Reader Modules for RFID Transponders

Devices included in this datasheet:

- µRWD0
- µRWD1
- µRWD2
- µRWD3

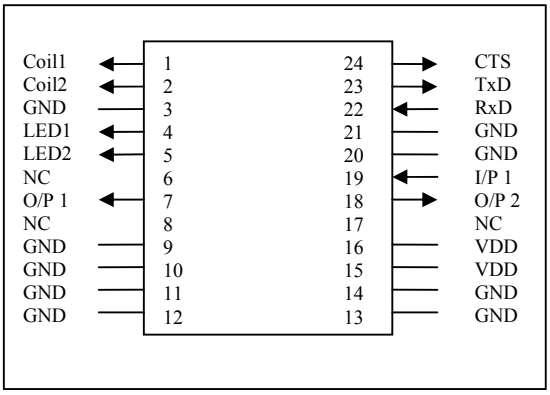
Referred to collectively as µRWDx.

FEATURES:

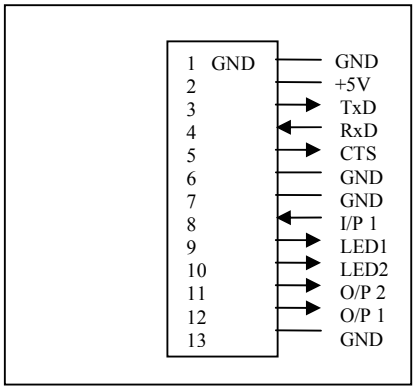
- Very easy integration
- Only four instructions to learn
- EEPROM Data area can hold upto 30 ident codes
- USART for communication with host
- High current sink upto 40 mA per Output for Relay Drive
- Single +5V Supply Operation
- Low Power Consumption

Pin Diagrams:

µRWD0 and µRWD1



µRWD2 and µRWD3



The Features of various modules:

The core of μRWD0 to μRWD3 is the same. The difference is in the communications interface and the availability of coil on board.

μRWD0 is a 24 pin DIL module and is the simplest of the four. It communicates at TTL level. μRWD1 is also a 24 pin DIL module but has RS232 level comm interface. Both μRWD0 and μRWD1 do not have coil on board. Appropriately wound coil is to be provided externally.

μRWD2 and μRWD3 are modules with 13 pin SIL footprint. The beauty of μRWD2 and μRWD3 is the embedded on board coil. All that they need is appropriate power supply. Again μRWD2 is having TTL level comm. interface and μRWD3 has RS232 level comm interface.

Supported Protocols

The μRWDx are being offered with HITAG2 Protocol Support. They communicate with HITAG2 Transponders configured in PASSWORD mode only. HITAG2 Transponders with any other configuration will not work with μRWDx.

However, μRWDx with support for other protocols are also available for use with transponders other than HITAG2. Information available on request.

Modes of Operation

Standalone Mode:

Standalone mode is the default mode of operation. In this mode of operation, authorized ident codes are previously stored in μRWDx, by connecting the μRWDx to any PC and running the software provided. During operation, the μRWDx is not connected to the host. When a HITAG2 TAG enters in the field, the ident code is checked against the stored list of authorized ident codes. If the ident code matches, then PASSWORD exchange takes place for mutual authentication. If the mutual authentication is successful, then both the Output 1 and Output 2 go low. Both the Outputs are capable of sinking up to 40 mA for driving External Relays. LED 1 Output also goes high, while LED 2 Output goes low, thereby appropriately driving external LED's. The LED1 and LED2 Outputs can source/sink 20 mA.

Host Connected Mode:

In this mode of operation, the ident list previously stored in the μRWDx has to be empty, thereby authorizing all HITAG2 Transponders for mutual authentication. A simple serial protocol allows a host system, may be a microcontroller or a PC, to communicate with μRWDx, on the RS-232 serial interface, either TTL level (Inverted) or proper RS-232 level depending on the type of module being used. The host can program new authorized ident codes, change passwords and can perform read/write operation to the HITAG2 TAG directly. When a HITAG2 TAG enters the field, after interrogating the ident code, password exchange takes place for mutual authentication. If the mutual authentication is successful, then both the Output 1 and Output 2 go low. Both the Outputs are capable of sinking up to 40 mA for driving External Relays. LED 1 Output also goes high, while LED 2 Output goes low, thereby appropriately driving external LED's. The LED1 and LED2 Outputs can source/sink 20 mA. These LED1 and LED2 Outputs can also be used as "Card Present" signals by the host system. The host can thereafter read various parameters from μRWDx or can continue dialog with the TAG directly.

Host Communications Protocol

While communicating with µRWDx, the host issues one of the following command and reads back the acknowledge code. The acknowledge code is decoded by the host to confirm that the command was received by the µRWDx correctly. Communication between the host and the µRWDx takes place at 9600 Baud, 8 Bits, 1 Stop Bit, No Parity. The LSB is transmitted first.

