

Single-Chip Voice Recording & Playback Device For Single 20-to 30-Second Message

FEATURES

- Single-chip,high-quality voice recording & playback sotation.
-No external Ics required.
-Minimum external components.
- Non-volatile Flash memory technology
-No volatile backup required
-100K record cycles(typical)
-100-year message
- Single message of 20 to 30 seconds,with external resistor selection

- User-friendly easy-to-use operation
-Programming &development systems not required
-Level-activated recording & edge-activated playback switches
- Low power consumption
-Operating current:25mA (typical,on load)
-Standby current:1 μ A (typical,no load)
- Automatic power-down feature for longer battery life.
- Chip Enable pin for simple message expansion.
- Single 5V power supply

GENERAL DESCRIPTION

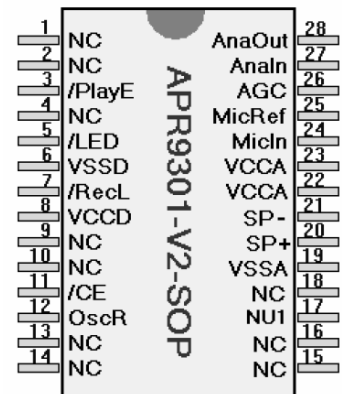
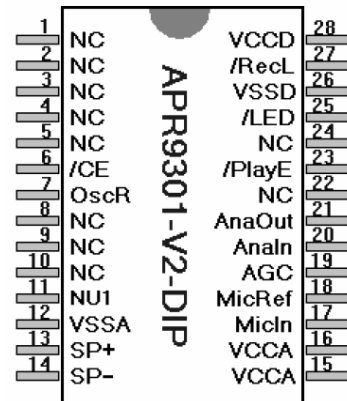
The APR9301 device offers true single-solid-state storage capability and requires no software or micro-controiler support. It provides high-quality recordine and playback with a single 20-to 30-second message. It is ideal for portable voice recorders, toys, and many other consumer and industrial applications.

Invox proprietary analog/multi-level storage technology is implemented in advanced Flash non-volatile memory cells, each of which can typically store more than 256 voltage levels. The APR9301 device stores and reproduces voice signals in their natural forms, eliminating the distortion that is often introduced by encoding and compression. The device combines a small size with low power consumption, non-volatility, and ease-of-use for a cost-effective solution to voice recording and playback.

PINOUT DIAGRAM

Figure 1. shows the pinouts for the APR9301

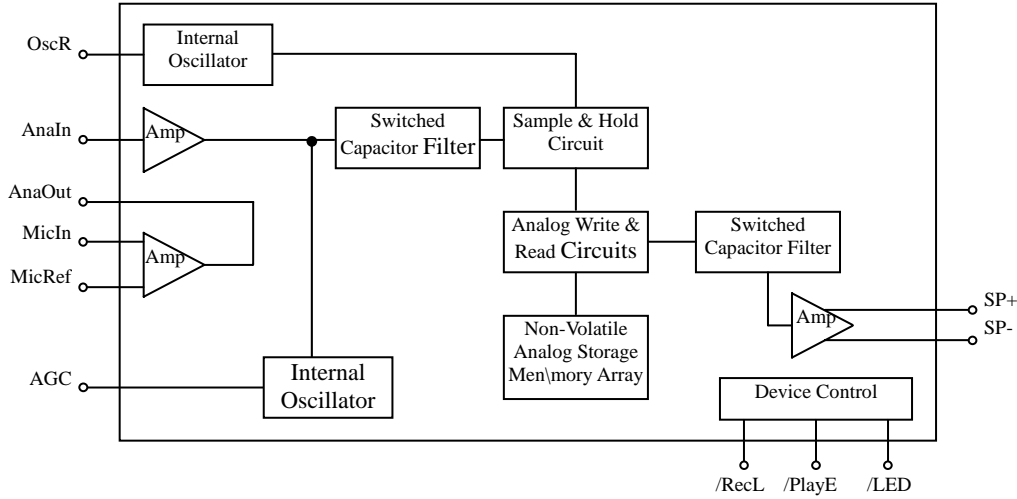
Figure 1. APR9301 Pinout Diagram*



FUNCTIONAL BLOCD DIAGRAM

Figure 2 shows he functiona block diagram of the AR9301 deviceI

Figure 2. APR9301 functional blocd Diagram



SAMPLE APPLICATION

Figure 3 shows the diagram for a single, 20-second message recording and playback application using the APR9301 device. When pins are connected as shown in this example, the operating modes are as follows:

