



Alpha Microelectronics Corp.

# AM5AA\_OTP SERIES DATA SHEET

**佑華微電子股份有限公司**

新竹市光復路二段 295 號 9 樓之 1

電話：03-573 6660

傳真：03-573 6661

[www.ealpha.com.tw](http://www.ealpha.com.tw)

**Alpha Microelectronics Corp.**

9F-1, 295, Sec. 2, Kuang Fu Rd., Hsinchu, Taiwan

Tel : +886-3-573 6660

Fax: +886-3-573 6661

[www.ealpha.com.tw](http://www.ealpha.com.tw)

## Revision History

Rev	Date	Description	Page
3.05	2019/12/18	1) Modify <a href="#">Chapter 2 (12)</a> : Built-in Infrared Ray (IR) carrier output.	6
		2) Add <a href="#">Section 6.4</a> : Large Capacitor Application.	20
3.04	2014/11/21	1) Change the name of AM5AA041A to AM5AA0410 and AM5AA041B to AM5AA0411.	-
		2) Update Chapter 6: Application Circuit.	-
		3) Modify Chapter 8: Ordering Information.	-
3.03	2014/6/26	1) Indicate AM5AA041x as AM5AA041A and AM5AA041B when referring to the different working voltage.	-
		2) Modify Section 4.2: Add AM5AA170x pin assignment of SOP28L.	-
		3) Modify Chapter 7: Add AM5AA170x package dimension of 28-Pin SOP.	-
		4) Add Chapter 8: Ordering Information.	-
3.02	2012/8/31	1) Modify Chapter 2: Features.	-
		2) Modify Chapter 4: Pin Configuration.	-
		3) Modify Chapter 6: Application Circuit.	-
3.01	2012/5/29	1) Modify Chapter 2: Features.	-
		2) Modify Chapter 4: Pin Description.	-
		3) Modify Chapter 6: Application Circuit.	-
3.00	2011/5/23	1) Modify Chapter 2: Features.	-
		2) Modify Section 4.1: AM5AA020x / AM5AA041x / AM5AA084x Pin Assignment.	-
		3) Modify Section 4.2: AM5AA170x Pin Assignment.	-
		4) Modify Section 5.2: DC Characteristics.	-
2.01	2011/2/23	Modify Chapter 1: General Description.	-
2.00	2010/12/16	1) Modify Chapter 2: Features.	-
		2) Modify Chapter 2: Modify instruction numbers from 32 to 31.	-
		3) Modify Chapter 4: Add sub series pin assignment.	-
		4) Modify Section 4.1: 14-pin package.	-
		5) Modify Section 5.2: DC Characteristics.	-
1.00	2010/10/18	New Release.	-

## Disclaimer

Alpha Microelectronics Corporation (hereinafter referred to as “Alpha”) strives to ensure the accuracy of all texts, graphics, data, code, and circuit diagrams contained in Alpha’s website ([www.ealpha.com.tw](http://www.ealpha.com.tw)) and product documentations, including but not limited to, IC datasheet, User Manual and Application Notice, but does not guarantee the accuracy, adequacy and completeness of the contents of the website and product documentations. Hence, Alpha and its employees, subsidiaries, branches, and agents are not liable for any direct, indirect, special or consequential loss arising from errors or omissions in the provided information of the website and/or product documentations. In addition, Alpha reserves the right to modify and update the contents of the website and product documentations at any times.

Alpha’s products are not designed for the purpose of high-security applications, and therefore are not recommended to be applied on life-support equipment, or any devices or systems that may cause personal injury or death due to failure or malfunction of Alpha’s products. Alpha and its employees, subsidiaries, branches and agents are exempt from all responsibilities for death or injury of anyone, damage caused to anything when Alpha’s products are applied on those devices, including but not limited to, medical or medical-related equipment, military or military-related equipment, aircrafts, traffic control systems, disaster prevention systems, combustion control systems and nuclear equipment.

## Table of Contents

<b>1</b>	<b>General Description .....</b>	<b>5</b>
<b>2</b>	<b>Features .....</b>	<b>5</b>
<b>3</b>	<b>Memory Organization.....</b>	<b>7</b>
3.1	ROM.....	7
3.2	SRAM.....	8
<b>4</b>	<b>Pin Configuration .....</b>	<b>8</b>
4.1	AM5AA020x / AM5AA041x / AM5AA084x Pin Assignment and Description .....	8
4.2	AM5AA170x Pin Assignment and Description.....	10
<b>5</b>	<b>Electrical Characteristics .....</b>	<b>11</b>
5.1	Absolute Maximum Rating .....	11
5.2	DC Characteristics .....	11
5.3	Typical $R_{OSC}$ vs. $V_{DD}$ for RM Mode Oscillator.....	13
<b>6</b>	<b>Application Circuit .....</b>	<b>16</b>
6.1	OSC Mode: Internal RC .....	16
6.2	OSC Mode: External RC .....	17
6.3	OSC Mode: IRC + OSC .....	18
6.3.1	Internal RC.....	18
6.3.2	External RC.....	19
6.4	Large Capacitor Application .....	20
<b>7</b>	<b>Package Dimension .....</b>	<b>21</b>
7.1	AM5AA020x / AM5AA041x / AM5AA084x Package Dimension.....	21
7.2	AM5AA170x Package Dimension .....	23
<b>8</b>	<b>Ordering Information .....</b>	<b>24</b>

## 1 General Description

AM5AA\_OTP series is a 4-bit microprocessor with the advantages of low cost and high voice quality. There are various features in AM5AA\_OTP series, including 4-bit ALU, ROM, RAM, I/O ports, timers, interrupt, clock generator and PWM outputs, etc. Among these, functions such as Watchdog Timer (WDT), Low Voltage Reset (LVR), and Infrared Ray Transmitter (IR) will reduce the system cost and enhance reliability. In addition, large current outputs significantly diversify AM5AA\_OTP applications; meanwhile, with CMOS technology, Sleep function can minimize power dissipation. RISC MCU architecture is very easy to program and control. There are 31 instructions in AM5AA\_OTP series, most of which are executed only in a single cycle. In the output stage, user can select the direct-drive (PWM) to output the audio data or configure the two audio pins as PWMIO.

## 2 Features

- (1) Single power supply can operate from 1.8 V to 3.6 V at 8 MHz and 2.0 V to 3.6 V at 12 MHz for AM5AA0410, as well as from 1.8 V to 5.5 V at 8 MHz and 2.0 V to 5.5 V at 12 MHz for AM5AA020x / AM5AA0411 / AM5AA084x / AM5AA170x.
- (2) Program ROM can be up to 64k x 10-bit (0000H ~ FFFFH).
- (3) There are 4 IC bodies in AM5AA\_OTP series:

Product	Voice Duration (sec)	ROM Size (10-bit)	Clock Source	Audio Output	Volume Control	IR	Reset
AM5AA020x	20	64k	RM	PWM	-	PRA[2]	PRA[3]
AM5AA041x	41	112k	RM	PWM	-		
AM5AA084x	84	224k	RM	PWM	-		
AM5AA170x	170	448k	RM	PWM	v		

- (4) The symbol “v” in the following table means that AM5AX series can be tested and verified by AM5AA series, but it is not guaranteed to be workable the other way round.

AM5AA \ AM5AX	AM5AB Series	AM5AC Series	AM5AD Series
AM5AA020x	v*	v	x
AM5AA041x	v*	v	x
AM5AA084x	v*	v	x
AM5AA170x	v*	v*	x

\*: If the I/O pin numbers of AM5AX series and AM5AA series are different, the unused I/O pin must be set as output in case any unexpected error occurs.

- (5) I/O Ports

Product	I/O Pins	Port Name
AM5AA020x	8	PRA ~ PRB
AM5AA041x	8	PRA ~ PRB
AM5AA084x	8	PRA ~ PRB
AM5AA170x	12	PRA ~ PRC

- (6) Each pin of all ports can be a wake-up pin when configured as input.
- (7) Support at most 4-level Stack, which can be used as data SRAM for additional 16 x 4-bit space.

Product	Data SRAM	4-Level Stack or Used As Additional Data SRAM
AM5AA020x	120 x 4 (18H ~ 8FH)	16 x 4 (90H ~ 9FH)
AM5AA041x		
AM5AA084x		
AM5AA170x		

- (8) Sleep Mode

System clock is totally stopped when entering Sleep Mode, in which all functions will stop to save power. User can wake up AM5AA\_OTP from Sleep Mode by changing data of the input port.

- (9) Each I/O pin can be controlled by three I/O registers:

- a) I/O direction register
- b) I/O data register
- c) I/O pull-low register

- (10) There are two ports with large current outputs: PRA[0] ~ PRA[3] and PRB[0] ~ PRB[3].