Write TAG

This Command instructs µRWDx to write 4 Bytes of data to the HITAG2 32 bit page.

	B7	.	.	.	.	.	B0	
Command:	0	1	0	1	0	1	1	1	(0x57)
Argument1:	x	x	x	x	x	N	N	N	(HITAG2 Page Address 0…7)
Argument2:	D	D	D	D	D	D	D	D	(Most Significant byte to write)
Argument3:	D	D	D	D	D	D	D	D	(Next Significant byte to write)
Argument4:	D	D	D	D	D	D	D	D	(Next Significant byte to write)
Argument5:	D	D	D	D	D	D	D	D	(Least Significant byte to write)
Reply:									
Acknowledge:	1	F	F	F	F	F	F	X	(F=Status Flags)

Read TAG

This Command instructs µRWDx to read 4 Bytes from HITAG2 32 bit page. If the read was successful, µRWDx indicates the result in the acknowledge status flags. Four bytes of TAG data follows acknowledge byte.

	B7	.	.	.	.	.	B0	
Command:	0	1	0	1	0	0	1	0	(0x52)
Argument1:	x	x	x	x	x	N	N	N	(HITAG2 Page Address 0…7)
Reply:									
Acknowledge:	1	F	F	F	F	F	F	X	(F=Status Flags)
Reply1:	D	D	D	D	D	D	D	D	(Most Significant byte read)
Reply2:	D	D	D	D	D	D	D	D	(Next Significant byte read)
Reply3:	D	D	D	D	D	D	D	D	(Next Significant byte read)
Reply4:	D	D	D	D	D	D	D	D	(Least Significant byte read)

(Reply 1 to Reply 4 bytes follow acknowledge only if read was successful, otherwise only acknowledge is issued by µRWDx.)

Tag and Other Parameters Status

This command instructs µRWDx to return status of the tag and other parameters.

	B7	.	.	.	.	.	B0	
Command:	0	1	0	1	0	0	1	1 (0x53)

Reply:
Acknowledge: 1 F F F F F F F (F=Status Flags)

Program EEPROM

The uRWDx has 128 bytes of internal EEPROM for holding programmable system parameters such as passwords and authorized ident codes. This command enables host to program individual bytes of the EEPROM with new data.

	B7	.	.	.	.	.	B0	
Command:	0	1	0	1	0	0	0	0 (0x50)
Argument1:	x	N	N	N	N	N	N	N (N=EEPROM memory location 1...127)
Argument2:	D	D	D	D	D	D	D	D (D=Data to be written to EEPROM)

Reply:
Acknowledge: 1 X X X X X X F (F=Status Flags)

Status Flags in the Acknowledge Byte

Bit 00: 1=Internal EEPROM Write OK.
0=Internal EEPROM Write Error.

Bit 01: 1=Successful Password Exchange after matching Ident code with transponder.
0= Password Exchange unsuccessful.

Bit 02: 1=Communication with transponder and acknowledgement OK.
0=Error in Communication with transponder.

Bit 03: 1=Serial Communication with the host OK.
0=Error in Serial Communication with the host.

Bit 04: 1=Antenna test OK.
0=Reader antenna Fault. (Antenna may not be connected.)

Bit 05: 1=Relay Output 1 is ON.
0= Relay Output 1 is OFF.

Bit 06: 1= Relay Output 2 is ON.
0= Relay Output 2 is OFF.

Internal EEPROM Memory Map

Byte 0x00:	Reader Password first Byte	"M"
Byte 0x01:	Reader Password Second Byte	"I"
Byte 0x02:	Reader Password Third Byte	"K
Byte 0x03:	Reader Password Fourth Byte	"R"
Byte 0x04:	Reserved for System use	
Byte 0x05:	Transponder password first byte	0xaa
Byte 0x06:	Transponder password Second byte	"H"
Byte 0x07:	Transponder password third byte	"T"

Byte 0x08:	Most Significant Byte	Ident Code 0x00
Byte 0x09:	Next Significant Byte	Ident Code 0x00
Byte 0x0a:	Next Significant Byte	Ident Code 0x00
Byte 0x0b:	Least Significant Byte	Ident Code 0x00
Byte 0x0c:	Most Significant Byte	Ident Code 0x01
Byte 0x0d:	Next Significant Byte	Ident Code 0x01
Byte 0x0e:	Next Significant Byte	Ident Code 0x01
Byte 0x0f:	Least Significant Byte	Ident Code 0x01
Byte 0x10:	Most Significant Byte	Ident Code 0x02
Byte 0x11:	Next Significant Byte	Ident Code 0x02
Byte 0x12:	Next Significant Byte	Ident Code 0x02
Byte 0x13:	Least Significant Byte	Ident Code 0x02
Byte 0x14:	Most Significant Byte	Ident Code 0x03
Byte 0x15:	Next Significant Byte	Ident Code 0x03
Byte 0x16:	Next Significant Byte	Ident Code 0x03
Byte 0x17:	Least Significant Byte	Ident Code 0x03