Record mode (Level-Activaed)

The / LED pin will go low during the actual recording process to provide a visual indication if an LED light is connected to this in. A single voice message of up to 20 seconds can be recorded. The chip is in record mode as long as the / RecL pin stays low(level-activated). If the message lasts longer than 20 seconds, recording will terminate automatically after the last available memory cell is written. If the message is shorter thn 20 seconds, the recording operation will stop when the/ RecL pin goes high. The speaker driver is automatically tristated during the recording operation.

Messages of up to 30 seconds can be recorded by using different OscR resistor values(see Table 1).

Playback Mode (Edge-Activated)

Playback always starts from the beginning of the message. The chip is in playback mode after the /PlayE pin pulses low(edge-activated). Playback will stop immediately when the / PlayE pin pulses low a second time. If the newly recorded message is shorter than the reviously recorded message, the remaining portion of the previous message will be played after the new message is played back. The input pre-amplifier, AGC, and main amplifier circuits are disabled during playback.

Standby Mode (/CE = "0")

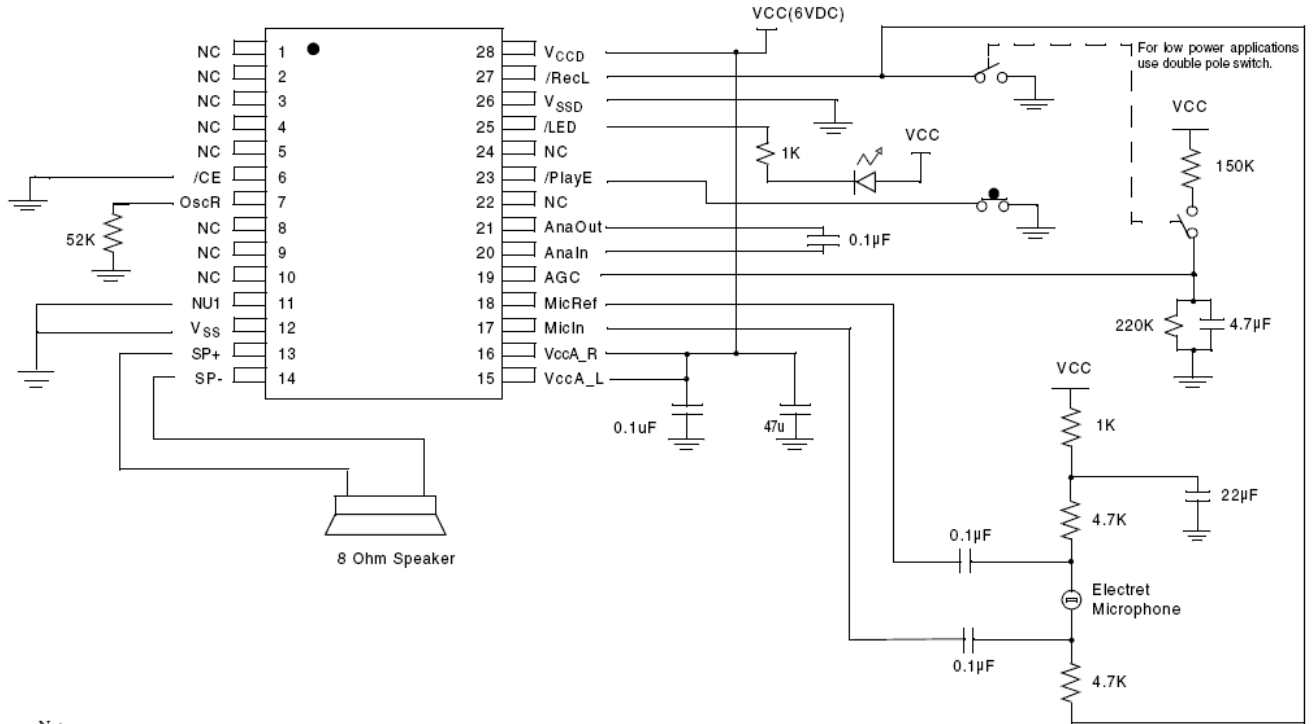
The chip will automatically return to the standby state after recording or playback operation is completed.

