巨華積体電路股份有限公司
APLUS INTEGRATED CIRCUITS INC.

# *ASM0406CB/0906CB*
# *DATA SHEET*

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# ASM0406CB/0906CB

**- VERY LOW-COST VOICE SYNTHESIZER WITH 4-BIT MICROPROCESSOR**

## 1.0 General Description

The ASM0406CB/0906CB 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 to RISC,with two stages of instruction pipeline. It allows all instructions to be executed in a single cycle, 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 15-bit DPR can access up to 32K 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 ASM0406CB/0906CB

**FIGURE 1.1 : Block Diagram of ASM0406CB/0906CB**

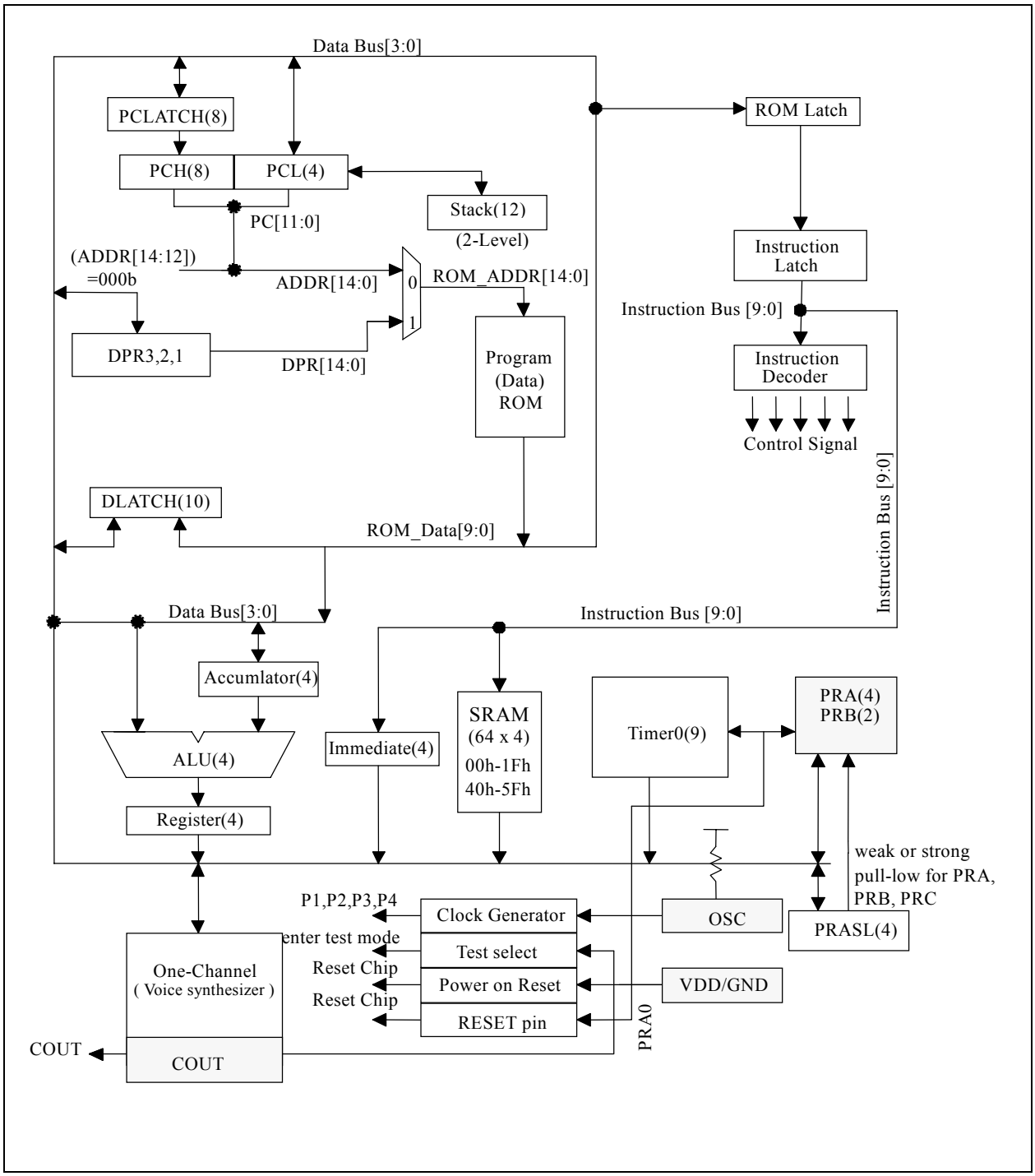
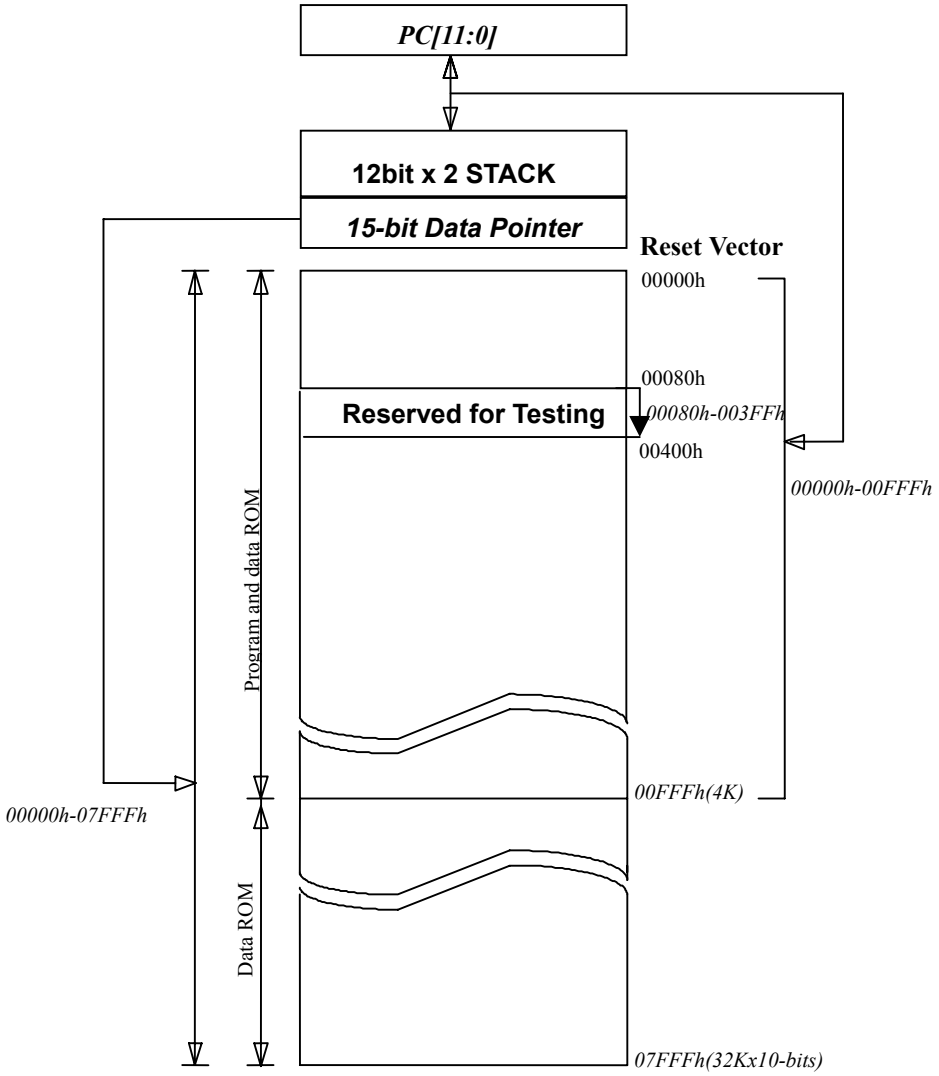


