FCC ID: SHVMAESTROMOUSE

Technical Description :

The brief circuit description is listed as follows :

For Main Unit :

- X1, U2 W55MID50 and associated circuit act as MFID Reader.
- U3 W567S1504650 and associated circuit act as Speech and Melody Processor.
- U1 SPY0030A and associated circuit act as Audio Driver.
- 5537, Q2, Q3 and associated circuit act as Light Sensor.
- Q4 ~ Q10 and associated circuit act as Motor Driver.
- D1, D2, D5, C1 and associated circuit act as Power Supply.

For Tags :

- L1, C1 & W55MID15 and associated circuit act as MFID Transponder.

Antenna Used :

A loop antenna has been used.

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Winbond *MFID^{WB}* Reader

W55MID50

Data Sheet

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System Description

2.1 W55MID50 System Block Diagram
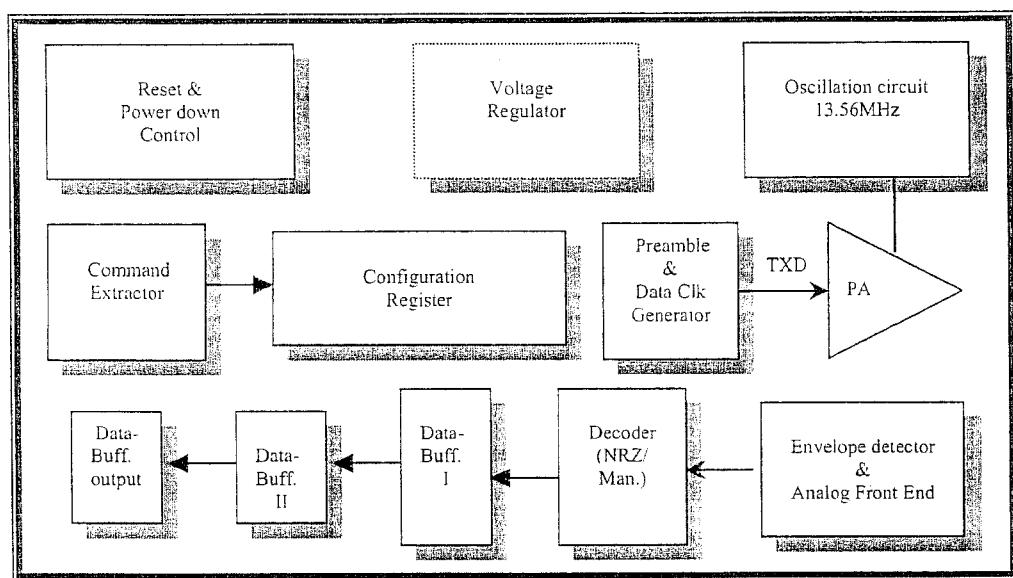
2.2 W55MID50 Functional Description

Transmission Power Amplifier (PA)

It provides 4 different selectable transmission power for Reader chip to support $MFID^{WB}$ 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.

Envelope Detector & Analog Front End

The major function of this unit provides $MFID^{WB}$ Tag's data can be extracted.

Voltage Regulator

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

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.

Reset and Power-down Control

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

Crystal Oscillation

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

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.

Data Buffer and Output

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

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8-CHANNEL SPEECH+MELODY PROCESSOR
(*BandDirector*™ Series)

Table of Contents-

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1. GENERAL DESCRIPTION

The W567Sxxx is a powerful microcontroller (uC) dedicated to speech and melody synthesis applications. With the help of the embedded 8-bit microprocessor & dedicated H/W, the W567Sxxx can synthesize 8-channel speech+melody simultaneously.

The two channels of synthesized speech can be in different kinds of format, for example ADPCM and MDPCM. The W567Sxxx can provide 8-channel high-quality *WinMelody*^{TM} , which can emulate the characteristics of musical instruments, such as piano and violin. The output of speech/melody channels are mixed together through the on-chip digital mixer to produce colorful effects. The mixer is further processed to drive dual speakers with stereo effects. With these hardware resources, the W567Sxxx is very suitable for high-quality and sophisticated scenario applications.

