九齊科技股份有限公司
Nyquest Technology Co., Ltd.

DATA SHEET

NY3PxxxE Series *(OTP for NY3C)*

2~3 I/O Single-Chip Speech Synthesizer

Version 1.1

Jul. 30, 2025

Revision History

Version	Date	Description	Modified Page
0.9	2025/04/21	Preliminary	-
1.0	2025/06/08	Modify package pin descriptions.	21
1.1	2025/07/30	1. Update Features. 2. Update External Feedback function. 3. Update NY3P086E die pad diagram.	4, 5, 7, 8 17 21

1. 概述

NY3PxxxE系列產品為單晶片CMOS語音合成 IC，是九齊科技為了支援 NY3C 系列MaskROM 產品所專門開發的嵌入式 EPROM架構的OTP IC (One Time Programmable)，共有5個母體分別為 NY3P007E、NY3P013E、NY3P021E、NY3P043E 和 NY3P086E。最多有 3個I/O腳，利用精準的內阻震盪(+/- 1%)，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。語音合成方式與 NY3C 系列MaskROM產品相同，藉由OTP燒錄過程中更換Code資料，可自行將不同的語音資料寫入EPROM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，然後使用*Q-Writer*軟體搭配 Smart Writer硬體來進行非常快速的OTP燒錄。

2. 功能

(1). 寬廣的工作電壓： 1.5V ~ 5.5V。

(2). 共有5個母體，對應不同NY3系列的容量(Hex-16進制)和秒數(@6kHz)如下：

NY3P007E	*NY3P013E*	*NY3P021E*	*NY3P043E*	*NY3P086E*
BC00H	13B80H	1FB80H	3FB80H	7FB80H
8.02s	13.46s	21.65s	43.50s	87.19s

NY3C 系列MaskROM產品的實際容量(Hex-16進制)和秒數(@6kHz)如下：

NY3C003C	*NY3C005C*	*NY3C007C*	*NY3C010C*	*NY3C016C*	*NY3C021C*	*NY3C027C*	*NY3C035C*	*NY3C043C*	*NY3C054C*	*NY3C065C*
5C00H	7C00H	BC00H	FC00H	17C00H	1FC00H	27C00H	37C00H	3FC00H	4FC00H	5FC00H
3.93s	5.29s	8.02s	10.75s	16.21s	21.67s	27.14s	38.06	43.52	54.44	65.37

※ 注意: 使用NY3P(E) OTP模擬 MaskROM IC 時，可以在 Q-Speech上將 Voice Sections 中的 Factor參數調整到一樣，這樣 Voice Data Size 相同，音質才會一樣。

※ 注意: NY3P(E) 音質、IO 均不相容 NY3D 系列。

(3). NY3P043E, NY3P086E 有 3個 I/O腳: OKY1/O5、OKY2/O4 和 IO2 可分別選作輸入腳或是輸出腳 。
NY3P007E, NY3P013E, NY3P021E 有 2個 I/O腳: OKY1/O5 和 IO2.

(4). 語音最多可被分割成 224個語音段(Voice Section)，每段長度可不同。每一個語音段的最大長度和最小長度都沒有限制。

(5). 最多有896個語音格(Voice Step)，可規劃成32個語音組(Voice Sentence)，OKY1/O5、OKY2/O4、IO2 和 POP能分別指定 32、32、1、1 個語音組(Sentence)。每一語音格(Step)可指定任一個語音段(Section)和 IO2、OKY2/O4、OKY1/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(+/- 1% 誤差)，*並無提供外部震盪電阻選項*。可支援 NY3C 系列不同的播放速度選項。

(a) NY3C 的 28種播放速度選項：

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
24.0kHz	20.0kHz	17.1kHz	15.0kHz	13.3kHz	12.0kHz	10.9kHz	10.0kHz	9.2kHz	8.6kHz
11	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
8.0kHz	7.5kHz	7.1kHz	6.7kHz	6.3kHz	6.0kHz	5.7kHz	5.5kHz	5.2kHz	5.0kHz
21	*22*	*23*	*24*	*25*	*26*	*27*	*28*		
4.8kHz	4.6kHz	4.4kHz	4.3kHz	4.1kHz	4.0kHz	3.9kHz	3.8kHz		

(7). I/O 對應圖：

NY3P(E)	OKY1/O5	OKY2/O4	IO2
NY3C	OKY/O3	IO1	IO2

(8). 輸入腳的輸入選項：

(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). OKY1/O5和OKY2/O4輸入腳最多各有32和32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).所有輸入腳都有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 OKY1/O5 > OKY2/O4 > IO2。*

(9). 所有的輸出腳都有以下 2 種輸出電流選項：

(a). Normal Sink Current Output (一般灌電流輸出) : 輸出腳接LED到VDD。(I_{OL}=22mA/33mA @V_{DD}=3V/4.5V)

(b). Large Sink Current Output (大灌電流輸出) : 輸出腳接LED到VDD。(I_{OL}=48mA/68mA @V_{DD}=3V/4.5V)

(10). 所有的輸出腳都分別有以下 9 種輸出選項：

(a). Stop_Low pulse：停止播放時送出低位準脈衝。

(b). Stop_High pulse：停止播放時送出高位準脈衝。 *(注意: OKY1/O5 不支援此選項)*

(c). Busy_High active：播放時送出高位準訊號。(Drive輸出) *(注意: OKY1/O5 不支援此選項)*

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

(e). LED 1.5Hz flash：播放時 LED 1.5Hz Sink輸出閃爍。

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

(g). LED 6Hz flash：播放時 LED 6Hz Sink輸出閃爍。

(h). LED dynamic 1/2：播放時 LED根據1/2聲音位準做Sink輸出動態閃爍。

(i). QIO訊號：可隨聲音作任意的輸出變化， IO2有一組QIO訊號，而OKY1/O5和OKY2/O4 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，NY3C的IO1和IO2總共有兩組QIO訊號，而OKY1/O3並沒有提供QIO選項。當NY3P043E、NY3P086E支援NY3C，OKY2模擬當作IO1，32個語音組(Sentence)變成1個語音組(Sentence)，此IO有一組QIO訊號。

IO	NY3P007E, NY3P013E, NY3P021E	NY3P043E, NY3P086E	NY3C
OKY1	X	X	X
IO2	QIO	QIO	QIO
OKY2 / IO1	-	X / QIO	- / QIO

※ *注意: LED 1.5Hz / 3Hz / 6Hz 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。*

(11). 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 / Retrigger。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-Loop 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。

(12). 特殊功能選項 ” 按鍵優先順序” (2-Key Priority)： 使用者可以決定先後按下兩鍵的優先播放順序，有2種順序選項：First Key (前鍵優先) 和 Last Key (後鍵優先)。First Key為先按的按鍵優先，為一般正常的操作；Last Key則為後按的按鍵優先，然而Last Key只支援OKY1/O5及OKY2/O4，使用者可以根據應用需求來使用Last Key。

(13). (特殊功能選項 ”內部觸發” (Internal-Feedback)： 此功能在2-IO時有兩組，OKY1 to OKY1或IO2 to OKY1。3-IO時有4組，OKY1 to OKY1、OKY1 to OKY2、OKY2 to OKY1、IO2 to OKY1。例如: 當OKY1(OKY2) 的聲音播放中被重覆觸發或聲音播放結束時，利用內部的Stop_High-Pulse信號來自動觸發 OKY2(OKY1) 所指定的語音組(Internal-Feedback Path)，播放該語音組一次。若NY3C的 BIN 轉燒入到 NY3PE 中，NY3PE雖無OKY1 to IO1功能，但是可支援NY3C的OKY1 to IO1功能(僅NY3P043E與NY3P086E)。

※ 注意: 當啟動此功能時，OKY1 或 OKY2 只能當做輸入腳。

(14). 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。

※ 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。

(15). 序列觸發功能(Serial-Trigger): 在 Edge/Unhold/Retrigger 觸發模式下，使用OKY1或OKY2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OKYx 的特定Sentence播放，通常搭配外部MCU來控制。

