



佑華微電子股份有限公司

AM9CB SERIES

Data sheet

佑華微電子股份有限公司

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一般規格:

AM9CB0030, AM9CB0038, AM9CB0060, AM9CB0068, AM9CB0098 AM9CB009D, AM9CB0128 AM9CB0188, AM9CB0248, AM9CB0300, AM9CB042D, SA1CA0035, SA1CA0095乃一單晶CMOS VLSI 語音合成器，它以LOGPCM編碼方式，合成長達3,6,9,12,18,24,30,42秒之語音。藉由製造過程中更換光罩，將客戶需要之語音資料編寫入ROM中。

特性:

1. 單一工作電壓範圍為2.4 - 5 伏特。
2. 語音總長度可達3,6,9,12,18,24,30,42秒，且可被分割成32語音段(section)，每段長度可不同。每一段有四種不同播放時間的選擇，但是任何一種播放時間皆不可長於原段的(語音+靜音)時間。
3. 其中每一段的長度 (語音+靜音時間) 最多可達22秒。(在6kHz取樣頻率下)。
4. 具有255個語音格(voice_step)，可規劃成32語音組(sub_table)。
每一語音格可指定一語音段長度, 播放速度, AUDIO電流輸出, 和STS1、STS2、STS3、STS4致能或非致能。
振盪器選項: 1>4.3k ; 2>5k ; 3>6k ; 4>7.5k ; 5>10k Hz (Vdd=3.0 ; Rosc=300kohm)。
STS4,3,2,1 致能選擇: 每一種由一個控制位元控制('0' -> 致能 ; '1' -> 非致能)。
5. 由光罩選擇可決定使用矩陣 (MATRIX) 觸發或單獨 (ALONE)觸發。(兩者各有其MODE模式選擇，防止誤動作時間及優先順序的選項), CPU觸發。
其中，‘MODE/STS3’可選擇輸入MODE控制模式或 STS4輸出 (光罩決定)。

 矩陣觸發：4×4矩陣輸入(M1 - M16)

◎優先順序:

M1>M2>M3>M4; M5>M6>M7>M8; M9>M10>M11>M12; M13>M14>M15>M16

- ◎ 防止誤動作(DEBOUNCE)時間: 11ms-提供一般手動操作;
1ms-提供較敏感的動作。

◎MODE模式選擇: MODE=0，對應至語音組1 -16；

MODE=1，對應至語音組17 -32。

 單獨觸發：八個單獨輸入(A 1- A 8)的特性：內含電阻式史密特輸入(270K-1M)提供光敏電阻(CDS)使用。

◎優先順序：A1>A2>A3>A4>A5>A6>A7>A8

- ◎防止誤動作(DEBOUNCE)時間：10ms-提供一般手動操作；
50us-提供跳動開關使用。

◎MODE模式選擇：MODE=0，對應至語音組1-8；

MODE=1，對應至語音組9-16。

如果MODE 選擇 STS4輸出, 則矩陣觸發對應至 (subtable 1-16) 或單獨觸發對應至 (subtable 1-8) 以上2種觸發, 每一輸入可選擇不同播放模式(光罩選擇):

邊緣觸發 / 位準觸發(EDGE/LEVEL); 保持 / 非保持(HOLD/UNHOLD);
後段蓋前段 / 非後段蓋前段(RETRIGGER/IRRETRIGGER)

串列式CPU觸發：以觸發輸入COL4當作連接其它CPU介面的輸入腳.此時其它輸入的接腳皆應為非致能。

6. A8或M16可由光罩選擇設定為一般觸發(NORMAL), 順序觸發(SEQUENTIAL)或CPU觸發。

一般觸發(NORMAL)：A8或M16的觸發如第5項所示:

順序觸發功能 (SEQUENTIAL)：可選擇是否配合'MODE'輸入使用。

A).當A8或M16設定為單鍵觸發,而且結合'MODE'輸入使用：

MODE=1 -> 一經觸發將由第17語音組 (subtable 17) 至設定之語音組 (subtable n ; n=17 - 32)每次觸發播放一語音組按順序循環播放。

MODE=0 -> 一經觸發將由第1語音組 (subtable 1) 至設定之與音組 (subtable n ; n=1 - 16)每次觸發播放一語音組按順序循環播放。

循環播放之語音組數在MODE=1 ,MODE=0須相同且<語音16。

當A8或M16設定為單鍵輸入,而且不配合'MODE'輸入控制使用：

一經觸發將由第1組 (subtable 1) 至設定之語音組 (subtable n ; n=1-32)每觸發播放一組按順序循環播放。

B)順序觸發 (A8或M16) 開始動作後, 若其它輸入觸發(A1-A7/M1-M15), 可經光罩選擇定義為『可重置或不可重置』。

◎可重置(RESET)：若其它輸入觸發,順序觸發功能的循環將被重置回第1語音組。

◎不可重置(UNRESET)：順序觸發功能的尋循環不受其它鍵觸發影響。

7. OUT1, OUT2, OUT3, MODE/STS4 可作以下選擇：

OUT1：可選擇為COUT或STS1狀態輸出。

OUT2：可選擇為PWM1或STS2狀態輸出。

OUT3：可選擇為 PWM2或STS3狀態輸出。

MODE/STS4：可選擇為 MODE控制輸入或STS4狀態輸出。

COUT 有3種電流輸出：1> 1.5mA；2> 3mA；3>4.5mA (Vdd=3v , full scale)。

PWM1, PWM2須同時選擇, 可驅動buzzer 或 8、32、64 ohm speaker。

8. STS1, STS2, STS3及STS4可做如下輸出選擇：
FOR AM9CB0030

<input type="checkbox"/> STS1輸出的選擇	<input type="checkbox"/> STS2輸出的選擇
A) COUT聲音輸出 B) 停止播放時送出高位準脈衝. C) 停止播放時送出低位準脈衝. D) 播放時送出高位準訊號. E) 播放時送出低位準訊號. F) LED 6HZ(靜音時閃爍). G) LED 3HZ(靜音時閃爍). H) LED 6HZ(靜音時熄滅). I) LED 3HZ(靜音時熄滅). J) LED動態送出低位準脈衝 0.34秒(每一語音格). K) LED動態送出低位準脈衝 0.68秒(每一語音格). L) LED動態送出低位準脈衝 1.02秒(每一語音格). M) 播放時(靜音除外)送出高位準訊號. N) 播放時(靜音除外)送出低位準訊號.	A) PWM1聲音輸出 B) 停止播放時送出高位準脈衝. C) 停止播放時送出低位準脈衝. D) 播放時送出高位準訊號. E) 播放時送出低位準訊號. F) LED 6HZ(靜音時閃爍). G) LED 3HZ(靜音時閃爍). H) LED 6HZ(靜音時亮著). I) LED 3HZ(靜音時亮著). J) LED 6HZ(靜音時熄滅)訊號. K) LED 3HZ(靜音時熄滅)訊號. L) LED動態 1/4位準訊號. M) LED動態 2/4位準訊號. N) LED動態 3/4位準訊號.

