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## ASM7306C/8406C

### 1.0 General Description

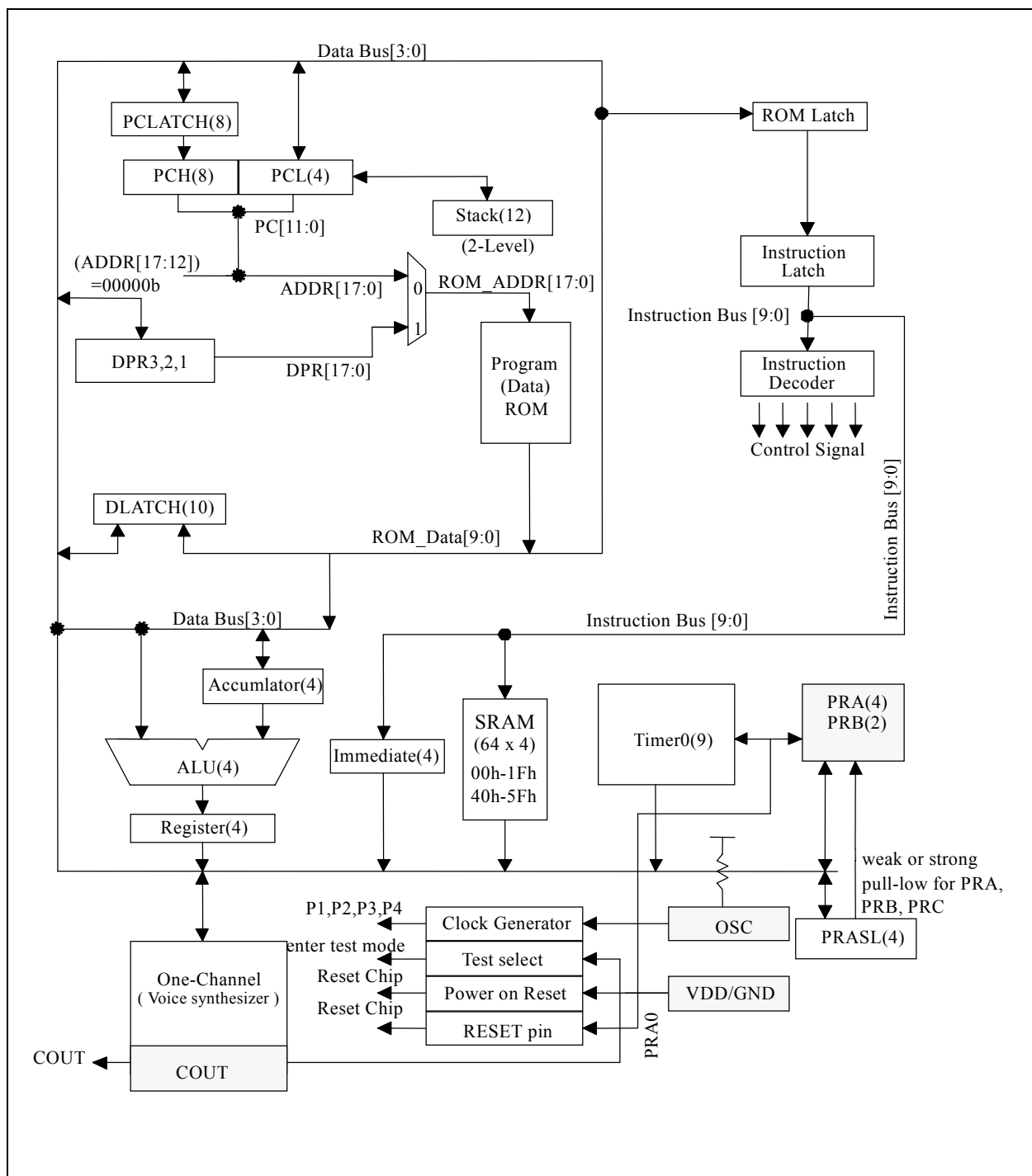
The ASM7306C/8406C is very low cost voice synthesizer with 4-bit microprocessor. It has various features including 4-bit ALU, ROM, RAM, I/O ports, timers, clock generator, watchdog timer(WDT), voice synthesizer, etc . It consists of 22 instructions in the device. With CMOS technology and halt function can minimize power dissipation . Its architecture is similar cycle, to RISC, with two stages of instruction pipeline. It allows all instructions to be in a executed single except for program branches and data table read instructions (which need two instruction cycles).

