aPR33A3

Seven sections random time Mode (Q7.0)

Datasheet

Recording voice IC

APLUS INTEGRATED CIRCUITS INC.

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■ FEATURES

- Operating Voltage Range: 3V ~ 6.5V
- Single Chip, High Quality Audio/Voice Recording & Playback Solution
  - ◆ No External ICs Required
  - ◆ Minimum External Components
- User Friendly, Easy to Use Operation
  - ◆ Programming & Development Systems Not Required
- 340 sec. Voice Recording Length in aPR33A3
- Powerful 16-Bits Digital Audio Processor.
- Nonvolatile Flash Memory Technology
  - ◆ No Battery Backup Required
- External Reset pin.
- Powerful Power Management Unit
  - ◆ Very Low Standby Current: 1uA
  - ◆ Low Power-Down Current: 15uA
  - ◆ Supports Power-Down Mode for Power Saving
- Built-in Audio-Recording Microphone Amplifier
  - ◆ No External OPAMP or BJT Required
  - ◆ Easy to PCB layout
- Configurable analog interface
  - ◆ Differential-ended MIC pre-amp for Low Noise
  - ◆ High Quality Line Receiver
- High Quality Analog to Digital, DAC and PWM module
  - ◆ Resolution up to 16-bits
- Simple And Direct User Interface
- 7 sections random time voice recording and play back.

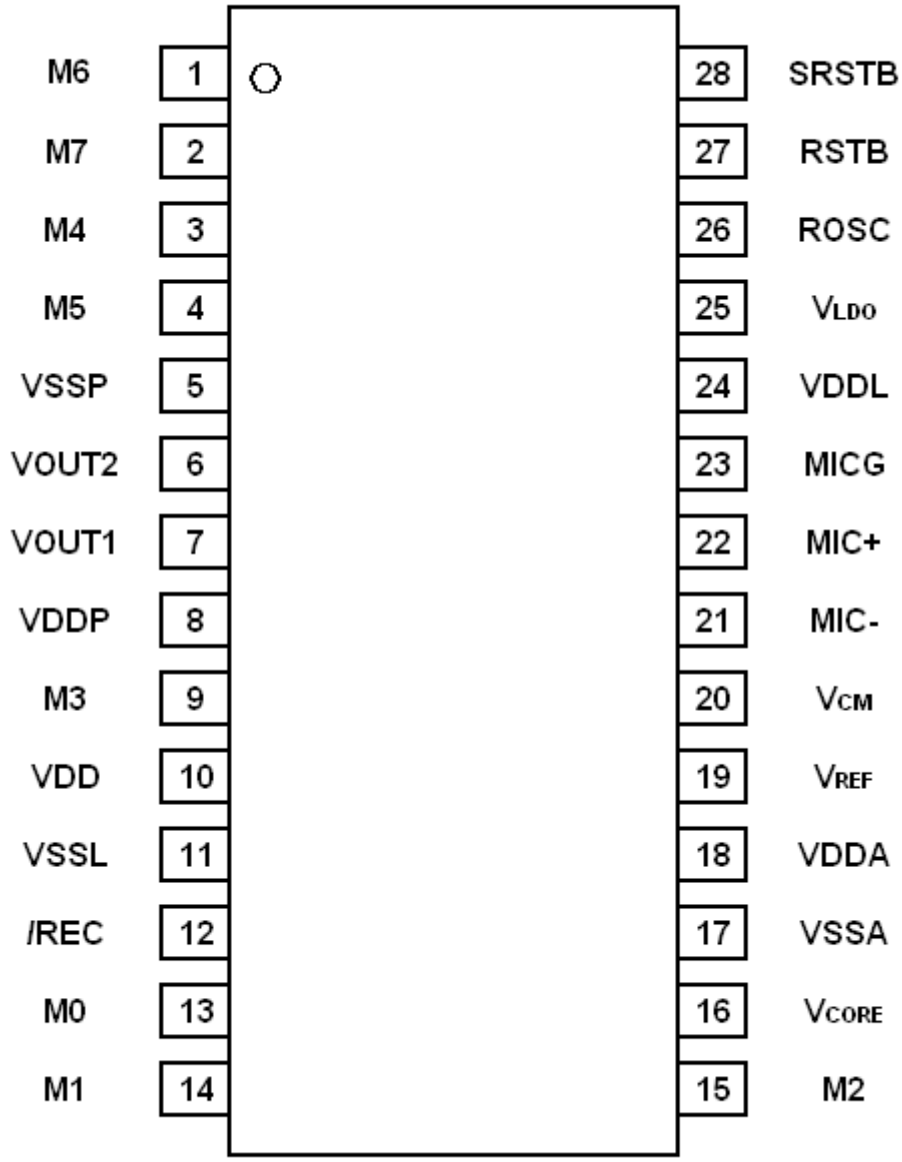
■ DESCRIPTION

Today's consumers demand the best in audio/voice. They want crystal-clear sound wherever they are in whatever format they want to use. APLUS delivers the technology to enhance a listener's audio/voice experience.

The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

The aPR33A series Q7.0 is specially designed for simple key trigger, user can record and playback the messages in random seven sections by switch, It is suitable in simple interface, e.g. toys, leave messages system, answering machine etc. Meanwhile, this mode provides the power-management system. Users can let the chip enter power-down mode when unused. It can effectively reduce electric current consuming to 15uA and increase the using time in any projects powered by batteries.

