



TECHNICAL DATA

AN EXCLUSIVE RADIO SHACK SERVICE TO THE EXPERIMENTER

SP0256-~~AK2~~ Voice Synthesizer -017

Features

- Natural Speech
- Stand Alone Operation with Inexpensive Support Components
- Wide Operating Voltage
- Word, Phrase, or Sentence Library, ROM Expandable
- Expandable to 491K of ROM Directly
- Simple Interface to Most Microcomputers or Microprocessors
- Supports L.P.C. Synthesis: Formant Synthesis: Allophone Synthesis

Description

The SP0256 (Speech Processor) is a single chip N-Channel MOS LSI device that is able, using its stored program, to synthesize speech or complex sounds.

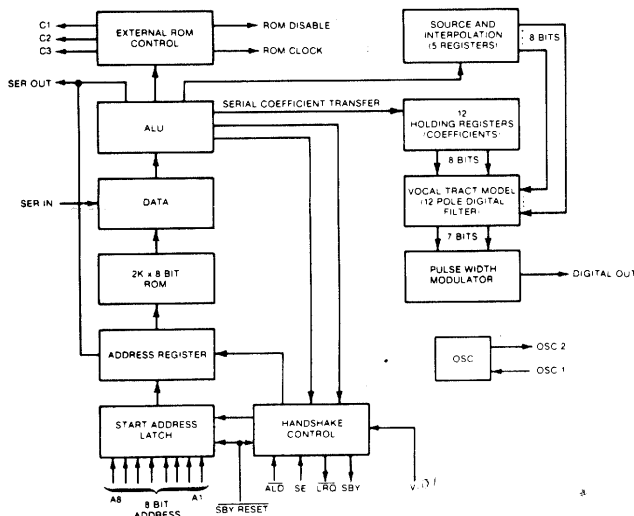
The achievable output is equivalent to a flat frequency response ranging from 0 to 5kHz, a dynamic range of 42dB, and a signal-to-noise ratio of approximately 35dB.

The SP0256 incorporates four basic functions:

- A software programmable digital filter that can be made to model a VOCAL TRACT.
- A 16K ROM which stores both data and instructions (THE PROGRAM).
- A MICROCONTROLLER which controls the data flow from the ROM to the digital filter, the assembly of the "word strings" necessary for linking speech elements together, and the amplitude and pitch information to excite the digital filter.
- A PULSE WIDTH MODULATOR that creates a digital output which is converted to an analog signal when filtered by an external low pass filter.

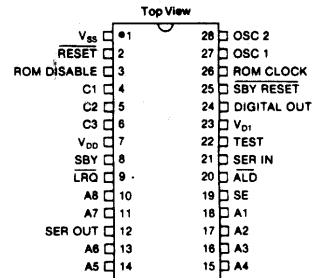
Applications

- Telecommunications
- Appliances
- Computer Peripherals
- Automotive
- Personal Computers
- Toys/Games
- Educational Aids
- Warning Systems
- Security Systems
- Electronic Musical Instruments
- Aids to the Blind
- Narrow Bandwidth
- Communication Systems



BLOCK DIAGRAM FOR SP0256

PIN CONFIGURATION 28 LEAD DUAL IN LINE



Absolute Maximum Ratings

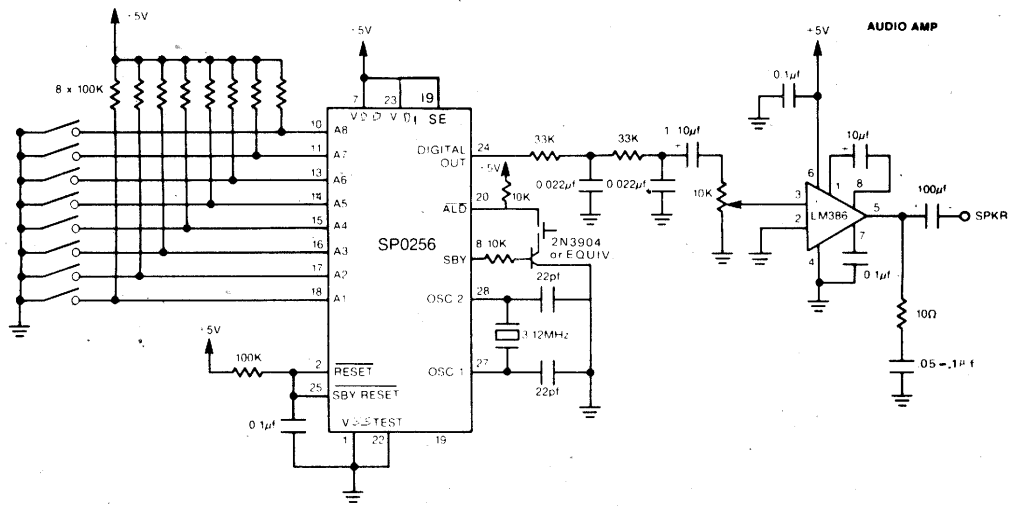
V _{D1} V _{DD}	-0.3V to +12V
Storage Temperature	-25°C to +125°C
Clock Crystal Frequency	3.12MHz