Power Down Mode (/CE = "1")

The chip is always in standby state. No recording or playback is allowed. Current consumption is typically less than 1 μ A.

Preliminary Specifications

Figure 3.Application Sample for the APR9301



- Notes: NC=NoConnect(must be floating)
- NU=Not Used(must be grounded)
- Pins 23 and 27 have internal pull-up resistors.
- The typical sampling frequency is 6.4 KHz with OscR=52K Ω

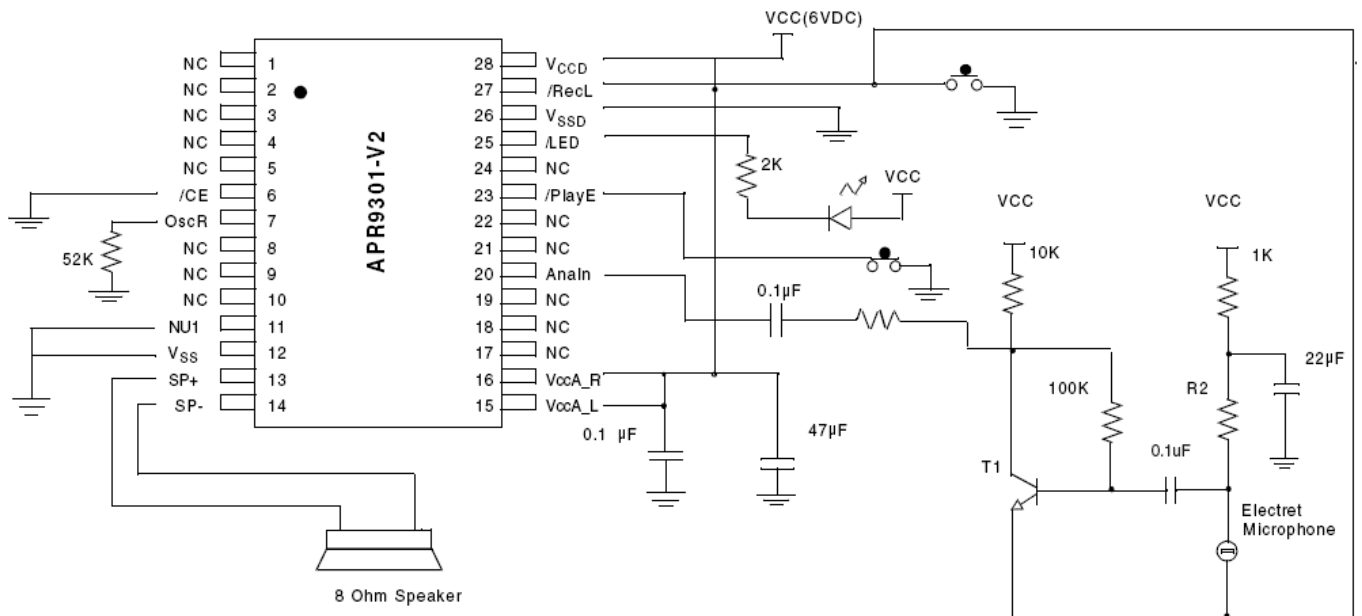
Table 1 shows the typical dependence of the sampling frequency and the total voice duration on the OscR resistor value.

Table 1. Typical Dependence of Sampling Frequency and the Total Voice Duration on OscR Resistor Value

(V_{CCA}=V_{CCD}=5V; V_{SSA}=V_{SSD}=0V; T_A=25°C)

Pin 7 - OscR	Typical Sampling Frequency	Typical Total Voice Duration
52 K Ω	6.4 kHz	20s
67 K Ω	5.3 kHz	24s
89 K Ω	4.0 kHz	30s

Figure 4 Sample Application Using External Microphone Biasing



Preliminary Specifications

ELECTRICAL CHARACTERISTICS

The following tables list Absolute Maximum Ratings, DC Characteristics, and Analog Characteristics for the APR9301 device.

