Nuvoton *MFID*^{WB} Transponder

W55MID35

Data Sheet

Contents

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 Nuvoton *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. For some of applications that need more than 243 ID, it can be bonding up to 8 tags together to gain more IDs. Till now the W55MID35 is the most cost effective solution on current anti-collision MFID transponder market.

1.1 W55MID35 Features

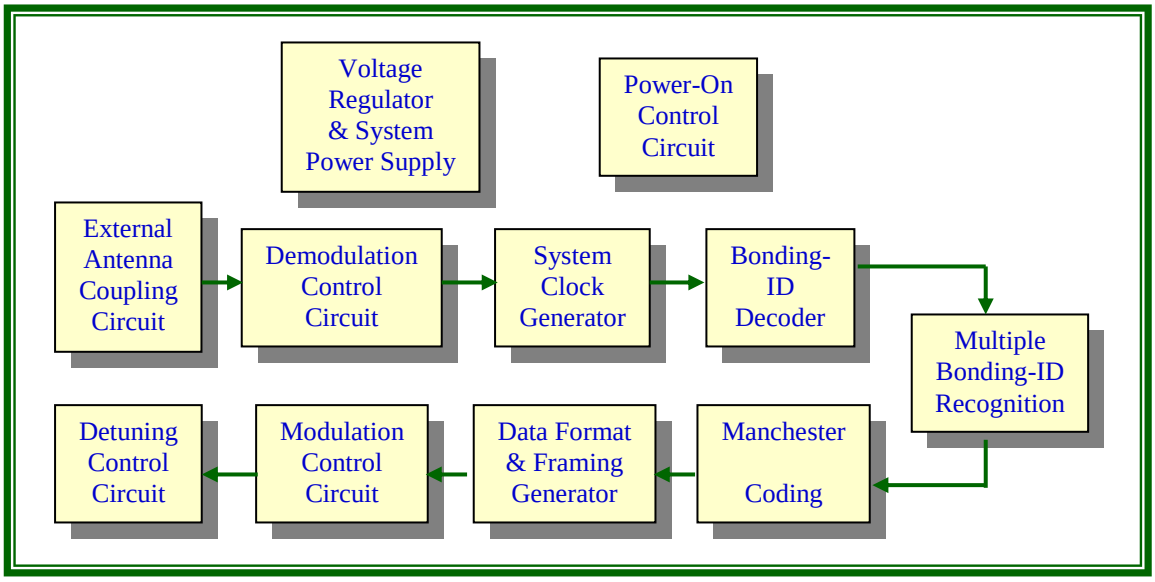
- Magnetic field resonance frequency: 13.56MHz
- Data clock: 32KHz
- Anti-collision read-only bonding-ID transponder
- Provides up to 6 ~ 8 tags can be recognized in the same time and same Reader antenna
- Option of
  - ***Unique-ID***: ID can not be same
  - ***Repeated-ID***: ID can be same
- Inductive 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
- Bonding up to 8 tags to gain more ID numbers.
- Low power, low voltage operation
- Operating distance: 0 ~ 5cm (typ.)
- Operating temperature: 0 ~ 70 °C
- Package: Dice form
- Reference design PC board Size: 1.0x1.0cm^2 (with PCB antenna)
- Nuvoton patented "3-state Bonding Finger" for multiple bonding-ID option
- Minimize external component: capacitor and PCB antenna only

1.2 W55MID35 Pad Description

Symbol	Pad No.	I/O	Functional Description
NRST	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
DO	10	--	Testing only, no connection
VDD	11	Power	Power path
OPTION	12	I	Option of ***Unique-ID*** operation (set OPTION="1") or ***Repeated-ID*** 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 resonatnce. 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

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

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 (Nuvoton 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 Nuvoton defined *MFID*^{WB} transponder data format.

Modulation Control Circuit

The modulation control circuit modulates the Nuvoton defined *MFID*^{WB} tag format into the magnetic field resonati

Electronic Characteristics

3.1 W55MID35 Absolute Maximum Ratings

Parameter	Rating	Unit
Maximum Current in COIL	10	mA
Power Dissipation (T_a = 70°C)	100	mW
Ambient Operating Temperature	0 to +70	°C
Storage Temperature	-40 to +85	°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, Ta = 25°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	Tamb	Ambient operating temp	0	25	70	°C
Operating Current	I_{OP}	f_{OP} = 13.56MHz	-	2	-	uA
Magnetic Resonat 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

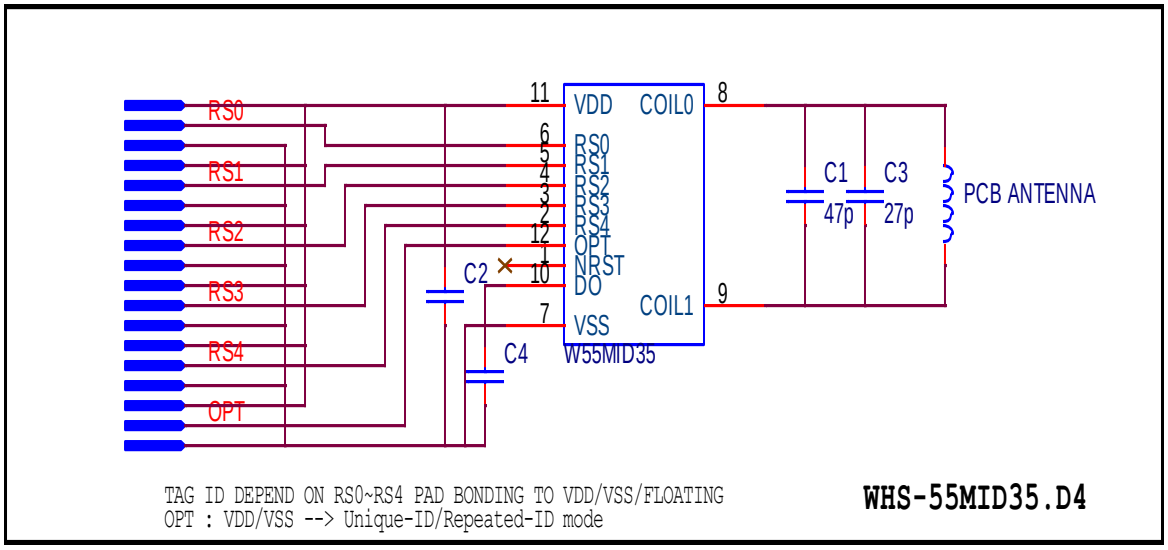
This W55MID35 application schematic is subject to modify for target specification evaluation. Some components are due to system specification evaluation purpose only which will be removed once the system evaluation is done. The magnetic field coupling strength is subject to the appropriate value of inductor 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} = 13.56MHz

$$fop = \frac{1}{2\pi\sqrt{LC}} = 13.56MHz$$

.1.2 W55MID35 Application Schematic:



4.2 W55MID35 Data Sheet Document History

Revision	Date	Description
A1.0	Sep. 2002	Preliminary version
A1.1	Dec. 2002	Pin assignment and description update
A2.0	Feb. 2003	Application schematic update
A3.0	Aug. 2005	Add Important Notice
A4.0	Aug. 2005	Application circuit modify to consistence with demo board
A5.0	Mar. 2009	Change company logo

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