# ASM2012CB

# DATA SHEET

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# ASM2012CB – *VERY LOW-COST VOICE SYNTHESIZER WITH 4-BIT MICROPROCESSOR*

## 1.0 General Description

The AM4DD0207 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 5V
- ◆ Internal Program ROM: 4K x 10-bit
- ◆ 1 sets of 16-bit DPR can access up to 64K x 10 bits data memory space
- ◆ Data Registers:
  - 96 x 4-bit data RAM (00-1Fh plus 40h-7Fh)
  - Unbanked special function registers (SFR) range: 20h-3Fh
- ◆ I/O Ports:
  - PRA: 4-bit I/O Port A (2Bh)
  - PRB: 4-bit Output Port B (2Dh)
  - PRC: 4-bit Input Port C (2Fh)
- ◆ 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 ASM2012CB

**FIGURE 1.1 : Block Diagram of ASM2012CB**

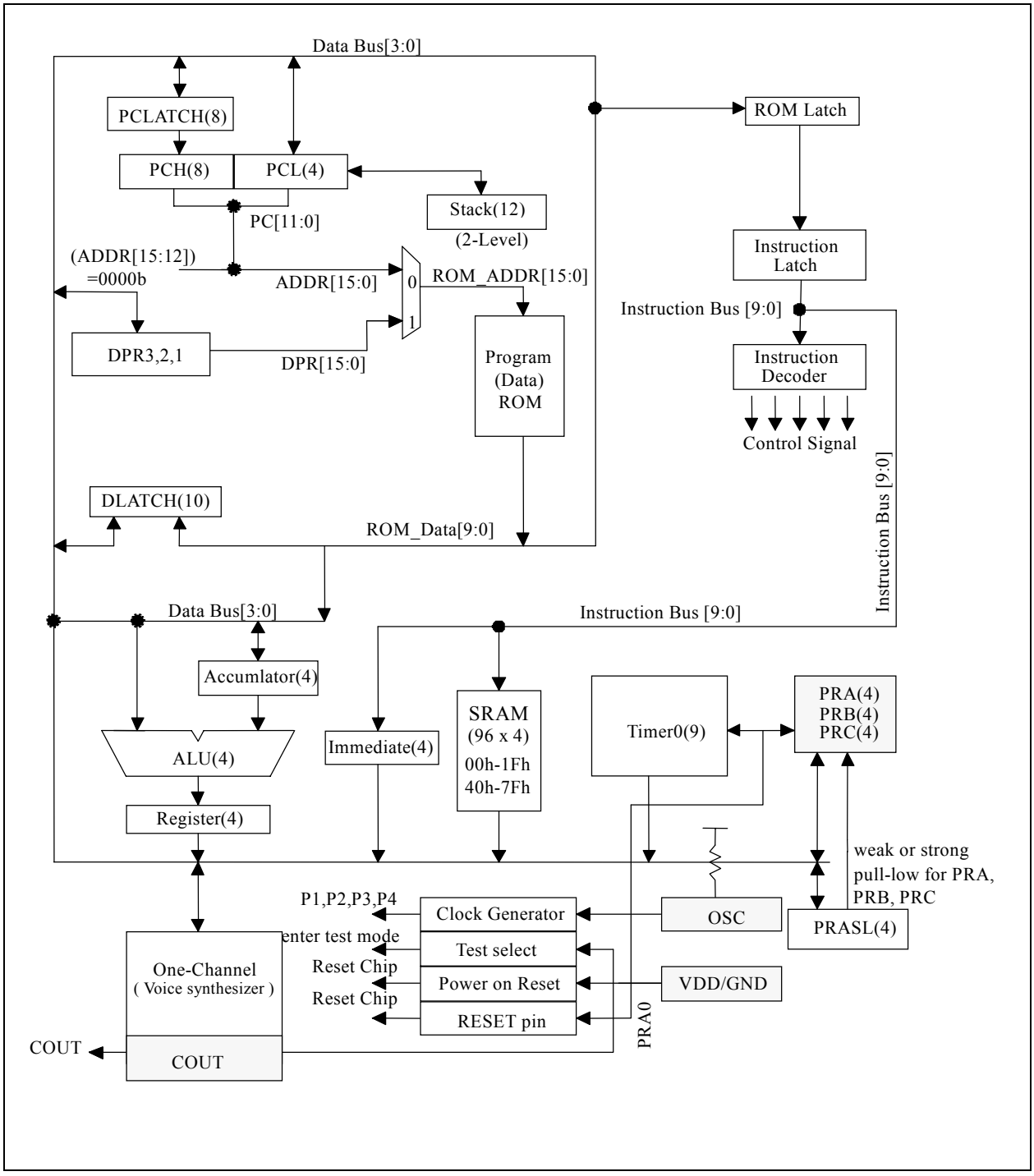
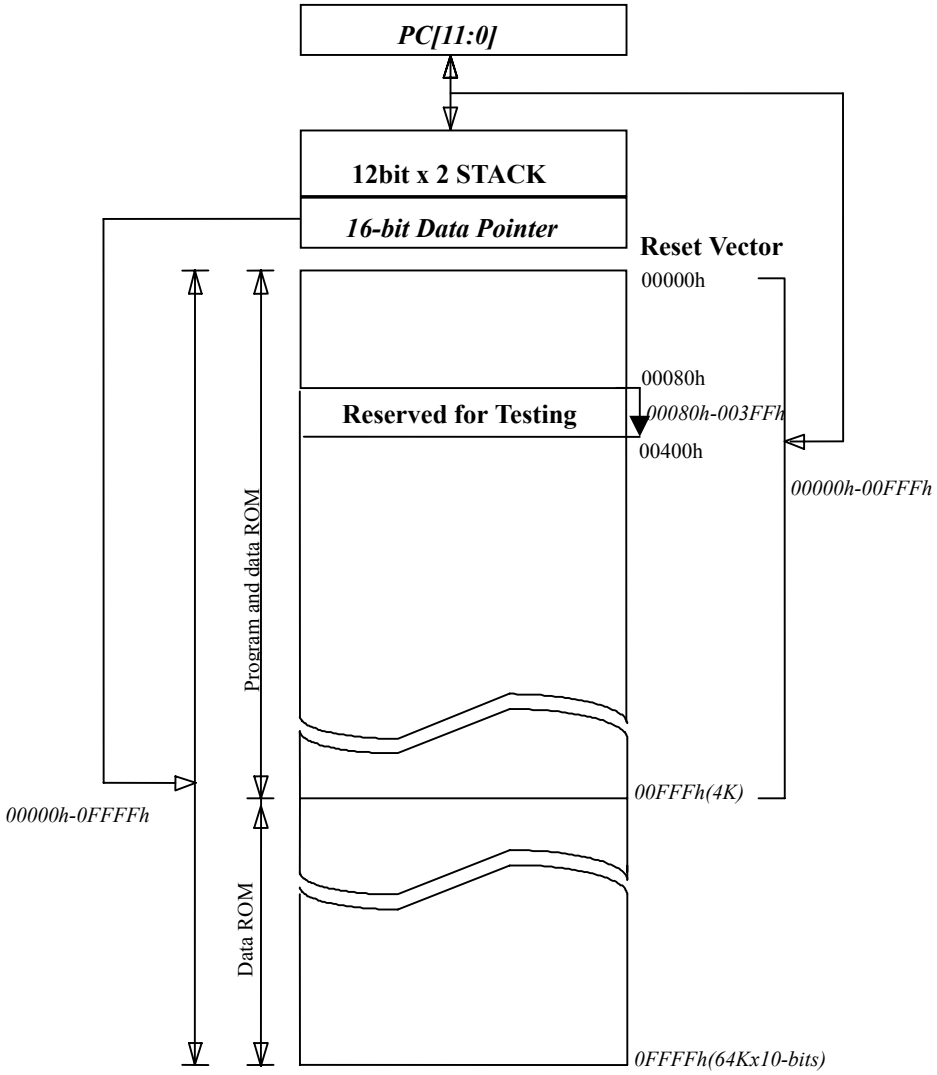