(16). 一組 9-bit 的 PWM 輸出可支援 NY3C 的 9-bit PWM 輸出，可直接驅動 8Ω、16Ω、32Ω、64Ω 的喇叭或蜂鳴片 。

(17). 支援低壓復位(LVR=1.5V)功能。

(18). 提供特殊的快速燒錄模式，以加快OTP燒錄時間。

(19). 支援特殊的*ICP* (In Circuit Programming) 燒錄功能，以方便客戶先組裝PCBA模組再進行燒錄。

(20). 提供可程式的Code資料保護模式。*(當Security-Bit 被燒斷後，資料將無法讀取。)*

(21). 提供多種出貨型態，以滿足客戶不同的應用需求。

(要進一步了解上述功能，請參考 NY3C 的規格書。)

1. GENERAL DESCRIPTION

The NY3PxxxE series are single-chip voice synthesizing CMOS IC. They are embedded EPROM architecture, and OTP (One Time Programmable) IC that are designed to support NY3C MaskROM products. There are 5 bodies: NY3P007E, NY3P013E, NY3P021E, NY3P043E and NY3P086E. There are maximum 3 I/O pins. Through accurate internal oscillation of +/- 1% tolerance, an external Rosc is unnecessary. There is only one PWM output for voice. Thus any external component is not required. Using the same speech algorithm as NY3C, customer's speech data can be written into EPROM by different code data. Besides, two interactive software developing tools of "*Q-Speech*" & "*Quick-IO*" are user-friendly and quick for programming, then users can write BIN code into OTP very fast by "*Q-Writer*" software cooperating with "*Smart Writer*" hardware.

2. FEATURES

(1). Wide operating voltage: 1.5V ~ 5.5V.

(2). There are 5 bodies. Corresponding to different NY3 series, the supported ROM size in Hex and speech duration at 6kHz are as following.

NY3P007E	*NY3P013E*	*NY3P021E*	*NY3P043E*	*NY3P086E*
BC00H	13B80H	1FB80H	3FB80H	7FB80H
8.02s	13.46s	21.65s	43.50s	87.19s

For NY3C MaskROM product series, the actual ROM size in Hex and speech duration at 6kHz are as following.

NY3C003C	*NY3C005C*	*NY3C007C*	*NY3C010C*	*NY3C016C*	*NY3C021C*	*NY3C027C*	*NY3C035C*	*NY3C043C*	*NY3C054C*	*NY3C065C*
5C00H	7C00H	BC00H	FC00H	17C00H	1FC00H	27C00H	37C00H	3FC00H	4FC00H	5FC00H
3.93s	5.29s	8.02s	10.75s	16.21s	21.67s	27.14s	38.06	43.52	54.44	65.37

※ *Note: Using NY3P(E) OTP to simulate NY3 MaskROM IC, users may adjust the Factor parameter of Voice Sections in Q-Speech to get same Voice Data Size for same sound quality.*

※ *Note: NY3P(E) does not compatible for NY3D for IO and sound quality.*

(3). NY3P043E, NY3P086E are 3 I/O pins: OKY1/O5、OKY2/O4 and IO2 an be either input or output pin. NY3P007E, NY3P013E, NY3P021E are 2 I/O pins: OKY1/O5 and IO2.

(4). The total voice duration can be partitioned up to maximum 224 *Voice Sections*. Each *Voice Section* length is flexible and each maximum or minimum *Voice Section* length is unlimited.

(5). Total maximum 896 *Voice Steps* are available for 32 *Voice Sentences*. OKY1/O5, OKY2/O4, IO2 and POP can assign 32, 32, 1 and 1 *Sentences* independently. Each *Step* can specify one *Voice Section* and enable/disable IO2, OKY2/O4, OKY1/O5 output option if IOx is set as output.

(6). Only build in an accurate internal oscillator of +/- 1% tolerance, *no external R oscillator*. It can support different play speed option of NY3C individually.

(a) NY3C: 28 kinds of play speed option.

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
24.0kHz	20.0kHz	17.1kHz	15.0kHz	13.3kHz	12.0kHz	10.9kHz	10.0kHz	9.2kHz	8.6kHz

11	12	13	14	15	16	17	18	19	20
8.0kHz	7.5kHz	7.1kHz	6.7kHz	6.3kHz	6.0kHz	5.7kHz	5.5kHz	5.2kHz	5.0kHz
21	22	23	24	25	26	27	28		
4.8kHz	4.6kHz	4.4kHz	4.3kHz	4.1kHz	4.0kHz	3.9kHz	3.8kHz		

(7). I/O mapping table.

NY3P(E)	OKY1/O5	OKY2/O4	IO2
NY3C	OKY/O3	IO1	IO2

(8). Input option for input pin:

(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). OKY1/O5 & OKY2/O4 input can select One-Key Sequential or Random for maximum 32 & 32 *Sentences* independently. At One-Key Sequential, the Reset function of playing *Sentence* sequence can be selected or not when other keys are triggered.

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

※ Note: Input priority is OKY1/O5 > OKY2/O4 > IO2.

(9). There are 4 kinds of output current option for all output pins.

(a). Normal Sink Current output: Output is connected a LED with VDD. (I_{ol}=22mA/33mA @V_{DD}=3V/4.5V)

(b). Large Sink Current output: Output is connected a LED with VDD. (I_{ol}=48mA/68mA @V_{DD}=3V/4.5V)

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

(a). Stop_Low pulse: Low active stop-pulse output whenever device stops playing.

(b). Stop_High pulse: high active stop-pulse output whenever device stops playing.

(※ Note: This option is not available for OKY1/O5.)

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

(※ Note: This option is not available for OKY1/O5.)

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

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

(f). LED 6Hz flash: 6Hz sink signal output to drive LED during playing.

(g). LED 12Hz flash: 12Hz sink signal output to drive LED during playing.

(h). LED dynamic 1/2: according to 1/2 sound level, dynamic sink signal output to drive LED during playing.

(i). QIO signal: arbitrary output with voice. For IO2 there is one set of QIO signal. And for OKY1/O5 and OKY2/O4, there is no QIO signal to select. User can edit the QIO signal by “Quick-IO” editor. For NY3C IO1 & IO2 there is two set of QIO signal. And for OKY1/O3, there is no QIO signal to select. When NY3P043E and NY3P086E support NY3C, OKY2 simulates as IO1, 32 Sentence become 1 Sentence. For this IO there is one set of QIO signal.

IO	NY3P007E, NY3P013E, NY3P021E	NY3P043E, NY3P086E	NY3C
OKY1	X	X	X
IO2	QIO	QIO	QIO
OKY2 / IO1	-	X / QIO	- / QIO

※ Note: Where (e) ~ (g) is the LED flash rate at 6kHz sample rate. For different play speed, the LED flash rate is different from original 1.4Hz, 3Hz or 6Hz.

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

(12). "*2-Key Priority*" special function: Users can decide the priority of 2 different keys when both keys are pressed at the same time. There are two kinds of priority option: First Key and Last Key. For First Key, the prior pressed key is first priority to play voice, and it's normal operation. As for Last Key, the later pressed key is first priority to play voice, and it only supports OKY1/O5 and OKY2/O4 input pins. Users can use Last Key option according to application requirement.

(13). "*Internal-Feedback*" special function: There are 2 sets of this function in 2-IO, OKY1 to OKY1 or IO2 to OKY1. In 3-IO, it has four sets: OKY1 to OKY1, OKY1 to OKY2, OKY2 to OKY1, IO2 to OKY1. For Example: When the playing sentence of OKY1(OKY2) is stopped or over, continue to play the assigned sentence of OKY2(OKY1) through internal Stop_High-Pulse signal (Internal-Feedback Path). If BIN from the NY3C is programmed into the NY3PE, although the NY3PE does not have the OKY1 to IO1 function, it still supports OKY1 to IO1 function from the NY3C (only for NY3P043E and NY3P086E).

※ Note: When enable this function, OKY1/O5 or OKY2/O4 is fixed as input pin.

(14). "*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.

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

(15). Serial-Trigger function: In Edge/Unhold/Retrigger mode, by using the One-Key Sequential and Reset functions of OKY1 or OKY2 and setting the Debounce time to be short, IC can access external serial clock signal to playback the specific Sentence of OKYx. Usually it cooperates with an external MCU.

