

# **AVM1504D**

# **DATA SHEET**

## **APLUS INTEGRATED CIRCUITS INC.**

**Address:**

3 F-10, No. 32, Sec. 1, Chenggung Rd., Taipei,  
Taiwan 115, R.O.C.  
(115)台北市南港區成功路一段 32 號 3 樓之 10.

**TEL:** 886-2-2782-9266

**FAX:** 886-2-2782-9255

**WEBSITE :** <http://www.aplusinc.com.tw>

**Sales E-mail:**

[sales@plusinc.com.tw](mailto:sales@plusinc.com.tw)

**Technology E-mail:**

[service@plusinc.com.tw](mailto:service@plusinc.com.tw)

---

### 一般規格：

AVM1504D 乃一單晶片 3 頻道的音色合成器。(1 個語音頻道單獨放音；或 2 個音樂頻道放音；或 2 個音樂頻道及 1 個語音頻道聯合放音) 此晶片有 504 個指令格，且以 LOGPCM 編碼方式，合成長達 1.5 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 ~ 6 伏特。
2. 聲音輸出組合如下：
  - A> 純語音：所有 D/A 的電流輸出全被語音使用。
  - B> 三個頻道隨意組合放音時：每個音樂頻道各佔四分之一 D/A 的電流輸出，語音頻道佔二分之一 D/A 的電流輸出。
3. 語音總長度可達 1.5 秒，且可被分割成 4 個語音段(voice\_section)。
4. 其中每一語音段的長度 (語音 + 靜音) 最多可達 2.7 秒 (在 6KHz 取樣頻率下)。
5. 一個具有 504 個指令格的 ROM，在順序觸發模式下可被分割為 4 個指令組。在合成過程中，節奏、音調、播放速度、拍差、語音段、STS 開關狀態，都可在曲子的任何位置編輯修改。

音樂音調：--3 到 ++5 包括半音。共有 53 個音符。

語音音調：-6# 到 +4 包括半音。共有 20 個音符。

語音播放速度：5.35 到 16 KHz。共有 20 種播放速度。

播放速度：5.35 5.66 6.00 6.36 6.73 7.14 7.56 8.01 8.49 9.08 9.53 10.10 10.70 11.33 12.00 12.72 13.47 14.28 15.27 16.0  
語音播放音調：-6# 7 1 1# 2 2# 3 4 4# 5 5# 6 6# 7 +1 +1# +2 +2# +3 +4

音樂節奏：82 88 95 103 112 123 137 154 176 205 246 拍/分鐘  
共有 11 種不同的節奏

拍差：1/8 1/4 3/8 1/2 5/8 3/4 1 1-1/4 1-1/2 2 2-1/2 3 3-1/2 4 0 拍  
共有 15 種不同的拍差

6. 只有一個輸入腳 TG1 且處於順序觸發方式。

◎防止誤動作 (DEBOUNCE) 時間：

長時間：4.2 ms 到 12 ms

短時間：20 us 到 59 us

註：若在停止狀態時觸發依據播放速度 7.64 KHz，若在播放過程中觸發依據播放速度 (5.3 KHz 到 16 KHz)

註：TG1 可規劃成下列選項：

<input type="checkbox"/> 邊緣觸發 / <input type="checkbox"/> 位準觸發	(EDGE/LEVEL)
<input type="checkbox"/> 保持 / <input type="checkbox"/> 非保持	(HOLD/UNHOLD)
<input type="checkbox"/> 後段蓋前段 / <input type="checkbox"/> 非後段蓋前段	(RETRIGGER/IRRETRIGGER).

7. 一個狀態輸出接腳 STS1 具有下列光罩選擇：

STS1 輸出的選擇

- a) 停止播放時送出高位準脈衝。
- b) 停止播放時送出低位準脈衝。
- c) 播放時送出高位準訊號。
- d) 播放時送出低位準訊號。
- e) LED 6HZ。
- f) LED 3HZ。
- g) 聲音動態 2/4位準訊號。
- h) 第1音樂頻道音符最初1/4拍或1/8拍閃爍。  
純語音時，聲音動態 2/4位準訊號。
- i) 第2音樂頻道音符最初1/4拍或1/8拍閃爍。  
純語音時，聲音動態 2/4位準訊號。
- j) 第1, 2音樂頻道音符最初1/4拍或1/8拍閃爍。  
純語音時，聲音動態 2/4位準訊號。

