D	0.400
E	0.250
F	0.050
G	0.080
H	0.250
I	3.550
J	0.125 DIA
K	0.200
L	0.100
M	0.050