(16). One 9-bit PWM output for NY3C 9-bit PWM output. It can directly drive 8, 16, 32, 64Ω speaker or piezo-buzzer.

(17). Low Voltage Reset (LVR=1.5V) is supported.

(18). A unique fast writing mode is provided to speed up OTP writing time.

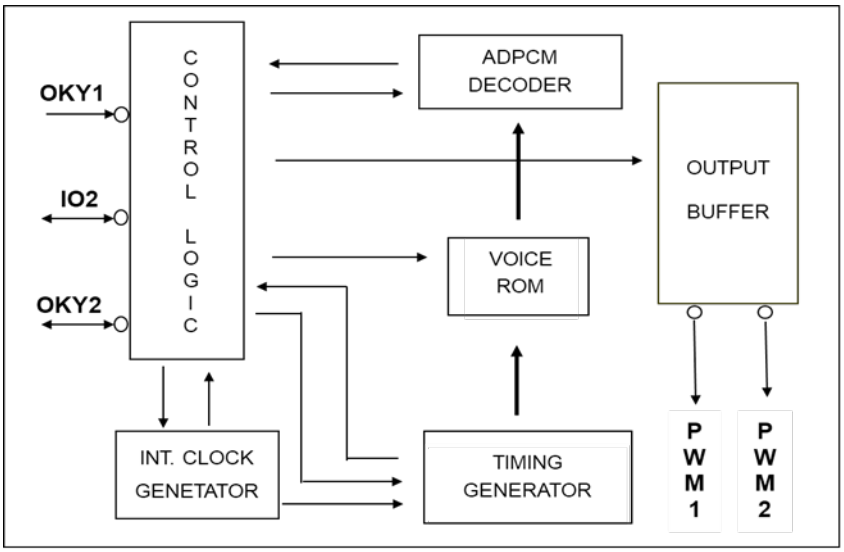
(19). A special *ICP* (In Circuit Programming) writing function is supported for user to fabricate PCBA in advance.

(20). Programmable code protection is provided. *(When the Security-Bit is burnt down, data can't be read.)*

(21). Various shipping type for different application requirement.

(For details of the above functions, please refer to NY3C datasheet.)

3. BLOCK DIAGRAM



4. PAD DESCRIPTION

Pad Name	ATTR.	Description
OKY1/O5 /Vpp	I	Input pin, active high, or positive high power for programming.
OKY2/O4/SDA	I/O	Output or input pin. To be input, active high. For NY3C code, this pin will become IO1. This pin can be SDA for programming. (No this pin for NY3P007E, NY3P013E, NY3P021E)
IO2 /SCL	I/O	Output or input pin. To be input, active high.
GND	Power	Negative power.
VDD	Power	Positive power.
PWM1/SDA	O	PWM output 1.
PWM2 /Mode	O	PWM output 2, or select programming mode.

5. DEVELOPMENT, DEMONSTRATION & PRODUCTION

User can use "*Q-Speech*" & "*Quick-IO*" software 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 "*OTP_Writer*" operation, user can download the "**.bin**" file into NY3P(E) chips to demonstrate the NY3 function. Customer can make pilot production by NY3P(E) OTP directly, or can send the "**.bin**" file to Nyquest to release MaskROM code for mass production. For more details, please refer to "*Q-Speech*" & "*Quick-IO*" user manual.

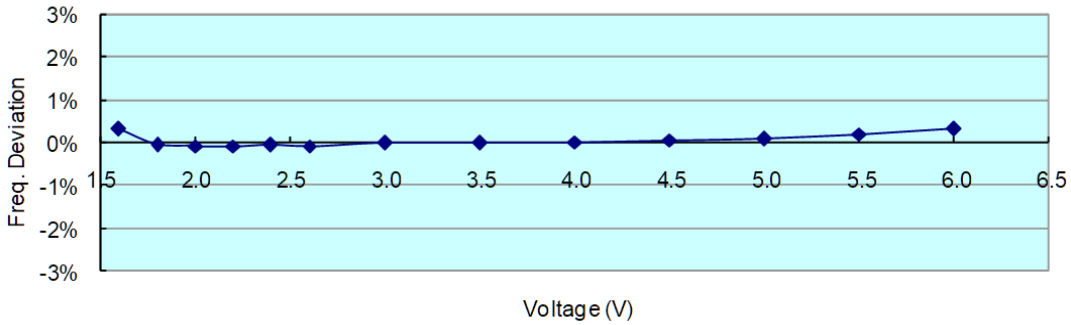
6. ABSOLUTE MAXIMUM RATING

Symbol	Rating	Unit
VDD~GND	-0.5 ~ +6.0	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	VDD	Min.	Typ.	Max.	Unit	Condition
VDD	Operating voltage	--	1.5	3.0	5.5	V	1.54MHz
ISB	Standby current	3.0		1.2		uA	LVR and POP disabled
		4.5		1.5			
		3.0		2.0			LVR or POP enabled
		4.5		3.0			
IOP	Operating current	3.0		1		mA	No load.
		4.5		1.5			
IIH	Input current (1.5M ohms pull-low)	3.0		2		uA	VIL=VDD
		4.5		5			
	Input current (300K ohms pull-low)	3.0		30		uA	
		4.5		85			
IOH	Output drive current	3.0		-7		mA	VOH=2.0V
		4.5		-11			VOH=3.5V
IOL	Output normal sink current	3.0		22		mA	VOL=1.0V
		4.5		33			
	Output large sink current	3.0		48		mA	
		4.5		68			
IPWM	PWM output current (Normal)	3.0		60		mA	Load=8 ohms
		4.5		100			
ΔF/F	Frequency deviation by voltage drop	3.0		-1.0		%	Fosc(3.0v)-Fosc(2.4v) / Fosc(3v)
		4.5		1.0			Fosc(4.5v)-Fosc(3.0v) / Fosc(4.5v)
	Frequency lot deviation	--		+-0.5		%	Fmax(VDD)-Fmin(VDD) / Fmax(VDD)
Fosc	Oscillation Frequency	--	1.52	1.54	1.56	MHz	VDD=1.7~5.5V

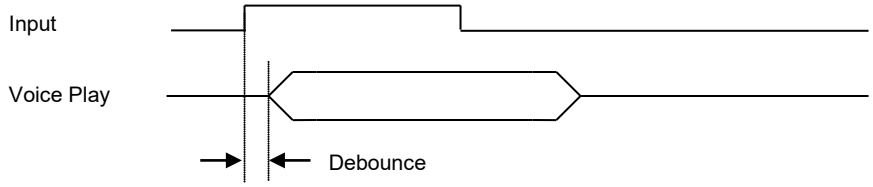
Voltage vs Freq. Deviation (SR=6.0KHz@3V)



8. TIMING DIAGRAM

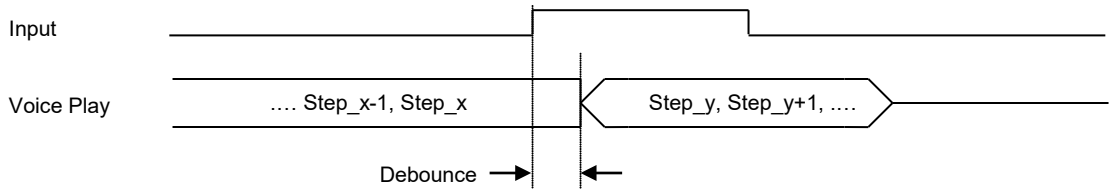
(1) Debounce Time

(a). Trigger while no playing voice



※ Debounce time is configured by 6.67 kHz S.R and the value is fixed. That is, Long debounce=20ms, Short debounce = 50us

