

A. General Description —

HT-821A0 is a single-chip PCM speech synthesis LSI implemented in CMOS technology. It is designed for operating with minimum number of external component and provides 3 seconds of voice capacity at 6 KHz sampling rate.

Blocks within the IC include: On-chip ROM for voice data storage, Current mode D/A, control logic and a gate array of 200 gate count. All blocks are already prepared for fabrication except gate array wiring and voice data, the gate array wiring and customer's voice data is programmed into the IC by changing two layer of masks during IC fabrication.

The 3 seconds of voice capacity can be separated into maximum 4 sections with arbitrary length combination and play function (such as: retriggerable key input, level hold trigger and section play sequence...ect,)can be programmed according to the requirment of customer by means of changing the wiring of on-chip gate array. The gate array offers 6 I/O pins for use as input trigger or output interface.

Three programmable output pins are provided, they can act as end-pulse output, LED flash or speech level indicator, depending on mask option selected (refer to pin description). The IC is offered in dice form or 16-pin dual-in-line package.

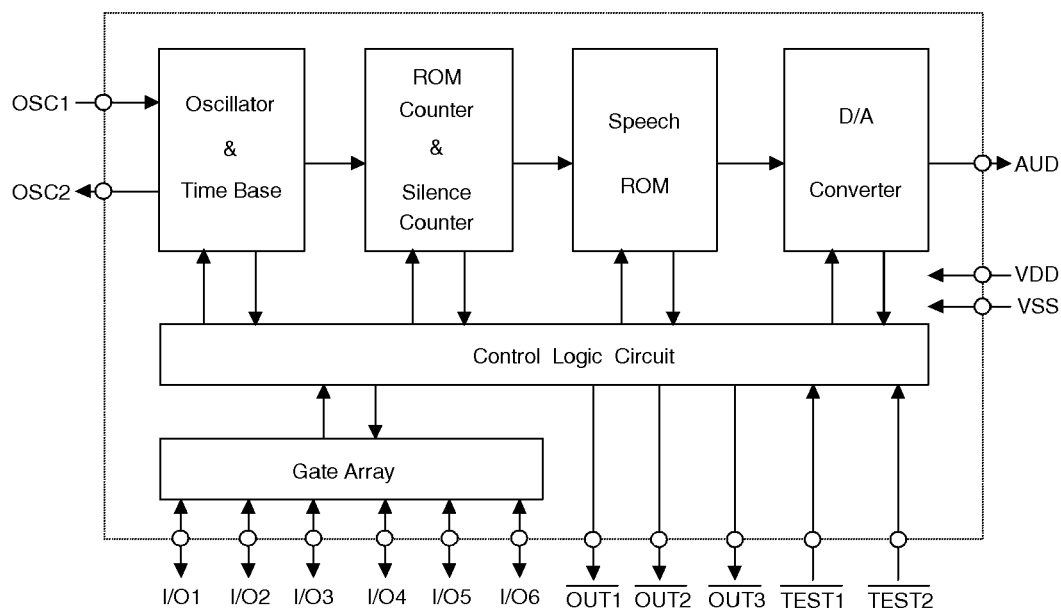
B. Features —

- On-chip gate array of 200 gates.
- Programmable play function.
- Direct diver output transistor.
- Low stand-by current (1 μ A typ).
- Minimum external component.
- 4 sections of speech.
- 6 gate array I/O pins.
- Provide 3 programmable output pins for
 1. end-pulse output for external driving.
 2. LED flash (4 Hz).
 3. LED indicator following level.
- Operating voltage 2.4~3.6V (or 3.5~5.0V).

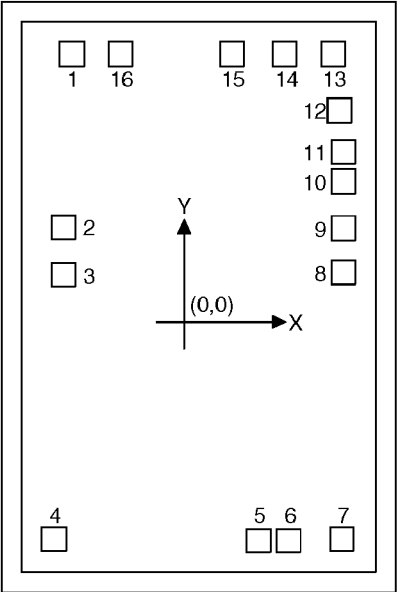
C. Application —

- Toys.
- Alarm clock.
- Public address system.
- Alert & warning system.
- Sound effect generator.
- Production with speech interface.

