九齊科技股份有限公司

Nyquest Technology Co., Ltd.

DATA SHEET

NY3L Series

5 I/O Single-Chip Speech Synthesizer

Version 1.1

May 8, 2018

Version	Date	Description	Modified Page
1.0	2014/08/13	Formal release.	-
1.1	2018/05/08	Modify the pull-low resistor option 300K to 1.5M.	3

1. 概述

NY3L系列產品為單晶片CMOS語音合成 IC，共有4個母體分別為NY3L003A、NY3L006A、NY3L009A 和 NY3L012A。具有5個I/O腳，利用精準的內阻震盪故不需外加震盪電阻，只有一組PWM輸出，故無須再外加任何零件。語音合成方式為 4-bit/5-bit Mixed Advanced LOG-PCM，搭配 9-bit PWM 硬體輸出，可以提供很好的音質。藉由製造過程中更換Code光罩，可將不同的語音資料寫入ROM中。用戶可使用簡便的 *Q-Speech* 和 *Quick-IO* 工具軟體來快速地進行開發。

2. 功能

(1). 寬廣的工作電壓： 1.6V ~6.4V。

(2). 共有4個母體，ROM大小及秒數如下：

	NY3L003A	*NY3L006A*	*NY3L009A*	*NY3L012A*
ROM Size	4800H (18432)	9000H (36864)	D800H (55296)	12000H (73728)
4-bit, 6kHz	3.07s	6.14s	9.22s	12.29s
5-bit, 6kHz	2.46s	4.92s	7.37s	9.83s

※ 注意：當選擇 Voice Quality Factor (VQF) =1，Bit 數接近 4-bit；當選擇 VQF =11，Bit 數接近 5-bit。

(3). 有5個I/O腳: O1和O2只能作為輸出腳，OKY/O5、IO3 和 IO4可分別選作輸入腳或是輸出腳。 (光罩選擇)

(4). 語音最多可被分割成32個語音段(Voice Section)，每段長度可不同。 每一個語音段的長度(語音+ 靜音時間) 最多可達 12 秒 (在6kHz取樣頻率下)。每一語音段中的語音+靜音長度必須為 04H (Hex) 的整數倍。

(5). 共有256個語音格(Voice Step)，可規劃成16個語音組(Voice Sentence)，每個語音組(Sentence)可放的語音格 (Step)並沒有限制(但最多只有256個語音格)。每一語音格(Step)可指定一語音段(Section) 和 O1、O2、IO3、IO4、OKY/O5 的輸出搭配(當IOx設為輸出時)。

(6). 只有內建一組準確的頻率振盪器(+/- 3% 誤差)，*並無提供外部震盪電阻選項*。共有27種不同播放速度的選擇，但只可選擇其中一種播放速度。

1	2	3	4	5	6	7	8	9	10
20.0kHz	17.1kHz	15.0kHz	13.3kHz	12.0kHz	10.9kHz	10.0kHz	9.2kHz	8.6kHz	8.0kHz
11	12	13	14	15	16	17	18	19	20
7.5kHz	7.1kHz	6.7kHz	6.3kHz	6.0kHz	5.7kHz	5.5kHz	5.2kHz	5.0kHz	4.8kHz
21	22	23	24	25	26	27			
4.6kHz	4.4kHz	4.3kHz	4.1kHz	4.0kHz	3.9kHz	3.8kHz			

(7). 輸入腳的輸入選項：(光罩選擇)

(a). 任一輸入腳可分別選擇 Edge/Level, Hold/Unhold, Retrigger/Irretrigger 不同的觸發方式組合。

(b). 任一輸入腳可分別選擇 CDS+1.5M、CDS、1.5M 的下拉電阻 或 Floating。(CDS+1.5M選項: 當按鍵按下時，IC內部為 1.5M 的下拉電阻；而當按鍵放開時，IC內部為 300K+1.5M 並聯 的下拉電阻 約250K。 CDS: 當按鍵按下時，IC內部為 Floating；而當按鍵放開時，IC內部為 300K 的下拉電阻。)

(c). 任一輸入腳可分別選擇Debounce時間：Long - 提供一般按鍵使用；Short - 提供彈跳開關使用。

(d). OKY/O5輸入腳最多有16個 Sentence 的 One-Key sequential 或 random 的選擇，在 One-Key sequential 時並可選擇Sentence的播放順序在其他按鍵被觸發後是否要Reset。

(e). 只有OKY/O5輸入腳可選擇是否有 Toggle On/Off 的功能 (1st 觸發 → 播放，2nd 觸發 → 停止，……)。

※ *注意: 按鍵輸入的優先順序為 OKY/O5 > IO3 > IO4 > POP。*

(8). 所有的輸出腳都有以下輸出電流選項：(光罩選擇)

(a). Normal Sink Current Output (一般灌電流輸出)：輸出腳接LED到VDD。提供4種不同輸出電流 100%(24mA@3V), 80%(19.5mA@3V), 50%(12.3mA@3V), 30%(7.35mA@3V)。

(b). Drive Current Output (拉電流輸出)：輸出腳接LED到GND。(I$_{oh}$=7mA/10mA @V$_{DD}$=3V/4.5V)。

(9). 所有的輸出腳都分別有以下 5 種輸出訊號選項：(光罩選擇)

(a). Busy_High active：播放時送出高位準訊號。(Drive輸出)

(b). Busy_Low active：播放時送出低位準訊號。(Sink輸出)

(c). LED 3Hz flash：播放時 LED 3Hz Sink輸出閃爍。

(d). LED dynamic 3/4：播放時 LED根據3/4聲音位準做Sink輸出動態閃爍。

(e). QIO訊號：可隨聲音作任意的輸出變化，O1和O2各有兩組QIO訊號(Q1/Q4, Q2/Q5)，每一個語音格(Step) 可選擇兩組QIO訊號的其中一組；IO3有一組QIO訊號(Q3) 可供選擇；而OKY/O5和IO4並沒有提供QIO選項。用戶使用此功能需先開啟 *Quick-IO* 編輯器來做QIO訊號編輯。

※ *注意: LED 3Hz flash 是指以 6kHz 的播放速度 時LED閃爍的頻率；不同的播放速度，LED閃爍的頻率也會 不同。*

(10). 特殊功能選項 ”上電播放” (Power-On-Play, POP)：電池一上電立即播放一次”上電播放語音組”(POP Sentence) ，觸發模式固定為 Edge/ Unhold。如果POP結合 Power-On-Loop (POL) 功能，則上電會循環播放”上電播放語音組”(POP Sentence) 。如果POP結合 Power-On-Play Interrupt (POP Interrupt) 功能，則上電播放時有其他按鍵被觸發，上電播放會立即停止並播放該按鍵所指定的語音組。(光罩選擇)

(11). 特殊功能選項 ”PWM開關” (PWM On/Off)：IO3或IO4可以被設定為PWM開關的按鍵，用來控制聲音是否輸出，觸發模式固定為 Edge/ Unhold/ Retrigger。另外還提供一個 Play_End 選項來搭配 PWM On/Off 功能，如果PWM輸出為關閉時且 Play_End 選項為 PWM On，在IC進入Sleep後，若觸發按鍵播放下一個語音組時，PWM輸出會自動開啟，播放下一個語音組的聲音；如果PWM輸出為關閉時且 Play_End 選項為 PWM No Change，在IC進入Sleep後，觸發OKY/O5按鍵播放後面的語音組不會有聲音輸出，使用者必須觸發 PWM開關的按鍵則PWM才會有聲音輸出。(光罩選擇)

(12). 特殊功能選項 ”短觸發循環播放” (Edge-Loop)：當OKY/O5按鍵一被觸發，該觸發按鍵所指定的語音組會一直循環播放。如果結合 One-Key Sequential 功能，再次觸發該按鍵，會循環播放下一個語音組。如果結合 Loop On/Off 功能，再觸發該按鍵，語音會停止，再次觸發則循環播放下一個語音組。如果結合 Loop-End 功能，在播放OKY/O5最後一個語音組時再次觸發該按鍵，語音會停止，再次觸發則回到第一個語音組進行循環播放。(光罩選擇)