Absolute Maximum Ratings

Item	symbol	Condition	Min	Max	Unit
Power supply voltage	V _{CC}	T _A =25°C	-0.3	7.0	V
Input voltage	V _{IN1}	T _A =25°C	-0.3	V _{CC} +0.3	V
Input voltage	V _{IN2}	I _{IN} < 20mA	-1.0	V _{CC} +1.0	V
Storage temperature	T _{STG}	-	-65	150	°C
Temperature under bias	T _{BS}	-	-65	125	°C
Lead temperature	T _{LD}	<10s		300	°C

DC Characteristics*

Item	symbol	Condition	Min	Typ	Max	Unit
Input high voltage	V _{IH}	-	0.8 × V _{CC}	-	-	V
Input low voltage	V _{IL}	-	-	-	0.8	V
Output high voltage	V _{OH}	I _{OH} = -1.6mA	2.4	-	-	V
Output low voltage	V _{OL}	I _{IL} = 4.0mA	-	-	0.45	V
Input leadage current	I _{IH}	V _{IH} = V _{CC}	-	-	1.0	µA
Input leadage current	I _{IL}	V _{IL} = V _{SS}	-1.0	-	-	µA
Output tristate Leadage current	I _{oz}	V _{OUT} = V _{CC} or	-1.0	-	1.0	µA

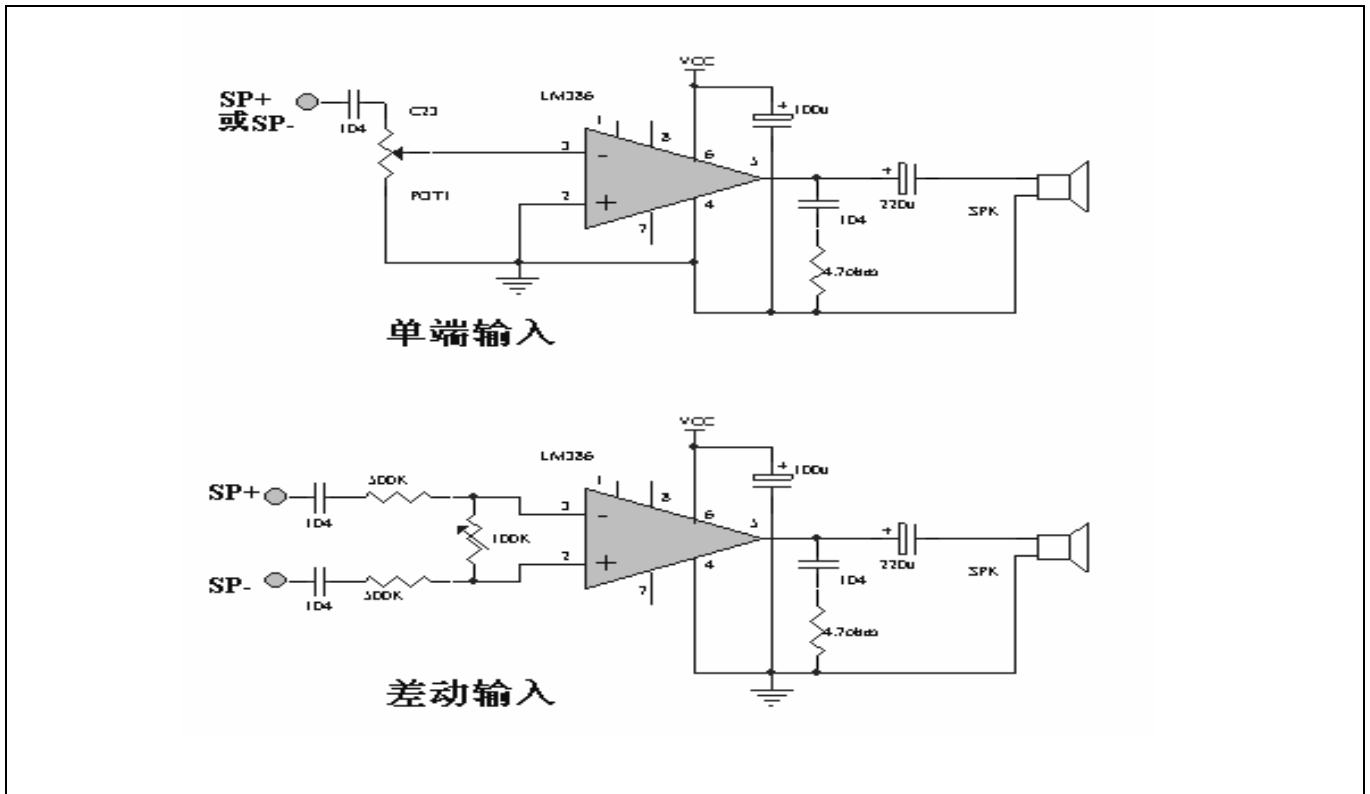
		$V_{OUT} = V_{SS}$				
Operating current consumption	I_{CC}	Internal Clock, no load	-	25	-	mA
Standby current consumption	I_{CCS}	No load	-	1.0	-	mA

