

Features

- Operating voltage: 4.5V~5.5V
- ADM algorithm
- Low noise
 - Echo mode: -85dB
 - Surround mode: -90dB

- Built-in 20Kb SRAM
- Automatic reset function
- 16-pin DIP/SOP package

Applications

- Television
- Karaoke systems

- Video disc player
- · Sound equipments

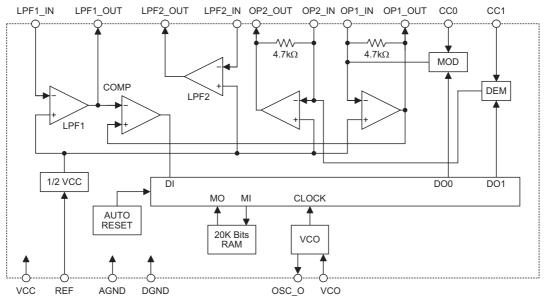
General Description

The HT8970 is an echo/surround effect processor. It is designed for various audio systems including karaoke, television, sound equipments, etc. The chip consists of a built-in pre-amplifier, VCO or Voltage Control OSC, 20Kb SRAM, A/D and D/A converters as well as delay time control logic.

Its built-in 20Kb SRAM can generate delay time effect and can control the delay time value through the external VCO resistor.

The VCO circuit can reduce external components and make it easy to adjust the delay time.



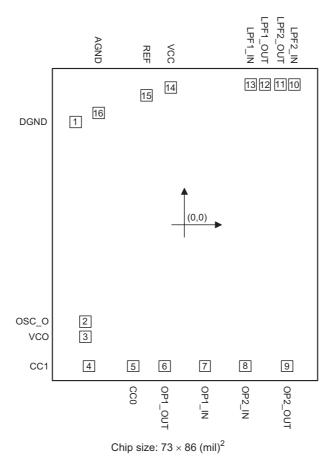




Pin Assignment

VCC 🗆	1	16	LPF1_IN
REF 🗆	2	15	LPF1_OUT
AGND 🗆	3	14	LPF2_OUT
DGND 🗆	4	13	LPF2_IN
OSC_O □	5	12	
VCO 🗆	6	11	DP2_IN
CC1	7	10	DOP1_IN
CC0 🗆	8	9	DOP1_OUT
HT8970 16 DIP-A/SOP-A			

Pad Assignment



The IC substrate should be connected to VSS in the PCB layout artwork.



HT8970

Pad Coordinates

Pad Coordinates		Unit: μm
Pad No.	Х	Y
1	-730.950	688.300
2	-668.800	-652.050
3	-668.800	-755.050
4	-642.650	-951.700
5	-344.900	-951.700
6	-134.150	-951.700
7	135.100	-951.700
8	406.400	-951.700
9	687.400	-951.700
10	735.950	941.950
11	640.950	941.950
12	537.950	941.950
13	442.950	941.950
14	-94.000	920.850
15	-256.650	868.650
16	-578.400	749.850

Pad Description

Pad No.	Pad Name	I/O	Description	
1	DGND	I	Digital ground	
2	OSC_O	0	System oscillator output	
3	VCO	I	System oscillator input, system frequency adjustable pin	
4	CC1	_	Current control 1	
5	CC0	_	Current control 0	
6	OP1_OUT	0	OP1 output	
7	OP1_IN	I	OP1 input	
8	OP2_IN	I	OP2 input	
9	OP2_OUT	0	OP2 output	
10	LPF2_IN	I	Low pass filter 2 input	
11	LPF2_OUT	0	Low pass filter 2 output	
12	LPF1_OUT	0	Low pass filter 1 output	
13	LPF1_IN	I	Low pass filter 1 input	
14	VCC	I	Analog and positive power supply	
15	REF	I	Analog reference voltage	
16	AGND	I	Analog ground	



Absolute Maximum Ratings

Supply Voltage	V _{SS} –0.3V to V _{DD} +6V	Storage Temperature	–50°C to 125°C
Input Voltage	V_{SS} –0.3V to V_{DD} +0.3V	Operating Temperature	–20°C to 70°C

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Electrical Characteristics

Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Turn	Max.	Unit
Symbol	Farameter	V_{DD}	Conditions	IVIIII.	Тур.	IVIAX.	Onit
V _{CC}	Operating Voltage	_		4.5	5.0	5.5	V
I _{CC}	Operating Current	5V		_	15	30	mA
G _V	Voltage Gain	5V	$R_L=47k\Omega$	_	-0.9	2.5	dB
V _{OMAX}	Maximum Output Voltage	5V	THD=10%	0.9	1.8	_	Vrms
No	Output Noise Voltage	5V	DIN Audio	_	-85	-60	dBV
PSRR	Power Supply Rejection Ratio	5V	∆V _{CC} =–20dBV (0.1Vrms) f=100Hz		-40	-30	dB

Functional Description

The HT8970 is an echo/surround effect generator with built-in 20Kb SRAM. The chip provides two playing modes (echo and surround) and the playing function block diagrams are shown as follows.