※Dynamic 的意思是 LED 會隨著聲音的振幅大小閃爍。

※每個指令組中，STS1 可被編輯為致能或非致能。

※停止播放脈衝的寬度為：15ms--45ms (播放速度為 6KHz 時寬度為 40ms)

備註：LED 3Hz 和 6Hz 會依據播放速度 (5.3KHz 到 16KHz) 而有所不同。實際播放完畢輸出脈衝的寬度根據最後的播放速度而定。

8. 具有播放完畢輸出脈衝內部回授至輸入腳的光罩選項。

9. 貪睡功能描述：

- 1. 貪睡功能的使用需要用到 2 個指令組：
  - 第一個指令組用來儲存設定時間到達時的鬧鈴音樂聲。
  - 第二個指令組用來儲存貪睡時間。
- 2. 詳細方式請見時序圖6。

**GENERAL DESCRIPTION :**

The AVM1504D is single-chip 3 channels timbre generator that can synthesize (2 ch. melody and/or 1 ch. voice). It is designed by instruction-based synthesizing method. Total has 504 instruction steps. Total voice is up to 1.5 seconds using APLUS qualified coding algorithm(LOGPCM). Customer speech data will be edited and programmed into ROM by changing one mask during the device fabrication.

**FEATURES :**

**1. Single power supply can operate from 2.4V through 6V.**

**2. With following audio output combination.**

A> voice only: all D/A are occupied by voice(VOICE MODE).

B> All 3 channel could play out with arbitrary combination; each melody channel occupy 1/4 of D/A, voice channel occupy 1/2 of D/A (SYMPHONY MODE)

**3. The total voice duration is about 1.5 seconds could be partitioned up to 4 voice sections.**

**4. Voice+mute length could up to 2.7 seconds (6k sampling rate) for each voice section.**

**5. One 504 instruction steps table, could be partitioned up to 4 sub\_tables in SEQUENTIAL mode.**

With programmable instructions, Tempo, pitch, playback speed, rhythm, voice section, even STS ON/OFF can be programmable changed anywhere during synthesizing.

Melody pitch: --3 to ++5 & rest node, include half node. Total has 53 tones.

Voice melody playback pitch: -6# to +4, include half node. Total has 20 tones.

Voice playback speed: 5.35 to 16k Hz. Total has 20 playback speeds.

Voice playback speed (Hz): 5.35 5.66 6.00 6.36 6.73 7.14 7.56 8.01 8.49 9.08 9.53 10.10 10.70 11.33 12.00 12.72 13.47 14.28 15.27 16.0

Voice playback pitch: -6# -7 1 1# 2 2# 3 4 4# 5 5# 6 6# 7 +1 +1# +2 +2# +3 +4

Melody Tempo: 82 88 95 103 112 123 137 154 176 205 246 beats/minute

Total has 11 different tempo.

Rhythm difference: 1/8 1/4 3/8 1/2 5/8 3/4 1 1-1/4 1-1/2 2 2-1/2 3 3-1/2 4 0 beat

Total has 15 different rhythm

**6. Only one trigger TG1 is used as SEQUENTIAL mode with resistive type Schmitt input (270K--1M) for CDS interface.**

SEQUENTIAL: if the input was triggered sequentially, the device will response by one sub\_table of voice step sequentially and cyclically, from sub\_table 1 to user defined sub\_table n (n=1 to 4).

Debounce time: depend on current playback speed (5.3Hz to 16Hz), or trigger during standby.

the dependent speed is 7.6k.

long --- 4.2 ms to 12.5 ms

short --- 150 us to 430 us

In this mode, TG1 could be assigned as different trigger type with following options:

EDGE/LEVEL, HOLD/UNHOLD, RETRIGGER/IRRETRIGGER.

Because only 1 trigger, it has NO option RESET/UNRESET. So playing sequence will always be sub\_table 1 to sub\_table n and then feedback to sub\_table 1 cyclically.

