

## MCU-Voice with Real-Time Clock (RTC)

### Features

- Single power supply 2.4V – 5.2V
- 4-bit ADPCM, 5-bit ADPCM & 8-bit PCM synthesis.
- 7K-22KHz max. of playing speed for ADPCM synthesizer
- 12K-32KHz max. of playing speed for PCM synthesizer
- Provides 3~340 seconds voice@ S.R.= 6KHz & 4-bit ADPCM
- Max. of two current type DAC audio outputs
- One PWM output to direct driving a speaker
- Programmable 2-channel tone melody generator
- 16 levels of digital volume control
- Powerful and easy instructions are provided
- Built in a high quality speech synthesizer
- On-chip RC oscillator
- Power saving STOP & HALT modes
- I/O State Change wake-up option for all of I/O port
- Support 32K crystal oscillator share with two pins of PA

### General Description

JA21000 is a series of 3 to 340 seconds single chip voice synthesizer IC with RTC which contains a PWM direct drive circuit or AUD output for transistor application. In addition, this chip also provides high sink current port pins, multi external interrupt pins function, and multi oscillator options. JA21000 series offers one of the best cost/performance ratios in the toy or industry for controller. It also supplies high-sink current port pins, multi-external wake-up pins function and multi-oscillator options. The JA21000 series can

support 32K crystal oscillator for timer with low operating current. In addition, this JA21000 series family IC leads users into an easy-to use development environment that shorten developer's period and fasten time-to-market. Moreover, fantastic sound effects can be generated by users easily without writing complex programs. This JA21000 series family offers the best cost/performance ratios for toy, consumer, and industry use.

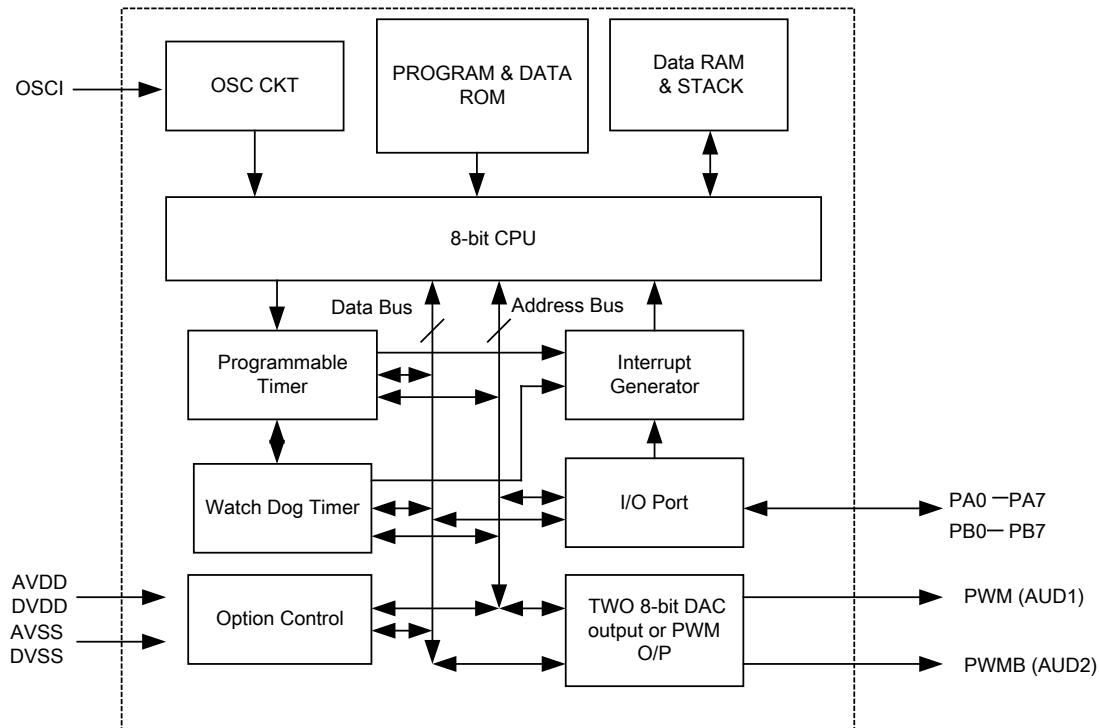
### Selection Table

Part No.	JA21003	JA21007	JA21014	JA21018	JA21032	JA21043
Voice Cap. (second )	3	7	14	18	32	43
I/O	8	8	8	8	12	12
Max. of PWM outputs	1	1	1	1	1	1
Max. of DAC outputs				1	2	2

Part No.	JA21064	JA21085	JA21128	JA21170	JA21256	JA21340
Voice Cap. (second )	64	85	128	170	256	340
I/O	12	12	16	16	16	16
Max. of PWM outputs	1	1	1	1	1	1
Max. of DAC outputs	2	2	2	2	2	2

