Alpha Microelectronics Corp.

AM9BE SERIES
DATA SHEET

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Revision History

Rev	Date	Description	Page
1.20	2019/2/15	1) Modify Chapter 10: (1) Add external oscillator description. 2) Modify Chapter 10: (2) Revise using external to internal oscillator.	27 27
1.10	2014/1/29	1) Modify Chapter 2: Add a note of using built-in variable frequency oscillator. 2) Modify Chapter 7: Add Fosc description to the DC Characteristics table.	-
1.01	2009/3/26	1) Modify operating range. 2) Modify Chapter 2: Features. 3) Modify pad description. 4) Modify absolute maximum rating. 5) Modify Chapter 7: DC Characteristics. 6) Modify motor recovery function.	-
1.00	2008/6/10	New release.	-

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1. 一般規格

AM9BE004A、AM9BE008A、AM9BE012A、AM9BE016A、AM9BE024A、AM9BE032A、AM9BE040A 、AM9BE048A、AM9BE056A、AM9BE064A、AM9BE072A、AM9BE080A、AM9BE088A、AM9BE096A 、AM9BE0104A、AM9BE0112A 皆爲單晶片 CMOS 語音合成 IC，他們都是非常低成本且高實用性的語音 IC 產品。本系列使用 ADPCM 編碼方式，可合成長達 4、8、12、16、24、32、40、48、56、64、72、80、88、96、104、112 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至 ROM。此外，使用者最多可有 4 個很彈性的 PowerIO 腳位選擇(IO1、IO2、IO3、OKY2 / O4)，以配合不同之應用，並可使用佑華所提供的 EzSpeech 工具軟體來進行開發。

2. 特性

(1) 單一工作電壓範圍爲 2.2 ~ 5.5 伏特(在此範圍內，可採用單一 Rosc 電阻值)。

(2) 語音總長度可達 4、8、12、16、24、32、40、48、56、64、72、80、88、96、104、112 秒，且最多可被分割成 256 個語音段(voice_section)，每段長度可不同。

(3) 每一段語音的長度分別最多可達 4、8、12、16、24、32、40、48、56、64、72、80、88、96、104、112 秒。在 6 KHz 取樣頻率下，每一段靜音時間的長度最多可達 131 秒，且每一段語音可編入 4 組 Sync 訊號給 IO1、IO2、IO3、OKY2 / O4 使用，可由 PowerIO 編輯器編輯 Sync 訊號。

(4) 共有 256 個語音格(voice_step)，可規劃成 32 對語音組(sub_table)，每對語音組是由一個起始語音組(Start sub_table)和一個循環語音組(Loop sub_table)所組成，每個語音組可放的語音格並沒有限制(但最多只有 256 個語音格)。每一語音格可指定一個語音段和播放速度，並搭配 IO1、IO2、IO3、OKY2 / O4 的輸出致能或非致能(IO1、IO2、IO3、OKY2 / O4 當作輸出時)。此外，在每一個語音格中還可以設定 Retrigger / Irretrigger 轉換(Invert 功能)，和進行語音組跳躍(Jumping / Looping 功能)。

(5) 在語音組的最後一個語音格中可設定**語音組跳躍功能**(Jumping)，可將現在的語音組(Start sub_table，例如 S1)播完後，接著播放指定的語音組(Loop sub_table，例如 L1)，並可進一步設定這個指定的語音組 L1 是否要無限循環的播放(Looping)。

(6) 特殊功能選項 **KeyReleaseJump** (按鍵放開後立即跳躍功能)，可以配合 Jumping 設定來使用，當按鍵一放開，則正在播放的起始語音組 S1 會立刻停止，並跳到對應的循環語音組 L1，而使用者可以配合 Looping 設定是否要將 L1 做無限循環的播放。

(7) 內建變頻振盪器，使用者可在 4 KHz ~ 10 KHz (+/- 3%誤差)與 10.01 KHz ~ 14 KHz (+/- 5%誤差)中選擇任意播放速度。

注意：當選擇的播放頻率不爲 OSC Trim 頻率(4 KHz ~ 10 KHz)時，無法保證頻率誤差在+/- 3%內；當選擇的播放頻率不爲 OSC Trim 頻率(10.01 KHz ~ 14 KHz)時，則無法保證頻率誤差在+/- 5%內。

(8) IO1、IO2、IO3、OKY2 / O4 可選擇作爲輸入腳或輸出腳 (光罩選擇)。

(9) 可選擇「電源啓動(PowerOnPlay)觸發輸入 + 多按鍵觸發輸入」模式(OKY 當輸入，IO1、IO2、IO3、OKY2 / O4 當作輸入或輸出)。

a) 每一種輸入可選擇不同觸發方式(光罩選擇)：

邊緣觸發 / 位準觸發(Edge / Level)；保持 / 非保持(Hold / Unhold)；可重新觸發 / 不可重新觸發(Retrigger / Irretrigger)。

注意：PowerOnPlay 觸發輸入模式只能固定爲 Edge / Unhold / Retrigger。

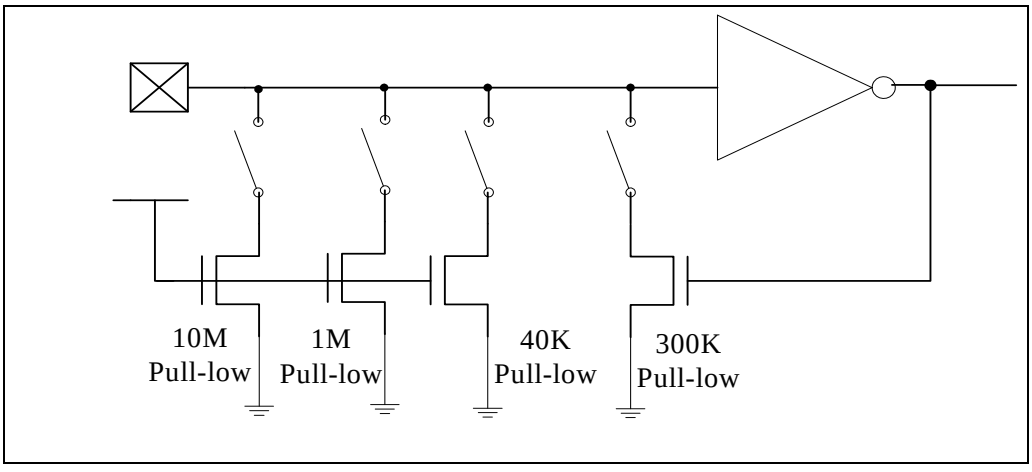
b) OKY 輸入最多有 64 個 sub_table 的 One-Key Sequential 或 Random 的選擇，而 OKY2 輸入最多有 28 個 sub_table 的 One-Key Sequential 的選擇。在 One-Key Sequential 時可選擇 sub-table 的順序是否要 Reset(當其他按鍵被觸發後)。

c) OKY 輸入可選擇是否有 Toggle On / Off 的功能。

d) OKY 輸入可選擇 40K、300K、300K+1M、1M pull-low 或 floating 的輸入方式。IO1 輸入可選擇 300K+1M、300K、1M pull-low 或 floating 的輸入方式。IO2 輸入可選擇 300K+1M、300K、1M pull-low 或 floating 的輸入方式。IO3 輸入可選擇 10M+1M、10M、1M pull-low 或 floating 的輸入方式。 OKY2 / O4 輸入可選擇 300K+1M、300K、1M pull-low 或 floating 的輸入方式。

輸入方式選項：

選 項	功 能 描 述
40K	IC 內部爲 40K 的下拉電阻，給一些按鍵阻抗較小，系統雜訊較大的應用使用。
300K + 1M	一般選項，大多用在按鍵觸發。當按鍵按下時，IC 內部爲 1M 的下拉電阻；而當按鍵放開時，IC 內部爲 1M+300K (並聯)的下拉電阻。
300K	IC 內部爲 300K 的下拉電阻，通常與光敏電阻一起使用。
1M	IC 內部爲 1M 的下拉電阻，保留給一些特殊應用使用。
10M	IC 內部爲 10M 的下拉電阻，通常使用在觸控的應用。
Floating	IC 內部無下拉電阻，通常連接到其他輸出腳來做控制使用；如果沒連接其他輸出腳，一定要將此腳位外拉電阻到地。



e) 每一種輸入可選擇不同按鍵反應時間(Debounce Time)：
   - Long：提供一般手動操作。
   - Short：提供跳動開關使用。

f) 優先順序：OKY > IO1 > IO2 > IO3 > OKY2 / O4。

(10) IO1、IO2、IO3、OKY2 / O4 可選擇以下兩種輸出方式或選擇大電流：

a) LED dynamic 2/4：播放時 LED 動態 2/4 位準訊號。

b) PowerIO 輸出：可隨聲音作任意的輸出變化並可設定初始值(需開啓 PowerIO 編輯器編輯 Sync 訊號)。

(11) PWM1、PWM2 可直接驅動 Buzzer 或 8、16、32、64Ω Speaker。

(12) 每一語音段中的語音或靜音長度爲 10HEX 的整數倍。

(13) 選擇頻率振盪器：

a) 選擇外部電阻可調式頻率振盪器：將 OSC 外接電阻到正電源。

b) 選擇內建頻率振盪器：將 OSC 接地。

(14) 馬達重設功能：

在 EzSpeech 中可選擇打開馬達重設的功能，並在 subtable 頁面選擇在哪一個 step 上打開接受 IO3 重設偵測，並在 IO3 執行想做的功能。

(15) 低電壓重設功能(LVR)：當電壓瞬間過低時，IC 會自動 RESET。

1. General Description

AM9BE004A, AM9BE008A, AM9BE012A, AM9BE016A, AM9BE024A, AM9BE032A, AM9BE040A, AM9BE048A, AM9BE056A, AM9BE064A, AM9BE072A, AM9BE080A, AM9BE088A, AM9BE096A, AM9BE0104A and AM9BE0112A are single-chip voice synthesizing CMOS ICs. They come with low-cost and high-applicable features and are capable of synthesizing voice up to 4, 8, 12, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104, 112 seconds using Alpha ADPCM algorithm. Customer's speech data can be programmed into ROM by changing one mask during the device fabrication. Besides, not only the very flexible and functional PowerIO pins (IO1, IO2, IO3, OKY2 / O4) are available for user to apply in various applications, but also an interactive development tool *EzSpeech* is ready for a user-friendly programming environment.

2. Features

(1) Single power supply can operate from 2.2 V to 5.5 V (Within this range, you can set Rosc as a fixed value).

(2) The total voice duration is about 4, 8, 12, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104 and 112 seconds that can be partitioned up to 256 voice_sections. The length of each voice_section is flexible.

(3) For each voice_section, the voice duration can be individually up to 4, 8, 12, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104 and 112 seconds. At 6-KHz sample rate, the mute length can be individually up to 131 seconds. SYNC signals can be edited into each voice using PowerIO editor (4 Syncs for IO1, IO2, IO3, OKY2 / O4).

(4) There are a total of 256 voice_steps that can be divided into 32 sub_tables. Each sub_table consists of one Start sub_table and one Loop sub_table. The number of voice_step for each sub_table is flexible, but the maximum is 256. Each voice_step can be specified with one voice_section, playback speed and IO1, IO2, IO3, OKY2 / O4 output enable options when IO1, IO2, IO3, OKY2 / O4 are set as output. Besides, in voice_step there are also other selections such as the Retrigger / Irretrigger Invert and Jumping / Looping function.

(5) In the last voice_step of sub_table, **Jumping** function is available, in which you can specify another Loop sub_table (e.g. L1) next to the current sub_table of Start sub_table (e.g. S1) to playback subsequently. Moreover, you can specify whether L1 sub_table is played in loop or not, i.e. performing Looping function.

