HT8970
Voice Echo

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

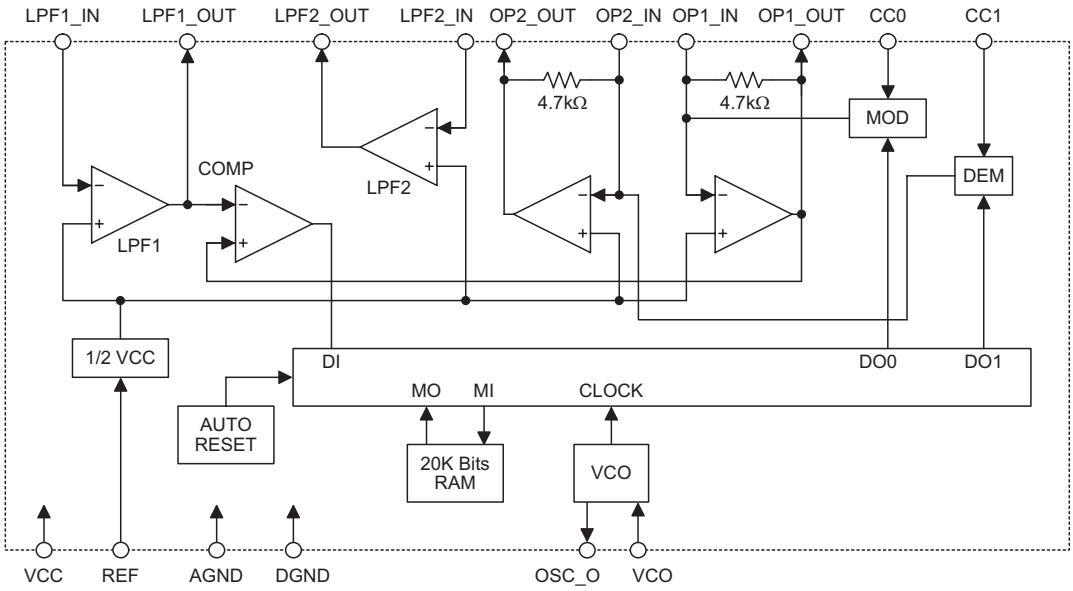
General Description

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.

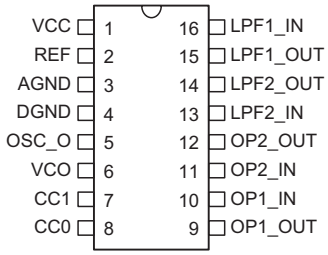
Its built-in 20Kb SRAM can generate delay time effect and can control the delay time value through the external VCO resistor.

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

Block Diagram

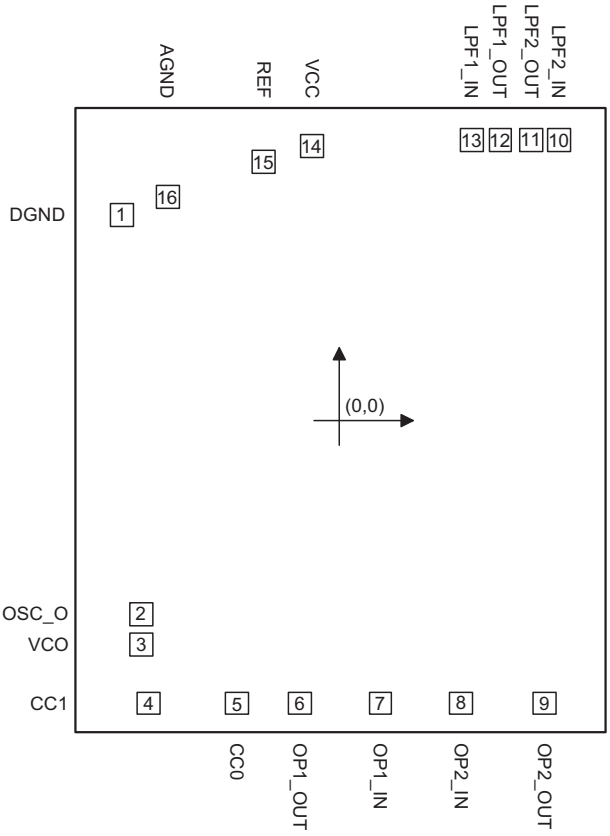


Pin Assignment



HT8970
16 DIP-A/SOP-A

Pad Assignment



Chip size: 73 × 86 (mil)^2

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

Pad Coordinates

Unit: μm

Pad No.	X	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	O	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	O	OP1 output
7	OP1_IN	I	OP1 input
8	OP2_IN	I	OP2 input
9	OP2_OUT	O	OP2 output
10	LPF2_IN	I	Low pass filter 2 input
11	LPF2_OUT	O	Low pass filter 2 output
12	LPF1_OUT	O	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