Note : The voice capacity is based on sampling rate of 6KHz and 4-bit ADPCM

**Block Diagram**



**Pad Assignment**

Pin Name	I/O	Internal	Description
DVSS	—	—	Digital negative power supply
AVSS	—	—	Analog negative power supply
PA0 – PA3	I/O	NMOS Open Drain	Keyboards scan output in matrix mode. Normal I/O pins in direct mode. For output mode, they are open drain output; For input mode, they are without pull-high resistor.
PA4 – PA7	I/O	CMOS with pull-high	Keyboards scan output in matrix mode. Normal I/O pins in direct mode. For output mode, they are CMOS output; For input mode, they are with pull-high resistor.
PB0 – PB7	I/O	CMOS with pull-high	Keyboards scan input in direct/matrix mode. PB0 – PB3 pins are for all series. PB4 – PB7 pins are for JA21128 — JA21340 only.
AVDD, DVDD	—	—	Positive power supply.
OSCI	I	—	In RC mode, it connects an external oscillator resistor between OSCI and VDD. As well, the pin can be used as an external clock input.
PWM (AUD1) PWMB (AUD2)	O	CMOS or Open Drain	Current type output or PWM type output by mask option. For current type output, it must drive an external transistor and only for JA21018 — JA21340. For PWM type output, it can drive a speaker directly. (8 ohm – 32 ohm) The AUD1 output is provided to JA21018 — JA21340, and the AUD2 output is provided to JA21032 — JA21340 only.

**Preliminary**

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**Absolute Maximum Rating**

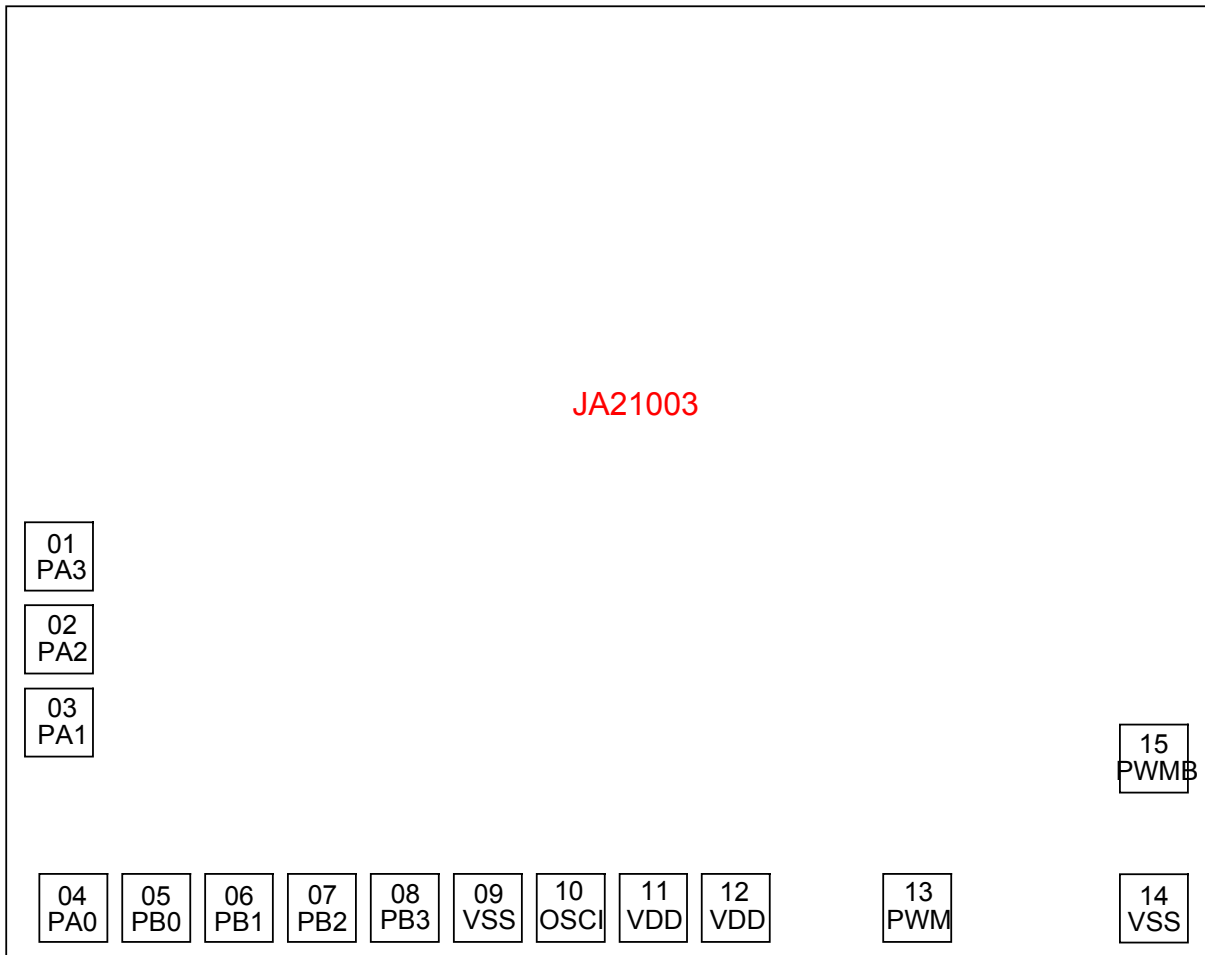
Symbol	Rating	Unit
$V_{DD} \sim V_{SS}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
VIN (for input)	$V_{SS} - 0.3 < V_{IN} < V_{DD} + 0.3$	V
VOUT (for all outputs)	$V_{SS} < V_{OUT} < V_{DD}$	V
T (operating)	-10 ~ +60	
T (storage)	-55 ~ +125	

