T-77-13

SHARP

NEW PRODUCT INFORMATION
PRELIMINARY

LR3987

Low Voltage Voice Synthesizer LSI with Voice Data ROM

Description

The LR3987 is a voice synthesizer LSI with 256K bit ROM for voice data memory.

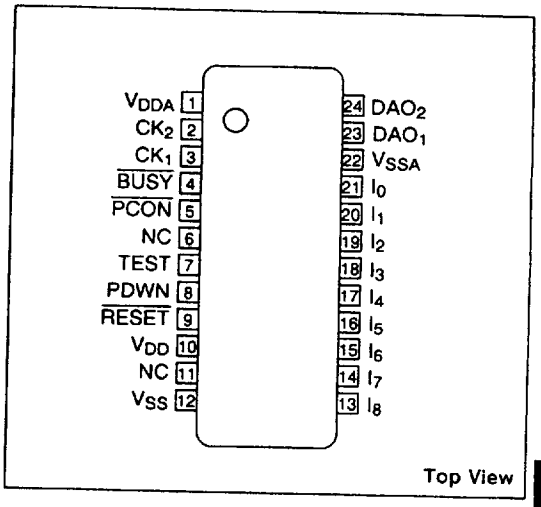
This device is designed by using unique waveform coding system which obtains high quality sound output.

It is suitable for use in operation guide message effect sound, alarm message and so forth of a variety of battery back-up systems due to its low voltage supply source.

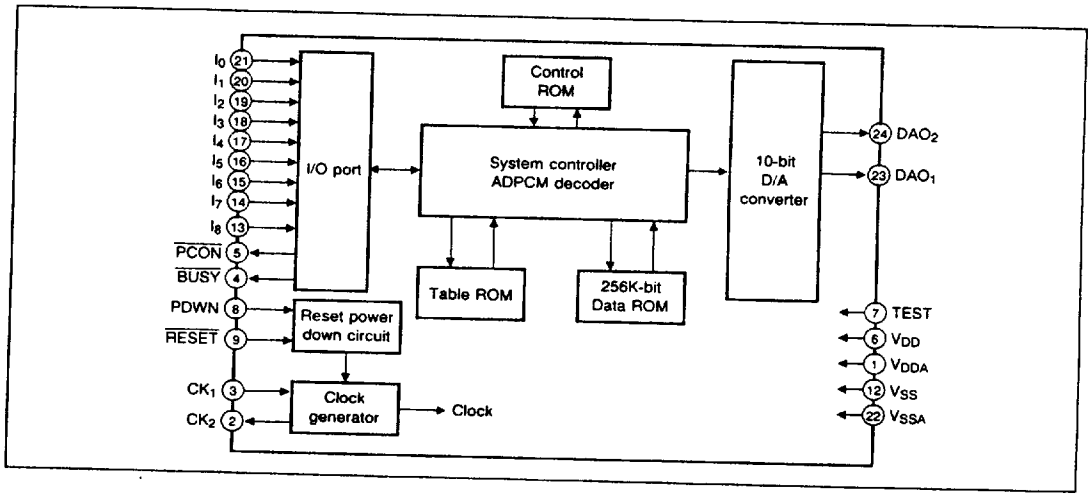
Features

1. Voice data ROM: 256K bits
   Voice output time: 20 sec. (MAX.)
2. Unique waveform coding system for high quality sound
   (Variable length code ADPCM and tree code)
3. Melody generator
4. Voice data compression cycling
5. Serial/Parallel control input selectable
6. CPU control or switch control mode available
7. Standby function for low power consumption
8. Power supply: 2.7 to 5.5V
9. Package: 24-pin, 450mil SOP