<input type="checkbox"/> STS3輸出的選擇	<input type="checkbox"/> STS4輸出的選擇
A) PWM2聲音輸出 B) 停止播放時送出高位準脈衝. C) 停止播放時送出低位準脈衝. D) 播放時送出高位準訊號 E) 播放時送出低位準訊號 F) LED 6HZ(靜音時閃爍). G) LED 3HZ(靜音時閃爍). H) LED 6HZ(靜音時熄滅). I) LED 3HZ(靜音時熄滅). J) LED動態送出低位準脈衝 0.34秒(每一語音格). K) LED動態送出低位準脈衝 0.68秒(每一語音格). L) LED動態送出低位準脈衝 1.02秒(每一語音格). M) 播放時(靜音除外)送出高位準訊號. N) 播放時(靜音除外)送出低位準訊號.	A) MODE選擇 B) 停止播放時送出高位準脈衝. C) 停止播放時送出低位準脈衝. D) 播放時送出高位準訊號. E) 播放時送出低位準訊號. F) LED 6HZ(靜音時閃爍). G) LED 3HZ(靜音時閃爍). H) LED 6HZ(靜音時亮著). I) LED 3HZ(靜音時亮著). J) LED 6HZ(靜音時熄滅). K) LED 3HZ(靜音時熄滅). L) LED動態 1/4位準訊號. M) LED動態 2/4位準訊號. N) LED動態 3/4位準訊號.

※如STS1(STS3)和STS2(STS4)選擇相同LED 6Hz或LED 3Hz之模式時它們將交互閃爍。

※若STS1，STS3同時選擇 LED動態送出低位準脈衝(每一語音格)，須選擇同一秒數。

※若STS2，STS4同時選擇 LED動態位準訊號，須選擇同一位準。

※ STS1，STS2，STS3及STS4可由光罩選擇對每一語音格(voice_step)致能或非致能。

※ 狀態輸出方式請以時序圖為準。

9. STS1, STS2, STS3及STS4可做如下輸出選擇:
FOR AM9CB0030除外

<input type="checkbox"/> STS1輸出的選擇	<input type="checkbox"/> STS2輸出的選擇
A) COUT聲音輸出 B) 停止播放時送出高位準脈衝. C) 停止播放時送出低位準脈衝. D) 播放時送出高位準訊號. E) 播放時送出低位準訊號. F) LED 6HZ(靜音時閃爍). G) LED 3HZ(靜音時閃爍). H) LED 1.5HZ(靜音時閃爍). I) LED 0.75HZ(靜音時閃爍). J) LED 6HZ(靜音時熄滅). K) LED 3HZ(靜音時熄滅). L) LED 1.5HZ(靜音時熄滅). M) LED 0.75HZ(靜音時熄滅). N) LED動態送出低位準脈衝 0.34秒(每一語音格). O) LED動態送出低位準脈衝 0.68秒(每一語音格). P) LED動態送出低位準脈衝 1.02秒(每一語音格). Q) 播放時(靜音除外)送出高位準訊號. R) 播放時(靜音除外)送出低位準訊號.	A) PWM1聲音輸出 B) 停止播放時送出高位準脈衝. C) 停止播放時送出低位準脈衝. D) 播放時送出高位準訊號. E) 播放時送出低位準訊號. F) LED 6HZ(靜音時閃爍). G) LED 3HZ(靜音時閃爍). H) LED 1.5HZ(靜音時閃爍). I) LED 0.75HZ(靜音時閃爍). J) LED 6HZ(靜音時亮著). K) LED 3HZ(靜音時亮著). L) LED 1.5HZ(靜音時亮著). M) LED 0.75HZ(靜音時亮著). N) LED 6HZ(靜音時熄滅)訊號. O) LED 3HZ(靜音時熄滅)訊號. P) LED 1.5HZ(靜音時熄滅)訊號. Q) LED 0.75HZ(靜音時熄滅)訊號. R) LED動態 1/4位準訊號. S) LED動態 2/4位準訊號. T) LED動態 3/4位準訊號.

<input type="checkbox"/> STS3輸出的選擇	<input type="checkbox"/> STS4輸出的選擇
A) PWM2聲音輸出 B) 停止播放時送出高位準脈衝. C) 停止播放時送出低位準脈衝. D) 播放時送出高位準訊號 E) 播放時送出低位準訊號 F) LED 6HZ(靜音時閃爍). G) LED 3HZ(靜音時閃爍). H) LED 1.5HZ(靜音時閃爍). I) LED 0.75HZ(靜音時閃爍). J) LED 6HZ(靜音時熄滅). K) LED 3HZ(靜音時熄滅). L) LED 1.5HZ(靜音時熄滅). M) LED 0.75HZ(靜音時熄滅). N) LED動態送出低位準脈衝 0.34秒(每一語音格). O) LED動態送出低位準脈衝 0.68秒(每一語音格). P) LED動態送出低位準脈衝 1.02秒(每一語音格). Q) 播放時(靜音除外)送出高位準訊號. R) 播放時(靜音除外)送出低位準訊號.	A) MODE選擇 B) 停止播放時送出高位準脈衝. C) 停止播放時送出低位準脈衝. D) 播放時送出高位準訊號. E) 播放時送出低位準訊號. F) LED 6HZ(靜音時閃爍). G) LED 3HZ(靜音時閃爍). H) LED 1.5HZ(靜音時閃爍). I) LED 0.75HZ(靜音時閃爍). J) LED 6HZ(靜音時亮著). K) LED 3HZ(靜音時亮著). L) LED 1.5HZ(靜音時亮著). M) LED 0.75HZ(靜音時亮著). N) LED 6HZ(靜音時熄滅). O) LED 3HZ(靜音時熄滅). P) LED 1.5HZ(靜音時熄滅). Q) LED 0.75HZ(靜音時熄滅). R) LED動態 1/4位準訊號. S) LED動態 2/4位準訊號. T) LED動態 3/4位準訊號.