**Electrical Characteristics**

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		VDD	Condition				
VDD	Operating Voltage	—	Fsys=4MHz	2.4	—	5.2	V
ISTB1	Standby Current	3.0V	System HALT, 32768 Crystal Off	—	—	2	uA
ISTB2	Standby Current	3.0V	System HALT, 32768 Crystal On	—	—	10	uA
IDD1	Operating Current (RC OSC)	3.0V	Fsys=4MHz	—	1	2	mA
VIL1	Input Low Voltage for I/O	3.0V	—	0	—	0.3VDD	V
VIH1	Input High Voltage for I/O	3.0V	—	0.7VDD	—	VDD	V
VRES	Power reset voltage	—	$V_{DD} \leq V_{RES}$ , System re-start	1.6	1.8	2.0	V
IOL	I/O Sink Current	3.0V	VOL=0.1VDD	4	8	—	mA
IOH	I/O source Current	3.0V	VOH=0.9VDD	-2	-4	—	mA
RPH	Pull-High Resistance	3.0V	VIL=0V	50	100	150	KΩ
FSYS1	System Clock (RC OSC)	3.0V	Rosc=300K	1.8	2	2.2	MHz
			Rosc=150K	3.6	4	4.4	
			Rosc=91K	5.4	6	6.6	

### Pad Diagram

#### 1. JA21003



Note : The IC substrate should be connect to VSS

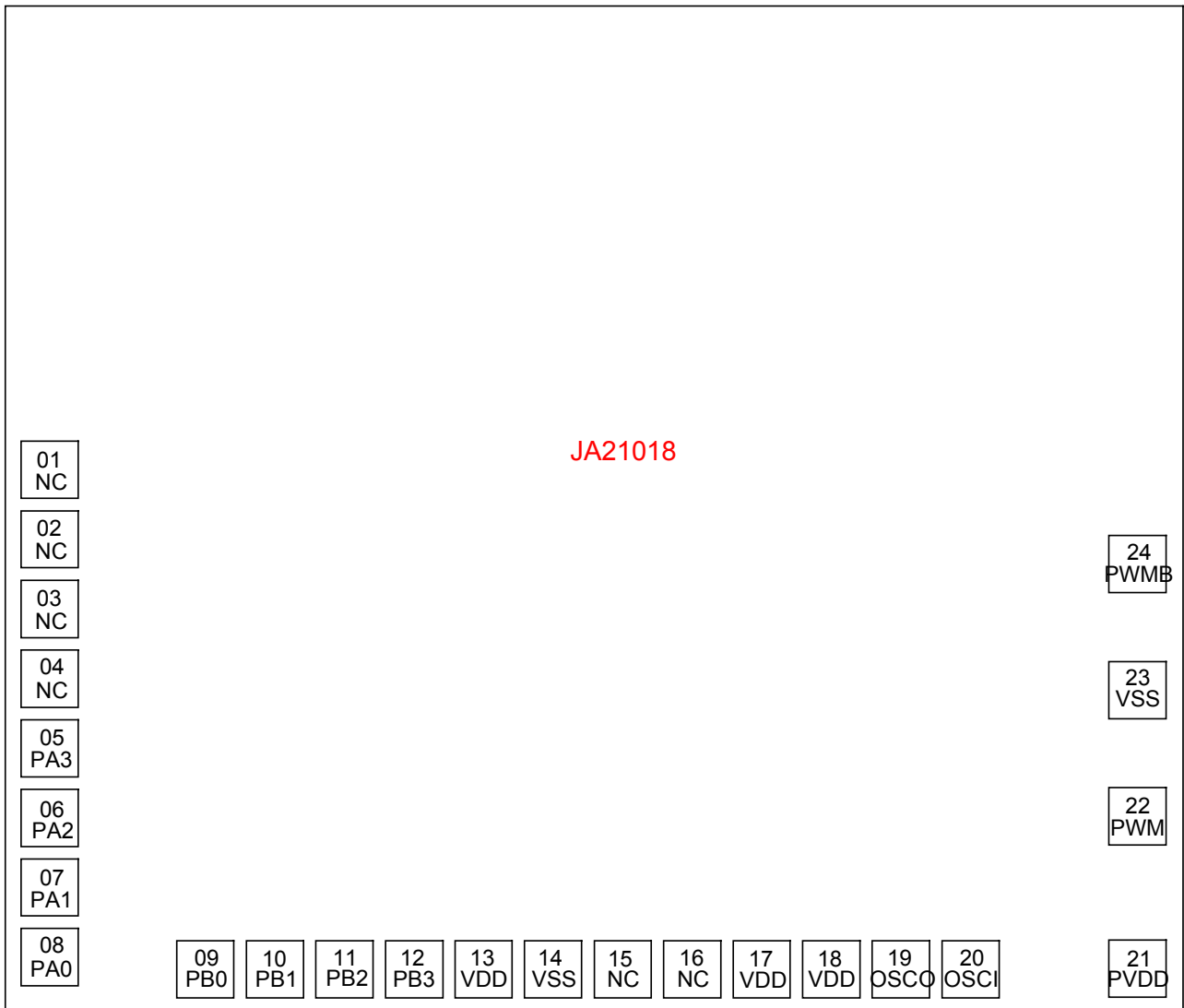


3. JA21014



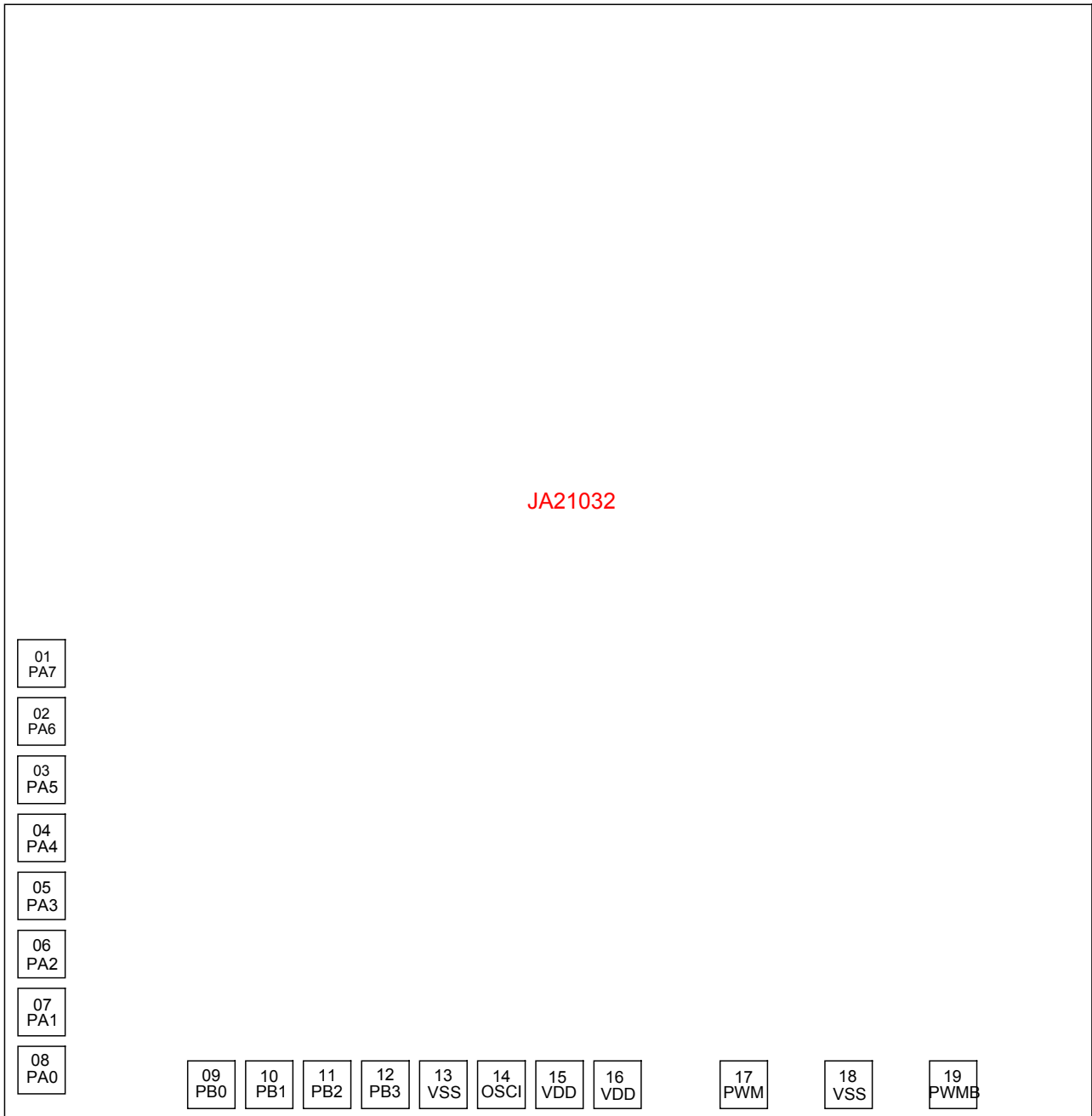
Note : 1. The IC substrate should be connect to VSS