※ *注意: Loop On/Off 不能和 Toggle On/Off 功能同時存在。*

(13). 特殊功能選項 ”防干擾Debounce” (Anti-Noise Debounce)：設定輸入腳的訊號觸發需要先偵測到一段低電平 (Low)的Debounce時間，才會進行正常的高電平(High)觸發的Debounce偵測。此功能可以用來避免外部的馬達雜訊干擾，並不會因為按鍵過程中的觸發訊號被雜訊拉低，導致IC重複觸發。(光罩選擇)

※ 注意: 當啟動此功能時，所有輸入口都會被設定為 Anti-Noise Debounce 功能。

(14). 特殊功能選項 ”雜訊觸發” (Noise-Trigger)：OKY/O5或IO4可以設定為雜訊觸發功能。當選擇此功能時，觸發模式被設定為 Edge/ Unhold 功能，應用時需將OKY/O5(或IO4)輸入在PCB的Layout做成較長的輸入線，當外部有較大的雜訊產生時，利用天線效應的原理來產生輸入訊號，OKY/O5(或IO4)外部懸空不需連接到VDD或GND腳，此功能常見於電子打火機和手機天線的應用。(光罩選擇)

(15). 序列觸發功能 (Serial-Trigger)：在 Edge/ Unhold/ Retrigger 觸發模式下，使用OKY/O5的 One-Key Sequential 和 Reset 功能，並設定觸發Debounce時間為Short Debounce，這樣就可以利用外部序列訊號輸入來控制OKY/O5 的特定Sentence播放，通常搭配外部MCU來控制。

(16). 一組 9-bit PWM 輸出，可直接驅動喇叭或蜂鳴片。

1. GENERAL DESCRIPTION

The NY3L series are single-chip voice synthesizing CMOS IC. There are 4 bodies: NY3L003A, NY3L006A, NY3L009A and NY3L012A. There are five I/O pins. Through accurate internal oscillation, external Rosc is unnecessary. There is only one PWM output for voice. Thus any external component is not required. Using 4-bit/5-bit Mixed Advanced LOG-PCM algorithm with 9-bit PWM hardware output, it can generate good sound quality. Customer's speech data can be programmed into ROM by changing one code mask during fabrication. Besides, two interactive software developing tools of "*Q-Speech*" & "*Quick-IO*" are user-friendly and quick for programming.

2. FEATURES

(1). Wide operating voltage: 1.6V ~ 6.4V.

(2). There are 4 bodies. ROM size and speech duration @ 4-bit/6kHz are as following.

	NY3L003A	*NY3L006A*	*NY3L009A*	*NY3L012A*
ROM	4800H (18432)	9000H (36864)	D800H (55296)	12000H (73728)
4-bit, 6kHz	3.07s	6.14s	9.22s	12.29s
5-bit, 6kHz	2.46s	4.92s	7.37s	9.83s

※ *Note: When the Voice Quality Factor (VQF) is set as 1, it's close to 4-bit. When the VQF is set as 11, it's close to 5-bit.*

(3). Five I/O pins: O1 and O2 can only be output pin. Other OKY/O5, IO3 and IO4 can be either input or output pin (Mask option).

(4). The total voice duration can be partitioned up to 32 *Voice Sections*. Each *Voice Section* length is flexible. Each voice length (voice+mute) can be individually up to 12 seconds at 6kHz S.R.. The *Voice Section* length of "voice length + mute length" must be the multiple of 04H (Hex).

(5). Total 256 *Voice Steps* are available for 16 *Voice Sentences*. Each *Sentence* can only use maximum 256 *Steps*. For each *Step*, it can specify one *Voice Section*.

(6). Only build in an accurate internal oscillator of +/- 3% tolerance, *no external R oscillator*. There are 27 kinds of options for play speed, but user can only select one of them to use.

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
20.0kHz	17.1kHz	15.0kHz	13.3kHz	12.0kHz	10.9kHz	10.0kHz	9.2kHz	8.6kHz	8.0kHz
11	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
7.5kHz	7.1kHz	6.7kHz	6.3kHz	6.0kHz	5.7kHz	5.5kHz	5.2kHz	5.0kHz	4.8kHz
21	*22*	*23*	*24*	*25*	*26*	*27*			
4.6kHz	4.4kHz	4.3kHz	4.1kHz	4.0kHz	3.9kHz	3.8kHz			

(7). Input option for input pin: (Mask option)

(a). Each input can select Edge/Level, Hold/Unhold and Retrigger/Irretrigger trigger modes.

(b). Each input can select CDS+1.5M、CDS、1.5M pull-low resistor or Floating type.

(CDS+1.5M option: Only 1.5M pull-low resistance at key-pressed, and 300K+1.5M in parallel pull-low resistance around 250K at key-released. CDS option: Floating at key-pressed, and 300K pull-low resistance at key-released.)

(c). Each input can select Debounce time: Long debounce for push-button; Short debounce for fast switch.

(d). OKY/O5 input can select One-Key Sequential or Random for maximum 16 *Sentences*. At One-Key Sequential, the Reset function of playing *Sentence* sequence can be selected or not when other keys are triggered.

(e). Only OKY/O5 input pin can select Toggle On/Off function (1st Trigger → play, 2nd trigger → stop, ...).

※ *Note: Input priority is OKY/O5 > IO3 > IO4 > POP.*

(8). There are some kinds of output option for all output pins. (Mask option)

(a). Normal Sink Current output: Output is connected a LED with VDD. There are 4 kinds of current output, 100%(24mA@3V), 80%(19.5mA@3V), 50%(12.3mA@3V), 30%(7.35mA@3V).

(b). Drive Current output: Output is connected a LED with GND. (I$_{oh}$=7mA/10mA @V$_{DD}$=3V/4.5V).

(9). There are 5 kinds of output option for all output pins: (Mask option)

(a). Busy_High active: high active signal output during playing. (Drive output)

(b). Busy_Low active: low active signal output during playing. (Sink output)

(c). LED 3Hz flash: 3Hz sink signal output to drive LED during playing.

(d). LED dynamic 3/4: according to 3/4 sound level, dynamic sink signal output to drive LED during playing.

(e). QIO signal: arbitrary output with voice. For O1 and O2, there are two sets of QIO signal (Q1/Q4, Q2/Q5). Each *Voice Step* can select one set of QIO signal. But for IO3, there is only one set of QIO signal (Q3) to select. And for OKY/O5 and IO4, there is no QIO signal to select. User can edit the QIO signal by "*Quick-IO*" editor.

※ *Note: Where "LED 3Hz flash" is the LED flash rate at 6kHz sample rate. For different play speed, the LED flash rate is different from original 3Hz.*

(10). "*Power-On-Play*" special function (POP): When power is on, play the POP Sentence one time. The trigger mode is fixed as Edge/ Unhold. To cooperate with *Power-On-Loop* (POL) function, the POP Sentence will be played in loop. To cooperate with *Power-On-Play Interrupt* (POP Interrupt) function, when other key is triggered, it stops playing the POP Sentence and immediately plays the assigned sentence of triggered key. (Mask option)

(11). "*PWM On/Off*" special function: IO3 or IO4 can be set as *PWM On/Off* switch to control sound output or not. The trigger mode is fixed as Edge/ Unhold/ Retrigger. Besides, there is a *Play_End* option to cooperate with *PWM On/Off* function. If PWM output is disabled and *Play_End* option is *PWM On*, after IC enter Sleep mode, PWM output will be enabled to play sound if key is triggered to play the next sentence. If PWM output is disabled and *Play_End* option is *PWM No Change*, after IC enter Sleep mode, PWM output will remain disabled and no sound output when OKY/O5 is triggered to play the next sentence. User must trigger *PWM On/Off* switch to enable PWM output. (Mask option)

