Alpha Microelectronics Corp.

AM4KA_OTP SERIES

DATA SHEET

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Revision History

Rev	Date	Description	Page
2.11	2013/9/4	1) Modify Chapter 4: Pin Configuration. 2) Modify Chapter 6: Application Circuit. 3) Modify Chapter 7: Package Dimension of AM4KA020x / AM4KA041x / AM4KA084x / AM4KA170x. 4) Add Chapter 8: Ordering Information.	11 19 20 25
2.10	2012/4/27	1) Modify Chapter 2: Features, volume control function. 2) Modify Chapter 4: Pin Assignment. 3) Modify Chapter 7: Package Dimension of AM4KA020x / AM4KA041x / AM4KA084x / AM4KA170x.	-
2.01	2011/2/23	Modify Chapter 1: General Description.	-
2.00	2010/12/16	1) Modify Chapter 2: Features. 2) Modify instruction number 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.	-

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1 General Description

AM4KA_OTP series is a 4-bit microprocessor with the advantages of low cost and high performance, containing 4-bit ALU, ROM, RAM, I/O ports, timers, interrupt, clock generator, audio synthesizer, PWM outputs, etc. The audio synthesizer contains one voice channel and two melody channels. Features such as Watchdog Timer (WDT), Low Voltage Reset (LVR), and Infrared Ray Transmitter (IR) can reduce system cost and enhance reliability. Furthermore, with CMOS technology, Sleep and Standby functions can minimize power dissipation.

RISC MCU architecture is very easy to program and control. There are 31 instructions in AM4KA_OTP series, most of which are executed only in a single cycle. The AM4KA_OTP hardware audio decoder supports an ADPCM algorithm at a wide range of selectable bit rates, which can be used to select various modes of the audio filter to meet user's requirements. In the audio output stage, user can select either a current DAC (Cout) or a direct-drive (PWM).

2 Features

(1) Single power supply can operate from 2.2 V to 3.6 V at 8 MHz for AM4KA041x, and from 2.2 V to 5.5 V at 8 MHz for AM4KA020x / AM4KA084x / AM4KA170x / AM4KA340x.

(2) Program ROM can be up to 64K x 10-bit (0000H ~ FFFFH).

(3) There are 5 IC bodies in AM4KA_OTP series:

Product	Voice Duration (sec)	ROM Size (10-bit)	Clock Source	8-Bit ADC	Audio Output	Volume Control	PRA[0] as OSC Share Pin	Mixer Rate	IR	Reset
AM4KA020x	20	64K	RM	-	PWM	v	v	32K/64K		
AM4KA041x	41	112K	RM	-	PWM	v	v	32K	PRA[2]	PRA[3]
AM4KA084x	84	224K	RM	-	PWM	v	v	32K/64K		
AM4KA170x	170	448K	RM/HM	v	PWM/ COUT	v	v	32K/64K	PRB[2]	PRB[3]
AM4KA340x	340	896K	RM/HM	v	PWM/ COUT	v	-	32K/64K	PRB[2] PRF[2]	PRB[3] PRF[3]

(4) The symbol "v" in the following table means that AM4K series can be tested and verified by AM4KA series, but it is not guaranteed to be workable in the opposite way.

Product	AM4KB Series	AM4KC Series	AM4KD Series	AM4KE Series	AM4KG Series	AM4KI Series
AM4KA020x	x	v	x	x	x	x
AM4KA041x	x	v	x	x	x	x
AM4KA084x	x	v	x	x	x	x
AM4KA170x	x	v*	v*	v	x	x
AM4KA340x	x	v*	v*	v*	v	x

*: If the I/O pin numbers of AM4KA series and AM4K 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
AM4KA020x	8	PRA, PRB
AM4KA041x	8	PRA, PRB
AM4KA084x	8	PRA, PRB
AM4KA170x	16	PRA, PRB, PRC and PRE
AM4KA340x	24	PRA ~ PRF

(6) Each pin of all I/O ports can be a wake-up pin when it is configured as input.

(7) Support at most 8-level stack, which can be used as data SRAM for additional 32 x 4-bit space.

Product	Data SRAM	8-Level Stack or Used As Additional Data SRAM
AM4KA020x	120x4 (28H ~ 9FH)	32x4 (A0H ~ BFH)
AM4KA041x	120x4 (28H ~ 9FH)	32x4 (A0H ~ BFH)
AM4KA084x	120x4 (28H ~ 9FH)	32x4 (A0H ~ BFH)
AM4KA170x	184x4 (28H ~ DFH)	32x4 (E0H ~ FFH)
AM4KA340x	184x4 (28H ~ DFH)	32x4 (E0H ~ FFH)

(8) Sleep and Standby Mode

System clock is totally stopped when entering Sleep Mode, in which all functions will stop to save power. The concept of Standby Mode is similar to Sleep Mode, except that the system clock in Standby Mode doesn't stop but works at a slower speed (512 KHz). User can wake up AM4KA_OTP from Sleep Mode by changing data of input port, and from Standby Mode by INT of base timer.

(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 three ports with large current output: PRA[0] ~ PRA[3], PRB[0] ~ PRB[3] and PRE[0] ~ PRE[3].

(11) Low-cost OSC (supported by AM4KA020x / AM4KA041x / AM4KA084x): *(Code Option)*

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

(12) 8-bit 4-channel ADC and internal constant voltage: *(Register Control)*

There are an embedded 4-channel ADC with 8-bit resolution and an internal constant voltage in AM4KA_OTP. The internal constant voltage is about 1.25 V.

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

There are built-in IR carrier output ports in AM4KA_OTP that can be used as transmission ports in wireless transmission. User can set PRA[2], PRB[2] or PRF[2] as the IR carrier pin. Through code option, the built-in IR carrier output can be switched to high or low. The frequency can also be specified by setting the timer value.

(14) Audio synthesizer:

The audio synthesizer contains one voice channel and two melody channels. For the voice channel, AM4KA_OTP supports a selectable bit rate ADPCM algorithm with high-quality voice compression. For melody channels, the pitch range is from C1 to B7.

(15) Audio Filter *(Register Control)*

AM4KA_OTP has two hardware audio filters that can work collectively or independently to minimize unwanted audio artifacts.

(16) Audio output method: *(Register Control)*

Both 12-bit DAC (Cout) and 10-bit direct-drive output (PWM) are supported to provide best audio output quality. The audio output type can be selected by pad (PWM2) option in the beginning, or is programmable via SFR at run time.

(17) 16-level volume control (supported by all series). *(Register Control)*

(18) 4-level current output *(Code Option)*

For different bipolar transistors, user can apply the current control to change the DC working point of DAC output.

(19) One interrupt for two programmable interrupt sources (base timer / sampling rate timer).

(20) There are 4 kinds of reset that can be recognized by SFR:

    a)   Power-On Reset

    b)   Watchdog Timer Reset

    c)   Low Voltage Reset

    d)   External Reset

(21) External Reset: User can set PRA[3], PRB[3] or PRF[3] as a reset pin. *(Code Option)*

(22) Number of instructions: 31.