- (11) Low-cost OSC: **(Code Option)**

PRA[0] can be selected as a general I/O or an OSC pin.

- (12) Built-in Infrared Ray (IR) carrier output: **(Code Option)**

There is a built-in IR carrier output pin in AM5AA\_OTP which can be used as a transmission pin for wireless transmission. User can set PRA[2] as the IR carrier pin. Through code option, the built-in IR carrier output can be switched to high or low. If user selects 8Mhz, the IR frequency can be 38.47Khz or 55.56Khz, and if user selects 12Mhz, the IR frequency can be 35.71Khz or 57.69Khz.

- (13) AM5AA\_OTP series contains one voice channel and only supports software decoder for the voice channel.

- (14) Audio output method:

The 10-bit direct-drive output (PWM) is supported to provide best audio output quality.

- (15) 8-level volume control. **(Register Control)**

- (16) 4-level stack SRAM space is shared by the interrupt. There is only one interrupt source, that is SR timer overflowing.

- (17) There are 4 kinds of reset:

- a) Power-on reset
- b) Watchdog Timer reset
- c) Low voltage reset
- d) External reset

- (18) External reset: User can set PRA[3] as a reset pin. **(Code Option)**

- (19) Number of instructions: 31.

- (20) PWMIO function is supported. **(Code Option)**

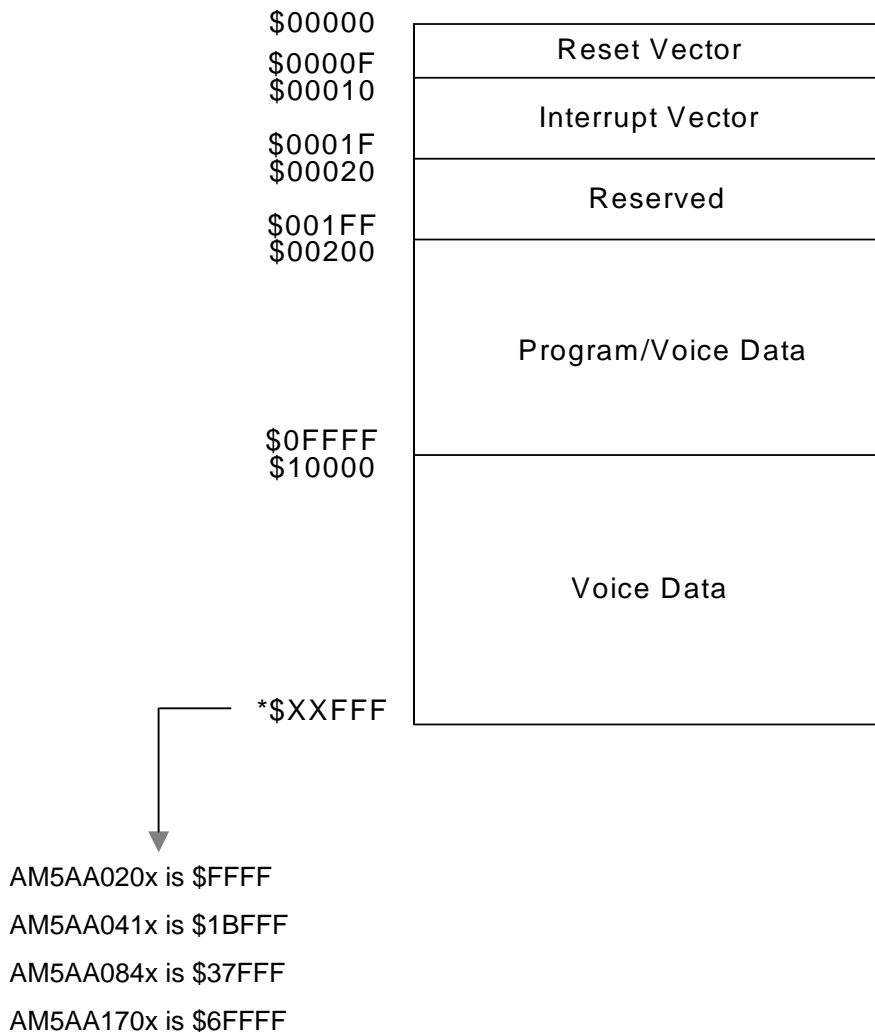
The audio pins PWM1 and PWM2 are not only audio output pins, but also data output pins.

**Note:** In Sleep Mode, both PWM1 and PWM2 are floating.

### 3 Memory Organization

#### 3.1 ROM

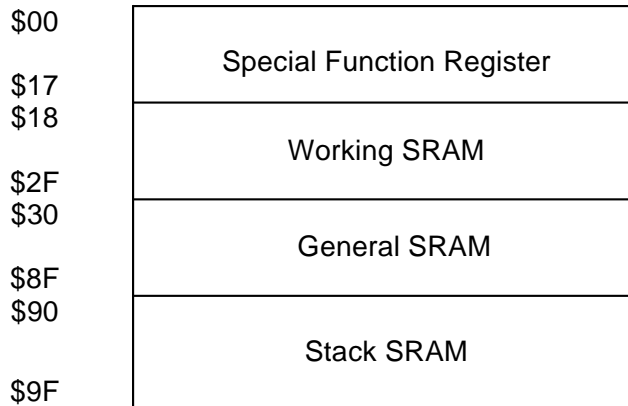
ROM memory is divided into five portions. The first portion 0x0~0xF is the address range for the reset vector in the normal mode. The second portion 0x10~0x1F is the address range for the interrupt vector in the normal mode. The third portion 0x20~0x1FF is reserved and not available for storing programs. The fourth portion 0x200~0xFFFF is the address range for user main program and voice data. The last portion 0x10000~0XXFFF could be used to store the voice data. For AM5AA\_OTP series, JMP and CALL instructions can only reach an immediate address within a 16-bit wide page, the main program and ISR therefore can only be located in the 0x200~0xFFFF address range. In addition, except for Program Counter (PC), all pointers such as voice pointer (VPTR) and temporary register (TREG) can reach up to 0xXXFFF. FIGURE 3.1 shows the ROM map.



**FIGURE 3.1 ROM Map of AM5AA\_OTP**

### 3.2 SRAM

SRAM is composed of special function register (SFR), working SRAM, general SRAM and stack SRAM. Address 0x00~0x17 is reserved for SFR. Address 0x18~0x2F is for the working SRAM which can be executed with logic or arithmetic instructions. Address 0x30~0x8F is for the general SRAM and address 0x90~0x9F is for the stack SRAM. The stack SRAM is reserved for storing the current PC value when a CALL instruction or interrupt occurs.



**FIGURE 3.2 SRAM Map of AM5AA\_OTP**

## 4 Pin Configuration

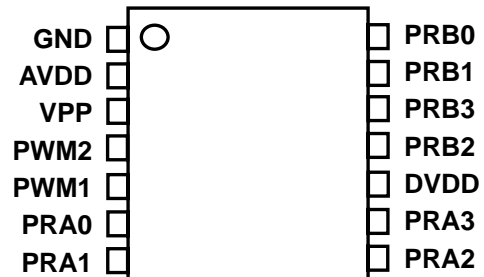
### 4.1 AM5AA020x / AM5AA041x / AM5AA084x Pin Assignment and Description

AM5AA020x, AM5AA041x and AM5AA084x have 8-pin and 14-pin packages using the same naming rule, which suffixes names of IC bodies with a specific character. Here takes AM5AA020x as an example.