(6) Use the special function **KeyReleaseJump** with Jumping setup to stop the currently playing Start sub_table S1 and immediately play the associated Loop sub_table L1 when key is released. You can also set Looping in L1 to play L1 in loop.

(7) Built-in variable frequency oscillator. You can choose any playback frequency within 4 KHz ~ 10 KHz (with +/- 3% deviation) or 10.01 KHz ~ 14 KHz (with +/- 5% deviation).

Note: If the playback frequency is not set as OSC Trim frequency (within 4 KHz ~ 10 KHz), the +/- 3% deviation is not guaranteed. Likewise, if not set within 10.01 KHz ~ 14 KHz, the +/- 5% deviation is not guaranteed.

(8) IO1, IO2, IO3 and OKY2 / O4 can be either input or output pin (Mask option).

(9) Selectable "PowerOnPlay + Multiple-Trigger Input" mode (OKY is input and IO1, IO2, IO3, OKY2 / O4 are input or output)

a) Each input pin has mask options for the trigger modes of Edge/Level, Hold/Unhold and Retrigger/Irritrigger.

Note: For PowerOnPlay, only Edge / Unhold / Retrigger trigger modes are available.

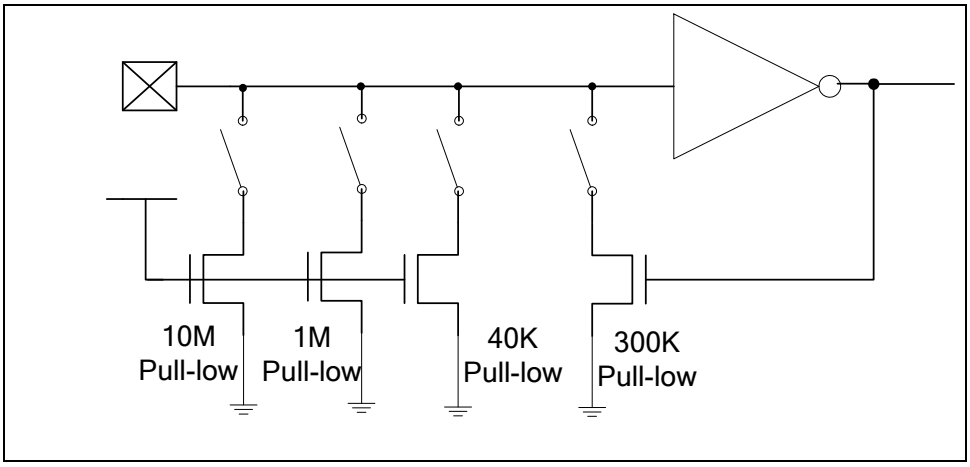
b) OKY input can choose One-Key Sequential or Random for maximum 64 sub_tables. OKY2 input can choose One-Key Sequential for maximum 32 sub_tables. For One-Key Sequential, you can set the sub_table sequence to be reset when other keys are triggered.

c) OKY input can be set to enable Toggle On / Off function.

d) OKY input can choose 40K, 300K, 300K+1M, 1M pull-low or floating input type. IO1 input can choose 300K+1M, 300K, 1M pull-low or floating input type. IO2 input can choose 300K+1M, 300K, 1M pull-low or floating input type. IO3 input can choose 10M+1M, 10M, 1M pull-low or floating input type. OKY2 / O4 input can choose 300K+1M, 300K, 1M pull-low or floating input type.

Input Types:

Option	Description
40K	Internal pull-low resistor of 40K ohms, usually for large noise applications.
300K + 1M	Normal selection for key trigger. 1M ohms pull-low resistor when key is pressed while 1M+300K ohms (parallel) pull-low resistor when key is released.
300K	Internal 300K ohms pull-low resistor, usually used with a photoresistor.
1M	Internal 1M ohms pull-low resistor, reserved for some special applications.
10M	Internal 10M ohms weak pull-low resistor, usually for touching trigger.
Floating	No internal resistor connection, usually connected to other output pin or connected to GND via an external resistor.



e) Two selectable Debounce Time for each input pin:
   - Long Debounce for push buttons.
   - Short Debounce for fast switches.

f) Input pin priority：OKY > IO1 > IO2 > IO3 > OKY2 / O4.

(10) IO1, IO2, IO3, OKY2 / O4 can be set as one of the following output types or set with large current.

a) LED dynamic 2/4: Dynamic sink signal output for driving LED during playing.

b) PowerIO output: Arbitrary output with voice, user can edit the Sync signal using PowerIO editor.

(11) PWM1 and PWM2 can directly drive buzzer as well as 8, 16, 32 or 64 ohms speaker.

(12) The voice or mute duration in each voice_section must be the multiple of 10HEX.

(13) Oscillator selection:

a) External oscillator: Connect OSC pin to Vdd with an external resistor, Rosc.

b) Internal oscillator: Connect OSC pin to GND.

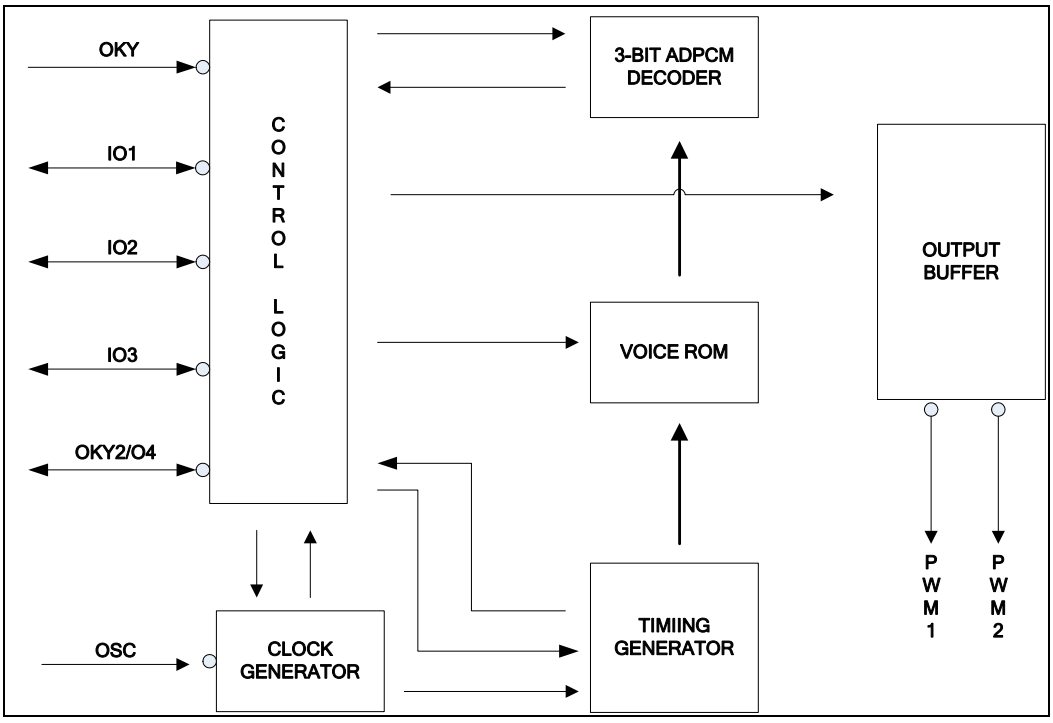
(14) Motor Recovery Function:

In EzSpeech, user can enable the motor recovery function and in the subtable page choose which step to accept IO3 motor recovery detection.

(15) Low Voltage Reset (LVR):

When the voltage is too low, IC will reset by itself.

3. Block Diagram



4. Pad Description

Pad Name	Pad No.	ATTR.	Function
PWM1, 2	1, 3	O	Audio output.
VDD	2, 11	Power	Positive power supply.
GND	4, 12	Power	Negative power supply.
OKY	5	I	Input for trigger.
IO1, 2, 3, 4	6, 7, 8, 9	I/O	Status output or input for trigger.
OSC	10	I	Oscillator input. For using internal oscillator, connect OSC to GND.

5. Code Development and Demo System

User can use *EzSpeech* software tool to develop the desired functions. For details, please see *EzSpeech* User Manual. After finishing the code programming, two files of **.eva** and **.htm**, one binary file and a function check list will be generated. User can download the **.eva** file into AM9BA_DB demo board to demonstrate the AM9BE function. The related mapping of AM9BA_DB is given as follows:

	AM9BE	AM9BA_DB	AM9BA_DB Description
I/O Pin	OKY	OKY	The same.
	IO1	IO1	The same.
	IO2	IO2	The same.
	IO3	IO3	The same.
	IO4	IO4	The same.
	PWM1, PWM2	PWM1, PWM2	PWM output to directly drive speakers.
	OSC	Rosc	Rosc is connected with 160K ohms resistor at 6 KHz.

Once the function has been approved, user only need to send the **.eva** file to Alpha for code tape-out.

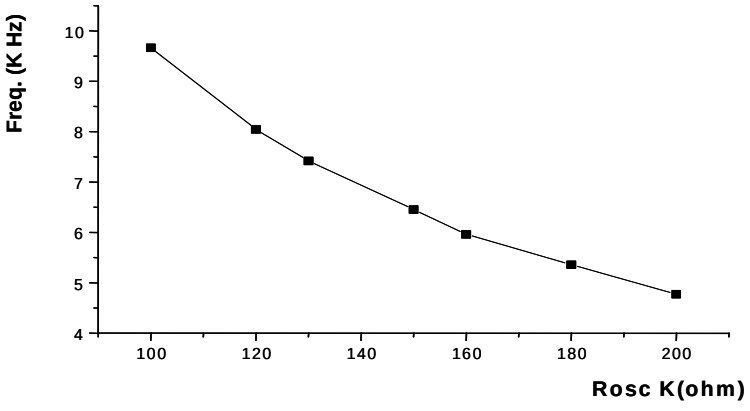
6. Absolute Maximum Rating

Symbol	Rating	Unit
Vdd ~ Vss	-0.5 ~ +6.0	V
Vin	Vss-0.3 < Vin < Vdd+0.3	V
Vout	GND < Vout < Vdd	V
Top (operating)	0 ~ +70	ºC
Tst (storage)	-25 ~ +85	ºC

7. DC Characteristics

Symbol	Parameter		Min.	Typ.	Max.	Unit	Condition
Vdd	Operating voltage		2.2	3.0	5.5	V	
F_{osc}	Operating frequency		1024	1536	3584	KHz	Play Speed: 4 KHz ~ 14 KHz
Isb	Supply current	Standby			1	uA	Vdd = 3 V, I/O open (with Rosc or OSC grounded)
Iop		Operating		150	200		
Iih	Input current: OKY (40K pull low)				100	uA	Vdd = 3 V
Iil				0			
Iih	Input current: OKY, IO1 (1M pull low)				3	uA	Vdd = 3 V
Iil				0			
Iih	Input current: OKY (10M pull low)				0.3	uA	Vdd = 3 V
Iil				0			
Iih	Input current: OKY, IO1 (CDS)				10	uA	Vdd = 3 V
Iil				0			
Ioh	PWM1, PWM2 output current			-30		mA	Vdd = 3 V, Vop = 2.4 V
Iol				30			Vdd = 3 V, Vop = 0.6 V
Ioh	IO1/IO2/IO3/IO4 output current (normal)			-1.55		mA	Vdd = 3 V, Vop = 2.6 V
				-4.5			Vdd = 4.5 V, Vop = 3.7 V
Iol				3.6			Vdd = 3 V, Vop = 0.4 V
				8			Vdd = 4.5 V, Vop = 0.8 V
Iol	IO1/IO2 /IO3/IO4 output current (large)			8.81			Vdd = 3 V, Vop = 0.4 V
				22			Vdd = 4.5 V, Vop = 0.8 V
dF/F	Frequency stability		-5		5	%	$\frac{Fosc(3\ V)-Fosc(2.4\ V)}{Fosc(3\ V)}$
dF/F	Fosc lot variation		-10		10	%	Vdd = 3 V, Rosc = 160KΩ

8. Frequency and External Rosc

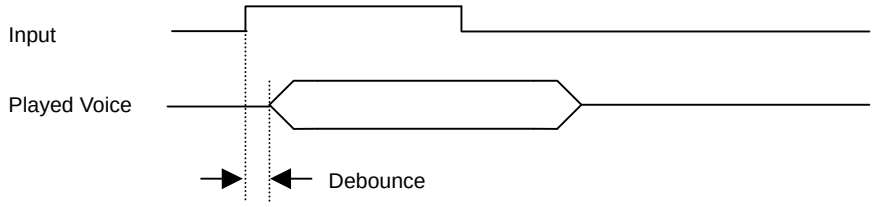


* The data are measured with internal option of 6 KHz playback speed.

