TECHNICAL DATA

AN EXCLUSIVE RADIO SHACK SERVICE TO THE EXPERIMENTER

SP0256-AL2 Voice Synthesizer

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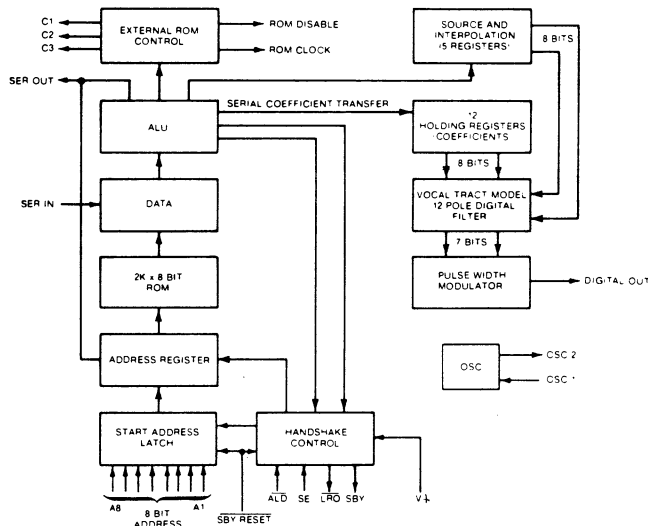
The achievable output is equivalent to a flat frequency response ranging from 0 to 5kHz, a dynamic range of 42dB, and a signal-to-noise ratio of approximately 35dB.

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.
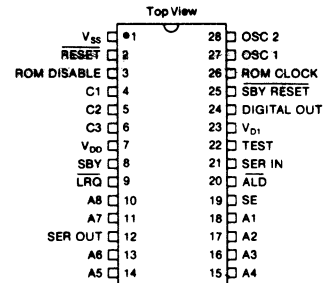
Applications

- Telecommunications
- Appliances
- Computer Peripherals
- Automotive
- Personal Computers
- Toys/Games
- Educational Aids

- Warning Systems
- Security Systems
- Electronic Musical Instruments
- Aids to the Blind
- Narrow Bandwidth
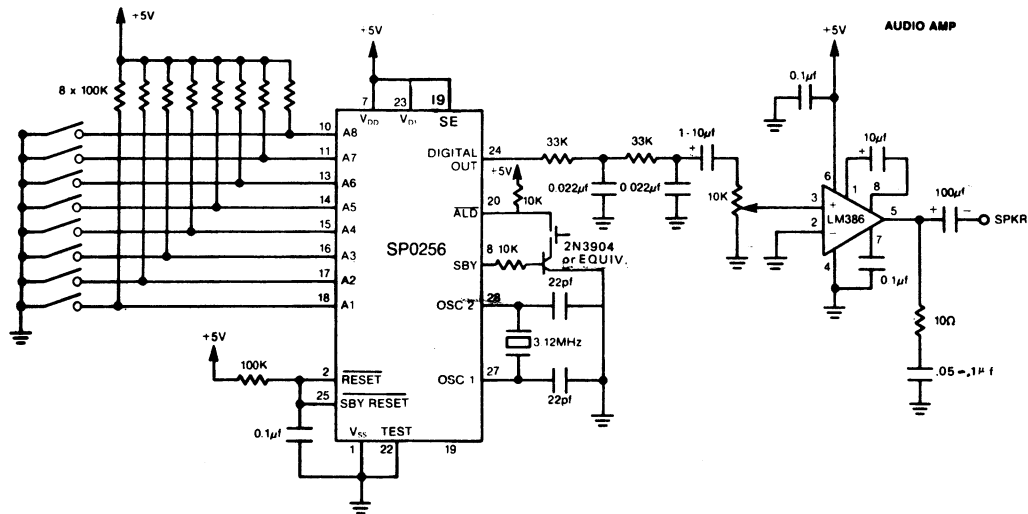- Communication Systems

PIN CONFIGURATION
28 LEAD DUAL IN LINE

Top View

Pin	Signal		Pin	Signal
1	V_{SS}		28	OSC 2
2	RESET		27	OSC 1
3	ROM DISABLE		26	ROM CLOCK
4	C1		25	SBY RESET
5	C2		24	DIGITAL OUT
6	C3		23	V_{D1}
7	V_{DD}		22	TEST
8	SBY		21	SER IN
9	LRQ		20	ALD
10	A8		19	SE
11	A7		18	A1
12	SER OUT		17	A2
13	A6		16	A3
14	A5		15	A4

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 OSC 1 (7.0V, no load)	—		1.0	10	μA
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