• Surround mode

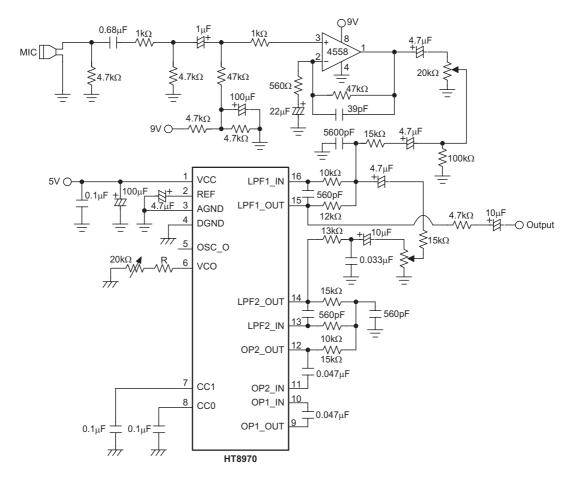
R_{OSC}-f_{OSC}-Delay_time Cross Table

56.6	44.8	36.2	30.4	26.0	23.2	20.6	kΩ
2.0	2.5	3.0	3.5	4.0	4.5	5.0	MHz
326	260	218	188	162	146	130	ms
18.3	16.6	15	14.2	13.4	12.5	11.6	kΩ
5.5	6.0	6.5	7.0	7.5	8.0	8.5	MHz
119	110	102	94.4	88	82.4	76.8	ms
					-		
10.8	9.5	8.4	7.6	6.8	6.3	5.6	kΩ
9	10	11	12	13	14	15	MHz
73.2	64.8	59.2	54.4	50.0	46.4	42.8	ms
5.00	4.09	3.68	3.42	3.08	2.84	2.65	kΩ
16	17	18	19	20	21	22	MHz
40.4	38.4	36.4	34.2	32.8	31.0	29.6	ms
	2.0 326 18.3 5.5 119 10.8 9 73.2 5.00 16	2.0 2.5 326 260 18.3 16.6 5.5 6.0 119 110 10.8 9.5 9 10 73.2 64.8 5.00 4.09 16 17	2.0 2.5 3.0 326 260 218 18.3 16.6 15 5.5 6.0 6.5 119 110 102 10.8 9.5 8.4 9 10 11 73.2 64.8 59.2 5.00 4.09 3.68 16 17 18	2.0 2.5 3.0 3.5 326 260 218 188 18.3 16.6 15 14.2 5.5 6.0 6.5 7.0 119 110 102 94.4 10.8 9.5 8.4 7.6 9 10 11 12 73.2 64.8 59.2 54.4 5.00 4.09 3.68 3.42 16 17 18 19	2.0 2.5 3.0 3.5 4.0 326 260 218 188 162 18.3 16.6 15 14.2 13.4 5.5 6.0 6.5 7.0 7.5 119 110 102 94.4 88 10.8 9.5 8.4 7.6 6.8 9 10 11 12 13 73.2 64.8 59.2 54.4 50.0 5.00 4.09 3.68 3.42 3.08 16 17 18 19 20	2.0 2.5 3.0 3.5 4.0 4.5 326 260 218 188 162 146 18.3 16.6 15 14.2 13.4 12.5 5.5 6.0 6.5 7.0 7.5 8.0 119 110 102 94.4 88 82.4 10.8 9.5 8.4 7.6 6.8 6.3 9 10 11 12 13 14 73.2 64.8 59.2 54.4 50.0 46.4 5.00 4.09 3.68 3.42 3.08 2.84 16 17 18 19 20 21	2.0 2.5 3.0 3.5 4.0 4.5 5.0 326 260 218 188 162 146 130 18.3 16.6 15 14.2 13.4 12.5 11.6 5.5 6.0 6.5 7.0 7.5 8.0 8.5 119 110 102 94.4 88 82.4 76.8 10.8 9.5 8.4 7.6 6.8 6.3 5.6 9 10 11 12 13 14 15 73.2 64.8 59.2 54.4 50.0 46.4 42.8 5.00 4.09 3.68 3.42 3.08 2.84 2.65 16 17 18 19 20 21 22