Analog Characteristics*

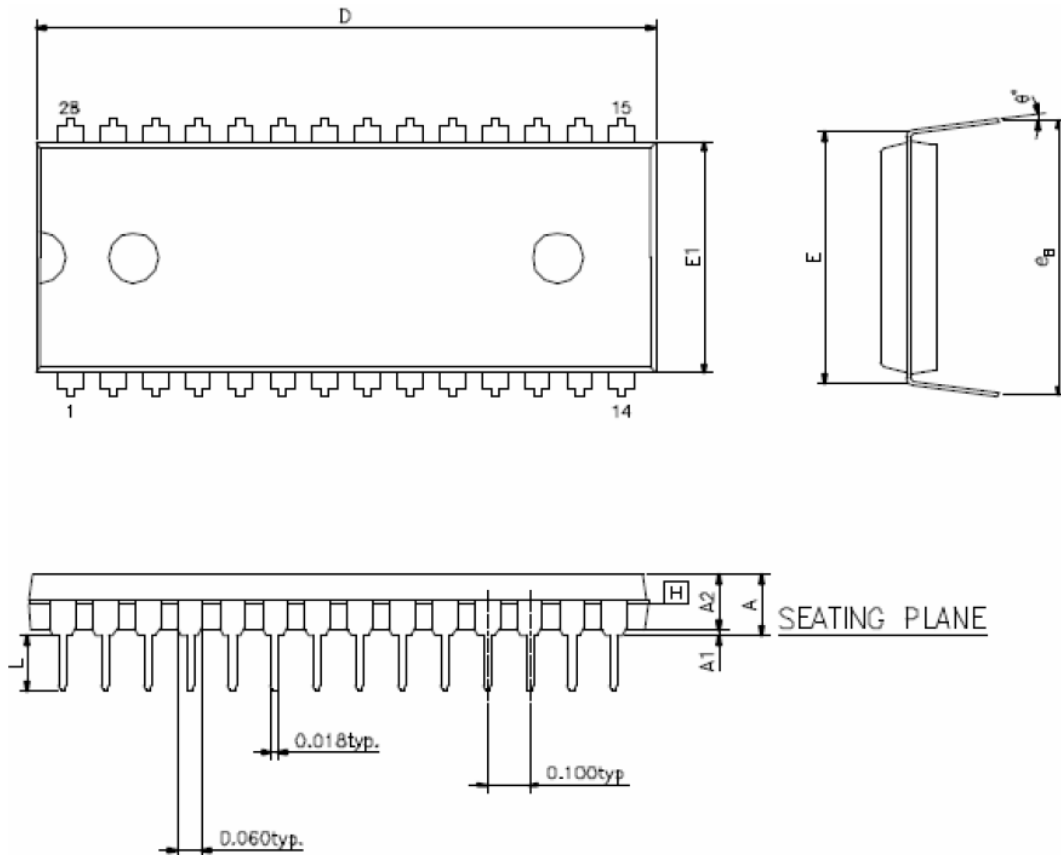
Item	Symbol	Condition	Min	Typ	Max	Unit
MicIn input voltage	VMI	-	-	-	20	mVp-p
MicIn input resistance	RMI	-	-	10	-	k Ω
MicIn amp gain(1)	GMI1	AGC = 0V	-	24	-	dB
MicIn amp gain(2)	GMI2	AGC = 2.5V	-	-45	-15	dB
Analn input voltage	VANI	-	-	-	50	mVp-p
Analn input resistance	RANI	-	-	10	-	k Ω
Analn amp gain	GANI	Analn to SP +/-	-	22	-	dB
AGC output resistance	RAGC	-	-	1	-	k Ω
SP +/- output power	PSP	$R_{SP\pm} = 16\Omega$	-	12.2	-	mW
Voltage amplitude across SP +/-	VSP	$R_{SP\pm} \geq 16\Omega$	-	1.25	-	Vp-p

