九齊科技股份有限公司

Nyquest Technology Co., Ltd.

DATA SHEET

NY3P Series *(OTP for NY3)*

5 I/O Single-Chip Speech Synthesizer

Version 1.8

Aug. 17, 2012

Revision History

Version	Date	Description	Modified Page
1.0	2010/3/17	Formally release.	-
1.1	2010/3/25	1. Modify the description of V_{REG} connected 104 capacitor. 2. Modify pad no 10 -- “PWM1/Mode → PWM2/Mode”	17 18
1.2	2010/7/26	1. Change the P/N of NY3P010A to NY3P016A. 2. Change the P/N of NY3P032A to NY3P035A. 3. Add NY3P010A new body. 4. Add NY3P087A new body.	3, 6, 21 3, 6, 21 3, 6, 21 3, 6, 21
1.3	2010/9/08	1. Add C1/C2 description for COB figure. 2. Cancel the shipping type of NY3P115AS8.	18 22
1.4	2011/1/05	1. Modify NY3P ROM size and voice duration. 2. Add Serial-Trigger function description. 3. Describe the pad name of COB golden finger.	3, 7 6, 10, 19 21
1.5	2011/3/11	1. Revise NY3P007A P/N to NY3P010A. 2. Revised NY3P010A ROM size and voice duration. 3. In Fast mode, one kind of playspeed is available. 4. Add 3-wire description in Serial-Trigger function.	3, 7, 24 3, 7 4, 8 19
1.6	2011/10/28	1. Revise operating voltage range to 1.6V~6.4V. 2. Add description for LVR voltage of 1.5V.	3, 7, 12 6, 10
1.7	2012/5/02	1. Revise COB Pin Assignment for golden finger.	21
1.8	2012/8/17	1. Add NY3P010A pad diagram.	21

1. 概述

NY3P系列產品爲單晶片CMOS語音合成 IC，是九齊科技爲了支援 NY3AxxxA, NY3BxxxA, NY3CxxxA, NY3DxxxA 系列MaskROM 產品所專門開發的崁入式EPROM架構的OTP IC (One Time Programmable)，共有6個母體分別爲 NY3P010A、NY3P016A、NY3P035A、NY3P065A、NY3P087A 和 NY3P115A。具有1個Input腳和4個I/O腳 (NY3P010A只有1個Input腳和2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NY3A, NY3B, NY3C, NY3D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OTP_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： 1.6V ~ 6.4V。

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

	NY3P010A	*NY3P016A*	*NY3P035A*	*NY3P065A*	*NY3P087A*	*NY3P115A*
NY3A	FBF8H	1BD80H	-	-	-	-
	10.75s	19.00s	-	-	-	-
NY3B	FBF8H	1BD80H	-	-	-	-
	10.75s	19.00s	-	-	-	-
NY3C	FBF8H	1BD80H	3BD80H	7BD80H	9FD80	DBD80
	10.75s	19.00s	40.85s	84.54s	109.12s	150.08s
NY3D	C993H	16466H	2FE00H	63133H	7FE00H	AFE00H
	8.60s	15.20s	32.68s	67.63s	87.29s	120.06s

NY3A, NY3B, NY3C, NY3D系列MaskROM產品的實際容量(Hex-16進制)和秒數(@6kHz)如下：

NY3A003A	*NY3A006A*	*NY3A009A*	*NY3A012A*
4880H	9100H	D980H	12200H
3.09s	6.19s	9.28s	12.37s

NY3B003A	*NY3B007A*	*NY3B010A*	*NY3B014A*
5400H	A800H	FC00H	15000H
3.58s	7.17s	10.75s	14.34s

NY3C003A	*NY3C005A*	*NY3C007A*	*NY3C010A*	*NY3C016A*	*NY3C021A*	*NY3C027A*	*NY3C035A*	*NY3C043A*	*NY3C054A*	*NY3C065A*
5C00H	7C00H	BB00H	FC00H	17C00H	1FC00H	27C00H	37C00H	3FC00H	4FC00H	5FC00H
3.93s	5.29s	7.98s	10.75s	16.21s	21.67s	27.14s	38.06	43.52	54.44	65.37

NY3D005A	*NY3D010A*	*NY3D016A*	*NY3D021A*	*NY3D032A*	*NY3D043A*	*NY3D054A*	*NY3D065A*	*NY3D076A*	*NY3D087A*	*NY3D100A*	*NY3D115A*
7C00H	FC00H	17C00H	1FC00H	2FC00H	3FC00H	4FC00H	5FC00H	6FC00H	7FC00H	97C00H	A7C00H
5.29s	10.75s	16.21s	21.67s	32.60s	43.52s	54.44s	65.37s	76.29s	87.21s	103.59s	114.52s

※ 注意: 使用NY3P 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。

(3). 有5個I/O腳: OKY1只能作爲輸入腳，OKY2/O4、IO1、IO2 和 IO3 可分別選作輸入腳或是輸出腳 (光罩選擇)。

※ 注意: NY3P010A 只有3個I/O腳 (OKY, IO1, IO2)。

(4). 語音最多可被分割成1008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1008個語音格(Voice Step)，可規劃成64個語音組(Voice Sentence)，OKY1、OKY2/O4、IO1、IO2、IO3能分別指定 32、29、1、1、1 個語音組(Sentence)。每一語音格(Step)可指定任一個語音段(Section)和 IO1、IO2、IO3、OKY2/O4 的輸出搭配(當IOx設爲輸出時)。

(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*。可分別支援NY3A, NY3B, NY3C, NY3D 系列不同的播放速度選項。

(a) NY3A的播放速度選項：

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
12.7kHz	11.2kHz	10.0kHz	9.0kHz	8.2kHz	7.5kHz	7.0kHz	6.5kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
6.0kHz	5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz	4.3kHz	4.1kHz

(b) NY3B的播放速度選項：

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
17.5kHz	14.7kHz	12.7kHz	11.2kHz	10.0kHz	9.0kHz	8.2kHz	7.5kHz	7.0kHz
10	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
6.5kHz	6.0kHz	5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz	4.3kHz	4.1kHz

(c) NY3C的播放速度選項：

正常的16種播放速度：*(不同Step可以選用不同播放速度)*

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
12.7kHz	11.2kHz	10.0kHz	9.0kHz	8.2kHz	7.5kHz	7.0kHz	6.5kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
6.0kHz	5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz	4.3kHz	4.1kHz

較快速的16種播放速度：*(不同Step只可以選用一種播放速度)*

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
17.5kHz	14.7kHz	12.7kHz	11.2kHz	10.0kHz	9.0kHz	8.2kHz	7.5kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
7.0kHz	6.5kHz	6.0kHz	5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz

(d) NY3D的播放速度選項：

正常的16種播放速度：*(不同Step可以選用不同播放速度)*

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
15.1kHz	13.3kHz	11.9kHz	10.7kHz	9.8kHz	9.0kHz	8.3kHz	7.7kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
7.2kHz	6.8kHz	6.4kHz	6.0kHz	5.7kHz	5.4kHz	5.1kHz	4.9kHz

較快速的16種播放速度：*(不同Step只可以選用一種播放速度)*

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
20.8kHz	17.5kHz	15.1kHz	13.3kHz	11.9kHz	10.7kHz	9.8kHz	9.0kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
8.3kHz	7.7kHz	7.2kHz	6.8kHz	6.4kHz	6.0kHz	5.7kHz	5.4kHz

(7). I/O 對應圖：

NY3P	OKY1	OKY2/O4	IO1	IO2	IO3
NY3A	OKY	-	-	-	-
NY3B	TG	-	IO1	-	-
NY3C	OKY	-	IO1	IO2	-
NY3D	OKY1	OKY2/O4	IO1	IO2	IO3

(8). 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+300K、CDS、300K 的下拉電阻 或 Floating。(CDS+300K選項: 當按鍵按下時，IC內部爲 300K 的下拉電阻；而當按鍵放開時，IC內部爲 100K+300K 並聯 的下拉電阻 約75K。CDS: 當按鍵按下時，IC內部爲 Floating ；而當按鍵放開時，IC內部爲 100K 的下拉電阻。)

※ *注意: NY3A 爲 CDS+1M、CDS、1M 的下拉電阻 或 Floating。*

(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和OKY2/O4輸入腳最多各有32和29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). 只有一個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爲 OKY1 > OKY2/O4 > IO1 > IO2 > IO3。*

(9). 所有的輸出腳都可提供大電流來直推高亮度LED。(I_{OL}=20mA @V_{DD}=3V)

(10). 所有的輸出腳都分別有以下 9 種輸出選項：(光罩選擇)

(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。

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

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

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

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

(g). LED 12Hz flash : 播放時 LED 12Hz 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，IO1、IO2、IO3各有兩組QIO訊號，每一個語音格(Step)可選擇兩組QIO訊號的其中一組，但OKY2/O4只有一組QIO訊號可供選擇，用戶使用此功能需先開啓Quick-IO編輯器來做QIO訊號編輯。

※ *注意: LED 3Hz / 6Hz / 12Hz flash 是指以 <u>6kHz 的播放速度</u> 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). 馬達復位功能(Motor-Recover): 當使用復位馬達時可選擇此功能，此時只能將IO2輸出腳連接到復位馬達來做馬達控制，並將馬達復位點連接到OKY2/O4 或 IO3 的輸入腳來做復位偵測。(光罩選擇)