4. JA21018



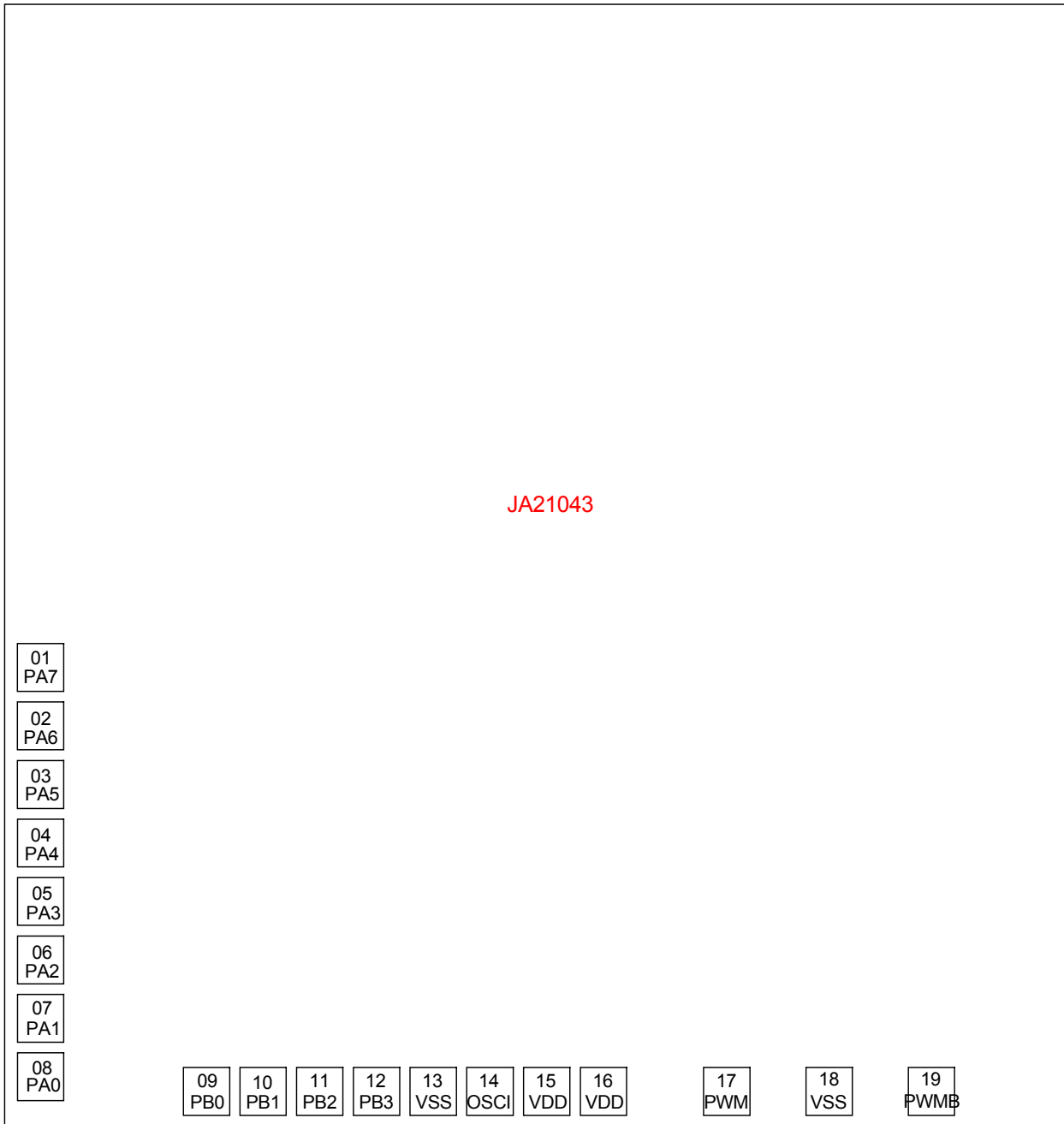
Note : 1. The IC substrate should be connect to VSS

5. JA21032



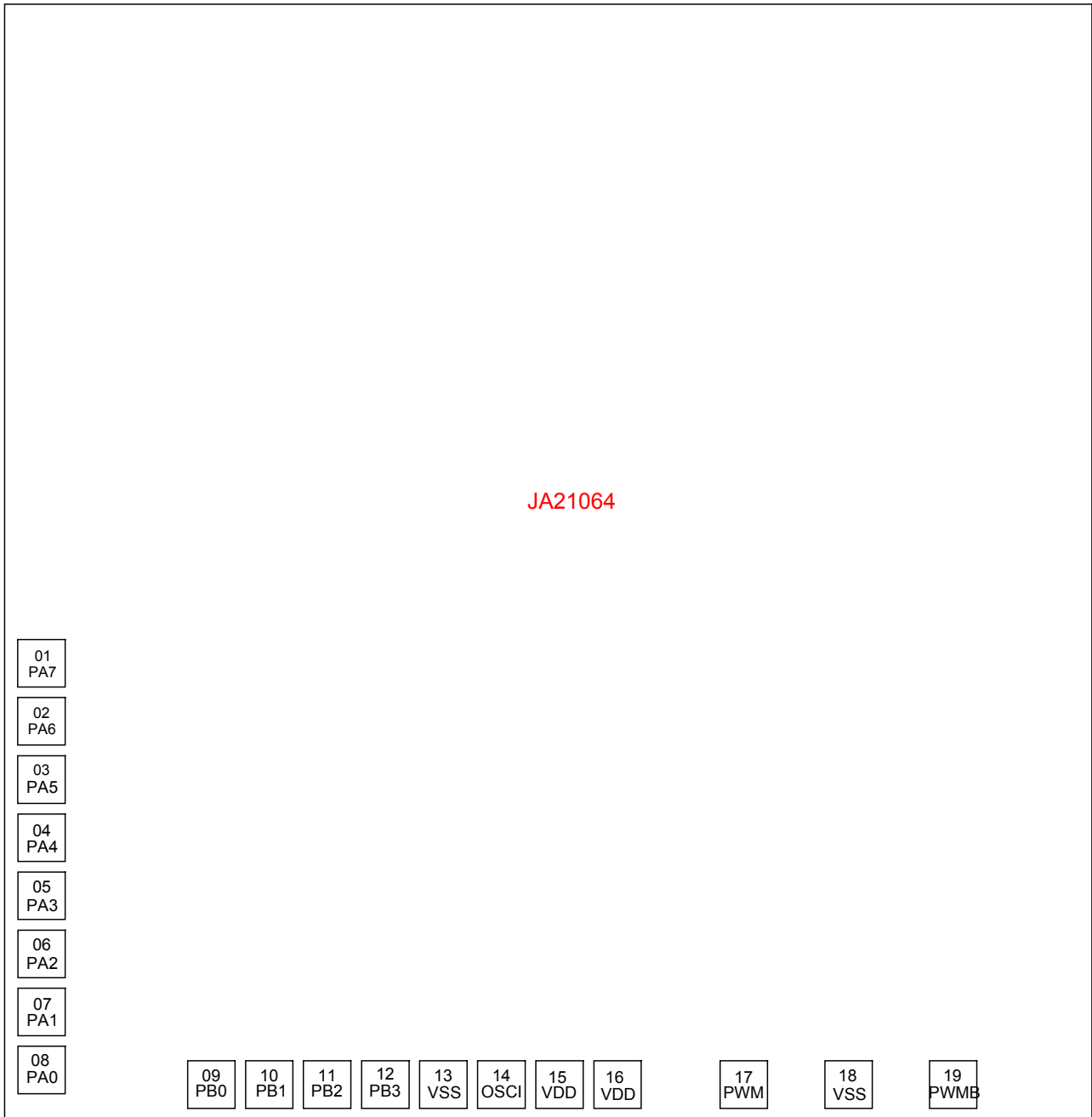
Note : The IC substrate should connect to VSS