**8 Pin -- AM5AA020xW / xX (PDIP / SOP)**

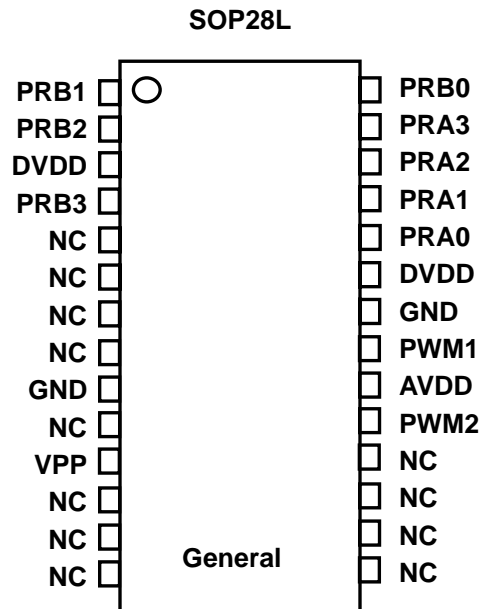


**14 Pin -- AM5AA020xP / xS (PDIP / SOP)**





Name	Attr.	Description
<b>PRA[0] / OSC1</b>	I/O	This I/O pin can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or 2 kinds of output current: (1) Normal current, (2) Large current. <b>(Code Option)</b> Or selected as an OSC pin: An oscillator input for RM mode. <b>(Code Option)</b>
<b>PRA[1] PRB[0]~PRB[3]</b>	I/O	This I/O pin can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or 2 kinds of output current: (1) Normal current, (2) Large current. <b>(Code Option)</b>
<b>PRA[2] / IR</b>	I/O	This I/O pin can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or 2 kinds of output current: (1) Normal current, (2) Large current. <b>(Code Option)</b> Or selected as an IR Carrier output pin with a programmable frequency at 38 KHz or 56 KHz. <b>(Code Option)</b>
<b>PRA[3] / Reset</b>	I/O	This I/O pin can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or 2 kinds of output current: (1) Normal current, (2) Large current. <b>(Code Option)</b> Or selected as an external RESET pin with weak pull-low capability. <b>(Code Option)</b>
<b>PWM1</b>	O	PWM1 output.
<b>PWM2</b>	O	PWM2 output.
<b>AV<sub>DD</sub></b>	Power	Positive power supply for analog part.
<b>DV<sub>DD</sub></b>	Power	Positive power supply for digital part.
<b>GND</b>	Power	Ground Potential.
<b>V<sub>PP</sub></b>	Power	Connect to V <sub>DD</sub> during normal operation. Connect to High Voltage when programming EPROM.

**4.2 AM5AA170x Pin Assignment and Description**


Name	Attr.	Description
<b>PRA[0] / OSC1</b>	I/O	This I/O pin can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or 2 kinds of output current: (1) Normal current, (2) Large current. <b>(Code Option)</b> Or selected as an OSC pin: An oscillator input for RM mode. <b>(Code Option)</b>
<b>PRA[1] PRB[0]~PRB[3]</b>	I/O	This I/O pin can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or 2 kinds of output current: (1) Normal current, (2) Large current. <b>(Code Option)</b>
<b>PRA[2] / IR</b>	I/O	This I/O pin can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or 2 kinds of output current: (1) Normal current, (2) Large current. <b>(Code Option)</b> Or selected as an IR Carrier output with a programmable frequency at 38 KHz or 56 KHz. <b>(Code Option)</b>
<b>PRA[3] / Reset</b>	I/O	This I/O pin can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or 2 kinds of output current: (1) Normal current, (2) Large current. <b>(Code Option)</b> Or selected as an external RESET pin with weak pull-low capability. <b>(Code Option)</b>

Name	Attr.	Description
<b>PRC[0]~PRC[3]</b>	I/O	This I/O pin can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type.
<b>PWM1</b>	O	PWM1 output.
<b>PWM2</b>	O	PWM2 output.
<b>AV<sub>DD</sub></b>	Power	Positive power supply for analog part.
<b>DV<sub>DD1~2</sub></b>	Power	Positive power supply for digital part.
<b>GND1~2</b>	Power	Ground Potential.
<b>V<sub>PP</sub></b>	Power	Connect to V <sub>DD</sub> during normal operation. Connect to High Voltage when programming EPROM.

## 5 Electrical Characteristics

The electrical characteristics of AM5AA\_OTP series are given in the following tables in which all the data are measured at room temperature. Various production processes among lots or different testing conditions may influence the data result.

### 5.1 Absolute Maximum Rating

SYMBOL	RATING	UNIT
V <sub>SS</sub> ~ V <sub>DD</sub>	-0.5 ~ +6.0	V
V <sub>in</sub> (All input)	V <sub>SS</sub> -0.3 < V <sub>in</sub> < V <sub>DD</sub> +0.3	V
V <sub>out</sub> (All output)	GND < V <sub>out</sub> < V <sub>DD</sub>	V
T <sub>OP</sub> (Operating)	0 ~ +70	°C
T <sub>ST</sub> (Storage)	-25 ~ +85	°C

### 5.2 DC Characteristics

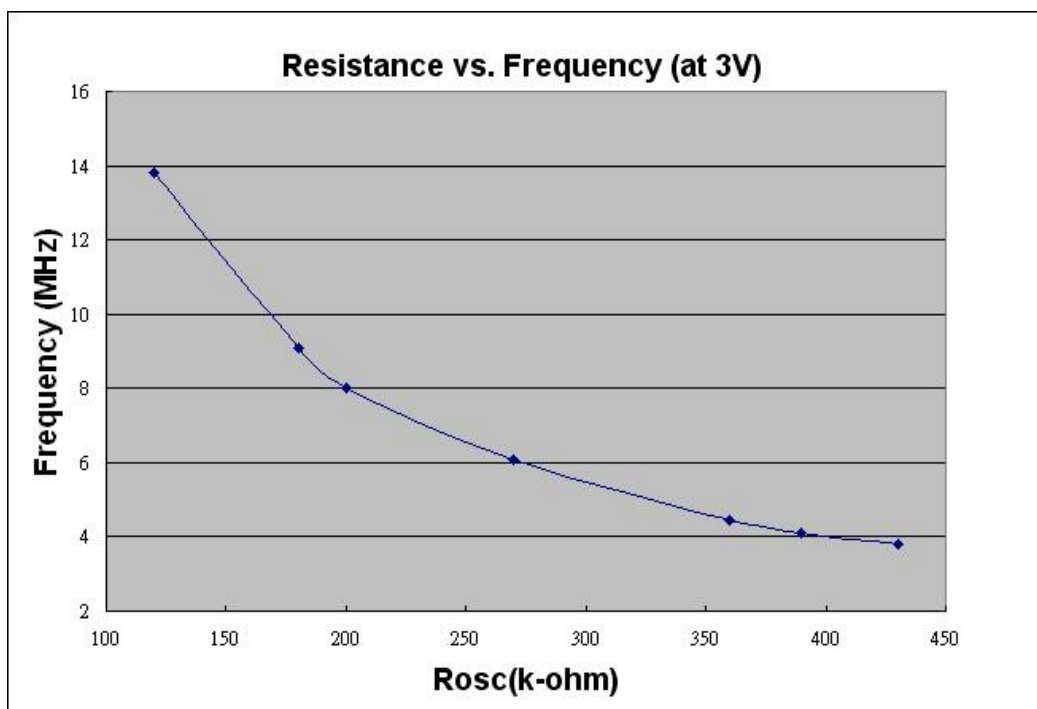
SYMBOL	PARAMETER	V <sub>DD</sub>	MIN.	TYP.	MAX.	UNIT	CONDITION
V <sub>DD</sub>	Operating Voltage		1.8	3	3.6	V	8 MHz for AM5AA0410
			2.0	3	3.6		12 MHz for AM5AA0410
			1.8	3	5.5	V	8 MHz for AM5AA020x/AM5AA0411 AM5AA084x/AM5AA170x
			2.0	3	5.5		12 MHz for AM5AA020x/AM5AA0411 AM5AA084x/AM5AA170x