※如STS1(STS3)和STS2(STS4)選擇相同LED 6Hz或LED 3Hz或LED 1.5Hz或LED 0.75 Hz之模式時它們將交互閃爍。

※若STS1，STS3同時選擇 LED動態送出低位準脈衝(每一語音格)，須選擇同一秒數。

※若STS2，STS4同時選擇 LED動態位準訊號，須選擇同一位準。

※STS1，STS2，STS3及STS4可由光罩選擇對每一語音格(voice_step)致能或非致能。

※狀態輸出方式請以時序圖為準。

※選擇 STS1(STS3) 的靜音閃爍時，可選擇 3Hz, 1.5Hz 或 0.75Hz的輸出。

※選擇 STS2(STS4) 的靜音閃爍時，可選擇 3Hz, 1.5Hz 或 0.75Hz的輸出。

※選擇 STS1(STS2,STS3,STS4)的靜音時熄滅和選擇 STS2(STS4) 的靜音時熄滅或靜音時亮著，僅可選擇單一位準 3Hz, 1.5Hz 或 0.75Hz的輸出。

10.自動選擇振盪電阻(光罩選擇)：

- A). 致能 - 如果有接外部振盪電阻，則優先使用外部振盪電阻；如果沒有，則使用內部已選擇之振盪電阻(振盪電阻的狀態須在觸發前決定)。
- B). 非致能 - 只能使用外部振盪電阻。
- C). 內部振盪電阻選擇：(光罩選擇)。

For AM9CB0030, AM9CB0038, AM9CB0060, AM9CB0068, AM9CB0098, AM9CB0128, AM9CB0188, AM9CB0248, AM9CB0300, AM9CB042D

電阻選擇 振盪器項 速度	A	B	C	D	E	F	G	H	I	J	K	L	M
4.3	8.9	8.6	7.9	7	6.3	5.8	5.4	5.1	4.7	4.3	4.1	3.9	3.6
5	10.3	10	9.2	8.2	7.3	6.8	6.3	5.9	5.5	5	4.8	4.6	4.2
6	12.4	12	11	9.8	8.8	8.1	7.5	7.1	6.6	6	5.7	5.5	5
7.5	15.5	15	13.8	12.3	11	10.1	9.4	8.9	8.3	7.5	7.1	6.9	6.3
10	20.7	20	18.3	16.3	14.7	13.5	12.5	11.8	11	10	9.5	9.2	8.3

For SA1CA0035, SA1CA0095

電阻選擇 振盪器項 速度	A	B	C	D	E	F	G	H	I	J	K	L	M
4.3	13.4	12.9	11.9	10.5	9.5	8.7	8.1	7.7	7.1	6.5	6.2	5.9	5.4
5	15.5	15	13.8	12.3	11	10.2	9.5	8.9	8.3	7.5	7.2	6.9	6.3
6	18.6	18	16.5	14.7	13.2	12.2	11.3	10.7	9.9	9	8.6	8.3	7.5
7.5	23.3	22.5	20.7	18.5	16.5	15.2	14.1	13.4	12.5	11.3	10.7	10.4	9.5
10	31.1	30	27.5	24.5	22.1	20.3	18.8	17.7	16.5	15	14.3	13.8	12.5

GENERAL DESCRIPTION:

The AM9CB0030, AM9CB0038, AM9CB0060, AM9CB0068, AM9CB0098, AM9CB009D, AM9CB0128 AM9CB0188, AM9CB0248, AM9CB0300, AM9CB042D, SA1CA0035, SA1CA0095 is a single-chip synthesizing CMOS VLSI that can synthesize voice up to 3,6,9,12,18,24,30,42 seconds, using ALPHA qualified coding algorithm (LOGPCM). Customer speech data will be edited and programmed into ROM by changing one mask during the device fabrication.

FEATURES:

- Single power supply can operate from 2.4v through 5v.
- The total voice duration is about 3, 6, 9, 12, 18, 24, 30, 42 seconds could be partitioned up to 32 voice sections . each voice section could have 4 playing_length , the longest one is the original voice+mute length .
- Voice + mute length could up to 22 seconds (6k sample rate) for each voice section .
- One 255 voice-steps table ,could be partitioned up to 32 groups of voice-step .
For each voice-step, could specify one length of one voice section and one of 5 levels playback speed and STS1, STS2, STS3, STS4 enable options .
playback speed : 1>4.3k ; 2>5k ; 3>6k ; 4>7.5k ; 5>10kHz .
STS4,3,2,1 enable options : each with one control bit . (dec to bin ; '0' -> enable , '1' -> disable)
- Three mask option trigger input mode : MATRIX , ALONE (with mode selection ,priority and debounce)
one mode control input 'MODE' , could be used as mode selection or STS4 . (mask option)
MATRIX : 4x4 matrix inputs ; M1-- M16 (MODE=0 -> subtable1 - 16 ; MODE=1 -> subtable17 - 32)
priority : M1>M2>M3>M4 ; M5>M6>M7>M8 ; M9>M10>M11>M12 ; M13>M14>M15>M16 .
debounce : 11ms or 1ms .
ALONE : 8 alone inputs ; A1 -- A8 (MODE=0 -> subtable1 - 8 ; MODE=1 -> subtable9 - 16)
each input could be one of 3 resistive type input :
1>10Mohm to GND ; 2>schmitt (270k - 1M) for CDS interface ; 3>schmitt (270k - 10M) for CDS interface .
A1 could be trigger input or control outputs (COUT , PWM , STS) enable ('1') or disable ('0') .
priority : A1>A2>A3>A4>A5>A6>A7>A8 .
debounce : 10ms or 50us
If MODE/STS4 is in STS4 mode , MATRIX only (subtable1 - 16) , ALONE only (subtable1 - 8)
In both mode , all the trigger input could be assign as different playing mode with following options :
EDGE/LEVEL ; HOLD/UNHOLD ; RETRIGGER/IRRETRIGGER .
CPU_INTERFACE : addressing access mode by input pulse count , in this mode A1 - A7 were disable ,could be access up to 32 subtables .
- A8 or M16 could be mask_selected as NORMAL , SEQUENTIAL or CPU_INTERFACE .
NORMAL : normal mode as in item 5 .
SEQUENTIAL : could be mask_selected as combined with MODE input or not .
If A8 or M16 is in SEQUENTIAL and combined with MODE input :
MODE=1 -> the device will response by one subtable sequentially and cyclically , from subtable1 7 to user _specify end subtable.
MODE=0 -> the device will response by one subtable sequentially and cyclically , from subtable 1 to user _specify end subtable.
The number of subtables (used in sequence) in MODE=1 and MODE=0 must be equal ; this number must less than 16 .
If A8 or M16 is in SEQUENTIAL and not combined with MODE input :
The device will response by one subtable sequentially and cyclically , from subtable1 to user defined end subtable.
The relationship between SEQUENTIAL (A8/M16) and other inputs (A1-A7 / M1-M15) could be mask_selected as RESET or UNRESET .
RESET : once the other inputs were triggered the SEQUENTIAL sequence will reset to subtable 1 .
UNRESET : sequential sequence and other inputs are independent .
- 4 OUT pins with following options :
OUT1 : COUT or STS1 OUT2 : PWM1 or STS2 OUT3 : PWM2 or STS3 OUT4 : MODE or STS4
COUT has 3 current output levels : 1>1.5mA ; 2>3mA ; 3>4.5mA . (full scale ; Vdd=3v)
PWM1 and PWM2 must be selected on the same time , can direct driving BUZZER or 8 or 32 or 64 ohm SPEAKER .