9. Timing Diagram

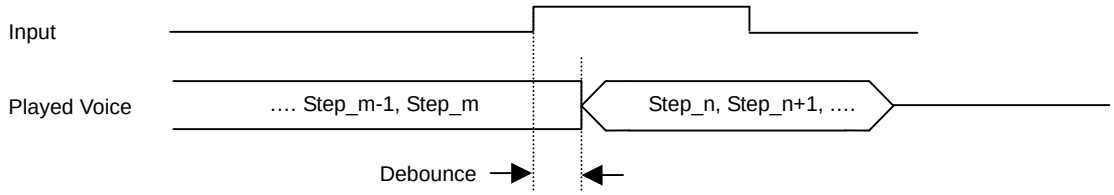
1) Debounce Time

(a) Trigger while no playing voice



※ Debounce Time is configured by 6 KHz S.R., and the value is fixed. That is, Slow Debounce = 20 ms, Fast Debounce < 50 us.

(b) Trigger while playing voice

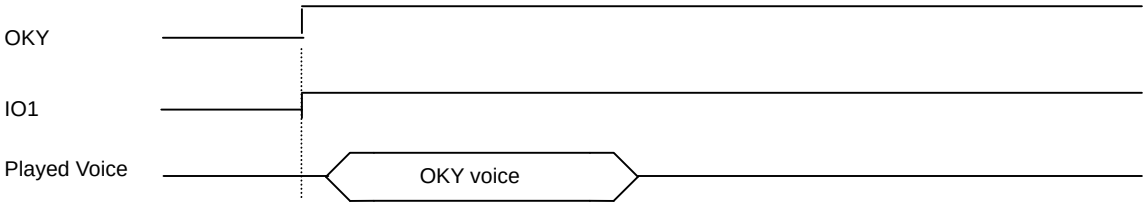


※ Debounce Time is configured by the S.R. of Step_m.

For example, if Step_m S.R.=8 KHz, Slow Debounce = 20 * (6k / 8k) ms = 15 ms; Fast debounce < 50 * (6k / 8k) us = 37.5 us.

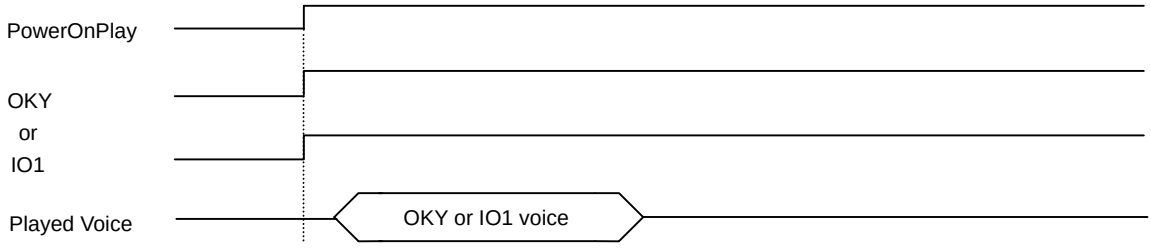
2) Input Priority

(a) Without PowerOnPlay



※ Priority: OKY > IO1 > IO2 > IO3 > OKY2/O4

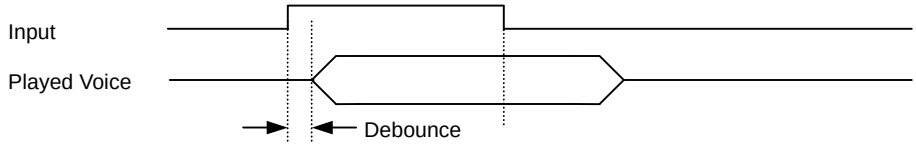
(b) With PowerOnPlay



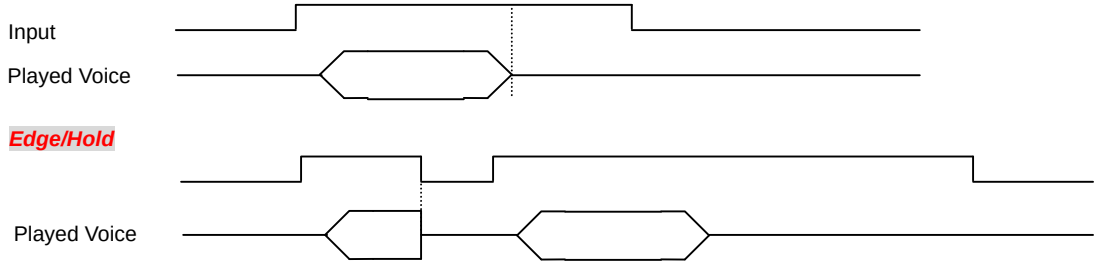
※ Priority: OKY > IO1 > IO2 > IO3 > OKY2/O4 > PowerOnPlay

3) General Timing Diagram

(a) Edge Mode, Edge Triggering

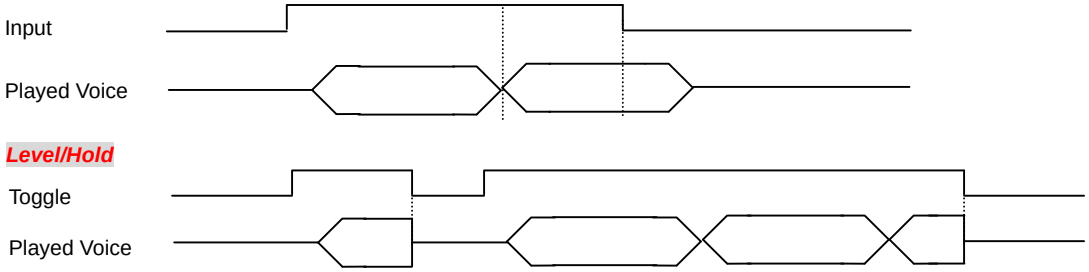


(b) Edge Mode, Level Triggering

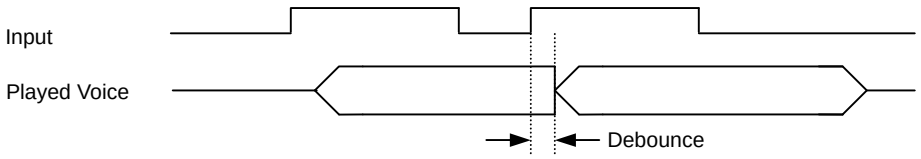


(c) Level Mode, Edge Triggering

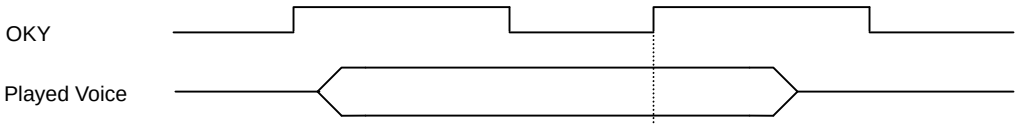
(d) Level Mode, Level Triggering



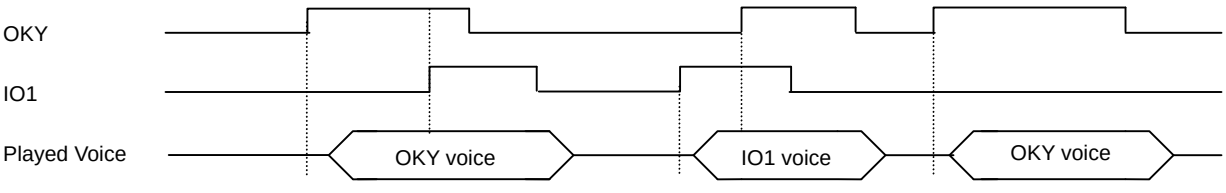
(e) Retrigger Mode



(f) Irretrigger Mode



(g) Retrigger Mode, First Key Priority



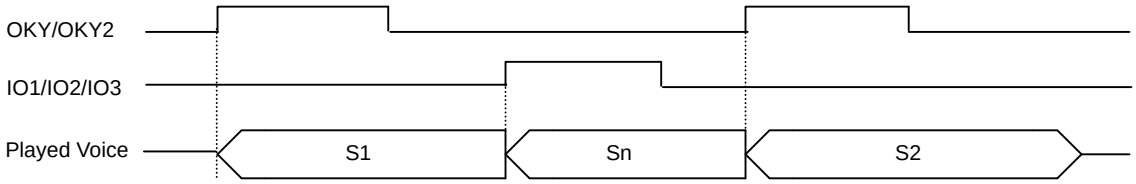
4) Special Timing Diagram

Debounce Time is ignored in the following diagrams.

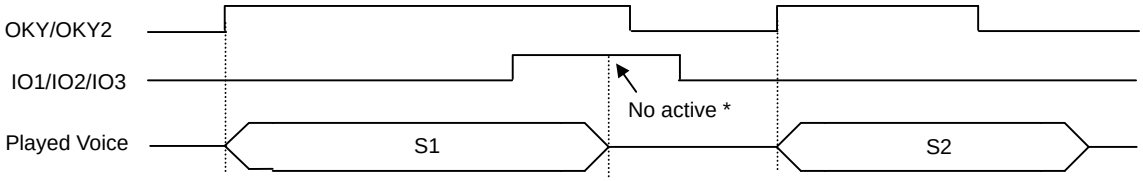
(a) Different Input Reload (No Jumping and Looping Function)

- OKY / OKY2 (E/U/R) = S1 S2, IO1 / IO2 / IO3 (E/U/R) = Sn

  (S1 stands for sub_table 1, Sn stands for sub_table n)

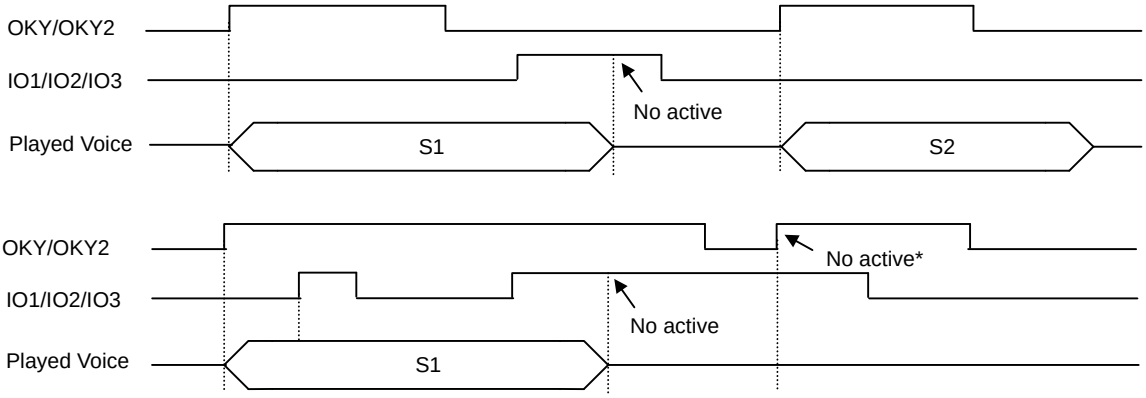


- OKY / OKY2 (E/U/R) = S1 S2, IO1 / IO2 / IO3 (L/x/x) = Sn



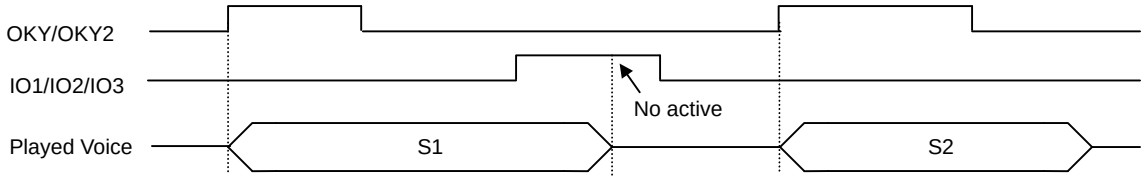
※ If IO1 is pressed during OKY voice playing, when S1 ends, the trigger mode will follow OKY (E/U/R).