The W567Sxxx is also capable of transmitting infrared (IR) signals with on-chip carrier generator. As a result, toys can be designed to interact with each other for more play values. A serial interface can be supported as external memory for memory expansion or content-updateable applications.

Besides, the W567Sxxx is equipped with a 4-channel Analog-to-Digital Converter (ADC). With ADC, a toy can respond to environment conditions such as temperature or pressure via sensory devices. Therefore, toys with ADC can behave vividly than ever before.

The W567Sxxx family contains several items with different playback duration as shown below: (@5-bit MDPCM algorithm, 6 KHz sampling rate)

Item	W567S010	W567S015	W567S020	W567S025	W567S030	W567S040
*Duration	14 sec.	18 sec.	27 sec.	31 sec.	35 sec.	52 sec.
Item	W567S060	W567S080	W567S100	W567S120	W567S150	W567S170
Duration	60 sec.	104 sec.	116 sec.	129 sec.	163 sec.	197 sec.
Item	W567S210	W567S260	W567S301	W567S341		
Duration	232 sec.	265 sec.	300 sec.	334 sec.		

Note:

*: The duration time is based on 5-bit MDPCM at 6 KHz sampling rate. The firmware library and timber library have been xcluded from user's ROM space for the duration estimation.

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4. BLOCK DIAGRAM
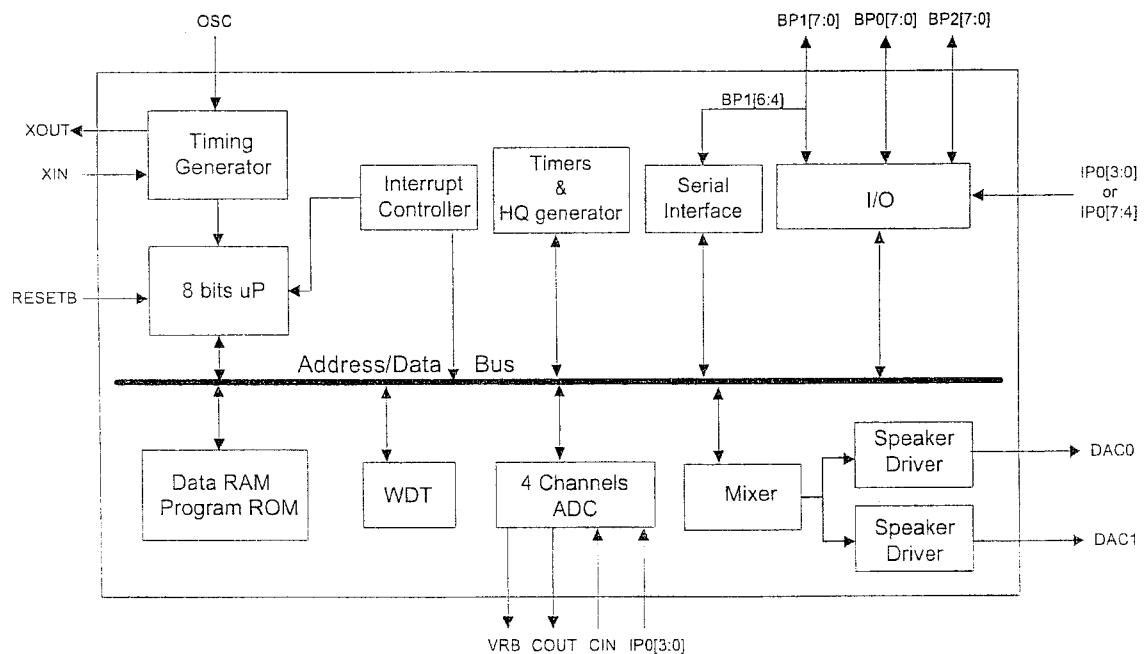
5. ELECTRICAL CHARACTERISTICS

5.1 Absolute Maximum Ratings

PARAMETER	RATING	UNIT
Supply Voltage to Ground Potential	-0.3 to +7.0	V
D.C. Voltage on Any Pin to Ground Potential	-0.3 to V_{DD} +0.3	V
Operating Temperature	0 to +70	°C
Storage Temperature	-55 to +150	°C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

Winbond Electronics Corp.