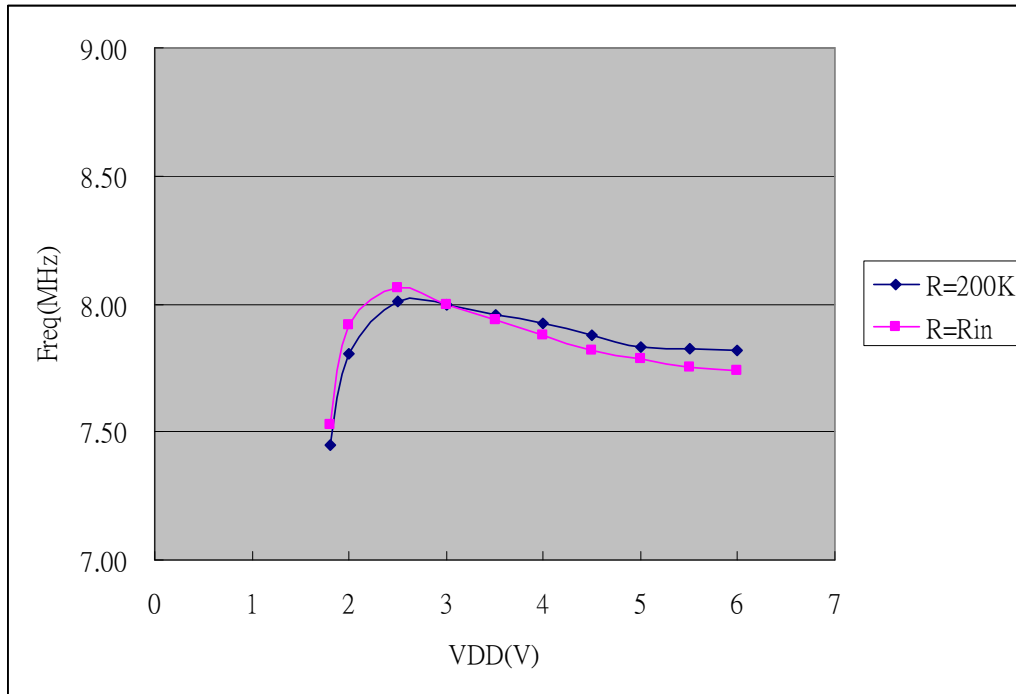
SYMBOL	PARAMETER		V <sub>DD</sub>	MIN.	TYP.	MAX.	UNIT	CONDITION
LVR	Low Voltage Reset				1.8±0.1		V	8 MHz
					2.0±0.1			12 MHz
I <sub>ht</sub>	Supply Current	Sleep	3			1	uA	Sleep Mode
			4.5			2		
I <sub>OP</sub>		Operating	3		1.83		mA	8 MHz, RM, I/O No Loads
			4.5		2.23			
		3		2.41		12 MHz, RM, I/O No Loads		
		4.5		4.15				
I <sub>IH</sub>	Input Current (Internal weak pull-low)		3		-3.3		uA	V <sub>IL</sub> = 0 V
			4.5		-8.4			
I <sub>OH</sub>	Output High Current (Normal current)		3		-3.58		mA	V <sub>OH</sub> = 2.6 V
			4.5		-8.45			V <sub>OH</sub> = 3.7 V
I <sub>OH</sub>	Output High Current (Large current)		3		-6.78			V <sub>OH</sub> = 2.6 V
			4.5		-15.9			V <sub>OH</sub> = 3.7 V
I <sub>OL</sub>	Output Low Current (Normal current)		3		6.81			V <sub>OL</sub> = 0.4 V
			4.5		16.33			V <sub>OL</sub> = 0.8 V
I <sub>OL</sub>	Output Low Current (Large current)		3		14.58			V <sub>OL</sub> = 0.4 V
			4.5		34.22			V <sub>OL</sub> = 0.8 V
I <sub>PWM</sub>	PWM Output Current (peak)		3	100			mA	Load = 8 ohms
dF/F	Frequency Stability		3.4		± 3		%	$\frac{F_{osc}(3.4V) - F_{osc}(2.2V)}{F_{osc}(3.4V)}$
			5.1		± 3		%	$\frac{F_{osc}(5.1V) - F_{osc}(2.7V)}{F_{osc}(5.1V)}$
dF/F	F <sub>osc</sub> Variation		3	7.76	8	8.24	MHz	8M ± 3%
			4.5					
			3	11.64	12	12.36		12M ± 3%
			4.5					

**Note:** Ambient temperature is 25°C. Alpha will keep user updated when the temperature setting is changed.

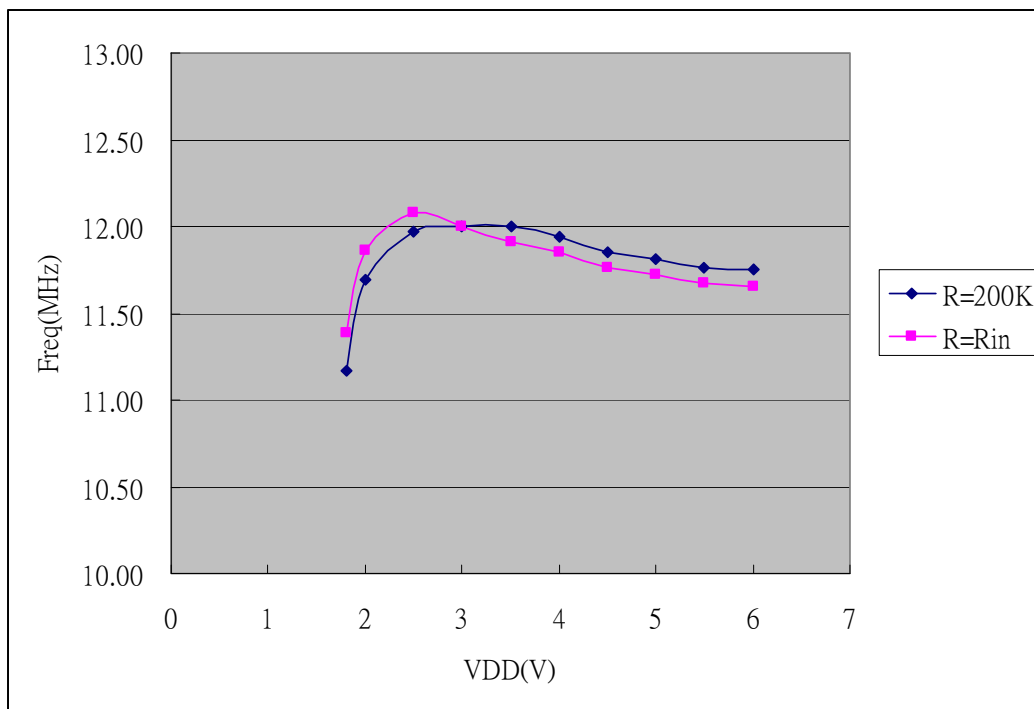
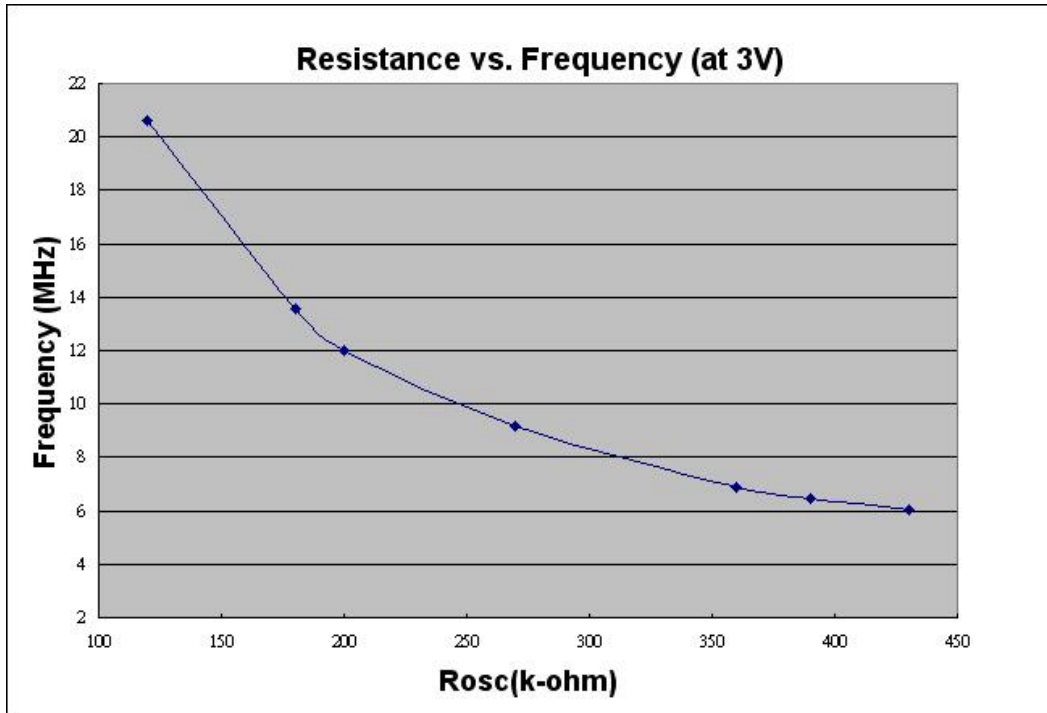
**5.3 Typical R<sub>OSC</sub> vs. V<sub>DD</sub> for RM Mode Oscillator**
**(1) Using 8 MHz System Clock**

V <sub>DD</sub>	Oscillator Frequency (8 MHz)				
	R <sub>osc</sub> =430K	R <sub>osc</sub> =270K	R <sub>osc</sub> =200K	R <sub>osc</sub> =120K	R <sub>osc</sub> =R <sub>in</sub>
1.8 V	3.83	5.89	7.45	11.61	7.53
2.0 V	3.89	6.07	7.81	12.72	7.92
2.5 V	3.87	6.17	8.01	13.81	8.07
3.0 V	3.81	6.10	8.00	13.83	8.00
3.5 V	3.76	6.02	7.95	13.75	7.93
4.0 V	3.71	5.97	7.93	13.65	7.88
4.5 V	3.68	5.92	7.88	13.53	7.82
5.0 V	3.66	5.88	7.83	13.43	7.78
5.5 V	3.64	5.86	7.83	13.37	7.76



