

FCC ID:YRG4020794RFID

Technical Description:

The brief circuit description is listed as follows:

- U2 W55MID50 acts as RFID Reader IC.
- XTAL2 and associated circuit act as 13.560 MHz Oscillator.
- SW1 act as On/Off Switch.
- U1 W584B150 acts as MCU and Sound Synthesizer.

Antenna Used:

A loop antenna has been used.



General Description

Winbond *MFID^{WB}* (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^{WB}* family that supports multi-functional Reader solution and especially focus on toy, security, and consumer related applications. The applications with

Winbond *MFID^{WB}* 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^{WB}* related application market.

1.1 W55MID50 Features

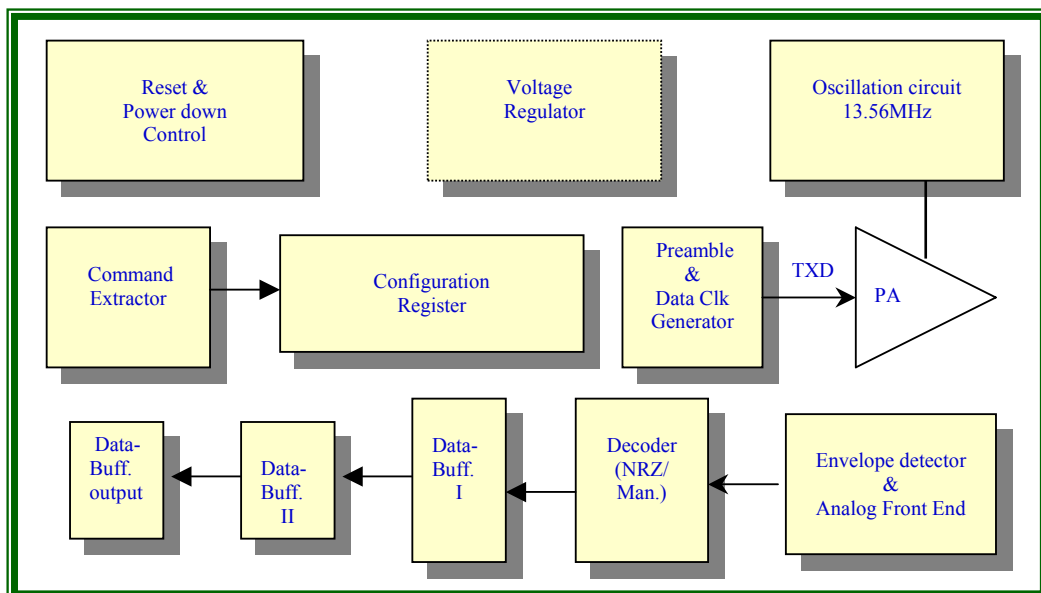
- ❑ Magnetic field resonance frequency: 13.56MHz
- ❑ Data clock: 22 ~ 66KHz
- ❑ Inductive coupled power supplies for transponder's no battery operation
- ❑ On-chip rectifier, voltage limiter, clock extraction, power management, uC interface
- ❑ Provides NRZ and Manchester coding data format
- ❑ Adjustable 4-level of Reader transmission power selection
- ❑ Provides serial and parallel mode uC interface
- ❑ uC data output rate $\geq 1\text{Mbps}$
- ❑ Low power, low voltage operation
- ❑ Supports power-down mode $\leq 1\mu\text{A}$
- ❑ 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: 2.0x2.0cm² (without PCB antenna)
- ❑ Winbond patented "Automatic Reader Transmission Power Adjustment" for Reader optimum transmission power adjust
- ❑ Minimize external components

1.2 W55MID50 Pin Description

| Symbol | PAD No. | I/O | Functional Description |
|--------|---------|-------|---|
| D3 | 1 | O | Data output #3 |
| D2 | 2 | O | Data output #2 |
| D1 | 3 | O | Data output #1 |
| D0 | 4 | O | Data output #0 |
| XIN | 5 | I | Connect to external 13.56MHz oscillator |
| XOUT | 6 | O | Connect to external 13.56MHz oscillator |
| VSS | 7 | GND | Digital power return path |
| CMD | 8 | I/O | R/W configuration register |
| CLK | 9 | I | Command R-W/ Read data clock |
| VDD | 10 | Power | Power path |
| RX_VDD | 11 | Power | Power path of Rx |
| RX_VSS | 12 | GND | Power return path of Rx |
| ENV | 13 | I | Envelope detector input |
| RESET | 14 | I | Reset, low active. |
| TagIn | 15 | O | Indication of tag arrival |
| COIL | 16 | O | PA output to connect with PCB antenna |
| TX_VSS | 17 | GND | Power return path of PA |
| TX_VDD | 18 | Power | Power path of PA |

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.



Electronic Characteristics

3.1 W55MID50 Absolute Maximum Ratings

| Parameter | Rating | Unit |
|--|------------|------------------|
| Maximum Current in COIL | 10 | mA |
| Power Dissipation ($T_a = 70^\circ\text{C}$) | 100 | mW |
| Ambient Operating Temperature | 0 to +70 | $^\circ\text{C}$ |
| Storage Temperature | -40 to +85 | $^\circ\text{C}$ |

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

3.2 W55MID50 DC Characteristics

(VDD-VSS = 4.5 V, $T_a = 25^\circ\text{C}$; unless otherwise specified)

| Parameter | Sym. | Conditions | Min. | Typ. | Max. | Unit |
|--------------------------|-----------|----------------------------|------|-------|------|------------------|
| Operating Magnetic Field | f_{OP} | Field in resonation | - | 13.56 | - | MHz |
| Operating Voltage | V_{DD} | Field in resonation | 3 | - | 5.5 | V |
| Operating Temperature | T_{amb} | Ambient operating temp | 0 | 25 | 70 | $^\circ\text{C}$ |
| Operating Current | I_{OP} | $f_{OP} = 13.56\text{MHz}$ | - | 22 | - | mA |
| Stand-by Current | I_{SB} | Power Down mode enter | - | 0.7 | 1 | uA |
| Sink Current | I_{SK} | $V_{oL} = 0.3V_{DD}$ | - | 10 | - | mA |
| Source Current | I_{SR} | $V_{oH} = 0.7V_{DD}$ | - | -6 | - | mA |

3.3 W55MID50 Ordering Information

W55MID50 provides two types of package in shipment: Dice form, PDIP-20, SOP-20, and Wafer

| Part Number | Package | Remarks |
|-------------|------------|--------------|
| W55MID50 | Dice form | |
| W55MID50 | PDIP-20 | |
| W55MID50 | SOP-20 | |
| W55MID50 | Wafer form | MOQ required |