# Winbond *MFID*^{WB} Transponder

W55MID15

Design Guide

Winbond
Electronics Corp.

Architecture Overview

3.1 W55MID15 System Block Diagram

```
┌──────────────────────────────────────────────────────────────────────────┐
│                ┌─────────────────┐      ┌──────────────┐                    │
│                │    Voltage      │      │  Power-On    │                    │
│                │   Regulator     │      │   Control    │                    │
│                │   & System      │      │   Circuit    │                    │
│                │ Power Supply    │      └──────────────┘                    │
│                └─────────────────┘                                          │
│  ┌───────────┐   ┌──────────────┐   ┌──────────┐   ┌──────────┐            │
│  │ External  │   │ Demodulation │   │  System  │   │ Bonding  │            │
│  │ Inductor  │ ▶ │   Control    │ ▶ │  Clock   │ ▶ │   ID     │            │
│  │ Coupling  │   │   Circuit    │   │Generator │   │ Decoder  │            │
│  │ Circuit   │   └──────────────┘   └──────────┘   └──────────┘            │
│  └───────────┘                                        ┌──────────────┐      │
│                                                       │   Multiple   │      │
│                                                       │  Bonding-ID  │      │
│  ┌───────────┐   ┌──────────────┐   ┌───────────┐     │    Array     │      │
│  │ Detuning  │   │ Modulation   │   │Data Format│   ┌──────────┐           │
│  │ Control   │ ◀ │  Control     │ ◀ │ & Framing │ ◀ │Manchester│           │
│  │ Circuit   │   │  Circuit     │   │ Generator │   │  Coding  │           │
│  └───────────┘   └──────────────┘   └───────────┘   └──────────┘           │
└──────────────────────────────────────────────────────────────────────────┘
```
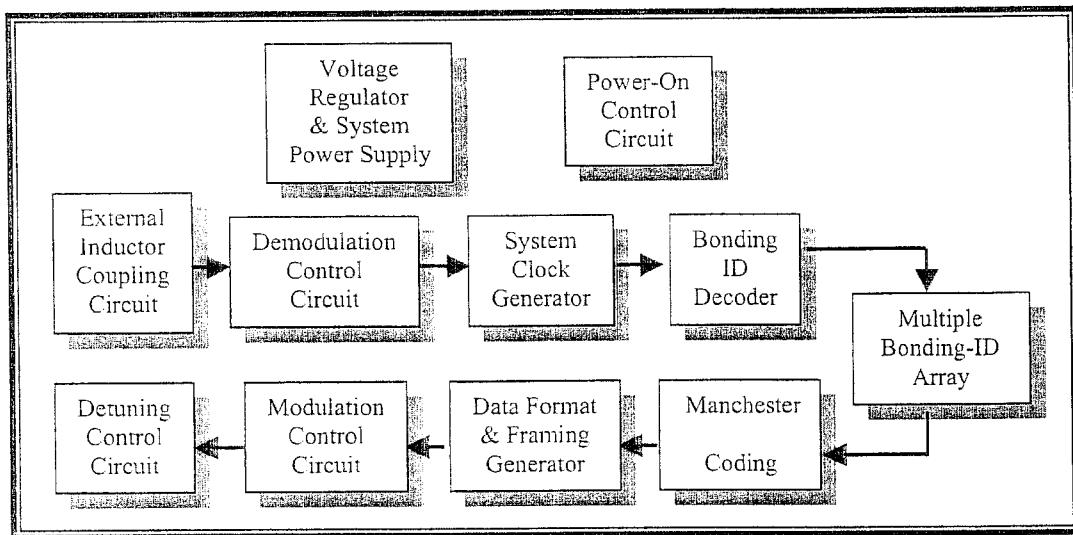
3.2 W55MID15 System Functional Description

External Inductor Coupling Circuit

The external inductor coupling circuit is designed for 13.56MHz magnetic field resonance. The coupled center frequency will depend on equivalent inductor of external PCB inductor and a paralleled capacitor.