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Byte 0x7c:	Most Significant Byte	Ident Code 0x1d
Byte 0x7d:	Next Significant Byte	Ident Code 0x1d
Byte 0x7e:	Next Significant Byte	Ident Code 0x1d
Byte 0x7f:	Least Significant Byte	Ident Code 0x1d

- The authorized Ident Code list is considered empty if the Ident Code 0x00 at locations 0x08 : 0x0b is ff: ff: ff: ff.
- Preferably the Ident Code list should also be terminated with Ident code ff: ff: ff: ff.

HITAG2 Configuration Byte

The first byte of page 0x03 defines the basic mode of operation of the HITAG2 transponder. Depending on the configuration held at these 8 bits, certain parts of the memory are either locked or opened for Read/Write operation. Please note that µRWDx currently only supports PASSWORD mode of operation and can only communicate with HITAG2 transponders with configuration byte = 0x06 (or configuration byte = 0x46 with configuration and TAG Password locked).

B7	.	.	.	.	.	B0	
0	0	0	0	0	1	1	0 (0x06)

Bit 00: Always 0.

Bit 01: Always 1.

Bit 02: Always 1.

Bit 03: Always 0.

Bit 04: 1=Page 6 and 7 Read only.
0=Page 6 and 7 Read/Write.

Bit 05: 1=Page 4 and 5 Read only.
0=Page 4 and 5 Read/Write.

Bit 06: 1=Page 3 Read only. Configuration and TAG Password FIXED. This bit is OTP.
0=Page 3 Read/Write.

Bit 07: 1=Page 1 No Read/ No Write. Page 2 (RWD Password) Read only. This bit is OTP.
0=Page 1 and 2 Read/Write.

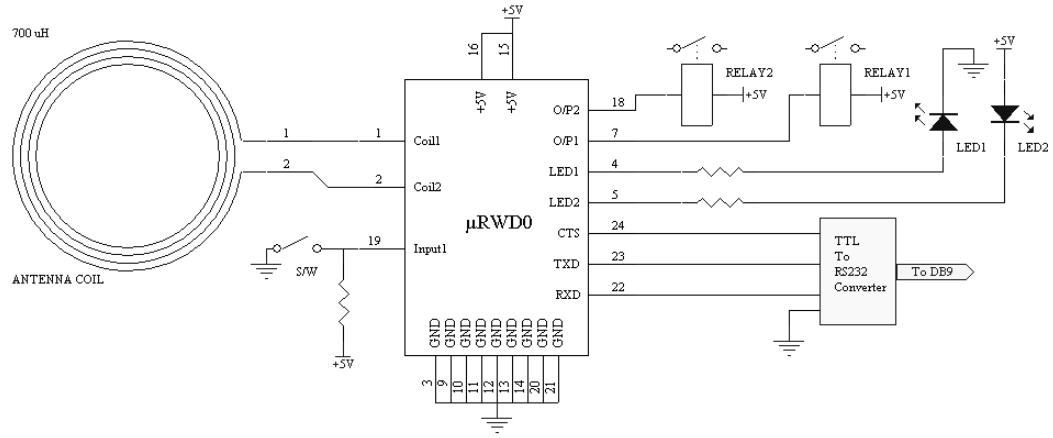
HITAG2 Memory Map

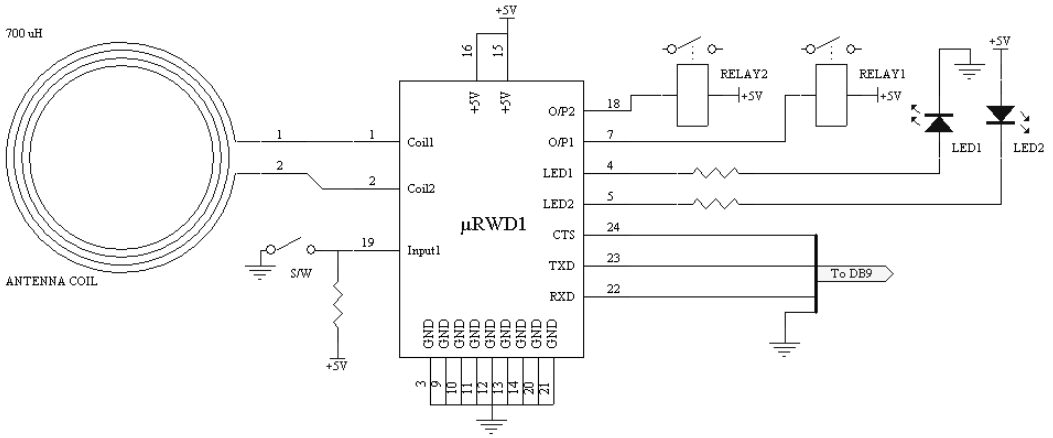
The memory of HITAG2 transponder consists of 256 bits of very low power EEPROM organized into 8 pages of 32 bits (4 bytes) each.