**7. Only one status output (STS1) has following mask options:**

**STS1:**

a>stop high\_pulse

b>stop low\_pulse

c>busy high\_active

d>busy low\_active

e>led 6Hz

f>led 3Hz

g>voice dynamic 2/4

h>melody ch1 on at first 1/4 or 1/8 beat, when pure voice, voice dynamic 2/4

i>melody ch2 on at first 1/4 or 1/8 beat, when pure voice, voice dynamic 2/4

j>both melody ch1 & ch2 on at first 1/4 or 1/8 beat, when pure voice, voice dynamic 2/4

Dynamic means LED will flash depending on voice signal.

For each sub-table, the STS1 could be programmed within sub\_table as active or inactive.

The pulse width of stop pulse: 15ms--45ms (40ms at playback speed 6KHz).

NOTE: the 3Hz and 6Hz depend on the ratio of current playback speed (5.3Hz to 16KHz).  
the stop pulse width depends on the ratio of final playback speed.

### 8. The internal stop pulse feedback mask options are offered.

### 9. Snooze Function description:

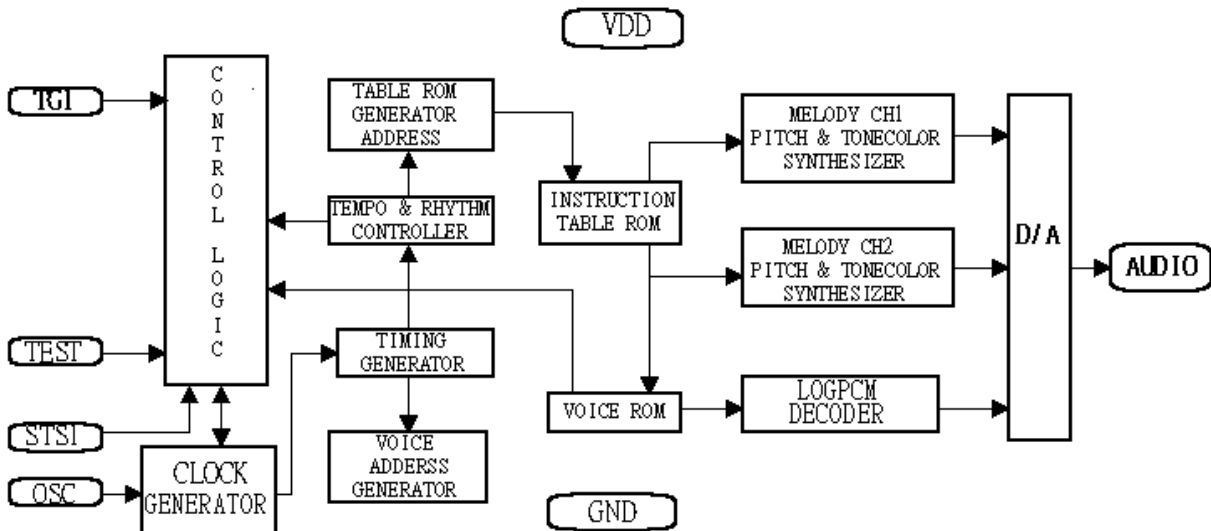
1. Snooze Function use 2 sub\_tables:

1st stores Ringing voice or melody (alarm sound), playing when time's up.

2nd stores [greeting sound +] snooze time.

2. Please refer to timing diagram 6.

### BLOCK DIAGRAM:



### PAD DESCRIPTION:

Pad Name	Pad No.	ATTR.	Function
Vdd	1	Power	Positive power supply.
OSC	2	I	Oscillator input (300K ohm connect to Vdd).
TEST	3	I	Test pad for production testing.
TG1	4	I	Trigger input, internal pull low (high active).
AUDIO	5	O	Current output for driving speaker.
STS1	6	O	Status output for Busy, LED or Stop pulse.
GND	7	Power	Negative power supply.