DC CHARACTERISTICS

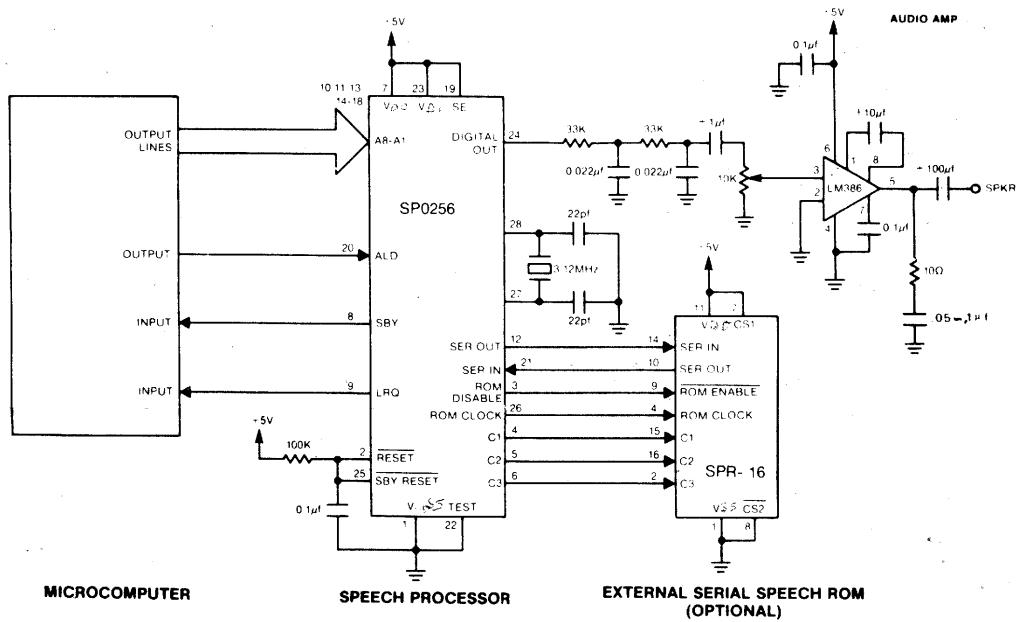
Operating Temperature T_A = 0°C to +70°C

Characteristics	Sym	Min	Max	Units
Primary Supply Voltage	V _{DD}	4.6	7	V
Standby Supply Voltage	V _{D1}	4.6	7	V
Primary Supply Current	I _{DD}	-	90	mA
Standby Supply Current	I _{D1}	-	-	mA
Inputs				
A1-A8, ALD, SER IN, TEST, SE				
Logic 0	V _{IL}	0	0.6	V
Logic 1	V _{IH}	2.4	V _{D1}	V
Capacitance	C _{IN}	-	10	pf
Leakage	I _{LC}	-	± 10	µA
RESET, SBY RESET				
Logic 0	V _{IL1}	0	0.6	V
Logic 1	V _{IH1}	3.6	V _{D1}	V
Oscillator Leakage	-	1.0	10	µA
OSC 1 (7.0V, no load)				
Outputs				
SBY, DIGITAL OUT, C1, C2, C3, LRQ, ROM DISABLE, ROM CLOCK, SER OUT				
Logic 0 (0.72mA load)	V _{OL}	0	0.6	V
Logic 1 (-50µA load)	V _{OH}	3.5	V _{D1}	V