- OKY / OKY2 (E/U/I) = S1 S2, IO1 / IO2 / IO3 (E/x/x) = Sn

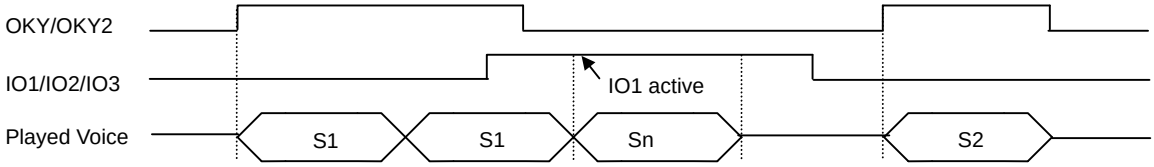


※ Because IO1 signal is still high, the OKY Edge signal is not active.

- OKY / OKY2 (E/U/I) = S1 S2, IO1 / IO2 / IO3 (L/x/x) = Sn

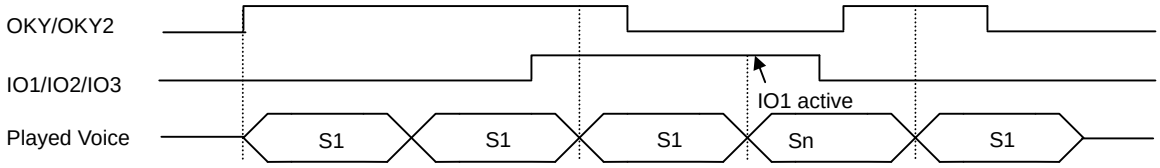


- OKY / OKY2 (L/U/X) = S1 S2, IO1 / IO2 / IO3 (E/x/x) = Sn

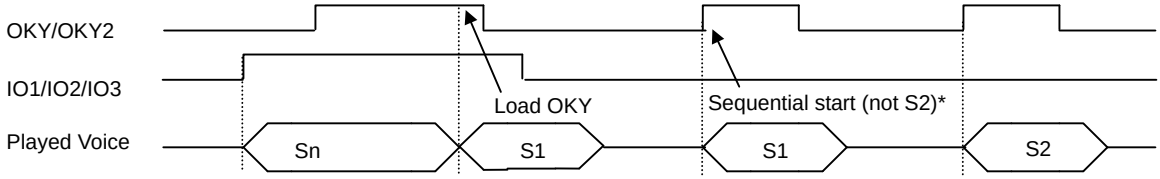


※ In the time of sub_table end: When S1 ends, the trigger mode follows OKY (L/U/x). When Sn ends, it follows IO1 (E/x/x). Once Sn is played (after S1 ends), the trigger mode follows IO1 (E/x/x) immediately.

- OKY / OKY2 (L/U/X) = S1 S2, IO1 / IO2 / IO3 (L/U/I) = Sn



※ Reload key priority: OKY > IO1 > IO2 > IO3 > OKY2 / O4



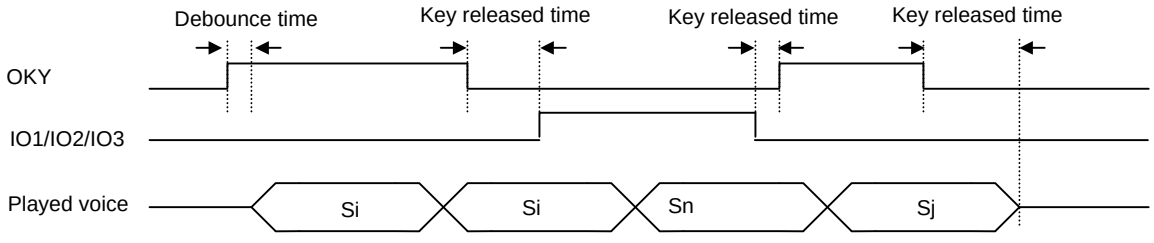
※ In OKY, 1st debounce occurs, and then S1 starts playing. That is, OKY Sequential number is counted only when debounce occurs.

※ When IO1 has been triggered and starts its voice playing, triggering OKY won't be followed by a sequential trigger because no debounce occurs.

(b) Random Function

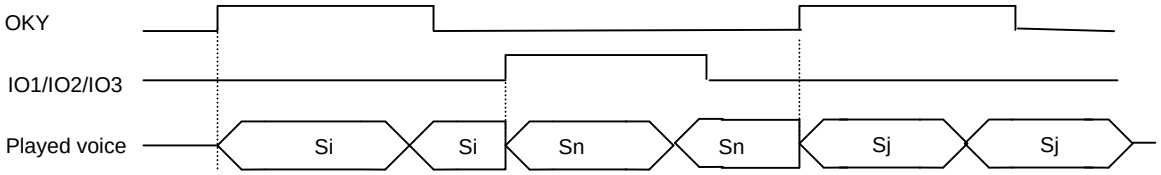
- OKY (L/U/I) = S1 S2, IO1 / IO2 / IO3 (L/U/I) = Sn

Random number is counted at Debounce Time and during voice playing when input key is released. The first trigger only counts Debounce Time due to there is no key-released time.



i=1 or 2 or 3 or 4; j=1 or 2 or 3 or 4 (i and j are random number)

➢ (c-2) OKY (L/U/R) = S1 S2, IO1 / IO2 / IO3 (L/U/R) = Sn

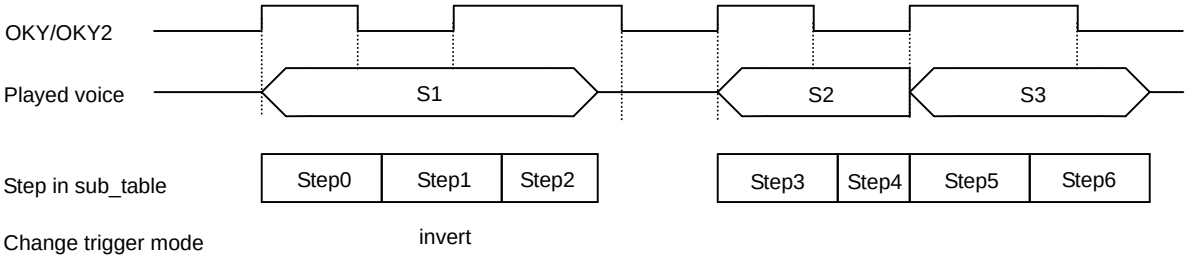


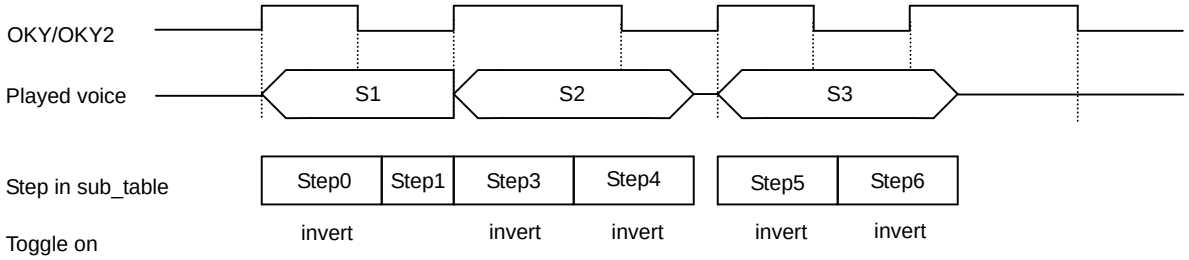
i=1 or 2 or 3 or 4; j=1 or 2 or 3 or 4 (i and j are random number)

(c) Change Trigger Mode while playing voice (Invert Retrigger / Irretrigger function in voice_step)

Use Invert function to change the Retrigger mode to Irretrigger mode or change the Irretrigger mode to Retrigger in each voice_step of sub_table.

OKY / OKY2 (E/U/R) = S1 S2 S3, (S1 = step0 + step1 + step2, S2 = step 3 + step4, S3 = step5 + step6)





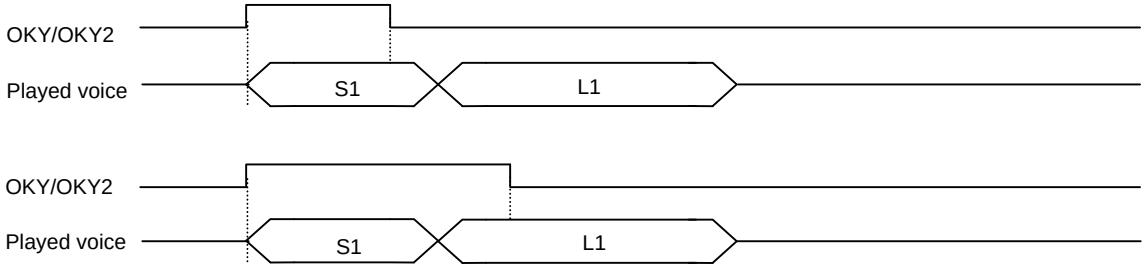
5) Jumping and Looping Function

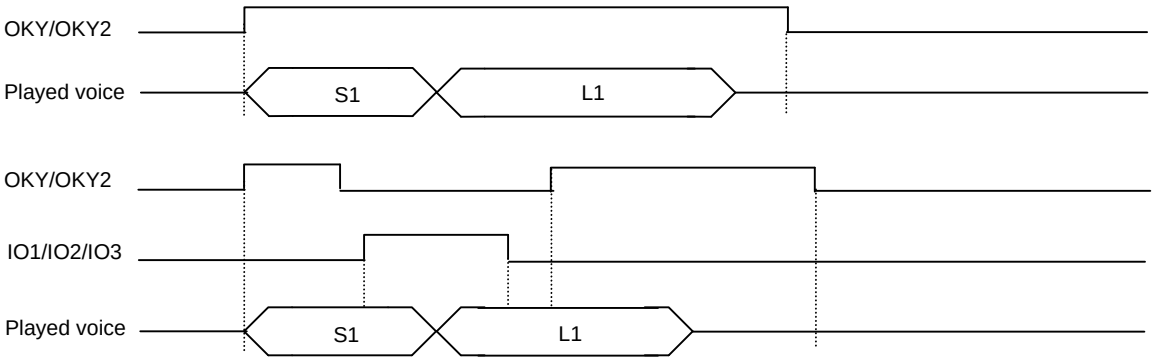
In the end of any Start sub_table, you can set a Jump instruction and indicates the associated Loop sub_table for Jumping function. If doing so, when 1st Start sub_table ends, IC will detect the instruction and the 2nd Loop sub_table will be immediately auto-played. In Loop sub_table, you can also set a Loop instruction for self-looping function.