(12). STB功能: 在Edge觸發模式下，當任何按鍵被持續按下幾秒鐘，IC會自動進入Standby mode 以便省電，可用來做 "長按停止" 功能。共有7種按鍵時間選項，約從1秒鐘到7秒鐘，由於播放速度會影響到按鍵時間，導致此時間並不會很準確，所以建議用戶務必用Demo board 來確認此按鍵時間 。(光罩選擇)

(13). 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時間爲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。

(14). 一組PWM輸出，可直接驅動喇叭或蜂鳴片。

(15). 支援低壓復位(LVR)功能。*(LVR=1.5V)*

(16). 提供特殊的快速燒錄模式，以加快OTP燒錄時間。

(17). 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。

(18). 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。)*

(19). 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NY3A, NY3B, NY3C, NY3D 的規格書，或聯繫九齊科技或九齊代理商。)

1. GENERAL DESCRIPTION

The NY3P series are single-chip voice synthesizing CMOS IC. They are embedded EPROM architecture, and OTP (One Time Programmable) IC that are designed to support NY3AxxxA, NY3BxxxA, NY3CxxxA and NY3DxxxA MaskROM products. There are 6 bodies: NY3P010A, NY3P016A, NY3P035A, NY3P065A, NY3P087A and NY3P115A. Each body has one input and four I/O pins except NY3P010A with one input and two 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 NY3A, NY3B, NY3C and NY3D, 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 "*OTP_Writer*" hardware.

2. FEATURES

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

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

	NY3P010A	*NY3P016A*	*NY3P035A*	*NY3P065A*	*NY3P087A*	*NY3P115A*
NY3A	FBF8H	1BD80H	-	-	-	-
	10.75s	19.00s	-	-	-	-
NY3B	FBF8H	1BD80H	-	-	-	-
	10.75s	19.00s	-	-	-	-
NY3C	FBF8H	1BD80H	3BD80H	7BD80H	9FD80	DBD80
	10.75s	19.00s	40.85s	84.54s	109.12s	150.08s
NY3D	C993H	16466H	2FE00H	63133H	7FE00H	AFE00H
	8.60s	15.20s	32.68s	67.63s	87.29s	120.06s

For NY3A, NY3B, NY3C and NY3D MaskROM product series, the actual ROM size in Hex and speech duration at 6kHz are as following.

NY3A003A	*NY3A006A*	*NY3A009A*	*NY3A012A*
4880H	9100H	D980H	12200H
3.09s	6.19s	9.28s	12.37s

NY3B003A	*NY3B007A*	*NY3B010A*	*NY3B014A*
5400H	A800H	FC00H	15000H
3.58s	7.17s	10.75s	14.34s

NY3C003A	*NY3C005A*	*NY3C007A*	*NY3C010A*	*NY3C016A*	*NY3C021A*	*NY3C027A*	*NY3C035A*	*NY3C043A*	*NY3C054A*	*NY3C065A*
5C00H	7C00H	BB00H	FC00H	17C00H	1FC00H	27C00H	37C00H	3FC00H	4FC00H	5FC00H
3.93s	5.29s	7.98s	10.75s	16.21s	21.67s	27.14s	38.06	43.52	54.44	65.37

NY3D005A	*NY3D010A*	*NY3D016A*	*NY3D021A*	*NY3D032A*	*NY3D043A*	*NY3D054A*	*NY3D065A*	*NY3D076A*	*NY3D087A*	*NY3D100A*	*NY3D115A*
7C00H	FC00H	17C00H	1FC00H	2FC00H	3FC00H	4FC00H	5FC00H	6FC00H	7FC00H	97C00H	A7C00H
5.29s	10.75s	16.21s	21.67s	32.60s	43.52s	54.44s	65.37s	76.29s	87.21s	103.59s	114.52s

※ Note: Using NY3P 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.

(3). Five I/O pins: OKY1 can only be input pin. Other OKY2/O4, IO1, IO2 and IO3 can be either input or output pin (Mask option).

※ Note: There are only three I/O pins for NY3P010A (OKY, IO1, IO2).

(4). The total voice duration can be partitioned up to maximum 1008 *Voice Sections*. Each *Voice Section* length is flexible and each maximum or minimum *Voice Section* length is unlimited.

(5). Total maximum 1008 *Voice Steps* are available for 64 *Voice Sentences*. OKY1, OKY2/O4, IO1, IO2 and IO3 can be assigned 32, 29, 1, 1 and 1 *Sentences* independently. Each *Step* can be specified one *Voice Section* and enable/disable IO1, IO2, IO3, OKY2/O4 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 NY3A, NY3B, NY3C and NY3D individually.

(a) NY3A play speed option.

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
12.7kHz	11.2kHz	10.0kHz	9.0kHz	8.2kHz	7.5kHz	7.0kHz	6.5kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
6.0kHz	5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz	4.3kHz	4.1kHz

(b) NY3B play speed option.

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
17.5kHz	14.7kHz	12.7kHz	11.2kHz	10.0kHz	9.0kHz	8.2kHz	7.5kHz	7.0kHz
10	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
6.5kHz	6.0kHz	5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz	4.3kHz	4.1kHz

(c) NY3C play speed option.

Normal play speed of 16 kinds of options: *(In different steps, 16 kinds of playspeed is available.)*

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
12.7kHz	11.2kHz	10.0kHz	9.0kHz	8.2kHz	7.5kHz	7.0kHz	6.5kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
6.0kHz	5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz	4.3kHz	4.1kHz

Fast play speed of 16 kinds of options: *(In different steps, one kind of playspeed is available, not 16 kinds.)*

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
17.5kHz	14.7kHz	12.7kHz	11.2kHz	10.0kHz	9.0kHz	8.2kHz	7.5kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
7.0kHz	6.5kHz	6.0kHz	5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz

(d) NY3D play speed option.

Normal play speed of 16 kinds of options: *(In different steps, 16 kinds of playspeed is available.)*

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
15.1kHz	13.3kHz	11.9kHz	10.7kHz	9.8kHz	9.0kHz	8.3kHz	7.7kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
7.2kHz	6.8kHz	6.4kHz	6.0kHz	5.7kHz	5.4kHz	5.1kHz	4.9kHz

Fast play speed of 16 kinds of options: *(In different steps, one kind of playspeed is available, not 16 kinds.)*

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
20.8kHz	17.5kHz	15.1kHz	13.3kHz	11.9kHz	10.7kHz	9.8kHz	9.0kHz
9	*10*	*11*	*12*	*13*	*14*	*15*	*16*
8.3kHz	7.7kHz	7.2kHz	6.8kHz	6.4kHz	6.0kHz	5.7kHz	5.4kHz

(7). I/O mapping table.

NY3P	OKY1	OKY2/O4	IO1	IO2	IO3
NY3A	OKY	-	-	-	-
NY3B	TG	-	IO1	-	-
NY3C	OKY	-	IO1	IO2	-
NY3D	OKY1	OKY2/O4	IO1	IO2	IO3

(8). 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+300K, CDS, 300K pull-low resistor or Floating type.

(CDS+300K option: Only 300k pull-low resistance at key-pressed, and 100K+300K in parallel pull-low resistance around 75K at key-released. CDS option: Floating at key-pressed, and 100K pull-low resistance at key-released.)

※ *Note: NY3A input type is CDS+300K, CDS, 300K pull-low resistor or Floating type.*

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

(d). OKY1 & OKY2/O4 input can select One-Key Sequential or Random for maximum 32 & 29 *Sentences* independently. At One-Key Sequential, the Reset function of playing *Sentence* sequence can be selected or not when other keys are triggered.

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

※ *Note: Input priority is OKY1 > OKY2/O4 > IO1 > IO2 > IO3.*

(9). All output pins support large-current output and can directly drive high brightness LED. (I_{OL}=20mA @V_{DD}=3V)

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

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

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

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

(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 IO1, IO2 and IO3, there are two sets of QIO signal. Each *Voice Step* can select one set of QIO signal. But for OKY2/O4, there is only one set of QIO signal to select. User can edit the QIO signal by "*Quick-IO*" editor.

※ *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 3Hz, 6Hz or 12Hz.*

(11). Motor-Recover function: User can select this function when using the recovering motor. In this application, IO2 is set as output to control the recovering motor. And the motor recovering sensor must be connected to OKY2/O4 or IO3 to detect the recovering signal. (Mask option)

(12). STB function: In Edge trigger mode, after any key is continuously pressed for few seconds, IC will enter standby mode automatically to save power. It's usually used in "*Level-Stop*" application. There are 7 kinds of key-pressing time from 1 to 7 seconds. Because play speed will affect the key-pressing time, it causes this key-pressing time inaccurate. *We suggest users MUST confirm this key-pressing time by demo board.* (Mask option)

(13). 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.

(14). One PWM output can directly drive speaker or buzzer.