6. JA21043



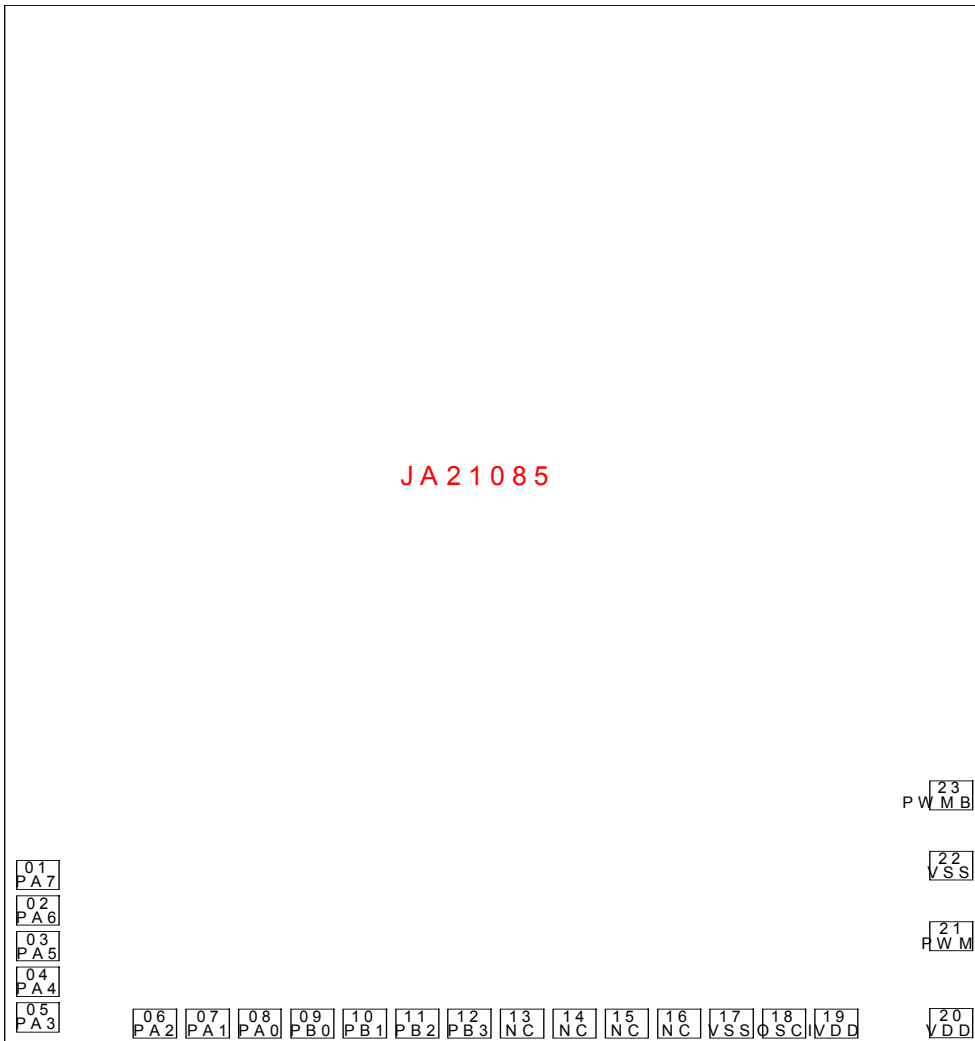
Note : The IC substrate should be connect to VSS

