

## **FCC ID: T7P15360**

### **Technical Description :**

The brief circuit description is listed as follows :

- ANT 1 acts as Loop Antenna.
- U1 W55MID50 acts as RFID Reader.
- Y1 and associated circuit act as 13.56 MHz Oscillator.
- U2 AM4EC063X acts as MCU and Sound Synthesizer.
- S1, S2-A and S2-B act as Control Keys.
- Q1, Q2 and associated circuit act as Power ON/OFF Control Circuit.

### **Antenna Used :**

An Integral Loop Antenna has been used.



## 1. GENERAL DESCRIPTION

Winbond *MFID<sup>WB</sup>* (Magnetic Field Identification) series is used in all areas of automatic data capture allowing contactless identification of objects using magnetic field. From ticketing to industrial automation and access control, the applications of MFID are burgeoning. In recent years automatic identification procedures have become very popular in many service industries, purchasing and distribution logistics, industry, manufacturing companies and material flow systems.

W55MID50 is one of series in Winbond *MFID<sup>WB</sup>* family that supports multi-functional Reader solution and especially focus on toy, security, and consumer related applications. The applications with Winbond *MFID<sup>WB</sup>* Tag series such as W55MID10 that provides read-only mask ROM-ID version transponder for mass production solution in toy industrial, meanwhile W55MID15 provides the other solution for manufacture option, which is 243 bonding-ID selection transponder. Besides the single tag transponder application, W55MID35 offers multi-transponder recognition function for intelligent and smart toy applications.

W55MID50 provides a wide variety of applications for toy, security, and consumer market meanwhile the W55MID50 is the most cost effective solution on current *MFID<sup>WB</sup>* related application market

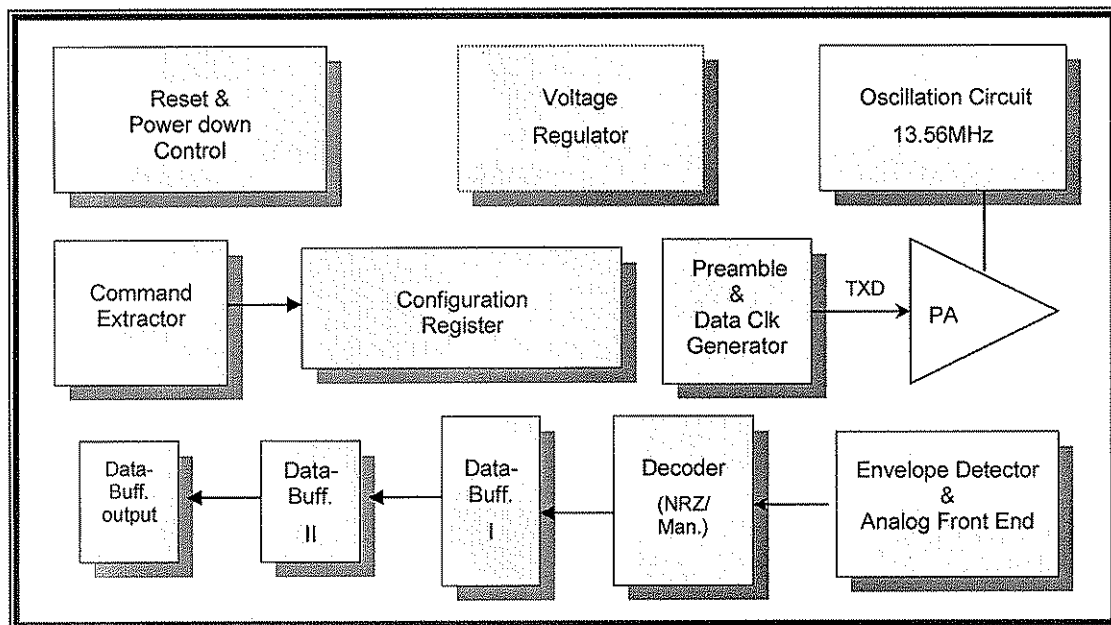
## 2. FEATURES

- Magnetic field resonance frequency: 13.56 MHz
- Data clock: 22 ~ 66KHz
- Inductive coupled power supplies for transponder's no battery operation
- On-chip rectifier, voltage limiter, clock extraction, power management,  $\mu$ C interface
- Provides NRZ and Manchester coding data format
- Adjustable 4-level of Reader transmission power selection
- Provides serial and parallel mode  $\mu$ C interface
- $\mu$ C data output rate  $\geq$  1Mbps
- Low power, low voltage operation
- Supports power-down mode  $\leq$  1 $\mu$ A
- Operating distance: 0 ~ 10cm
- Operating voltage: 2.4V ~ 5.5V
- Operating temperature: 0 ~ 70 °C
- Package: Dice form, PDIP-20, SOP-20
- Reference design PC board Size: 2.0 x 2.0cm<sup>2</sup> (without PCB antenna)
- Winbond patented "Automatic Reader Transmission Power Adjustment" for Reader optimum transmission power adjust
- Minimize external components