(b). Trigger While playing voice



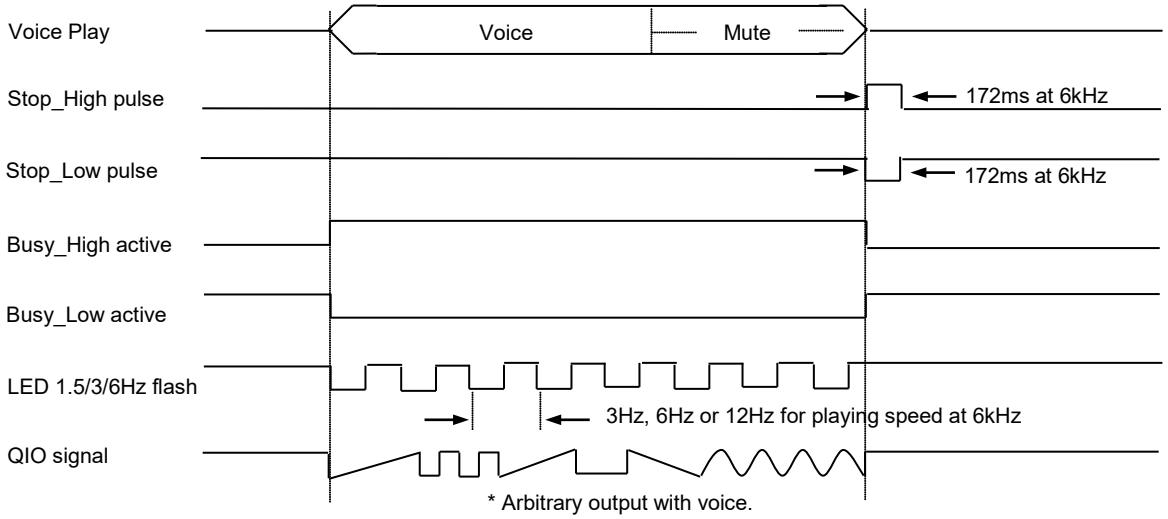
※ Debounce Time is configured by the S.R. of Step_x. At S.R. = 6kHz, Long debounce = 20ms, Short debounce = 50us

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: OKY1/O5 > OKY2 > > IO2 >

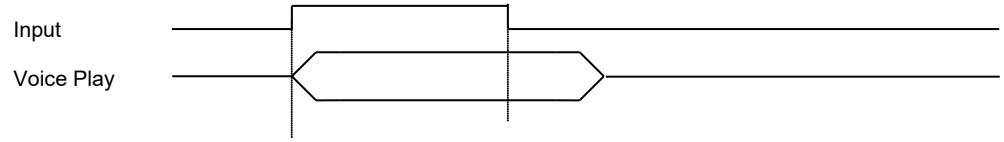
(3) Output Signal (IO2, O4)



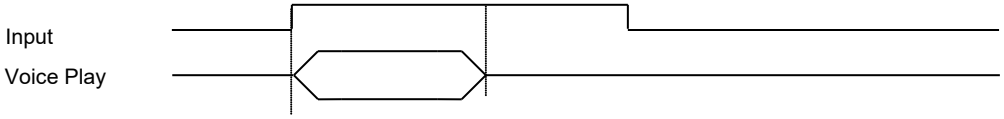
LED dynamic 1/2: When the voice amplitude is higher than 1/2 level, LED will be ON, i.e. output signal is low.

(4) Basic Operation

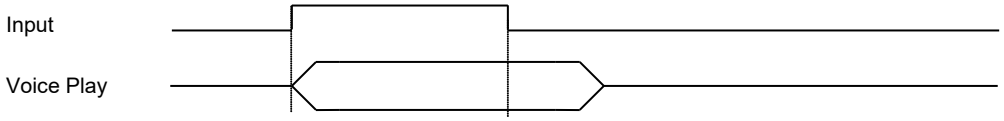
(a). Edge mode, Edge trigger



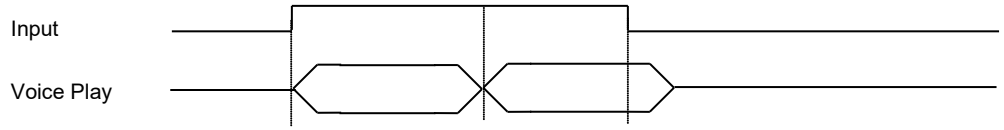
(b). Edge mode, Level trigger



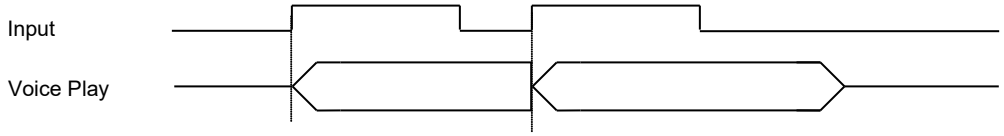
(c). Level mode, Edge trigger



(d). Level mode, Level trigger

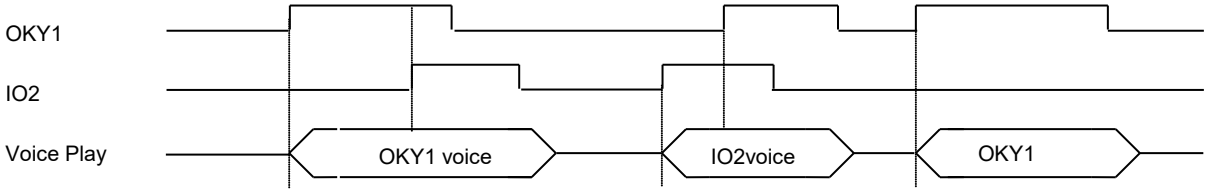


(e). Retrigger mode



(f). Irretrigger mode

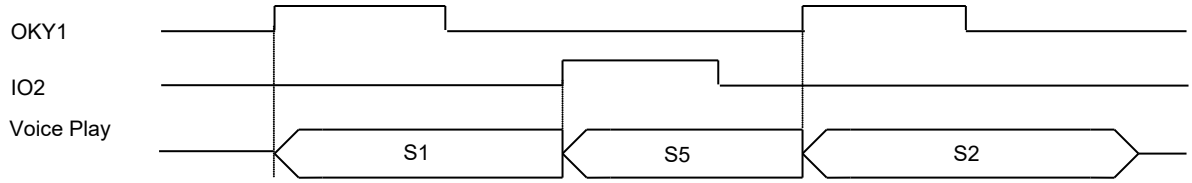
(g). Retrigger mode, first key priority



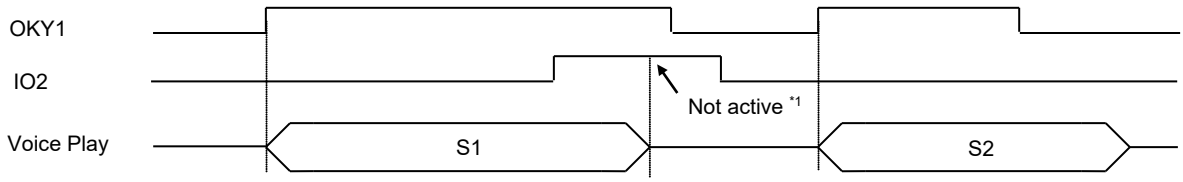
(5) Advanced Operation

(a). Different Input Reload *(OKY1 is in Sequential mode)*

(a-1) OKY1 (E/U/R) = S1 S2 S3 S4, IO2(E/U/R) = S5 (S1 means Sentence 1)