D. Block Diagram —



E. Pad Assignment & Position —



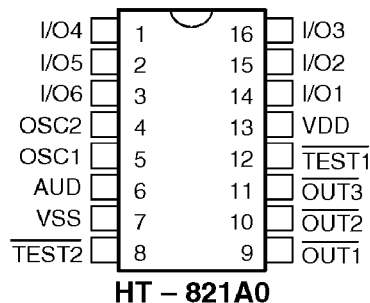
Chip Size: 2160 × 3560 (μm)²

* The substrate should be connected to VSS in PCB layout artwork.

Unit: μm

Pad No.	Symbol	X	Y	Pad No.	Symbol	X	Y
1	I/O6	−811.00	1513.25	9	$\overline{\text{OUT3}}$	891.00	422.25
2	OSC2	−862.00	427.25	10	$\overline{\text{TEST1}}$	892.00	715.25
3	OSC1	−862.00	130.25	11	VDD	892.00	901.75
4	AUD	−923.65	−1524.25	12	I/O1	865.00	1160.75
5	VSS	359.00	−1534.25	13	I/O2	827.00	1513.25
6	$\overline{\text{TEST2}}$	544.00	−1534.25	14	I/O3	520.50	1513.25
7	$\overline{\text{OUT1}}$	879.50	−1524.25	15	I/O4	192.50	1513.25
8	$\overline{\text{OUT2}}$	891.00	145.25	16	I/O5	−504.50	1513.25

F. Pin Assignment —



G. Absolute Maximum Ratings —

(Ta=25°C)

Parameter	Symbol	Minimum	Maximum	Unit
Supply Voltage	V _{DD}	-0.3	5.5	V
Input Voltage	V _I	V _{SS} -0.3	V _{DD} +0.3	V
Storage Temperature	T _{STG}	-50	125	°C
Operating Temperature	T _{OP}	0	70	°C

H. Electric Characteristics —

(Ta=25°C)

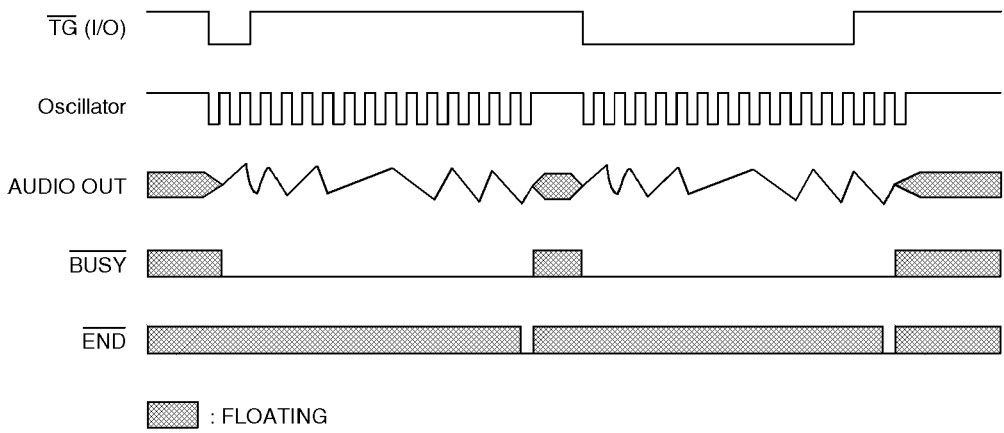
Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		VDD	Condition				
V _{DD}	Operating Voltage	—	—	2.4	3	5.0	V
I _{OP}	Operating Current	3V	—	—	150	300	μA
I _{DD}	Stand-by Current	3V	No Load.	—	1	5	μA
I _{AUD}	Max AUD. Output Current	3V	V _{OH} =0.6V	-1.5	-2.0	—	mA
I _{OUT}	OUT Pin Sink Current	3V	V _{OL} =1.3V	3.0	5.0	—	mA
T _{END}	END Pulse Width	—	F _{OSC} =96KHz	100	160	—	μS
I _{SW}	Input Pin Switch Current	3V	V _{IL} =0V	8	15	35	μA
V _{IH}	"H" Input Voltage	—	—	0.7V _{DD}	—	—	V
V _{IL}	"L" Input Voltage	—	—	—	—	0.2V _{DD}	V