Pin Connections



Block Diagram



LR3987 Low Voltage Voice Synthesizer LSI with Voice Data ROM

Pin Descriptions

Pin name	I/O	Function
I_0-I_6	I	The I_0-I_6 pins are used to specify the voice output phrase No. in a parallel control input. The I_0 and I_1 pins are used, and the rest are left unused in a serial control input.
I_7	–	The I_7 is left unused, and must be kept low level.
I_8	I	The I_8 is used to start voice output. It is left unused in a serial control input.
$\overline{RESET}$	I	The $\overline{RESET}$ pin is used for initialization of the device.
PDWN	I	Applying a High level signal to the PDWN pin places the device in standby mode.
$\overline{BUSY}$	O	The $\overline{BUSY}$ output pin goes Low during voice output.
$\overline{PCON}$	O	The $\overline{PCON}$ pin is used to control the power supply for external circuits.
DAO_1	O	The DAO_1 pin is a D/A output pin.
CK_1	I	The CK_1 and CK_2 connect with an external crystal oscillator.
CK_2	O	The CK_1 is used to input the external clock.
TEST	I	The TEST pin must be kept Low level or non-connected.
V_{DD}	–	The V_{DD} pin is the digital power supply input.
V_{SS}	–	The V_{SS} pin is the digital ground.
V_{DDA}	–	The V_{DDA} pin is the analog power supply input.
V_{SSA}	–	The V_{SSA} pin is the analog ground.

Absolute Maximum Ratings ($V_{SS} = V_{SSA} = 0V$, $V_{DD} = V_{DDA}$)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{DD}	– 0.3 to + 7.0	V
Supply voltage	V_{DDA}	– 0.3 to + 7.0	V
Input voltage	V_{IN}	– 0.3 to V_{DD} + 0.3	V
Output voltage	V_{OUT}	– 0.3 to V_{DD} + 0.3	V
Storage temperature	Tstg	– 55 to + 150	°C

Recommended Operating Conditions

($V_{SS} = 0V$)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{DD}	2.5 to 5.5	V
Supply voltage	V_{DDA}	2.5 to 5.5	V
Input voltage	V_{IN}	0 to V_{DD}	V
Output voltage	V_{OUT}	0 to V_{DD}	V
Oscillator frequency	fosc	2 ± 5%	MHz
Operating temperature	Topr	– 10 to + 70	°C

■ DC Characteristics

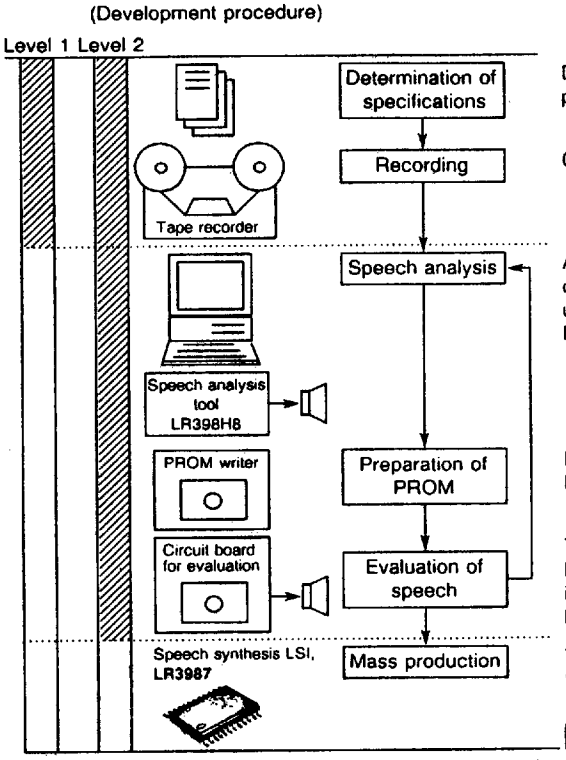
(1) 3V power supply ($V_{DD} = V_{DDA} = 3.0V$, fosc = 2MHz, Topr = 25°C)

Parameter	Symbol	Applicable pins	Condition	MIN.	TYP.	MAX.	Unit
Input voltage	V_{IH}	I_0-I_6, I_8, $\overline{RESET}$, PDWN		2.4			V
	V_{IL}					0.3	V
Input current	I_{IH1}	$\overline{RESET}$, PDWN	$V_{IN} = V_{DD}$			1	μA
	I_{IL1}		$V_{IN} = 0V$			− 120	μA
	I_{IH2}	I_0-I_6, I_8, CK_1	$V_{IN} = V_{DD}$			1	μA
	I_{IL2}		$V_{IN} = 0V$			− 1	μA
Output voltage	V_{OH}	$\overline{PCON}$, $\overline{BUSY}$	$I_0 = 1mA$	2.6			V
	V_{OL}		$I_0 = -1mA$			0.4	V
Current consumption	I_{DD}	V_{DD}, V_{SS}	Operating, Outputs open		1.5	3	mA
			Standby		1	5	μA
	I_{DDA}	V_{DDA}, V_{SSA}	Operating, Outputs open		1.5	3	mA
			Standby		1	5	μA