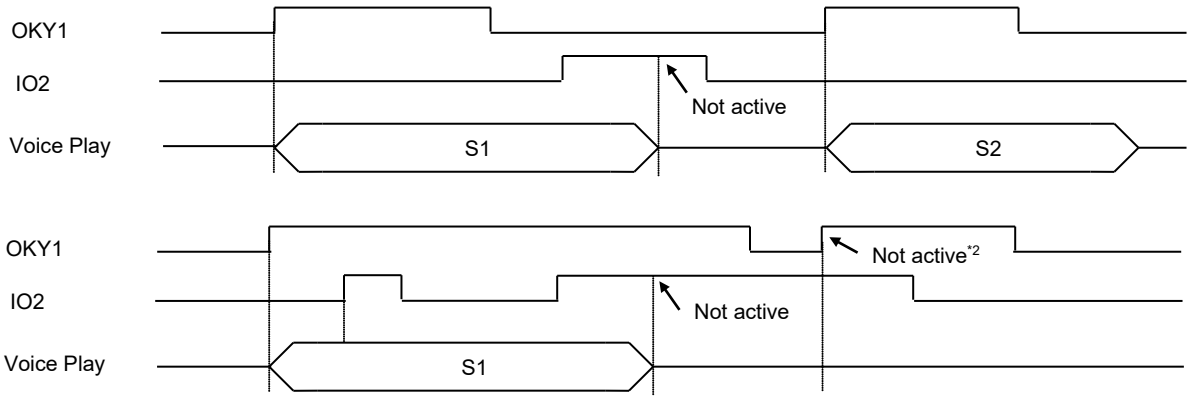


(a-2) OKY1 (E/U/R) = S1 S2 S3 S4, IO2 (L/x/x) = S5



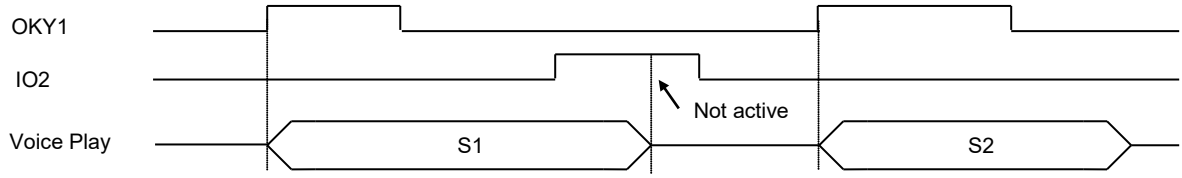
*1: If you press IO2 during OKY1 voice playing, at the moment of S1 end, the trigger mode follows OKY1

(a-3) OKY1 (E/U/l) = S1 S2 S3 S4, IO2 (E/x/x) = S5

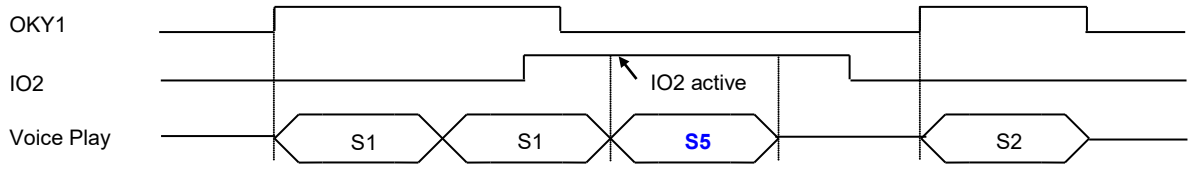


*2: Because IO2 signal is still high in the same time IC can't accept the OKY1 Edge signal.

(a-4) OKY1 (E/U/l) = S1 S2 S3 S4, IO2(L/x/x) = S5



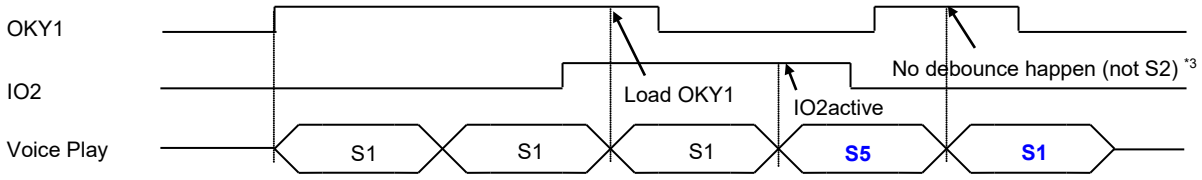
(a-5) OKY1 (L/U/x) = S1 S2 S3 S4, IO2(E/x/x) = S5



※ In the time of Sentence end: When S1 end, the trigger mode follows OKY1 (L/U/x). When S5 end, it follows IO2 (E/x/x).

※ Once S5 is played (just leave S1 ending), the trigger mode follows IO2 (E/x/x) immediately.

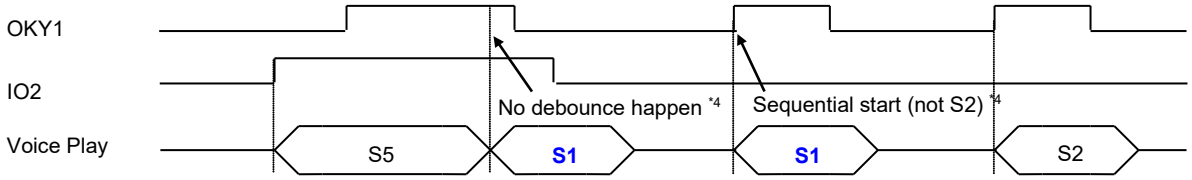
(a-6) OKY1 (L/U/x) = S1 S2 S3 S4, IO2 (L/U/I) =S5



※ Reload key priority: OKY1 > IO2

*3: In OKY1 mode, Sequential number is counted only if there is debounce happened.

(a-7) OKY1 (L/U/x) = S1 S2 S3 S4, IO2 (L/U/x) =S5

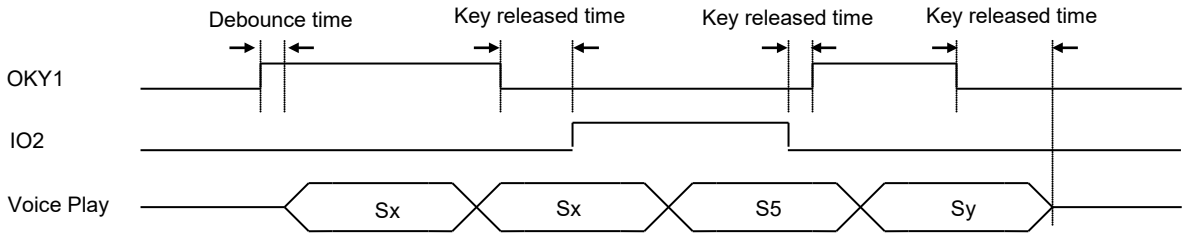


*4: In OKY mode, 1st trigger without debounce and Sequential number is still "1". 2nd trigger with debounce, after trigger the Sequential number become "2".

(b). Random Function

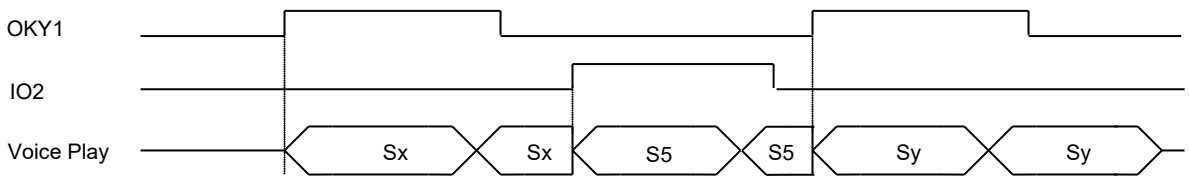
(b-1) OKY1 (L/U/I) =S1 S2 S3 S4, IO2 (L/U/I) =S5

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".