■ PIN CONFIGURATION

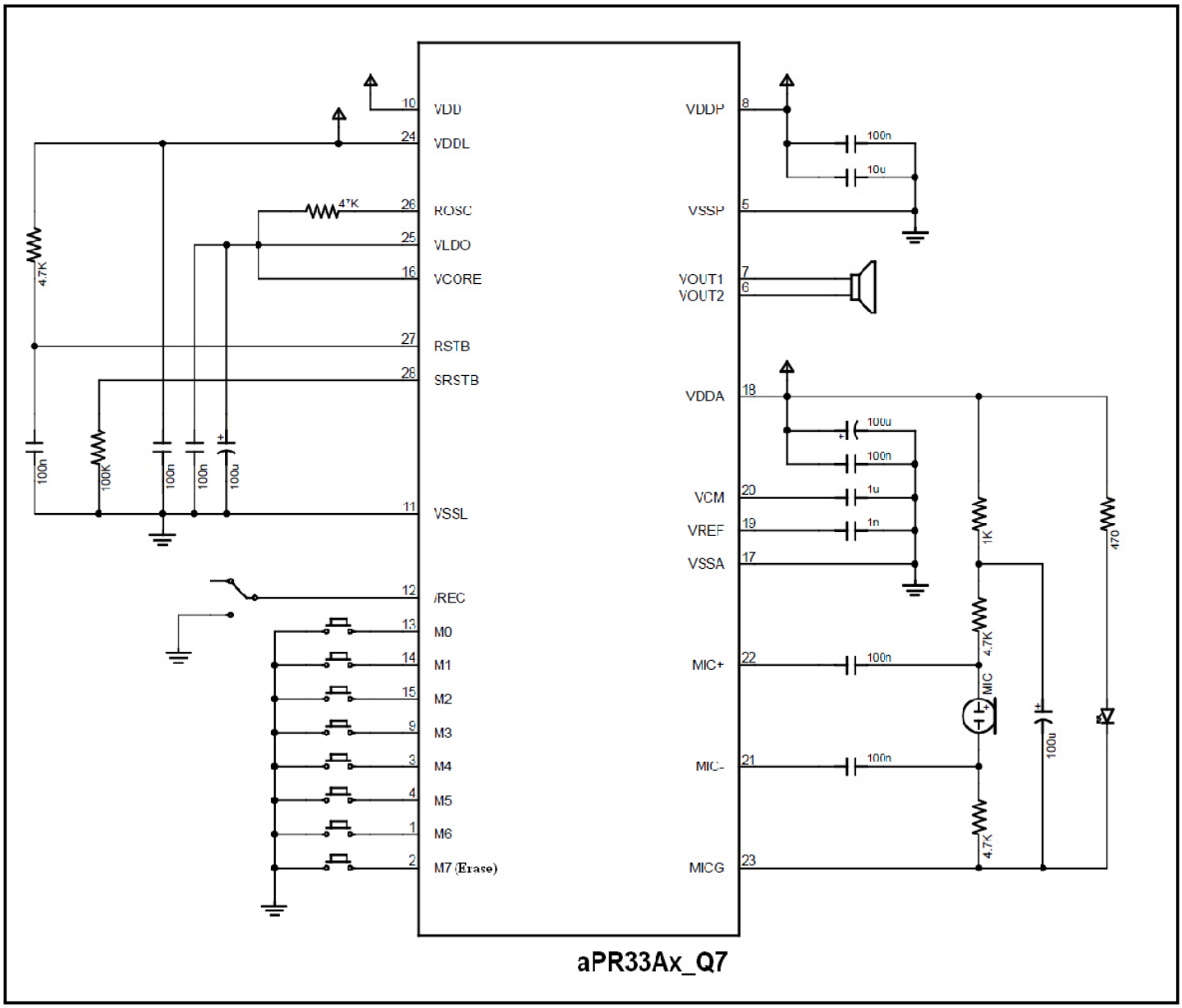


DIP / SOP Package

■ PIN DESCRIPTION

Pin Names	Pin No	TYPE	Description
VDDP VDD VDDA VDDL	8 10 18 24		Positive power supply.
VSSP VSSL VSSA	5 11 17		Power ground.
V_{LDO}	25		Internal LDO output.
V_{CORE}	16		Positive power supply for core.
V_{REF}	19		Reference voltage.
V_{CM}	20		Common mode voltage.
Rosc	26	INPUT	Oscillator resistor input.
RSTB	27	INPUT	Reset. (Low active)
SRSTB	28	INPUT	System reset, pull-down a resistor to the VSSL.
MIC+ MIC-	21 22	INPUT	Microphone differential input.
MICG	23	OUTPUT	Microphone ground.
VOUT1	7	INPUT	PWM output to drive speaker directly. DAC option.
VOUT2	6	INPUT	PWM output to drive speaker directly. DAC output.
/REC	12	INPUT	Record Mode. (Low active)
M0	13	INPUT	Message-0.
M1	14	INPUT	Message-1.
M2	15	INPUT	Message-2.
M3	9	INPUT	Message-3.
M4	3	INPUT	Message-4.
M5	4	INPUT	Message-5.
M6	1	INPUT	Message-6
M7	2	INPUT	Erase

■ TYPICAL APPLICATION



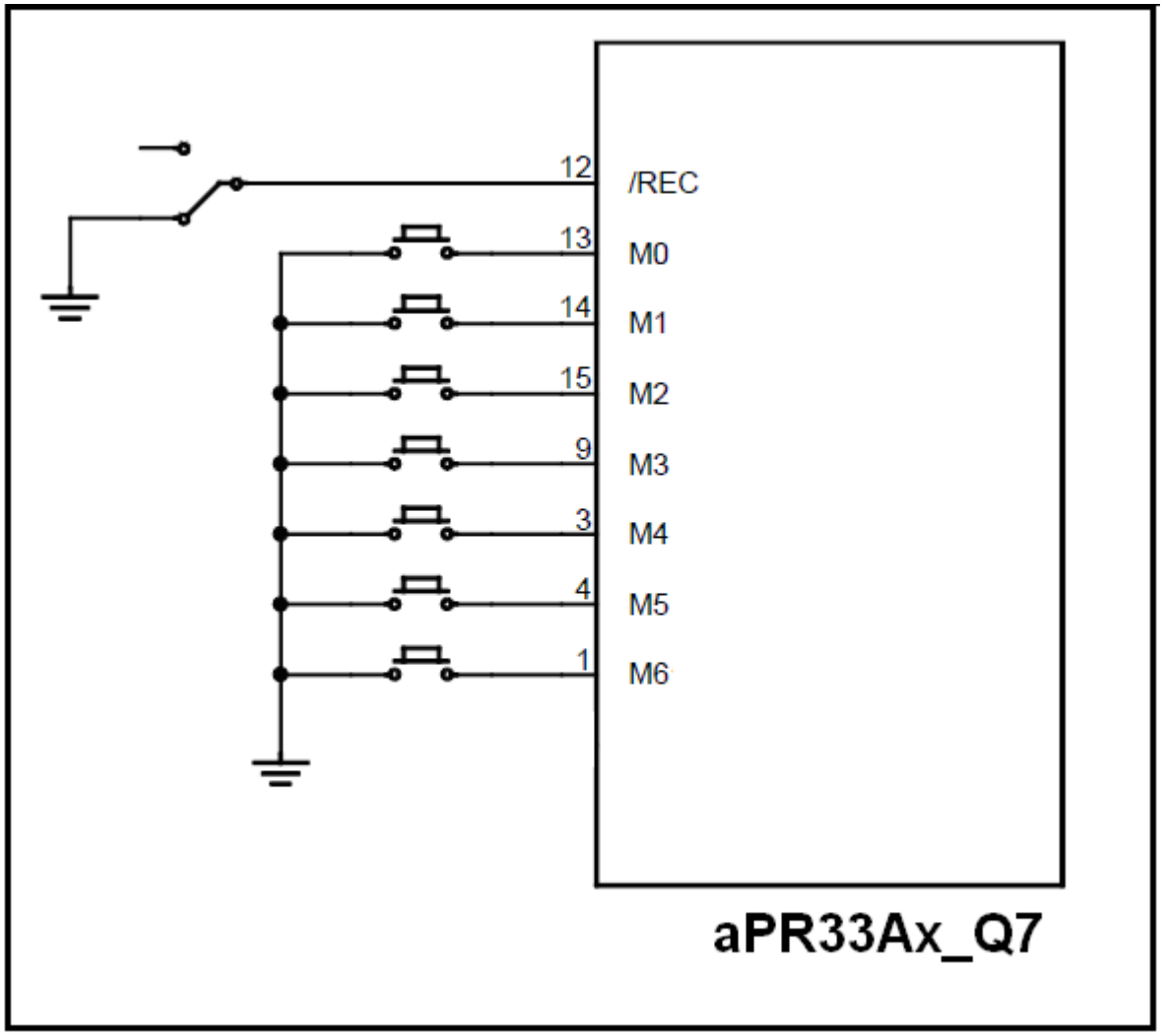
■ RECORD MESSAGE

During the /REC pin drove to V_{IL}, chip in the record mode.

When the message pin (M0, M1, M2 … M6) drove to V_{IL} in record mode, press and release them will play “beep” tone to start recording. When you finish recording press and release them will play “beep” tone to end recording.

The following fig. showed a typical record circuit for 7-message mode. We connected a slide-switch between /REC pin and VSS, and connected 7 tact-switches between M0 ~ M6 pin and VSS. When the slide-switch fixed in VSS side and any tact-switch will be pressed.

Note: After reset, /REC and M0 to M6 pin will be pull-up to VDD by internal resistor.



■ PLAYBACK MESSAGE

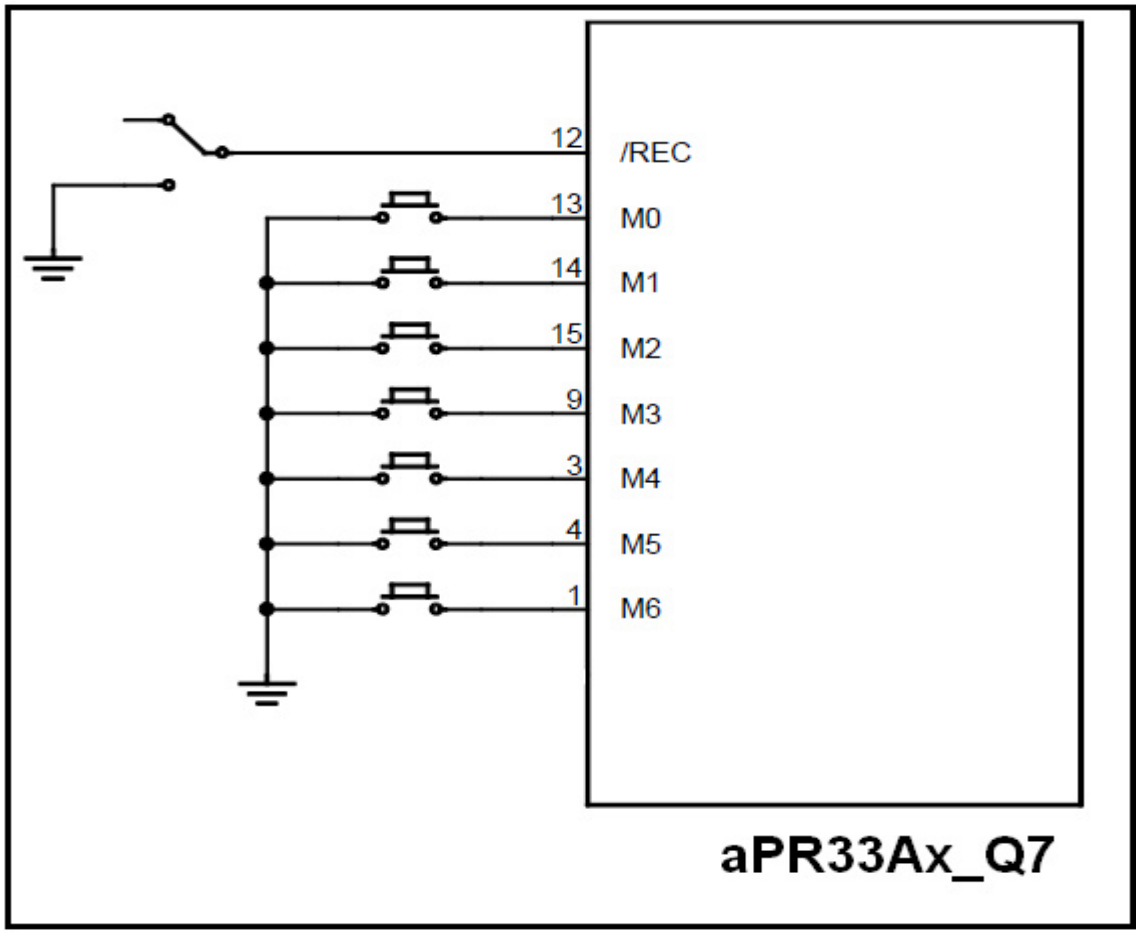
During the /REC pin drove to V_{IH}, chip in the playback mode.