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

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

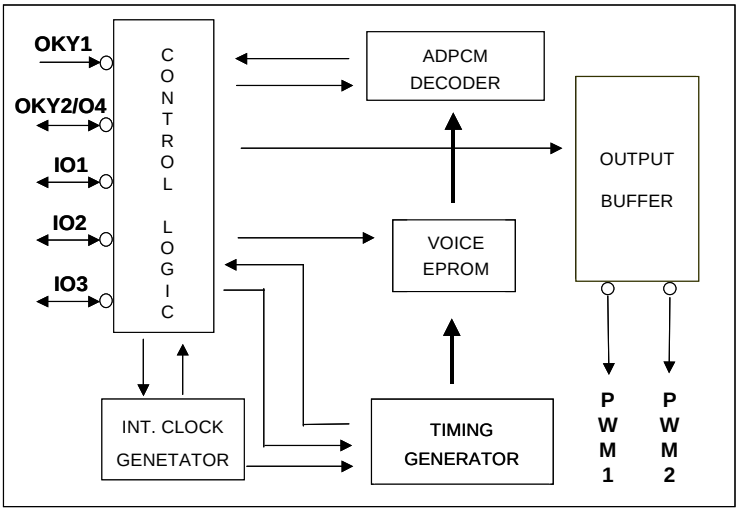
(17). A special *ICP* (In Circuit Programming) writing function is supported for user to fabricate PCBA in advance.

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

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

(For details of the above functions, please refer to NY3A, NY3B, NY3C and NY3D datasheet, or contact Nyquest or her agents.)

3. BLOCK DIAGRAM



4. PAD DESCRIPTION

Pad Name	Pad No.	ATTR.	Description
Test	-	I	Test pad. *(This pad is only for NY3P065A body.)*
OKY1/VPP	1	I	Input pin, active high, or positive high power for programming.
OKY2/O4	2	I/O	Output or input pin. To be input, active high. *(N/A for NY3P010A)*
IO1/SDA	3	I/O	Output or input pin. To be input, active high.
IO2/SCL	4	I/O	Output or input pin. To be input, active high.
IO3	5	I/O	Output or input pin. To be input, active high. *(N/A for NY3P010A)*
V_{REG}	6	Power	Regulator input. Connect a 0.1uF cap to GND or keep floating.
GND	7	Power	Negative power.
VDD	8	Power	Positive power.
PWM1	9	O	PWM output 1.
PWM2/Mode	10	O	PWM output 2, or select programming mode.

5. DEVELOPMENT, DEMONSTRATION & PRODUCTION

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 "*OTP_Writer*" operation, user can write the "**.bin**" file into NY3P OTP chips to demonstrate the NY3 function. Customer can make pilot production by NY3P 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.

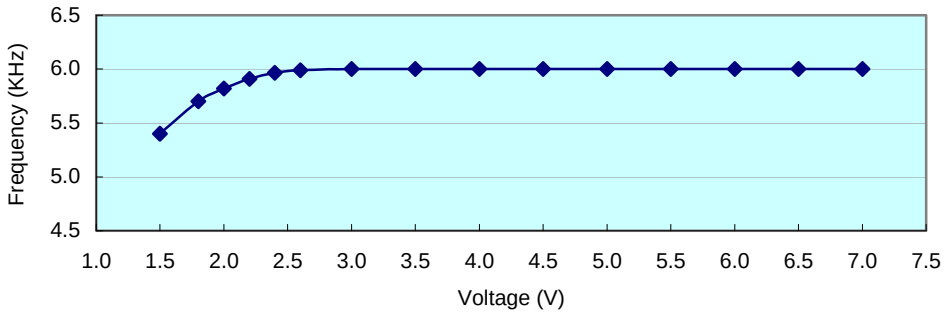
6. ABSOLUTE MAXIMUM RATING

Symbol	Rating	Unit
VDD~GND	-0.5 ~ +7.0	V
V_{in}	GND-0.3 < V_{in} < VDD+0.3	V
V_{out}	GND < V_{out} < VDD	V
T_{op} (operating)	-0 ~ +70	°C
T_{st} (storage)	-55 ~ +150	°C

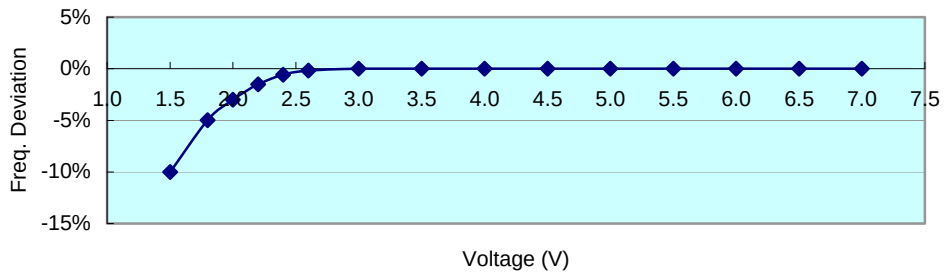
7. DC CHARACTERISTICS

Symbol	Parameter		Min.	Typ.	Max.	Unit	Condition
V_{DD}	Operating voltage		1.6	3.0	6.4	V	
I_{sb}	Standby current, V_{DD}=3V/4.5V			1		uA	No loading
I_{op}	Operating current	V_{DD}=3V		850			
		V_{DD}=4.5V		1100			
I_{ih}	Input current (1M ohms pull-low, NY3A only)				3	uA	V_{DD}=3V
					8		V_{DD}=4.5V
I_{ih}	Input current (300k ohms pull-low)				10	uA	V_{DD}=3V
					25		V_{DD}=4.5V
I_{ih}	Input current (100k ohms pull-low)				30	uA	V_{DD}=3V
					80		V_{DD}=4.5V
I_{oh}	Output drive current			-10		mA	V_{DD}=3V, V_{oh}=1.0V
				-20			V_{DD}=4.5V, V_{oh}=2.2V
I_{ol}	Output sink current			20		mA	V_{DD}=3V, V_{ol}=1.0V
				34			V_{DD}=4.5V, V_{ol}=1.0V
I_{oh}	PWM1, PWM2 output current			-65		mA	V_{DD}=3V, V_{oh}=1.5V
I_{ol}				65			V_{DD}=3V, V_{ol}=1.5V
△F/F	Frequency deviation by voltage drop	V_{DD}=3V		1		%	$\frac{Fosc(3.0v)-Fosc(2.4v)}{Fosc(3v)}$
		V_{DD}=4.5V		0.1			$\frac{Fosc(4.5v)-Fosc(3.0v)}{Fosc(4.5v)}$
△F/F	Frequency lot deviation (V_{DD}=3V)		-1		1	%	$\frac{Fmax(3.0v)-Fmin(3.0v)}{Fmax(3.0v)}$
Fosc	Oscillation Frequency		1.31	1.54	1.61	MHz	V_{DD}=1.6~6.4V

Voltage vs Frequency (SR=6.0KHz@3V)



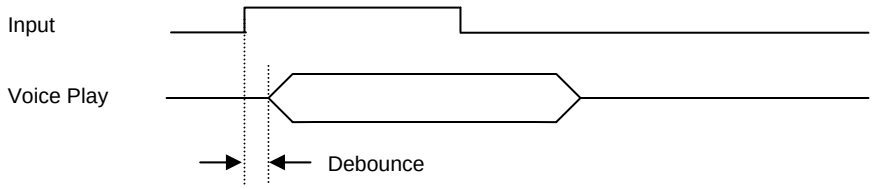
Voltage vs Freq. Deviation (SR=6.0KHz@3V)