### 1.1 Feature

- ◆ Single power supply can operate from 2.4V through 5.5V
- ◆ Internal Program ROM: 4K x 10-bit
- ◆ 1 sets of 18-bit DPR can access up to 256K x 10 bits data memory space
- ◆ Data Registers:
  - 64 x 4-bit data RAM (00-1Fh plus 40h-5Fh)
  - Unbanked special function registers (SFR) range: 20h-3Fh
- ◆ I/O Ports:
  - PRA: 4-bit I/O Port A (2Bh)
  - PRB: 2-bit Output Port B (2Dh)
- ◆ On-chip clock generator:     Resistive Clock Drive(**RM**)
- ◆ Timer: 1
  - Timer0: a 9-bit auto-reload timer/counter
- ◆ Stack: 2-level subroutine nesting
- ◆ HALT and Release from HALT function to reduce power consumption
- ◆ Watch Dog Timer (**WDT**)
- ◆ Instruction: 1-cycle instruction except for table read and program branches which are 2-cycles
- ◆ Number of instruction: 22
- ◆ The Voice function can be implemented by microprocessor instruction
  - One 8-bit COUT output for ASM7306C/8406C

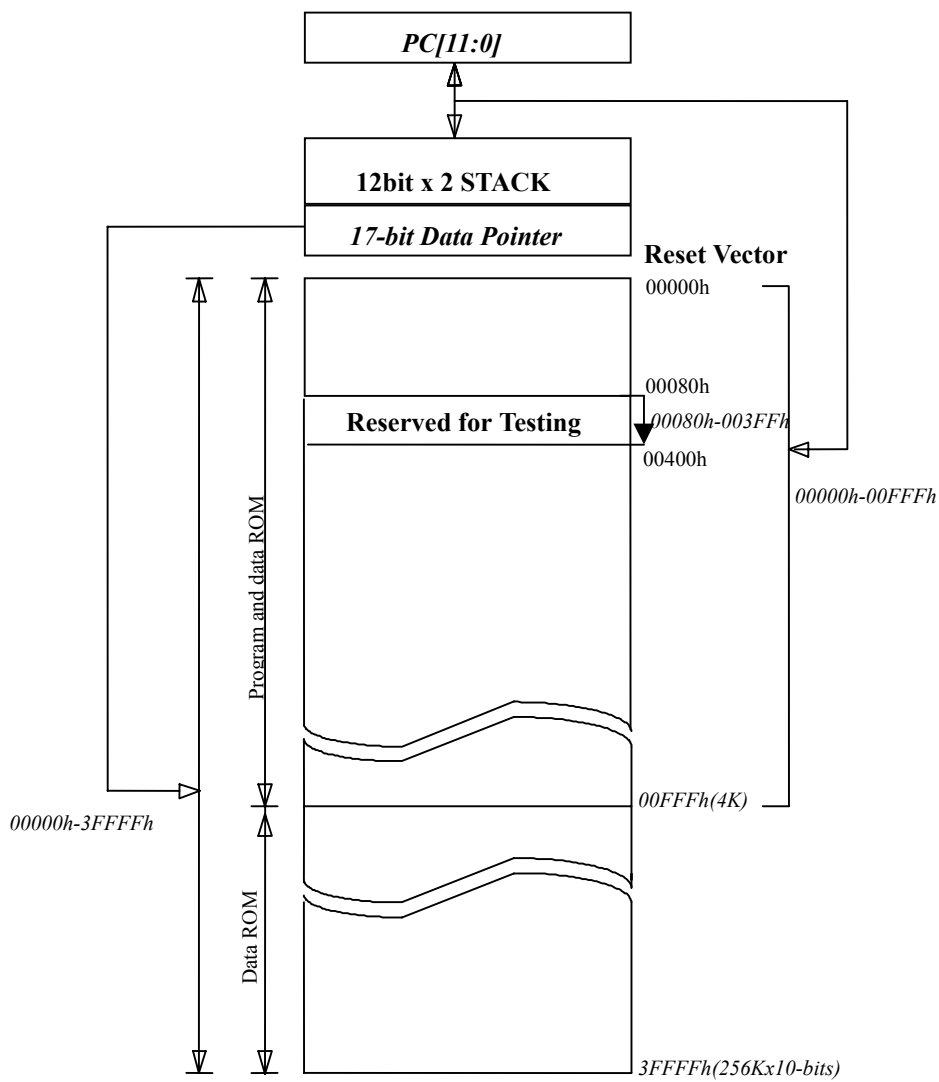


**FIGURE 1.1 : Block Diagram of ASM8406C**





**FIGURE 1.2 : External ROM Map of ASM7306C/8406C**

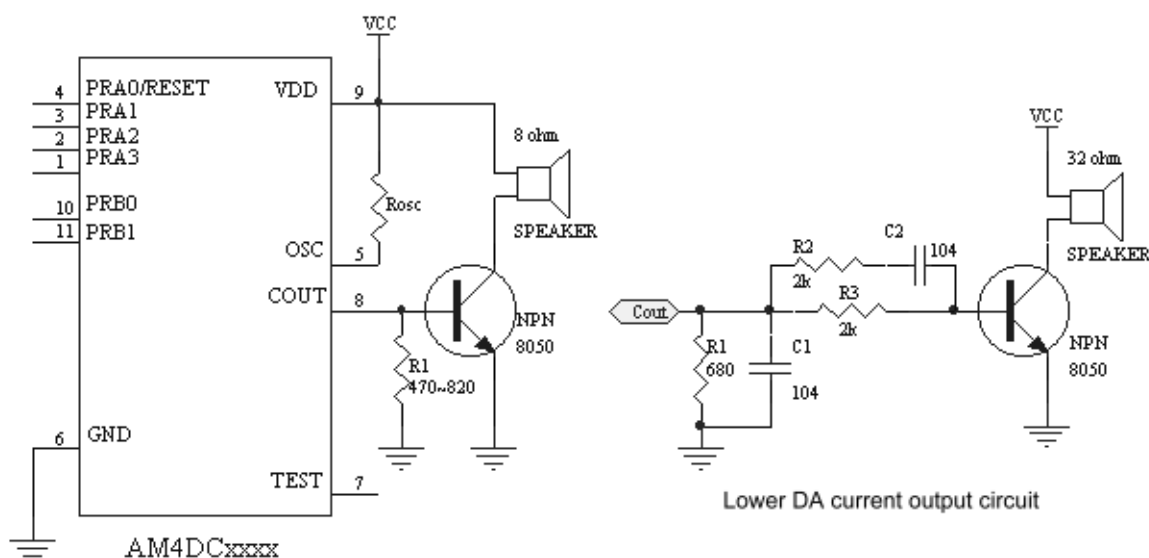




## 1.2 Pin-Out

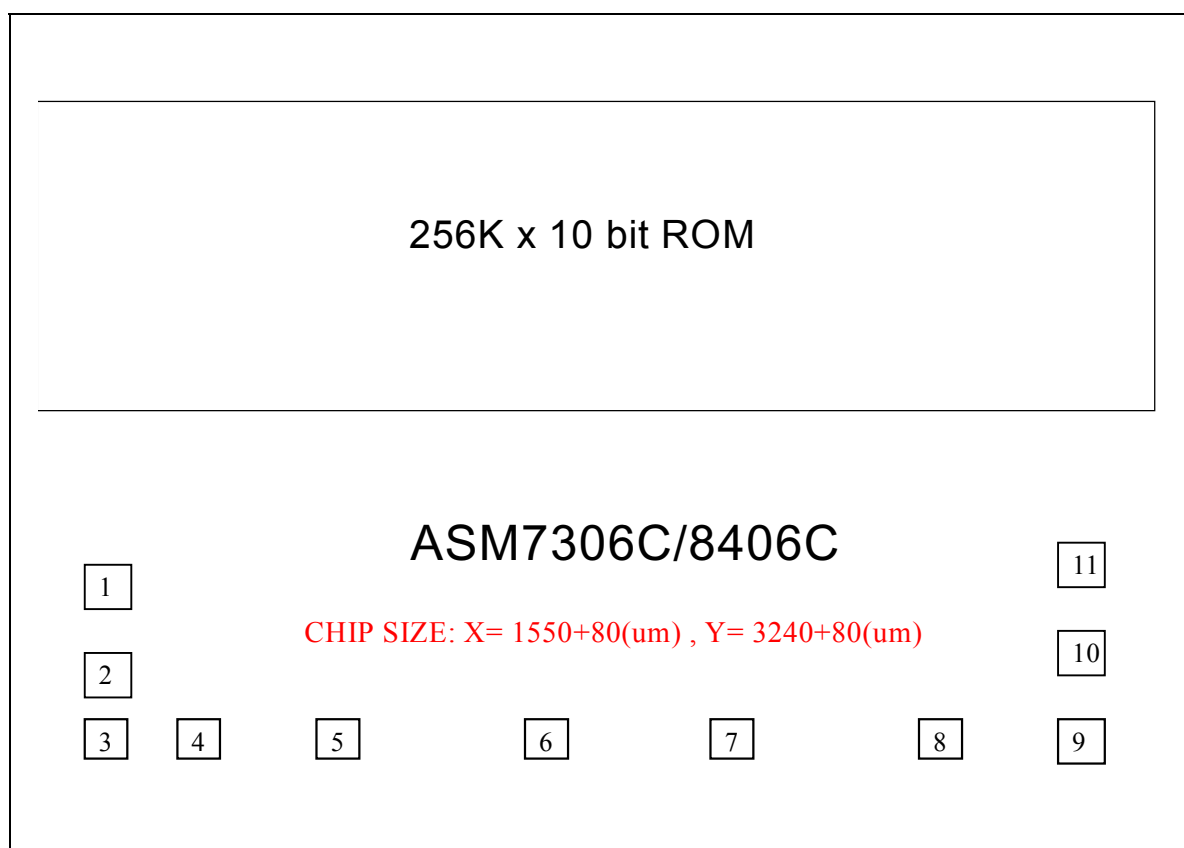
| ASM7306C/8406C Pin-Out |     |                  |                                                                                                                                                                                                                                      |
|------------------------|-----|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VDD                    | I   | -                | Power supply during operation                                                                                                                                                                                                        |