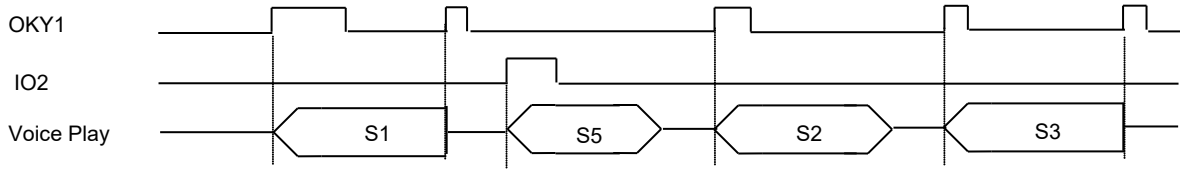
x=1, 2, 3 or 4; y=1, 2, 3 or 4 (x and y are random number)

(b-2) OKY1 (L/U/R) =S1 S2 S3 S4, IO2 (L/U/R) =S16

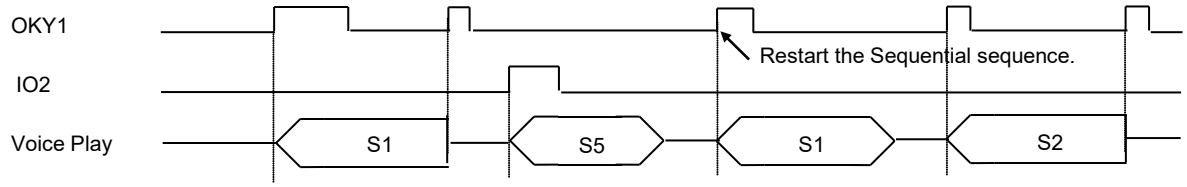


(c). Toggle On/Off Function

(c-1) OKY1 (E/U/R) =S1 S2 S3 S4, IO2 (E/U/R) =S5 (OKY1 is Sequential mode without Reset)



(c-2) OKY1 (E/U/R) =S1 S2 S3 S4, IO2 (E/U/R) =S16 (OKY1 is Sequential mode with Reset)



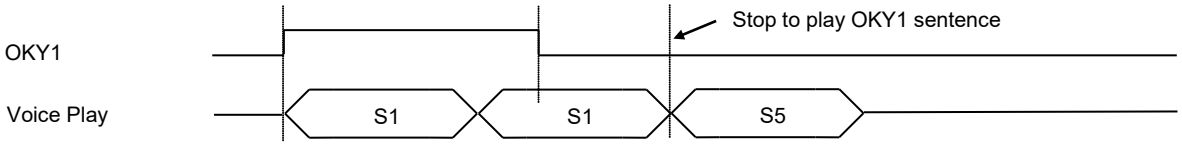
※ When OKY1 Sequential counter is going, to trigger other inputs will reset OKY1 Sequential sequence.

(d). Internal-Feedback Function *(OKY1/O5 is fixed as input)*

Each sentence can assign an Internal-Feedback Path to play a fixed sentence after IO's sentence stop.

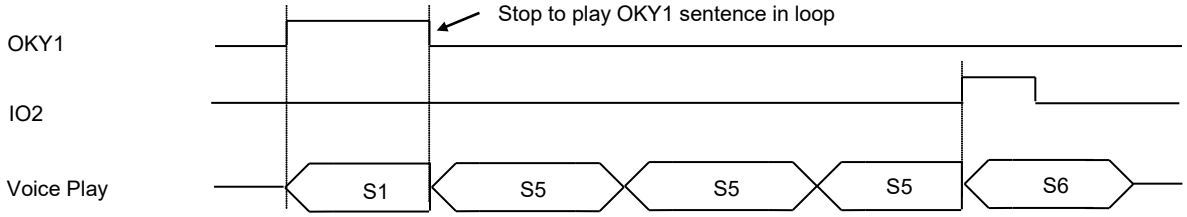
(d-1) OKY1 (L/U/I) = S1 S2 S3 S4, OKY2 = S5, Internal-Feedback Path = OKY1/O5 → OKY2

If S1 is optioned with Internal-Feedback Path,



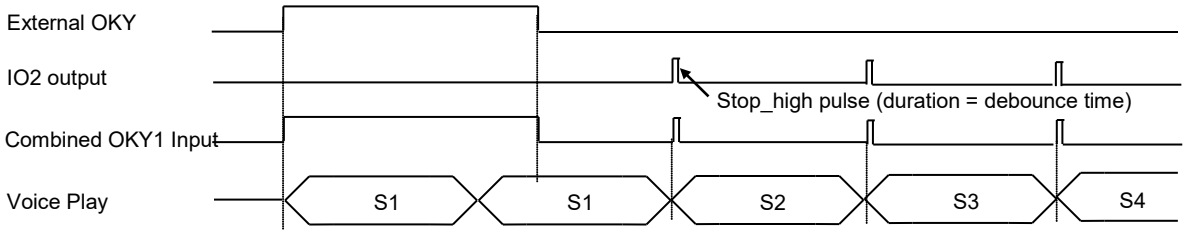
(d-2) OKY1 (L/H/I) = S1 S2 S3 S4, OKY2 (x/x/R) = S5, IO2 (E/U/I) = S6, Internal-Feedback Path = OKY1/O5 → OKY2

If both S1 and S5 are optioned with Internal-Feedback Path,



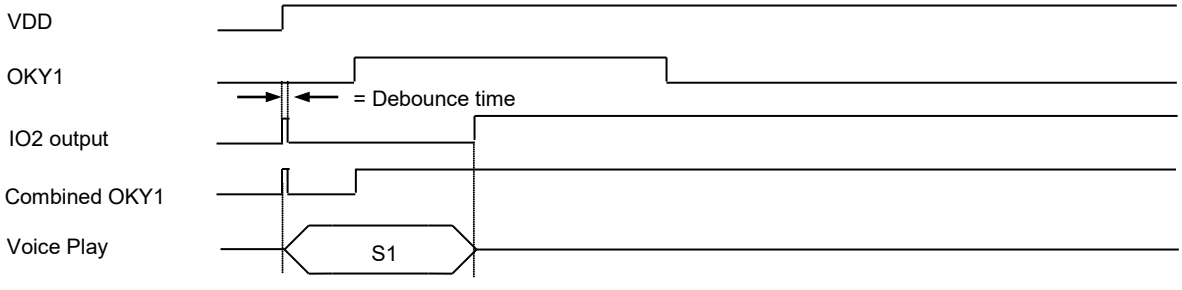
(e). External Feedback Function *(IO2 is output and connected to OKY1 input)*

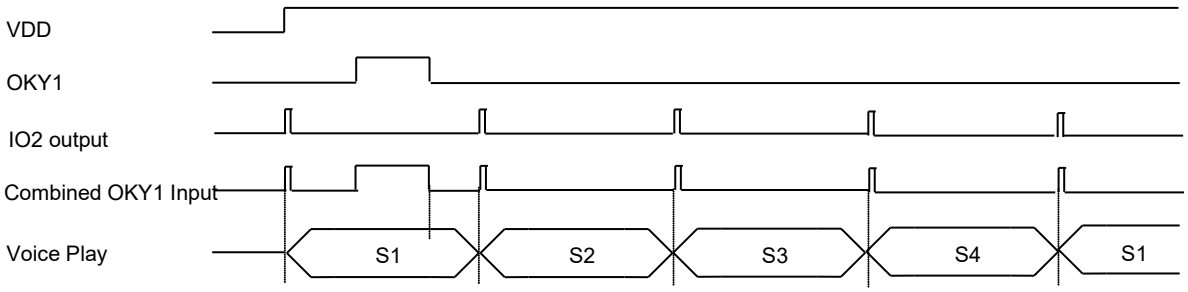
(d-1) OKY1 (L/U/I) =S1 S2 S3 S4, IO2=Stop_high pulse (When voice ends, IO2 shows a high pulse.)



※ 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) OKY1 (E/U/I) = S1 S2 S3 S4, IO2= Busy_low (When not playing voice, IO2 is high.)

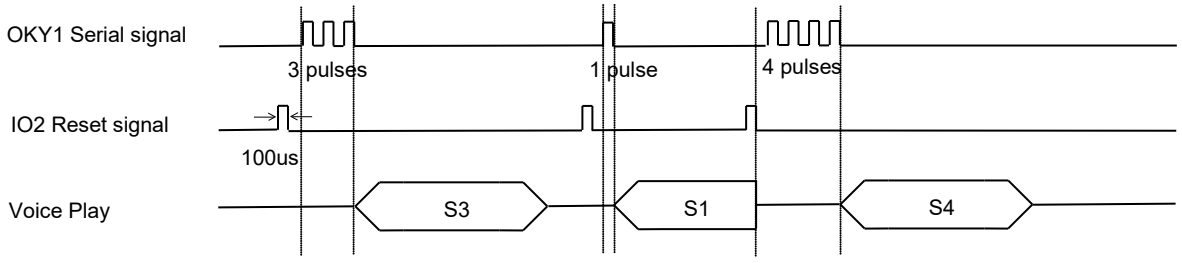




※ When power on, IO2 will generate a high pulse at Busy_low status and the duration is equal to debounce time.