8. TIMING DIAGRAM

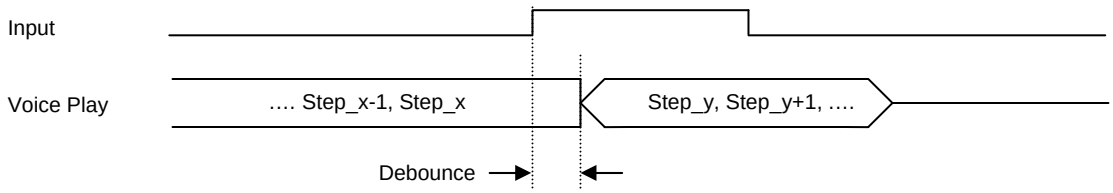
(1) Debounce Time

(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

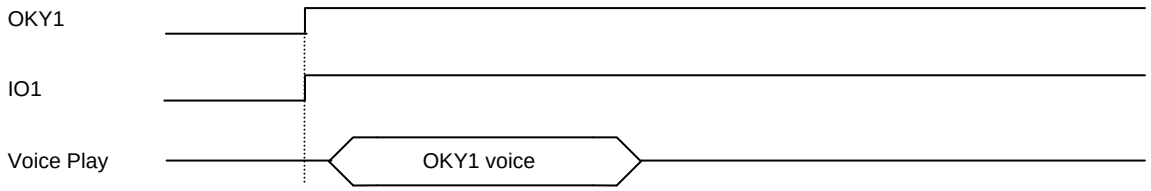
(b). Trigger While playing voice



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

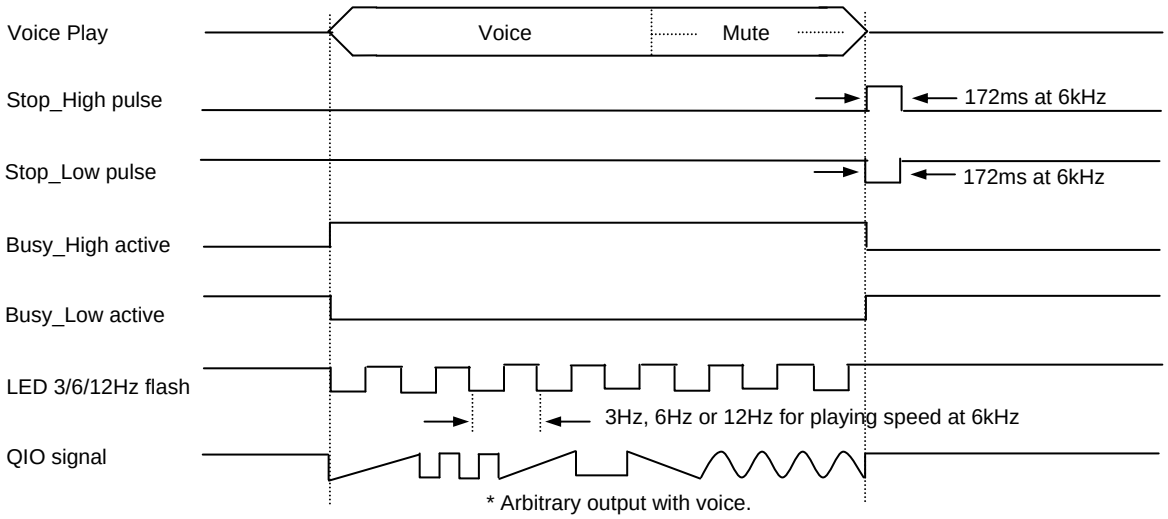
For example, if Step_x S.R. = 8kHz, Long debounce = 20ms*(6k/8k) = 15ms, Short debounce = 50us*(6k/8k) = 37.5us

(2) Input Priority



※ Priority: OKY1 > OKY2 > IO1 > IO2 > IO3

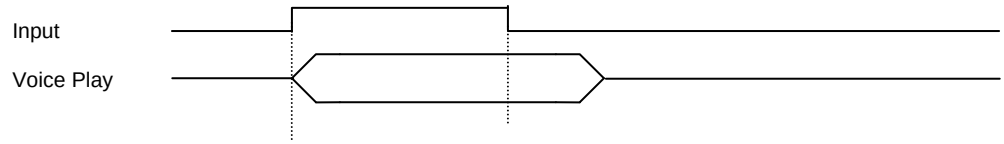
(3) Output Signal (IO1, IO2, IO3, O4)



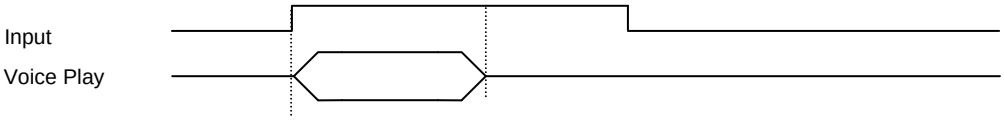
LED dynamic 1/2: When the voice amplitude is higher than 1/2 level, LED will be ON, i.e. output signal is low.

(4) Basic Operation

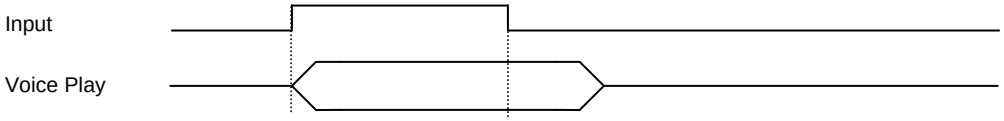
(a). Edge mode, Edge trigger



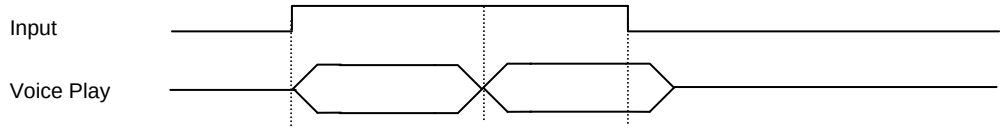
(b). Edge mode, Level trigger



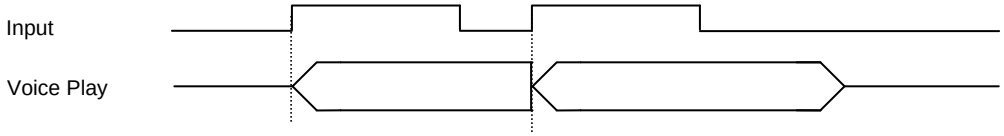
(c). Level mode, Edge trigger



(d). Level mode, Level trigger

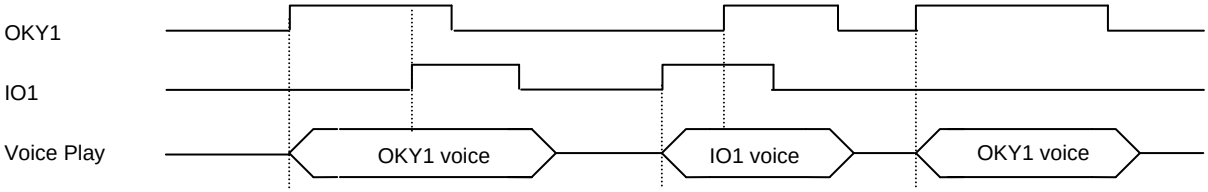


(e). Retrigger mode



(f). Irretrigger mode

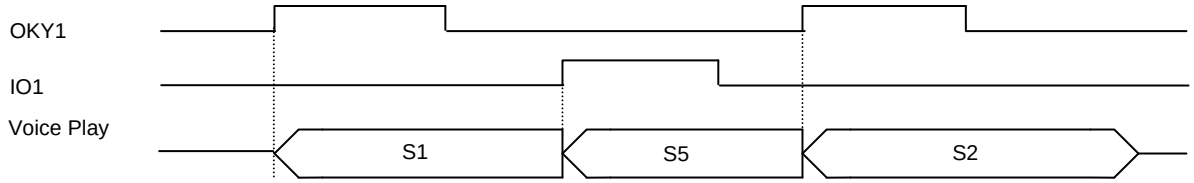
(g). Retrigger mode, first key priority



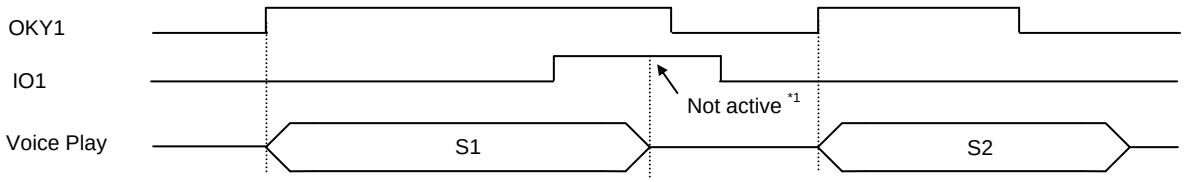
(5) Advanced Operation

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

(a-1) OKY1 (E/U/R) = S1 S2 S3 S4, IO1(E/U/R) = S5 (S1 means Sentence 1)

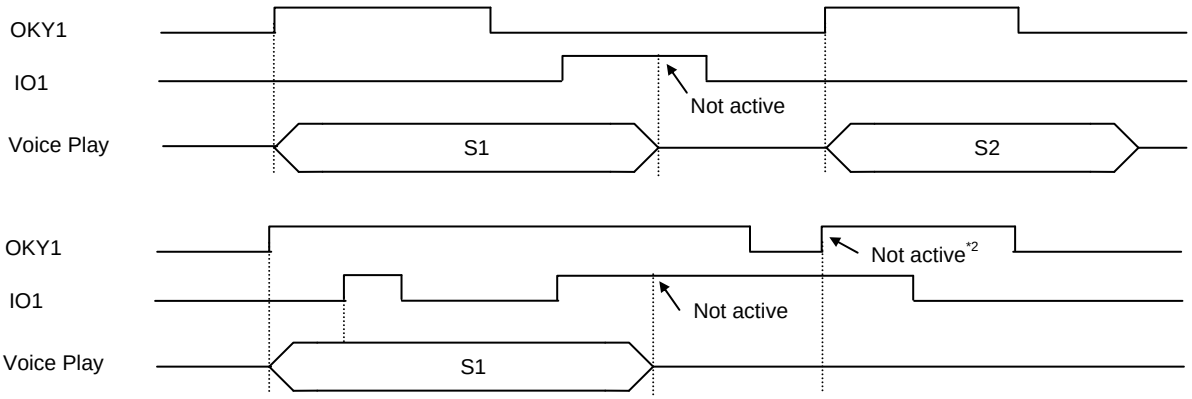


(a-2) OKY1 (E/U/R) = S1 S2 S3 S4, IO1 (L/x/x) = S5



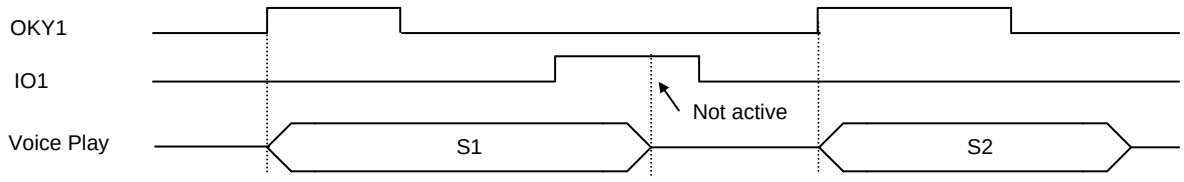
*1: If you press IO1 during OKY1 voice playing, at the moment of S1 end, the trigger mode follows OKY1

(a-3) OKY1 (E/U/I) = S1 S2 S3 S4, IO1 (E/x/x) = S5

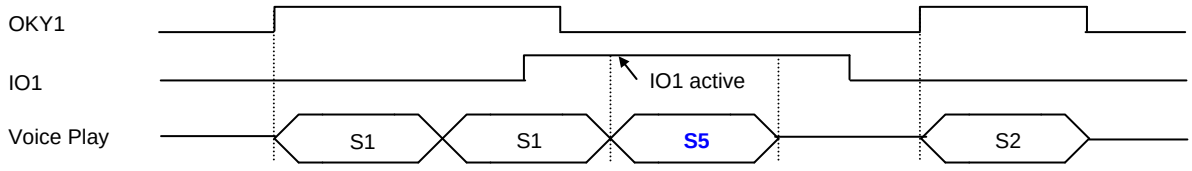


*2: Because IO1 signal is still high in the same time IC can't accept the OKY1 Edge signal.