7. JA21064



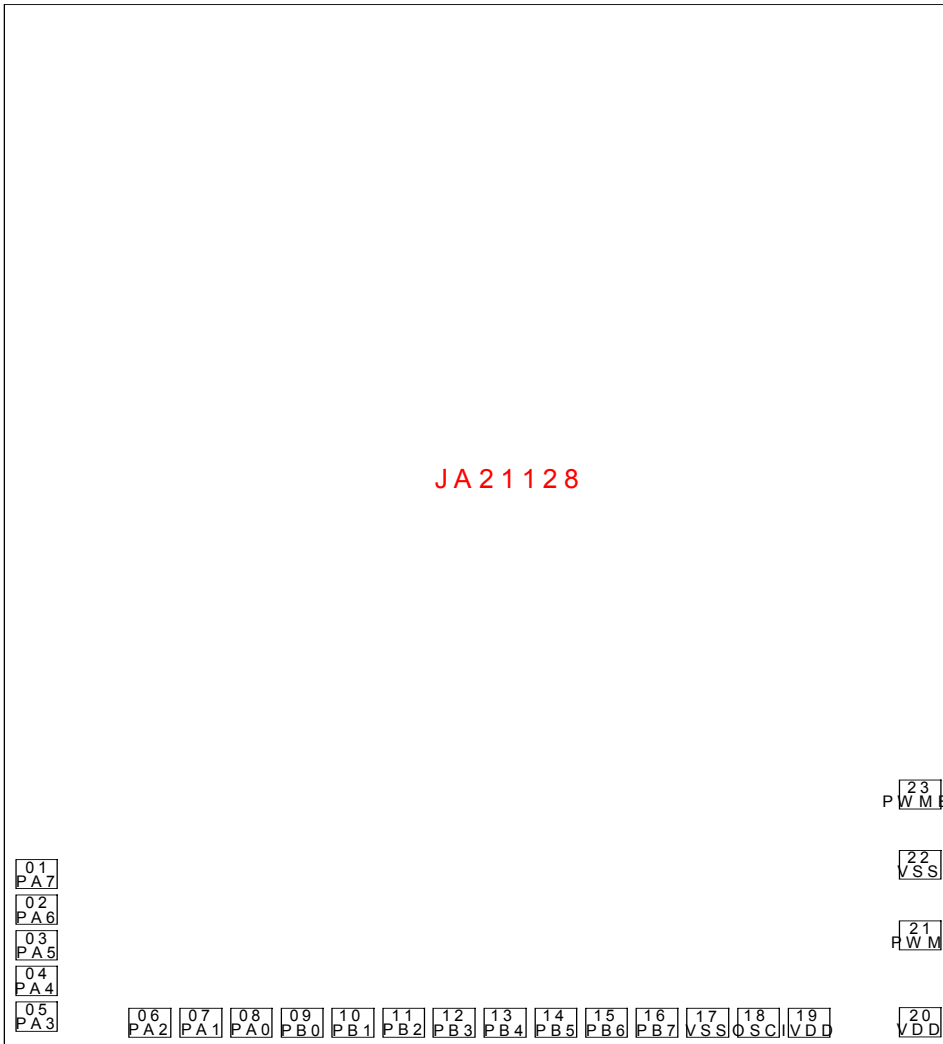
Note : The IC substrate should be connect to VSS