## W55MID50



### 4. BLOCK DIAGRAM





## 5. FUNCTIONAL DESCRIPTION

### 5.1 Transmission Power Amplifier (PA)

It provides 4 different selectable transmission power for Reader chip to support *MFID<sup>WB</sup>* Tag's radiation power supply. The external inductor coupling circuit is designed for 13.56MHz magnetic field resonance. The coupled center frequency will depend on equivalent value of external PCB inductor and capacitor.

### 5.2 Envelope Detector & Analog Front End

The major function of this unit provides *MFID<sup>WB</sup>* Tag's data can be extracted.

### 5.3 Voltage Regulator

The voltage regulator generates the system needs of device power supply.

### 5.4 Configuration Register

System configuration register controls the all functional settings of W55MID50 such as Tag data format, Tag detection cycle, output data format, and PA transmission power selection.

### 5.5 Reset and Power-down Control

The function of system power-down control mode is normally used for power consumption saving.

### 5.6 Crystal Oscillation

The 13.56MHz system clock generator generates the need of device system clock.

### 5.7 Decoder NRZ/Manchester

This unit is in charge of Tag data format decoder, which can provide Tag-ID data format decoding of NRZ or Manchester.

### 5.8 Data Buffer and Output

This unit buffers the Tag-ID data, which is under de-frame processing.

## 1.0 General Description

The AM4EC series are very low cost voice and melody synthesizer with 4-bits CPU. They have various features including 4-bits ALU, ROM, RAM, I/O ports, timers, clock generator, voice and melody synthesizer, and PWM (Direct drive) or D/A current outputs, etc. The audio synthesizer contains one voice-channel and two melody-channels. Furthermore, they consist of 27 instructions in these devices. With CMOS technology and halt function can minimize power dissipation. Their architectures are similar to RISC, with two stages of instruction pipeline. They allow all instructions to be executed in a single cycle, except for program branches and data table read instructions (which need two instruction cycles).

## 2.0 Features

- (1) Single power supply can operate from 2.2~5.5V at 4MHz or 3.6~5.5V at 8MHz.
- (2) Program ROM: 16k x 10 bits
- (3) 1 set of 16-bits DPR can access up to 64k x 10 bits melody data memory space, and 1 set of 18-bits VPR can access up to 256k x 10 bits voice data memory space.

Product	Voice Duration (sec)	Voice Pointer (VPR)	ROM Size (10-bit)
AM4EC005x	5	14-bits	16k
AM4EC010x	10	15-bits	32k
AM4EC015x	15	16-bits	48k
AM4EC020x	20	16-bits	64k
AM4EC031x	31	17-bits	96k
AM4EC041x	41	17-bits	128k
AM4EC052x	52	18-bits	160k
AM4EC063x	63	18-bits	192k

- (4) Data Registers:
  - a). 128 x 4-bits data RAM (00-7Fh)  
(4EC005x/4EC010x are 96 x 4-bits data RAM 00-5Fh)
  - b). Unbanked special function registers (SFR) range: 00h-2Fh
- (5) I/O Ports:
  - a). PRA: 4-bits I/O Port A (10h) can be programmed to input/output individually. (Register control)
  - b). PRB: 4-bits I/O Port B (13h) can be configured to input/output individually. (Mask option)
- (6) On-chip clock generator: Resistive Clock Drive (*RM*)
- (7) Timer: 1-set Voice Interrupt (Timer0: a 9-bits auto-reload timer/counter).
- (8) Stack: 2-level subroutine nesting.
- (9) Built-in 4-level Volume Control can be programmed.
- (10) Built-in 8-level DAC current output can be configured. (Mask option)
- (11) Built-in IR Carrier Output: Port B[1] can be configured as IR pin by 38k / 56kHz. (Mask option)

- (12) External Reset: Port B[3] can be configured as reset pin. (Mask option)
- (13) HALT and Release from HALT function to reduce power consumption
- (14) Watch Dog Timer (**WDT**)
- (15) Instruction: 1-cycle instruction except for table read and program branches which are 2-cycles
- (16) Number of instruction: 27
- (17) DAC: 1 channel voice and dual tone melody synthesizer (One 9-bits Cout or 8-bits PWM output).

**FIGURE 1 : ROM Map of AM4EC Series**