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

OKY1 (E/U/R) =S1 S2 S3 S4, IO2(E/U/R) =S5 (OKY1 Reset is enabled, and S5 is a short mute Sentence)

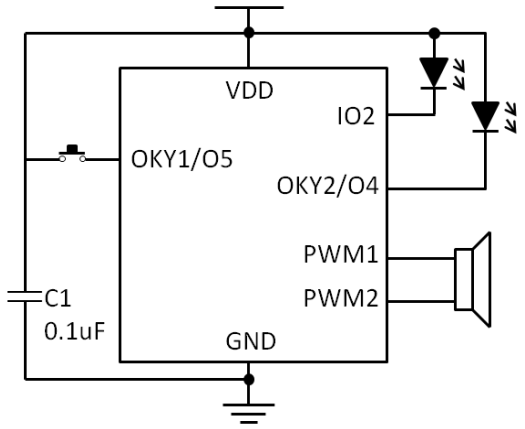


※ The pulse width must be longer than 50us (i.e. short debounce time), and users can set the typical pulse width as 100us.

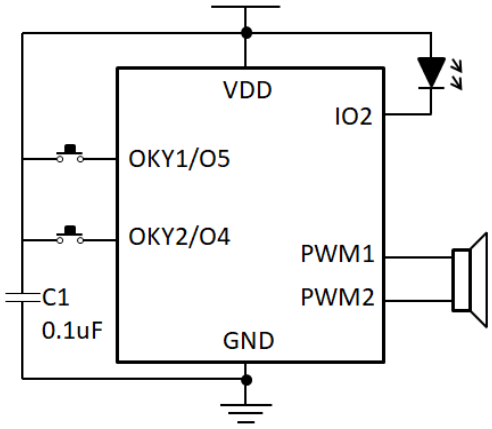
※ The above is the simplest 2-wire control by external MCU. If necessary, user can use 3-wire control with Busy_High output signal to do feedback.

9. APPLICATION

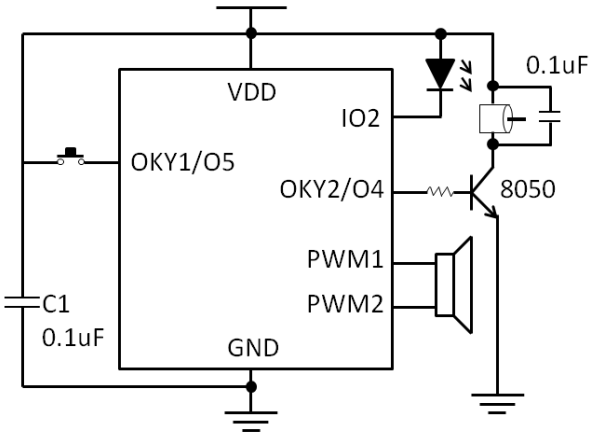
(1) 1 trigger with 2 LEDs (Sink)



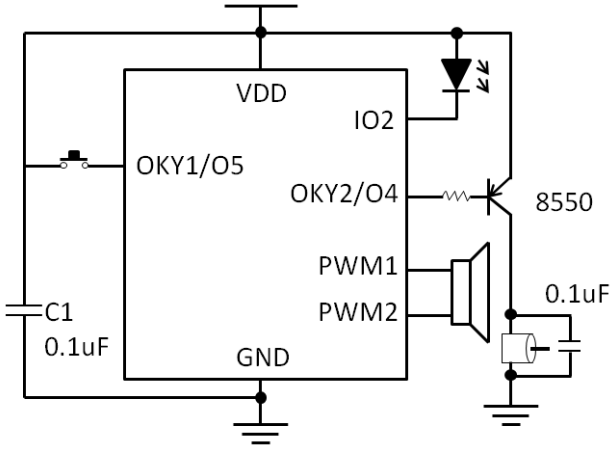
(2) 2 triggers with 1 LEDs (Sink)



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



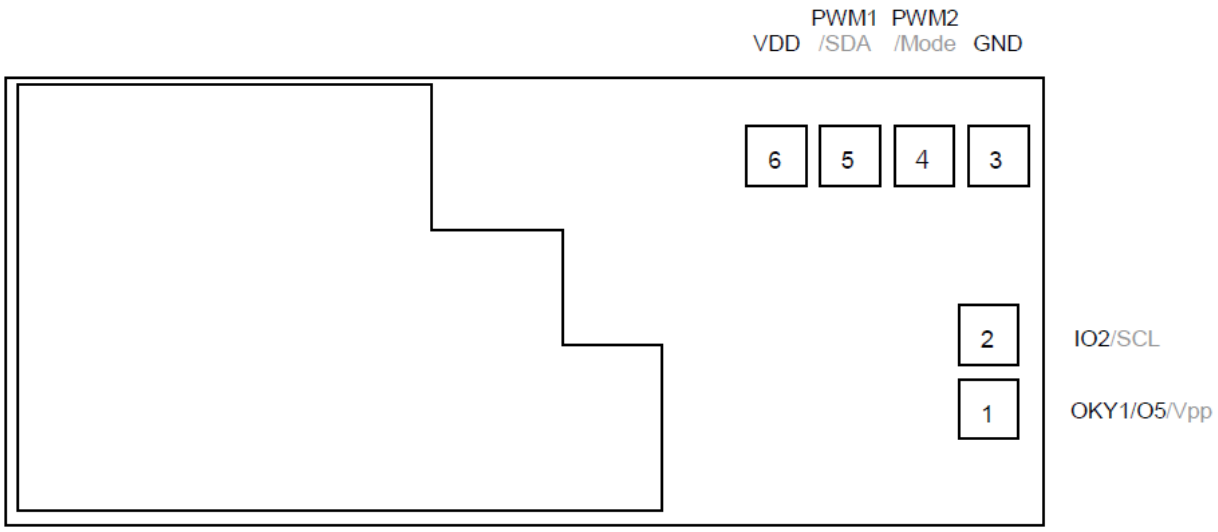
(4) 1triggers with 1LEDs (Sink) and 1 motor (Sink)



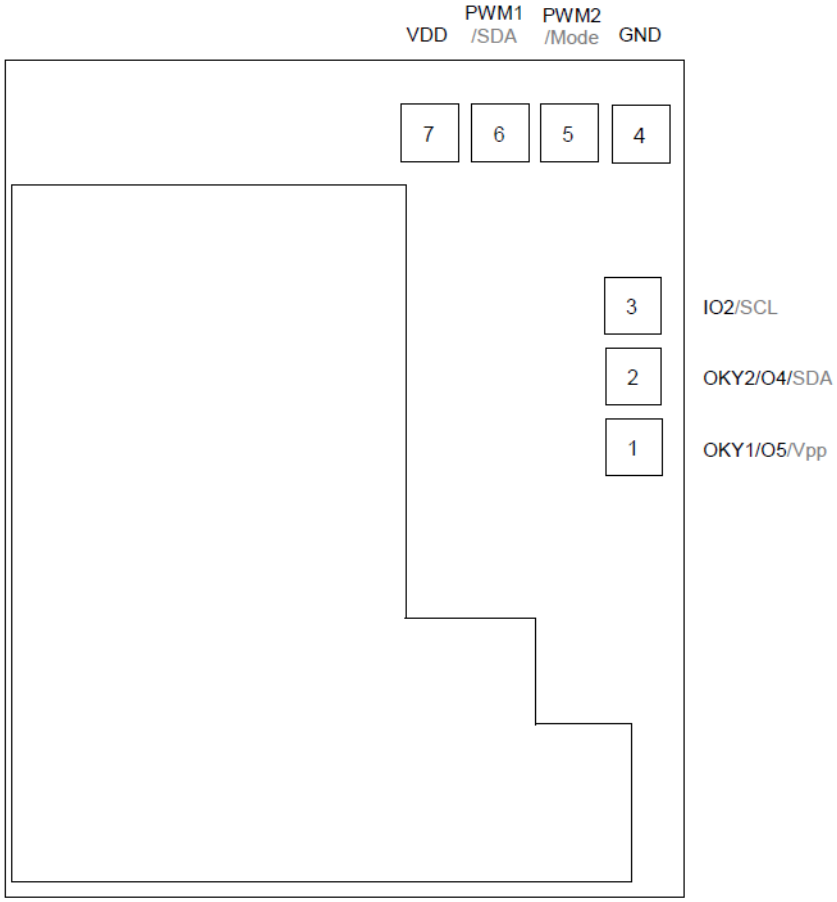
Note: C1 is VDD power cap, please MUST connect a 0.1uF cap between VDD and GND, or there will be noise while playing voice.

