



## Feature

H616XP Series are powerful stereo music synthesizer controller IC and can play maximum 32 channel midi music. There are 24 I/O ports and can store voice up to 170 seconds (6K sample rate). Equipped two (Left/Right audio) 16-bit DAC and 1 speaker amplifier are for audio output.

- Built-in 8-bits MCU core (**JUPITER**).
- Built-in **programmable sound generator(PSG)**
- Built-in voltage control oscillator with *programmable* PLL (VCO-PLL clock generator).
- Internal system clock speed up to 45 MHz (max. 45 MHz at Vcc = 3.0V).
- Operating voltage: 2.40V~3.60V (typ. 3.0V).
- Operating current: 35mA (average operating current without audio load).
- Built-in maximum 4Mbit (512K Bytes) OTP-ROM.
- Built-in maximum 16Kbit (2048 Bytes) SRAM.
- Equipped 2 EQ-OP for signal amplifier or filter.
- Equipped 1 speaker amplifier ( 0.5W ).
- Built-in 2-wired serial bus interface (I<sup>2</sup>C like , slave mode).
- Built-in micro-controller interface ( 8-bit parallel interface ).
- Equipped two (Left/Right audio) 16-bit DAC (voltage DAC) audio output.
- Standby current: typ. 2.0μA (25°C).

## Description

The H616XP is based on Helios's 8-bit MCU (JUPITER) and equipped a powerful programmable sound generator (PSG) for processing sweet-sounding. In internal system bus, the MCU (JUPITER) features efficient addressing register and memory timing control register to validate access the I/O registers, high speed working memory and program code. The H616XP equipped two high-resolution 16-bit D/A for audio output and they support time-sharing mode for processing up to 64-poly sounds ( normally 24-poly ).

There are many speech processing firmware library for 4-bit ADPCM, 1-bit ADM, and so on; since the H616XP has built-in PSG, it also support high quality standard MIDI playing library and can play maximum 32-channel midi music.

