

FCC ID: RS460348A

Technical Description :

The brief circuit description of Game unit is listed as follows :

- Y1 and associated circuit act as RF Oscillator.
- U1SPLB37A and associated circuit act as MPU.
- U2MM3024 and associated circuit act as Voltage Regulator.
- Q1, Q3, Q4, Q5, Q6 and associated circuit act as Switches.
- U4 and associated circuit act as MF ID reader.

The brief circuit description of tag is listed as follows :

- U5, U6, U7, U8 and associated circuit act as MF ID Transponders.
- L4, L6, L7, L8 and associated circuit act as Antenna.

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.

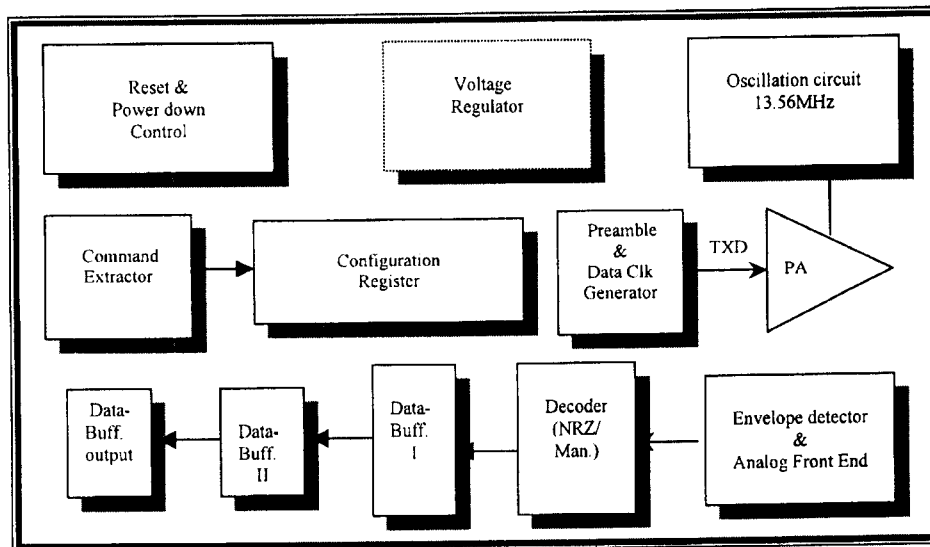
1.1 W55MID50 Features

- ☐ 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



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



Winbond *MFID^{WB}* Transponder

W55MID35

Data Sheet



Contents

General Description	3
1.1 W55MID35 Features	3
1.2 W55MID35 Pad Description	4
System Description	5
2.1 W55MID35 System Block Diagram	5
2.2 W55MID35 Functional Description	5
Electronic Characteristics	6
3.1 W55MID35 Absolute Maximum Ratings	6
3.2 W55MID35 DC Characteristics	6
3.3 W55MID35 Ordering Information	7
Design Information	7
4.1 W55MID35 Reference Design	7
4.1.1 W55MID35 Demo Board	7
4.2 W55MID35 Data Sheet Document History	8



General Description

MFID^{WB} (Magnetic Field Identification) 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.

W55MID35 is one of Winbond *MFID^{WB}* (Magnetic Field Identification) series in *WinRF^{WB}*

family that focus on toy and consumer related applications. W55MID35 offers multi-transponder recognition function for intelligent and smart toy applications. Regarding the *MFID^{WB}* Reader series, the W55MID50 supports multi-functional *MFID^{WB}* Reader solution.

W55MID35 provides total up to 243 different bonding-ID options in manufacture and 10-bit ID length in each bonding option ID. Till now the W55MID35 is the most cost effective solution on current anti-collision MFID transponder market.

1.1 W55MID35 Features

- ☐ Magnetic field resonance frequency: 13.56MHz
- ☐ Data clock: 32KHz
- ☐ Anti-collision read-only bonding-ID transponder
- ☐ Provides up to 6 ~ 8 tags can be recognized in the same time and same Reader antenna
- ☐ Option of
 - *Unique-ID*: ID can not be same
 - *Repeated-ID*: ID can be same
- ☐ Inductive coupled power supply for no battery operation
- ☐ On-chip rectifier, voltage limiter, clock extraction
- ☐ 10bit bonding-ID length
- ☐ Manchester coding data format
- ☐ Provides total 243 bonding-ID options in *Repeated-ID* mode and total 64 bonding-ID options in *Unique-ID* mode
- ☐ Low power, low voltage operation
- ☐ Operating distance: 0 ~ 5cm (typ.)
- ☐ Operating temperature: 0 ~ 70 °C
- ☐ Package: Dice form
- ☐ Reference design PC board Size: 1.0x1.0cm² (with PCB antenna)
- ☐ Winbond patented "3-state Bonding Finger" for multiple bonding-ID option
- ☐ Minimize external component: capacitor and PCB antenna only