Note: In Jumping and Looping function, **Different Input Reload** function in (4-a) doesn't work.

(a) Set S1 as Jumping without Looping

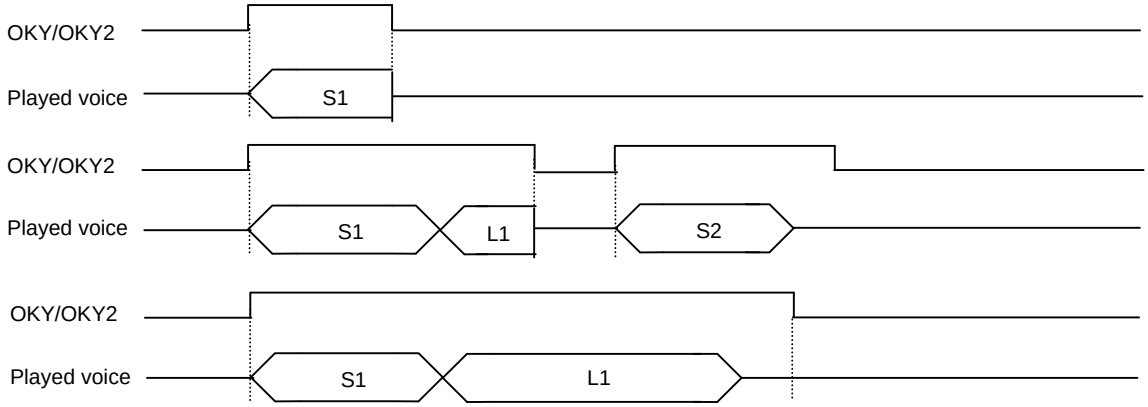
➢ OKY / OKY2 (E/U/I) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn (L1 stands for the Jumping sub_table of S1)



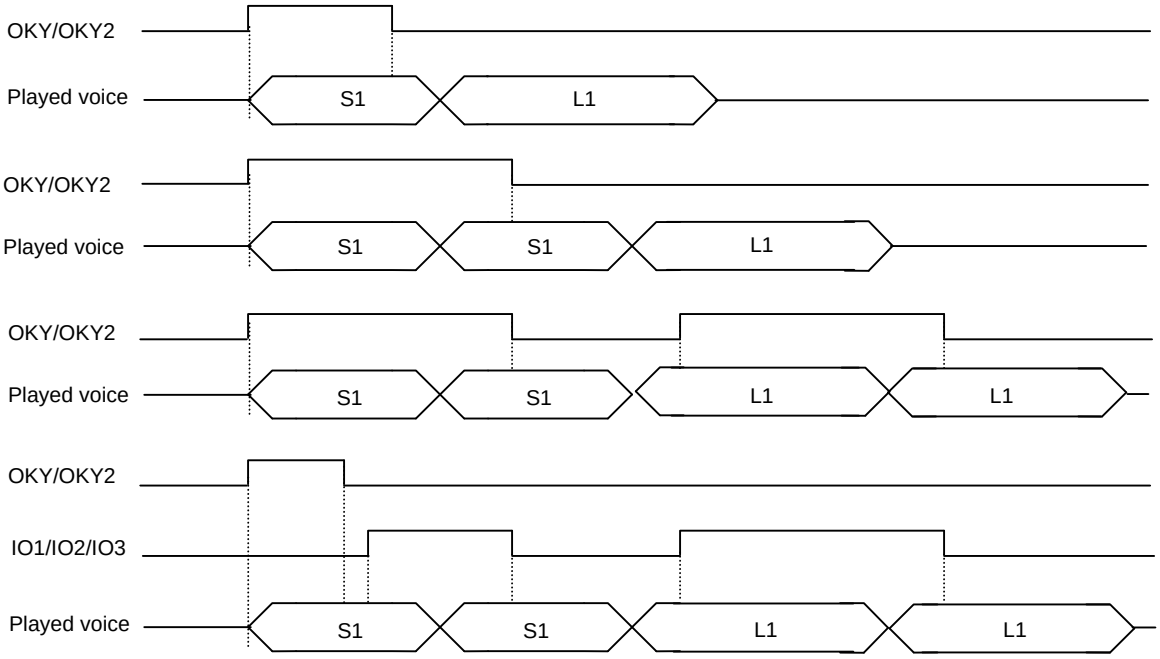


※ While playing OKY's voice (S1 or L1), triggering OKY or IO1 is not active in Edge / Irretrigger mode.

➢ OKY / OKY2 (E/H/x) = S1 L1 S2 S3

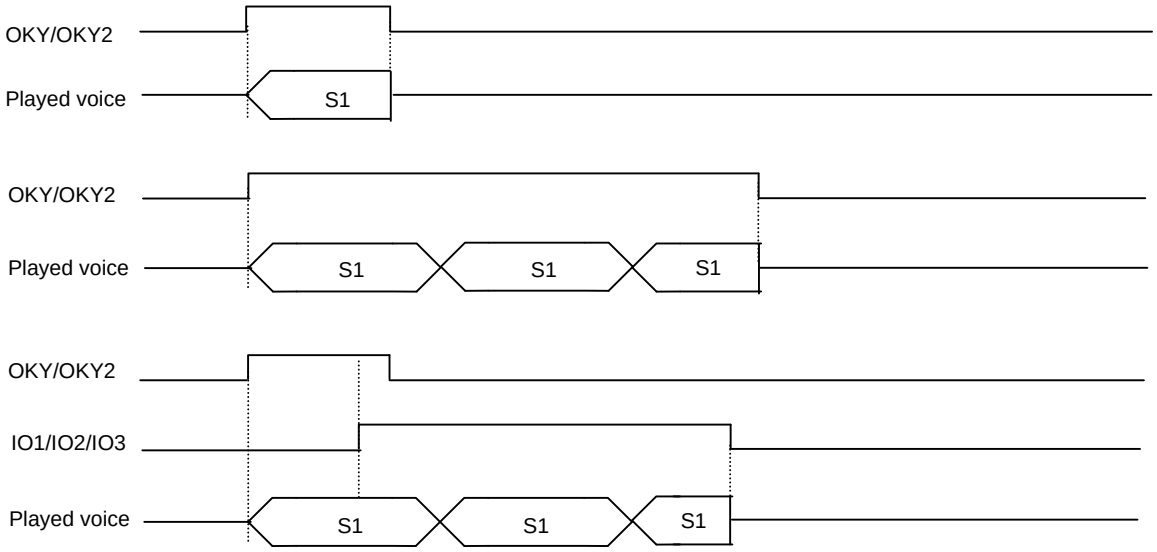


➢ OKY / OKY2(L/U/I) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn



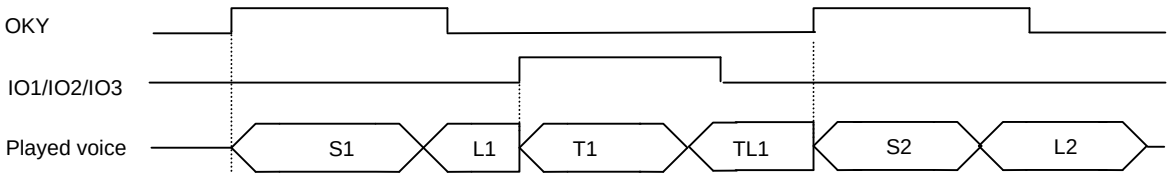
※ Without Different Input Reload, while playing OKY's voice, triggering IO1 is recognized as to trigger OKY.

➢ OKY / OKY2 (L/H/x) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn



※ Without Different Input Reload, while playing OKY's voice, triggering IO1 is recognized as to trigger OKY.

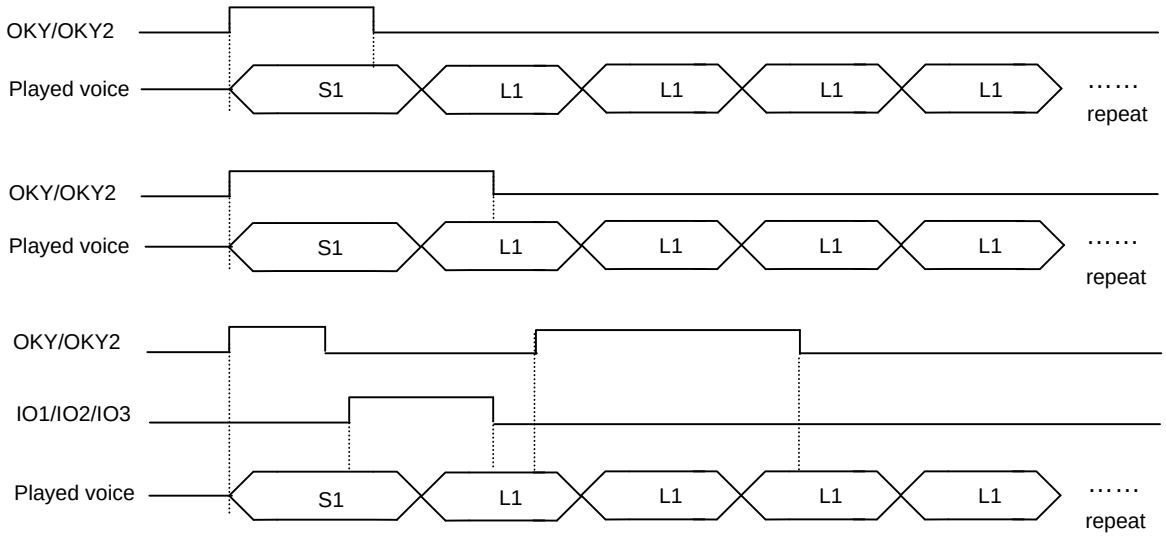
➢ OKY (E/U/R) = S1 L1 S2 L2 , OKY2 (E/U/R) = T1 TL1



(b) Set S1 as Jumping with Looping

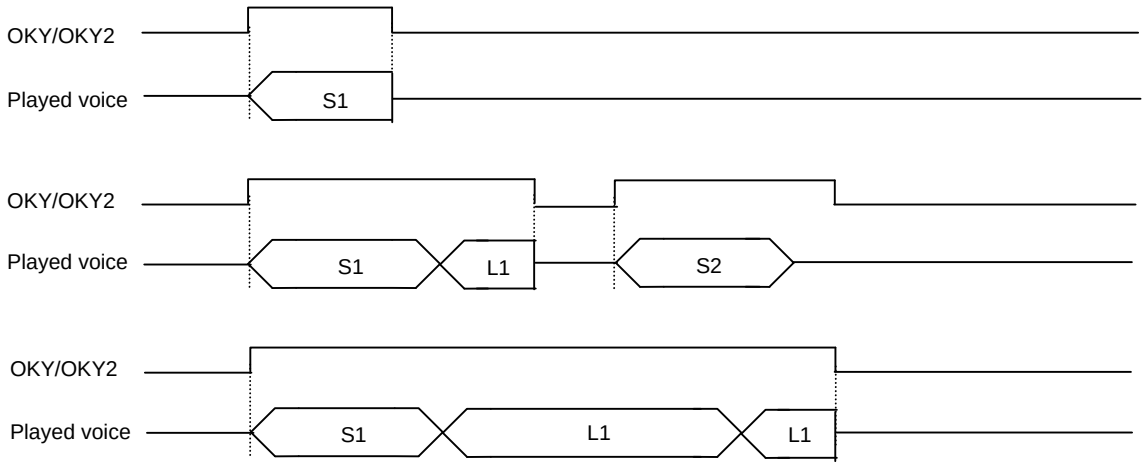
The timing diagram is similar with **Jumping without Looping** in (5-a) except the last self-looping.