(2) 5V power supply ($V_{DD} = V_{DDA} = 5.0V$, fosc = 2MHz, Topr = 25°C)

Parameter	Symbol	Applicable pins	Condition	MIN.	TYP.	MAX.	Unit
Input voltage	V_{IH}	I_0-I_6, I_8, $\overline{RESET}$, PDWN		4.0			V
	V_{IL}					1.0	V
Input current	I_{IH1}	$\overline{RESET}$, PDWN	$V_{IN} = V_{DD}$			1	μA
	I_{IL1}		$V_{IN} = 0V$			− 200	μA
	I_{IH2}	I_0-I_6, I_8, CK_1	$V_{IN} = V_{DD}$			1	μA
	I_{IL2}		$V_{IN} = 0V$			− 1	μA
Output voltage	V_{OH}	$\overline{PCON}$, $\overline{BUSY}$	$I_0 = 1mA$	4.5			V
	V_{OL}		$I_0 = -1mA$			0.4	V
Current consumption	I_{DD}	V_{DD}, V_{SS}	Operating, Outputs open		2	5	mA
			Standby		1	5	μA
	I_{DDA}	V_{DDA}, V_{SSA}	Operating, Outputs open		2	5	mA
			Standby		1	5	μA

Development Flow Chart



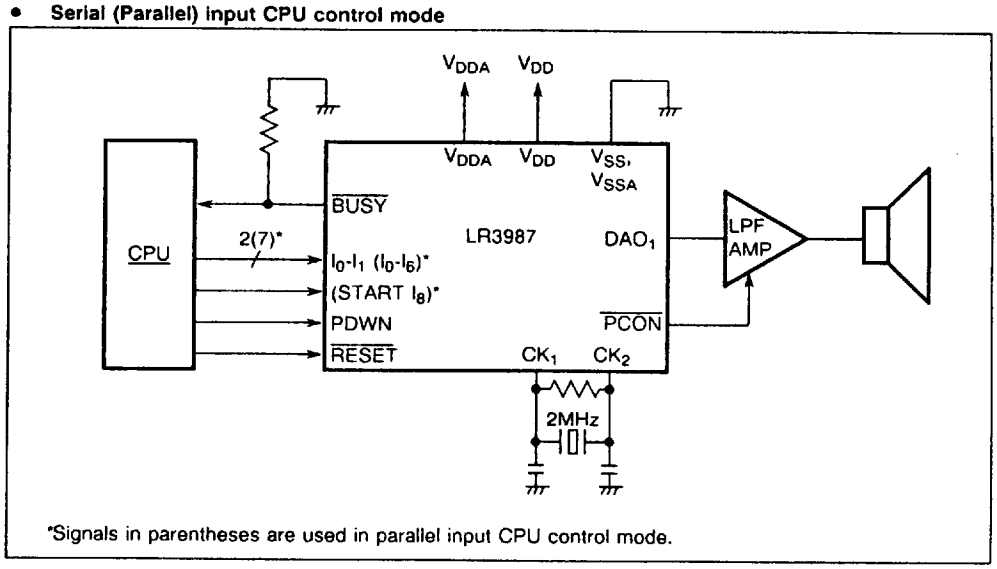
*For the development level 2, Sharp offers support tools such as evaluation chip LR3985, evaluation board LR398LH2 and analysis tool LR398H8 operated on IBM PC host computer.

Sharp's Product Lineup (Voice synthesizer LSI)

Model No.	Power supply	Voice memory		Voice output time
LR3987	**3V**	On-chip ROM	256K bits	20 sec.
LR3984	5V		1M bits	30 to 85 sec.
LR368101		ROM less	External 2M bits	120 sec.
LR3683		On-chip FIFO	80 bytes	Depends on ROM at CPU

System Configuration Example

- **Serial (Parallel) input CPU control mode**



*Signals in parentheses are used in parallel input CPU control mode.

- **Parallel input switch control mode**