(a-4) OKY1 (E/U/I) = S1 S2 S3 S4, IO1 (L/x/x) = S5



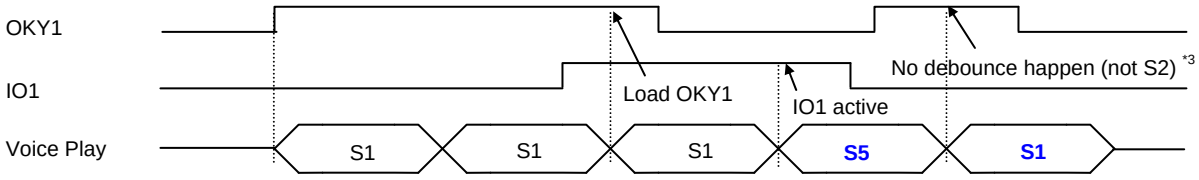
(a-5) OKY1 (L/U/x) = S1 S2 S3 S4, IO1 (E/x/x) = S5



※ In the time of Sentence end: When S1 end, the trigger mode follows OKY1 (L/U/x). When S5 end, it follows IO1 (E/x/x).

※ Once S5 is played (just leave S1 ending), the trigger mode follows IO1 (E/x/x) immediately.

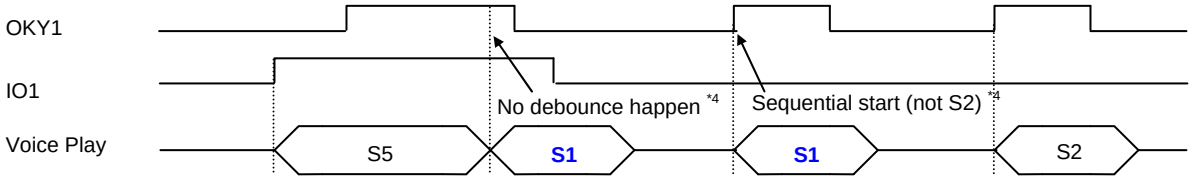
(a-6) OKY1 (L/U/x) = S1 S2 S3 S4, IO1 (L/U/l) =S5



※ Reload key priority: OKY1 > IO1

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

(a-7) OKY1 (L/U/x) = S1 S2 S3 S4, IO1 (L/U/x) =S5

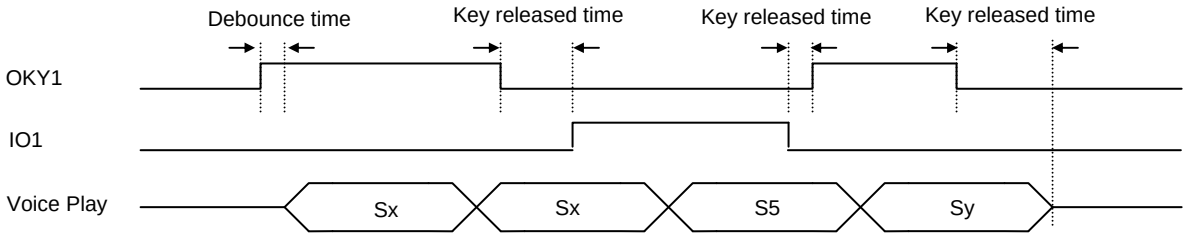


*4: In OKY mode, 1st trigger without debounce and Sequential number is still "1". 2nd trigger with debounce, after trigger the Sequential number become "2".

(b). Random Function

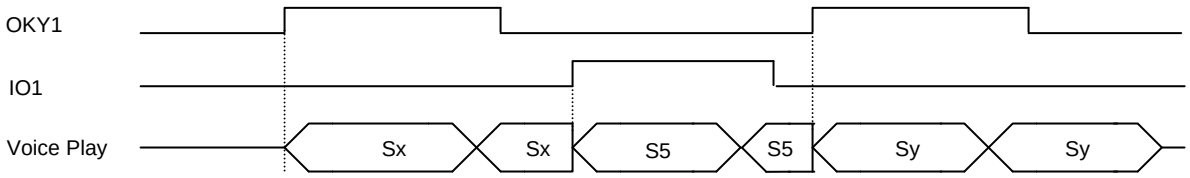
(b-1) OKY1 (L/U/l) =S1 S2 S3 S4, IO1 (L/U/l) =S5

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".



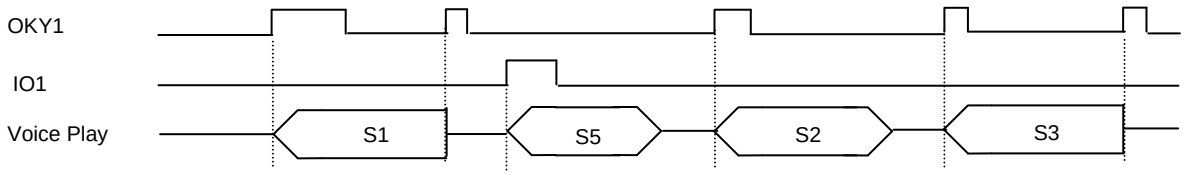
x=1, 2, 3 or 4; y=1, 2, 3 or 4 (x and y are random number)

(b-2) OKY1 (L/U/R) =S1 S2 S3 S4, IO1 (L/U/R) =S16

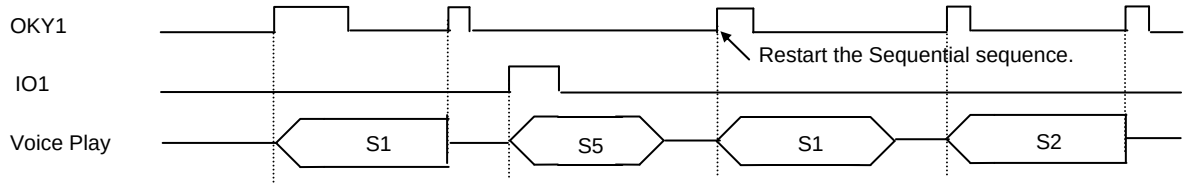


(c). Toggle On/Off Function

(c-1) OKY1 (E/U/R) =S1 S2 S3 S4, IO1 (E/U/R) =S5 (OKY1 is Sequential mode without Reset)



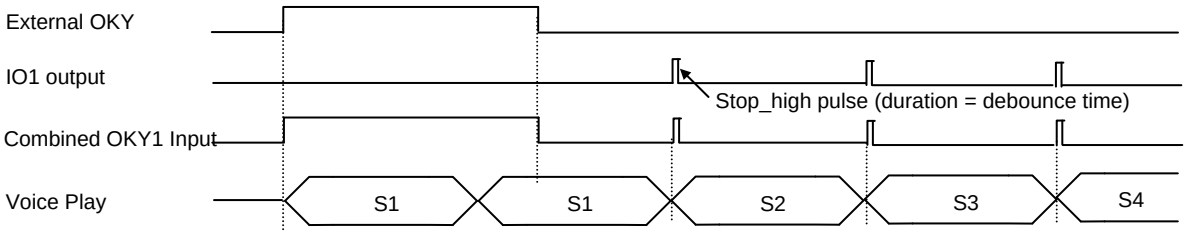
(c-2) OKY1 (E/U/R) =S1 S2 S3 S4, IO1 (E/U/R) =S16 (OKY1 is Sequential mode with Reset)



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

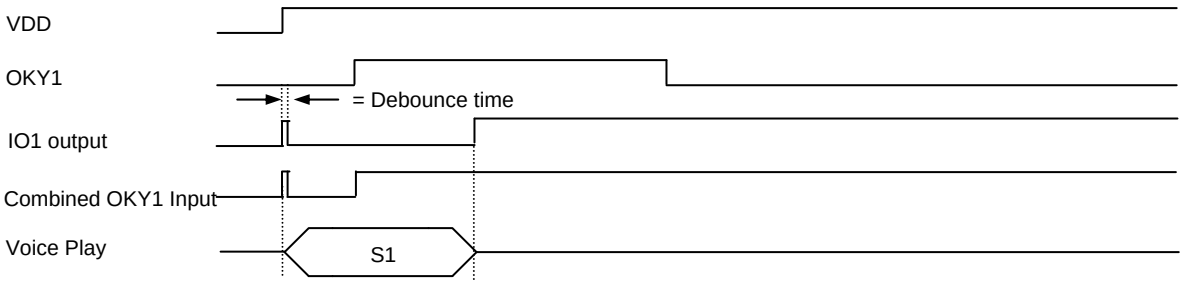
(d). External Feedback Function *(IO1 is output and connected to OKY1 input)*