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		VDD	Condition				
T _{TG}	Input Trigger Pulse Width	—	F _{osc} =96KHz	200	—	—	μS

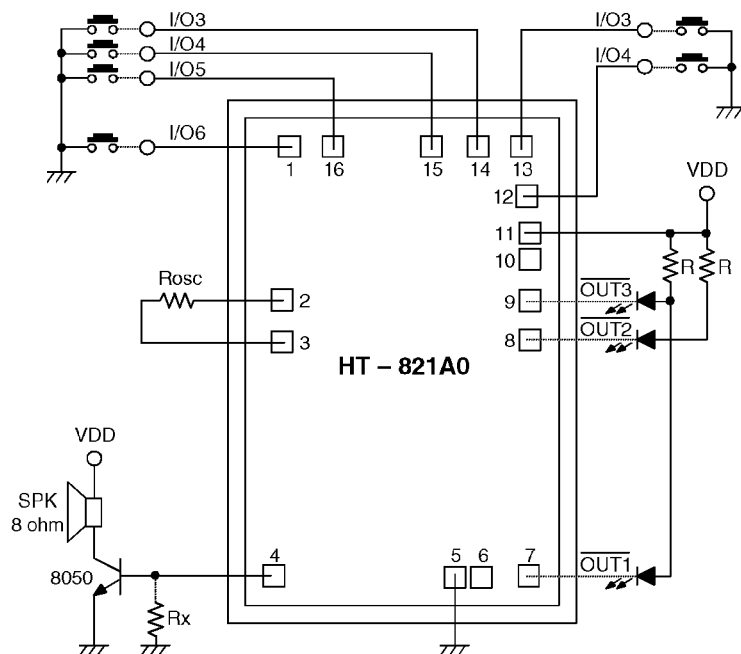
I. Pin Description —

Pin No.	Pin Name	I/O	Description
1	I/O4	I/O	Programmable I/O pin of gate array.
2	I/O5	I/O	Programmable I/O pin of gate array.
3	I/O6	I/O	Programmable I/O pin of gate array.
4	OSC2	O	Oscillator output pin.
5	OSC1	I	Oscillator input pin.
6	AUD	O	Speech output for driving external transistor.
7	VSS	I	Negative power supply (GND).
8	$\overline{\text{TEST2}}$	I	Test pin.
9	$\overline{\text{OUT1}}$	O	Section 1 or section 4 end pulse, or LED 4Hz flash output (mask option). Open drain, low active output.
10	$\overline{\text{OUT2}}$	O	Section 2 end pulse, or busy or speech level LED indicator (mask option). Open drain, low active output.
11	$\overline{\text{OUT3}}$	O	Section 3 end pulse, or end pulse of every section or LED 4Hz flash output(mask option). Open drain, low active output.
12	$\overline{\text{TEST1}}$	I	Test pin.
13	VDD	I	Positive power supply.
14	I/O1	I/O	Programmable I/O pin of gate array.
15	I/O2	I/O	Programmable I/O pin of gate array.
16	I/O3	I/O	Programmable I/O pin of gate array.

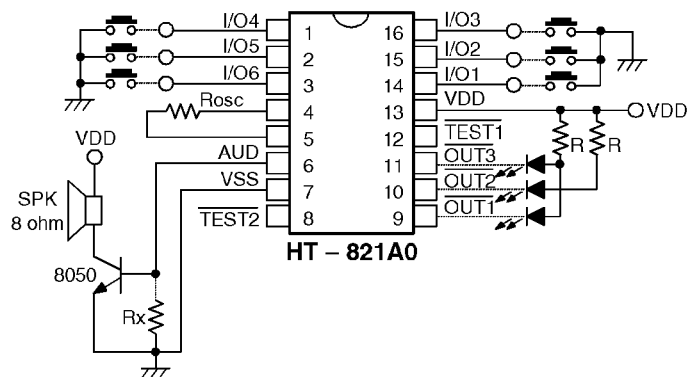
J. Timing Diagram —



K. Application Circuit —



* The substrate should be connected to VSS in PCB layout artwork.