8. 4 status outputs (STS1 , STS2 , STS3 , STS4) , one mask option status output (MODE/STS4) :

For AM9CB0030

* STS1

```
a>cout
b>stop high_pulse
d>busy high_active
f>led 6hz (flash at mute)
h>led 6hz (off at mute )
j>led dybzl 0.34sec.
l>led dybzl 1.02sec.
n>busy low ,except mute
```

```
c>stop low_pulse
e>busy low_active
g>led 3hz (flash at mute)
i>led 3hz (off at mute)
k>led dybzl 0.68sec.
m>busy high ,except mute
```

* STS2

```
a>pwm1
b>stop high_pulse
d>busy high_active
f>led 6hz (flash at mute)
h>led 6hz (on at mute)
j>led 6hz (off at mute)
l>led dynamic 1/4
n>led dynamic 3/4
```

```
c>stop low_pulse
e>busy low_active
g>led 3hz (flash at mute)
i>led 3hz (on at mute)
k>led 3hz (off at mute)
m>led dynamic 2/4
```

* STS3

```
a>pwm2
b>stop high_pulse
d>busy high_active
f>led 6hz (flash at mute)
h>led 6hz (off at mute )
j>led dybzl 0.34sec.
l>led dybzl 1.02sec.
n>busy low ,except mute
```

```
c>stop low_pulse
e>busy low_active
g>led 3hz (flash at mute)
i>led 3hz (off at mute)
k>led dybzl 0.68sec.
m>busy high ,except mute
```

* STS4

```
a>mode
b>stop high_pulse
d>busy high_active
f>led 6hz (flash at mute)
h>led 6hz (on at mute)
j>led 6hz (off at mute)
l>led dynamic 1/4
n>led dynamic3/4
```

```
c>stop low_pulse
e>busy low_active
g>led 3hz (flash at mute)
i>led 3hz (on at mute)
k>led 3hz (off at mute)
m>led dynamic 2/4
```

If both STS1(STS3) and STS2(STS4) are in 6hz or 3hz mode ,they will flash alternatively .

For STS1 and STS3 options , the DYBZL must selected same level .

For STS2 and STS4 options , the DYNAMIC must selected same level .

STS4 was enabled only when the MODE/STS4 is in STS4 option .

For each voice_step , the STS1 , STS2 , STS3 , STS4 could be mask_selected as active or inactive .

9. 4 status outputs (STS1 , STS2 , STS3 , STS4) ,one mask option status output (MODE/STS4) :

For expect AM9CB0030

* STS1

```
a>cout
b>stop high_pulse
d>busy high_active
f>led 6hz (flash at mute)
h>led 1.5hz (flash at mute)
j>led 6hz (off at mute )
l>led 1.5hz (off at mute )
n>led dybzl 0.34sec.
p>led dybzl 1.02sec.
r>busy low ,except mute
```

```
c>stop low_pulse
e>busy low_active
g>led 3hz (flash at mute)
i>led 0.75hz (flash at mute)
k>led 3hz (off at mute)
m>led 0.75hz (off at mute)
o>led dybzl 0.68sec.
q>busy high ,except mute
```

* STS2

```
a>pwm1
b>stop high_pulse
d>busy high_active
f>led 6hz (flash at mute)
h>led 1.5hz (flash at mute)
j>led 6hz (on at mute)
l>led 1.5hz (on at mute)
n>led 6hz (off at mute)
p>led 1.5hz (off at mute)
r>led dynamic 1/4
t>led dynamic 3/4
```

```
c>stop low_pulse
e>busy low_active
g>led 3hz (flash at mute)
i>led 0.75hz (flash at mute)
k>led 3hz (on at mute)
m>led 0.75hz (on at mute)
o>led 3hz (off at mute)
q>led 0.75hz (off at mute)
s>led dynamic 2/4
```

* STS3

```
a>pwm2
b>stop high_pulse
d>busy high_active
f>led 6hz (flash at mute)
h>led 1.5hz (flash at mute)
j>led 6hz (off at mute )
l>led 1.5hz (off at mute )
n>led dybzl 0.34sec.
p>led dybzl 1.02sec.
r>busy low ,except mute
```

```
c>stop low_pulse
e>busy low_active
g>led 3hz (flash at mute)
i>led 0.75hz (flash at mute)
k>led 3hz (off at mute)
m>led 0.75hz (off at mute)
o>led dybzl 0.68sec.
q>busy high ,except mute
```

* STS4

```
a>mode
b>stop high_pulse
d>busy high_active
f>led 6hz (flash at mute)
h>led 1.5hz (flash at mute)
j>led 6hz (on at mute)
l>led 1.5hz (on at mute)
n>led 6hz (off at mute)
p>led 1.5hz (off at mute)
r>led dynamic 1/4
t>led dynamic3/4
```

```
c>stop low_pulse
e>busy low_active
g>led 3hz (flash at mute)
i>led 0.75hz (flash at mute)
k>led 3hz (on at mute)
m>led 0.75hz (on at mute)
o>led 3hz (off at mute)
q>led 0.75hz (off at mute)
s>led dynamic 2/4
```

If both STS1(STS3) and STS2(STS4) are in 6hz or 3hz mode ,they will flash alternatively .

For STS1 and STS3 options , the DYBZL must selected same level .

For STS2 and STS4 options , the DYNAMIC must selected same level .

STS4 was enabled only when the MODE/STS4 is in STS4 option .

For each voice_step , the STS1 , STS2 , STS3 , STS4 could be mask_selected as active or inactive.

If select flash at mute of STS1(STS3) , can select 3hz or 1.5hz or 0.75hz .

If select flash at mute of STS2(STS4) , can select 3hz or 1.5hz or 0.75hz .

If both select off at mute of STS1(STS2,STS3,STS4) or on at mute of STS2(STS4) , can only select 3hz or 1.5hz or 0.75hz at the same level .

10. Automatic Rosc selection : (mask option)

Enable - the device will use external Rosc if it has external Rosc ; the device will use internal Rosc automatically if it hasn't external Rosc . (it must be determined before operation)

Disable - use external Rosc only .

Internal Rosc options : one of 13 internal Rosc options with different playback speed .