(12). "*Edge-Loop*" special function: When OKY/O5 is triggered, playing the assigned sentence in loop. To cooperate with One-Key Sequential function, playing the next assigned sentence in loop once key is triggered again. To cooperate with *Loop On/Off* function, stop playing if triggered once more, and play the next assigned sentence in loop once key is triggered again. To cooperate with *Loop-End* function, stop playing if triggered once more when playing the last sentence of OKY/O5, and play the first sentence in loop once key is triggered again. (Mask option)

   ※ *Note: Loop On/Off function cannot co-exist with Toggle On/Off function.*

(13). "*Anti-Noise Debounce*" special function: For a right trigger detection, the trigger signal needs a low-level Debounce time in advance of normal Debounce detection for high-level signal. It is used to prevent noise interference such like motor noise. With this function, the trigger signal won't result in double-trigger which usually occur when noise pull the high signal to low. (Mask option)

   ※ *Note: When enable this function, all inputs are optioned as Anti-Noise Debounce function.*

(14). "*Noise-Trigger*" special function: OKY/O5 or IO4 can be set as *Noise-Trigger* function. When this function is selected, OKY/O5 (or IO4) is set as Edge/ Unhold function. In PCB layout, OKY/O5 (or IO4) input needs a longer input line. By antenna effect, it takes place an input signal when larger noise happens outside. OKY/O5 (or IO4) is floating externally and is not necessary to connect to VDD or GND. It's popular in electric lighter or mobile antenna application. (Mask option)

(15). Serial-Trigger function: In Edge/ Unhold/ Retrigger mode, by using the One-Key Sequential and Reset functions of OKY/O5 and setting the Debounce time to be short, IC can access external serial clock signal to playback the specific Sentence of OKY/O5. Usually it cooperates with an external MCU.

(16). One 9-bit PWM output can directly drive speaker or buzzer.

3. BLOCK DIAGRAM
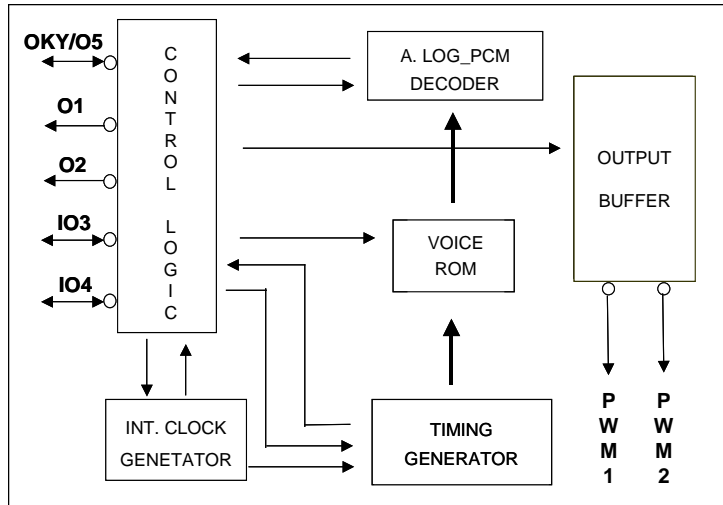
4. PAD DESCRIPTION

Pad Name	Pad No.	ATTR.	Description
OKY/O5	1	I/O	Input or output pin. To be input, active high.
O1	2	O	Output pin.
O2	3	O	Output pin.
IO3	4	I/O	Input or output pin. To be input, active high.
IO4	5	I/O	Input or output pin. To be input, active high.
GND	6	Power	Negative power.
VDD	7	Power	Positive power.
PWM1	8	O	PWM output 1.
PWM2	9	O	PWM output 2.

5. DEVELOPMENT & DEMONSTRATION

User can use "*Q-Speech*" & "*Quick-IO*" software tools to develop the desired functions. After finishing the code programming, user will get 2 files of "**.bin**" and "**.htm**", the binary file and function check list. Through "*Q-Writer*" operation, user can download the "**.bin**" file into *NY3L_FPGA_Tool* to demonstrate the NY3L function. Once the function has been approved, user only needs to send the "**.bin**" file to Nyquest for code release. For more details, please refer to "*Q-Speech*" & "*Quick-IO*" user manual.

6. ABSOLUTE MAXIMUM RATING

Symbol	Rating	Unit
VDD~GND	-0.5 ~ +7.5	V
V_{in}	GND-0.3 < V_{in} < VDD+0.3	V
V_{out}	GND < V_{out} < VDD	V
T_{op} (operating)	-0 ~ +70	ºC
T_{st} (storage)	-55 ~ +150	ºC

7. DC CHARACTERISTICS

Symbol	Parameter	V$_{DD}$	Min.	Typ.	Max.	Unit	Condition
V$_{DD}$	Operating voltage	--	1.6	3.0	6.4	V	
I$_{SB}$	Standby current	--		0.1	0.5	uA	
I$_{OP}$	Operating current	3.0		250		uA	No load.
		4.5		550			
I$_{IH}$	Input current (1.5M ohms pull-low)	3.0		2		uA	V$_{IL}$=VDD
		4.5		5			
	Input current (300K ohms pull-low)	3.0		10		uA	
		4.5		25			
I$_{OH}$	Output drive current	3.0		-7		mA	V$_{OH}$=2.0V
		4.5		-10			V$_{OH}$=3.5V
I$_{OL}$	Output sink current (100%)	3.0		24		mA	V$_{OL}$=1.0V
		4.5		36			
	Output sink current (80%)	3.0		19.5		mA	
		4.5		30			
	Output sink current (50%)	3.0		12.3		mA	
		4.5		18.8			
	Output sink current (33%)	3.0		7.35		mA	
		4.5		11.4			
I$_{PWM}$	PWM output current	3.0		60		mA	Load=8 ohms
		4.5		100			
ΔF/F	Frequency deviation by voltage drop	3.0		1		%	$\dfrac{Fosc(3.0v)-Fosc(2.4v)}{Fosc(3v)}$
		4.5		-0.5			$\dfrac{Fosc(4.5v)-Fosc(3.0v)}{Fosc(4.5v)}$
	Frequency lot deviation	--	-3		3	%	$\dfrac{Fmax(V_{DD})-Fmin(V_{DD})}{Fmax(V_{DD})}$
Fosc	Oscillation Frequency	--	614	768	800	kHz	VDD=1.6~5.5V

Voltage vs Freq. Deviation (SR=6.0KHz@3V)
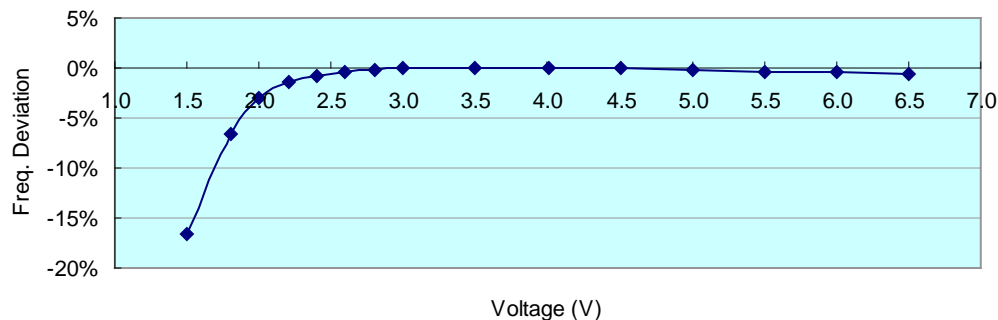
8. TIMING DIAGRAM

(1) Debounce Time

(a). Trigger while no playing voice
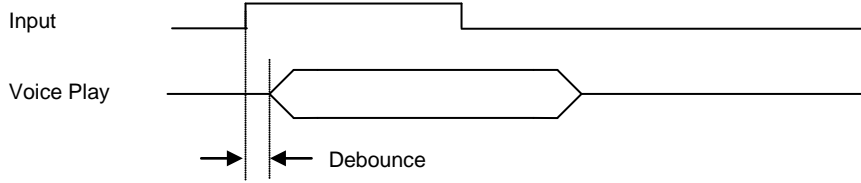
※ Debounce time is configured by 7.2 kHz S.R and the value is fixed. That is, Long debounce=17ms, Short debounce = 42us.