Voltage Regulator & System Power Supply

The voltage regulator generates the need of device power supply.

Power-On Control Circuit

System power-on control circuit initiates the device to get into initial state.

Demodulation Control Circuit

The demodulation control circuit demodulates the signal of command, which is magnetic field coupling from W55MID50 $MFID^{HB}$ Reader system.

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System Clock Generator

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

Bonding-ID Decoder

The memory array decoder circuit decodes the mapping location of memory array, which indicates by external RS0, RS1, RS2, RS3, and RS4 the 3-state Bonding Finger (Winbond patented).

Multiple Bonding-ID Arrays

The multiple Bonding-IDs array provides total up to 243 different bonding-ID and 10bit in each ID.

Data Format and Framing Generator

The data format and framing generator is in charge of the entire bonding-ID and command data into a Winbond defined $MFID^{WB}$ tag format.

Modulation Control Circuit

The modulation control circuit modulates the Winbond defined $MFID^{WB}$ transponder format into the magnetic field resonation.

3.3 W55MID15 Pad Functional Description

| Symbol	Pad No.	I/O	Pad Functional Description
NC	1	--	Testing only, no connection
RS4	2	I	3-state bonding finger
RS3	3	I	3-state bonding finger
RS2	4	I	3-state bonding finger
RS1	5	I	3-state bonding finger
RS0	6	I	3-state bonding finger
VSS	7	Ground	Ground return path
COIL0	8	I/O	Coupling energy input and customer-ID output
COIL1	9	I/O	Coupling energy input and customer-ID output
NC	10	--	Testing only, no connection
VDD	11	Power	Power path

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4.4 W55MID15 Bonding Pad Information

Window: (xl = -390.000, yl = -540.000), (xh = 390.000, yh = 540.000)
Windows size: Width = 780.000, length = 1080.000

PAD NO	PAD NAME	X	Y
1	NC	-302.500	444.000
2	RS4	-302.500	316.500
3	RS3	-302.500	191.500
4	RS2	-302.500	66.500
5	RS1	-302.500	-58.500
6	RS0	-302.500	-183.500
7	VSS	-300.000	-315.000
8	Coil0	-300.000	-450.000
9	Coil1	299.000	-450.000
10	NC	304.000	-320.000
11	VDD	302.500	449.000

4.4.1 W55MID15 Bonding Pad Diagram

W55MID15

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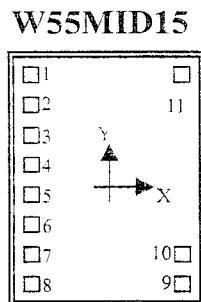
Design Information

5.1 W55MID15 Bonding-ID List

W55MID15 provides total 243 bonding-ID option by using 5 bonding pads (RS4, RS3, RS2, RS1, and RS0), each pad can be chosen to connect "GND", "VDD", or left "Floating". The mapping table as listed below and each bonding-ID is constructed by 10-bit. Designer can base on the ID mapping list to program Reader system uC for applications.

5.1.1 RS-pad vs. Bonding-ID List

- RS-pad: Bonding "0 = GND" ➔ ID = "00"
- RS-pad: Bonding "1 = VDD" ➔ ID = "01"
- RS-pad: Bonding "X = Floating" ➔ ID = "10"

	RS4	RS3	RS2	RS1	RS0
Bonding	0	0	0	0	0
ID	00	00	00	00	00
Bonding	1	1	1	1	1
ID	01	01	01	01	01
Bonding	X	X	X	X	X
ID	10	10	10	10	10
⋮	⋮	⋮	⋮	⋮	⋮
Bonding	0	1	0	1	0
ID	00	01	00	01	00
Bonding	X	1	X	1	X
ID	10	01	10	01	10
Bonding	X	1	X	1	X
ID	10	01	10	01	10
Bonding	1	X	0	1	X
ID	01	10	00	01	10