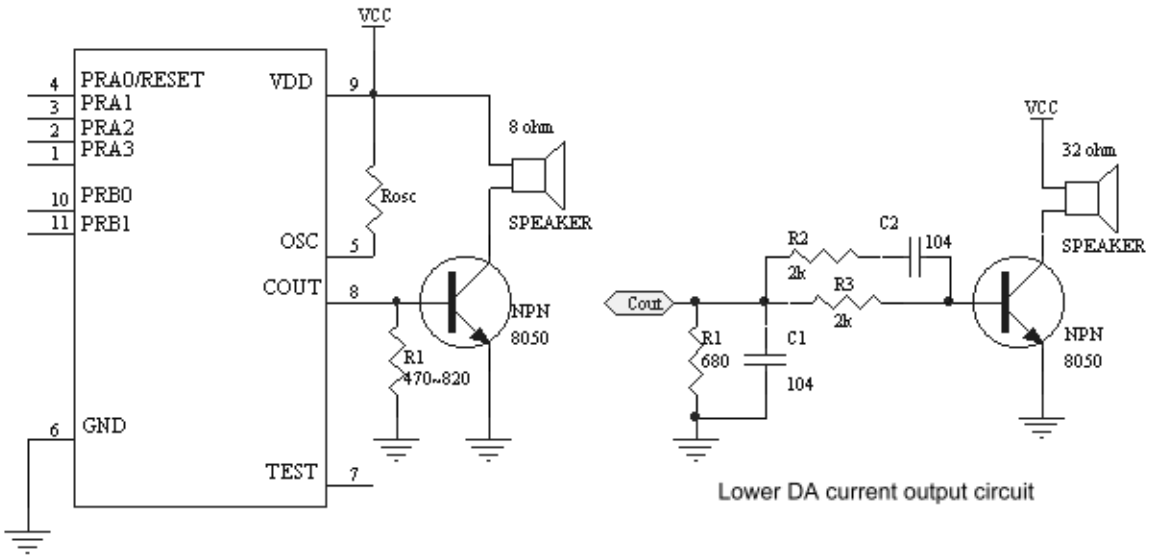
**FIGURE 1.2 : External ROM Map of ASM0406CB/0906CB**



## 1.2 Pin-Out

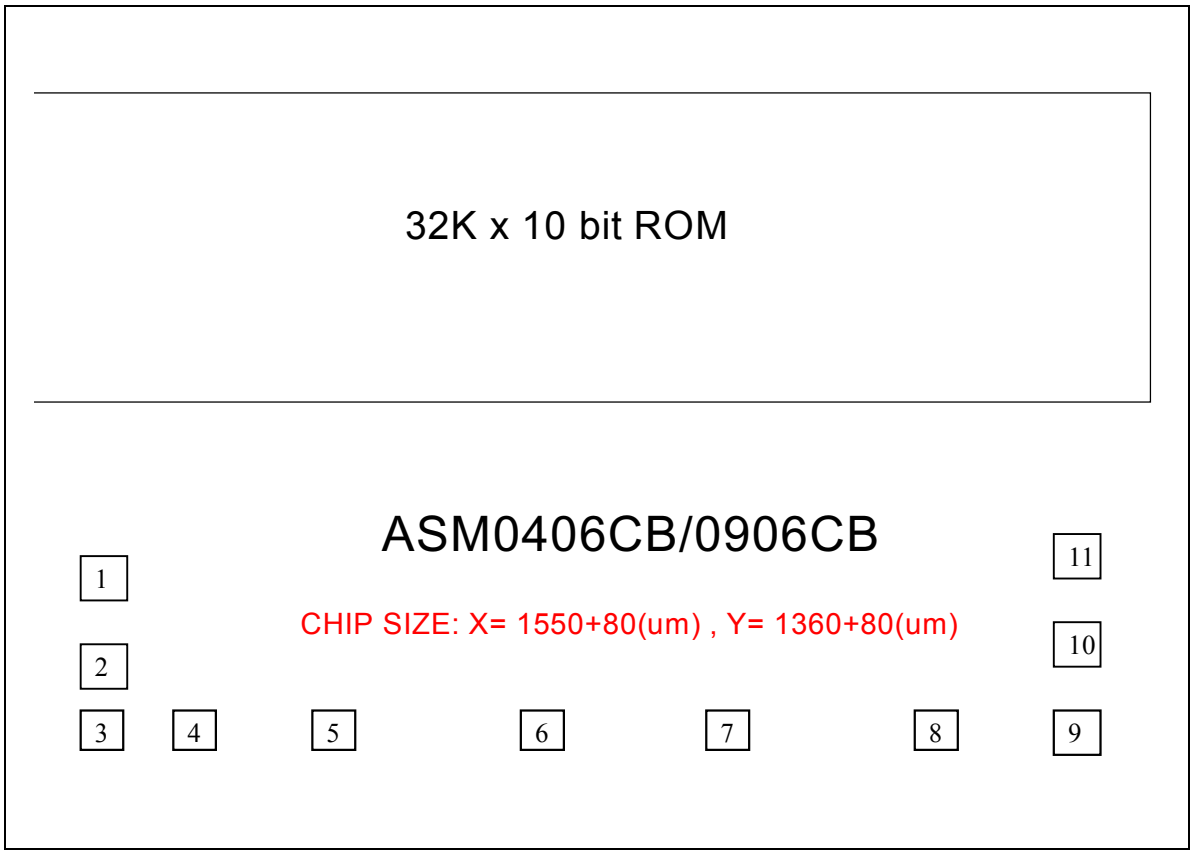
| ASM0406CB/0906CB Pin-Out | | | |
|---|---|---|---|
| **VDD** | I | - | Power supply during operation |
| **PRA3-1** | I/O | STI<br>Std./O.D. | I/O port with programmable strong pull-low or weak pull-low or fix-input-floating capability<br>Output type with standard or Open-Drain output |
| ***PRA0/RESET*** | 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>*Mask option selected as an external RESET pin with weak pull-low capability* |
| **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