(b). Trigger While playing voice
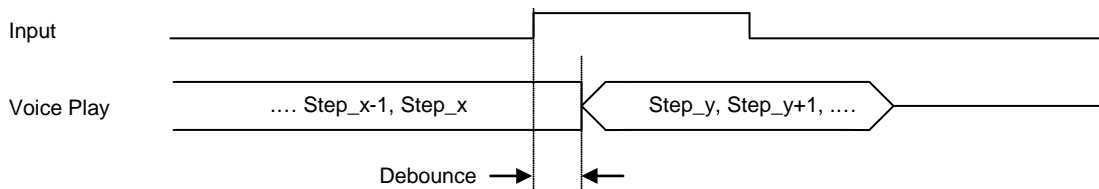
※ Debounce Time is configured by the S.R. of Step_x. At S.R. = 6kHz, Long debounce = 20ms, Short debounce = 50us.

For example, if Step_x S.R. = 8kHz, Long debounce = 20ms*(6k/8k) = 15ms, Short debounce = 50us*(6k/8k) = 37.5us.

(2) Input Priority
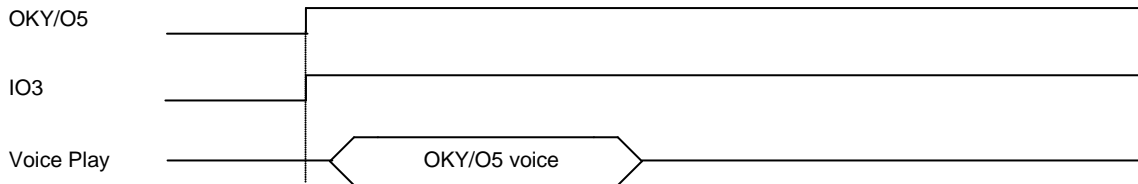
※ Priority: OKY/O5 > IO3 > IO4

(3) Output Signal (OKY/O5, O1, O2, IO3, IO4)
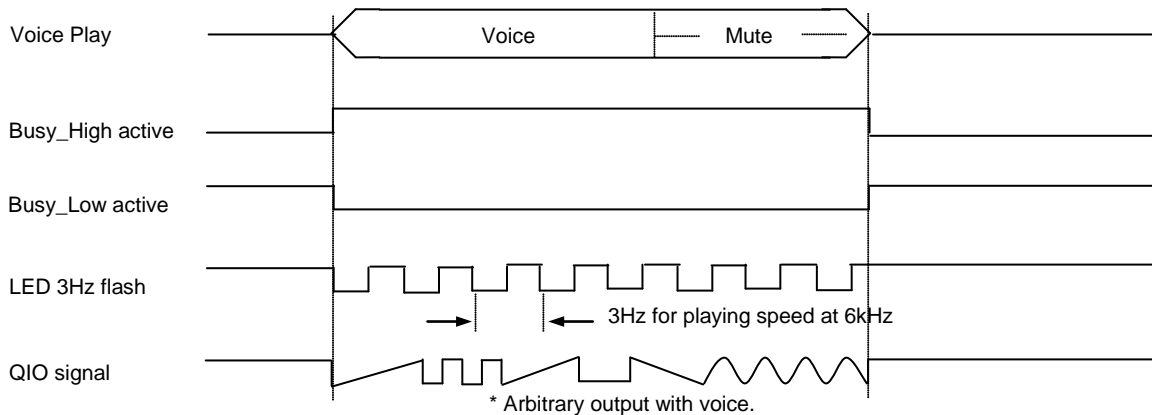
LED dynamic 3/4: When the voice amplitude is higher than 3/4 level, LED will be ON, i.e. output signal is low.

※　There are no QIO signal for OKY/O5 and IO4 output.

(4) Basic Operation

(a). Edge mode, Edge trigger

Input

Voice Play
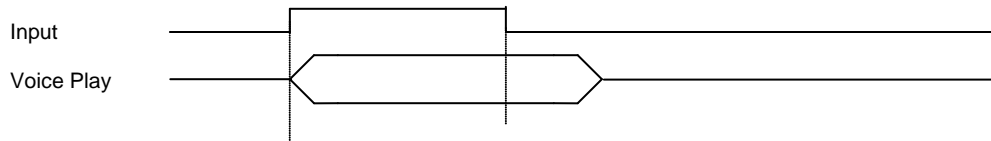
(b). Edge mode, Level trigger

Input

Voice Play
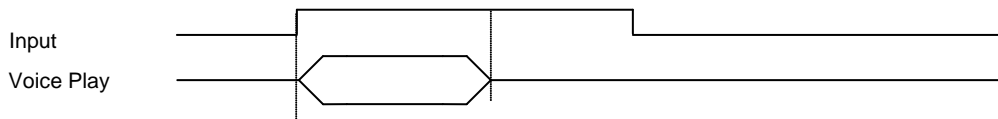
(c). Level mode, Edge trigger

Input

Voice Play
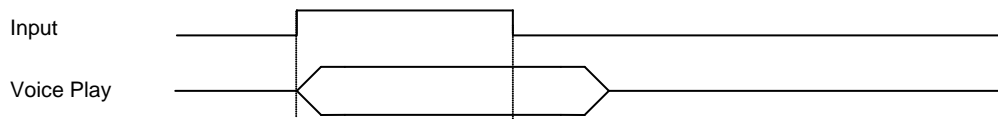
(d). Level mode, Level trigger

Input

Voice Play

(e). Retrigger mode

Input

Voice Play
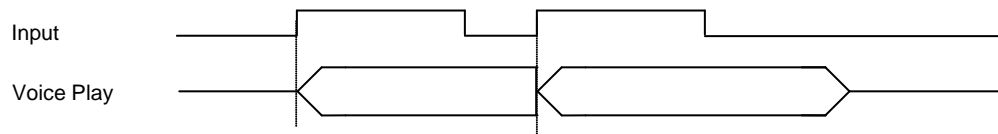
(f). Irretrigger mode
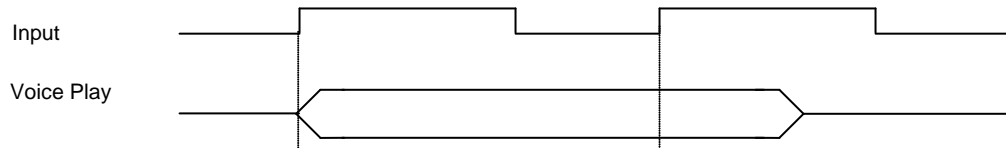
Input

Voice Play

(g). Retrigger mode, first key priority

OKY/O5

IO3

Voice Play   OKY voice   IO3 voice   OKY voice
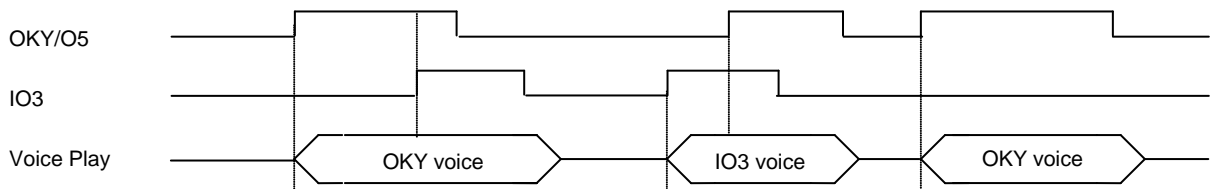
(5) Advanced Operation

(a). Different Input Reload (OKY is in Sequential mode)

(a-1) OKY (E/U/R) = S1 S2 S3 S4, IO3(E/U/R) = S5   (S1 means Sentence 1)