Input Voltage.....V_{SS}–0.3V to V_{DD}+0.3V

Storage Temperature.....–50°C to 125°C

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

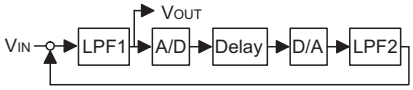
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{CC}	Operating Voltage	—	—	4.5	5.0	5.5	V
I_{CC}	Operating Current	5V	—	—	15	30	mA
G_V	Voltage Gain	5V	R_L=47kΩ	—	–0.9	2.5	dB
V_{OMAX}	Maximum Output Voltage	5V	THD=10%	0.9	1.8	—	Vrms
N_O	Output Noise Voltage	5V	DIN Audio	—	–85	–60	dBV
PSRR	Power Supply Rejection Ratio	5V	ΔV_{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

- Echo mode

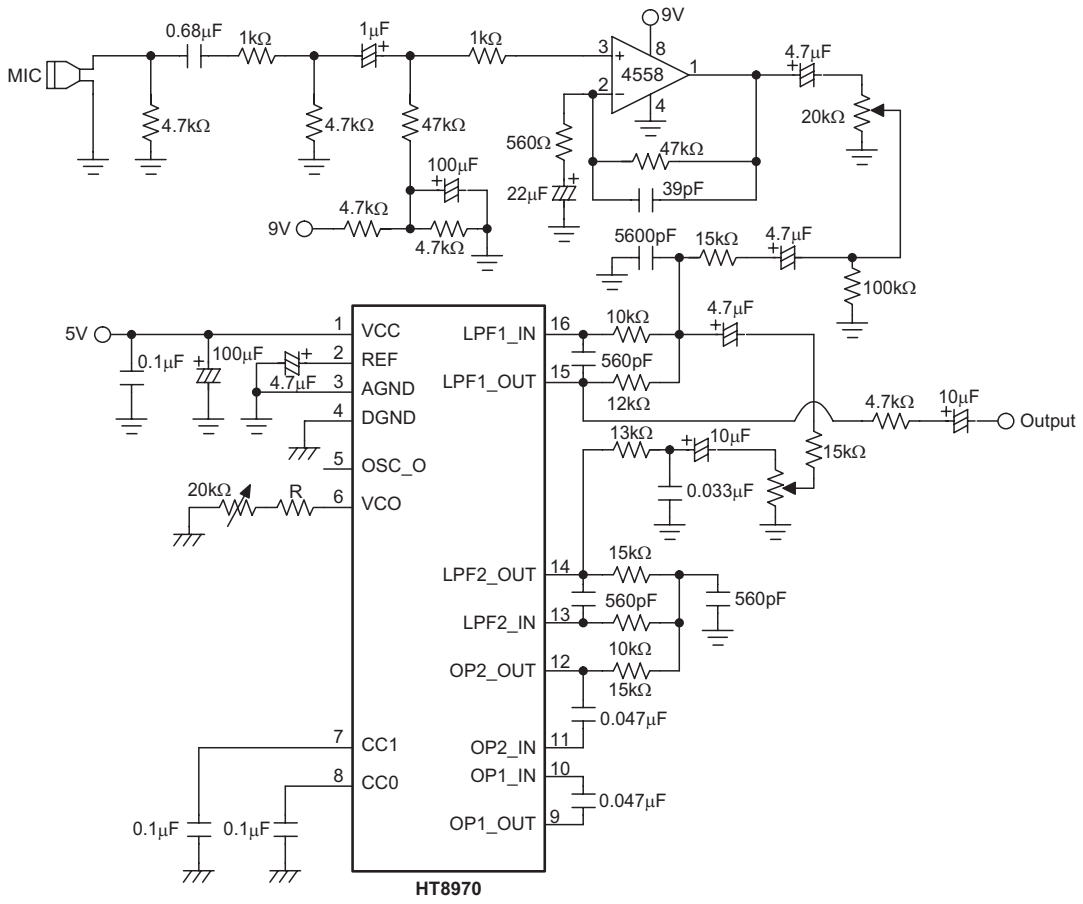


R_{OSC}-f_{OSC}-Delay_time Cross Table

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

Application Circuits

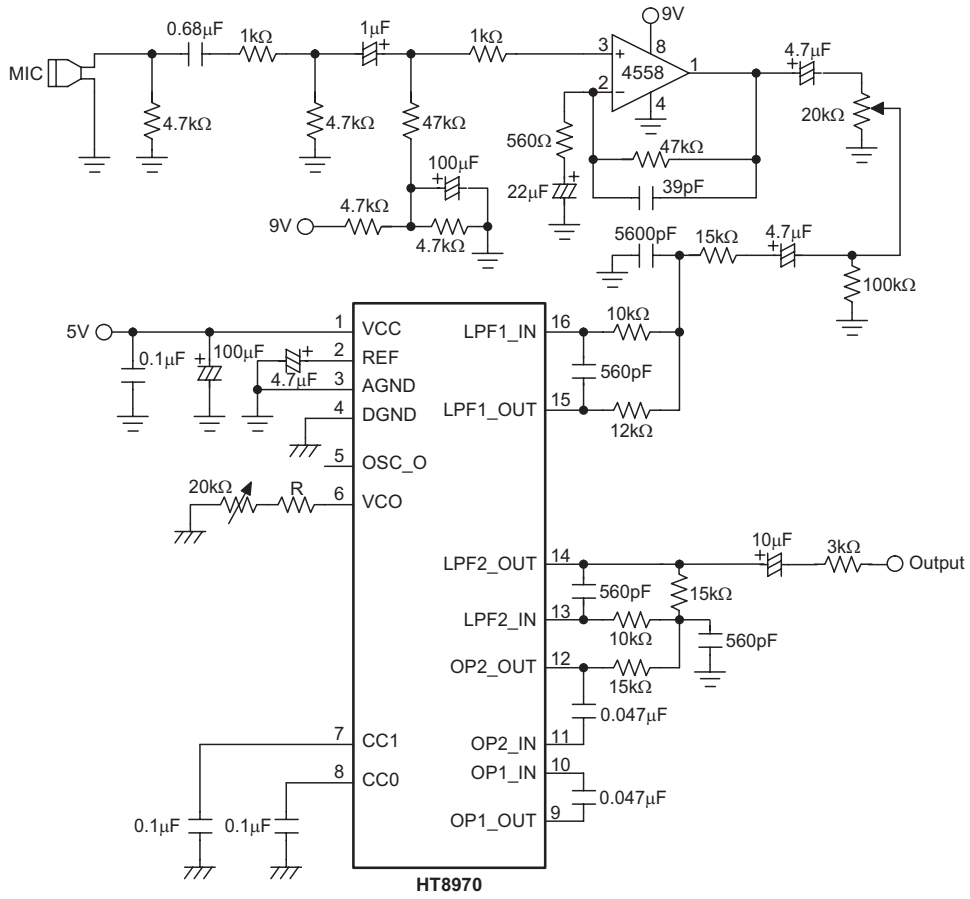
Echo Mode



Note: ⏚: Analog ground, ⫽⏚: 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

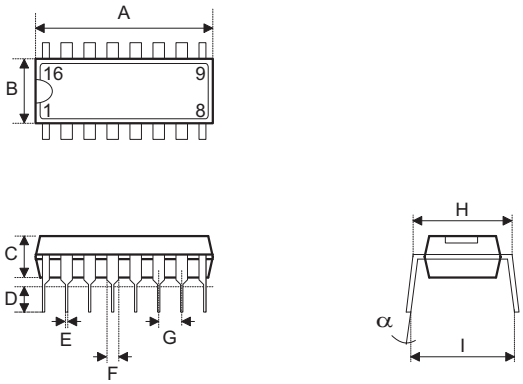


Note: ⏚: Analog ground, ⏚: Digital ground

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.