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TYPICAL APPLICATION STAND ALONE CONFIGURATION

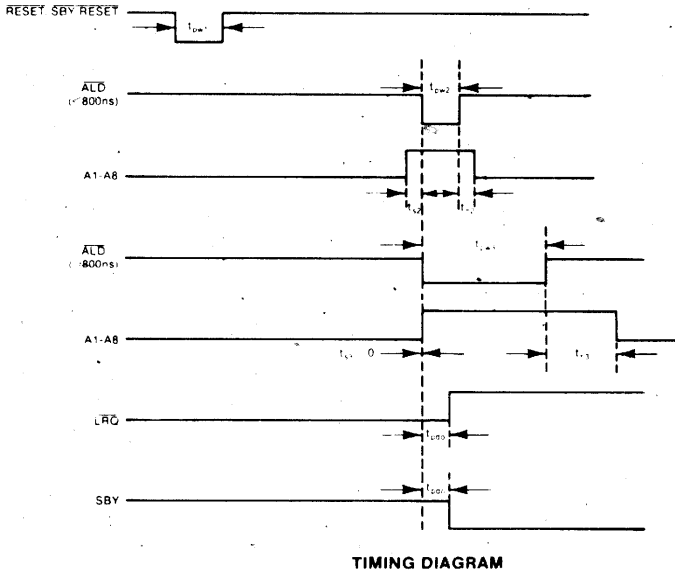


TYPICAL APPLICATION MICROCOMPUTER INTERFACE

AC CHARACTERISTICS

Operating Temperature: $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$

Characteristics	Sym	Min	Max	Units
Clock Frequency, 3.120 MHz	—	—	—	MHz
Reset, SBY Reset	t_{pw1}	100	—	μs
ALD (< 800ns)	t_{pw2}	200	800	ns
A1-A8 Set Up	t_{s2}	160	—	ns
A1-A8 Hold	t_{h2}	160	—	ns
ALD ($\geq 800\text{ns}$)	t_{pw3}	800	—	ns
A1-A8 Set Up	t_{s3}	0	—	ns
A1-A8 Hold	t_{h3}	1200	—	ns
$\overline{\text{LRQ}}$	t_{pd0}	—	640	ns
SBY	t_{pd0}	—	640	ns

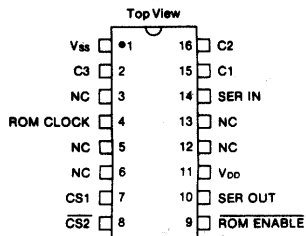


Vocabulary List

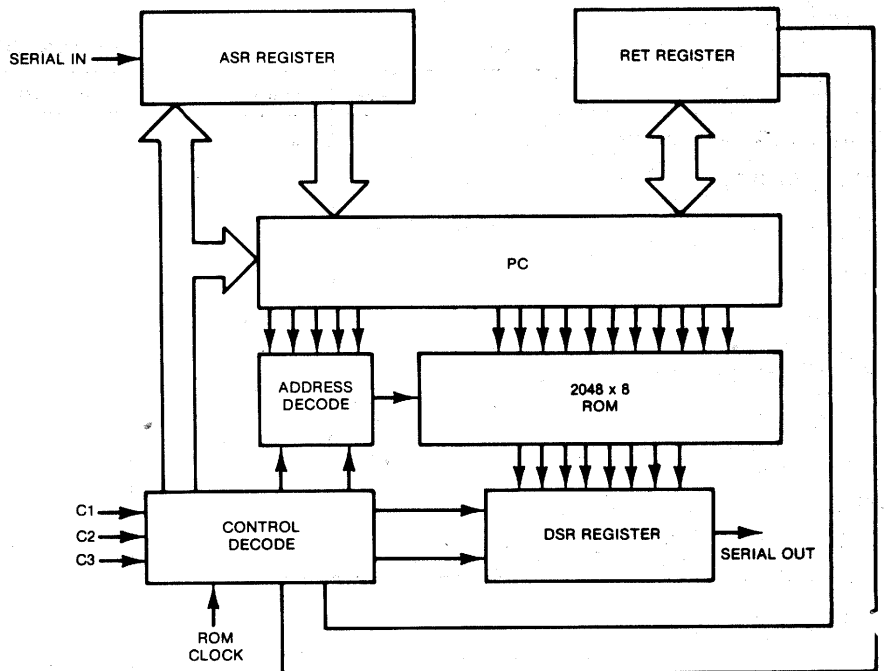
Address	Word	Address	Word
0	Oh	18	Eighteen
1	One	19	Nineteen
2	Two	20	Twenty
3	Three	21	Thirty
4	Four	22	Forty
5	Five	23	Fifty
6	Six	24	It Is
7	Seven	25	A.M.
8	Eight	26	P.M.
9	Nine	27	Hour
10	Ten	28	Minute
11	Eleven	29	Hundred Hour
12	Twelve	30	Good Morning
13	Thirteen	31	Attention Please
14	Fourteen	32	Please Hurry
15	Fifteen	33	Melody A
16	Sixteen	34	Melody B
17	Seventeen	35	Melody C