OKY/O5
IO3
Voice Play
| S1 | S5 | S2 |

(a-2) OKY (E/U/R) = S1 S2 S3 S4, IO3 (L/x/x) = S5
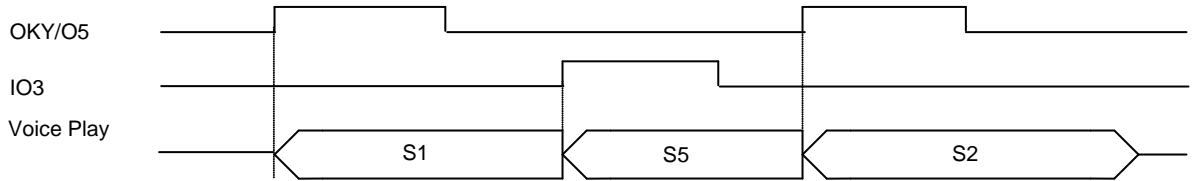
OKY/O5
IO3
Not active [*1]
Voice Play
| S1 | S2 |
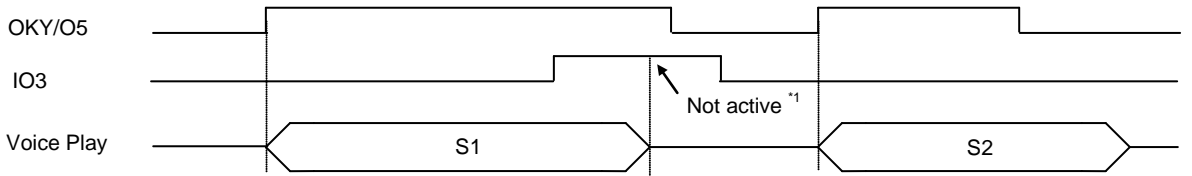
*1: If you press IO3 during OKY/O5 voice playing, at the moment of S1 end, the trigger mode follows OKY/O5 (E/U/R).

(a-3) OKY (E/U/I) = S1 S2 S3 S4, IO3 (E/x/x) = S5

OKY/O5
IO3
Not active
Voice Play
| S1 | S2 |

OKY/O5
Not active [*2]
IO3
Not active
Voice Play
| S1 |
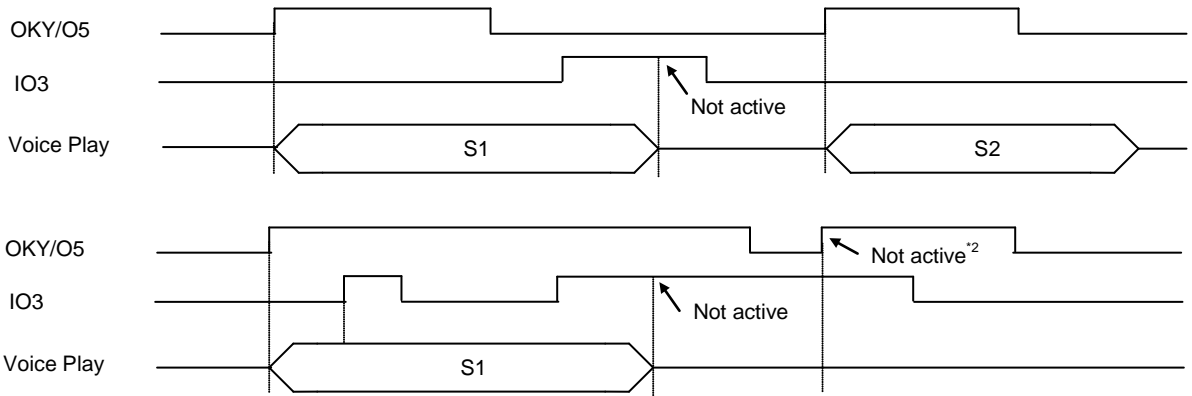
*2: Because IO3 signal is still high in the same time IC can't accept the OKY/O5 Edge signal.

(a-4) OKY (E/U/I) = S1 S2 S3 S4, IO3 (L/x/x) = S5

OKY/O5
IO3
Not active
Voice Play
| S1 | S2 |
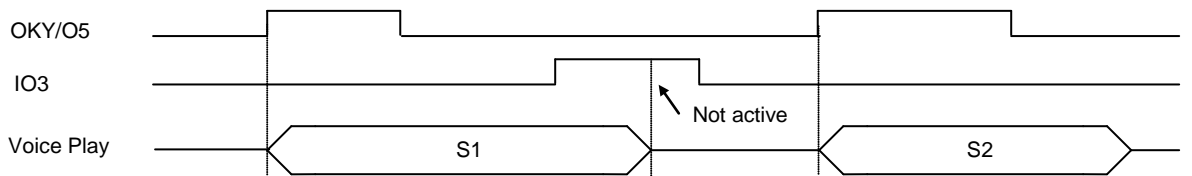
(a-5) OKY (L/U/x) = S1 S2 S3 S4, IO3 (E/x/x) = S5

OKY/O5
IO3
IO3 active
Voice Play
| S1 | S1 | **S5** | S2 |
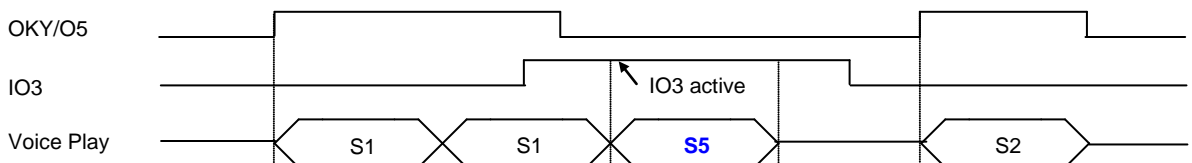
※   In the time of Sentence end: When S1 end, the trigger mode follows OKY/O5 (L/U/x). When S5 end, it follows IO3 (E/x/x).

※   Once S5 is played (just leave S1 ending), the trigger mode follows IO3 (E/x/x) immediately.

(a-6) OKY (L/U/x) = S1 S2 S3 S4, IO3 (L/U/I) = S5

OKY/O5

IO3   Load   No debounce happen (not S2) [*3]

     IO3 active

Voice Play   S1   S1   S1   **S5**   **S1**

※ Reload key priority: OKY/O5 > IO3
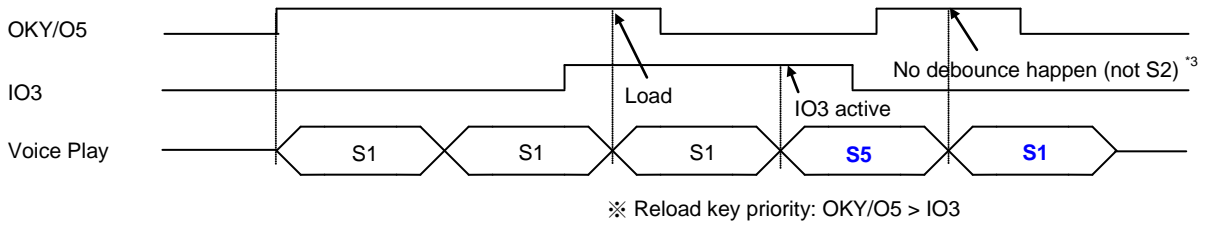
*3: In OKY/O5 mode, Sequential number is counted only if there is debounce happened.

(a-7) OKY (L/U/x) = S1 S2 S3 S4, IO3 (L/U/x) = S5

OKY/O5

IO3   No debounce happen [*4]   Sequential start (not S2) [*4]

Voice Play   S5   **S1**   **S1**   S2
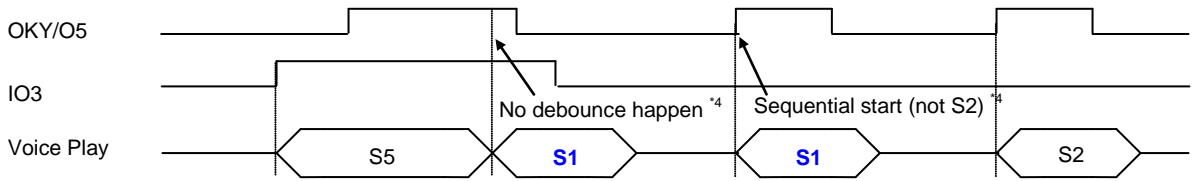
*4: In OKY mode, 1st trigger without debounce and Sequential number is still "1". 2nd trigger with debounce, after trigger the Sequential number become "2".