* Typical Values: $V_{CCD} = V_{CCA} = 5V$
 $V_{SSD} = V_{SSA} = 0V$
 $T_A = 25^\circ C$

APR9301 外接功放的电路图



PACKAGE OUTLINE : DIP – 28 (600 MIL)



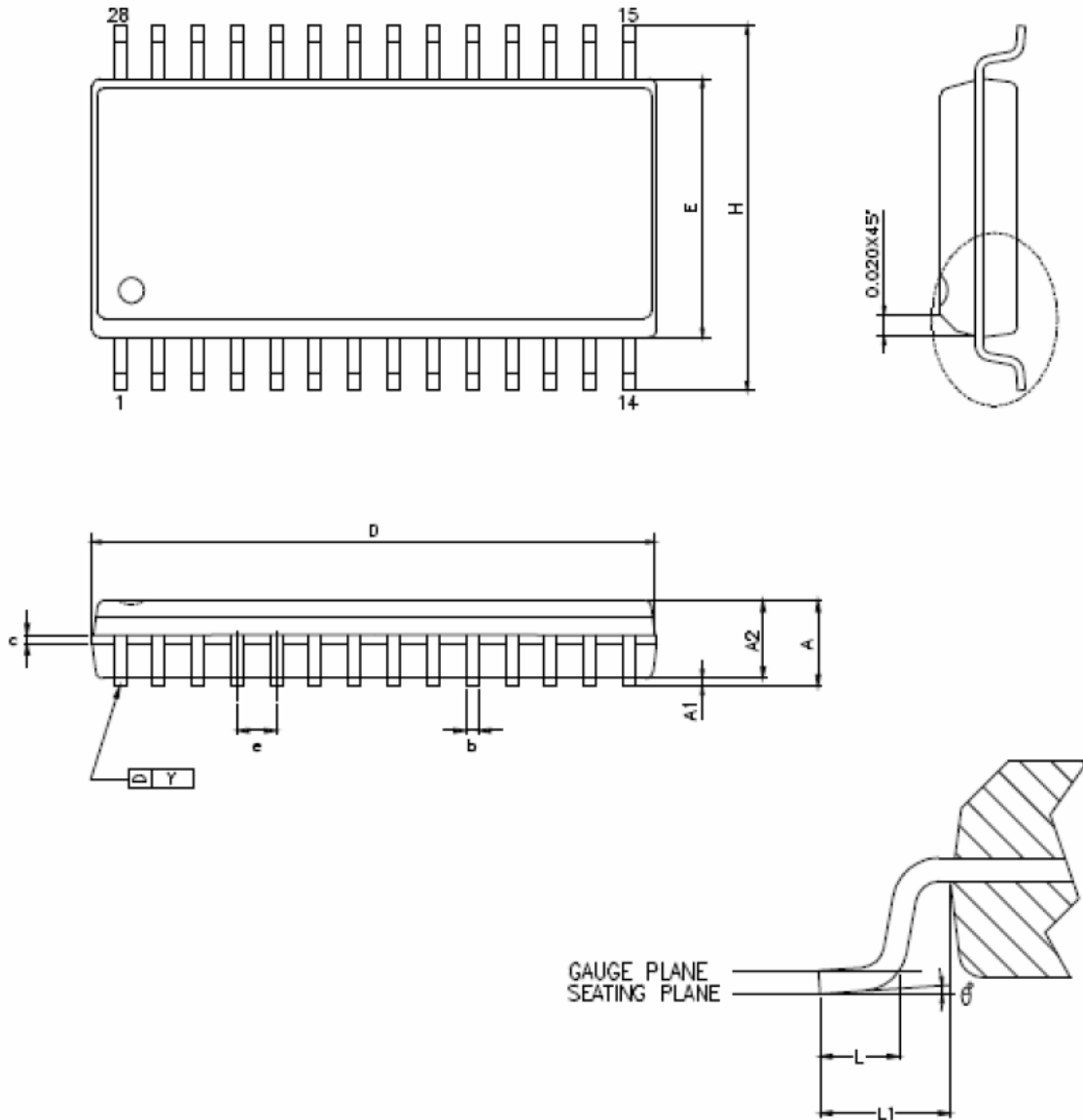
SYMBOLS	MIN.	NOR.	MAX.
A	—	—	0.220
A1	0.015	—	—
A2	0.150	0.155	0.160
D	1.455	1.460	1.470
E	0.600 BSC		
E1	0.540	0.545	0.550
L	0.115	0.158	0.200
e _B	0.630	0.650	0.670
θ	0	7	15