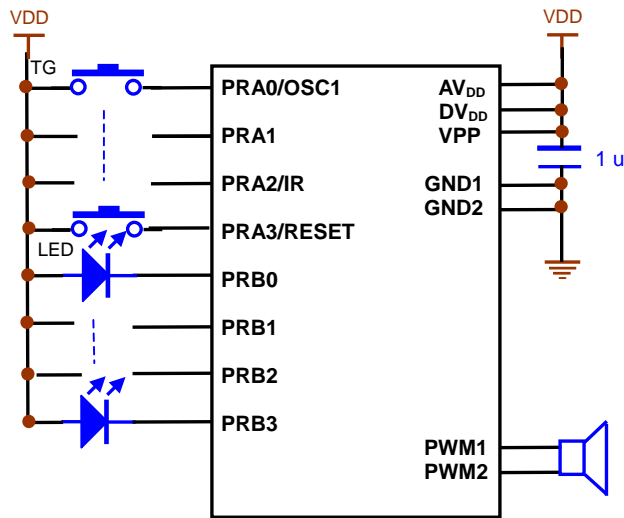

**(2) Using 12 MHz System Clock**

VDD	Oscillator Frequency (12 MHz)				
	Rosc=430K	Rosc=270K	Rosc=200K	Rosc=120K	Rosc=Rin
2.0 V	6.13	9.09	11.70	18.93	11.87
2.5 V	6.11	9.24	11.97	20.59	12.08
3.0 V	6.04	9.16	12.00	20.60	12.00
3.5 V	5.98	9.06	12.00	20.44	11.91
4.0 V	5.90	8.96	11.94	20.28	11.85
4.5 V	5.84	8.88	11.85	20.11	11.76
5.0 V	5.69	8.82	11.82	19.93	11.72
5.5 V	5.71	8.79	11.76	19.78	11.68

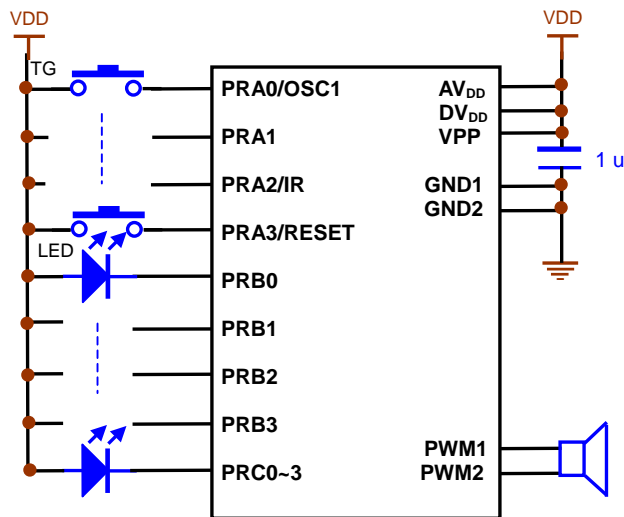


## 6 Application Circuit

### 6.1 OSC Mode: Internal RC



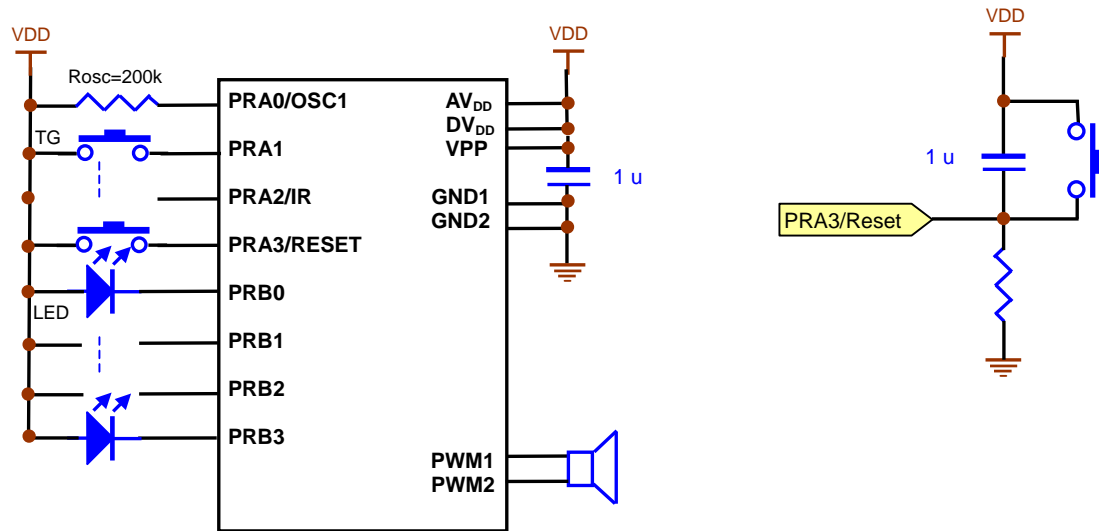
AM5AA020x / AM5AA041x / AM5AA084x



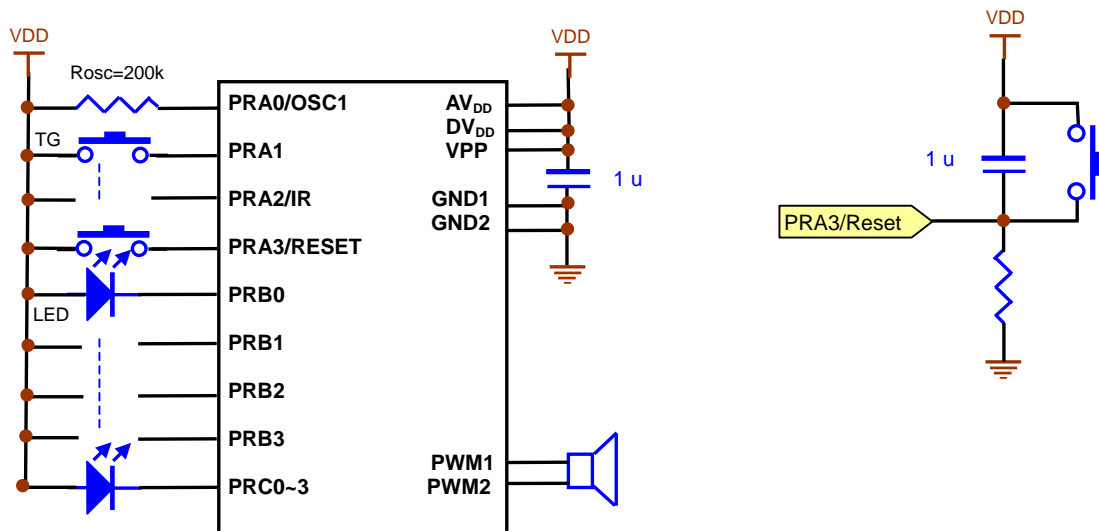
AM5AA170x



## 6.2 OSC Mode: External RC



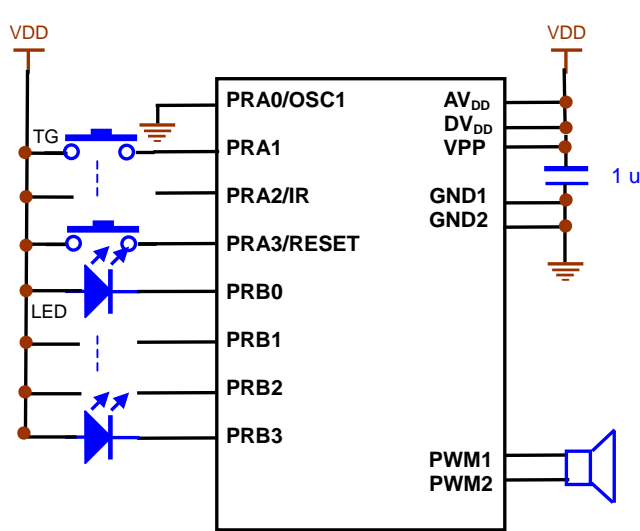
AM5AA020x / AM5AA041x / AM5AA084x



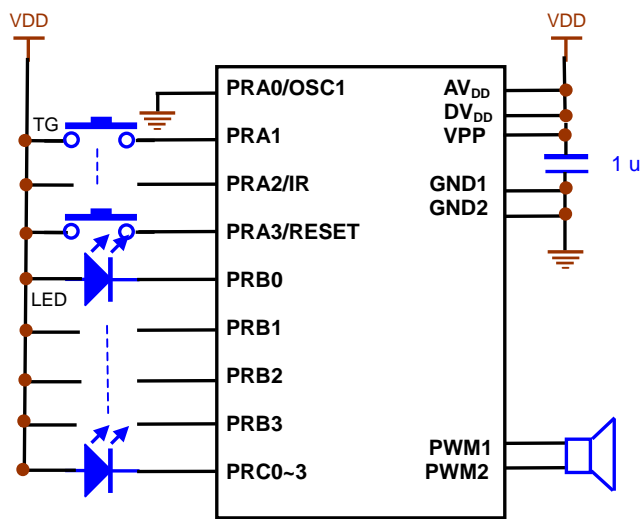
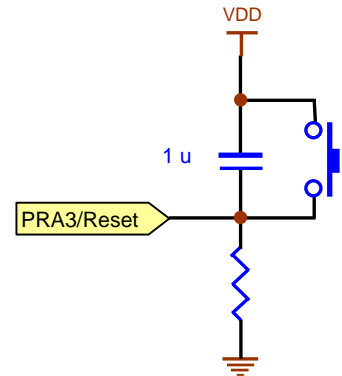
AM5AA170x