For AM9CB0030, AM9CB0038, AM9CB0060, AM9CB0068, AM9CB0098, AM9CB0128 AM9CB0188, AM9CB0248, AM9CB0300, AM9CB042D:

playback speed=4.3khz -> a>8.9k ; b>8.6k ; c>7.9k ; d>7.0k ; e>6.3k ; f>5.8k ; g>5.4k ; h>5.1k ; i>4.7k ; j>4.3k ; k>4.1k ; l>3.9k ; m>3.6k hz . (Vdd=3v)

playback speed=5.0khz -> a>10.3k ; b>10.0k ; c>9.2k ; d>8.2k ; e>7.3k ; f>6.8k ; g>6.3k ; h>5.9k ; i>5.5k ; j>5.0k ; k>4.8k ; l>4.6k ; m>4.2k hz . (Vdd=3v)

playback speed=6.0khz -> a>12.4k ; b>12.0k ; c>11.0k ; d>9.8k ; e>8.8k ; f>8.1k ; g>7.5k ; h>7.1k ; i>6.6k ; j>6.0k ; k>5.7k ; l>5.5k ; m>5.0k hz . (Vdd=3v)

playback speed=7.5khz -> a>15.5k ; b>15.0k ; c>13.8k ; d>12.3k ; e>11.0k ; f>10.1k ; g>9.4k ; h>8.9k ; i>8.3k ; j>7.5k ; k>7.1k ; l>6.9k ; m>6.3k hz . (Vdd=3v)

playback speed=10khz -> a>20.7k ; b>20.0k ; c>18.3k ; d>16.3k ; e>14.7k ; f>13.5k ; g>12.5k ; h>11.8k ; i>11.0k ; j>10.0k ; k>9.5k ; l>9.2k ; m>8.3k hz . (Vdd=3v)

For SA1CA0035, SA1CA0095:

playback speed=4.3khz -> a>13.4k ; b>12.9k ; c>11.9k ; d>10.5k ; e>9.5k ; f>8.7k ; g>8.1k ; h>7.7k ; i>7.1k ; j>6.5k ; k>6.2k ; l>5.9k ; m>5.4k hz . (Vdd=3v)

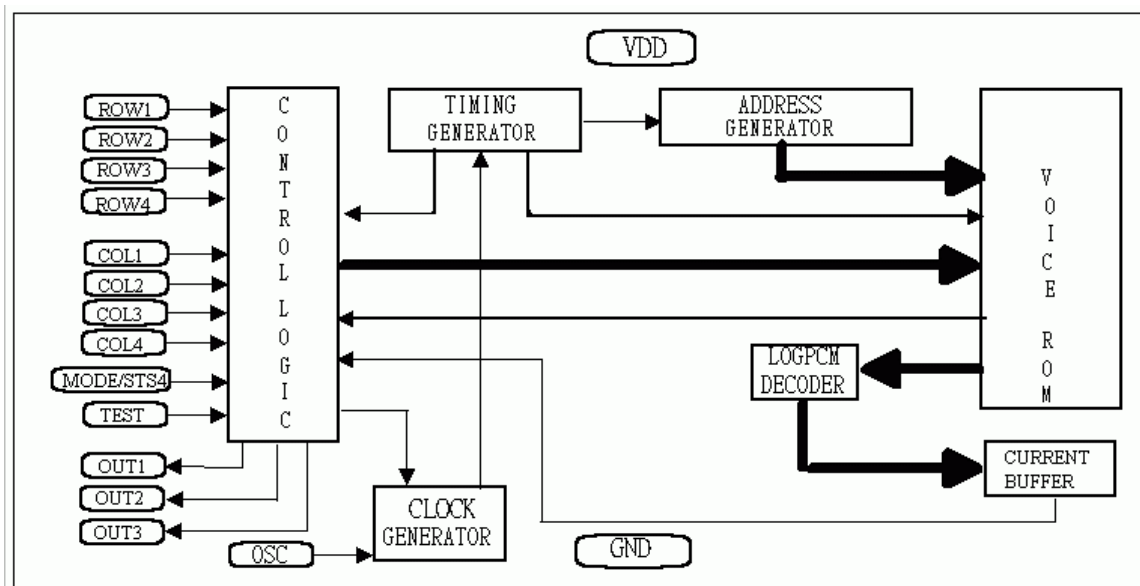
playback speed=5.0khz -> a>15.5k ; b>15k ; c>13.8k ; d>12.3k ; e>11k ; f>10.2k ; g>9.5k ; h>8.9k ; i>8.3k ; j>7.5k ; k>7.2k ; l>6.9k ; m>6.3k hz . (Vdd=3v)

playback speed=6.0khz -> a>18.6k ; b>18k ; c>16.5k ; d>14.7k ; e>13.2k ; f>12.2k ; g>11.3k ; h>10.7k ; i>9.9k ; j>9k ; k>8.6k ; l>8.3k ; m>7.5k hz . (Vdd=3v)

playback speed=7.5khz -> a>23.3k ; b>22.5k ; c>20.7k ; d>18.5k ; e>16.5k ; f>15.2k ; g>14.1k ; h>13.4k ; i>12.5k ; j>11.3k ; k>10.7k ; l>10.4k ; m>9.5k hz . (Vdd=3v)

playback speed=10khz -> a>31.1k ; b>30k ; c>27.5k ; d>24.5k ; e>22.1k ; f>20.3k ; g>18.8k ; h>17.7k ; i>16.5k ; j>15k ; k>14.3k ; l>13.8k ; m>12.5k hz . (Vdd=3v)

BLOCK DIAGRAM:



PIN DESCRIPTION:

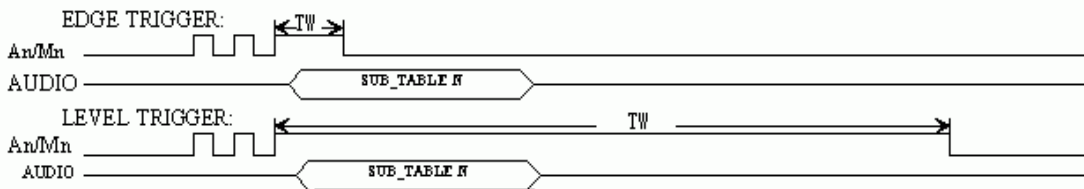
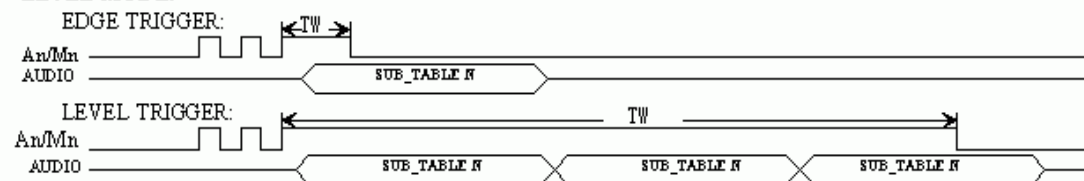
PAD NAME	PIN ATTR.	FUNCTION
VDD,VDD1	POWER	POSITIVE POWER SUPPLY.
OSC	I	OSCILLATOR INPUT (300K ohm CONNECT TO VDD).
TEST	I	TEST PAD, FOR PRODUCTION TESTING (TEST HIGH FOR TESTING)
MODE/STS4	I/O	I/O PAD , MODE : MODE SELECTION , STS4 : STATUS OUTPUT
ROW 1-4	I/O	OUTPUT FOR MATRIX MODE ; INPUT FOR ALONE MODE
COL 1-4	I	TRIGGER INPUT , INTERNAL PULL LOW (HIGH ACTIVE)
OUT1	O	STATUS OUTPUT OR AUDIO (CURRENT OUTPUT)
OUT2	O	STATUS OUTPUT OR AUDIO (PWM1 OUTPUT)
OUT3	O	STATUS OUTPUT OR AUDIO (PWM2 OUTPUT)
GND,GND1	POWER	NEGATIVE POWER SUPPLY.