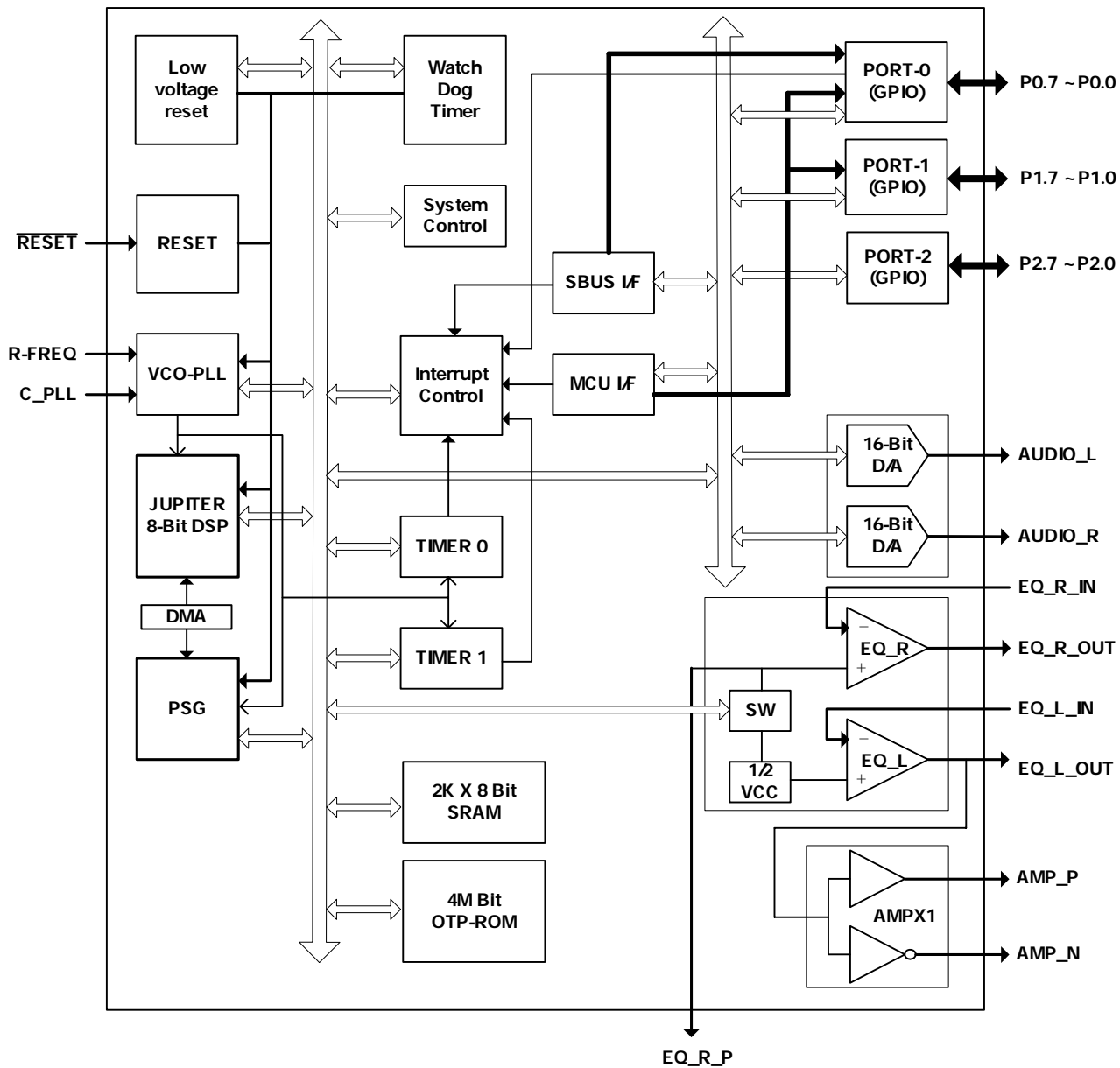
The H616XP features 24 general purpose I/O pins and they can be individual bit programmed to input or output mode and each I/O can be programmed to pull-up or not. The each I/O of port 0 can be programmed to select interrupt source and the interrupt signal can be falling or rising trigger.

As the MCU's high performance and system clock speed is up to 45 MHz, the H616XP features the VCO and PLL clock system, and the system clock is programmable. Since the system clock is programmable, the H616XP can be more flexible for playing sound by configure the PSG's function and system clock.

There are two 8-bit timers, each timer is base on 8-bit up counter, 8-bit reload data, and base clock pre-scale. Usually, the timer can be configured to speech sample frequency.

The H616XP also supports two device interface, one is 2-wired serial bus (I<sup>2</sup>C like), and the other is 8-bit parallel MCU control interface. To configure these two interface to set H616XP being slave mode and communicate with the other host controller.

## Block Diagram



H616XP Block Diagram

### DC Electrical Characteristics (V<sub>DD</sub> = 3.0V, V<sub>SS</sub> = 0V, F<sub>OSC</sub> = 45 MHz, T<sub>A</sub> = 25°C, unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
D0-D7 IRQ	Driving Current		4		mA	VOH=2.7
AUDIO_L AUDIO_R EQ_L_OUT EQ_R_OUT	Driving Current		4		mA	
AMP_P AMP_N	Driving Current			360	mA	RL=8
D0-D7 IRQ SDA SDL	Sink Current		4		mA	
AUDIO_L AUDIO_R EQ_L_OUT EQ_R_OUT	Sink Current		4		mA	VOL=0.3
AMP_P AMP_N	Sink Current			360	mA	RL=8
I <sub>STD</sub>	Standby Current	1.2	1.5	2	uA	
HIGH VOLTAGE	Driving Voltage		2/3 VCC		V	
LOW VOLTAGE	Driving Voltage		1/3 VCC		V	