BLOCK DIAGRAM FOR SP0256

CUSTOM PACKAGED IN USA BY RADIO SHACK, A DIVISION OF TANDY CORPORATION

TYPICAL APPLICATION STAND ALONE CONFIGURATION
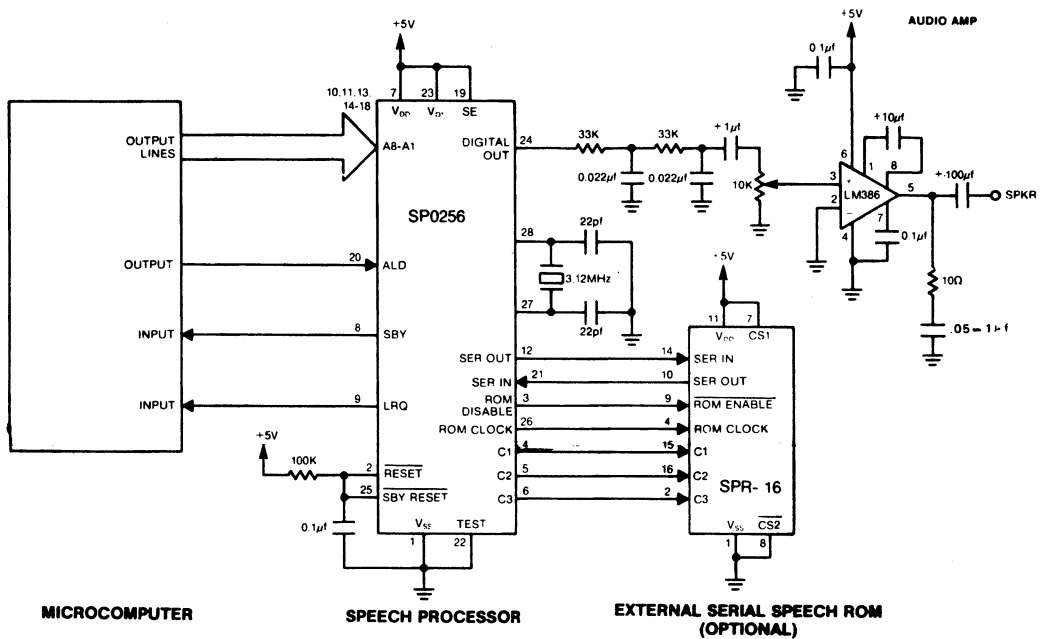
MICROCOMPUTER   SPEECH PROCESSOR   EXTERNAL SERIAL SPEECH ROM
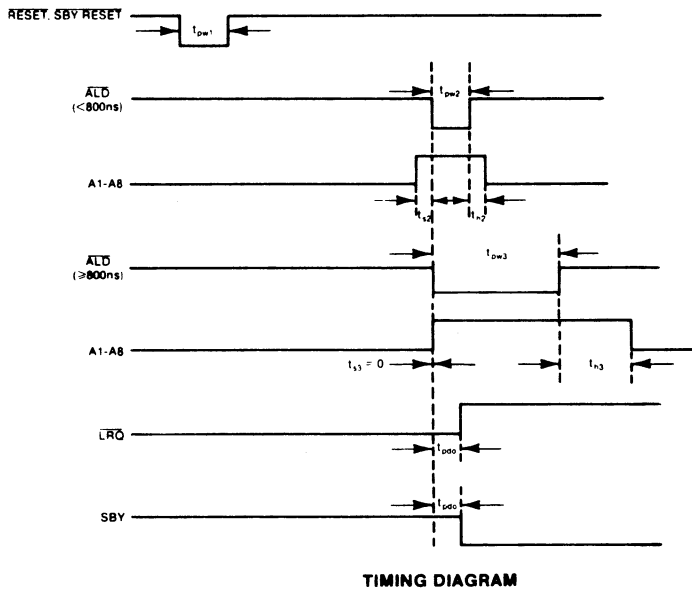   (OPTIONAL)

TYPICAL APPLICATION MICROCOMPUTER INTERFACE

AC CHARACTERISTICS
Operating Temperature: $T_A = 0°C$ to $+70°C$

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 (≥800ns)	t_{pw3}	800	—	ns
A1-A8 Set Up	t_{s3}	0	—	ns
A1-A8 Hold	t_{h3}	1200	—	ns
LRQ	t_{pd0}	—	640	ns
SBY	t_{pd0}	—	640	ns