Application Circuits

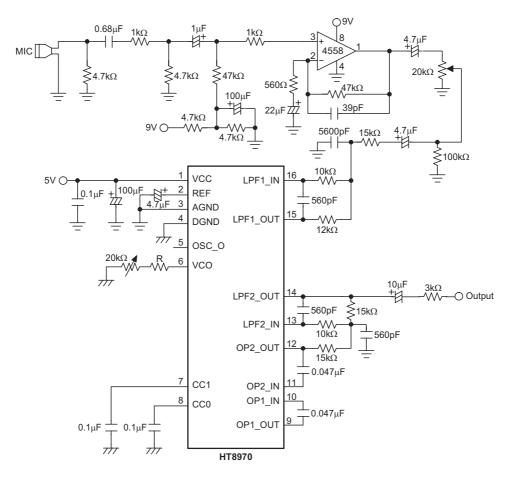
Echo Mode



Note: $\frac{1}{2}$: Analog ground, $\frac{1}{777}$: Digital ground When the value of the R_{OSC} increases, the range of the Delay time also increases. Please refer to the R_{OSC} - f_{OSC} - Delay_time Cross table for the R_{OSC} & Delay time values.



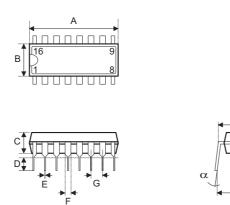
Surround Mode





Package Information

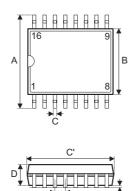
16-pin DIP (300mil) Outline Dimensions



Complease		Dimensions in mil				
Symbol	Min.	Nom.	Max.			
А	745	—	775			
В	240		260			
С	125	_	135			
D	125		145			
E	16		20			
F	50		70			
G	_	100				
Н	295	_	315			
I	335	_	375			
α	0°	_	15°			



16-pin SOP (300mil) Outline Dimensions



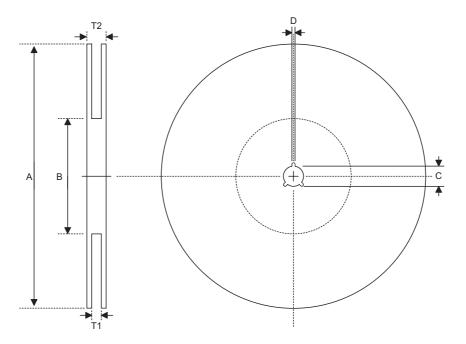


Symbol		Dimensions in mil				
Symbol	Min.	Nom.	Max.			
A	394		419			
В	290		300			
С	14		20			
C′	390		413			
D	92		104			
E	_	50	_			
F	4					
G	16		50			
Н	4		12			
α	0°		10°			



Product Tape and Reel Specifications

Reel Dimensions

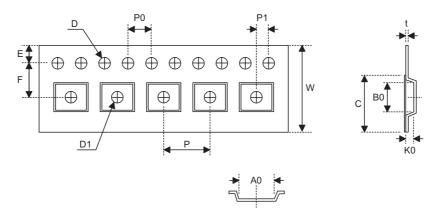


SOP 16W (300mil)

Symbol	Description	Dimensions in mm
А	Reel Outer Diameter	330±1
В	Reel Inner Diameter	62±1.5
С	Spindle Hole Diameter	13.0±0.5 _0.2
D	Key Slit Width	2±0.5
T1	Space Between Flange	16.8+0.3 0.2
T2	Reel Thickness	22.2±0.2



Carrier Tape Dimensions



SOP 16W (300mil)

Symbol	Description	Dimensions in mm
W	Carrier Tape Width	16±0.2
Р	Cavity Pitch	12±0.1
E	Perforation Position	1.75±0.1
F	Cavity to Perforation (Width Direction)	7.5±0.1
D	Perforation Diameter	1.5+0.1
D1	Cavity Hole Diameter	1.5+0.25
P0	Perforation Pitch	4±0.1
P1	Cavity to Perforation (Length Direction)	2±0.1
A0	Cavity Length	10.9±0.1
В0	Cavity Width	10.8±0.1
К0	Cavity Depth	3±0.1
t	Carrier Tape Thickness	0.3±0.05
С	Cover Tape Width	13.3



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