Lower DA current output circuit

## 1.4 Bonding Diagram




**Substrate must be connected to GND.**

| ASM0406CB/0906CB Pad Location | | | | Chip Size: X= 1550 + 80 (um), Y=1360 + 80 (um) | | | |
|---|---|---|---|---|---|---|---|
| PAD # | PAD Name | X | Y | PAD # | PAD Name | X | Y |
| 1 | RA3 | -664.92 | -275.52 | 7 | TEST | 105.44 | -600.2 |
| 2 | RA2 | -664.92 | -403.64 | 8 | COUT | 303.96 | -600.2 |
| 3 | RA1 | -662.64 | -600.2 | 9 | VDD | 683.04 | -600.2 |
| 4 | RA0 | -468.24 | -600.2 | 10 | RB0 | 664.92 | -399.2 |
| 5 | OSC | -281.04 | -600.2 | 11 | RB1 | 664.92 | -280.8 |
| 6 | GND | -111.72 | -600.2 | | | | |

## 1.5 DC Characteristics for ASM0406CB/0906CB

| SYMBOL | PARAMETER | | VDD | MIN. | TYP. | MAX. | UNIT | CONDITION |
|---|---|---|---|---|---|---|---|---|
| VDD | OPERATING VOLTAGE | | | 2.4 | 3 | 5.5 | V | depending on Freq. |
| Isb | SUPPLY CURRENT | STANDBY | 3 | | | 1 | uA | 4MHz, RM in HALT Mode |
| | | | 5 | | | 1 | | |
| Iop | | OPERATING | 3 | | 2 | | mA | 4MHz, RM IO Floating |
| | | | 5 | | 7 | | | |
| Iih | INPUT CURRENT /Internal pull low | | 3 | | 3 | | uA | 4MHz, RM in HALT Mode (IO Ports with weak pull-high pull-low) |
| | | | 5 | | 9 | | | |
| | | | 5 | | -5.2 | | | |
| Ioh | OUTPUT HIGH CURRENT | | 3 | | -3 | | mA | 4MHz, RM (IO ports) |
| | | | 5 | | -8 | | | |
| Iol | OUTPUT LOW CURRENT | | 3 | | 7 | | | |
| | | | 5 | | 20 | | | |
| Cout | DA CURRENT OUT (FULL SCALE) | | 3 | | 4 | | | |
| | | | 5 | | 5.2 | | | |
| dF/F | FREQUENCY STABILITY | | | -10 | | 10 | % | Fosc(3v- 2.4v) / Fosc (3v) |
| dF/F | Fosc VARIATION | | | -20 | | 20 | % | VDD=3V, Rosc=850k, 4MHz |

**FIGURE 1.3 : Frequency Range for Rosc in RM mode**

| Resistor(k ohm) | 1200 | 1000 | 820 | 560 |
|---|---|---|---|---|
| 3v Freq.(MHz) | 2.92 | 3.51 | 4.13 | 7.02 |