$R = 100 \sim 330\Omega$

$R_x \cong 1K\Omega$ for $V_{DD} = 4V \sim 5V$.

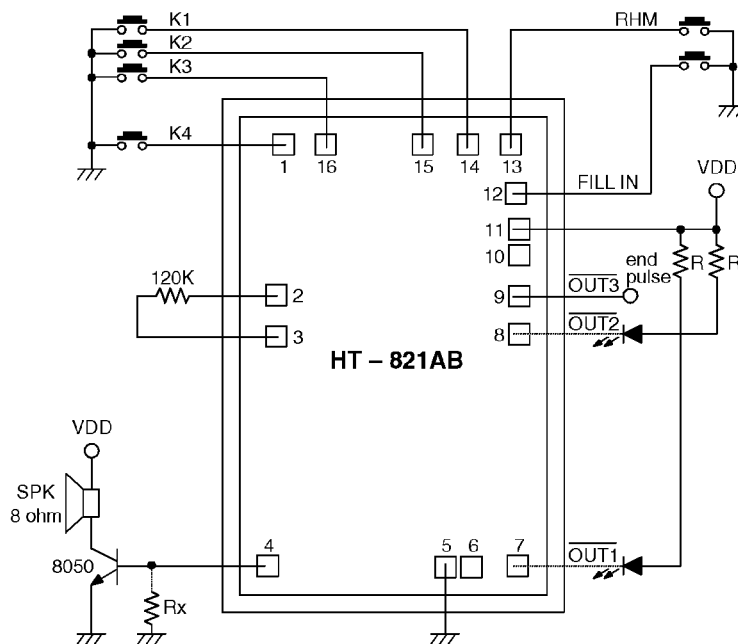
Function and connection of I/O1 ~ I/O6 are depending on the gate array wiring.

$R_x \cong 1K\Omega$ for $V_{DD} = 4V \sim 5V$.

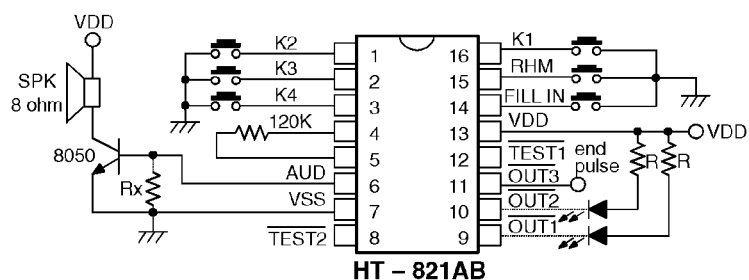
	Manual	Rhythm
K1	Ride Cymbal	Rhumba
K2	Bass Drum	Tango
K3	Low Conga	Big Band
K4	Snare Drum	Rock
FILL IN	—	Fill in

$$R_x \cong 1K\Omega \text{ for } V_{DD} = 4V \sim 5V.$$

Application Circuit (HT-821AB----4 Rhythm 1 Fill in/4 Drum 2)



* The substrate should be connected to VSS in PCB layout artwork.



$R = 100 \sim 300\Omega$

$R_x \cong 1K\Omega$ for $VDD = 4V \sim 5V$.

RHM : Manual/Rhythm Select (toggle).

OUT1 : 4Hz flash.

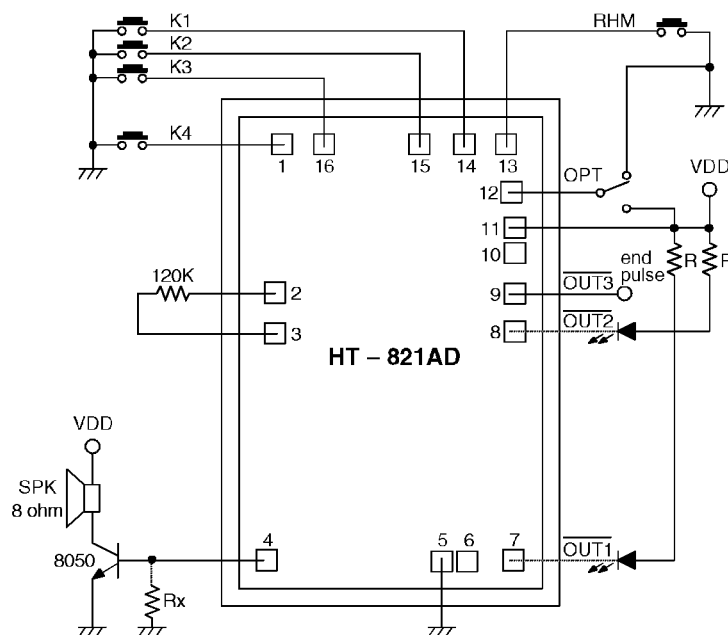
OUT2 : Flash following volume.