### AC Electrical Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
TAS	Address Set-Up Time	0			nS	
TAH	Address Hold time	0			nS	
TDS	Data Set-Up Time	20			nS	
TDH	Data Hold time	2			nS	
TAC	Access Time	0			nS	
TPW	Pulse Width time	20			nS	

### H616XP Series

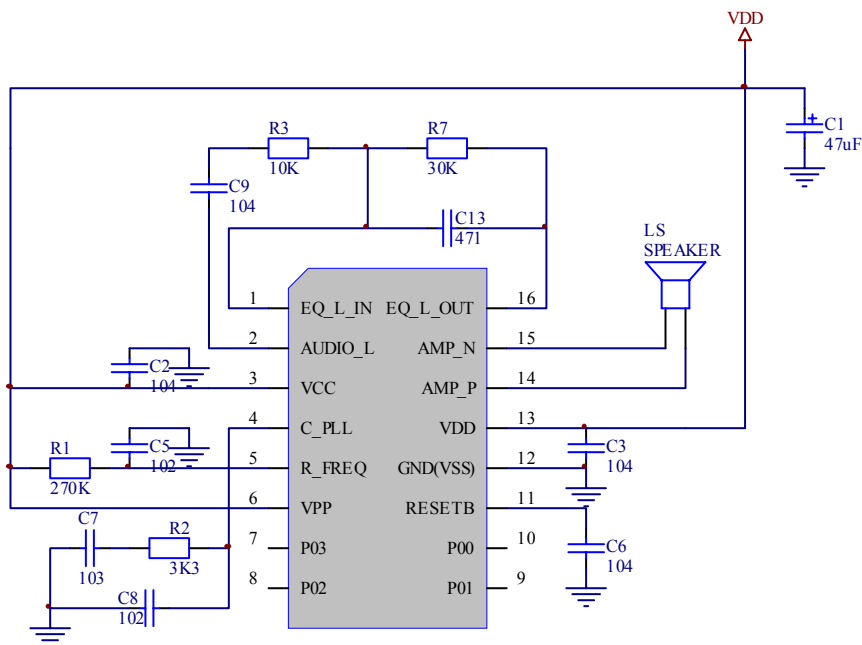
Part No.	ROM Size	RAM Size	Voice Duration @6K	Channel
<b>H6161P</b>	<b>1M-Bit</b>	<b>1K Bytes</b>	<b>40"</b>	<b>16</b>
<b>H616AP</b>	<b>2M-Bit</b>	<b>1K Bytes</b>	<b>60"</b>	<b>24</b>
<b>H6162P</b>	<b>2M-Bit</b>	<b>1K Bytes</b>	<b>80"</b>	<b>24</b>
<b>H6163P</b>	<b>3M-Bit</b>	<b>2K Bytes</b>	<b>120"</b>	<b>32</b>
<b>H6164P</b>	<b>4M-Bit</b>	<b>2K Bytes</b>	<b>170"</b>	<b>32</b>