W55MID35 Data Sheet



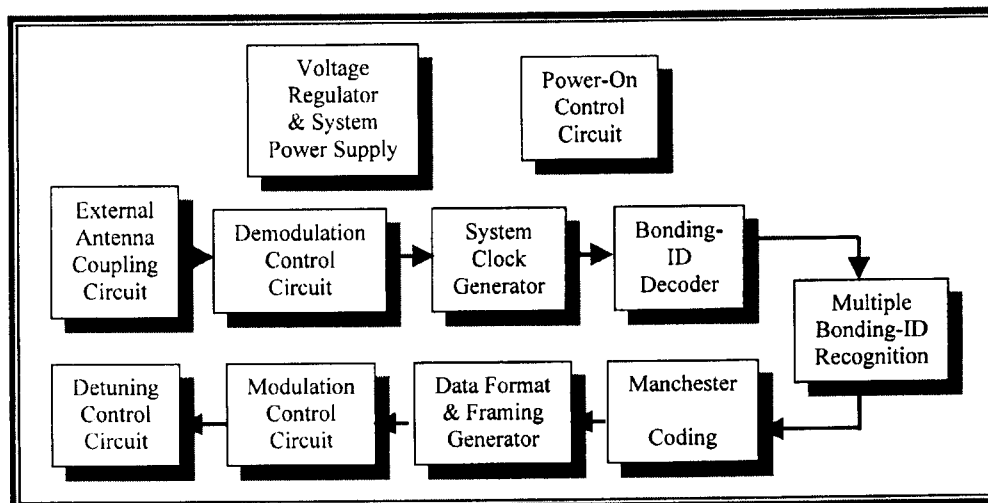
1.2 W55MID35 Pad Description

Symbol	Pad No.	I/O	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
OPTION	12	I	Option of <i>Unique-ID</i> operation (set OPTION="1") or <i>Repeated-ID</i> operation (set OPTION="0")



System Description

2.1 W55MID35 System Block Diagram



2.2 W55MID35 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 *MFIDTM* Reader system.

System Clock Generator

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

W55MID35 Data Sheet



Bonding-ID Decoder

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

Multiple Bonding-ID Recognition

The multiple Bonding-ID recognition provides total up to 8 different customer-IDs and 10bit ID length can be recognize in the same time.

Data Format and Framing Generator

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

Modulation Control Circuit

The modulation control circuit modulates the Winbond defined *MFID^{WB}* tag format into the magnetic field resonance.

Electronic Characteristics

3.1 W55MID35 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 W55MID35 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 resonance	-	13.56	-	MHz
Operating Voltage	V_{DD}	Field in resonance	3	-	5.5	V
Operating Temperature	T_{amb}	Ambient operating temp	0	25	70	$^\circ\text{C}$
Operating Current	I_{OP}	$f_{OP} = 13.56\text{MHz}$	-	2	-	μA
Magnetic Resonant Voltage	V_M		6	-	9	V



3.3 W55MID35 Ordering Information

W55MID35 provides two types of package in shipment: Dice form & Wafer

Part Number	Package	Remarks
W55MID35	Dice form	
W55MID35	Wafer form	MOQ required

Design Information

4.1 W55MID35 Reference Design

This W55MID35 application schematic is subject to modify for target specification evaluation. Some components are due to system specification evaluation purpose only which will be removed once

the system evaluation is done. The magnetic field coupling strength is subject to the appropriate value of inductor and capacitor.

4.1.1 W55MID35 Demo Board

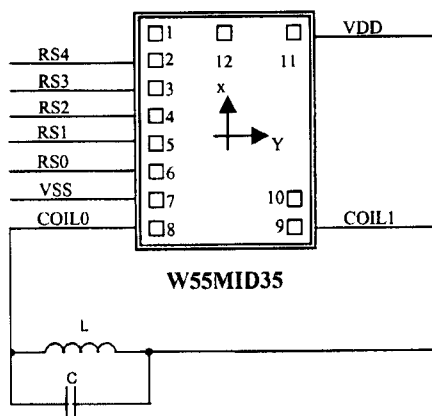
The value of "L" will depend on PCB coil layout and the value of "C" needs to fine-tune and matches the magnetic field resonance center $f_{OP} = 13.56\text{MHz}$

$$f_{OP} = \frac{1}{2\pi\sqrt{L.C}} = 13.56\text{MHz}$$

W55MID35 Data Sheet



- W55MID35 Application Schematic:



4.2 W55MID35 Data Sheet Document History

Revision	Date	Description
A0	2002/9/15	Preliminary version
A1	2002/12/31	Pin assignment and description update
A2	2003/2/7	Application schematic update



Headquarters

No. 4, Creation Rd. III,
Science-Based Industrial Park,
Hsinchu, Taiwan
TEL: 886-3-5770066
FAX: 886-3-5792697
<http://www.winbond.com.tw/>
Voice & Fax-on-demand: 886-2-27197006

Taipei Office

11F, No. 115, Sec. 3, Min-Sheng East Rd.,
Taipei, Taiwan
TEL: 886-2-27190505
FAX: 886-2-27197502

Winbond Electronics (H.K.) Ltd.

Rm. 803, World Trade Square, Tower II,
123 Hoi Bun Rd., Kwun Tong,
Kowloon, Hong Kong
TEL: 852-27513100
FAX: 852-27552064

Winbond Electronics North America Corp.

Winbond Memory Lab.
Winbond Microelectronics Corp.
Winbond Systems Lab.
2727 N. First Street, San Jose,
CA 95134, U.S.A.
TEL: 408-9436666
FAX: 408-6441798

Note: All data and specifications are subject to change without notice.