| PRA3-1                 | I/O | STI<br>Std./O.D. | I/O port with programmable strong pull-low or weak pull-low or fix-input-floating capability<br>Output type with standard or Open-Drain output                                                                                       |
| PRA0/RESET             | I/O | STI<br>Std./O.D. | I/O port with programmable strong pull-low or weak pull-low or fix-input-floating capability<br>Output type with standard or Open-Drain output<br><i>Mask option selected as an external RESET pin with weak pull-low capability</i> |
| OSC                    | I   | -                | RM mode Oscillator input                                                                                                                                                                                                             |
| COUT                   | O   | -                | Current Output of Audio                                                                                                                                                                                                              |
| GND                    | I   | -                | Circuit Ground Potential                                                                                                                                                                                                             |
| TEST                   | O   | -                | Enter Test Mode. ( TEST = High )                                                                                                                                                                                                     |
| PRB0-1                 | O   | Std./O.D.        | Output type with standard or Open-Drain output                                                                                                                                                                                       |

## 1.3 Application circuit





## 1.4 Bonding Diagram



**Substrate must be connected to GND.**

| ASM7306C/8406C Pad Location |          |         |          | CHIP SIZE: X= 1550+80(um) , Y= 3240+80(um) |          |        |          |
|-----------------------------|----------|---------|----------|--------------------------------------------|----------|--------|----------|
| PAD #                       | PAD Name | X       | Y        | PAD #                                      | PAD Name | X      | Y        |
| 1                           | RA3      | -664.92 | -1211.84 | 7                                          | TEST     | 105.44 | -1536.52 |
| 2                           | RA2      | -664.92 | -1339.96 | 8                                          | COU      | 303.96 | -1536.52 |
| 3                           | RA1      | -662.64 | -1536.52 | 9                                          | VDD      | 683.04 | -1536.52 |
| 4                           | RA0      | -468.24 | -1536.52 | 10                                         | RB0      | 664.92 | -1335.52 |
| 5                           | OSC      | -281.04 | -1536.52 | 11                                         | RB1      | 664.92 | -1217.12 |
| 6                           | GND      | -111.72 | -1536.52 |                                            |          |        |          |