## Application Circuit

### Important Notice for application circuit:

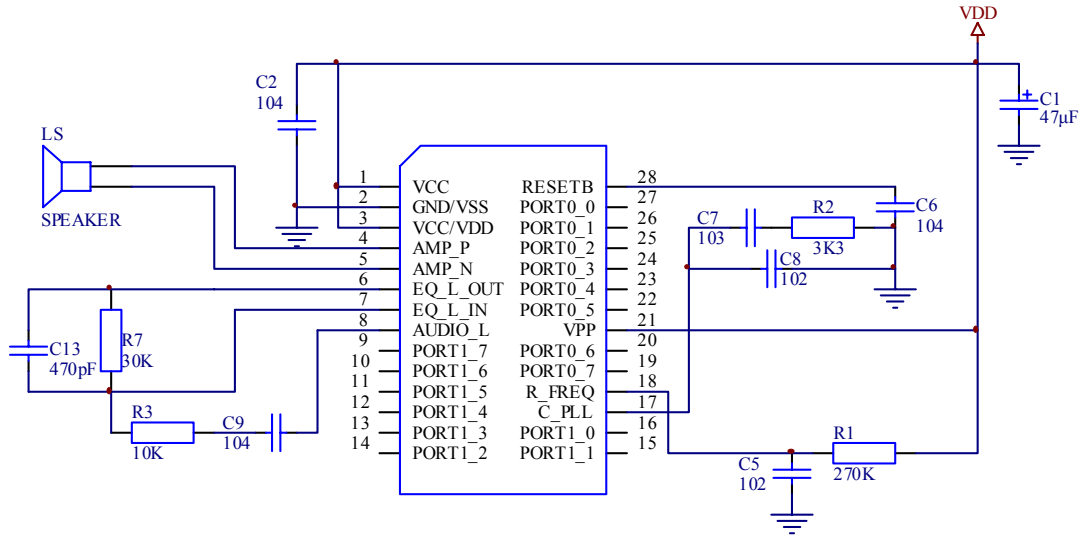
1. The parameter marked in the circuit for the electronic parts is for reference only. It should be adjusted according to actual usage to get best effect. The parts of C2,C3,C4, C5, R1 should be assembled as near as possible to the port respectively.
2. Change R1 value to adjust the speed of play. The smaller the value is, the faster the speed.
3. Adjust R7·R5 value to change the volume, the smaller the value is the lower the volume is.
4. If you need to connect to external amplifier, the audio signal can be get out from the EQ\_L\_OUT