3 Memory Organization

3.1 ROM

ROM memory is divided into six portions. The first portion 0x0~0xF is addressed for Reset Vector in the normal mode. The second portion 0x10~0x1F is addressed for Interrupt Vector in the normal mode. The third portion 0x20~0x3FF is reserved and not available for storing programs. The fourth portion 0x400~0x7FF is reserved for the selectable bit rate ADPCM algorithm. The fifth portion 0x800~0xFFFF is addressed for user's main program and voice data. The last portion 0x10000~0xXXFFF can be used to store voice data. Because 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 0x800~0xFFFF address range. In addition, except for Program Counter (PC), all pointers such as voice pointer (VPTR) and temporary register (TREG) can reach up to 0xDFFFF. FIGURE 3.1 shows the ROM map.
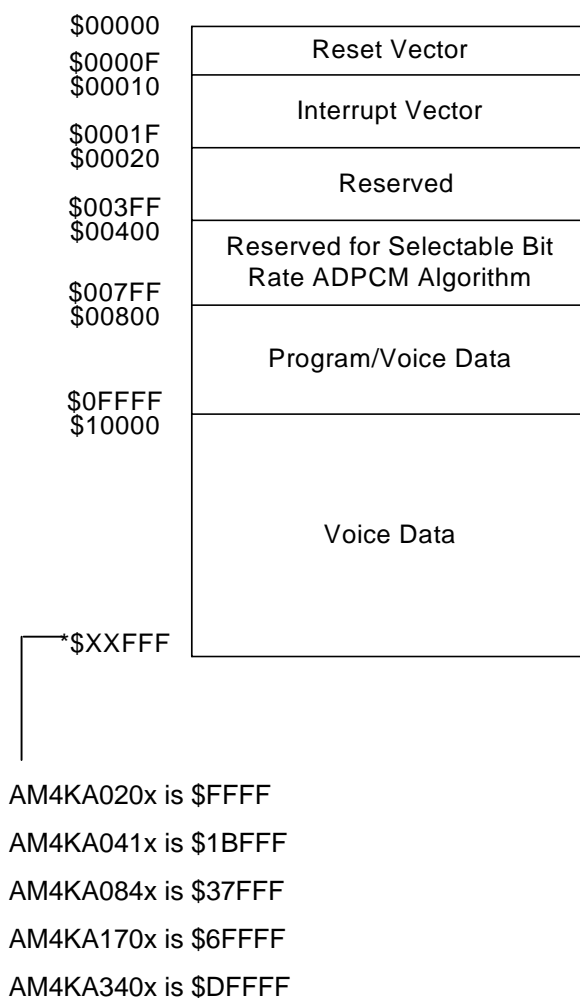
Address	Section
$00000 – $0000F	Reset Vector
$00010 – $0001F	Interrupt Vector
$00020 – $003FF	Reserved
$00400 – $007FF	Reserved for Selectable Bit Rate ADPCM Algorithm
$00800 – $0FFFF	Program/Voice Data
$10000 – *$XXFFF	Voice Data

AM4KA020x is $FFFF

AM4KA041x is $1BFFF

AM4KA084x is $37FFF

AM4KA170x is $6FFFF

AM4KA340x is $DFFFF

FIGURE 3.1   AM4KA_OTP ROM Map

3.2 SRAM

SRAM is composed of Special Function Register (SFR), working SRAM, general SRAM and stack SRAM. Note that there are two kinds of SRAM structure, in which SFR and working SRAM are the same but general and stack SRAM are different based on subseries shown as below. In FIGURE 3.2, address 0x00~0x27 is reserved for SFR. Address 0x28~0x3F is for the working SRAM which can be executed with logic or arithmetic instructions. Address 0x40~0x9F is for the general SRAM, and address 0xA0~0xBF is for the stack SRAM of AM4KA020x, AM4KA041x and AM4KA084x. In FIGURE 3.3, address 0x40~0xDF is for the general SRAM and address 0xE0~0xFF is for the stack SRAM of AM4KA170x and AM4KA340x. The stack SRAM is reserved for storing the current PC value when a CALL instruction or interrupt occurs. Furthermore, AM4KA_OTP SRAM also supports indirect addressing mode.
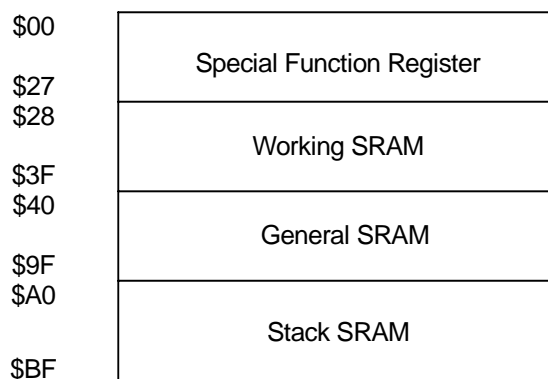
$00	Special Function Register
$27	
$28	Working SRAM
$3F	
$40	General SRAM
$9F	
$A0	Stack SRAM
$BF	

FIGURE 3.2   SRAM Map of AM4KA020x / AM4KA041x / AM4KA084x

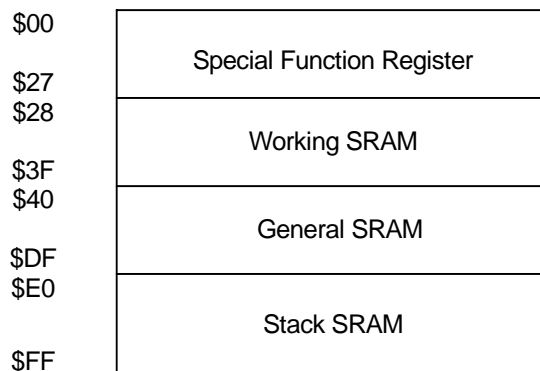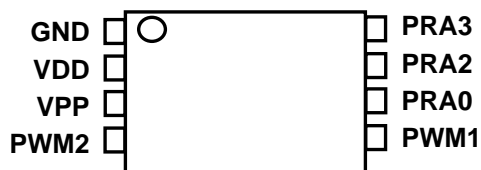|	
$00	Special Function Register
$27	
$28	Working SRAM
$3F	
$40	General SRAM
$DF	
$E0	Stack SRAM
$FF	

FIGURE 3.3   SRAM Map of AM4KA170x / AM4KA340x
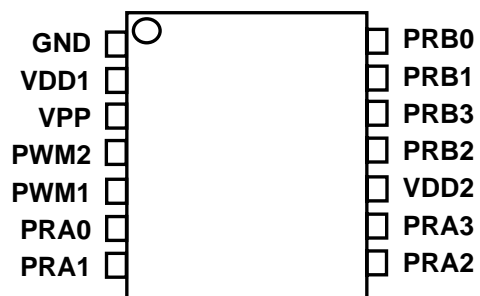
4 Pin Configuration