When the message pin (M0, M1, M2 … M6) drove from V_{IH} to V_{IL} in playback mode, the message playback starting.

The message playback will continue until message pin drove from V_{IH} to V_{IL} again or end of this message.

The following fig. showed a typical playback circuit for 7-message mode. We connected a slide-switch between /REC and VSS, and connected 7 tact-switches between M0 ~ M6 and VSS. When the slide-switch fixed in float side and any tact-switch will be pressed, chip will start message playback and until the user pressed the tact-switch again or end of message.

Note: After reset, /REC and M0 to M6 pin will be pull-up to VDD by internal resistor.

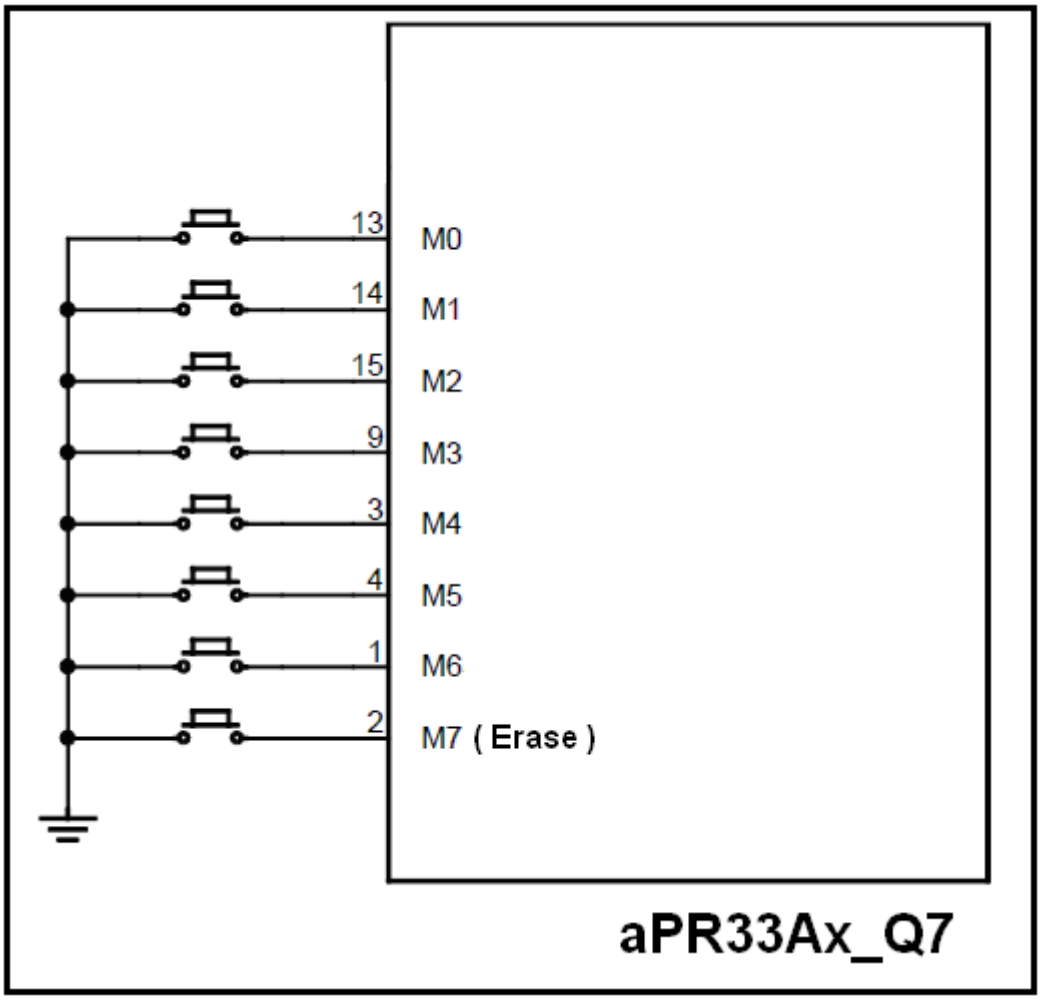


■ ERASE MESSAGE

During the M7 pin drove to V_{IL}, chip in the erase mode.

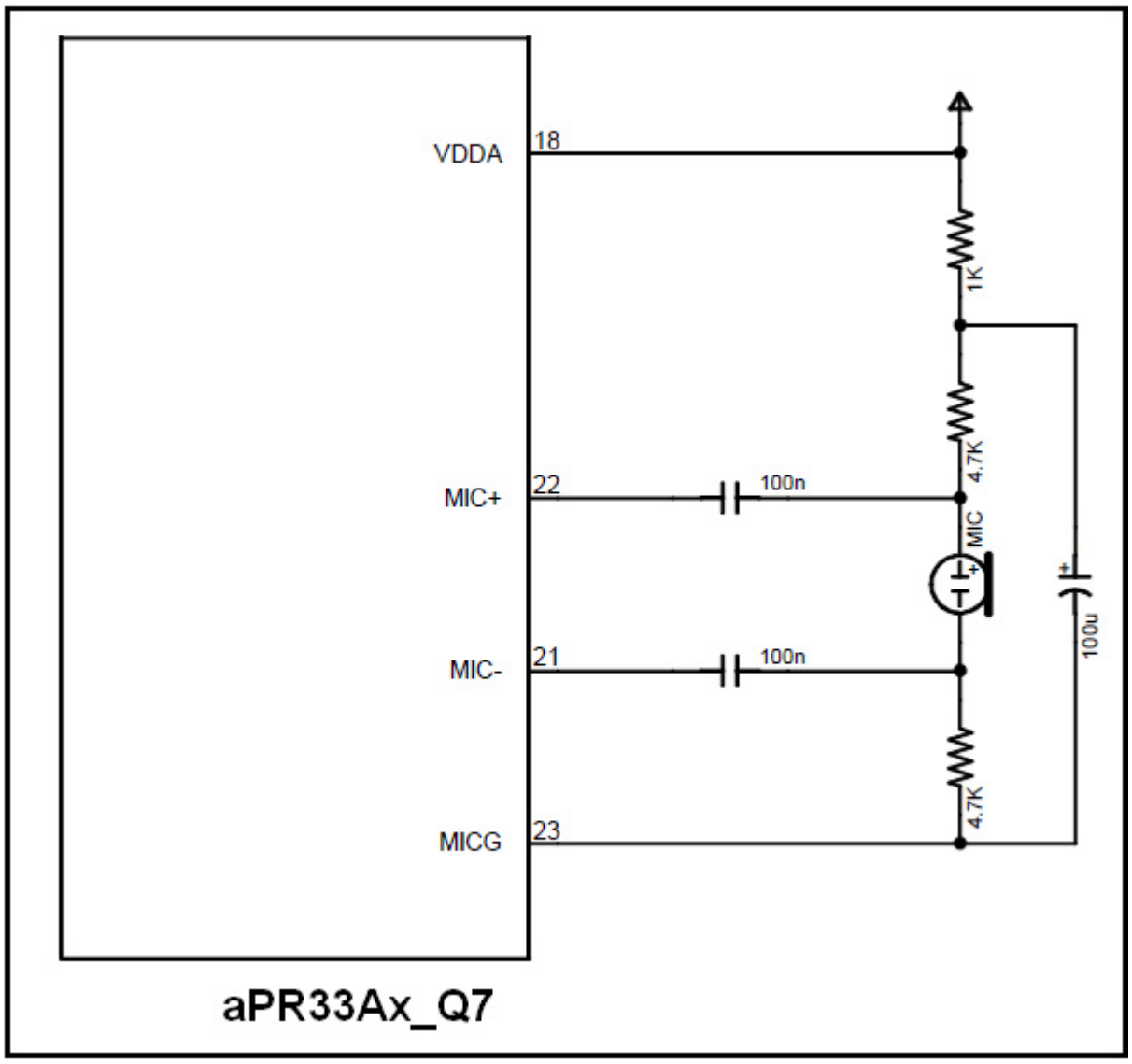
If there are data in pin (M0, M1, M2 … M6), and you want to change the data then you will hear “BEEP BEEP” sound to remind you that you can not do any further recording.