### Application Circuit 1. H616XP-I16

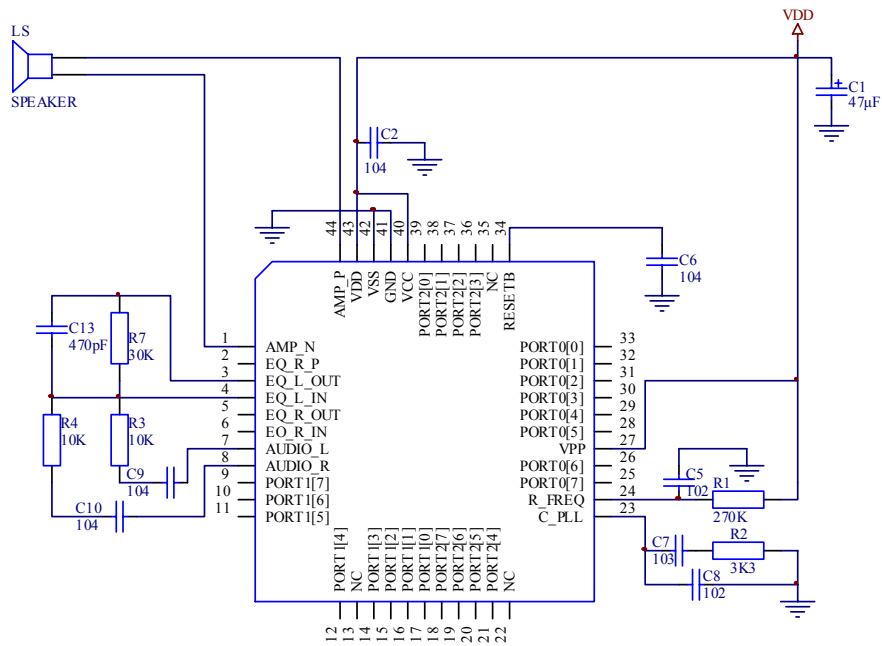


H616XP\_I16L

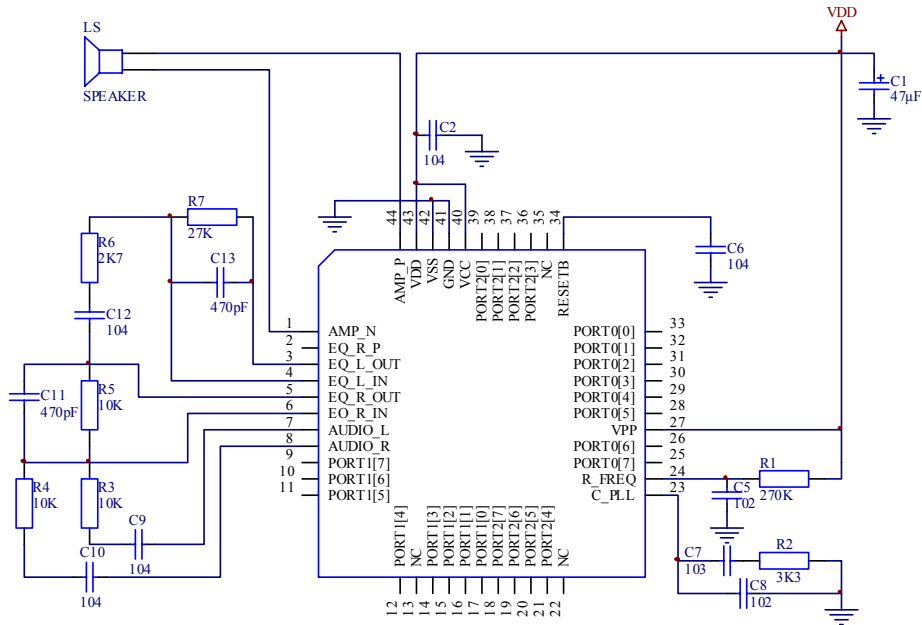
## Application Circuit 2. H616XP - P28



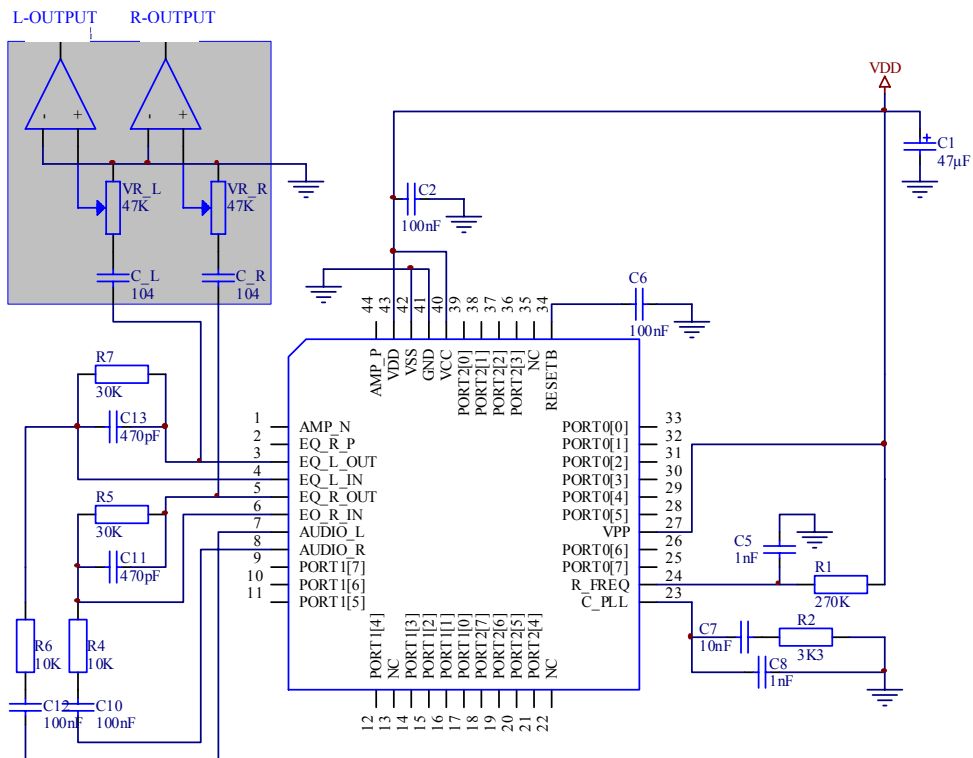
## Application Circuit 3. H616XP - F44 Mono one step EQ