ABSOLUTE MAXIMUM RATING:

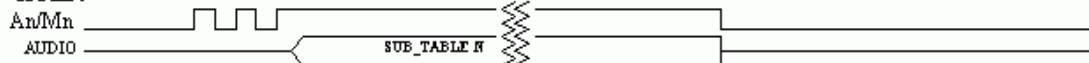
SYMBOL	RATING	UNIT
VDD~VSS	-0.5~+7.0	V
VIN (FOR ALL INPUT)	VSS-0.3<VIN<VDD+0.3	V
VOU (FOR ALL OUTPUT)	GND<VOU<VDD	V
T (OPERATING)	0~+70	°C
T (STORAGE)	-25~+75	°C

DC CHARACTERISTICS:

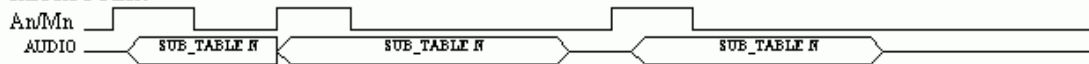
SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT	CONDITION
VDD	OPERATING VOLTAGE	2.4	3	5	V	
I _{sb}	SUPPLY CURRENT	STANDBY		0.1	μA	VDD=3V , I/O OPEN (WITH R _{osc})
I _{op}		OPERATING		200		
I _{ih}	INPUT CURRENT ROW1-4, COL1-4 IN ALONE MODE (SCHMITT 270K - 1M)		0	5	μA	VDD=3V
I _{il}						
I _{ih}	INPUT CURRENT ROW1-4, COL1-4 IN ALONE MODE (SCHMITT 270K - 10M)		0	0.3	μA	VDD=3V
I _{il}						
I _{ih}	INPUT CURRENT MODE INPUT		0	0.5	μA	VDD=3V
I _{il}						
I _{oh}	MATRIX MODE (ROW 1 - 4) OUTPUT CURRENT		-0.6		mA	VDD=3V , V O/P=0V
I _{ol}			10			VDD=3V , V O/P=3V
I _{cout}	OUT1 USE AS CURRENT OUT (FULL SCALE)	-1.2	-1.5	-1.8	mA	VDD=3V, V O/P=0.7V
		-2.4	-3	-3.6		
		-3.6	-4.5	-5.4		
I _{oh}	OUT1,OUT2,OUT3 USE AS STATUS OUTPUT DURING OPERATING		-0.6		mA	VDD=3V, V O/P=0V
I _{ol}		8	10	12		VDD=3V, V O/P=3V
dF/F	FREQUENCY STABILITY	-10		10		$\frac{F_{osc(3v)} - F_{osc(2.4v)}}{F_{osc(3v)}}$
dF/F	F _{osc} VARIATION	-10		10		VDD=3V, R _{osc} =300K

TIMING DIAGRAM:
1.>EDGE/LEVEL
EDGE MODE:

LEVEL MODE:


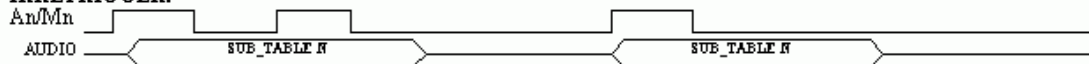
* NOTE: Tw IS THE MINIMUM INPUT PULSE WIDTH > DEBOUNCE TIME (10ms or 50us)

2.>HOLD/UNHOLD
HOLD:

UNHOLD:

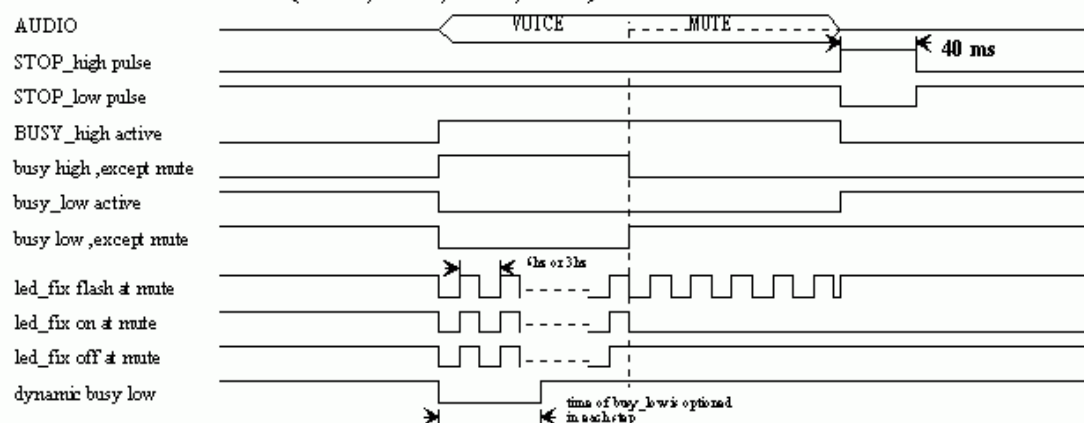

*NOTE: BOTH EDGE AND LEVEL HAVE HOLD AND UNHOLD OPTION.

3.>RETRIGGERABLE/IRRETRIGGERABLE
RETRIGGER:


PLAY FROM BEGINNING IMMEDIATLLY

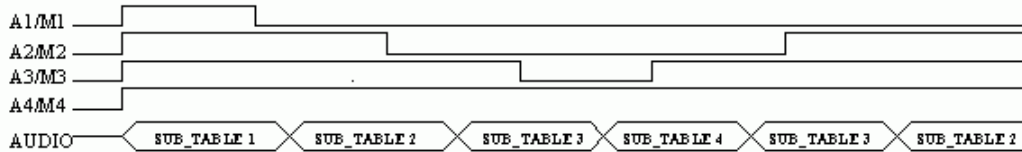
IRRETRIGGER:


IGNORE TRIGGER INPUT SIGNAL DURING PLAYING

4.>STATUS OUTPUT(STS1,STS2,STS3,STS4)


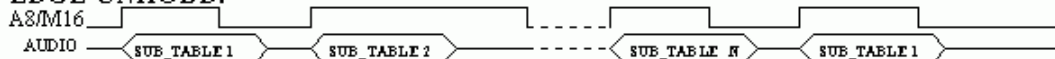
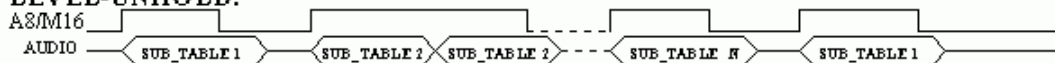
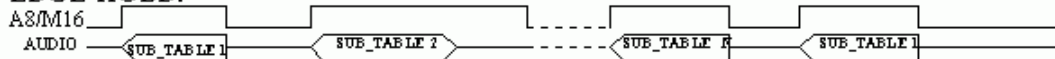
DYNAMIC: Partition the voice amplitude 8 steps (01234567);
 1/4:0,7LED on. 2/4:0.1,6,7 LED on. 3/4:0.1,2,5,6,7LED on.