(b). Random Function

(b-1) OKY (L/U/I) = S1 S2 S3 S4, IO3 (L/U/I) = S5

Random (or Sequential) number is counted during "debounce time" or "key released time". But the first-time trigger only relies on "debounce time" due to no "key release time".

   Debounce time   Key released time   Key released time   Key released time

OKY/O5

IO3

Voice Play   Sx   Sx   S5   Sx

x=1, 2, 3 or 4 (x is random number)
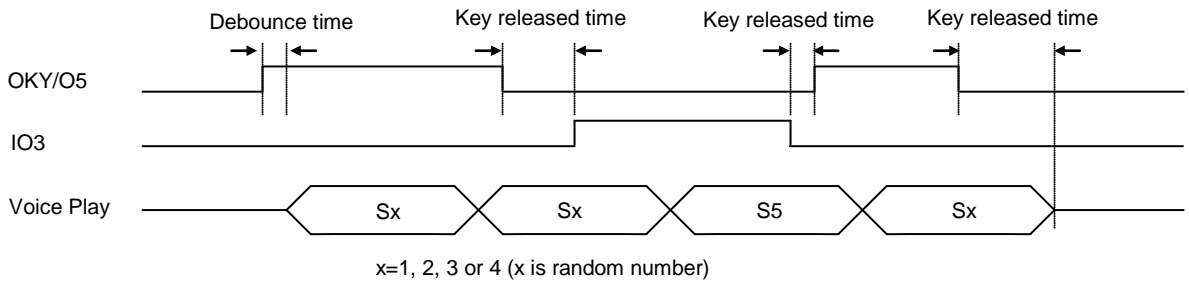
(b-2) OKY (L/U/R) = S1 S2 S3 S4, IO3 (L/U/R) = S5

OKY/O5

Voice Play   Sx   Sx   S5   S5   Sx   Sx
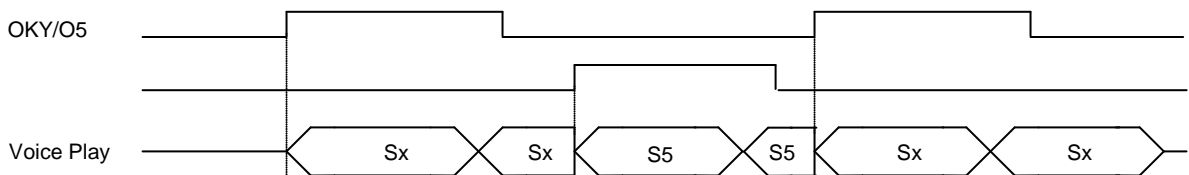
(c). Toggle On/Off Function

(c-1) OKY (E/U/R) = S1 S2 S3 S4, IO3 (E/U/R) = S5   (OKY is Sequential mode without Reset)
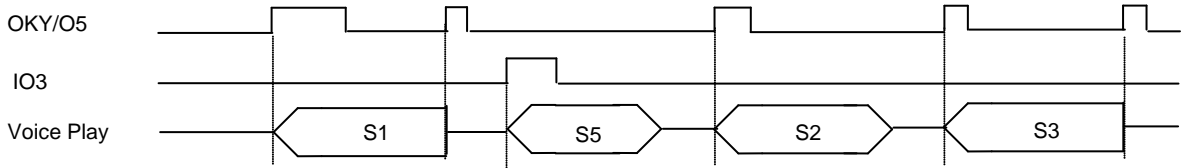
(c-2) OKY (E/U/R) = S1 S2 S3 S4, IO3 (E/U/R) = S5   (OKY is Sequential mode with Reset)
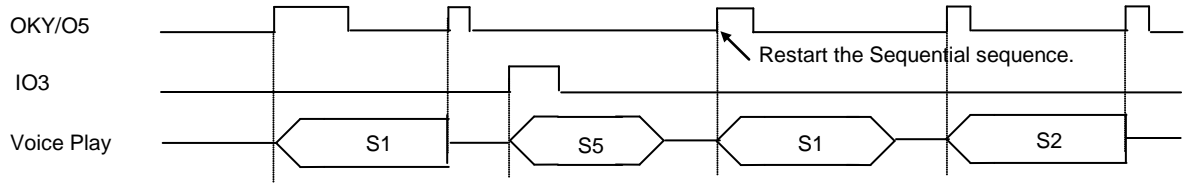
※ When OKY Sequential counter is going, to trigger other inputs will reset OKY Sequential sequence.

(d). External Feedback Function (O1 is output and connected to OKY input)

(d-1) OKY (L/U/I) = S1 S2 S3 S4, O1=Stop_high pulse (When voice ends, O1 shows a high pulse.)
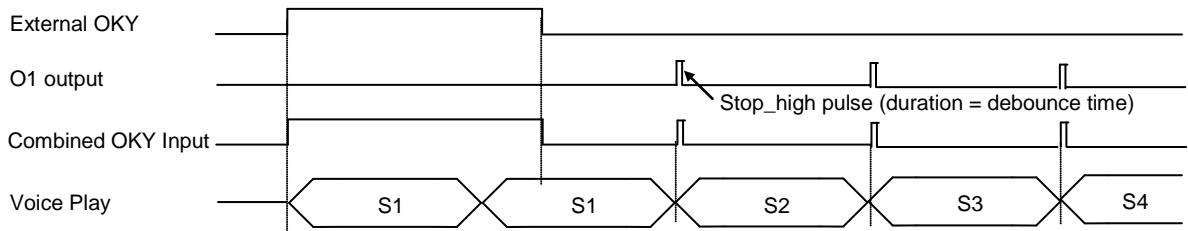
※ Originally the duration of Stop_high pulse is 172ms at 6kHz, but the high signal will trigger voice and turn low after debounce.

(d-2) OKY (E/U/I) = S1 S2 S3 S4, O1= Busy_low (When not playing voice, O1 is high.)
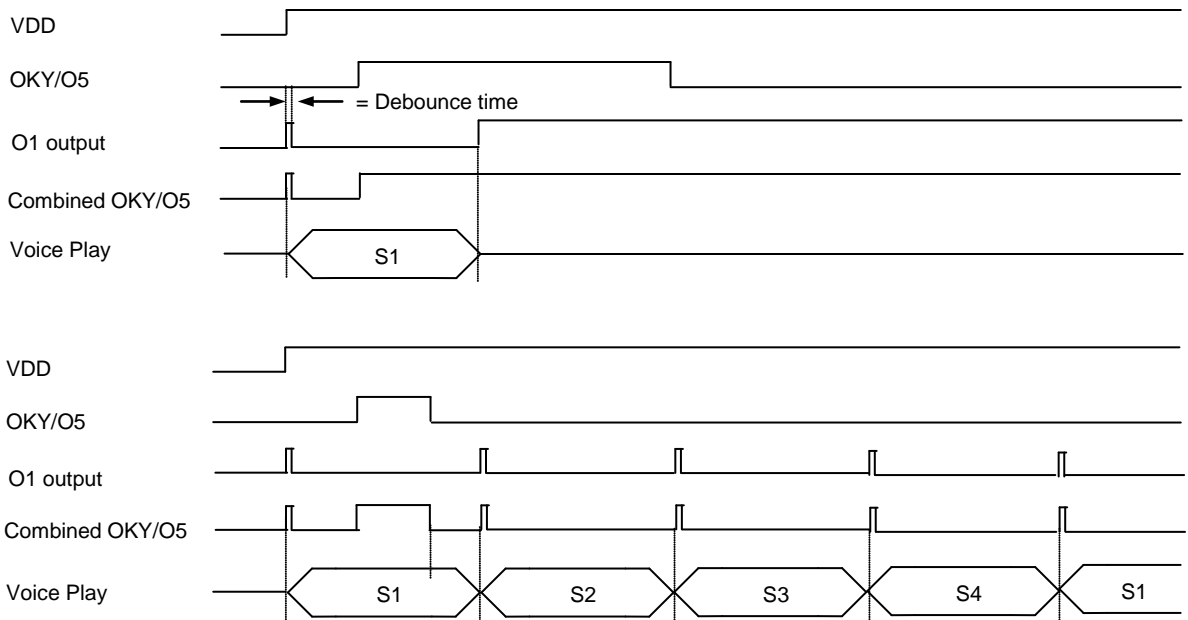
※ When power on, O1 will generate a high pulse at Busy_low status and the duration is equal to debounce time.