OUT3 : End pulse of all sections.

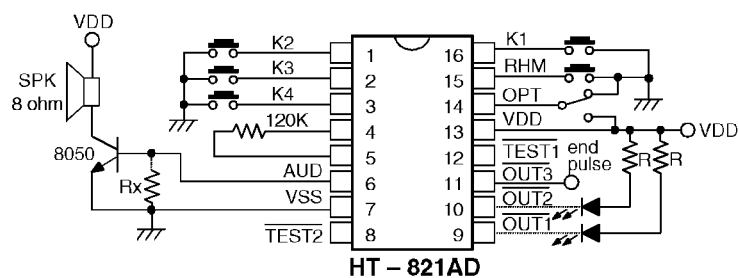
K1 ~ K4 are retriggerable.

	Manual	Rhythm
K1	Crash Cymbal	Rhumba
K2	Low Tom Tom	Tango
K3	Timbal	Big Band
K4	High Hat Close	Rock
FILL IN	—	Fill in

Application Circuit (HT-821AD----1 Rhythm 4 Fill in/4 Drum 3)



* The substrate should be connected to VSS in PCB layout artwork.



File in option :

OPT = VDD : 1 section (4 measures max.).

OPT = VSS : 2 section (4 measures min.).

RHM : Manual/Rhythm Select (toggle).

OUT1 : 4Hz flash.

OUT2 : Flash following volume.

OUT3 : End pulse of all sections.

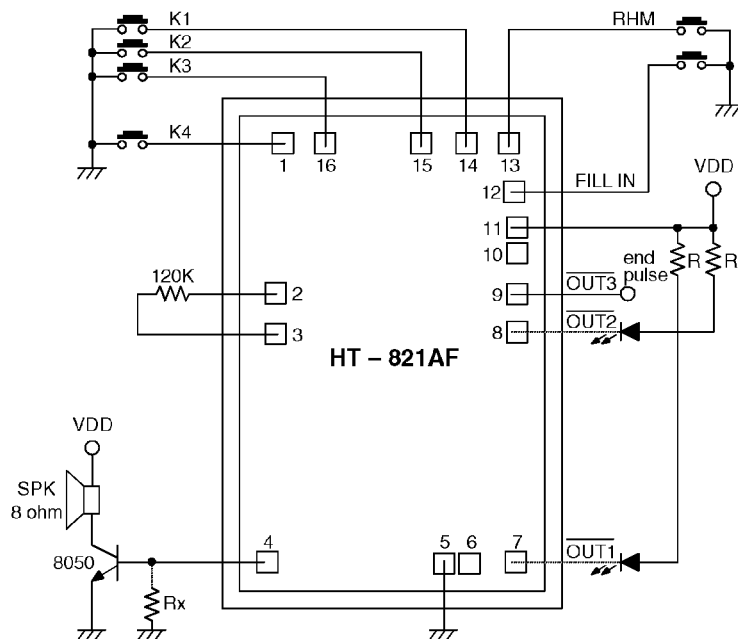
	Manual	Rhythm
K1	Crash Symbal	Fill in 1
K2	Synthesis Tom Tom Low	Fill in 2
K3	Cow Bell Low	Fill in 3
K4	Hand Clap	Fill in 4

K1 ~ K4 are retriggerable.

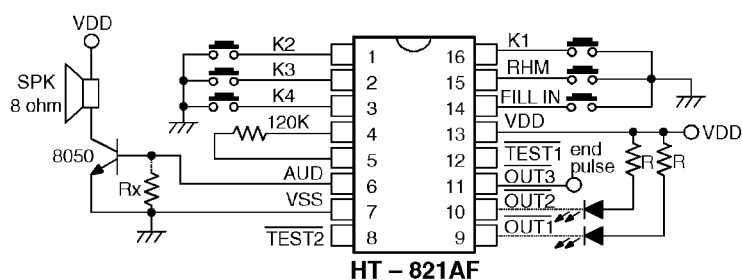
R = 100 ~ 300Ω.