## Application Circuit 4. H616XP - F44 Mono 2 step EQ

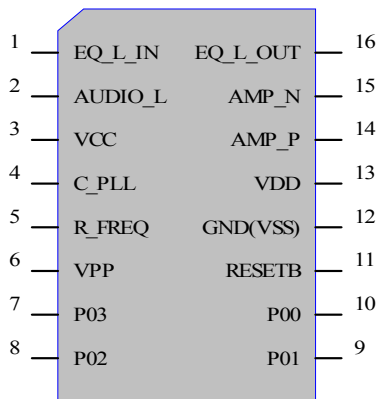


## Application Circuit 5. H616XP - F44 Stereo Output (external amplifier Unit is needed)

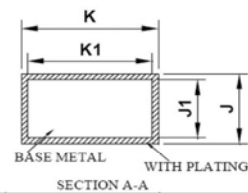
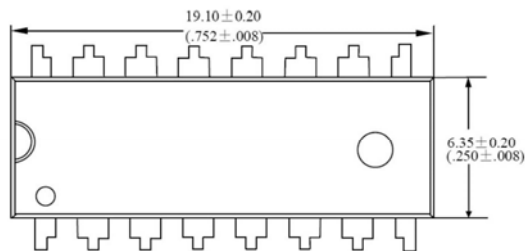
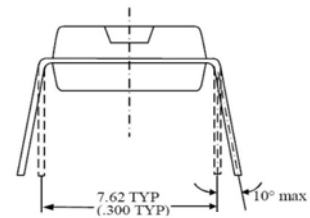
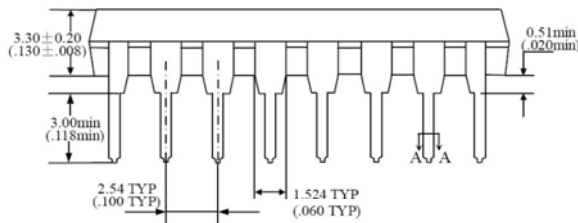


## Package and Pin configuration

# DIP16L

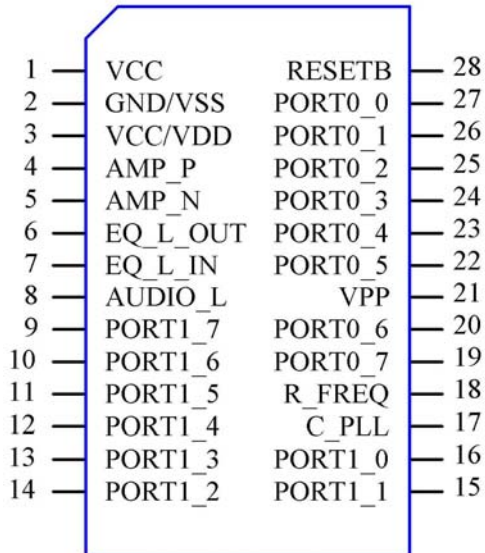


引线间距 Lead Pitch	2.54mm(100mil)
跨度 Row Spacing	7.62mm(300mil)
载体尺寸 Pad Size	80mil×80mil
	80mil×110mil
	110mil×140mil
载体打凹深度 Depressed Die Pad	0.305 ± 0.05 (0.012 ± 0.002)
单位 Unit	mm(inch)