➢ OKY / OKY2 (E/U/I) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn

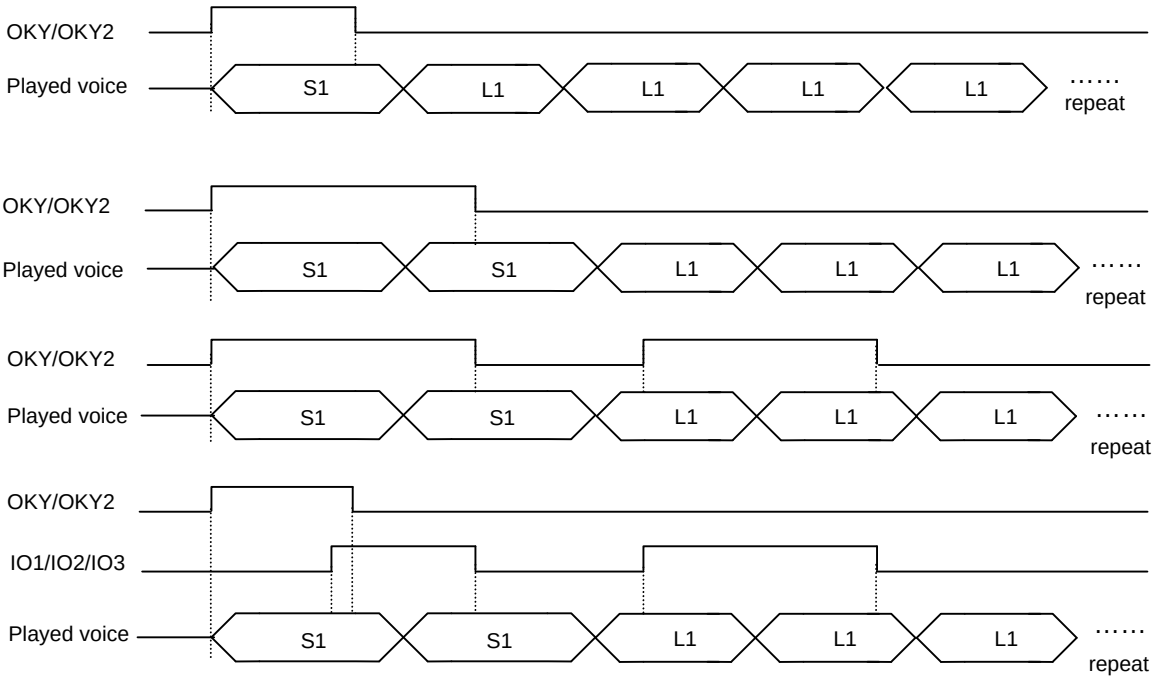


※ While playing OKY's voice (S1 or L1), triggering OKY or IO1 is not active in Edge / Irretrigger mode.

- OKY / OKY2 (E/H/x) = S1 L1 S2 S3

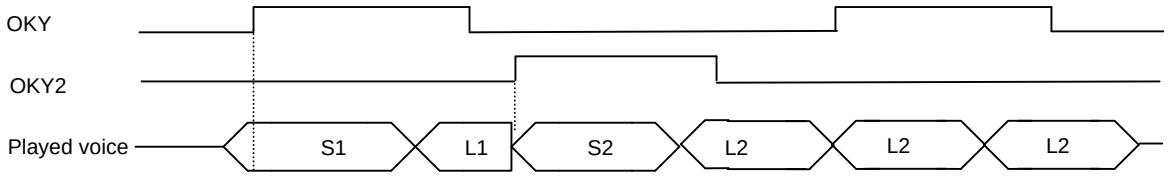


- OKY / OKY2 (L/U/I) = S1 L1 S2 S3

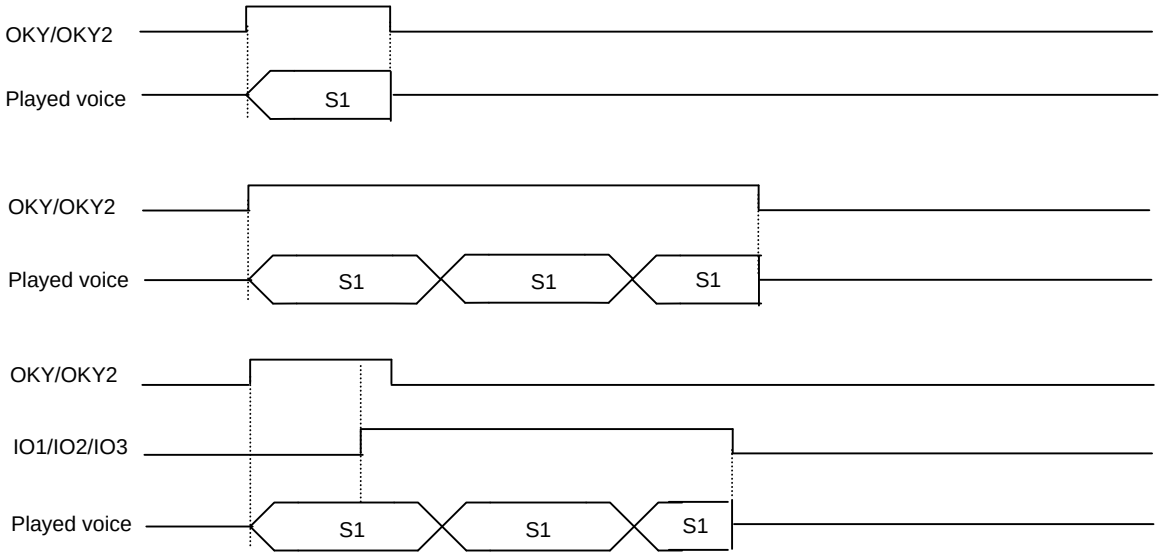


※ While playing OKY's voice, triggering IO1 is recognized as to trigger OKY. Reload function doesn't work.

- OKY (E/U/R) = S1 L1, OKY2 (E/U/I) = S2 L2



➢ OKY / OKY2 (L/H/x) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn

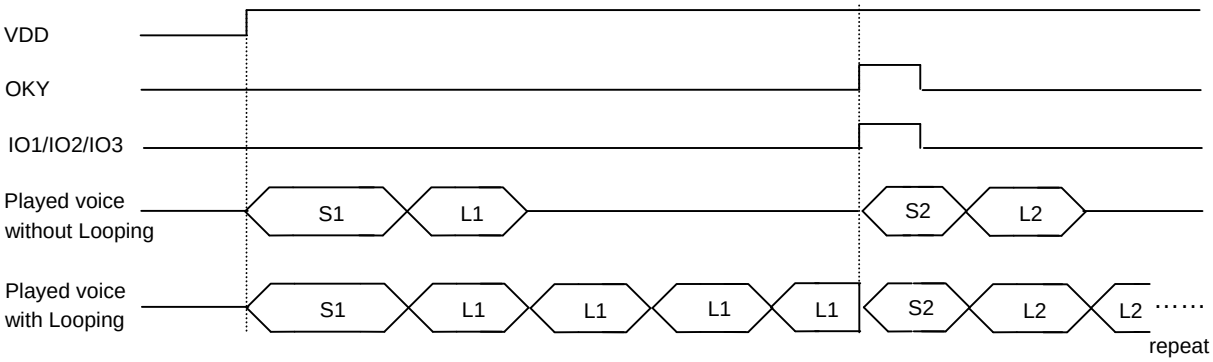


※ Without Different Input Reload, while playing OKY's voice, triggering IO1 is recognized as to trigger OKY.

(c) PowerOnPlay with Jumping and Looping or without Looping

The trigger mode of PowerOnPlay is fixed as E/U/R, other trigger signal will stop PowerOnPlay's voice immediately and play the voice of the interrupted trigger no matter in Reload or Jumping status.

PowerOnPlay (E/U/R) = S1 L1, OKY / OKY2 (x/U/I) = S2 L2, IO1 / IO2 / IO3 = S3 L3



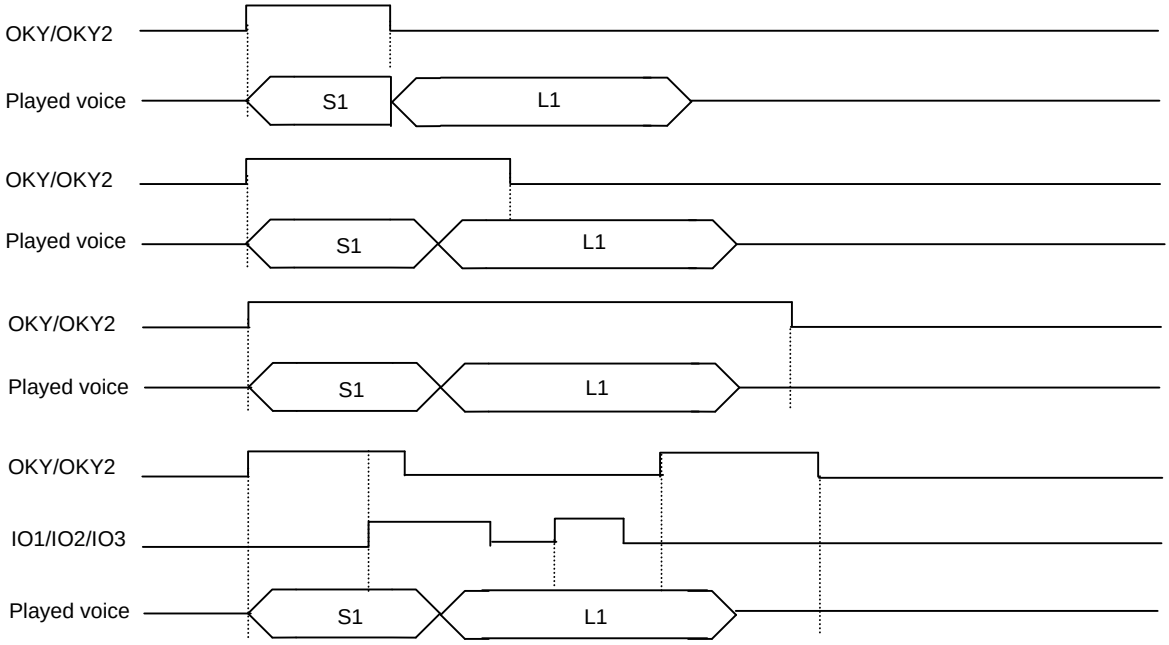
※ Priority: OKY > IO1 > IO2 >IO3 > OKY2/O4 > PowerOnPlay

6) KeyReleaseJump Function

KeyReleaseJump is a combined function of Hold and Jumping. It is a special setting, when trigger is released, the voice immediately stops and jumps to Jumping sub_table. When ticking this option, all input pins are in KeyReleaseJump condition.