10. DIE PAD DIAGRAM

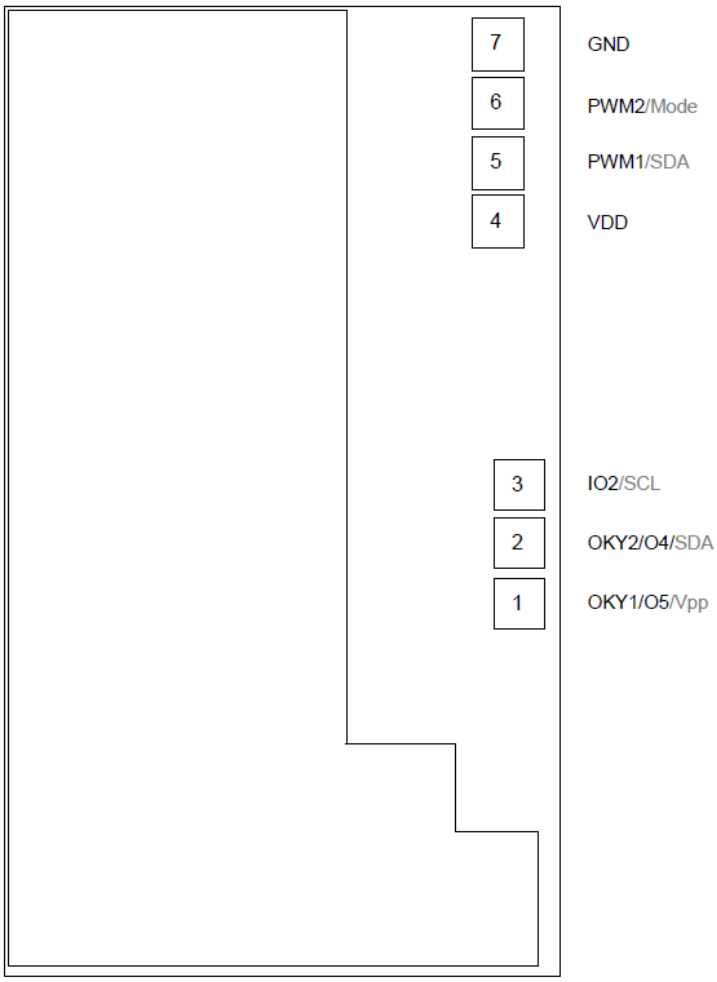
NY3P007E, NY3P013E, NY3P021E



NY3P043E



NY3P086E

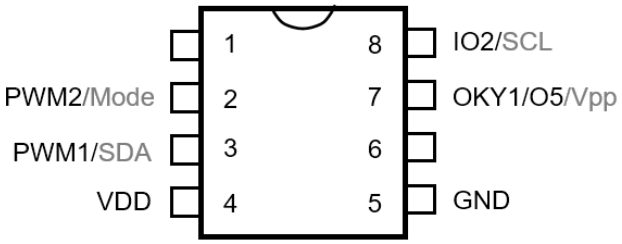


* IC substrate must be connected to GND or floating.

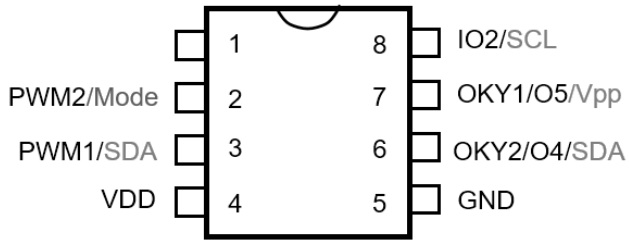
* * Both SDA from PWM1 or OKY2 can work for programming.

11. PACKAGE PIN ASSIGNMENT

11.1 8-pin SOP

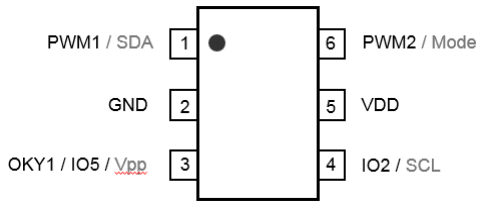


NY3P007ES8 /
NY3P013ES8 /
NY3P021ES8



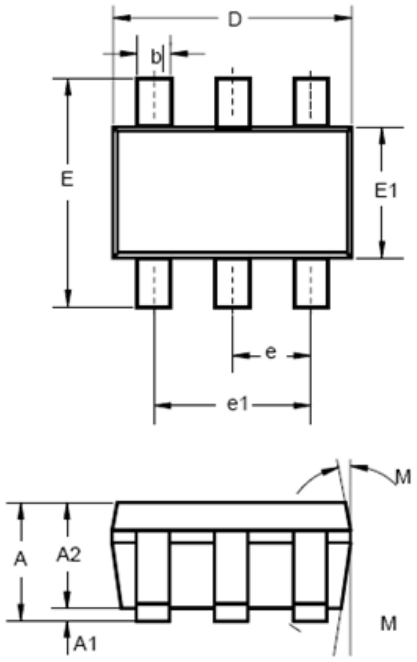
NY3P043ES8 /
NY3P086ES8

11.2 SOT23-6



12. PACKAGE DIMENSION

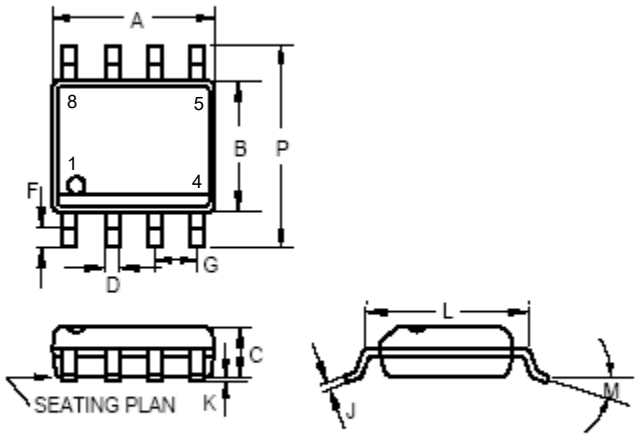
12.1 6-Pin Plastic SOT23-6 (63 mil)



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	-	-	0.057	-	-	1.45
A1	-	-	0.006	-	-	0.15
A2	0.035	0.045	0.051	0.90	1.15	1.30
b	0.012	-	0.020	0.30	-	0.50
c	0.003	-	0.009	0.08	-	0.22
D	0.114 BSC			2.90 BSC		
E	0.110 BSC			2.80 BSC		
E1	0.063`BSC			1.60 BSC		
e	0.037 BSC			0.95 BSC		
e1	0.075BSC			1.90 BSC		
L	0.012	0.018	0.024	0.30	0.45	0.60
L1	0.024 REF			0.60 REF		
L2	0.010 BSC			0.25 BSC		
°M	5°	10°	15°	5°	10°	15°

Note: For SOT23-6 IC, 3000 units per reel.

12.2 8-Pin Plastic SOP (150 mil)



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.183	-	0.202	4.65	-	5.13
B	0.144	-	0.163	3.66	-	4.14
C	0.068	-	0.074	1.35	-	1.88
D	0.010	-	0.020	0.25	-	0.51
F	0.015	-	0.035	0.38	-	0.89
G	0.050 BSC			1.27 BSC		
J	0.007	-	0.010	0.19	-	0.25
K	0.005	-	0.010	0.13	-	0.25
L	0.189	-	0.205	4.80	-	5.21
M	-	-	8°	-	-	8°
P	0.228	-	0.244	5.79	-	6.20

Note: For SOP8, 100 pcs per tube & 2.5K pcs per reel.