Rx ≅ 1KΩ for VDD = 4V ~ 5V.

Application Circuit (HT-821AF----4 Rhythm 1 Fill in/4 Drum 3)



* The substrate should be connected to VSS in PCB layout artwork.



$R = 100 \sim 300\Omega$

$R_x \cong 1K\Omega$ for $V_{DD} = 4V \sim 5V$.

RHM : Manual/Rhythm Select (toggle).

OUT1 : 4Hz flash.

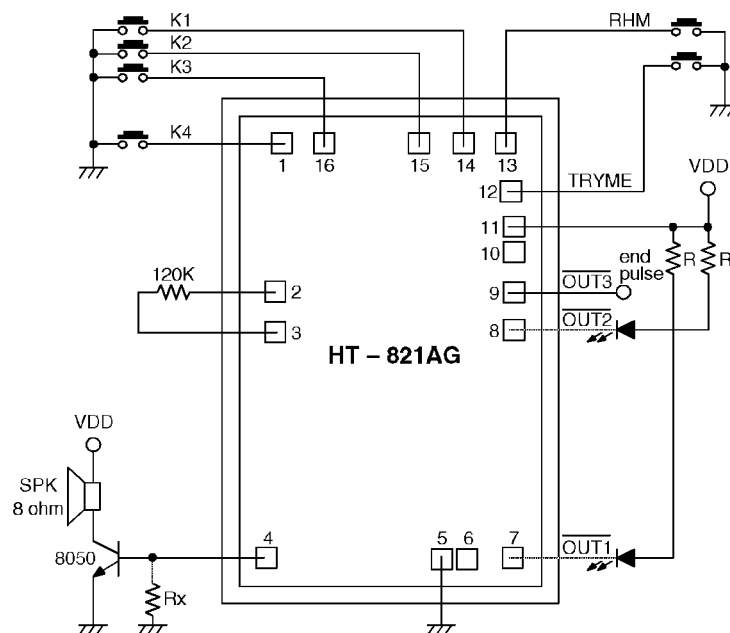
OUT2 : Flash following volume.

OUT3 : End pulse of all sections.

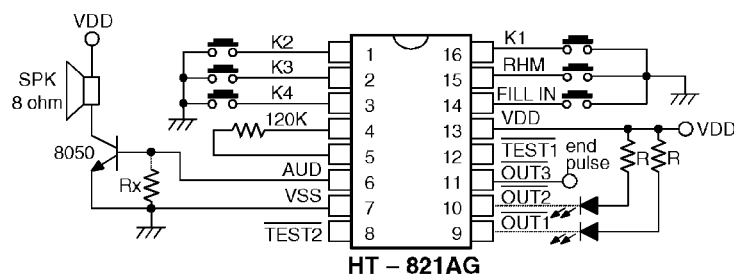
K1 ~ K4 are retriggerable.

	Manual	Rhythm
K1	Crash Symbol	Rhumba
K2	Synthesis Tom Tom Low	Tango
K3	Cow Bell Low	Big Band
K4	Hand Clap	Rock
FILL IN	—	Fill in

Application Circuit (HT-821AG----1 Rhythm 4 Fill in/4 Drum 1 With TRYME Key)



* The substrate should be connected to VSS in PCB layout artwork.



TRYME : play built-in rhythm 7 times.
 (it will play 5 times after fill-in, if any one of K1~K4 is pressed during auto-play progressing; or switch to rhythm mode if RHM key is pressed.)

RHM : Manual/Rhythm Select (toggle).

OUT1 : 4Hz flash.

OUT2 : Flash following volume.

OUT3 : End pulse of all sections.

	Manual	Rhythm
K1	Crash Symbal	Rhumba
K2	Tom Tom Low	Tango
K3	Cow Bell Low	Big Band
K4	Hand Clap	Rock

K1 ~ K4 are retriggerable.

R = 100 ~ 300Ω.

Rx ≅ 1KΩ for VDD = 4V ~ 5V.