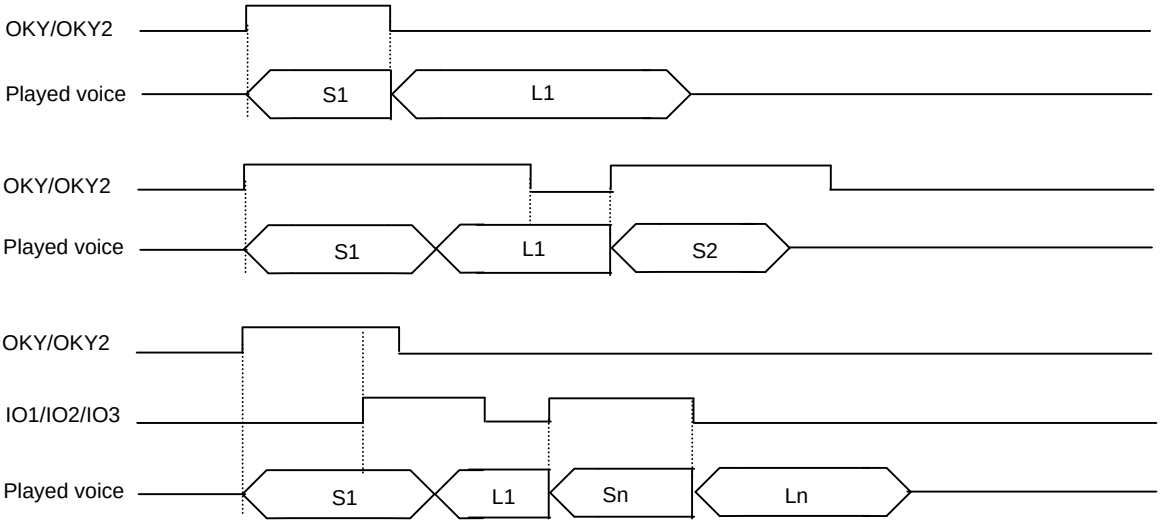
(a) KeyReleaseJump with Jumping and without Looping

- OKY/OKY2(E/x/I)=S1 L1 S2 S3, IO1/IO2/IO3 (x/x/x)=Sn Ln (L1 stands for the Jumping sub_table of S1)



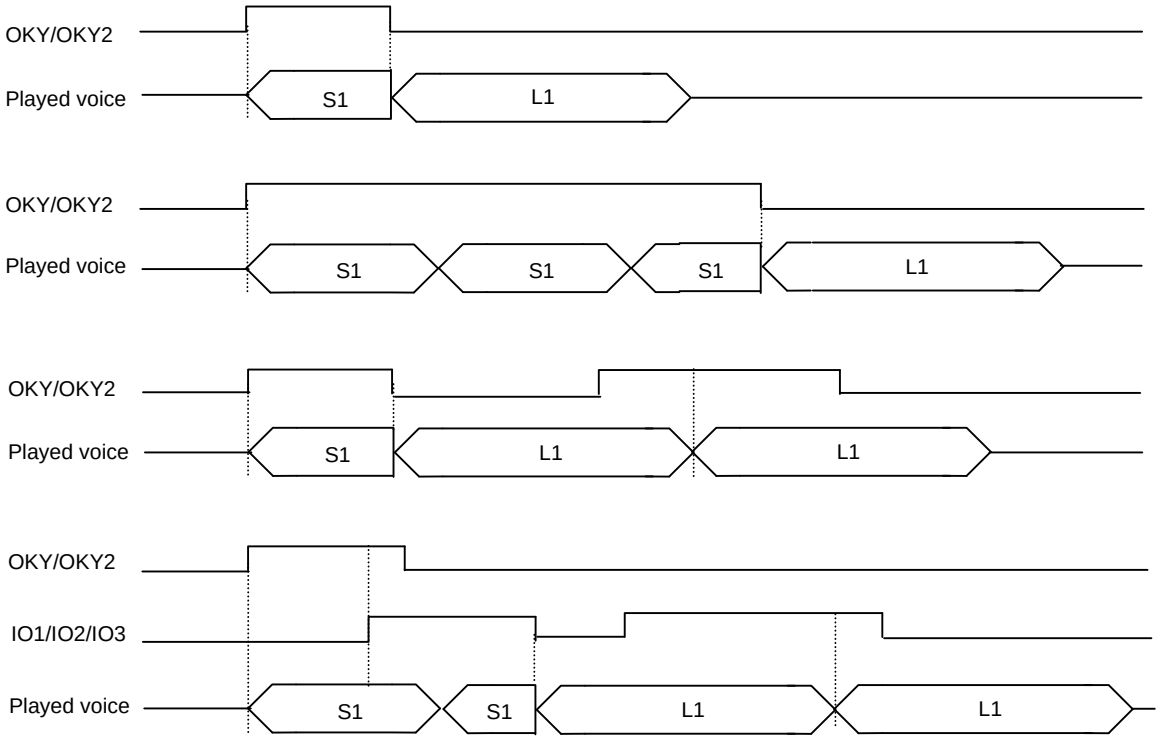
※ While playing OKY's voice (S1 or L1), triggering OKY or IO1 is not active in Edge / Irretrigger mode.

- OKY / OKY2 (E/x/R) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn Ln



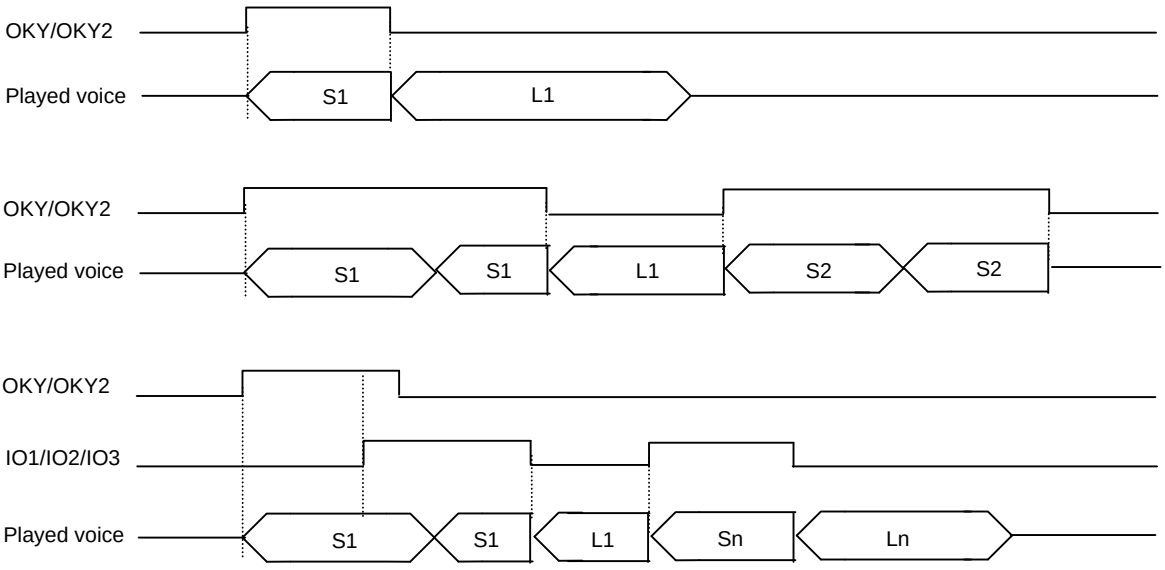
※ While playing OKY's Looping voice (L1, key is released), triggering OKY or IO1 is active in Retrigger mode.

➢ OKY / OKY2 (L/x/I) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn Ln



※ While playing OKY's voice (S1 or L1), triggering IO1 is recognized as to trigger OKY.

➢ OKY / OKY2 (L/x/R) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn Ln

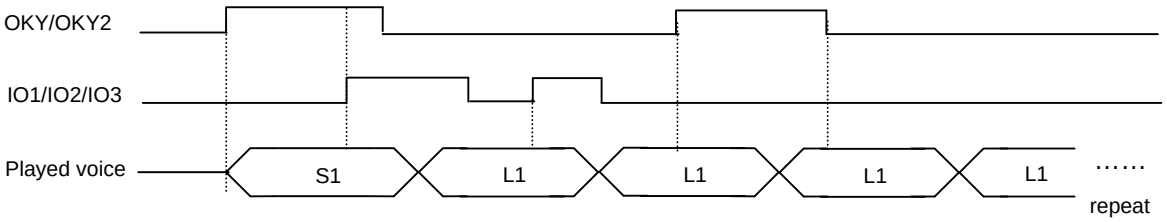


※ While playing OKY's Looping voice (L1, key is released), triggering OKY or IO1 is active in Retrigger mode.

(b) KeyReleaseJump with Jumping and Looping

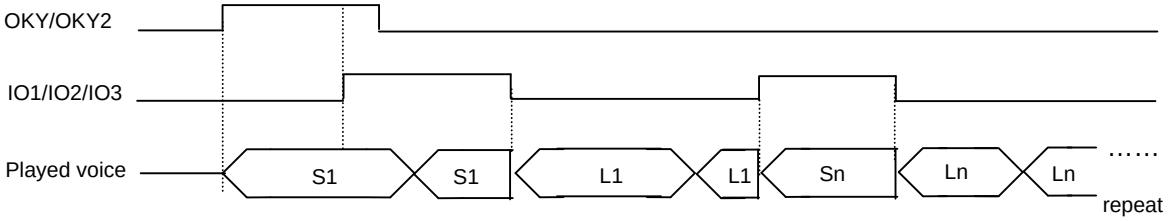
The timing diagrams are similar with **Jumping Without Looping** in (6-a) except the last self-looping.

- OKY / OKY2 (E/x/I) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn Ln (L1 & Ln are set Looping)



※ While playing OKY's voice (S1 or L1), triggering OKY or IO1 is not active in Edge / Irretrigger mode.

- OKY / OKY2 (L/x/R) = S1 L1 S2 S3, IO1 / IO2 / IO3 (x/x/x) = Sn Ln (L1 & Ln are set Looping)

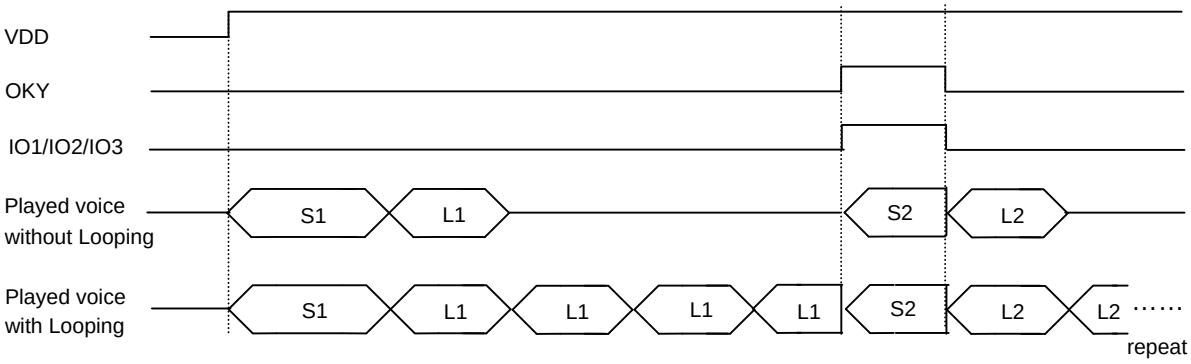


※ While playing OKY's Looping voice (L1, key is released), triggering OKY or IO1 is active in Retrigger mode.

(c) PowerOnPlay with KeyReleaseJump

The trigger mode of PowerOnPlay is fixed as E/U/R, other trigger signal will stop PowerOnPlay's voice immediately and play the voice of the interrupted trigger no matter in Reload or Jumping status.