4.1 AM4KA020x / AM4KA041x / AM4KA084x Pin Assignment and Description

AM4KA020x, AM4KA041x and AM4KA084x have 8-pin and 14-pin packages using the same package naming rule that suffixes a specific character after the series name. Here takes AM4KA020x as an example.
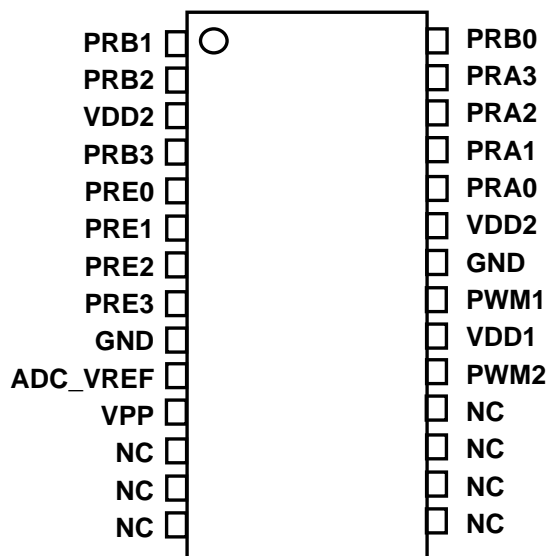
8 Pin -- AM4KA020xW / xX (PDIP / SOP)

```
GND  □ ○        PRA3
VDD  □          PRA2
VPP  □          PRA0
PWM2 □          PWM1
```

14 Pin – AM4KA020xP / xS (PDIP / SOP)

```
GND  □ ○        PRB0
VDD1 □          PRB1
VPP  □          PRB3
PWM2 □          PRB2
PWM1 □          VDD2
PRA0 □          PRA3
PRA1 □          PRA2
```

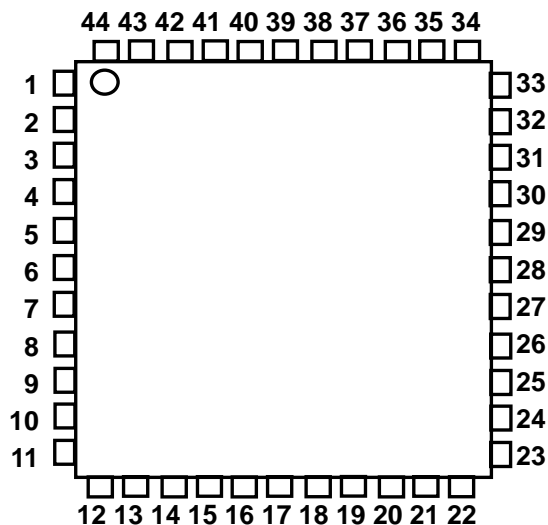| Pin Name	Attr.	Description
PRA[0] / OSC1	I/O	Each I/O port can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or 2 kinds of output current: (1) Normal current, (2) Large current. *(Code Option)* Or selected as an OSC pin: An oscillator input pin for RM Mode. *(Code Option)*
PRA[1] PRB[0]~PRB[3]	I/O	Each I/O port 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. *(Code Option)*
PRA[2] / IR	I/O	Each I/O port 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. *(Code Option)* Or selected as an IR Carrier Output pin with programmable 37 KHz. *(Code Option)*
PRA[3] / Reset	I/O	Each I/O port 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. *(Code Option)* Or selected as an external RESET pin with weak pull-low capability. *(Code Option)*
PWM1	O	PWM1 output.
PWM2	O	PWM2 output.
$V_{DD1~2}$	Power	Power supply.
GND	Power	Ground Potential.
V_{PP}	Power	Connect to V_{DD} during normal operation. Connect to High Voltage when programming EPROM.

4.2 AM4KA170x Pin Assignment and Description

28 Pin – AM4KA170xS / xD (SOP / SSOP)

```
PRB1 ──┐ O                ┌── PRB0
PRB2 ──┤                  ├── PRA3
VDD2 ──┤                  ├── PRA2
PRB3 ──┤                  ├── PRA1
PRE0 ──┤                  ├── PRA0
PRE1 ──┤                  ├── VDD2
PRE2 ──┤                  ├── GND
PRE3 ──┤                  ├── PWM1
 GND ──┤                  ├── VDD1
ADC_VREF ──┤              ├── PWM2
 VPP ──┤                  ├── NC
  NC ──┤                  ├── NC
  NC ──┤                  ├── NC
  NC ──┤                  ├── NC
```

44 Pin – AM4KA170xQ (LQFP)

```
        44 43 42 41 40 39 38 37 36 35 34
      ┌────────────────────────────────┐
    1 │ O                              │ 33
    2 │                                │ 32
    3 │                                │ 31
    4 │                                │ 30
    5 │                                │ 29
    6 │                                │ 28
    7 │                                │ 27
    8 │                                │ 26
    9 │                                │ 25
   10 │                                │ 24
   11 │                                │ 23
      └────────────────────────────────┘
        12 13 14 15 16 17 18 19 20 21 22
```

Pin	Name	Pin	Name	Pin	Name	Pin	Name
1	NC	12	PRA2	23	PRE0	34	NC
2	NC	13	PRA3	24	PRE1	35	NC
3	NC	14	PRB0	25	PRE2	36	NC
4	PWM2	15	PRB1	26	PRE3	37	NC
5	VDD1	16	PRB2	27	GND	38	NC
6	PWM1	17	VDD2	28	ADC_VREF	39	NC
7	GND	18	PRB3	29	NC	40	NC
8	VDD2	19	PRC0	30	NC	41	NC
9	NC	20	PRC1	31	NC	42	NC
10	PRA0	21	PRC2	32	VPP	43	NC
11	PRA1	22	PRC3	33	NC	44	NC

Pin Name	Attr.	Description
PRA[0] / OSC1	I/O	Each I/O port 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. *(Code Option)* Or selected as an OSC pin: An oscillator input pin for RM Mode. *(Code Option)*
PRA[1]~PRA[3] PRB[1]	I/O	Each I/O port 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. *(Code Option)*
PRB[0] / OSC2	I/O	Each I/O port 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. *(Code Option)* Or selected as a crystal output pin for HM Mode. *(Code Option)*
PRB[2] / IR	I/O	Each I/O port 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. *(Code Option)* Or selected as an IR Carrier Output pin with programmable 37 KHz. *(Code Option)*
PRB[3] / Reset	I/O	Each I/O port 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. *(Code Option)* Or selected as an external RESET pin with weak pull-low capability. *(Code Option)*
PRC[0]~PRC[3]	I/O	Each I/O port can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type.
PRE[0]~PRE[3] / ADC0~3	I/O	Each I/O port 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. *(Code Option)* Or selected as an analog ADC input channel. *(Code Option)*
ADC_V$_{REF}$	I	ADC reference voltage.
PWM1/DA1	O	PWM1 output, or current output of Audio 1.
PWM2	O	PWM2 output.
V$_{DD1~2}$	Power	Power supply.
GND	Power	Ground Potential.
V$_{PP}$	Power	Connect to V$_{DD}$ during normal operation. Connect to High Voltage when programming EPROM.
NC	-	This pin is not connected internally.