**ABSOLUTE MAXIMUM RATING:**

Symbol	Rating	Unit
Vdd~Vss	-0.5 ~ +7.0	V
Vin	Vss-0.3 < Vin < Vdd+0.3	V
Vout	GND < Vout < Vdd	V
Top (operating)	0 ~ +70	°C
Tst (storage)	-25 ~ +85	°C

**DC CHARACTERISTICS:**

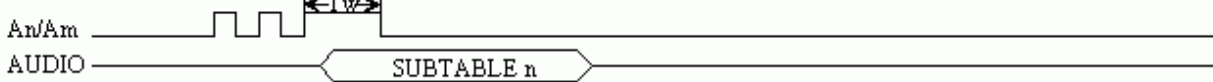
Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
Vdd	Operating voltage	2.4	3	6	V	
Isb	Supply current			0.1	uA	Vdd=3V, I/O open (with Rosc)
Iop				200		
Iih	TG1 input current in Sequential mode			5	uA	Vdd=3V
Iil			0			
Iaudio	Current output (AUDIO) (full scale)	-3.2	-4.0	-6.0	mA	Vdd=3V, Vop=0.7V current level=8
Ioh	STS1 output current		-0.7		mA	Vdd=3V, Vop=0V
Iol			10			Vdd=3V, Vop=3V
dF/F	Frequency stability	-5		5	%	$\frac{Fosc(3v)-Fosc(2.4v)}{Fosc(3v)}$
dF/F	Fosc lot variation	-10		10	%	Vdd=3V, Rosc=300K

### TIMING DIAGRAM:

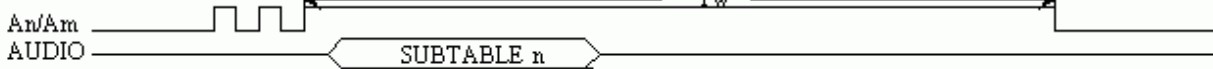
#### 1.>EDGE/LEVEL

##### EDGE MODE:

EDGE TRIGGER:

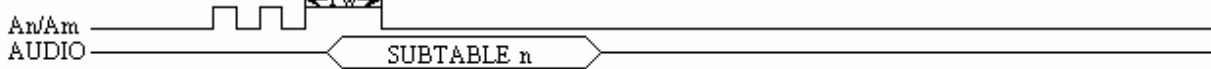


LEVEL TRIGGER:



##### LEVEL MODE:

EDGE TRIGGER:



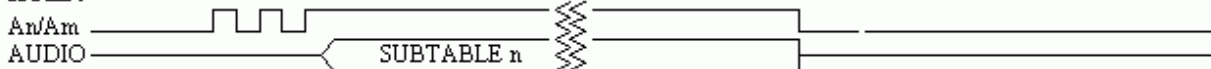
LEVEL TRIGGER:



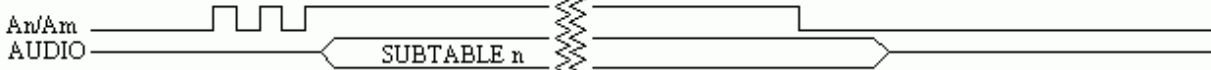
\* NOTE: Tw IS THE MINIMUM INPUT PULSE WIDTH - DEBOUNCE TIME (10 ms or 50 μs)

#### 2.>HOLD/UNHOLD

##### HOLD:



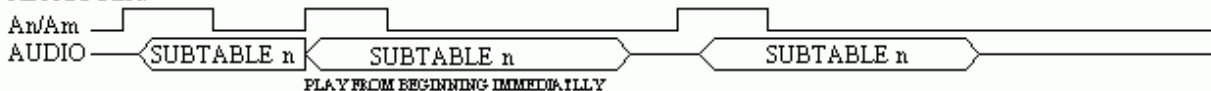
##### UNHOLD:



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

#### 3.>RETRIGGERABLE/IRRETRIGGERABLE

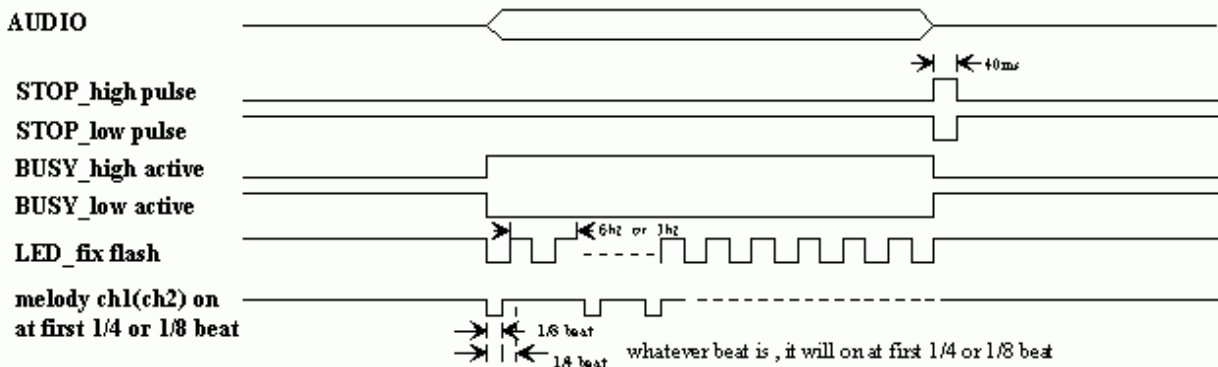
##### RETRIGGER:



##### IRRETRIGGER:



#### 4.>STATUS OUTPUT(STS1)



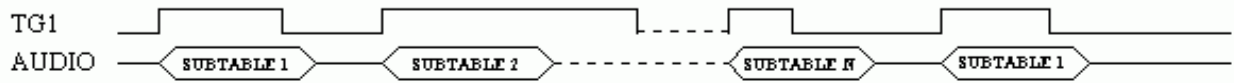
DYNAMIC: Partition the voice amplitude 8 steps ( 0 1 2 3 4 5 6 7 )

24 0 1 6 7 LED on.

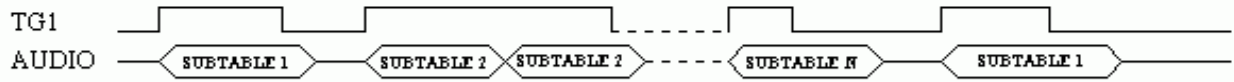
LED on means status output low.

### 5.>SEQUENTIAL

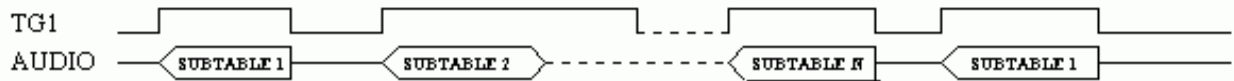
EDGE-UNHOLD



LEVEL-UNHOLD



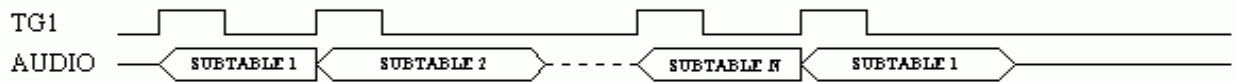
EDGE-HOLD



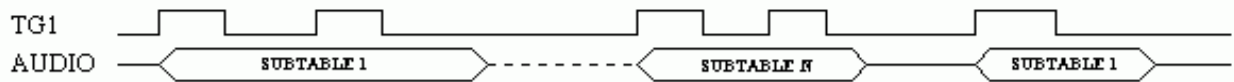
LEVEL-HOLD



RETRIGGER

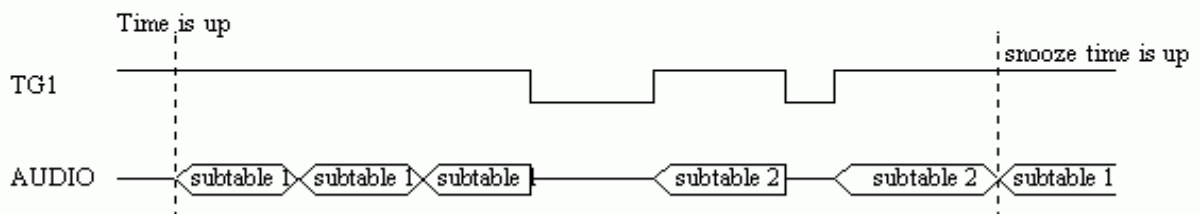


IRRETRIGGER



### 6.>SNOOZE FUNCTION :

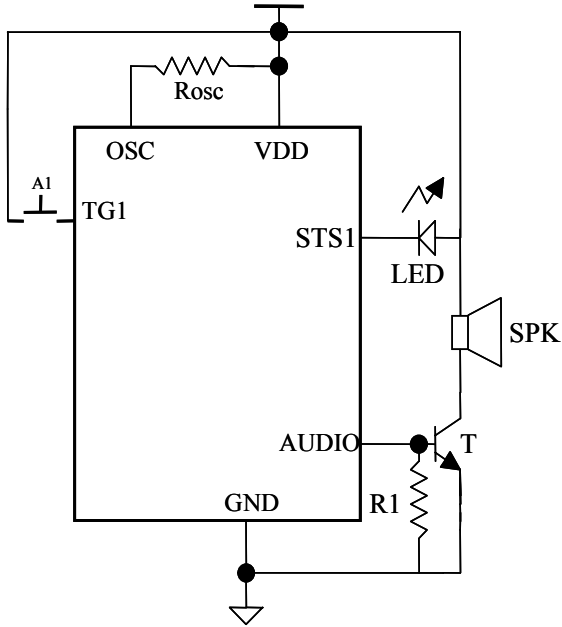
for application of snooze function, use subtable 1-2.



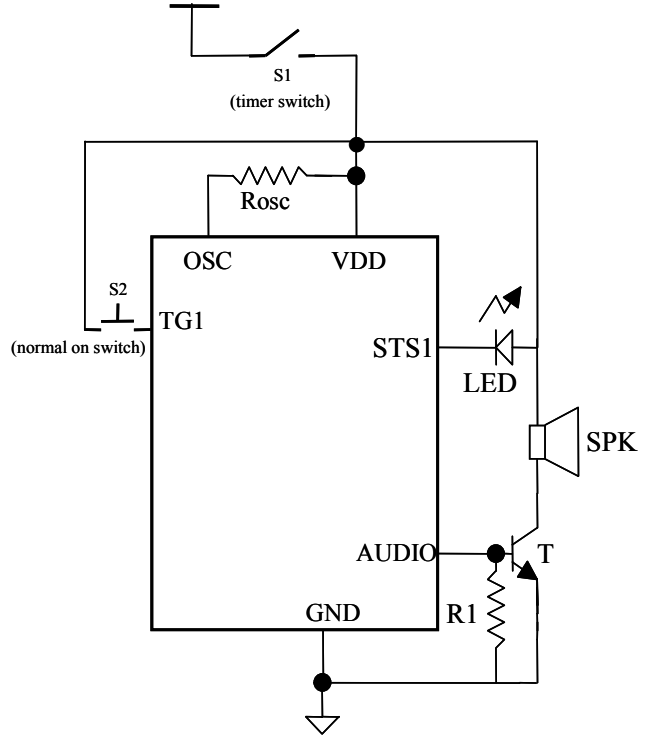