So, you have to M7 pin keep holding to V_{IL}, and press pin (M0, M1, M2 … M6) to delete the original data (LED on about 1 second) to complete the erase procedure.

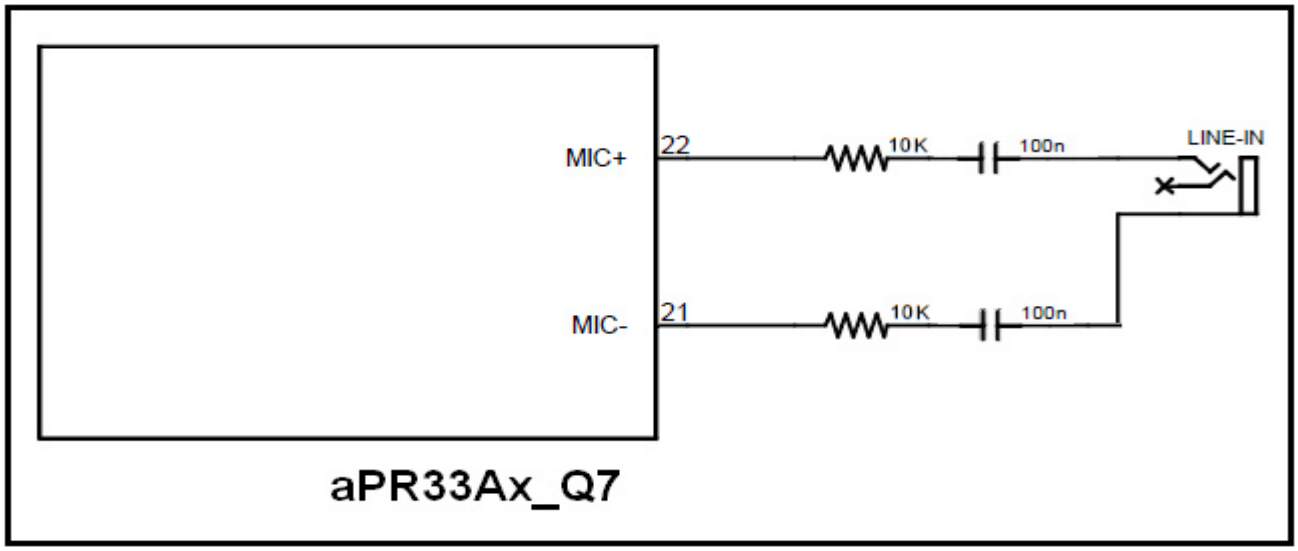


■ VOICE INPUT

The aPR33A series supported single channel voice input by microphone or line-in. The following fig. showed circuit for different input methods: microphone, line-in and mixture of both.

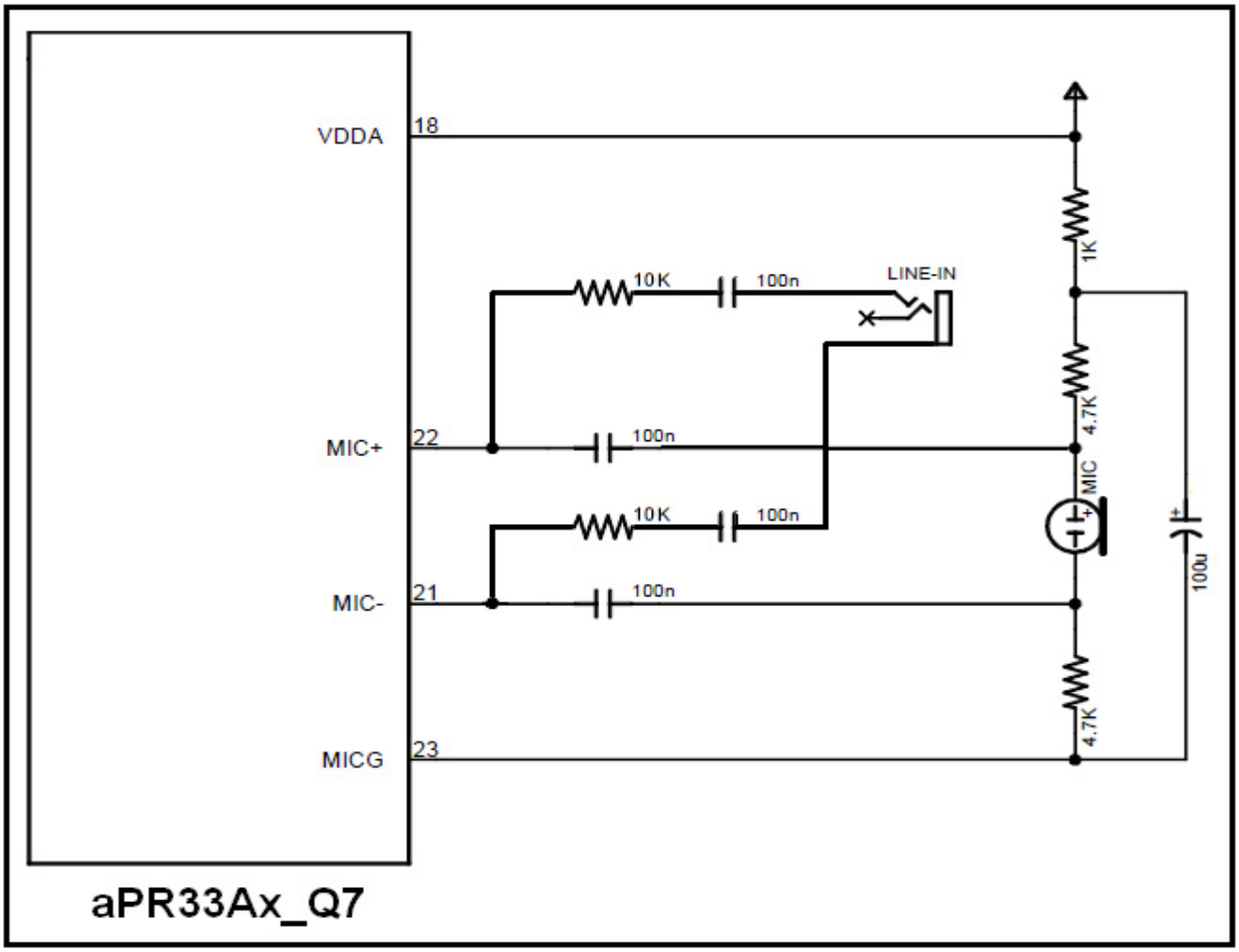


(A) Microphone



Note: The 10K resistor used for input signal adjust, and the value just for reference.

(B) Line-In



Note: The 10K resistor used for input signal adjust, and the value just for reference.

(C) Microphone + Line-In

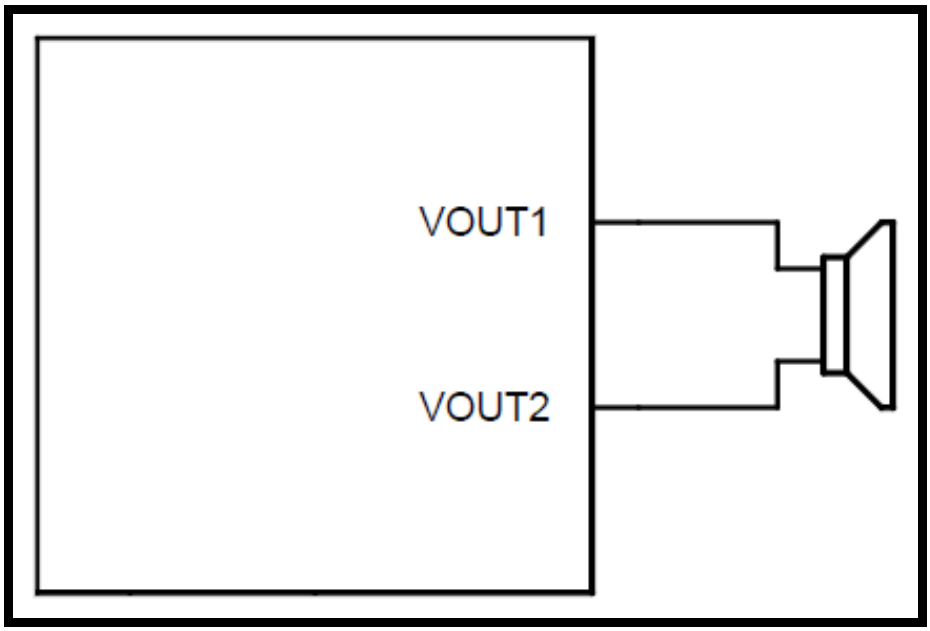
■ VOICE OUTPUT

The aPR33A series support 2 voice output mode, PWM and DAC.