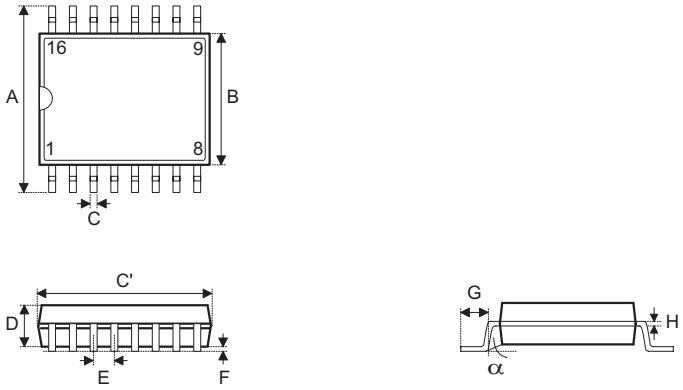
Package Information

16-pin DIP (300mil) Outline Dimensions



Symbol	Dimensions in mil		
	Min.	Nom.	Max.
A	745	—	775
B	240	—	260
C	125	—	135
D	125	—	145
E	16	—	20
F	50	—	70
G	—	100	—
H	295	—	315
I	335	—	375
α	0°	—	15°

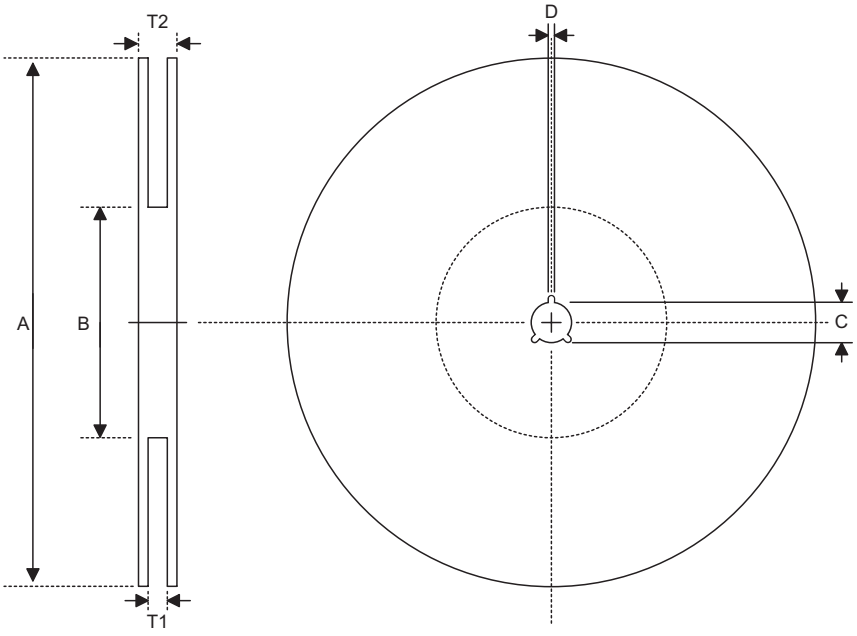
16-pin SOP (300mil) Outline Dimensions



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

Product Tape and Reel Specifications

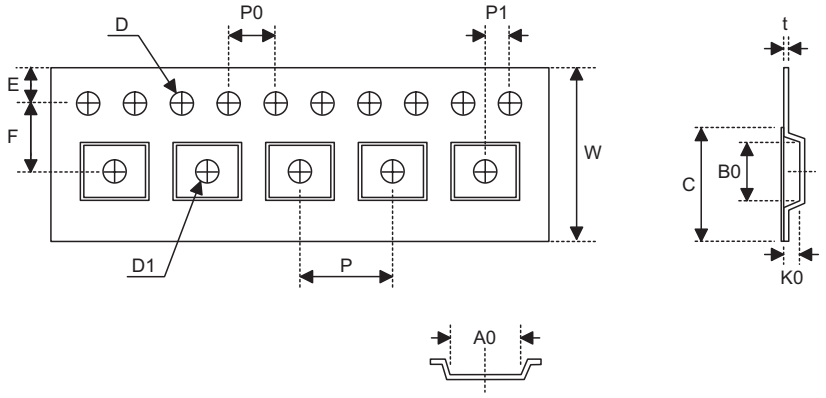
Reel Dimensions



SOP 16W (300mil)

Symbol	Description	Dimensions in mm
A	Reel Outer Diameter	330±1
B	Reel Inner Diameter	62±1.5
C	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
P	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
B0	Cavity Width	10.8±0.1
K0	Cavity Depth	3±0.1
t	Carrier Tape Thickness	0.3±0.05
C	Cover Tape Width	13.3