(e). Power-On-Play (POP) Function

(e-1) POP (E/U/I) = S2, OKY = S1, O1 = 3Hz Sink with S1 and S2
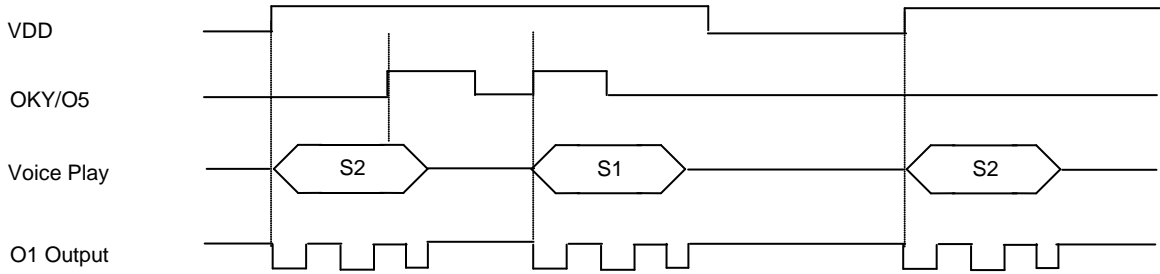
(e-2) POP (L/U/I) = S2, O1 = 3Hz Sink, O2 = 3Hz Sink, Power-On-Loop (POL) is enabled.

When both O1 and O2 are set as output and the trigger mode of Power-On-Play is set as Level mode, cooperating with Power-On-Loop (POL) function, play voice in loop.
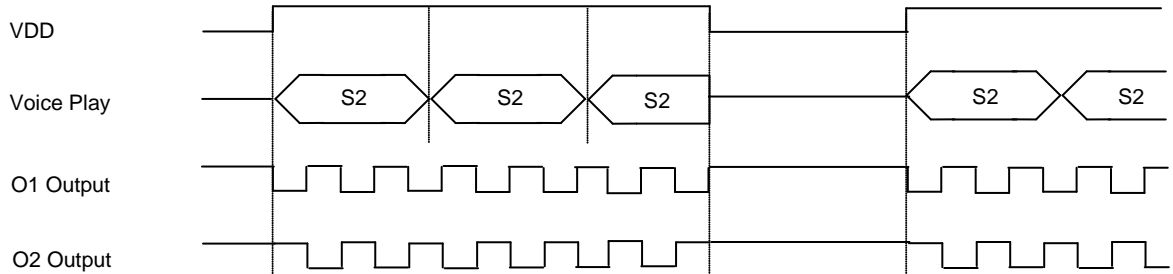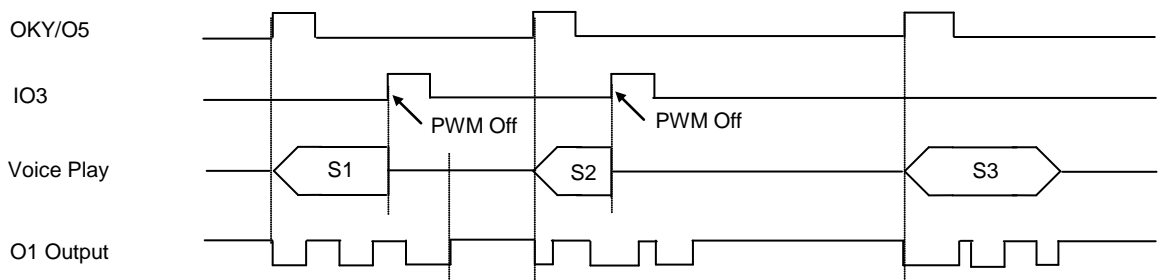

(f). PWM On/Off Function

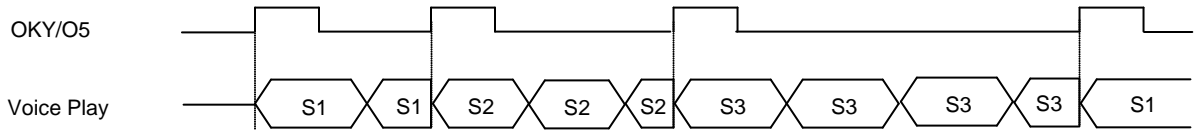*(f-1) OKY (E/U/R) = S1 S2 S3, IO3 is set as PWM On/Off key and Play_End Reset is disabled.*
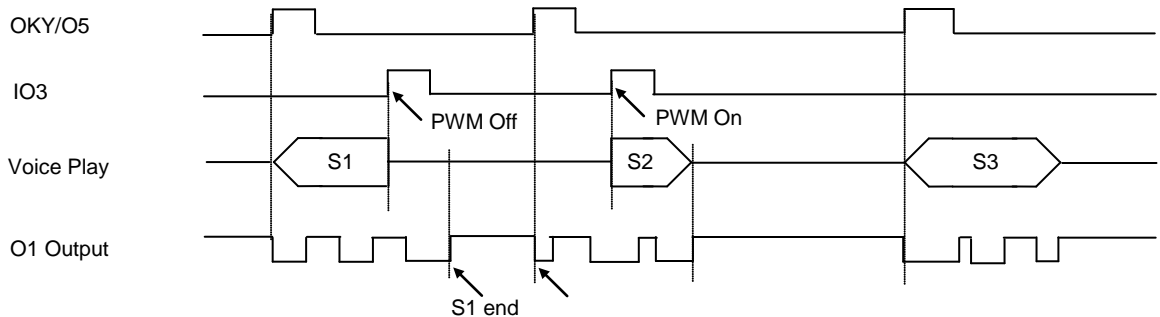
(f-2) OKY (E/U/R) = S1 S2 S3, IO3 is set as PWM On/Off key and Play_End Reset is enabled.

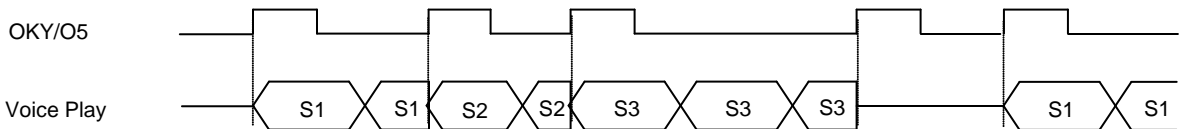**(g). Edge-Loop Function**

(g-1) OKY (E/U/R) = S1 S2 S3

(g-2) OKY (E/U/R) = S1
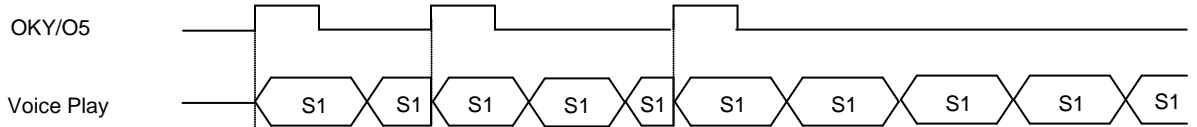
(g-3) OKY (E/U/R) = S1 S2 S3, Loop On/Off is enabled.
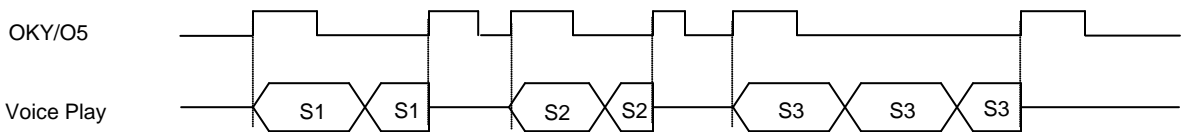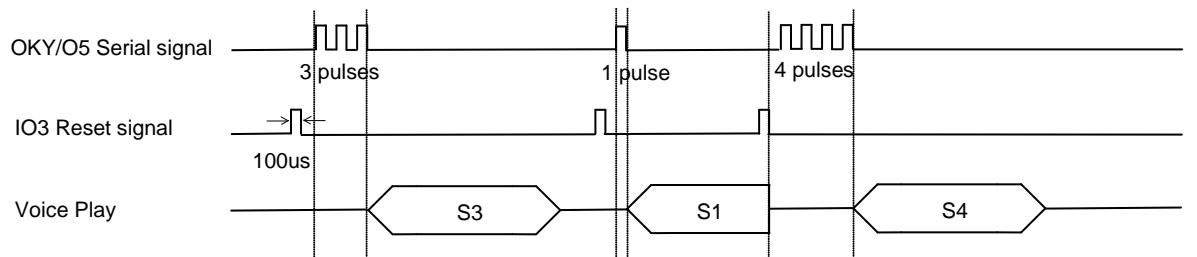