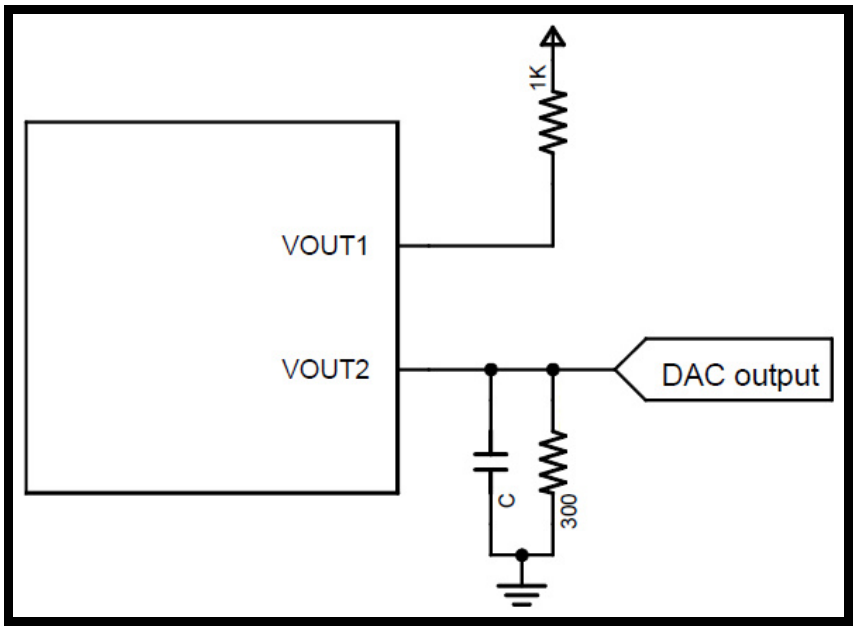
The PWM mode use VOUT1 and VOUT2 pin to drive speaker directly without external components to save cost.

The DAC mode use VOUT2 pin to output current signal. User can use the signal to drive audio amplifier or mix with other components in their applications to provide larger voice volume.

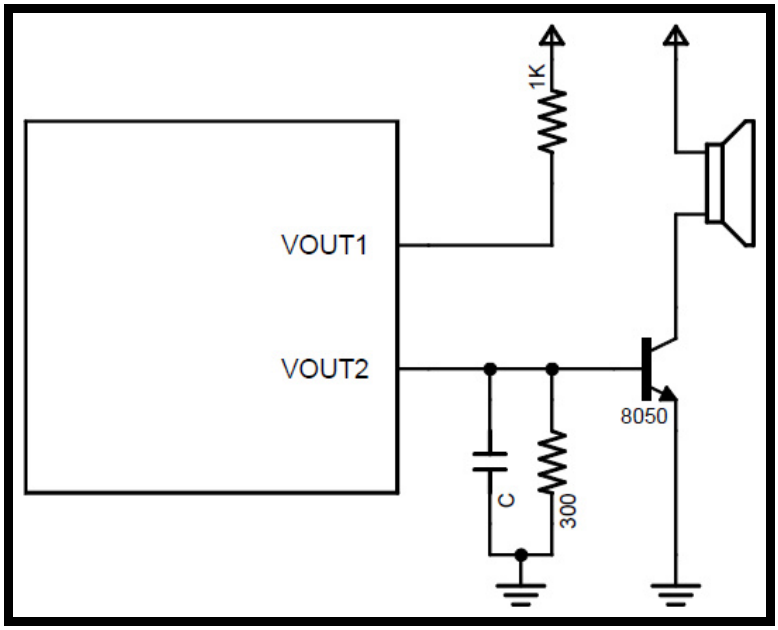
The following fig. show circuit for different output methods: PWM, DAC, DAC with transistor, DAC with audio amplifier AP4890B.



