

FCC ID: QWS8226

Technical Description :

The brief circuit description is listed as follows :

- Y1 and associated circuit act as RF Oscillator.
- U2, W588S050 and associated circuit act as Sound Generator.
- U1, W55MID50 and associated circuit act as Coding and Decoding.
- U3 and associated circuit act as Energy Demultiplexer.
- W55MID15 and associated circuit act as Bonding-ID Selection Transponder.

Antenna Used :

A loop antenna has been used.

W55MID50 Data Sheet



Winbond *MFID^{WB}* Reader

W55MID50

Data Sheet

W55MID50 Data Sheet



Contents

General Description	3
1.1 W55MID50 Features	3
1.2 W55MID50 Pin Description	4
System Description	5
2.1 W55MID50 System Block Diagram.....	5
2.2 W55MID50 Functional Description	5
Electronic Characteristics	7
3.1 W55MID50 Absolute Maximum Ratings.....	7
3.2 W55MID50 DC Characteristics.....	7
3.3 W55MID50 Ordering Information	7
3.4 FAQ	8
3.5 W55MID50 Data Sheet Document History	8



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 1Mbps
- Low power, low voltage operation
- Supports power-down mode \leq 1uA
- 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

W55MID50 Data Sheet



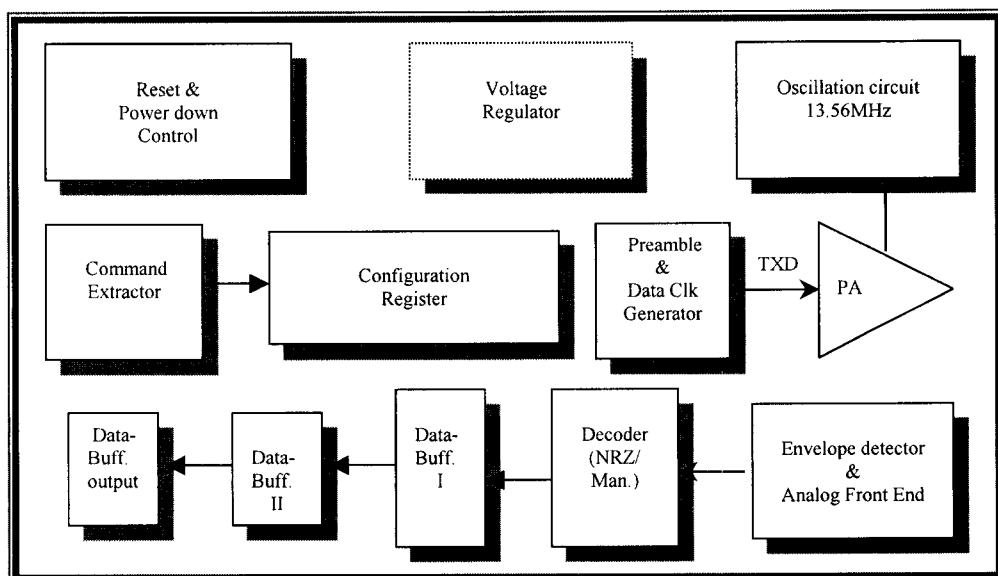
1.2 W55MID50 Pin Description

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
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

W55MID50 Data Sheet



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 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}	$f_{OP} = 13.56\text{MHz}$	-	22	-	mA
Stand-by Current	I_{SB}	Power Down mode enter	-	0.7	1	uA
Sink Current	I_{SK}	$V_{OL} = 0.3VDD$	-	10	-	mA
Source Current	I_{SR}	$V_{OH} = 0.7VDD$	-	-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

W55MID50 Data Sheet



3.4 FAQ

Q. What "MFID^{WB}" means?

A. "MFID^{WB}" Magnetic Field Identification, which is a Winbond contactless identification chip product series. There are many application, architecture, and circuit design patented by Winbond.

Q. What different between W55MID15 and W55MID35?

A. W55MID15 is a single-tag application without "Anti-collision" algorithm build-in. W55MID35 is a multi-tag application with "Anti-collision" algorithm build-in.