4.3 AM4KA340x Pin Description

Pin Name	Attr.	Description
PRA[0]~PRA[3] **PRB[1]**	I/O	Each I/O port 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. *(Code Option)*
PRB[0] **/ OSC2**	I/O	Each I/O port 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. *(Code Option)* Or selected as a crystal output pin for HM Mode. *(Code Option)*
PRB[2] **/ IR**	I/O	Each I/O port 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. *(Code Option)* Or selected as an IR Carrier Output pin with programmable 37 KHz. *(Code Option)*
PRB[3] **/ Reset**	I/O	Each I/O port 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. *(Code Option)* Or selected as an external RESET pin with weak pull-low capability. *(Code Option)*
PRC[0]~PRC[3] **PRD[0]~PRD[3]** **PRF[0]~PRF[1]**	I/O	Each I/O port can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type.
PRE[0]~PRE[3] **/ ADC0~3**	I/O	Each I/O port 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. *(Code Option)* Or selected as an analog ADC input channel. *(Code Option)*
PRF[2] **/ IR**	I/O	Each I/O port can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or selected as an IR Carrier Output pin with programmable 37 KHz. *(Code Option)*

Pin Name	Attr.	Description
PRF[3] / Reset	I/O	Each I/O port can be programmed to input / output individually. Input type with weak pull-low or input-floating capability. Buffer Output type. Or selected as an external RESET pin with weak pull-low capability. *(Code Option)*
ADC_V$_{REF}$	I	ADC reference voltage.
OSC1	I	R oscillator input for RM Mode, or crystal input for HM Mode.
PWM1/DA1	O	PWM1 output, or current output of Audio 1.
PWM2	O	PWM2 output.
V$_{DD}$	Power	Positive power supply.
GND	Power	Ground Potential.
V$_{PP}$	Power	Connect to V$_{DD}$ during normal operation. Connect to High Voltage when programming EPROM.

5 Electrical Characteristics

The electrical characteristics of AM4KA_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
$V_{SS} \sim V_{DD}$	-0.5 ~ +6.0	V
V_{in} (For all input)	V_{SS}-0.3 < V_{in} < V_{DD}+0.3	V
V_{out} (For all output)	GND < V_{out} < V_{DD}	V
T_{op} (Operating)	0 ~ +70	℃
T_{st} (Storage)	-25 ~ +85	℃

5.2 DC Characteristics

SYMBOL	PARAMETER		V_{DD}	MIN.	TYP.	MAX.	UNIT	CONDITION
V_{DD}	Operating Voltage			2.2	3	3.6	V	AM4KA041x
				2.2	3	5.5	V	AM4KA020x / AM4KA084x / AM4KA170x / AM4KA340x
I_{ht}	Supply Current	Sleep	3			1	uA	Sleep Mode
			4.5			2		
I_{sb}		Standby	3		100		uA	Standby Mode (512 KHz)
			4.5		200			
I_{op}		Operating	3		2.47		mA	8 MHz, RM, DAC stops I/O No Load
			4.5		4.73			
I_{ih}	Input Current (Internal weak pull-low)		3		-3		uA	V_{il} = 0 V
			4.5		-8.2			
I_{oh}	Output High Current		3		-4.3		mA	V_{oh} = 2.6 V
			4.5		-10.3			V_{oh} = 3.7 V
I_{ol}	Output Low Current (Normal Current)		3		5.2			V_{ol} = 0.4 V
			4.5		12.7			V_{ol} = 0.8 V
I_{ol}	Output Low Current (Large Current)		3		10.8			V_{ol} = 0.4 V
			4.5		27.9			V_{ol} = 0.8 V
I_{PWM}	PWM Output Current (peak)		3	100			mA	Load = 8 ohms
I_{cout}	DAC Output Current		3		0.9 ~ 3.68		mA	Full Scale
			4.5		1.02 ~ 4.1			
dF/F	Frequency Stability		3.4		± 3		%	$\dfrac{Fosc (3.4V) - Fosc (2.2V)}{Fosc (3.4V)}$

SYMBOL	PARAMETER	V$_{DD}$	MIN.	TYP.	MAX.	UNIT	CONDITION
dF/F	Frequency Stability	5.1		± 3		%	$\dfrac{\text{Fosc (5.1V)} - \text{Fosc (2.7V)}}{\text{Fosc (5.1V)}}$
dF/F	F$_{osc}$ Variation	3 / 4.5	7.76	8	8.24	MHz	8M ± 3%
dF/F	F$_{STB}$ Variation	3		± 20		%	Standby (512 KHz)
V$_{CONST}$	ADC Internal Constant Voltage	3 / 4.5	1.2	1.25	1.3	V	8 MHz, RM, DAC stops I/O No Load
T$_{ADSMP}$	ADC Sample and Hold	3 / 4.5	5			us	8 MHz, RM, DAC stops I/O No Load
T$_{COMP}$	ADC Comparator Out	3 / 4.5		3		us	8 MHz, RM, DAC stops I/O No Load
INL	Integral Nonlinearity	3 / 4.5			± 2	LSB	8 MHz, RM, DAC stops I/O No Load

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

5.3 Typical R$_{osc}$ vs. V$_{DD}$ for RM Mode Oscillator

V$_{DD}$	Oscillator Frequency (MHz)				
	Rosc=430K	Rosc=270K	Rosc=200K	Rosc=120K	Rin
2.0 V	3.58	5.45	7.45	11.30	7.40
2.2 V	3.63	5.63	7.70	12.31	7.73
2.5 V	3.65	5.79	7.90	13.21	7.90
3.0 V	3.69	5.77	8.00	13.65	8.00
3.5 V	3.72	5.79	7.97	13.60	7.96
4.0 V	3.68	5.79	7.97	13.63	7.98
4.5 V	3.70	5.78	7.94	13.61	7.96
5.0 V	3.73	5.79	7.95	13.55	7.96
5.5 V	3.75	5.82	7.96	13.37	7.97

Resistance vs. Frequency (at 3V)