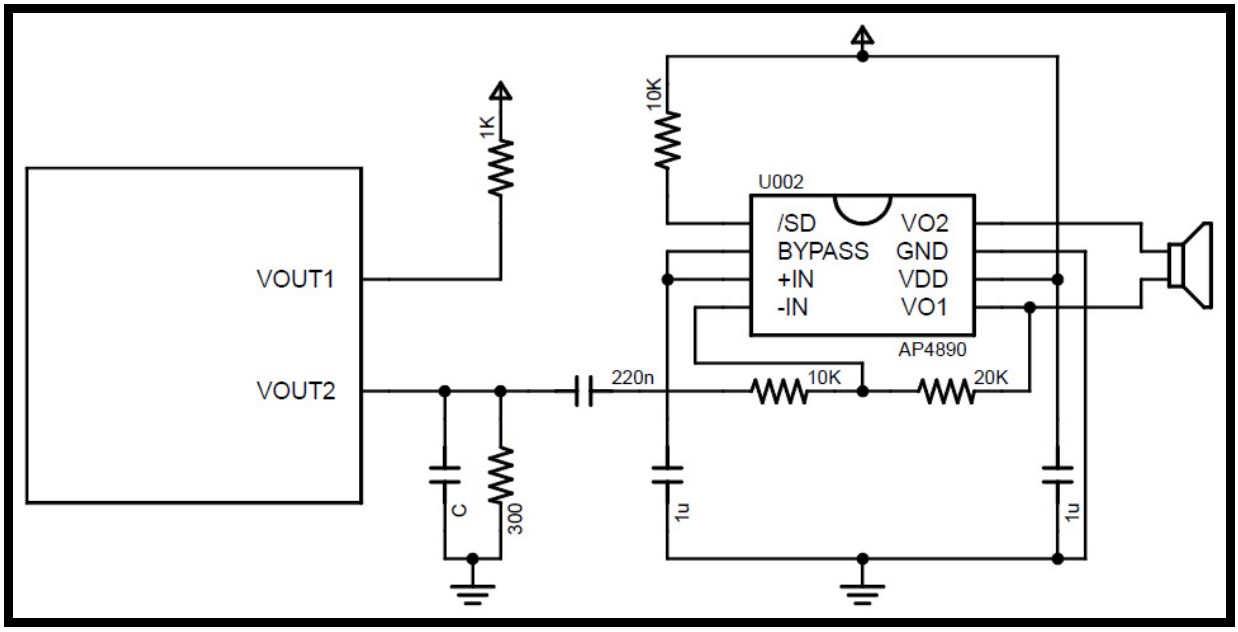
(A) PWM



(B) DAC



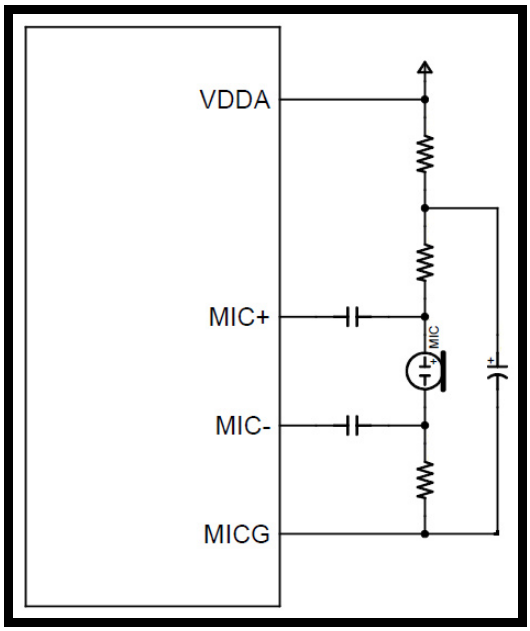
(C) DAC with transistor



(D) DAC with audio amplifier AP4890B

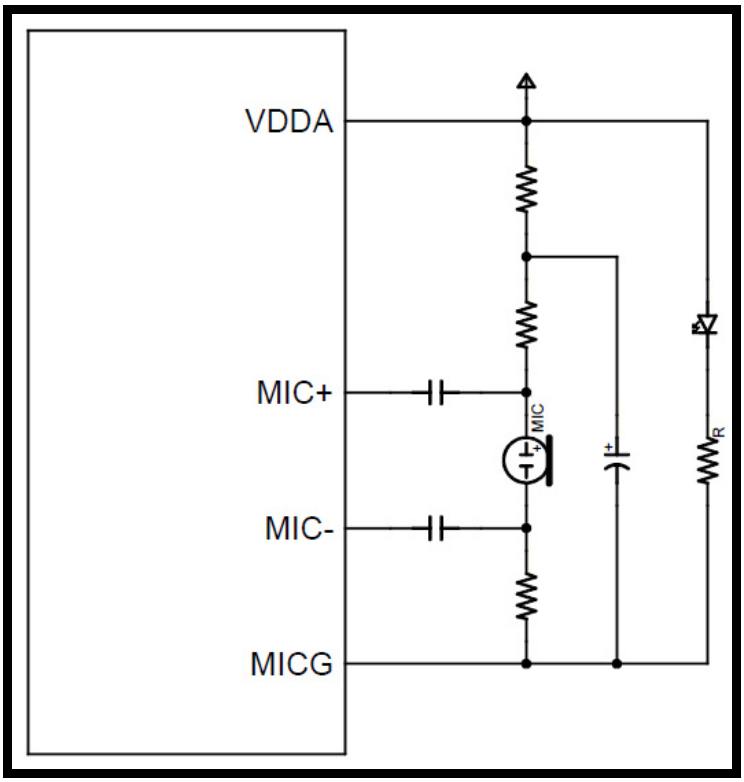
■ BUSY

The MICG pin will be drove to low during the message record or playback, and drove to high during idle or standby, user can detect MICG status to know chip is busy or not.

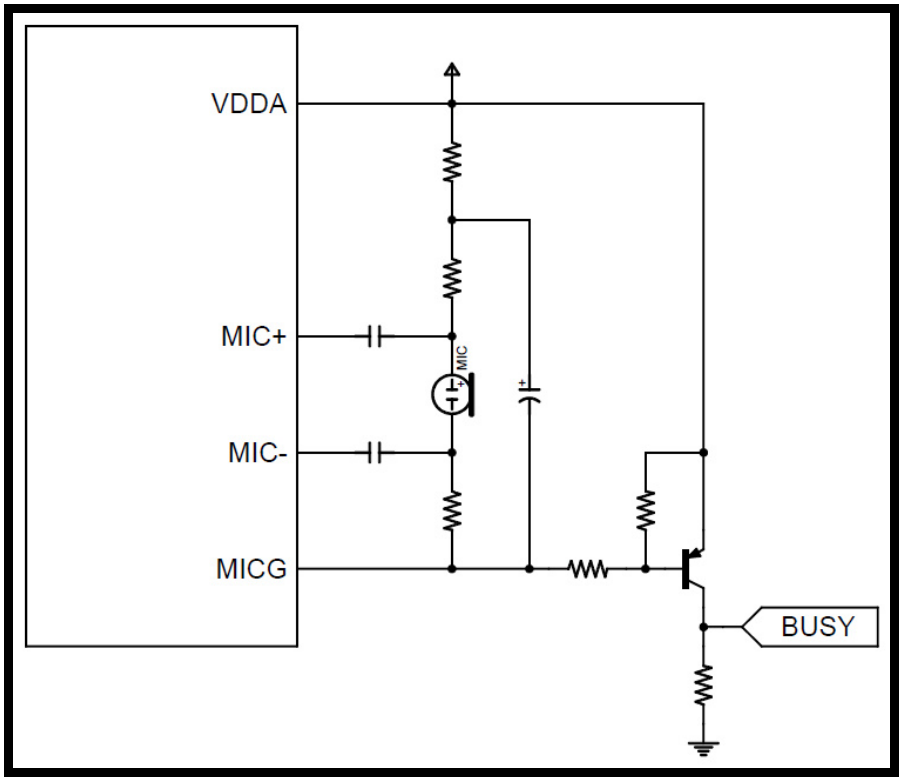


Please note it is limited for MICG pin driving current. Reference to I_{OH} and I_{OL} in section "**DC CHARACTERISTICS"**. If MICG pin is over loading from external circuit, it will cause noise in microphone circuit.

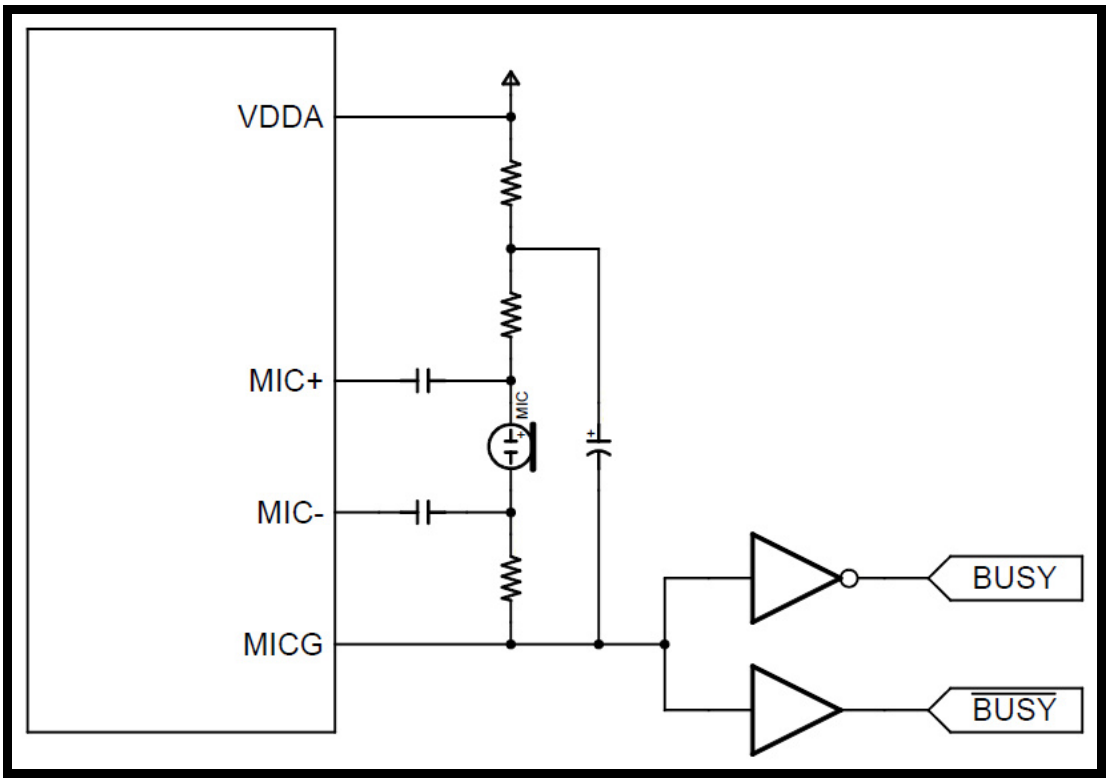
Below is a typical application. We add one LED to indicate IC record and playback status. We use one Resistor to limit current. And suggest R> 470Ω



Below Transistor circuit is to get higher current, larger than I_{OH} or I_{OL}.



To get best sound quality, we can use buffer or inverter to isolate MICG to avoid noise from external circuit. Driving current is provided by buffer(inverter) only.