Q. What is the operating frequency?

A. Both W55MID15 and W55MID35 are operating on 13.553MHz ~ 13.567MHz ISM.

Q. Does W55MID50 Reader IC pass FCC compliance testing?

A. W55MID50 pass FCC compliance test of Section 15.209 and Section 15.225.

Q. How are W55MID15 and W55MID35 IDs generated?

A. W55MID15 and W55MID35 IDs are generated by manufacturing bonding option of pads RS0 ~ RS4.

Q. How many W55MID15 and W55MID35 IDs are generated?

A. There are total 243 bonding option IDs for W55MID15 and W55MID35.

Q. How are W55MID15 and W55MID35 IDs read?

A. W55MID50 is a function of MFID Reader IC. W55MID15 and W55MID35 automatically respond with its ID when it is coupled by magnetic resonance power from Reader.

Q. Is it possible to read multiple MFID^{WB} chips in the same magnetic area?

A. W55MID35 has been implemented by "Anti-collision" algorithm to allow more than one IDs can be simultaneously recognized in the same magnetic area.

Q. How many W55MID35 IDs can be simultaneously read in the same magnetic area?

A. Actually, there is no any limitation in total number of W55MID35 tags can be simultaneously read, if the Reader system can provide sufficient coupled magnetic resonance power to every W55MID35 tag.

Q. Does anything interfere with MFID chip readout operation?

A. W55MID series is operating on 13.553MHz ~ 13.567MHz, therefore it is far away from 27MHz and 2.45GHz. There is no any interference with W55MIDseries.

3.5 W55MID50 Data Sheet Document History

Revision	Date	Description
A0	2002/9/15	Preliminary version
A1	2002/12/29	Pin functional description update
A2	2003/2/7	General description update
A3	2003/3/23	FCC compliance testing report

W55MID50 Data Sheet



QUIETEK

Report No. 032H051FI

Test Report Certification

Test Date : Mar. 17, 2003
Report No. : 032H051FI



Accredited by NIST (NVLAP)
NVLAP Lab Code: 200347-0

Product Name	: MFID READER
Applicant	: Winbond Electronics Corp.
Address	: No. 9, Li Hsin Rd.,(PK31) Science-Based Industrial Park Hsinchu, Taiwan, R.O.C.
Manufacturer	: Winbond Electronics Corp.
Model No.	: W55MID50
FCC ID.	: ID2-W55MID50
Rated Voltage	: DC 4.5V (Power by Battery)
Trade Name	: Winbond
Measurement Standard	: FCC Part 15 Subpart C Paragraph 15.225
Measurement Procedure	: ANSI C63.4:1992
Test Result	: Complied



The Test Results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government.

Documented By : Jimmy Peng
(Jimmy Peng)

Tested By : Ken Hsu
(Ken Hsu)

Approved By : Kevin Wang
(Kevin Wang)

W55MID50 Data Sheet



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: 408-5441798

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

W55MID15 Data Sheet



Winbond *MFID^{WB}* Transponder

W55MID15

Data Sheet

W55MID15 Data Sheet



Contents

General Description	3
1.1 W55MID15 Features	3
1.2 W55MID15 Pad Description	4
System Description	5
2.1 W55MID15 System Block Diagram.....	5
2.2 W55MID15 Functional Description	5
Electronic Characteristics	6
3.1 W55MID15 Absolute Maximum Ratings.....	6
3.2 W55MID15 DC Characteristics.....	6
3.3 W55MID15 Ordering Information	7
Design Information	7
4.1 W55MID15 Reference Design	7
4.1.1 W55MID15 Demo Board	7
4.2 W55MID15 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.

W55MID15 is one of Winbond *MFID^{WB}* (Magnetic Field Identification) series in *WinRF^{WB}*

family that focus on toy and consumer related applications meanwhile W55MID15 provides manufacture bonding-ID transponder. Regarding the *MFID^{WB}* Reader series, the W55MID50 supports multi-functional *MFID^{WB}* Reader solution. Besides the single transponder application, W55MID35 offers multi-transponder recognition function for intelligent and smart toy applications.

W55MID15 provides total 243 different bonding-IDs in manufacture and 10bit ID length in each ID. That can extremely save customer's design investment in consumer MFID related products.