VDD vs. Frequency
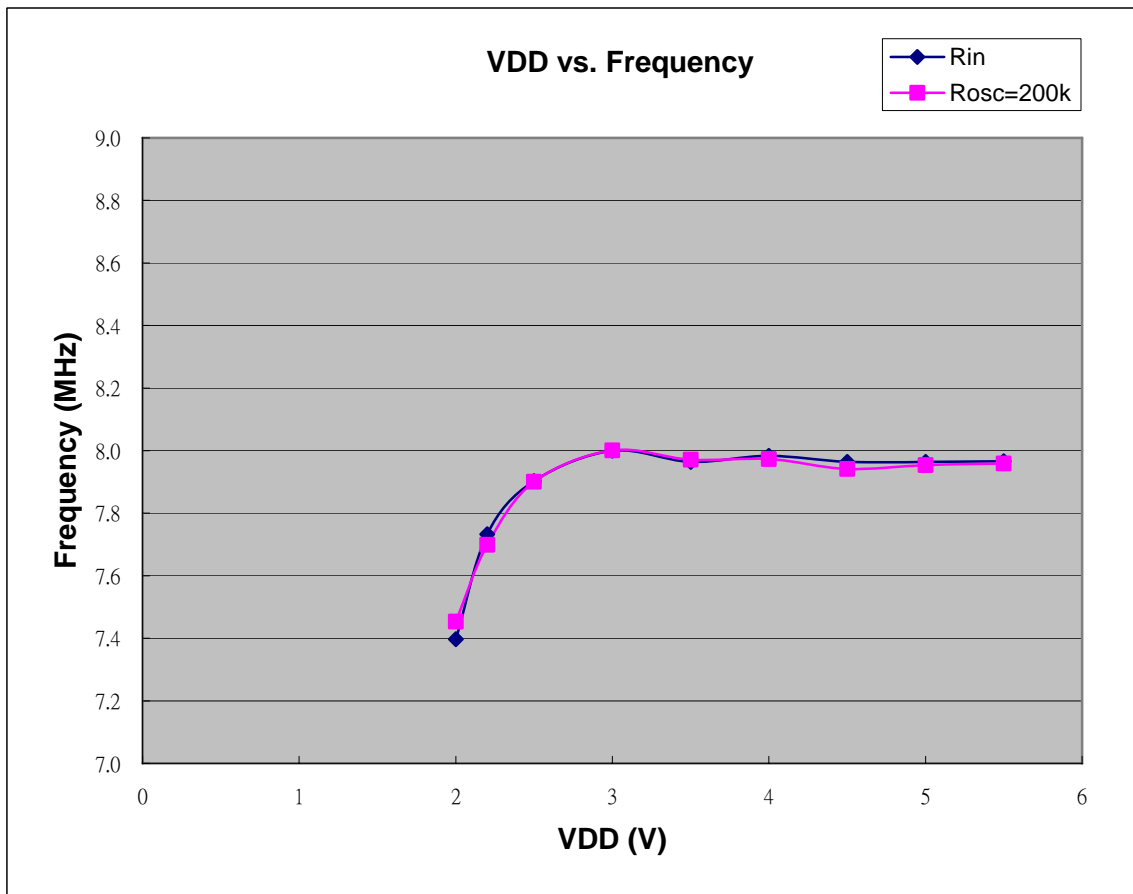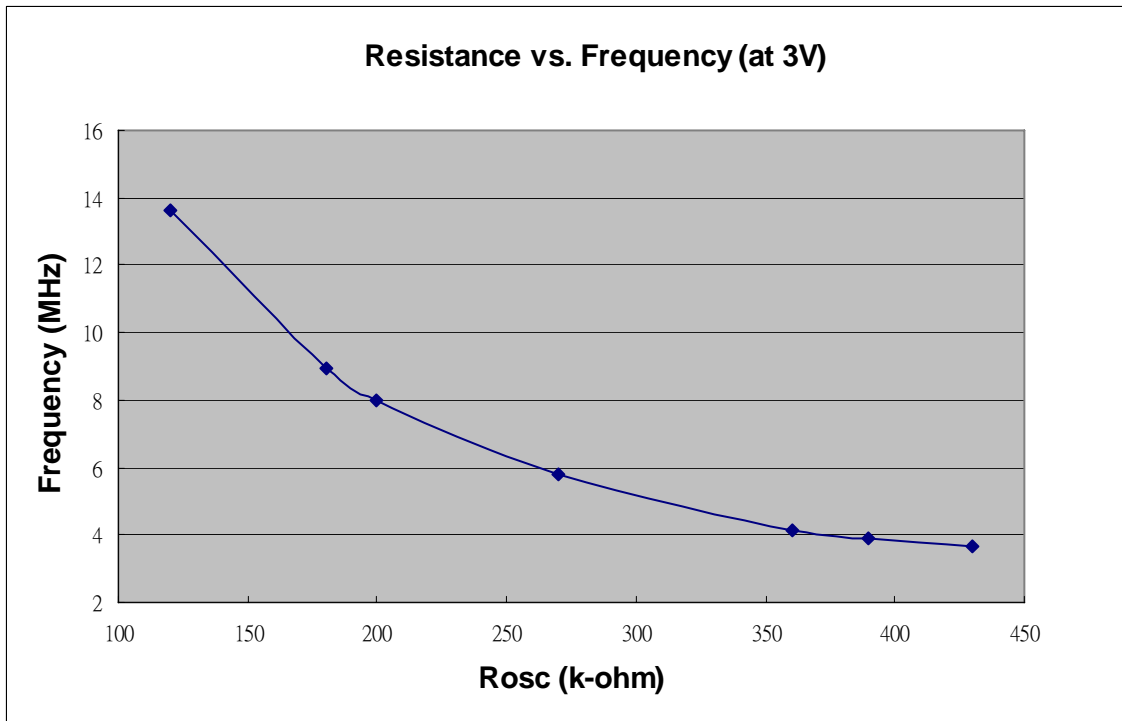
6 Application Circuit