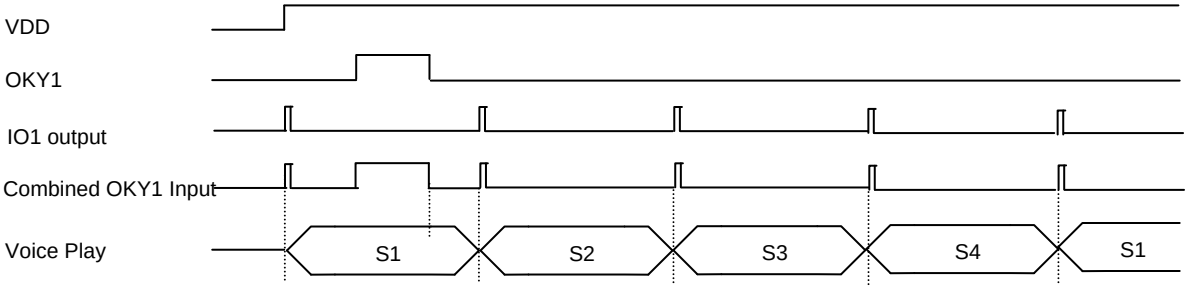
(d-1) OKY1 (L/U/I) =S1 S2 S3 S4, IO1=Stop_high pulse (When voice ends, IO1 shows a high pulse.)



※ 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, IO1= Busy_low (When not playing voice, IO1 is high.)

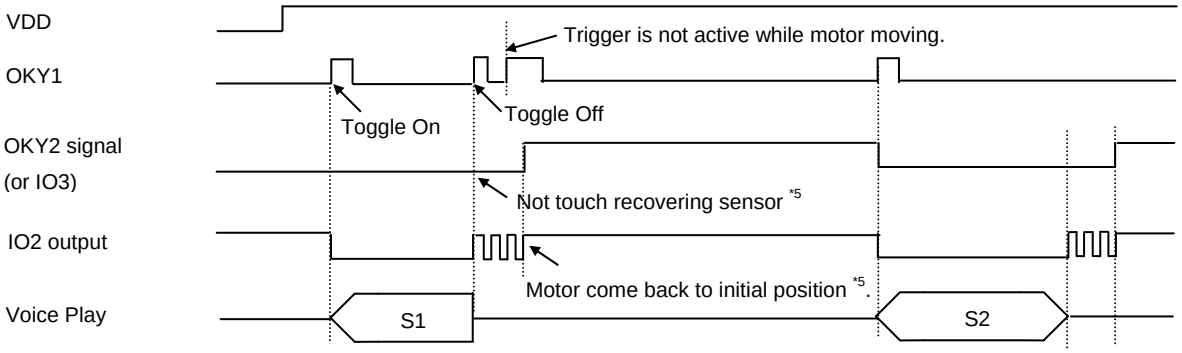




※ When power on, IO1 will generate a high pulse at Busy_low status and the duration is equal to debounce time.

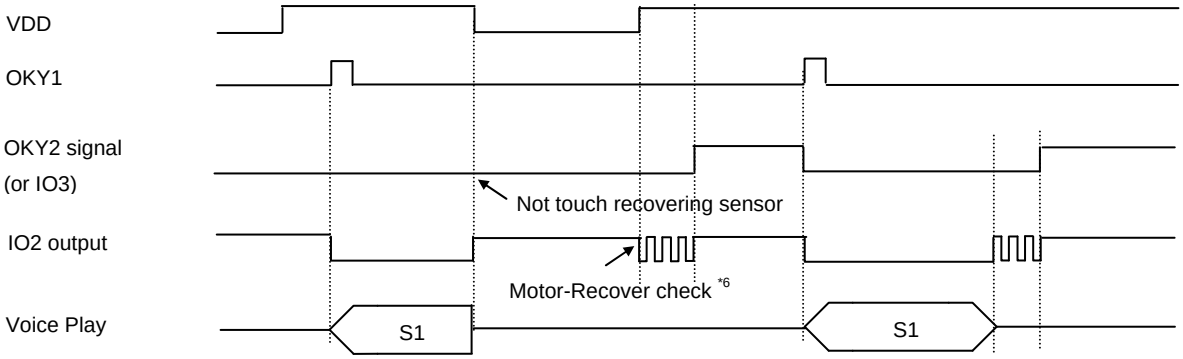
(e). Motor-Recover Function

(e-1) OKY1 (E/U/R) = S1 S2 S3 S4, IO2= Busy_low (OKY1 is Toggle On/Off and OKY2 is connected to sensor.)



*5: If motor doesn't stop at initial position when voice stop playing, IO2 will output one kind of signal (DC, 15Hz or 30Hz option) to keep motor moving to initial position.

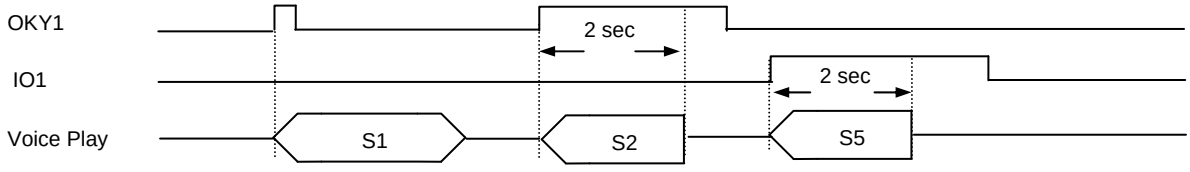
(e-2) OKY1 (E/U/R) = S1 S2 S3 S4, IO2= Busy_low (OKY1 is Toggle On/Off and OKY2 is connected to sensor.)



*6: If motor doesn't stay at initial position when power-on, IO2 will output one kind of signal (DC, 15Hz or 30Hz option) to keep motor moving to initial position.

(f). STB Function

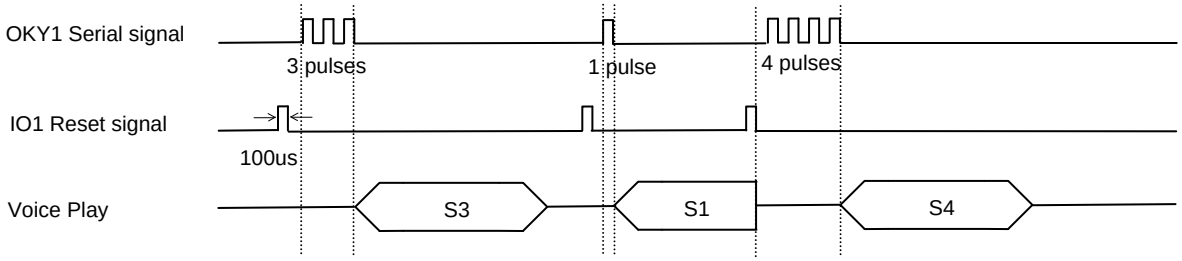
OKY1 (E/U/x) =S1 S2 S3 S4, IO1 (E/U/x) =S5 (Key-pressing time is set as 2 sec)



※ When any key is pressed over 2 sec, IC will stop playing voice and enter standby mode.

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

OKY1 (E/U/R) =S1 S2 S3 S4, IO1 (E/U/R) =S5 (OKY1 Reset is enabled, and S5 is a short mute Sentence)

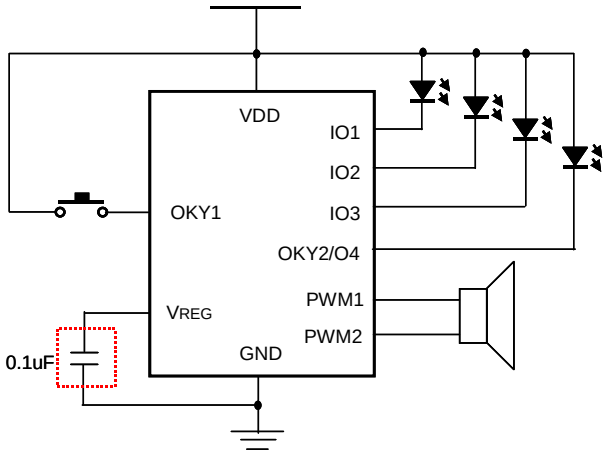


※ The pulse width must be longer than 50us (i.e. short debounce time), and users can set the typical pulse width as 100us.

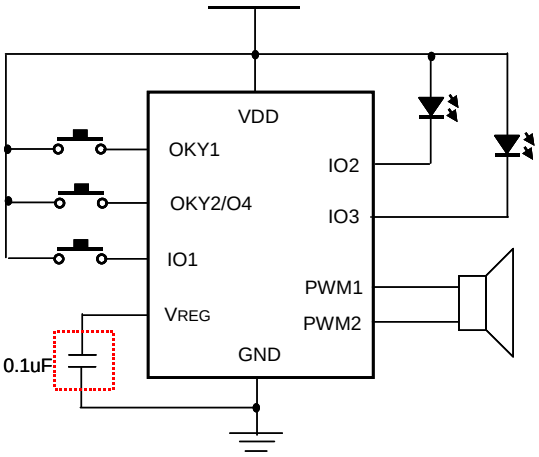
※ The above is the simplest 2-wire control by external MCU. If necessary, user can use 3-wrie control with Busy_High outptut signal to do feedback.