TIMING DIAGRAM

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	LRQ	LOAD REQUEST. LRQ is a logic 1 output whenever the input buffer is full. When 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 1μs 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 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	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.
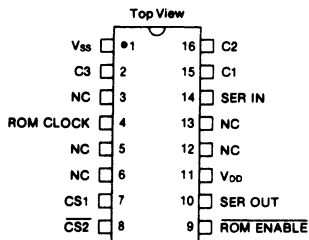
Pin Configuration for SPR016
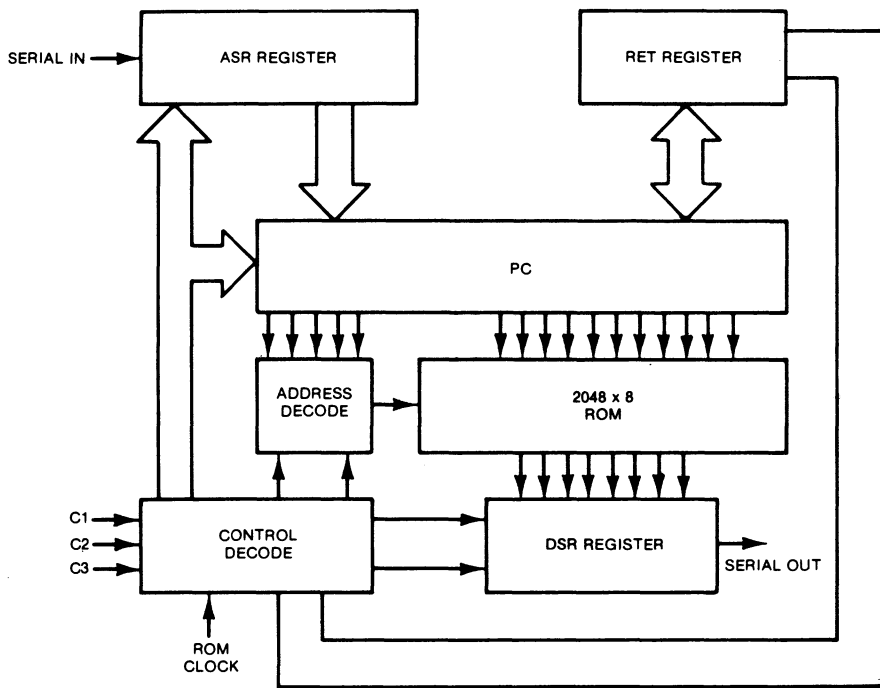
BLOCK DIAGRAM FOR SPR016
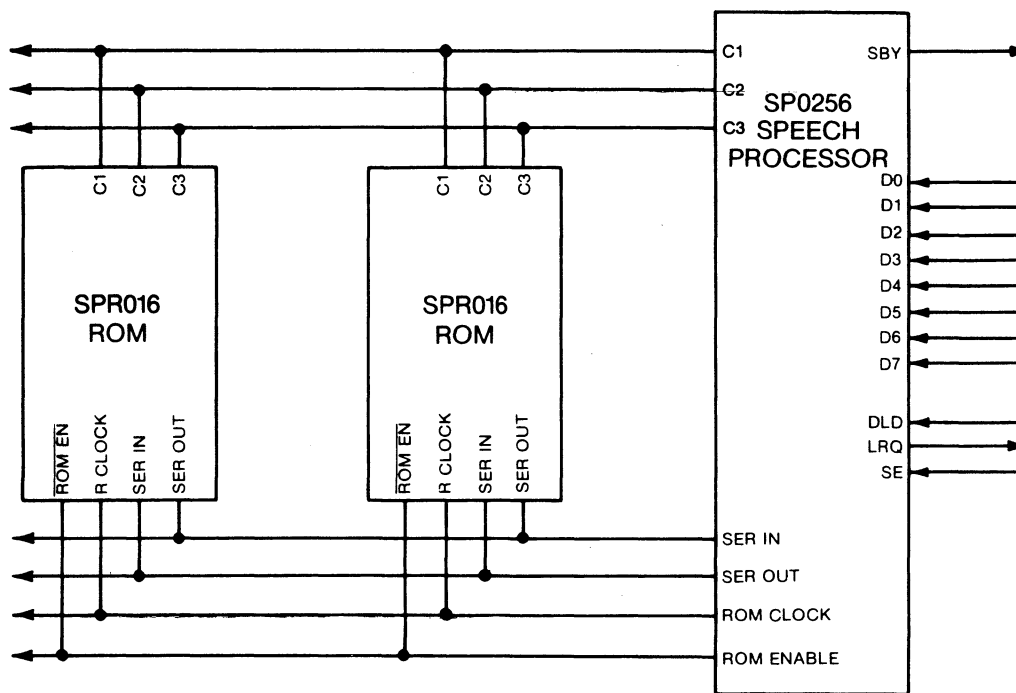
Simple Interface of SPR016s to SP0256

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