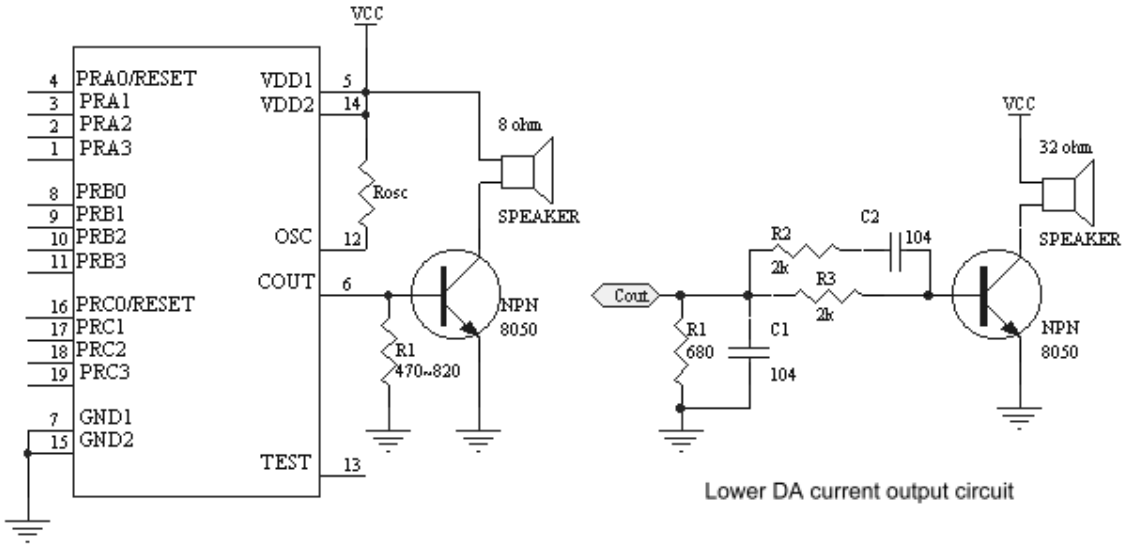
**FIGURE 1.2 : External ROM Map of ASM2012CB**