## 6.3 OSC Mode: IRC + OSC

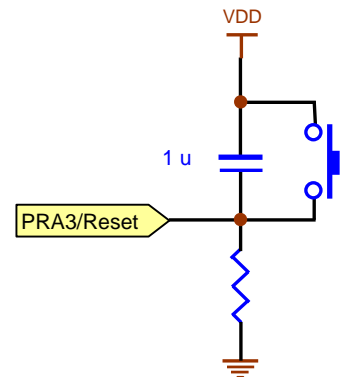
### 6.3.1 Internal RC



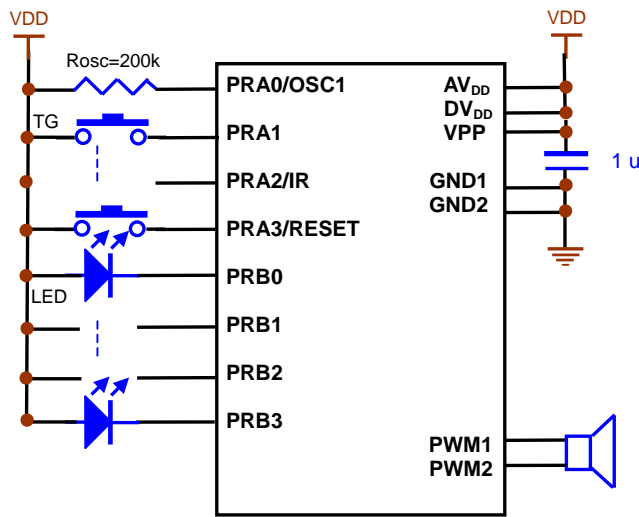
AM5AA020x / AM5AA041x / AM5AA084x



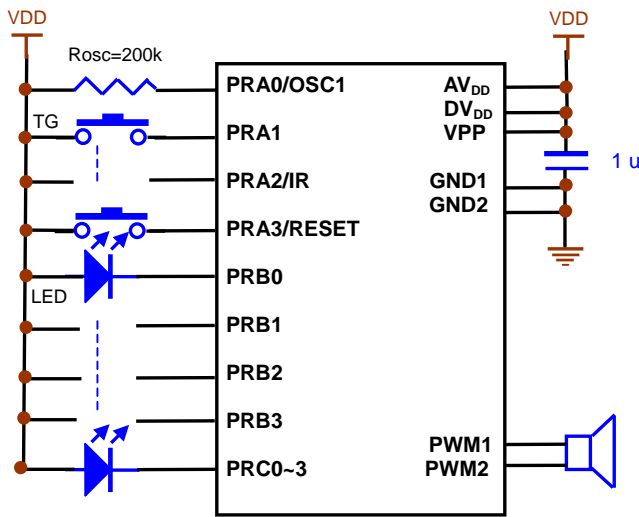
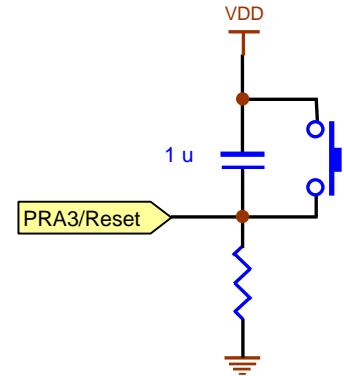
AM5AA170x



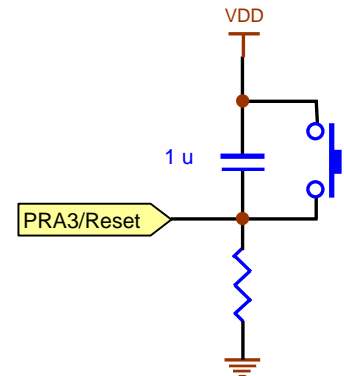
## 6.3.2 External RC



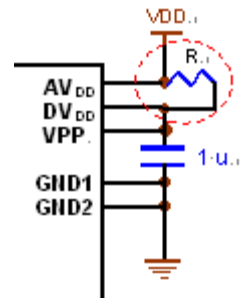
**AM5AA020x / AM5AA041x / AM5AA084x**



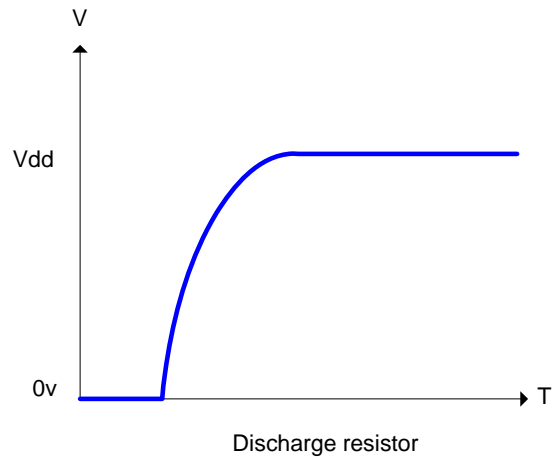
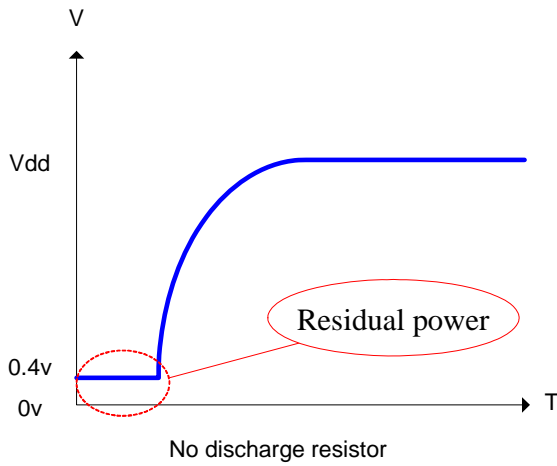
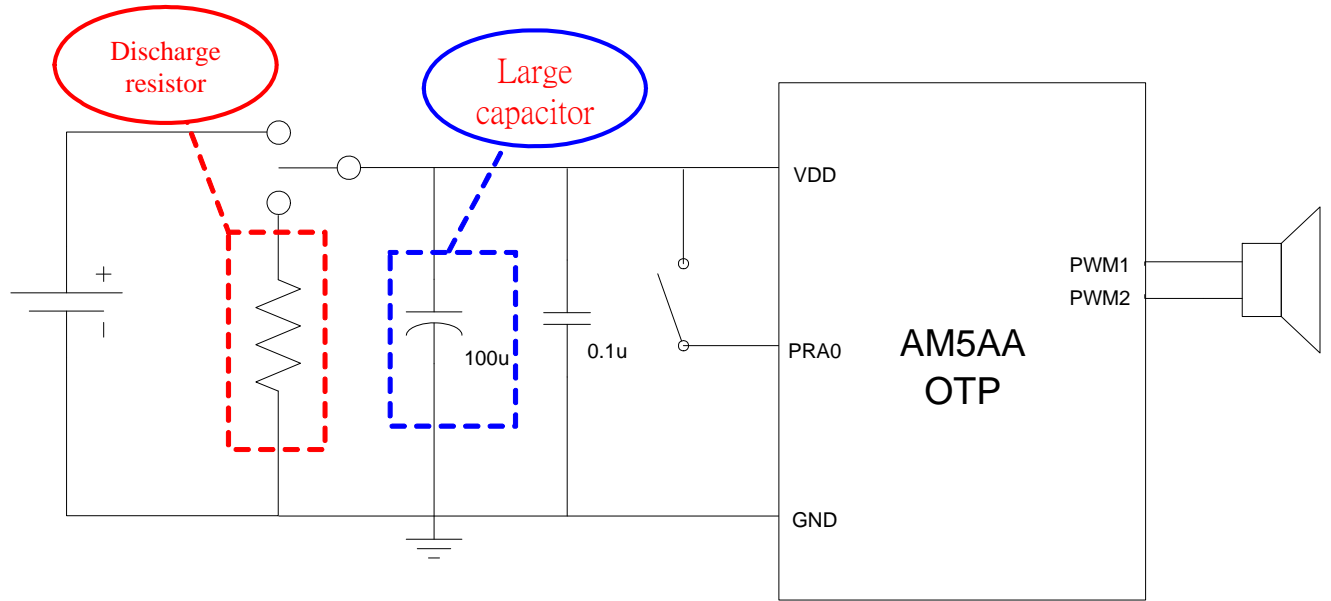
**AM5AA170x**



**Note:** Normally, AV<sub>DD</sub> and DV<sub>DD</sub> on the applications should be directly connected to VDD as shown above. However, in the case of selecting system clock as 12 MHz and working voltage as 3 V, for more stable circuit characteristics, a 10 ohm resistor (R) should be added. The resistor connection is marked in the dashed circle as shown in the figure to the right.