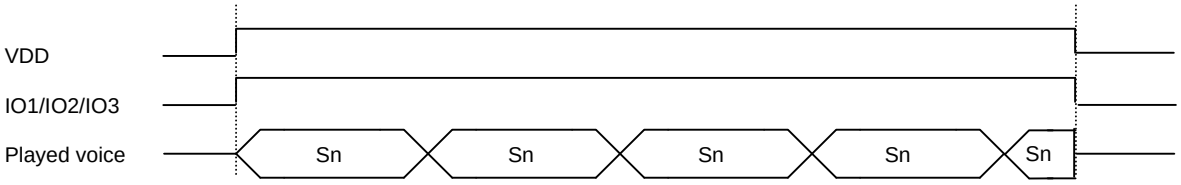
PowerOnPlay (E/U/R) = S1 L1, OKY / OKY2 (x/U/I) = S2 L2, IO1 / IO2 / IO3 = S3 L3

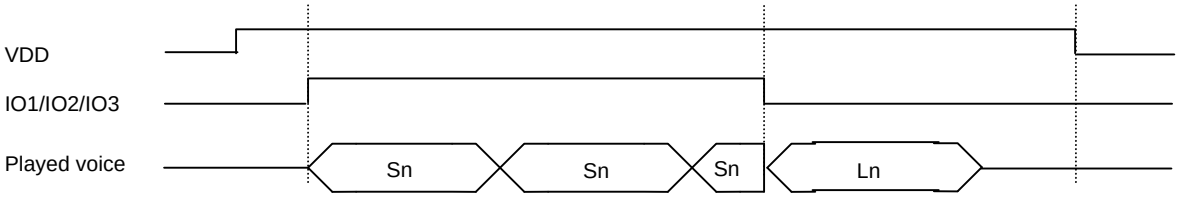


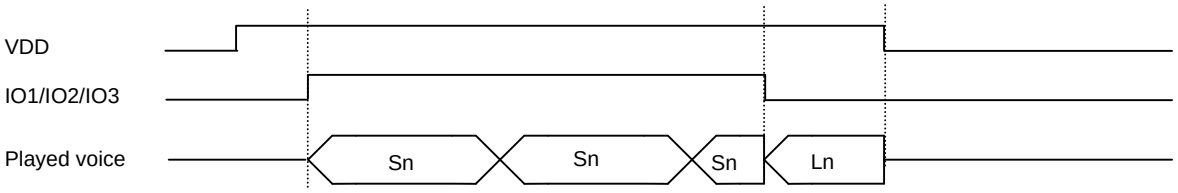
※ Priority: OKY > IO1 > IO2 >IO3 > OKY2/O4 > PowerOnPlay

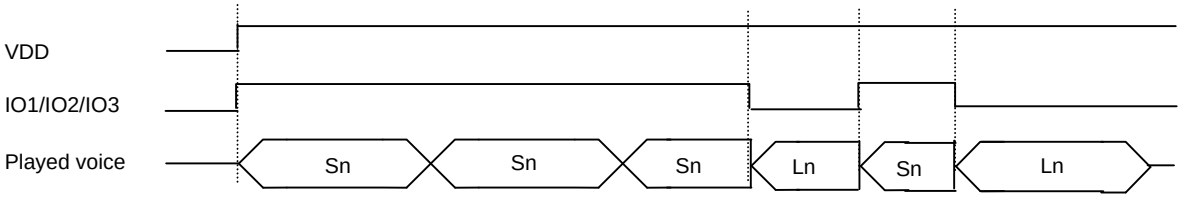
7) Set KeyReleaseJump Function

IO1 / IO2 / IO3 (L/x/R) = Sn Ln, long debounce (Ln stands for Jumping, usually used to play greeting voice)





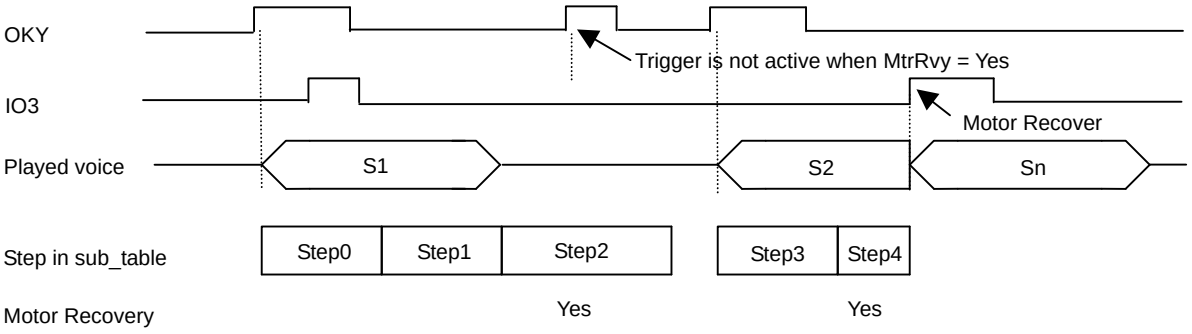




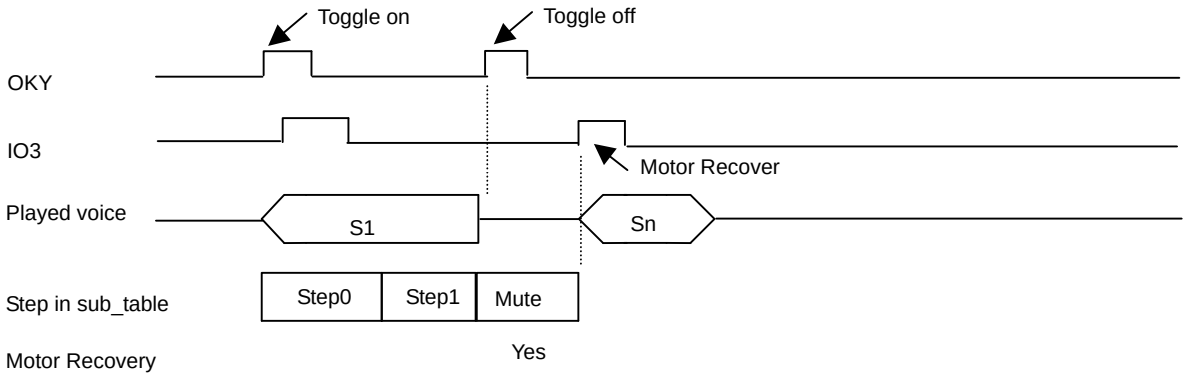
8) Motor Recovery Function

Motor Recovery function can trigger IO3 only when MtrRvy function is invoked by the voice_step of sub_table.

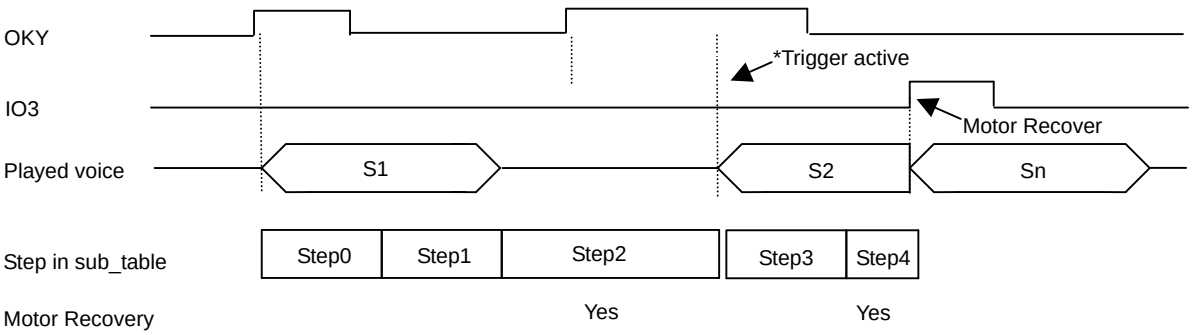
OKY (E/U/R) = S1 S2, (S1= step0 + step1 + step2, S2= step 3 + step4), IO3 (E/U/R) = Sn



OKY (E/U/R) = S1 S2, (S1 = step0 + step1 + step2 (Jump to Mute), S2 = step 3 + step4), IO3 (E/U/I) = Sn



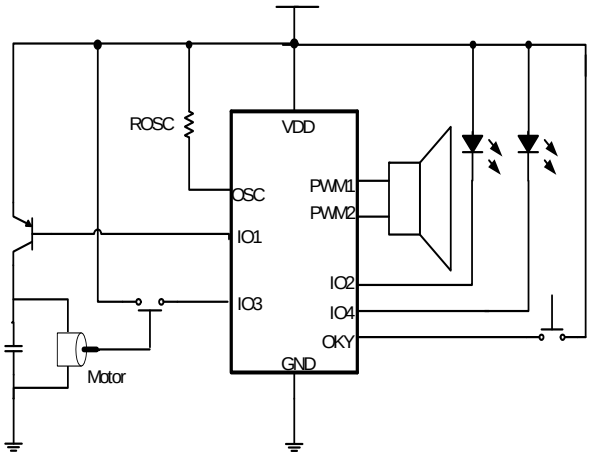
OKY (E/U/R) = S1 S2, (S1 = step0 + step1 + step2, S2 = step 3 + step4), IO3 (E/U/R) = Sn



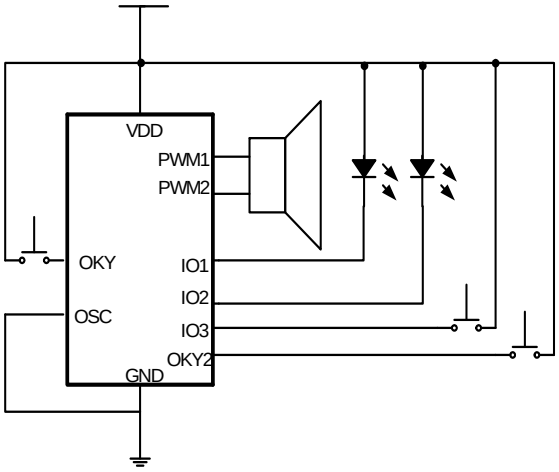
*The trigger is disabled when MtrRvy = Yes but will be enabled when MtrRvy ends.

10. Application

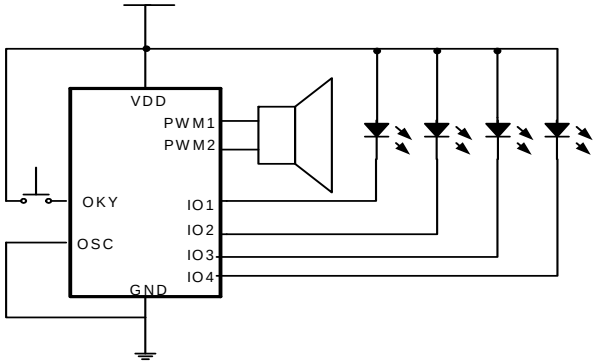
(1) OKY is input, IO1 is output, external oscillator
IO3 is for Motor recovery input



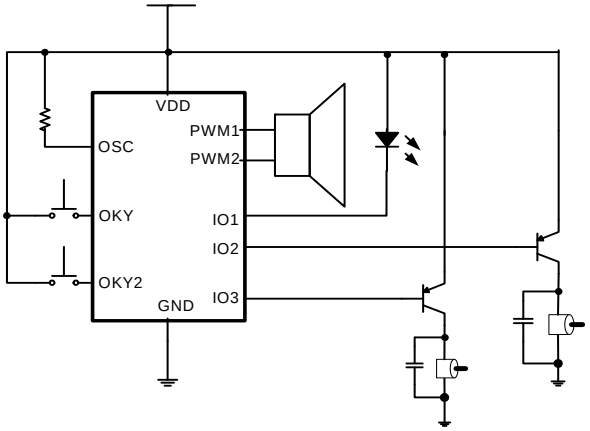
(2) 3 triggers, 2 LED, internal oscillator



(3) 1 input, 4 LEDs, internal oscillator
IO1 / IO2 / IO3 / IO4 are output



(4) 2 triggers, 1 LED, 2 motors, external oscillator
IO1 / IO2 / IO3 are output



* IO1 / IO2 / IO3 are set to output mode,
select **Sync output** for driving 2 motors, 1 LED.

* While driving motors, one capacitor is recommended to be connected between VDD and GND.

Note: The above application circuits are for reference only, please contact Alpha if further information is needed.

11. Bonding Diagram