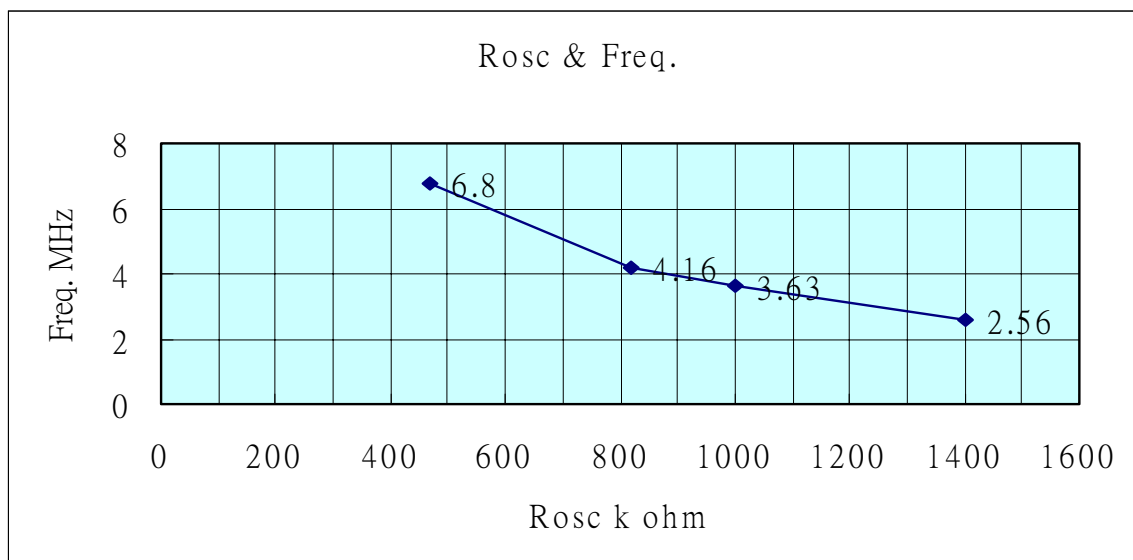


## 1.5 DC Characteristics for ASM7306C/8406C

| SYMBOL           | PARAMETER                           |           | VDD | MIN. | TYP. | MAX. | UNIT | CONDITION                                                              |
|------------------|-------------------------------------|-----------|-----|------|------|------|------|------------------------------------------------------------------------|
| VDD              | OPERATING VOLTAGE                   |           |     | 2.4  | 3    | 5.5  | V    | depending on Freq.                                                     |
| I <sub>sb</sub>  | SUPPLY CURRENT                      | STANDBY   | 3   |      |      | 1    | uA   | 4MHz, RM<br>in HALT Mode                                               |
|                  |                                     |           | 5   |      |      | 1    |      |                                                                        |
| I <sub>op</sub>  |                                     | OPERATING | 3   |      | 2    |      | mA   | 4MHz, RM<br>IO Floating                                                |
|                  |                                     |           | 5   |      | 7    |      |      |                                                                        |
| I <sub>ih</sub>  | INPUT CURRENT<br>/Internal pull low |           | 3   |      | 3    |      | uA   | 4MHz, RM<br>in HALT Mode<br>(IO Ports with weak<br>pull-high pull-low) |
|                  |                                     |           | 5   |      | 9    |      |      |                                                                        |
|                  |                                     |           | 5   |      | -5.2 |      |      |                                                                        |
| I <sub>oh</sub>  | OUTPUT HIGH CURRENT                 |           | 3   |      | -3   |      | mA   | 4MHz, RM<br>(IO ports)                                                 |
|                  |                                     | 5         |     | -8   |      |      |      |                                                                        |
| I <sub>ol</sub>  | OUTPUT LOW CURRENT                  |           | 3   |      | 7    |      |      |                                                                        |
|                  |                                     |           | 5   |      | 20   |      |      |                                                                        |
| C <sub>out</sub> | DA CURRENT OUT<br>(FULL SCALE)      |           | 3   |      | 4    |      |      |                                                                        |
|                  |                                     |           | 5   |      | 5.2  |      |      |                                                                        |
| dF/F             | FREQUENCY STABILITY                 |           |     | -10  |      | 10   | %    | <u>F<sub>osc</sub>(3v- 2.4v)</u><br>F <sub>osc</sub> (3v)              |
| dF/F             | F <sub>osc</sub> VARIATION          |           |     | -20  |      | 20   | %    | VDD=3V,<br>R <sub>osc</sub> =820k, 4MHz                                |

FIGURE 1.3 : Frequency Range for R<sub>osc</sub> in RM mode

|                 |      |      |      |      |
|-----------------|------|------|------|------|
| Resistor(k ohm) | 1400 | 1000 | 820  | 470  |
| 3v Freq.(MHz)   | 2.56 | 3.63 | 4.16 | 6.80 |



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