PIN FUNCTIONS

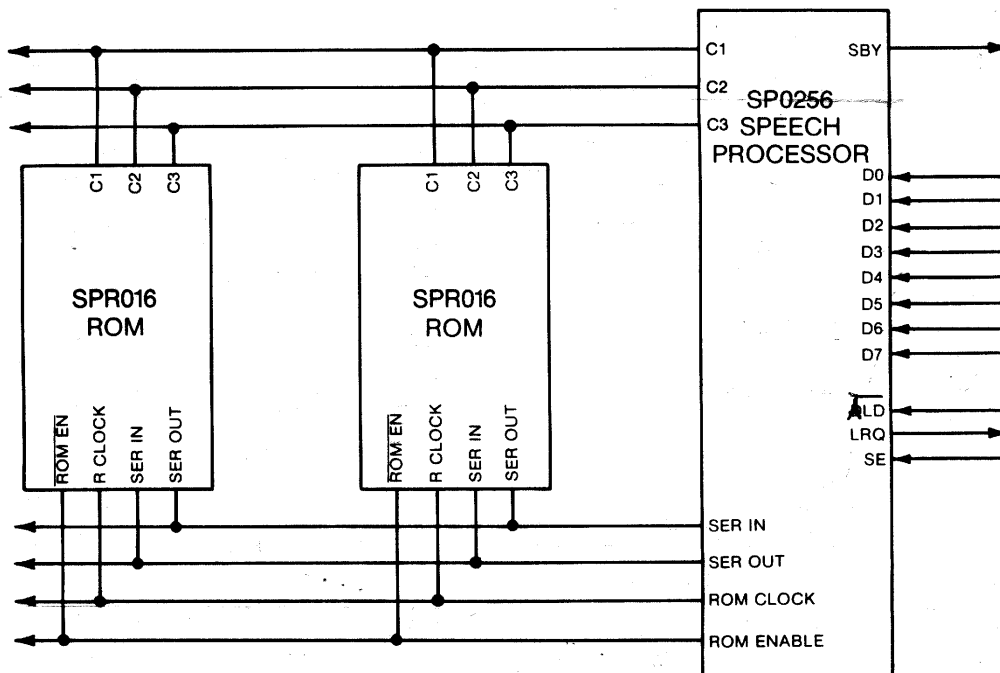
Pin Number	Name	Function
1	V_{SS}	Ground
2	RESET	A logic 0 resets the SP. Must be returned to a logic 1 for normal operation.
3	ROM DISABLE	For use with an external serial speech ROM. A logic 1 disables the external ROM.
4,5,6	C1,C2,C3	Output control lines used by an external serial speech ROM.
7	V_{DD}	Primary power supply.
8	SBY	STANDBY. A logic 1 output indicates that the SP is inactive (i.e. not talking) and V_{DD} can be powered down externally to conserve power. When the SP is reactivated by an address being loaded, SBY will go to logic 0.
9	$\overline{\text{LRQ}}$	LOAD REQUEST. $\overline{\text{LRQ}}$ is a logic 1 output whenever the input buffer is full. When $\overline{\text{LRQ}}$ goes to a logic 0, the input port is loaded by placing the 8 address bits on A1-A8 and pulsing the ALD input.
10,11,13,14,15,16,17,18	A8,A7,A6,A5,A4,A3,A2,A1	8-bit address which defines any one of 256 speech entry points.
12	SER OUT	SERIAL ADDRESS OUT. This output transfers a 16-bit address serially to an external speech ROM.
19	SE	STROBE ENABLE. Normally held in a logic 1 state. When tied to ground, ALD is disabled and the SP will automatically latch in the address on the input bus approximately $1\mu\text{s}$ after detecting a logic 1 on any address line.
20	ALD	ADDRESS LOAD. A negative pulse on this input loads the 8 address bits into the input port. The leading edge of this pulse causes $\overline{\text{LRQ}}$ to go high.
21	SER IN	SERIAL IN. This is an 8-bit serial data input from an external speech ROM.
22	TEST	A logic 1 places the SP in test mode. This pin should normally be grounded.
23	V_{D1}	Standby power supply for the interface logic and controller.
24	DIGITAL OUT	Pulse width modulated digital speech output which, when filtered by a 5kHz low pass filter and amplified, will drive a loudspeaker.
25	$\overline{\text{SBY RESET}}$	STANDBY RESET. A logic 0 resets the interface logic. Normally should be a logic 1.
26	ROM CLOCK	1.56MHz clock for an external serial speech ROM.
27	OSC 1	XTAL IN. Input connection for a 3.12MHz crystal.
28	OSC 2	XTAL OUT. Output connection for a 3.12MHz crystal.



Pin Configuration for SPR016



BLOCK DIAGRAM FOR SPR016



Simple Interface of SPR016s to SP0256

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