6.1 PRA0 as General I/O Pin
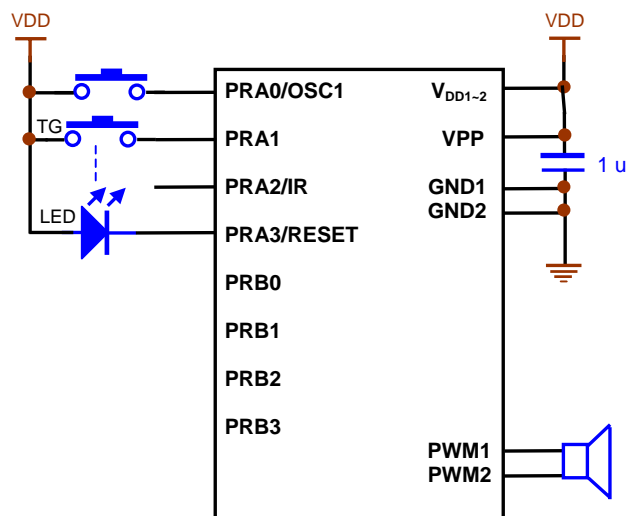
AM4KA020x / AM4KA041x / AM4KA084x

6.2 PRA0 as OSC Pin
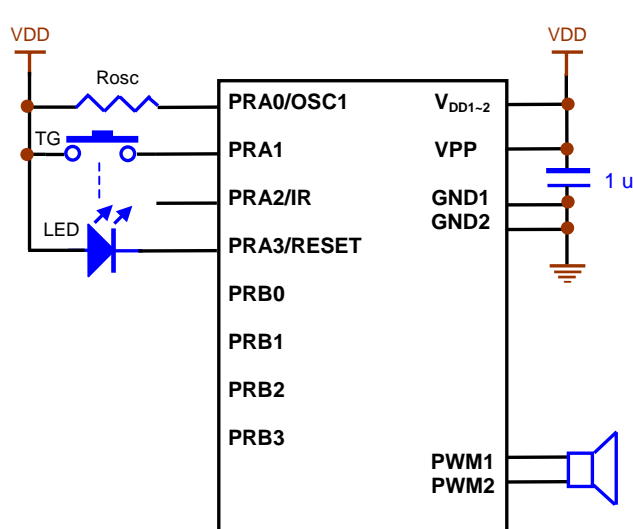
AM4KA020x / AM4KA041x / AM4KA084x
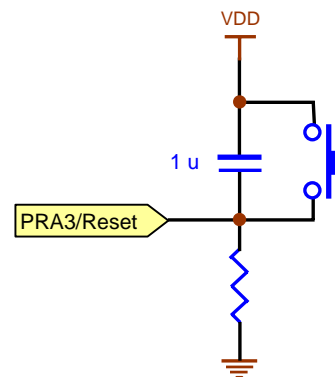
7 Package Dimension of AM4KA020x/AM4KA041x/AM4KA084x/AM4KA170x
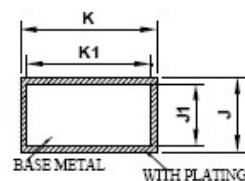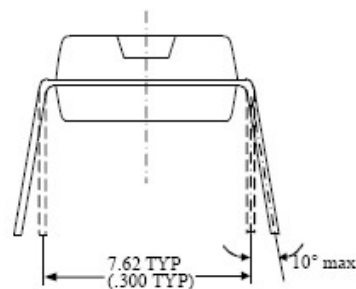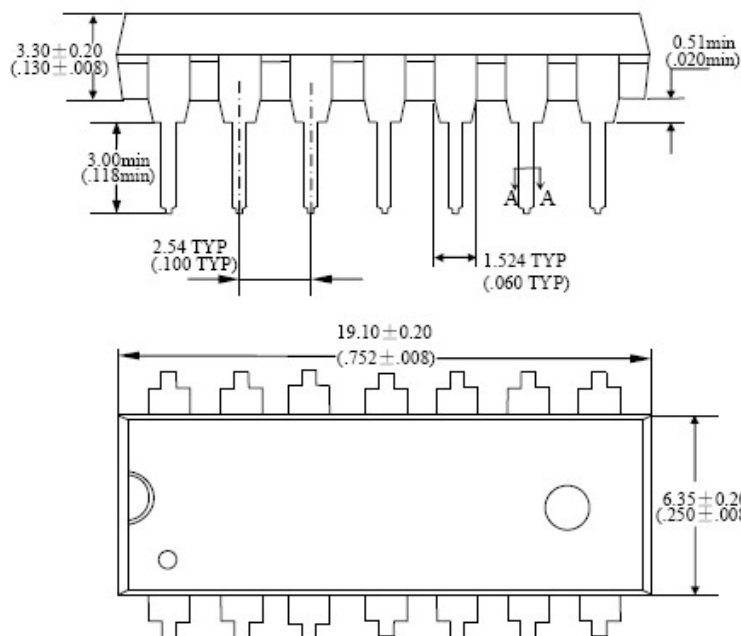
8-Pin PDIP 300 mil
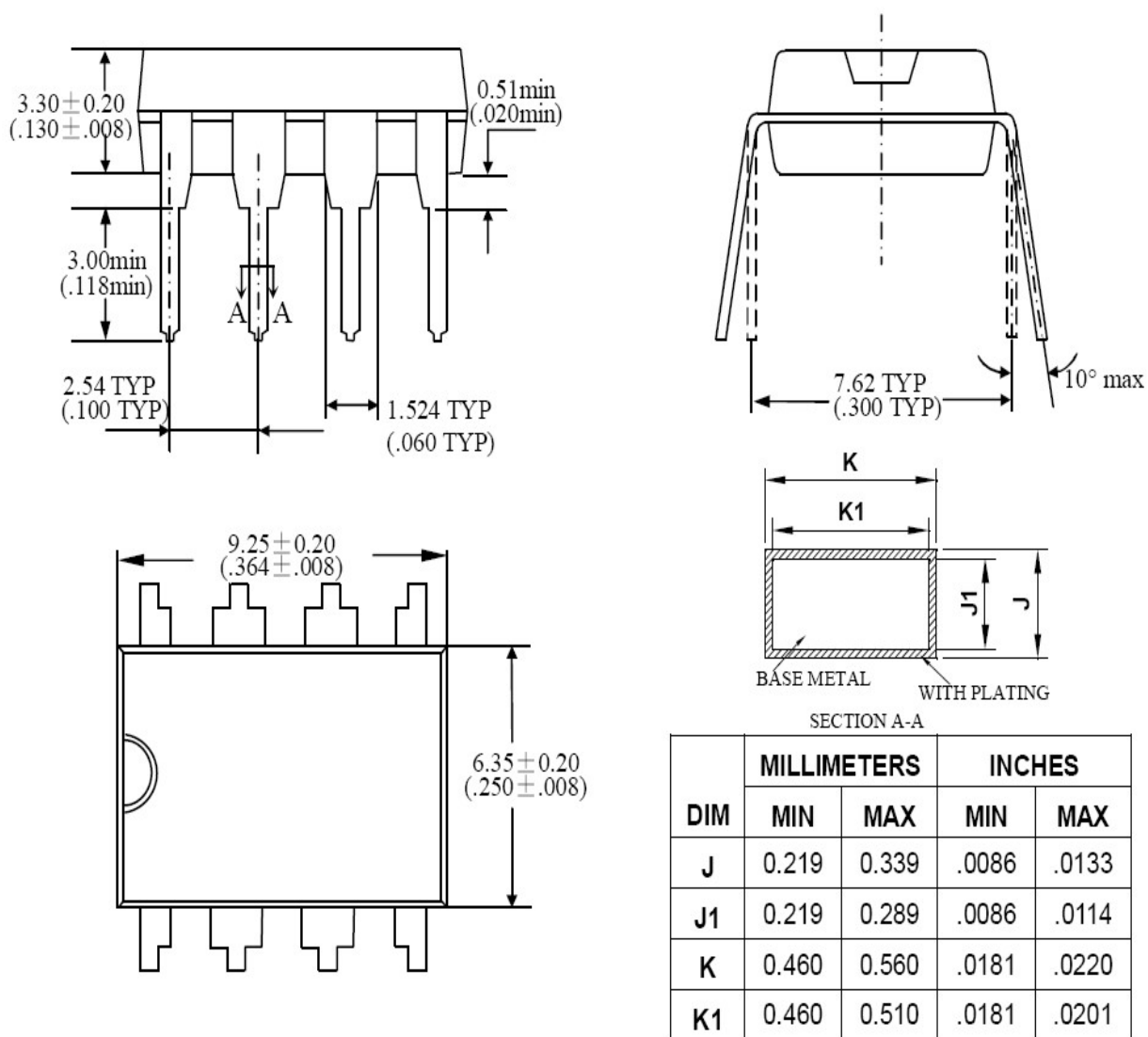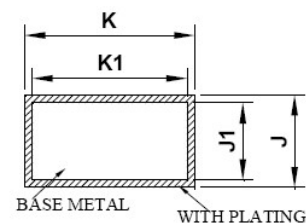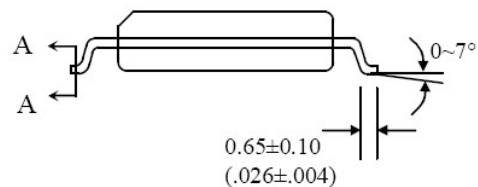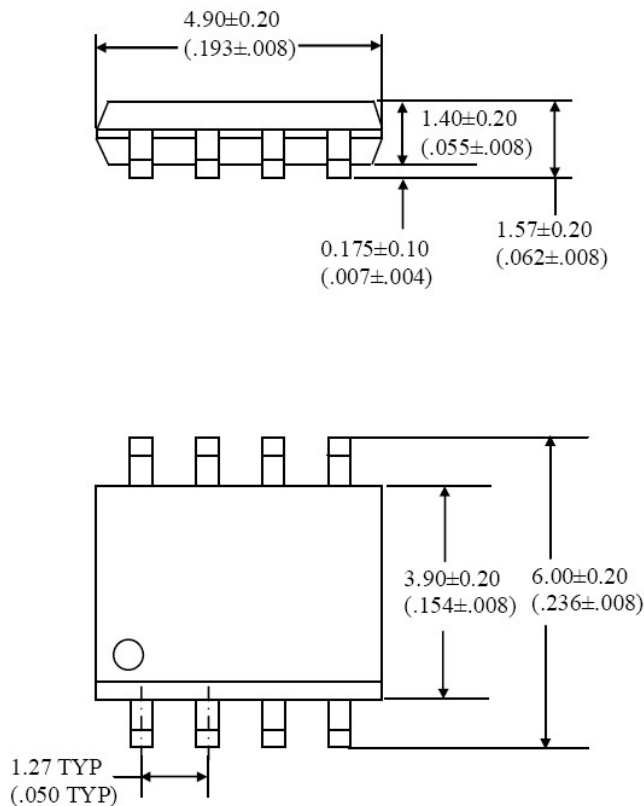
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
J	0.219	0.339	.0086	.0133
J1	0.219	0.289	.0086	.0114
K	0.460	0.560	.0181	.0220
K1	0.460	0.510	.0181	.0201