## APPLICATION CIRCUIT:

A> SEQUENTIAL, LED DRIVING.



B> SNOOZE FUNCTION, POWER-ON TYPE



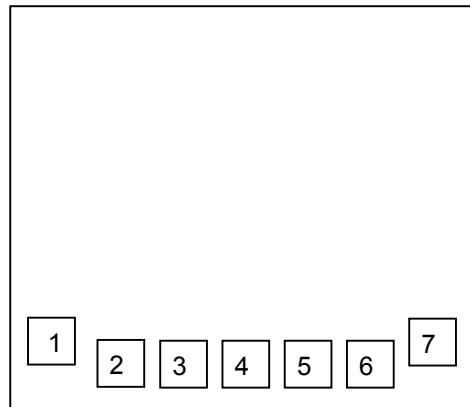
NOTE :  $R_{osc}=300K\ \text{ohm}$  ,  $T=\beta\ 100$  TRANSISTOR ,  $R1=1K$  NEED ( ONLY WHEN WISH TO LOWER THE POWER CONSUMPTION).  
 SPK=8 ohm SPEAKER ( ALL ARE TYPICAL ).

## BONDING DIAGRAM:

AVM1504D			
Pad No.	Name	X	Y
1	Vdd	-751.0	-686.75
2	OSC	-516.9	-695.55
3	TEST	-309.9	-695.55
4	TG1	-102.9	-695.55
5	AUDIO	324.5	-695.55
6	STS1	531.5	-695.55
7	GND	758.9	-686.75

Substrate must be connected to GND.

Chip Size: 1070um x 1060um  
 Pad Size: 80um x 80um



NOTE: All data and specifications are subject to change without notice.