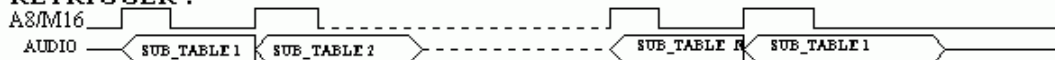
LED on means status output low. : every beginning of voice step will reset status signal..

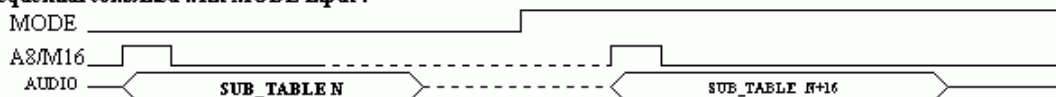
5> PRIORITY :


NOTE : PRIORITY A1>A2>A3>A4>A5>A6>A7>A8
M1>M2>M3>M4 ; M5>M6>M7>M8 ; M9>M10>M11>M12 ; M13>M14>M15>M16

The device will detect the input priority at start playing or level repeat.

6.> SEQUENTIAL :
EDGE-UNHOLD:

LEVEL-UNHOLD:

EDGE-HOLD:

LEVEL-HOLD:

RETRIGGER :

IRRETRIGGER :

*** Sequential combined with MODE input :**

7.> CPU_INTERFACE : addressing access mode by input pulse count (A8)

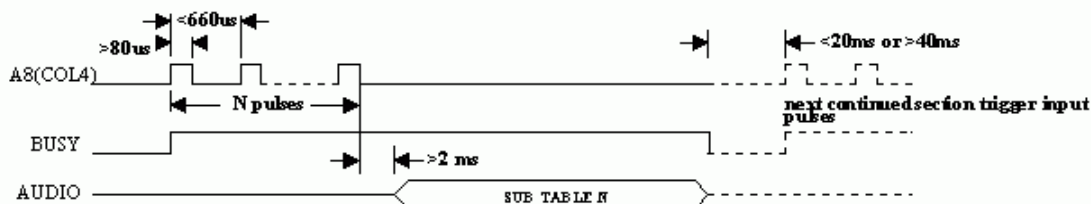
In this mode , some of the mask_options must set as follow :

MATRIX/ALONE -> ALONE ; SEQUENTIAL/NORMAL -> SEQUENTIAL ; sequential not combined with MODE ;

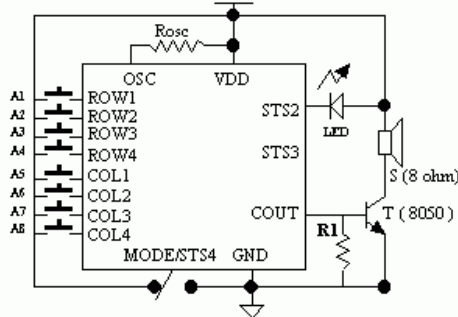
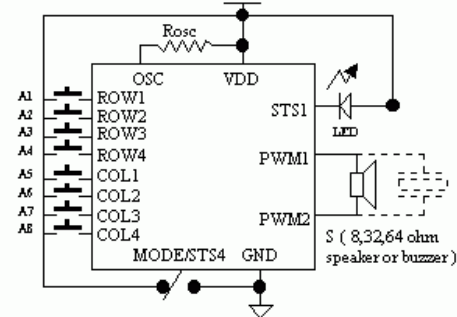
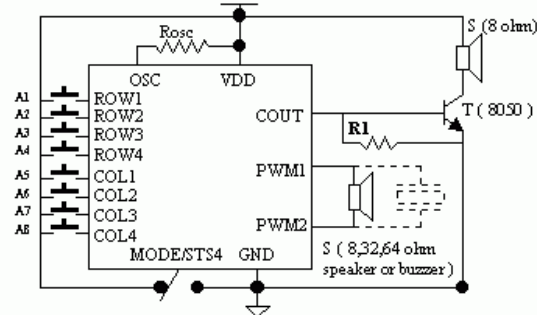
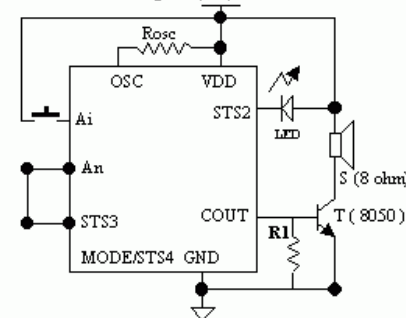
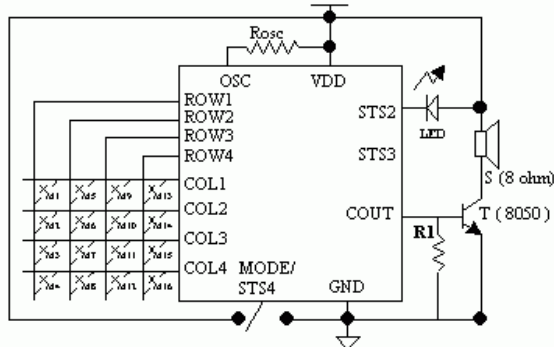
RESET/UNRESET -> RESET

The A8 input playing mode as right , EDGE/LEVEL -> EDGE ; HOLD/UNHOLD -> UNHOLD ;

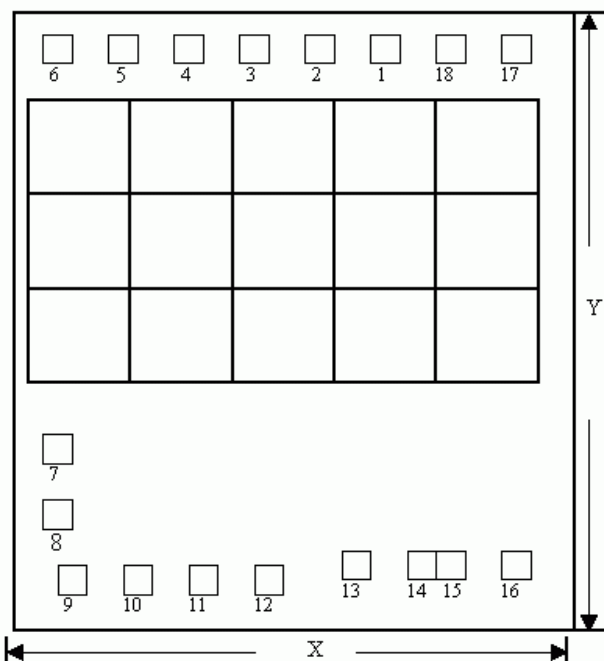
RETRIGGER/IRRETRIGGER -> RETRIGGER



All the timing are base on 64khz sample rate .