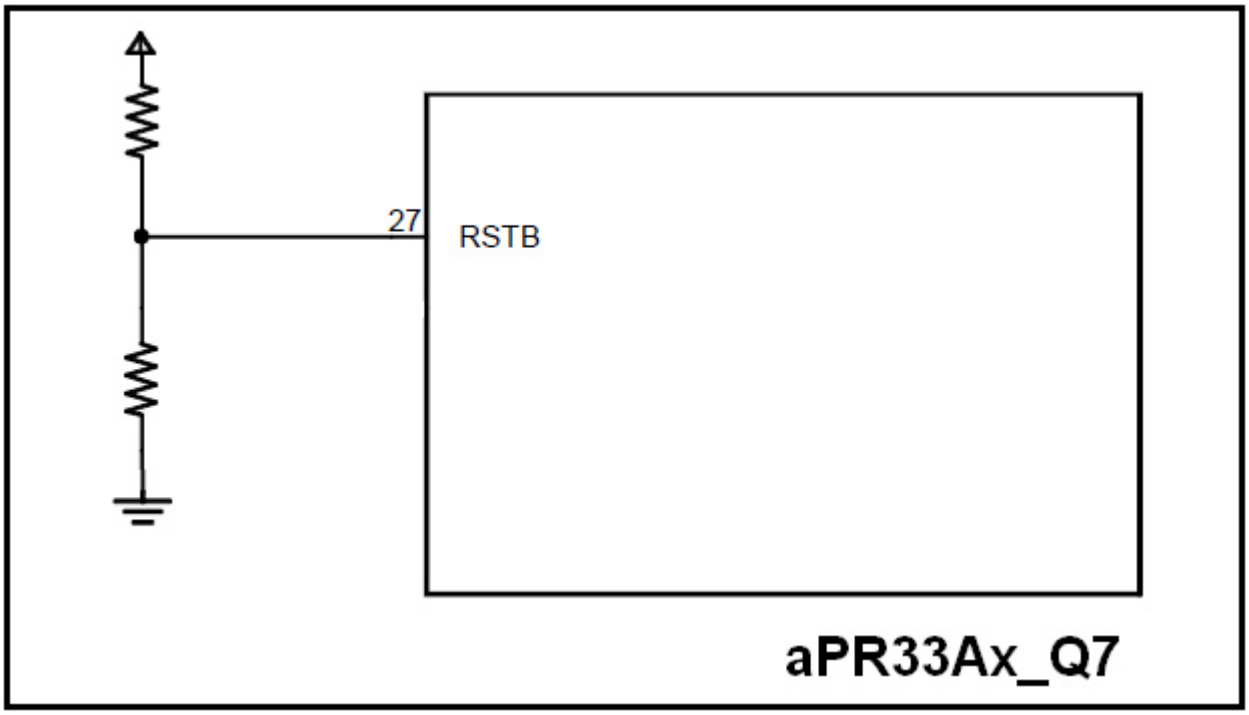


■ RESET

aPR33A series can enter standby mode when RSTB pin drive to low. During chip in the standby mode, the current consumption is reduced to I_{SB} and any operation will be stopped, user also can not execute any new operate in this mode.

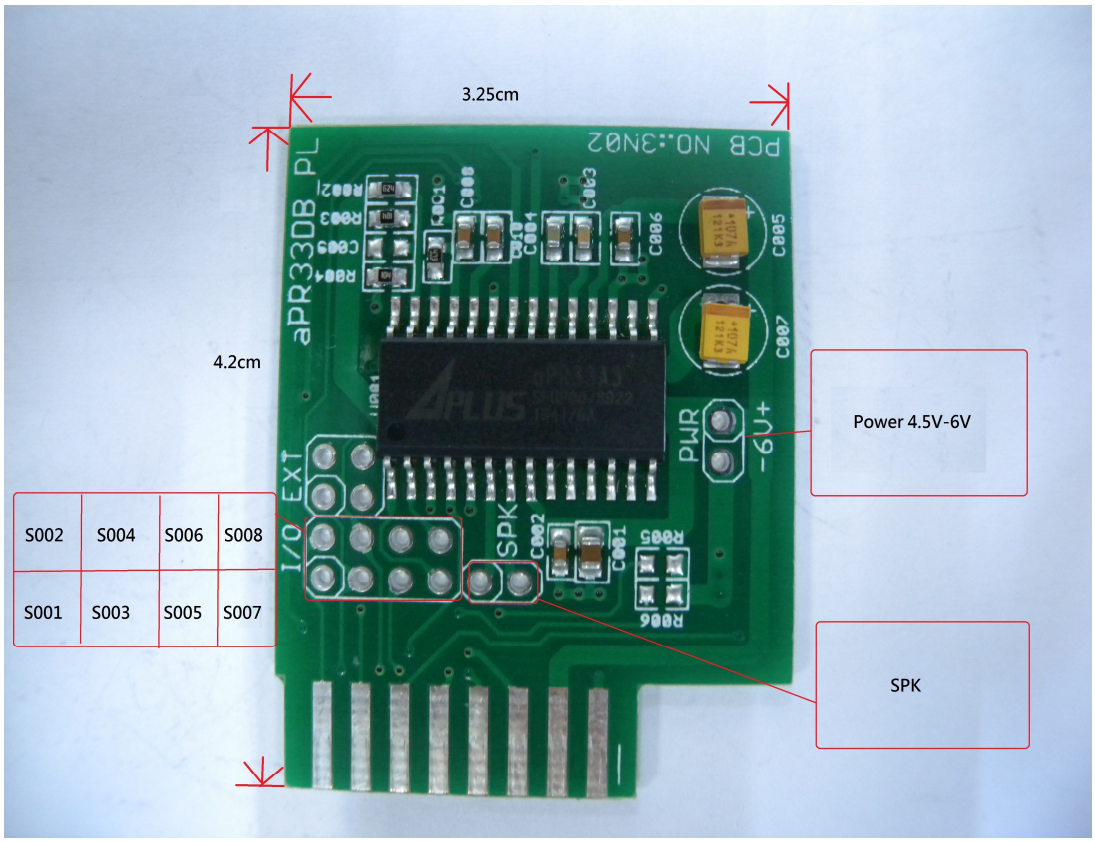
The standby mode will continue until RSTB pin goes to high, chip will be started to initial, and playback “beep” tone to indicate enter idle mode.

User can get less current consumption by control RSTB pin specially in some application which concern standby current.



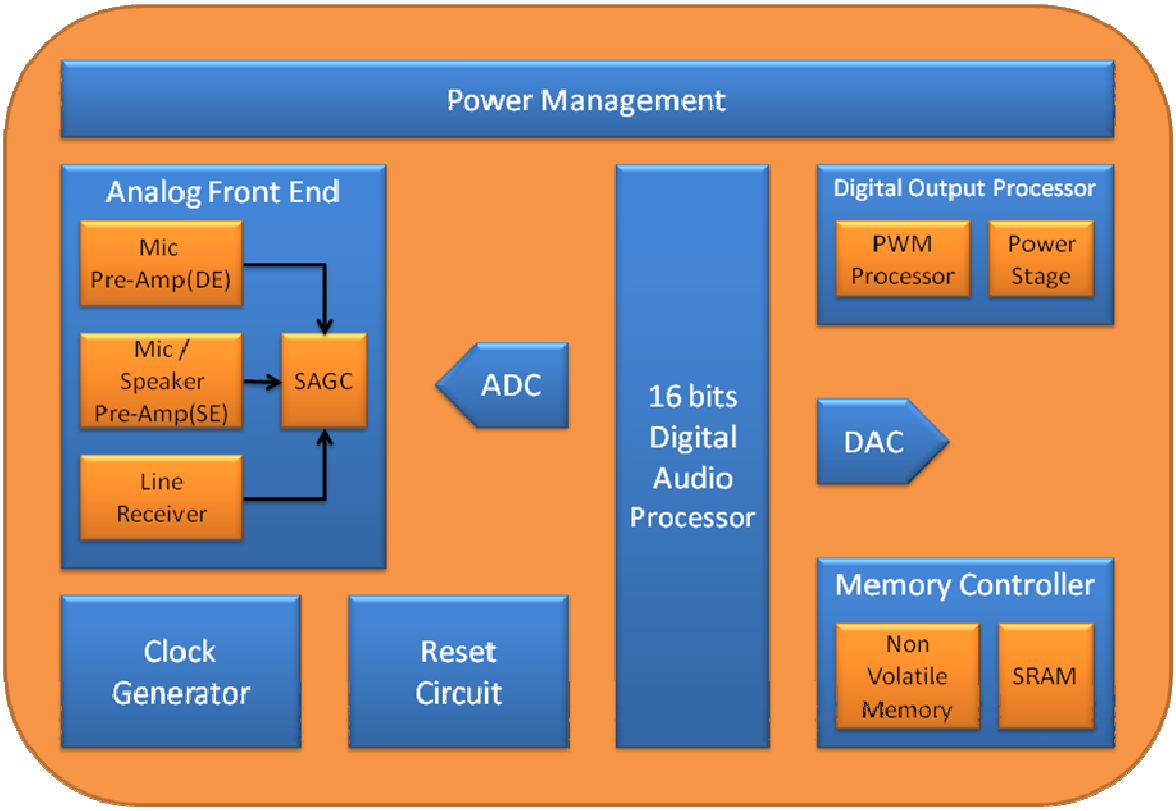
■ EXAMPLE

You can use microphone-in or line-in to do 7 sections random time voice recording with Q writer. After recording satisfied, Q card offer I/O holes to allow you connecting speaker, batteries and switches(There are two wires for the switch. Please connect one to our I/O hole, the other one to GND.)