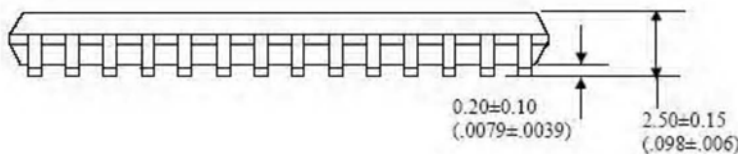
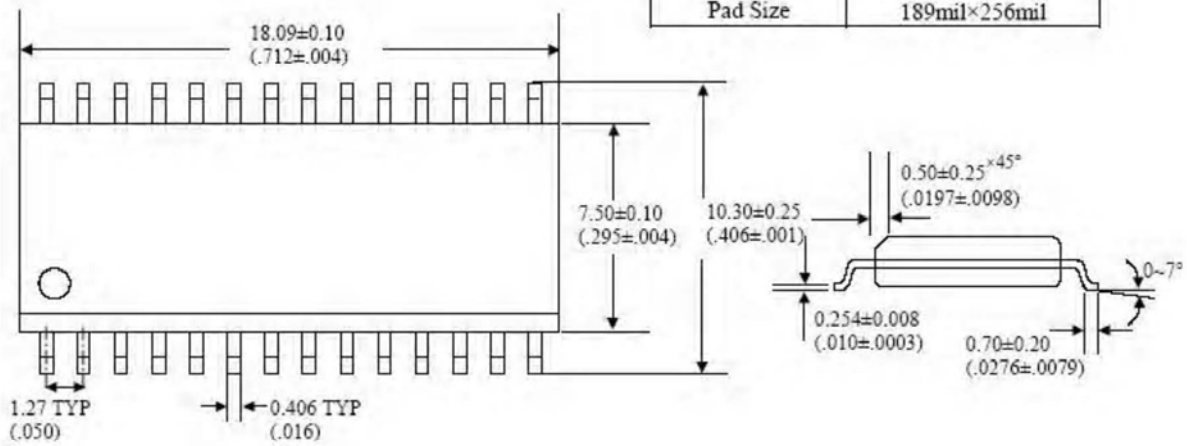
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
J	0.219	0.339	.0086	.0133
J1	0.219	0.289	.0086	.0114
K	0.460	0.560	.0181	.0220
K1	0.460	0.510	.0181	.0201

## Package and Pin configuration



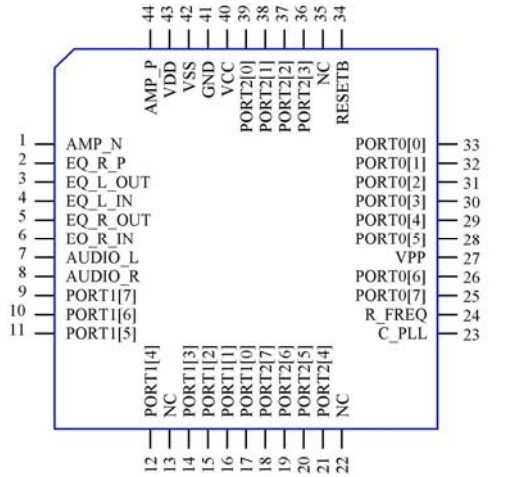
## SOP28

引线间距	1.27mm(50mil)
Lead Pitch	1.27mm(50mil)
切筋凸缘	0~0.1mm(0~3.9mil)
Trim Flange	0~0.1mm(0~3.9mil)
单位	mm(inches)
Unit	mm(inches)
载体尺寸	150mil×190mil
Pad Size	189mil×256mil