UNIT : INCH

NOTE:

1. JEDEC OUTLINE : MS-011 AB
2. E1 DOES NOT INCLUDE MOLD FLASH.

PACKAGE OUTLINE : SOP – 28 (330 MIL)



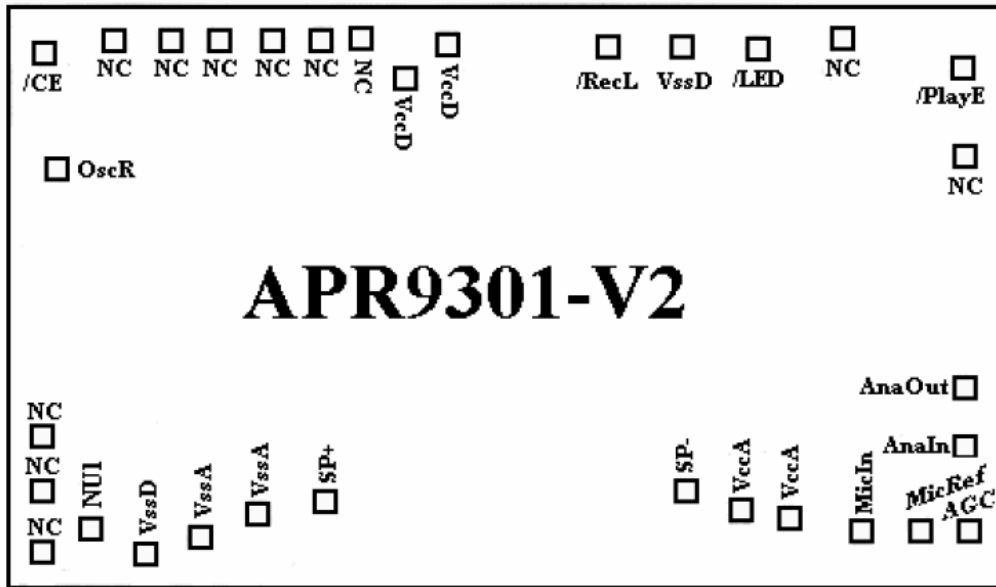
SYMBOLS	MIN.	NOM.	MAX.
A	—	—	0.112
A1	0.002	—	—
A2	0.094	0.098	0.102
b	0.014	0.016	0.020
c	0.008	0.010	0.014
D	0.708	0.713	0.718
E	0.324	0.331	0.336
H	0.453	0.465	0.477
e	0.044	0.050	0.056
L	0.028	0.036	0.038
L1	0.059	0.067	0.075
Y	—	—	0.004
θ°	0	—	10°

UNIT : INCH

NOTES:

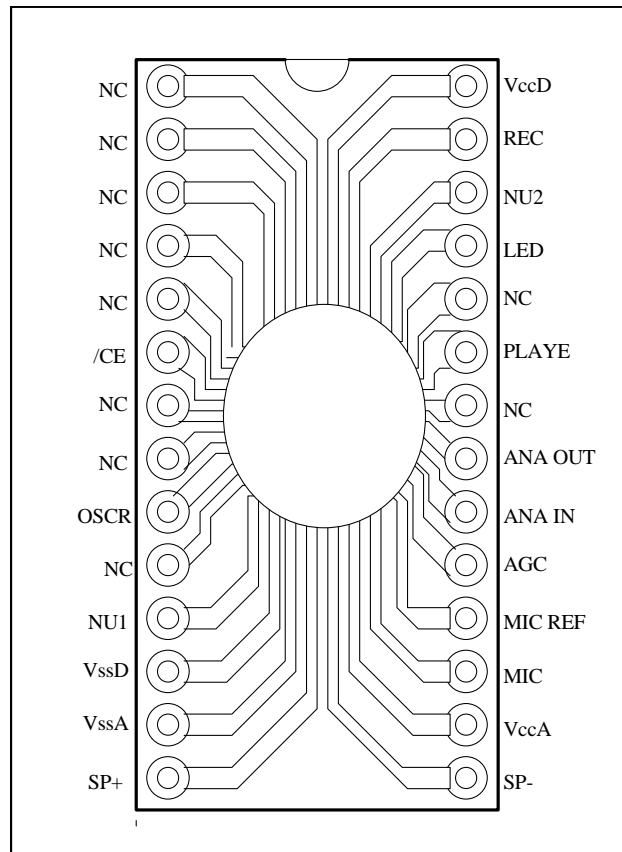
1. JEDEC OUTLINE : MO-059 AD
2. DIMENSIONS "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .15mm (.006in) PER SIDE.
3. DIMENSIONS "E" DOES NOT INCLUDE INTER-LEAD FLASH, OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .25mm (.010in) PER SIDE.

APR9301 Die Bonding Pad Diagram



Notes:
 Die diagram is with respect to die center(um)
Die Dimensions:
 X=214± 1 mils(5500um)
 Y=144± 1 mils(3750um)
Die Thickness:
 13.8± 1.0 mils
 (350± 25um)
Pad Opening:
 4.3mils
 110um
 * Connect substrate to Ground.

28PIN COB



28PIN COB 和 DIP 引脚有区别

- 1、 ROsc 为第 9 脚 (DIP28 为第 7 脚)
- 2、 第 7 脚悬空 (DIP28 为 ROsc)
- 3、 NC 脚为空脚
- 4、 其余引脚同 DIP28

APR9301 Bonding Pad Coordinates

Pin	Pin Name	X - Axis (Note)	Y - Axis (Note)
/CE	Chip Enable	-2496.2	1565.8
OscR	Oscillator Frequency-Setting Resistor	-2459.55	729.8
NU1	Connect to Ground	-1808.45	-1496.1
VSSD	Digital Ground Supply	-1564.05	-1572
VSSA	Analog Ground Supply	-1384.05	-1548.7
VSSA	Analog Ground Supply	-1204.35	-1477.1
SP+	Non-Inverting Speaker Output	-707.15	-1390
SP-	Inverting Speaker Output	479.15	-1389.9
VCCA	Analog Power Supply	976.45	-1492
VCCA	Analog Power Supply	1190.4	-1523.7
MinIn	Microphone Input	1619.45	-1551.4
MicRef	Microphone Reference Input	2035.45	-1551.4
AGC	Automatic Gain Control	2487.45	-1551.4
AnaIn	Analog Signal Input	2487.45	-1049.9
AnaOut	Analog Signal Output	2487.45	-648.9
/PlayE	Edge-Activated Playback	2493.65	1371.1
/LED	LED Output	1430.7	1565.8
VSSD	Connect to Ground	865.75	1565.8
/Recl	Level-Activated Record	258.15	1565.8
VCCD	Digital Power Supply	-229.4	1579.05
VCCD	Digital Power Supply	-510.8	1541.6

Note: With respect to die center(um)