8-Pin SOP 150 mil

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
J	0.178	0.278	.0070	.0109
J1	0.178	0.228	.0070	.0090
K	0.406	0.496	.0160	.0195
K1	0.406	0.456	.0160	.0180

14-Pin PDIP 300 mil

	MILLIMETERS		INCHES	
DIM	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

14-Pin SOP 150 mil
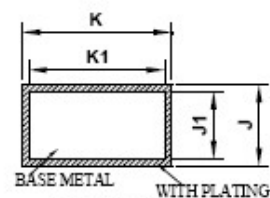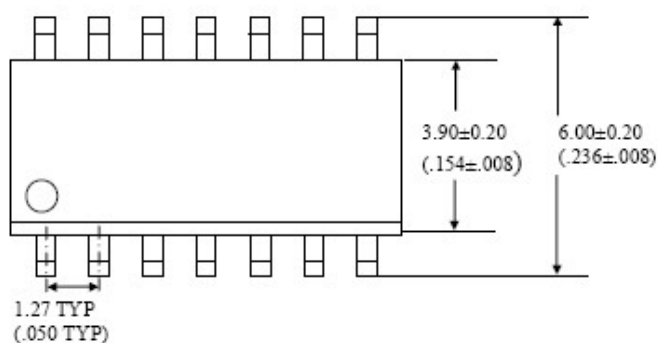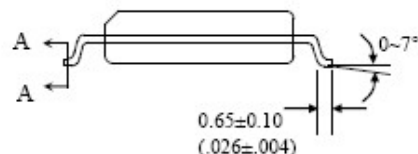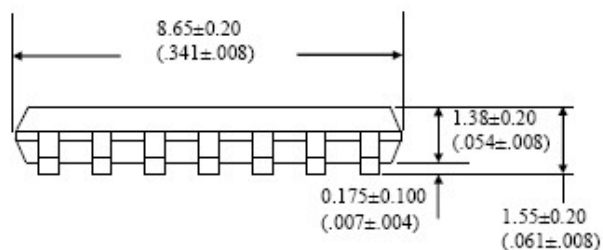
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
J	0.178	0.278	.0070	.0109
J1	0.178	0.228	.0070	.0090
K	0.406	0.496	.0160	.0195
K1	0.406	0.456	.0160	.0180

28-Pin SSOP 209 mil
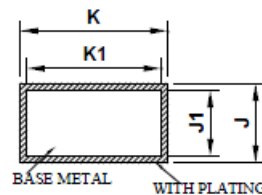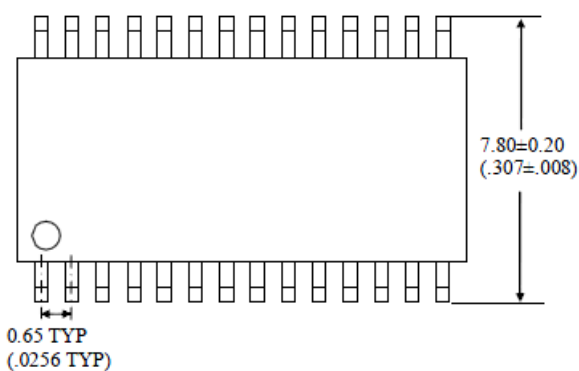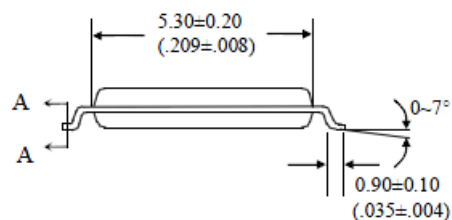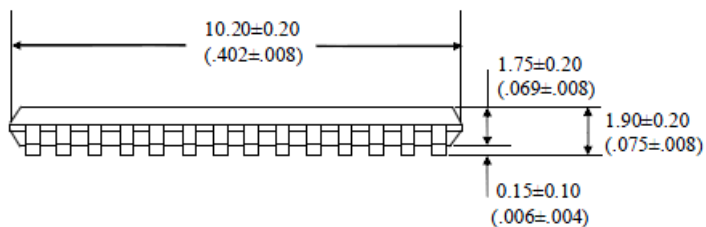
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
J	0.132	0.222	.0052	.0087
J1	0.132	0.172	.0052	.0068
K	0.300	0.400	.0118	.0157
K1	0.300	0.350	.0118	.0138