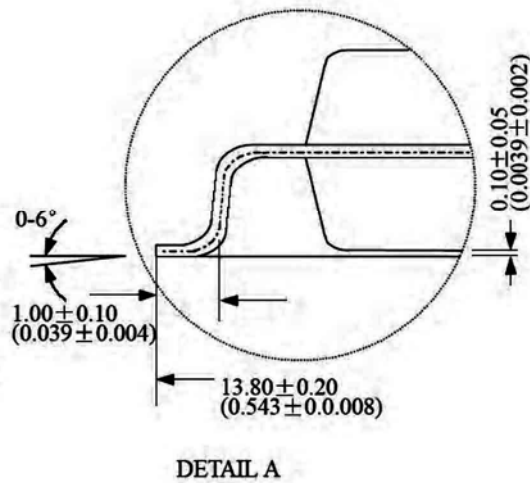
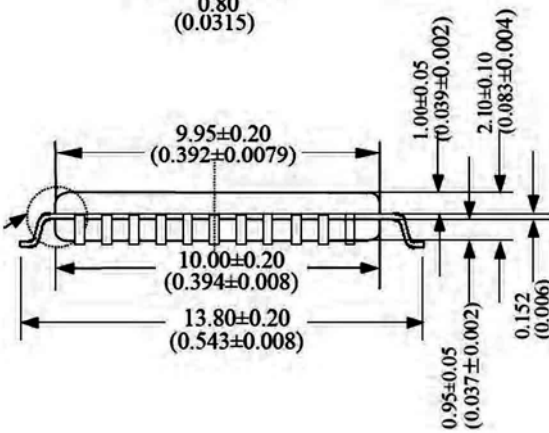
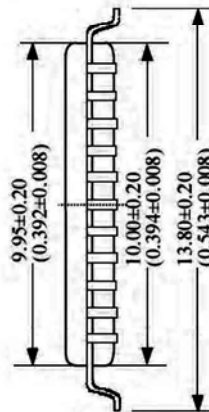
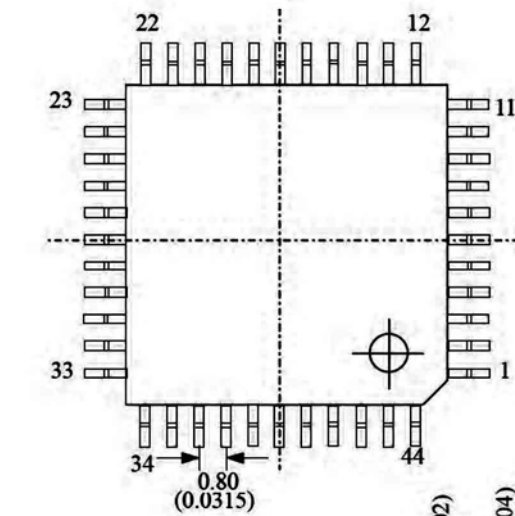


## Package and Pin configuration

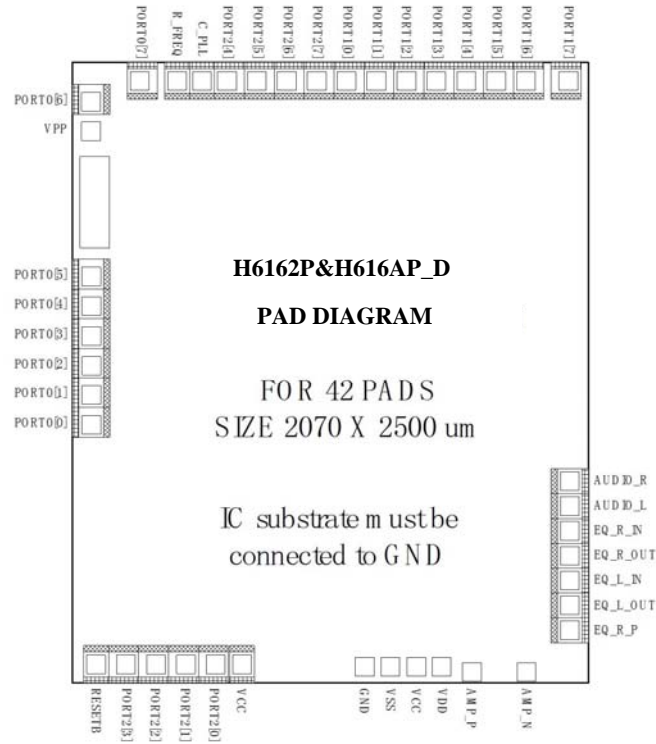


## QFP44

引线间距 Lead Pitch	0.80mm(31.5mil)
单位 Unit	mm(inches)
载体尺寸 Pad Size	210mil×210mil



## Pin Configurations (–)



## Pin Configurations (=)