(g-4) OKY (E/U/R) = S1 S2 S3, Loop-End is enabled.

(h). Serial-Trigger Function *(All inputs must be set as short debounce)*

OKY (E/U/R) =S1 S2 S3 S4, IO3 (E/U/R) =S5   (OKY Reset is enabled, and S5 is a short mute Sentence)
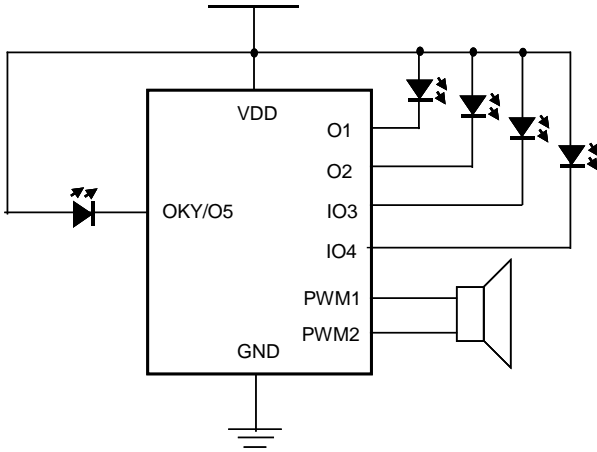

※ The pulse width must be longer than 50us (i.e. short debounce time), and users can set the typical pulse width as 100us.
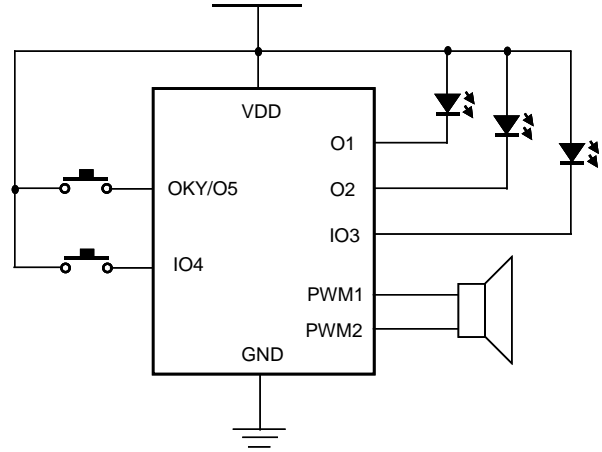
※ The above is the simplest 2-wire control by external MCU. If necessary, user can use 3-wrie control with Busy_High outptut

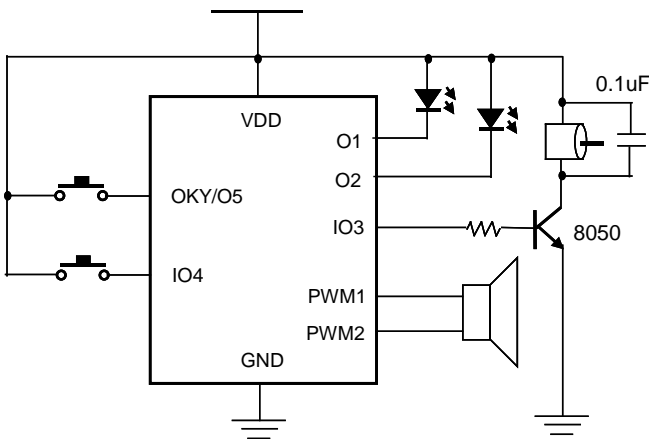signal to do feedback.
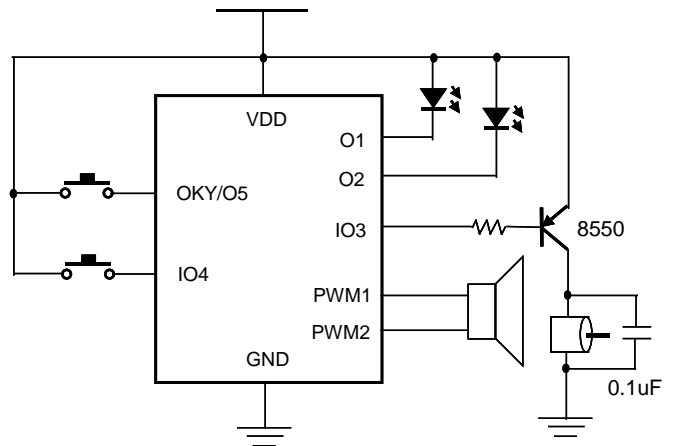
9. APPLICATION

(1) POP trigger with 5 LEDs (Sink)

(2) 2 trigger with 3 LEDs (Sink)

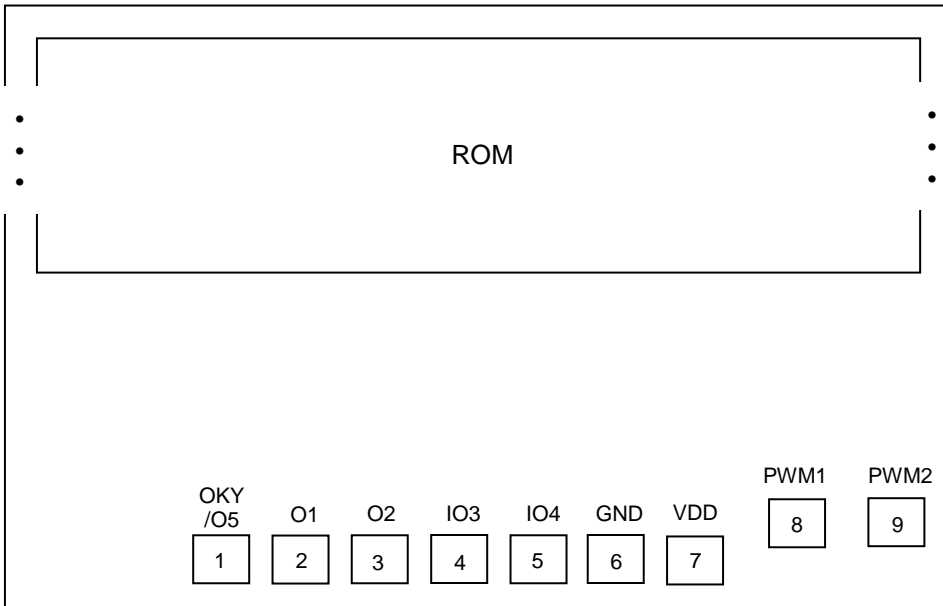**(3) 2 triggers with 2 LEDs (Sink) and 1 motor (Drive)**

(4) 2 triggers with 2 LEDs (Sink) and 1 motor (Sink)

* Please contact Nyquest or her agents if users want to add any power capacitor between VDD and GND.

10. DIE PAD DIAGRAM

ROM

OKY /O5	O1	O2	IO3	IO4	GND	VDD	PWM1	PWM2
1	2	3	4	5	6	7	8	9

* The IC substrate must be connected to GND or Floating.