9. APPLICATION

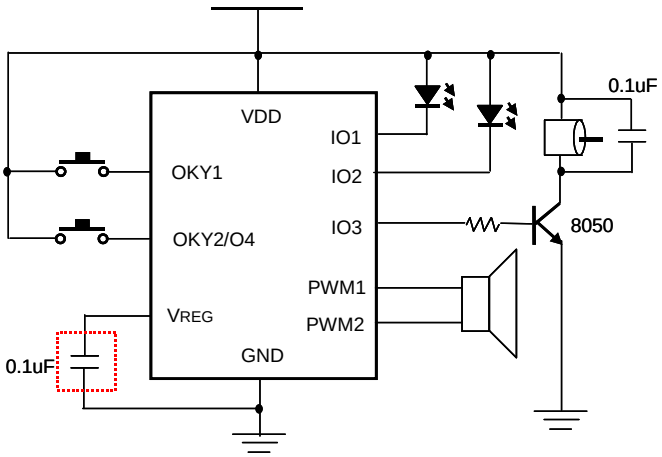
(1) 1 trigger with 4 LEDs (Sink)



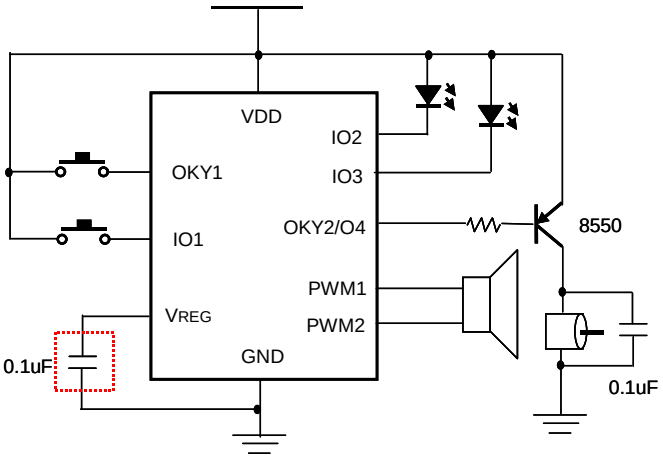
(2) 3 triggers with 2 LEDs (Sink)



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



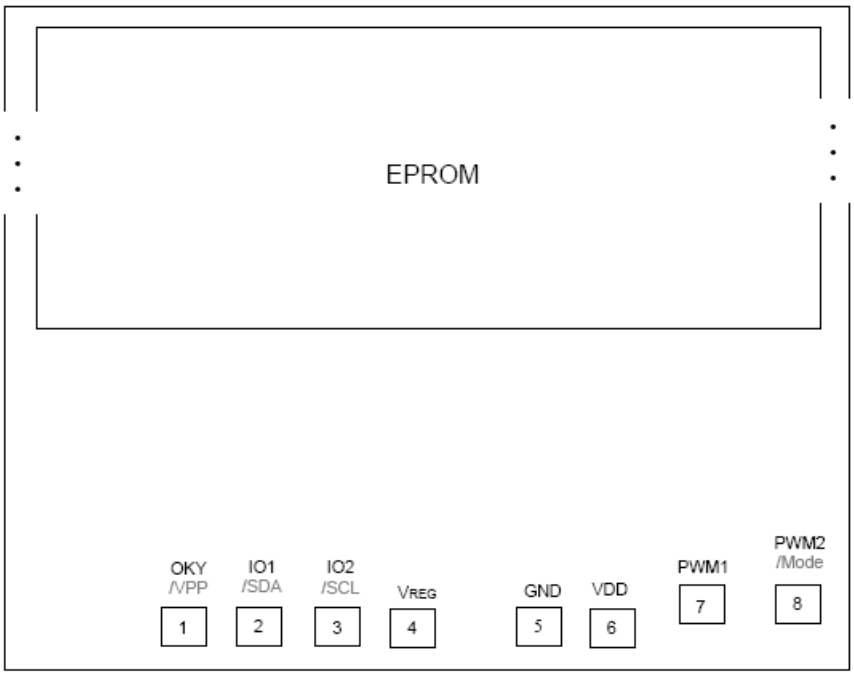
(4) 2 triggers with 2 LEDs (Sink) and 1 motor (Sink)



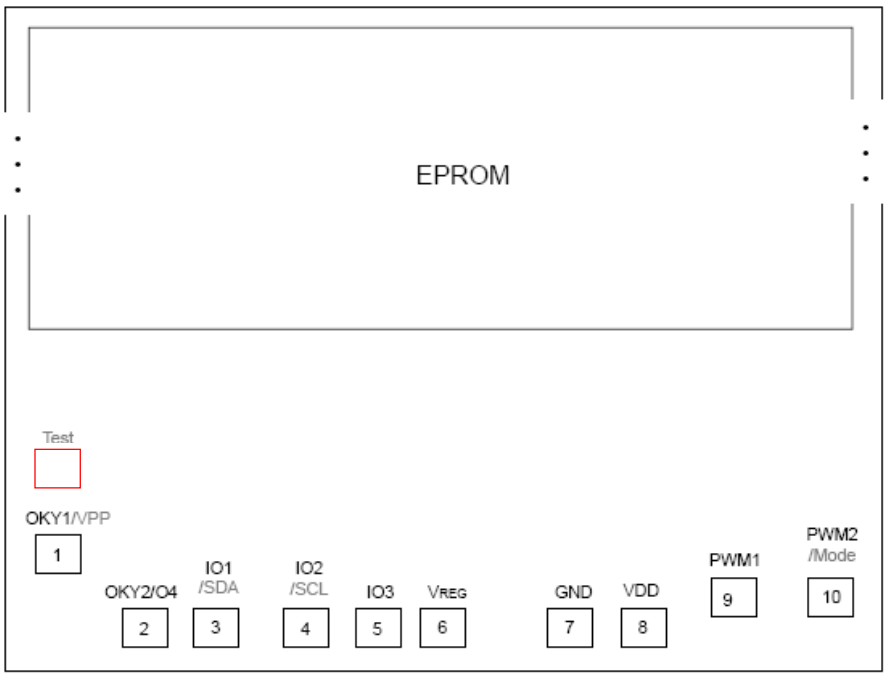
Note: At high voltage of 4.5V or higher voltage, V_{REG} may be connected to GND with a 0.1uF cap for less power noise. At 3V, V_{REG} doesn't need to connect any capacitor and can be kept this pad floating to save a capacitor.

10. DIE PAD DIAGRAM

NY3P010A



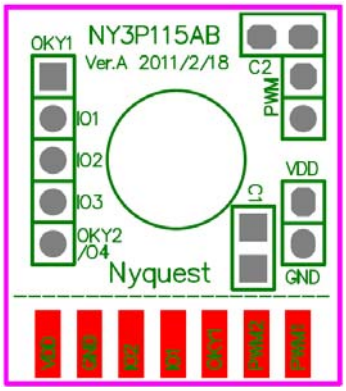
Other NY3PxxxA

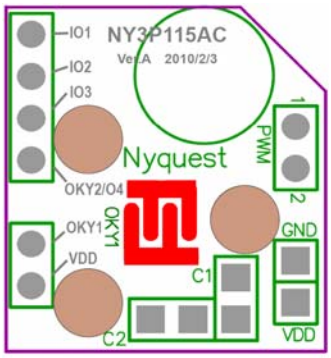


**** There is no "Test" pad for NY3P010A, NY3P016A, NY3P035A, NY3P087A and NY3P115A bodies.**

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

11. COB PIN ASSIGNMENT

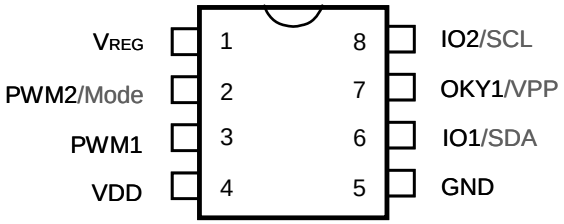




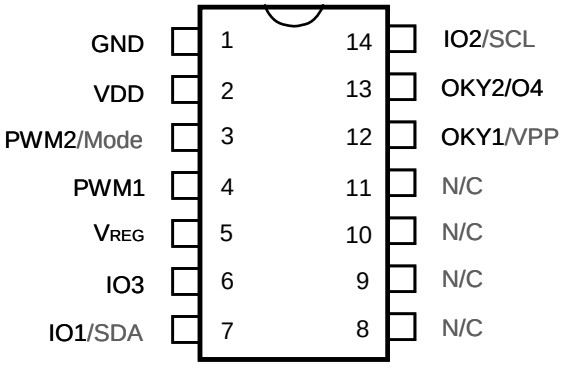
Note: C1 is VDD power cap.
C2 is V_{REG} cap.