28-Pin SOP 300 mil
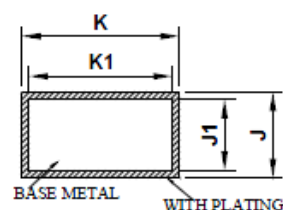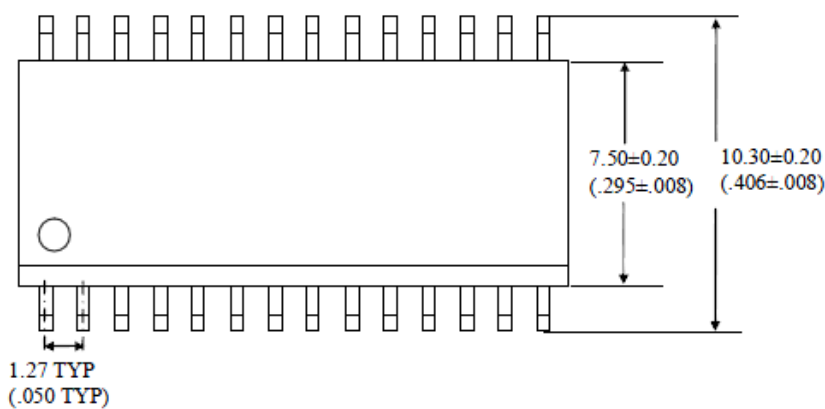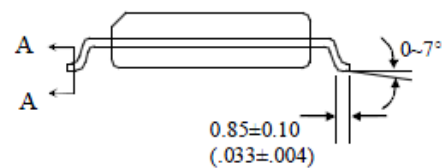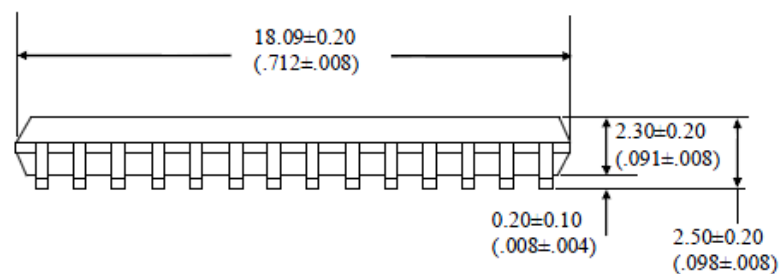
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
J	0.219	0.339	.0086	.0133
J1	0.219	0.289	.0086	.0114
K	0.406	0.496	.0160	.0195
K1	0.406	0.456	.0160	.0180

44-Pin LQFP
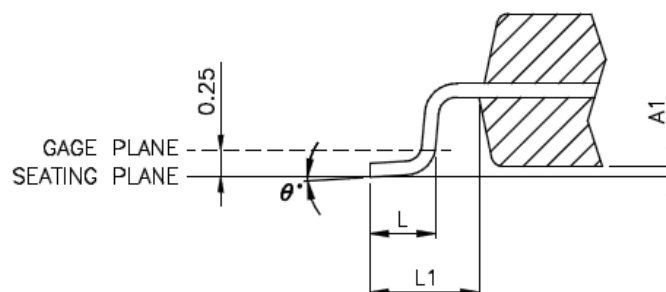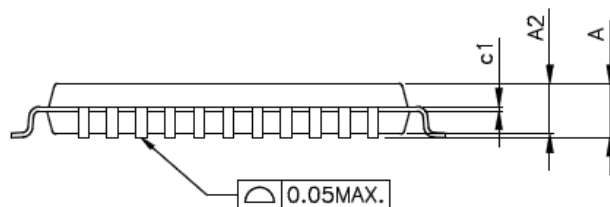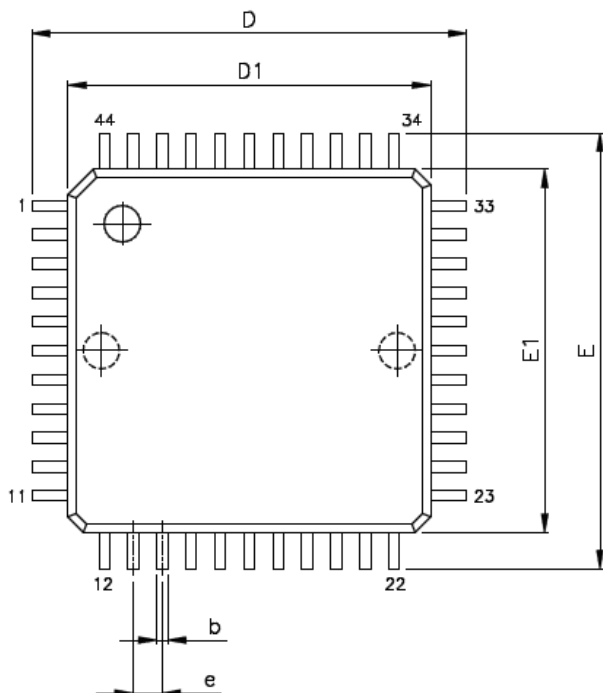
VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.60
A1	0.05	—	0.15
A2	1.35	1.40	1.45
c1	0.09	—	0.16
D	12.00 BSC		
D1	10.00 BSC		
E	12.00 BSC		
E1	10.00 BSC		
e	0.80 BSC		
b (w/o plating)	0.25	0.30	0.35
L	0.45	0.60	0.75
L1	1.00 REF		
$\theta°$	0°	3.5°	7°

NOTES:

1. JEDEC OUTLINE:MS—026 BCB
2. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25mm PER SIDE. D1 AND E1 ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS IMCLUDING MOLD MISMATCH.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION.ALLOWABLE DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED THE MAXIMUM b DIMENSION BY MORE THAN 0.08mm.

8 Ordering Information

P/N *	Package Type	Pin Count	Package Size
AM4KA020AP	PDIP	14	300 mil
AM4KA020AS	SOP	14	150 mil
AM4KA020AW	PDIP	8	300 mil
AM4KA020AX	SOP	8	150 mil
AM4KA041AP	PDIP	14	300 mil
AM4KA041AS	SOP	14	150 mil
AM4KA041AW	PDIP	8	300 mil
AM4KA041AX	SOP	8	150 mil
AM4KA084AP	PDIP	14	300 mil
AM4KA084AS	SOP	14	150 mil
AM4KA084AW	PDIP	8	300 mil
AM4KA084AX	SOP	8	150 mil
AM4KA170AD	SSOP	28	209 mil
AM4KA170AQ	LQFP	44	-
AM4KA170AS	SOP	28	300 mil

* Indication of Part Number (P/N):

AMXXXXXXXX-XXX

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 : DIP package
S/X : SOP package
D : SSOP package
Q : QFT package

Code Number:

From 000 - ZZZ