■ BLOCK DIAGRAM

Figure 1. Block Diagram



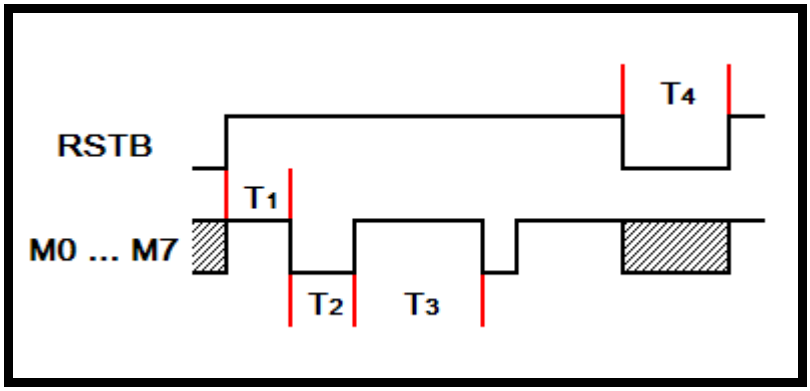
■ ABSOLUTE MAXIMUM RATINGS

Symbol	Rating	Unit
VDD – VSS	-0.3 ~ +10.0	V
V_{IN}	VSS-0.3 < V_{IN} < VDD+0.3	V
V_{OUT}	VSS < V_{OUT} < VDD	V
T(Operating)	-40 ~ +85	℃
T(Junction)	-40 ~ +125	℃
T(Storage)	-40 ~ +125	℃

■ DC CHARACTERISTICS

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
VDD	Operating Voltage	3.0		6.5	V	
I_{SB}	Standby Current			1	μA	
I_{PDN}	Power-Down Current		15	20	μA	
$I_{OP(IDLE)}$	Operating Current (Idle)		20		mA	VDD = 5V
$I_{OP(REC)}$	Operating Current (Record)		35		mA	VDD = 5V
$I_{OP(PLAY)}$	Operating Current (Playback)		25		mA	VDD = 5V
V_{IH}	"H" Input Voltage	2.5			V	
V_{IL}	"L" Input Voltage			0.6	V	
I_{VOUT}	VOUT Current		185		mA	
I_{OH}	O/P High Current		8		mA	VDD = 5V / VOH=4.5V
I_{OL}	O/P Low Current		14		mA	VDD = 5V / VOH=0.5V
R_{NPIO}	Input pin pull-down resistance		300		KΩ	External floating or drive low.
			1		MΩ	External drive high.
R_{UPIO}	Input pin pull-up resistance		4.7		KΩ	
△Fs/Fs	Frequency stability			5	%	VDD = 5V ± 1.0V
△Fc/Fc	Chip to chip Frequency Variation			5	%	Also apply to lot to lot variation.

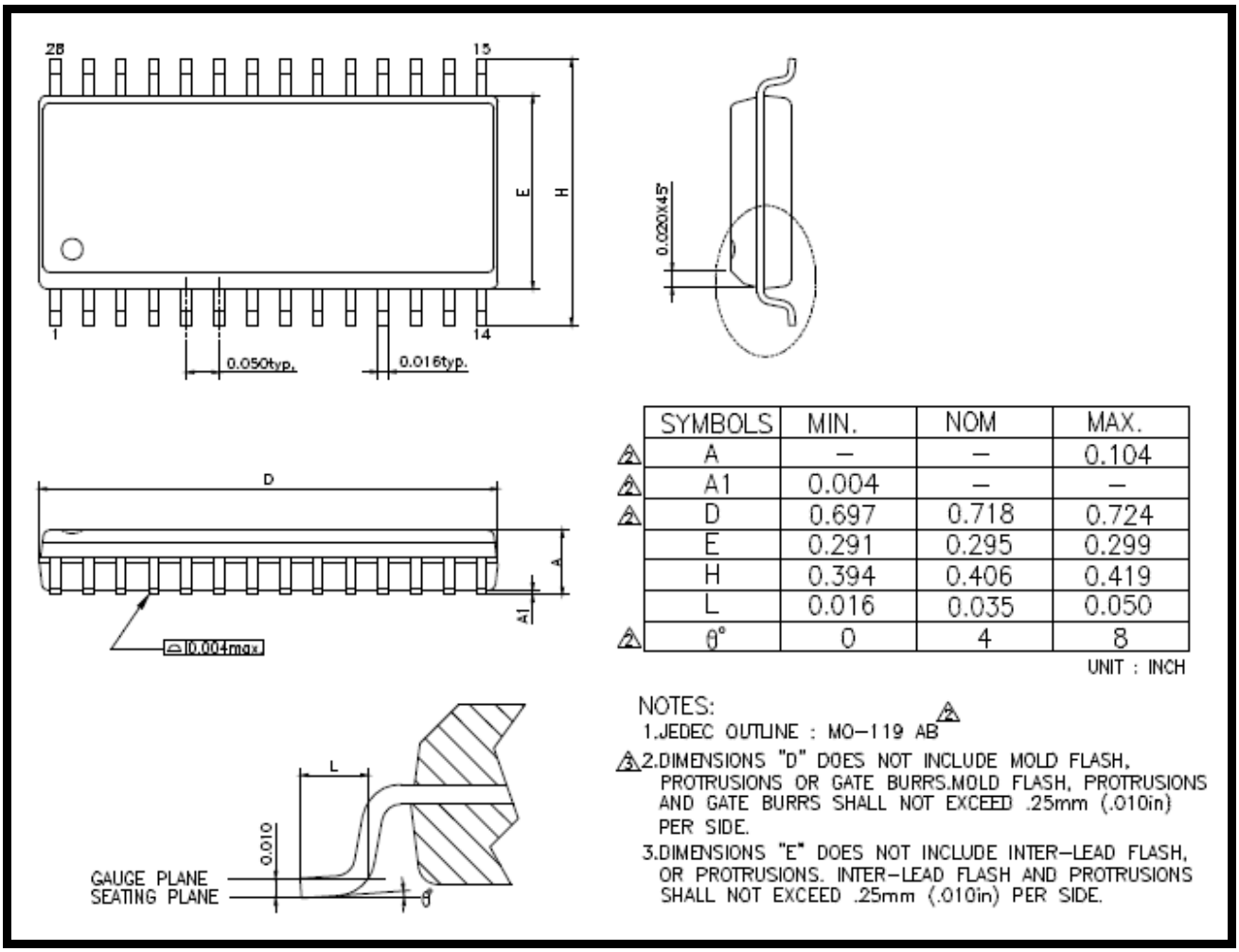
■ AC CHARACTERISTICS



Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
T1	/CS Setup Time	100	--	--	mS	VDD=5.0V
T2	Trigger Setup Time	16	--	--	mS	VDD=5.0V
T3	Trigger Hold Time	16	--	--	mS	VDD=5.0V
T4	/CS Hold Time	100	--	--	uS	VDD=5.0V

■ PACKAGE INFORMATION

28Pin 300mil SOP Package

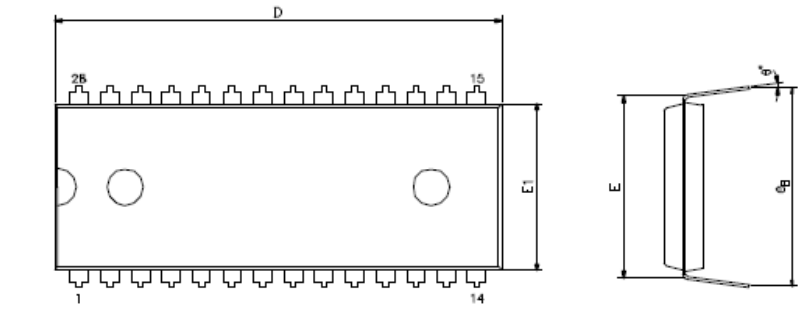


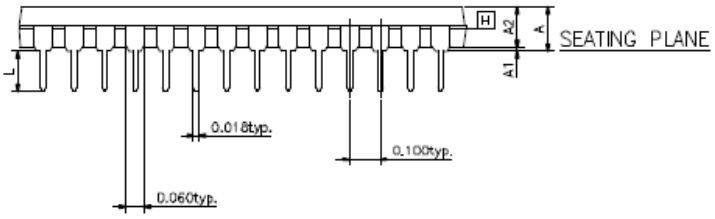
	SYMBOLS	MIN.	NOM	MAX.
2	A	–	–	0.104
2	A1	0.004	–	–
2	D	0.697	0.718	0.724
	E	0.291	0.295	0.299
	H	0.394	0.406	0.419
	L	0.016	0.035	0.050
2	θ°	0	4	8

UNIT : INCH

NOTES:
1. JEDEC OUTLINE : MO-119 AB 2
2 3. DIMENSIONS "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .25mm (.010in) 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.

28Pin 600mil DIP Package





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.

■ HISTORY

Ver. A (2014/01/08)

- Original version data sheet for aPR33Ax-Q7.0.