### 6.4 Large Capacitor Application

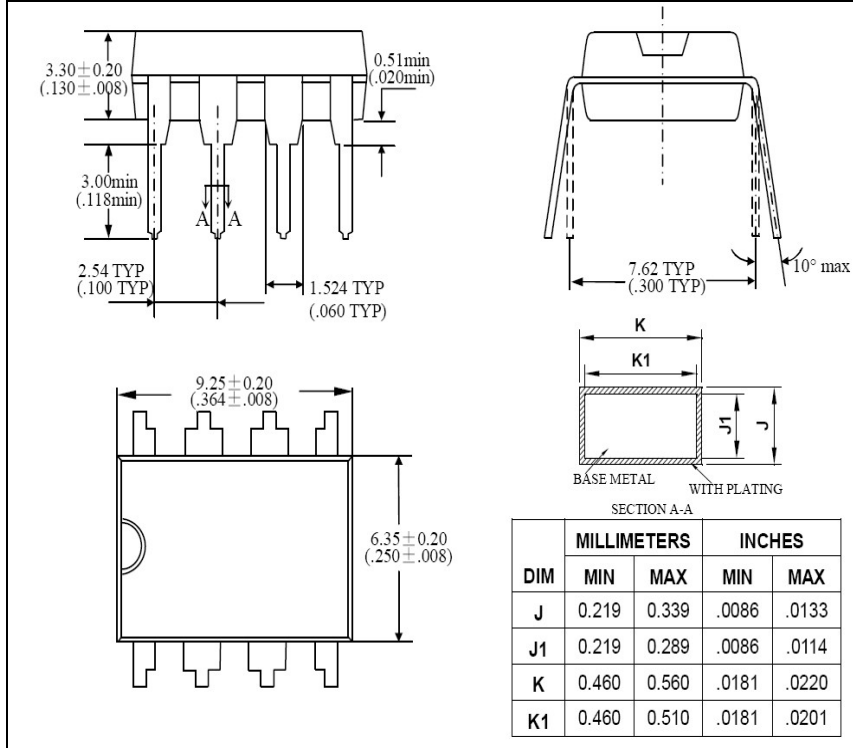


**Note:** If a large capacitor is used in the application, it is recommended to add a discharge resistor. Because the large capacitor is easy to cause the residual power after the power is turned off, causing problems in power-on.