1.1 W55MID15 Features

- Magnetic field resonance frequency: 13.56MHz
- Data clock: 32KHz
- Read-only bonding-ID transponder
- Inductive coupled power supply for no battery operation
- On-chip rectifier, voltage limiter, clock extraction
- 10bit bonding-ID length
- Provides Manchester coding data format
- RS0, RS1, RS2, RS3, and RS4 the 3-state bonding finger for the total 243 bonding-ID option in manufacture
- Low power, low voltage operation
- Operating distance: 0 ~ 5cm
- 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

W55MID15 Data Sheet



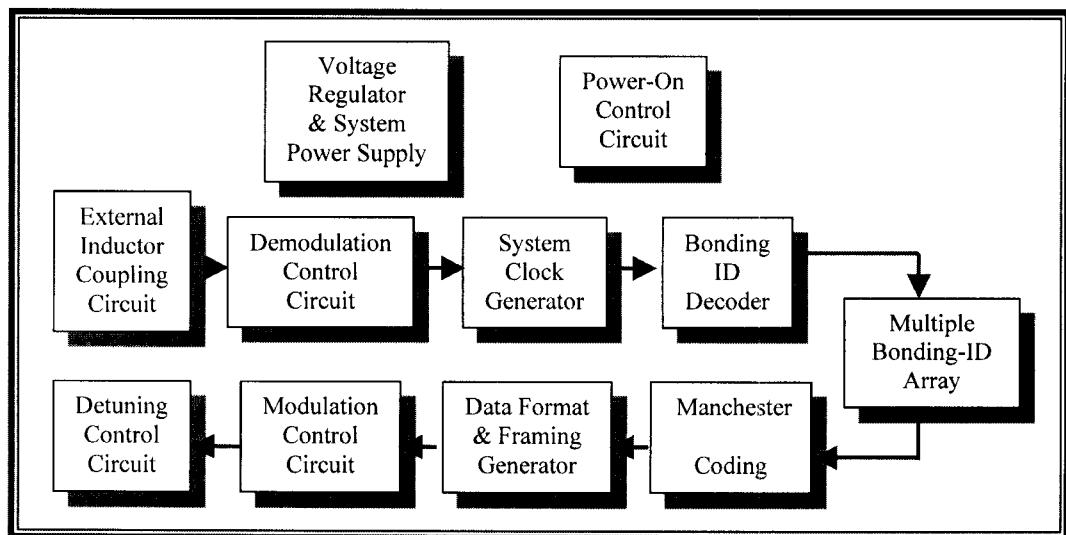
1.2 W55MID15 Pad Description

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



System Description

2.1 W55MID15 System Block Diagram



2.2 W55MID15 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^{WB}* Reader system.

System Clock Generator

W55MID15 Data Sheet



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 resonance.

Electronic Characteristics

3.1 W55MID15 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 W55MID15 DC Characteristics

($V_{DD-VSS} = 4.5$ 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	-	uA
Magnetic Resonant Voltage	V_M		6	-	9	V



3.3 W55MID15 Ordering Information

W55MID15 provides two types of package in shipment: Dice form & Wafer

Part Number	Package	Remarks
W55MID15	Dice form	
W55MID15	Wafer form	MOQ required

Design Information

4.1 W55MID15 Reference Design

This W55MID15 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 W55MID15 Demo Board

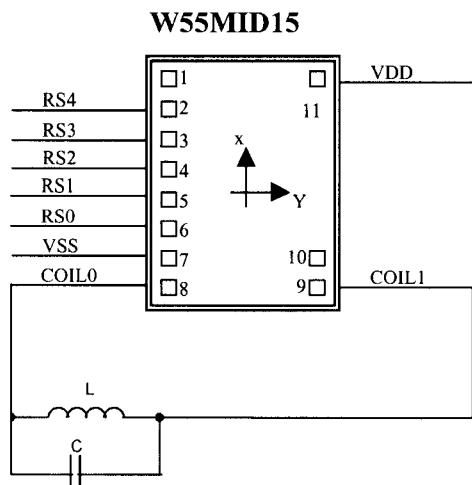
$$f_{op} = \frac{1}{2\pi\sqrt{LC}} = 13.56\text{MHz}$$

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 $f_{op} = 13.56\text{MHz}$

W55MID15 Data Sheet



- W55MID15 Application Schematic:



4.2 W55MID15 Data Sheet Document History

Revision	Date	Description
A0	2002/9/15	Preliminary version
A1	2002/12/29	Pin functional 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: 852-27513200

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

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