## 1.2 Pin-Out

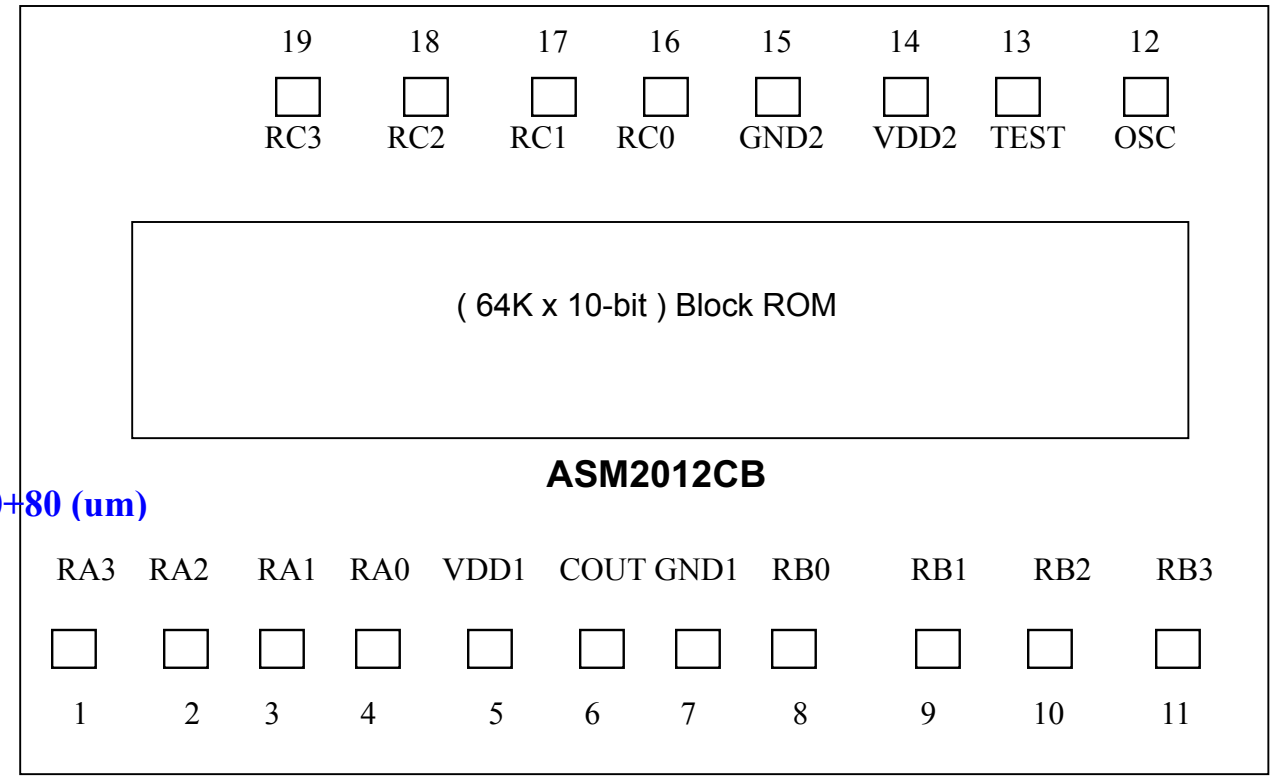
| ASM2012CB Pin-Out | | | |
|---|---|---|---|
| **PRC1** | I | STI<br>Std./O.D. | Input port with programmable strong pull-low or weak pull-low or fix-input-floating capability |
| ***PRC0/RESET*** | I | STI<br>Std./O.D. | Input port with programmable strong pull-low or weak pull-low or fix-input-floating capability<br>*Mask option selected as an external RESET pin with weak pull-low capability* |
| **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 |
| **VDD1** | I | - | First Power supply during operation |
| **COUT** | O | - | Current Output of Audio |
| **GND1** | I | - | First Circuit Ground Potential |
| **GND2** | I | - | Second Circuit Ground Potential |
| **TEST** | O | - | Enter Test Mode. ( TEST = High ) |
| **VDD2** | I | - | Second Power supply during operation |
| **PRB0-3** | O | Std./O.D. | Output type with standard or Open-Drain output |
| **PRC2-3** | I | STI<br>Std./O.D. | Input port with programmable strong pull-low or weak pull-low or fix-input-floating capability |

## 1.3 Application circuit




Lower DA current output circuit

## 1.4 Bonding Diagram




Y=1780+80 (um)

X= 1540+80 (um)

**Substrate must be connected to GND.**

| ASM2012CB Pad Location | | | | Chip Size: X= 1540+80 (um), Y=1780+80 (um) | | | |
|---|---|---|---|---|---|---|---|
| PAD # | PAD Name | X | Y | PAD # | PAD Name | X | Y |
| 1 | RA3 | -682.16 | -772.68 | 11 | RB3 | 674.88 | -772.68 |
| 2 | RA2 | -559.84 | -772.68 | 12 | OSC | 633.56 | 804 |
| 3 | RA1 | -437.52 | -772.68 | 13 | TEST | 432.48 | 804 |
| 4 | RA0 | -315.2 | -772.68 | 14 | VDD2 | 273.16 | 804 |
| 5 | VDD1 | -191.28 | -772.68 | 15 | GND2 | 134.68 | 804 |
| 6 | COUT | 71.12 | -772.68 | 16 | RC0 | -51.76 | 804 |
| 7 | GND1 | 189.52 | -772.68 | 17 | RC1 | -248.4 | 804 |
| 8 | RB0 | 307.92 | -772.68 | 18 | RC2 | -454.24 | 804 |
| 9 | RB1 | 430.24 | -772.68 | 19 | RC3 | -650.88 | 804 |
| 10 | RB2 | 552.56 | -772.68 | | | | |

## 1.5 DC Characteristics for ASM2012CB

| 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=200k, 4MHz |

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

| Resistor(k ohm) | 300 | 200 | 130 | 110 |
|---|---|---|---|---|
| 3v Freq.(MHz) | 2.56 | 3.92 | 5.48 | 7.11 |