8. JA21085



Note : The IC substrate should connect to V<sub>SS</sub>

9. JA21128



Note : The IC substrate should be connect to V<sub>SS</sub>

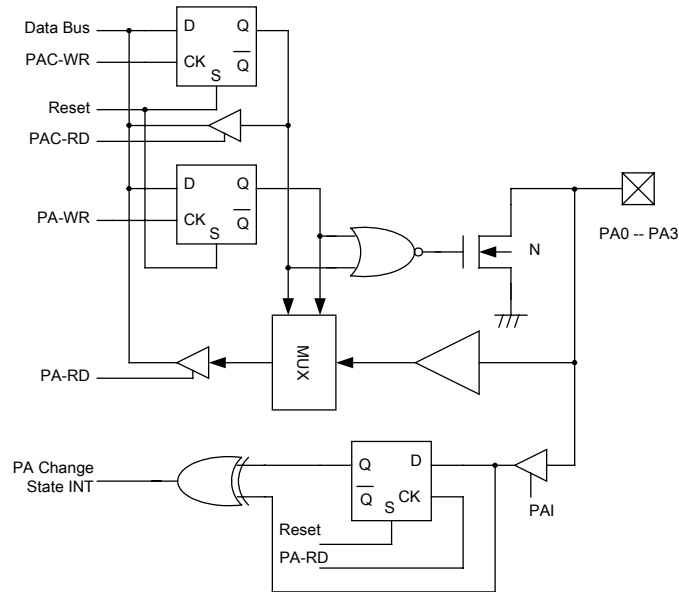




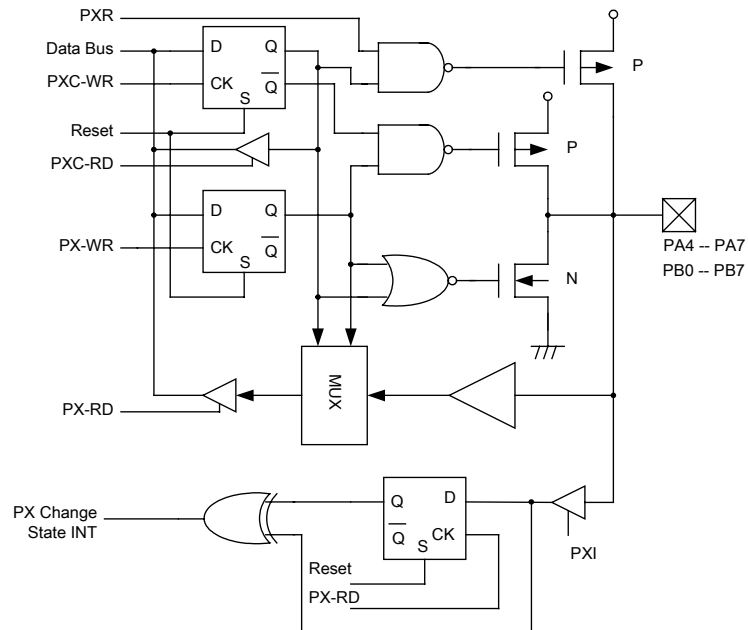


### I/O Port structure

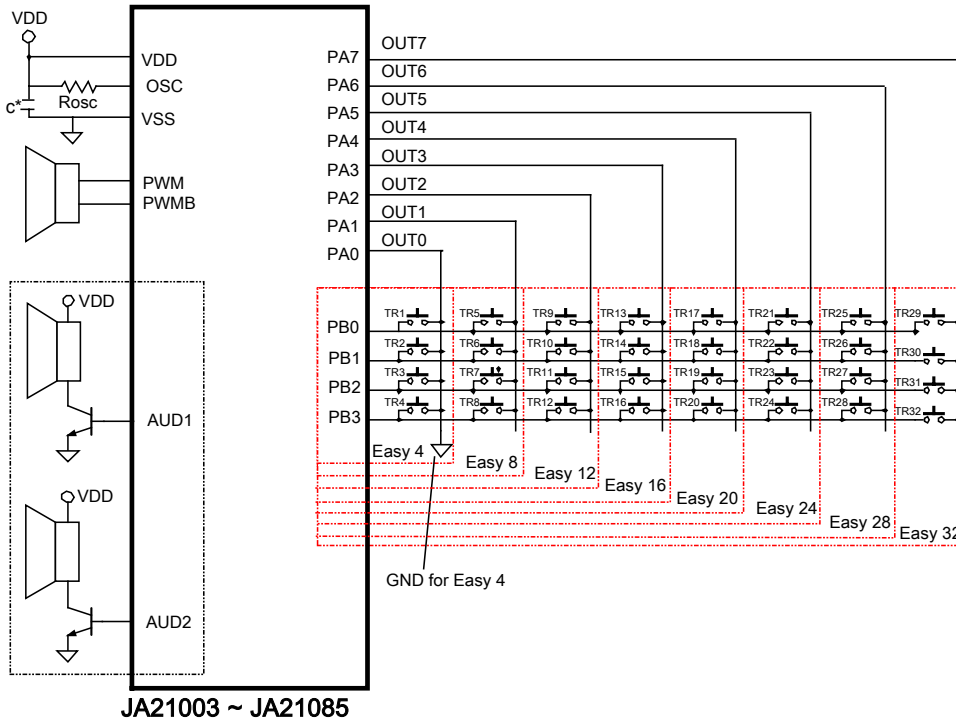
For the PA0~PA3, they are defined as NMOS open drain output only when PAC is set as output mode.



For the others of the Port A, they can be configured as follows :

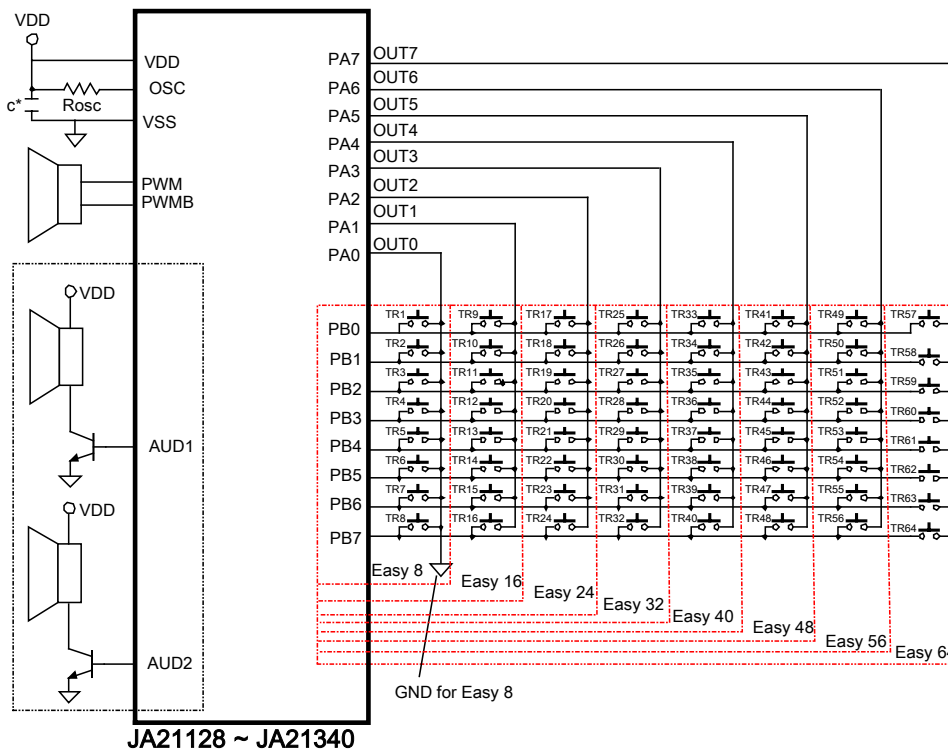


### Application Circuit 1 (JA21003~JA21085)



- Note : 1. The AUD1 and AUD2 is shared with PWM and PWMB.  
 2. The capacitor "c" is suggested as 0.1 $\mu$ F. (if with motor application, a 10-100 $\mu$ F capacitor should be added in addition)

Application Circuit 2 (JA21128~JA21340)



Note : 1. The AUD1 and AUD2 is shared with PWM and PWMB.

3. The capacitor "c" is suggested as 0.1μF. (if with motor application, a 10-100μF capacitor should be added in addition)

Revision History

Date	Reversion #		Page
2004.6.14	0.9	1. Add AUD2 to JA21032, JA21043	1,3
2005.4.15	1.0	1. Add AD5 algorithm description 2. Delete bonding location 3. Modify PB is I/O pin	1 4~13 2