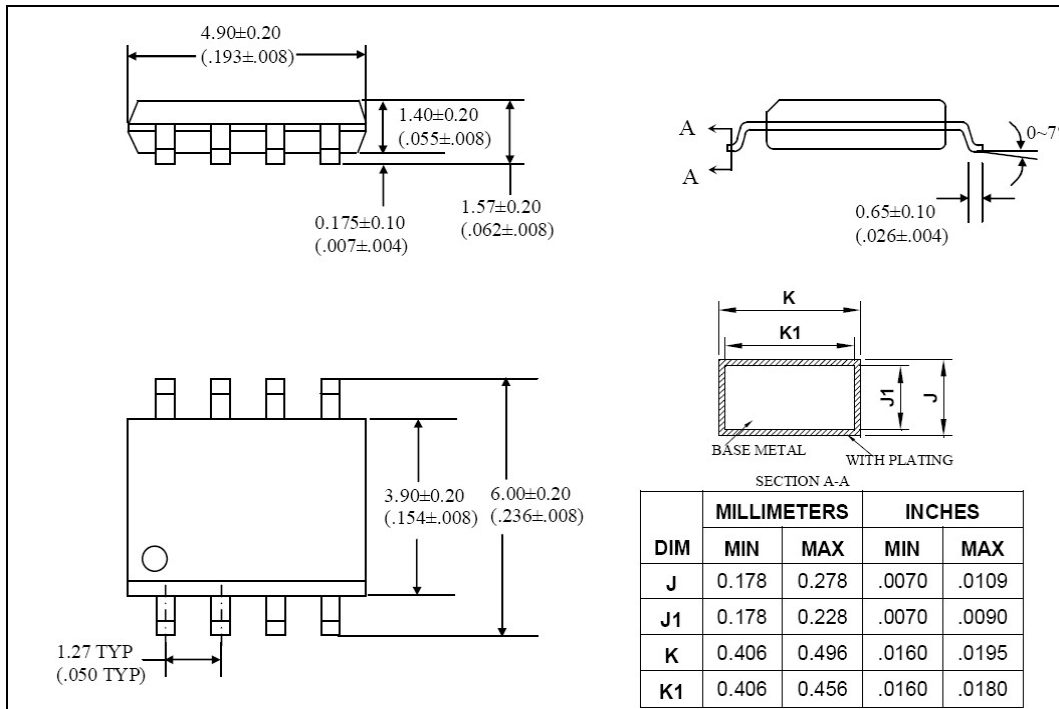
## 7 Package Dimension

### 7.1 AM5AA020x / AM5AA041x / AM5AA084x Package Dimension

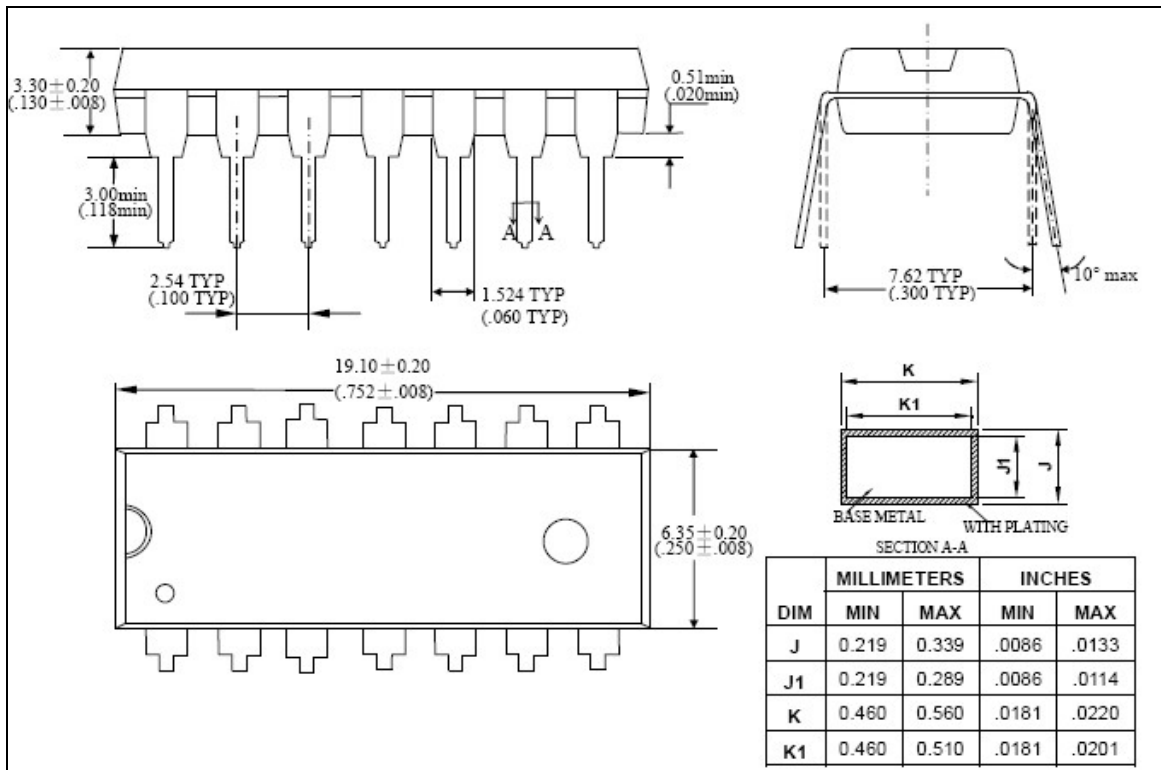
#### 1) 8-Pin PDIP 300 mil



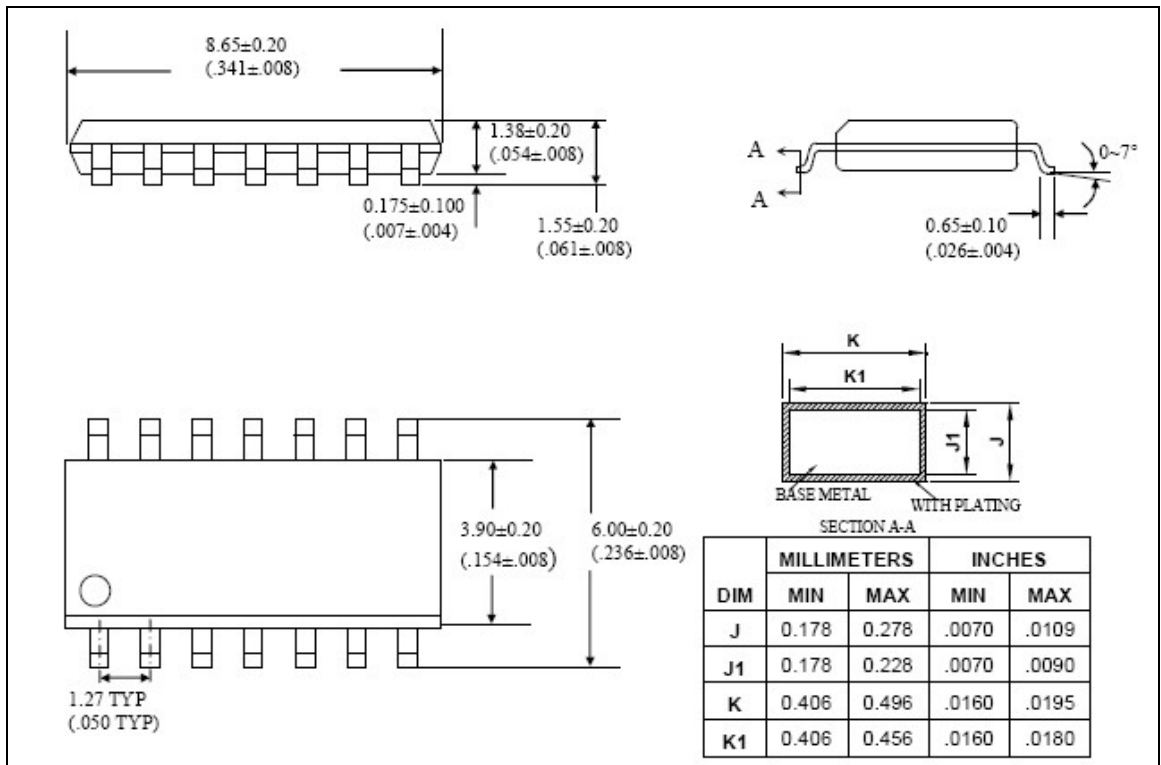
#### 2) 8-Pin SOP 150 mil



### 3) 14-Pin PDIP 300 mil

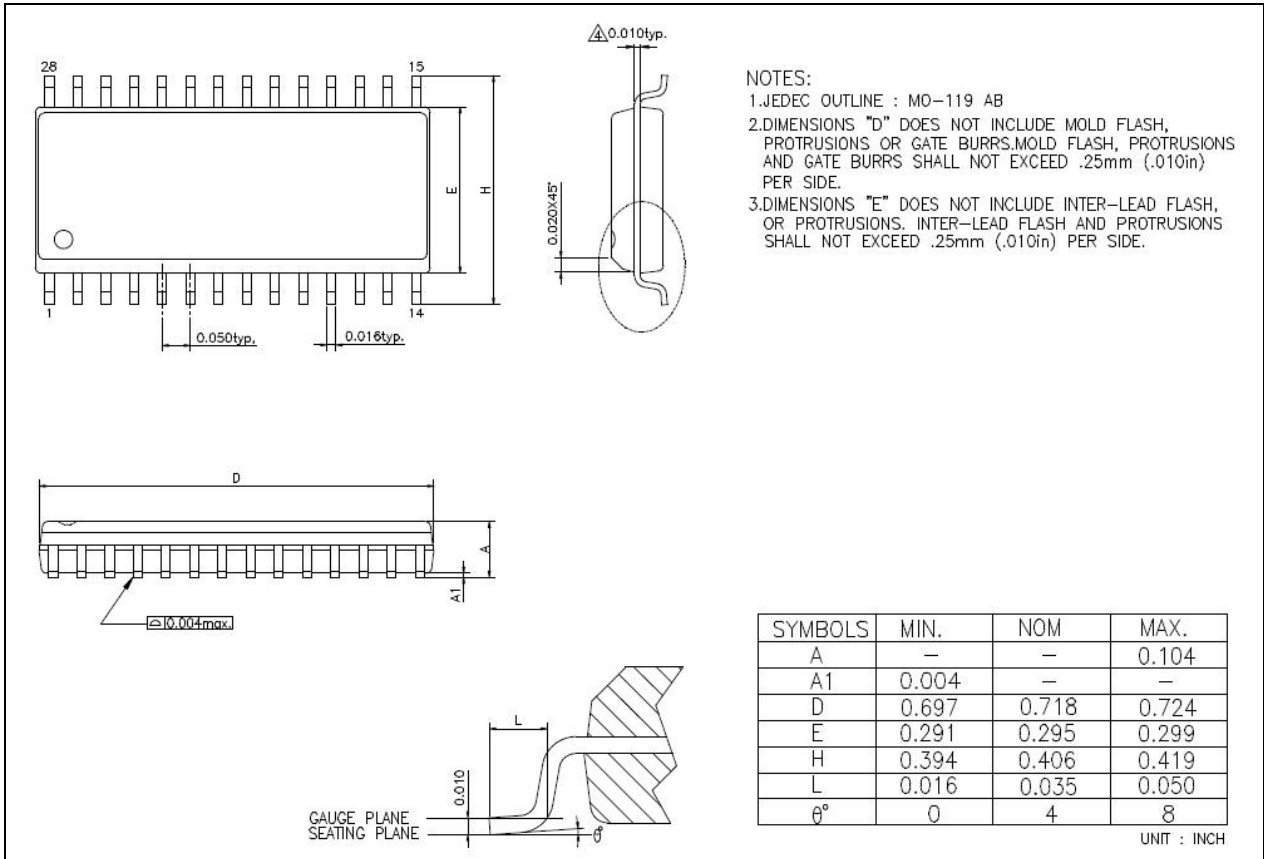


### 4) 14-Pin SOP 150 mil



## 7.2 AM5AA170x Package Dimension

### 28-Pin SOP 300 mil



## 8 Ordering Information

P/N *	Package Type	Pin Count	Package Size
AM5AA0200P	PDIP	14	300 mil
AM5AA0200S	SOP	14	150 mil
AM5AA0200W	PDIP	8	300 mil
AM5AA0200X	SOP	8	150 mil
AM5AA0410P	PDIP	14	300 mil
AM5AA0410S	SOP	14	150 mil
AM5AA0410W	PDIP	8	300 mil
AM5AA0410X	SOP	8	150 mil
AM5AA0411P	PDIP	14	300 mil
AM5AA0411S	SOP	14	150 mil
AM5AA0411W	PDIP	8	300 mil
AM5AA0411X	SOP	8	150 mil
AM5AA0840P	PDIP	14	300 mil
AM5AA0840S	SOP	14	150 mil
AM5AA0840W	PDIP	8	300 mil
AM5AA0840X	SOP	8	150 mil
AM5AA1700S	SOP	28	300 mil



\* Indication of Part Number (P/N):

**AM****X****X****X****X****X****X****-****X****X****X**

**CPU Core:**

- 4 : 4-bit CPU
- 5 : Tiny CPU
- 8 : 8-bit CPU
- 9 : State Machine

**Series:**

From A - Z

**Sub Series:**

From A - Z  
A: OTP type sub series

**Part Number:**

Speech IC : Duration In 6KHz

**Body Version:**

From A - Z, 0 - 9

**Package Type:**

- P/W : PDIP package
- S/X : SOP package
- D : SSOP package
- Q : QFT package

**Code Number:**

From 000 - ZZZ