12. PACKAGE PIN ASSIGNMENT

8-pin DIP, SOP

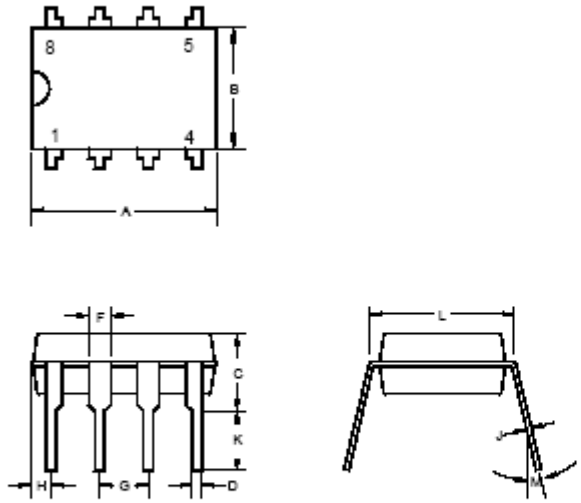


14-pin DIP, SOP



13. PACKAGE DIMENSION

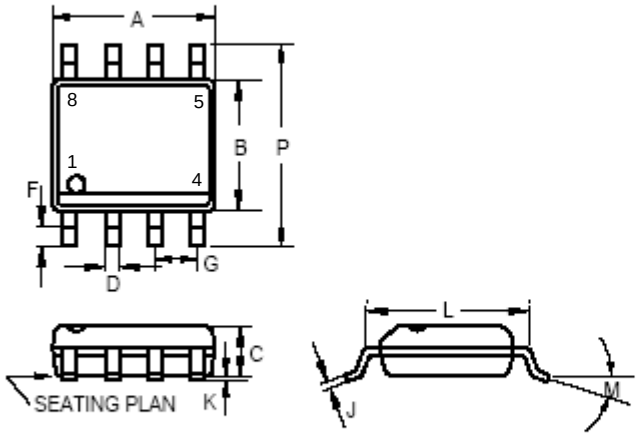
8-Pin Plastic DIP (300 mil)



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.355	0.365	0.400	9.02	9.27	10.16
B	0.240	0.250	0.280	6.10	6.35	7.11
C	-	-	0.210	-	-	5.33
D	-	0.018	-	-	0.46	-
F	-	0.060	-	-	1.52	-
G	-	0.100	-	-	2.54	-
H	0.050	-	0.090	1.27	-	2.29
J	0.008	-	0.015	0.20	-	0.38
K	0.115	0.130	0.150	2.92	3.30	3.81
L	0.300 BSC.			7.62 BSC.		
M	-	7°	15°	-	7°	15°

Note: For 8-pin Plastic package, 50 units per tube.

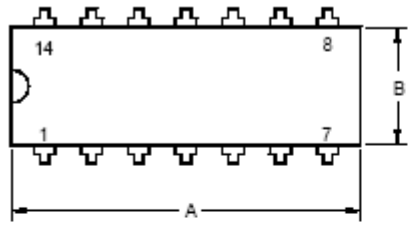
8-Pin Plastic SOP (150 mil)

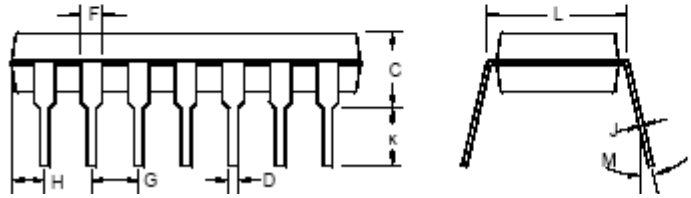


	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.183	-	0.202	4.65	-	5.13
B	0.144	-	0.163	3.66	-	4.14
C	0.068	-	0.074	1.35	-	1.88
D	0.010	-	0.020	0.25	-	0.51
F	0.015	-	0.035	0.38	-	0.89
G	0.050 BSC			1.27 BSC		
J	0.007	-	0.010	0.19	-	0.25
K	0.005	-	0.010	0.13	-	0.25
L	0.189	-	0.205	4.80	-	5.21
M	-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

Note: For 8-pin S.O.I.C., 100 units per tube.

14-Pin Plastic DIP (300 mil)

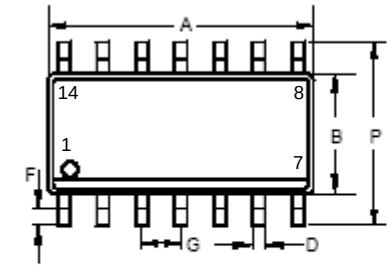


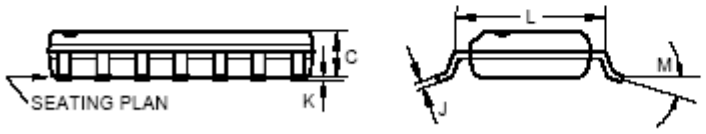


	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.730	-	0.810	18.54	-	20.57
B	0.240	-	0.260	6.09	-	6.60
C	-	-	0.200	-	-	5.08
D	0.015	-	0.020	0.38	-	0.51
F	0.03	-	0.060	0.76	-	1.52
G	0.100 BSC			2.54 BSC		
H	0.050	-	0.090	1.27	-	2.28
J	0.008	-	0.015	0.20	-	0.38
K	0.125	-	-	3.18	-	-
L	0.300 BSC			7.62 BSC		
M	-	-	15°	-	-	15°

Note: For 14-pin Plastic package, 25 units per tube.

14-Pin Plastic SOP (150 mil)





	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.337	-	0.344	8.55	-	8.75
B	0.144	-	0.163	3.66	-	4.14
C	0.068	-	0.074	1.73	-	1.88
D	0.017	-	0.020	0.35	-	0.51
F	0.016	-	0.044	0.40	-	1.12
G	0.050 BSC			1.27 BSC		
J	-	0.004		-	0.10	-
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	5.80	-	6.20

Note: For 14-pin S.O.I.C., 50 units per tube.

14. ORDERING INFORMATION

P/N	Shipping Type	Remarks
NY3P010A	Die	Empty ROM data
NY3P010A-xxxx *1	Die	Programmed ROM data
NY3P010AW-xxxx *1	Wafer	Programmed ROM data
NY3P010AB	COB	20 mm x 17 mm (20mm x 23 mm w/ V-Cut)
NY3P010AC	COB	19 mm x 21 mm, for Squeeze Box (擠壓盒)
NY3P010AP8	DIP-8	Width 300 mil
NY3P010AS8	SOP-8	Width 150 mil
NY3P016A	Die	Empty ROM data
NY3P016A-xxxx *1	Die	Programmed ROM data
NY3P016AW-xxxx *1	Wafer	Programmed ROM data
NY3P016AB	COB	20 mm x 17 mm (20mm x 23 mm w/ V-Cut)
NY3P016AC	COB	19 mm x 21 mm, for Squeeze Box (擠壓盒)
NY3P016AP8	DIP-8	Width 300 mil
NY3P016AS8	SOP-8	Width 150 mil
NY3P016AP14	DIP-14	Width 300 mil
NY3P016AS14	SOP-14	Width 150 mil
NY3P035A	Die	Empty ROM data
NY3P035A-xxxx *1	Die	Programmed ROM data
NY3P035AW-xxxx *1	Wafer	Programmed ROM data
NY3P035AB	COB	20 mm x 17 mm (20mm x 23 mm w/ V-Cut)
NY3P035AC	COB	19 mm x 21 mm, for Squeeze Box (擠壓盒)
NY3P035AP8	DIP-8	Width 300 mil
NY3P035AS8	SOP-8	Width 150 mil
NY3P035AP14	DIP-14	Width 300 mil
NY3P035AS14	SOP-14	Width 150 mil
NY3P065A	Die	Empty ROM data
NY3P065A-xxxx *1	Die	Programmed ROM data
NY3P065AW-xxxx *1	Wafer	Programmed ROM data
NY3P065AB	COB	20 mm x 17 mm (20mm x 23 mm w/ V-Cut)
NY3P065AC	COB	19 mm x 21 mm, for Squeeze Box (擠壓盒)
NY3P065AP8	DIP-8	Width 300 mil
NY3P065AS8	SOP-8	Width 150 mil
NY3P065AP14	DIP-14	Width 300 mil
NY3P065AS14	SOP-14	Width 150 mil
NY3P087A	Die	Empty ROM data
NY3P087A-xxxx *1	Die	Programmed ROM data
NY3P087AW-xxxx *1	Wafer	Programmed ROM data

P/N	Shipping Type	Remarks
NY3P087AB	COB	20 mm x 17 mm (20mm x 23 mm w/ V-Cut)
NY3P087AC	COB	19 mm x 21 mm, for Squeeze Box (擠壓盒)
NY3P087AP8	DIP-8	Width 300 mil
NY3P087AS8	SOP-8	Width 150 mil
NY3P087AP14	DIP-14	Width 300 mil
NY3P087AS14	SOP-14	Width 150 mil
NY3P115A	Die	Empty ROM data
NY3P115A-xxxx *1	Die	Programmed ROM data
NY3P115AW-xxxx *1	Wafer	Programmed ROM data
NY3P115AB	COB	20 mm x 17 mm (20mm x 23 mm w/ V-Cut)
NY3P115AC	COB	19 mm x 21 mm, for Squeeze Box (擠壓盒)
NY3P115AP8	DIP-8	Width 300 mil
~~NY3P115AS8~~ *2	~~SOP-8~~	N/A
NY3P115AP14	DIP-14	Width 300 mil
~~NY3P115AS14~~ *2	~~SOP-14~~	N/A

*1 "xxxx": Code number.

*2 NY3P115A doesn't support SOP-8 & SOP-14 package.