APPLICATION CIRCUIT:
A> ALONE , COUT , LED DRIVING :

B> ALONE , PWM , LED DRIVING :

C> ALONE , COUT , PWM :

D> ALONE , use stop_high pulse to trigger other TG input (An) :

E> MATRIX , COUT , LED DRIVING :


NOTE: 1>Rosc=300K ohm (typical) or use internal Rosc (it must be determined before operation)
 Tbata=100 (typical) . R1=1k needed only when wish to lower the power consumption .
 2>BUZZER:resonant frequency should around 1KHz.
 3>COUT,PWM1,PWM2 are tristate during standby.

BONDING DIAGRAM:

Chip Size:

PRODUCT	X	Y	PAD SIZE (um ²)	SUBSTRATE	UNIT
AM9CB0030	1300.0	1680.0	80 * 80	GND	um
AM9CB0038 SA1CA0035	1320.0	1700.0	80 * 80	GND	um
AM9CB0060	1300.0	1830.0	80 * 80	GND	um
AM9CB0068	1320.0	1850.0	80 * 80	GND	um
AM9CB0098 SA1CA0095	1320.0	2050.0	80 * 80	GND	um
AM9CB0128	1320.0	2210.0	80 * 80	GND	um
AM9CB0188	1320.0	2580.0	80 * 80	GND	um
AM9CB0248	1320.0	2930.0	80 * 80	GND	um
AM9CB0300	1300.0	3290.0	80 * 80	GND	um
AM9CB042D	1320.0	4030.0	80 * 80	GND	um

Pad Location:

PIN NO.	NAME	AM9CB0030 AM9CB0038 SA1CA0035		AM9CB0068 AM9CB0060		AM9CB0098 AM9CB009D SA1CA0095	
		X	Y	X	Y	X	Y
1	VDD1	190.71	688.87	190.71	766.7	190.71	865.8
2	OSC	50.38	688.87	50.38	766.7	50.38	865.8
3	COL4	-135.14	688.87	-135.14	766.7	-135.14	865.8
4	COL3	-265.79	688.87	-265.79	766.7	-265.79	865.8
5	COL2	-396.44	688.87	-396.44	766.7	-396.44	865.8
6	COL1	-527.09	688.87	-527.09	766.7	-527.09	865.8
7	ROW4	-498.81	-350.81	-498.81	-428.7	-498.81	-527.7
8	ROW3	-498.81	-471.71	-498.81	-549.6	-498.81	-648.6
9	ROW2	-498.81	-688.87	-498.81	-766.7	-498.81	-865.8
10	ROW1	-368.16	-688.87	-368.16	-766.7	-368.16	-865.8
11	OUT1	-237.51	-688.87	-237.51	-766.7	-237.51	-865.8
12	VDD	-69.19	-688.87	-69.19	-766.7	-69.19	-865.8
13	OUT2	107.45	-619.97	107.45	-697.8	107.45	-796.9
14	GND	261.11	-619.97	261.11	-697.8	261.11	-796.9
15	GND1	341.71	-619.97	341.71	-697.8	341.71	-796.9
16	OUT3	495.37	-619.97	495.37	-697.8	495.37	-796.9
17	TEST	524.1	688.87	524.1	766.7	524.1	865.8
18	MODE/STS4	393.45	688.87	393.45	766.7	393.45	865.8

PIN NO.	NAME	AM9CB0128		AM9CB0188		AM9CB0248	
		X	Y	X	Y	X	Y
1	VDD1	190.71	943.6	190.71	1130.0	190.71	1306.9
2	OSC	50.38	943.6	50.38	1130.0	50.38	1306.9
3	COL4	-135.14	943.6	-135.14	1130.0	-135.14	1306.9
4	COL3	-265.79	943.6	-265.79	1130.0	-265.79	1306.9
5	COL2	-396.44	943.6	-396.44	1130.0	-396.44	1306.9
6	COL1	-527.09	943.6	-527.09	1130.0	-527.09	1306.9
7	ROW4	-498.81	-605.5	-498.81	-791.9	-498.81	-968.8
8	ROW3	-498.81	-726.4	-498.81	-912.8	-498.81	-1089.7
9	ROW2	-498.81	-943.6	-498.81	-1130.0	-498.81	-1306.9
10	ROW1	-368.16	-943.6	-368.16	-1130.0	-368.16	-1306.9
11	OUT1	-237.51	-943.6	-237.51	-1130.0	-237.51	-1306.9
12	VDD	-69.19	-943.6	-69.19	-1130.0	-69.19	-1306.9
13	OUT2	107.45	-874.7	107.45	-1061.1	107.45	-1238.0
14	GND	261.11	-874.7	261.11	-1061.1	261.11	-1238.0
15	GND1	341.71	-874.7	341.71	-1061.1	341.71	-1238.0
16	OUT3	495.37	-874.7	495.37	-1061.1	495.37	-1238.0
17	TEST	524.1	943.6	524.1	1130.0	524.1	1306.9
18	MODE/STS4	393.45	943.6	393.45	1130.0	393.45	1306.9

PIN NO.	NAME	AM9CB0300		AM9CB042D	
		X	Y	X	Y
1	VDD1	190.71	1493.2	190.71	1856.4
2	OSC	50.38	1493.2	50.38	1856.4
3	COL4	-135.14	1493.2	-135.14	1856.4
4	COL3	-265.79	1493.2	-265.79	1856.4
5	COL2	-396.44	1493.2	-396.44	1856.4
6	COL1	-527.09	1493.2	-527.09	1856.4
7	ROW4	-498.81	-1155.1	-498.81	-1518.34
8	ROW3	-498.81	-1276.0	-498.81	-1665.24
9	ROW2	-498.81	-1493.2	-498.81	-1856.4
10	ROW1	-368.16	-1493.2	-368.16	-1856.4
11	OUT1	-237.51	-1493.2	-237.51	-1856.4
12	VDD	-69.19	-1493.2	-69.19	-1856.4
13	OUT2	107.45	-1424.3	107.45	-1787.5
14	GND	261.11	-1424.3	261.11	-1787.5
15	GND1	341.71	-1424.3	341.71	-1787.5
16	OUT3	495.37	-1424.3	495.37	-1787.5
17	TEST	524.1	1493.2	524.1	1856.4
18	MODE/STS4	393.45	1493.2	393.45	1856.4