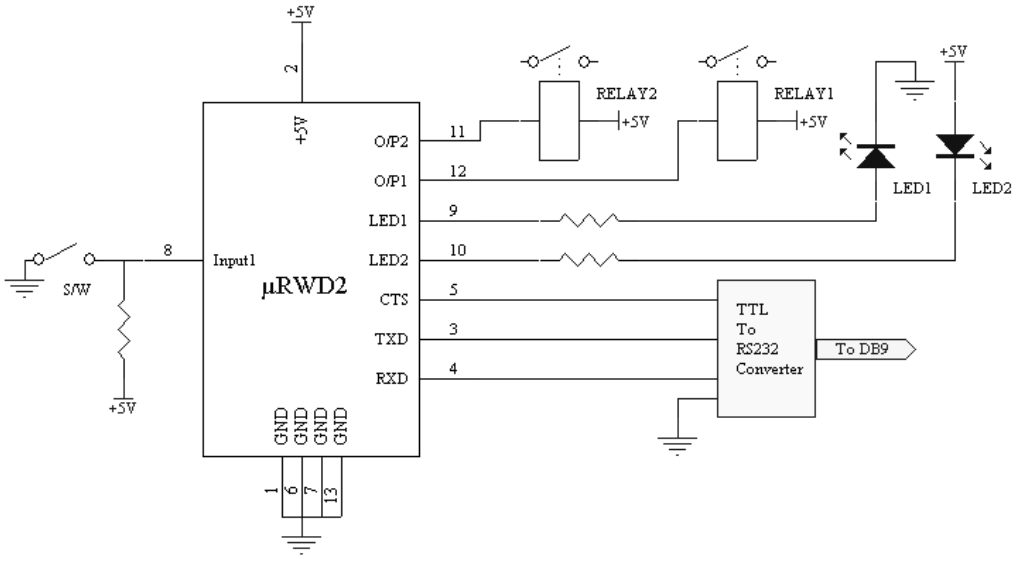
Table below depicts the memory configuration of a typical HITAG2 transponder in PASSWORD mode.

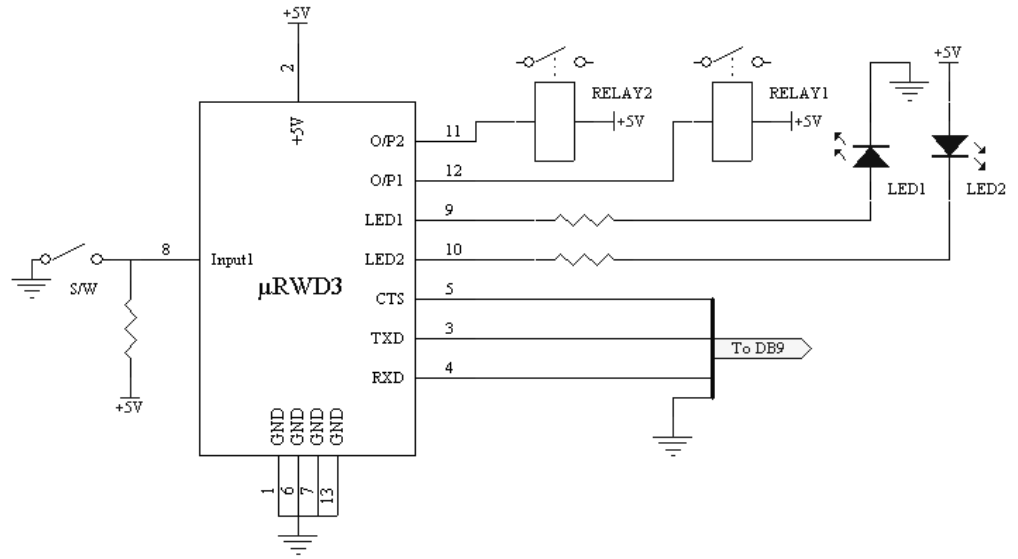
Page#	**Content**
0x00	Serial No.
0x01	Password RWD
0x02	Reserved
0x03	8 Bit Config., 24 bit Password TAG
0x04	Read/Write Page
0x05	Read/Write Page
0x06	Read/Write Page
0x07	Read/Write Page

Typical Application:



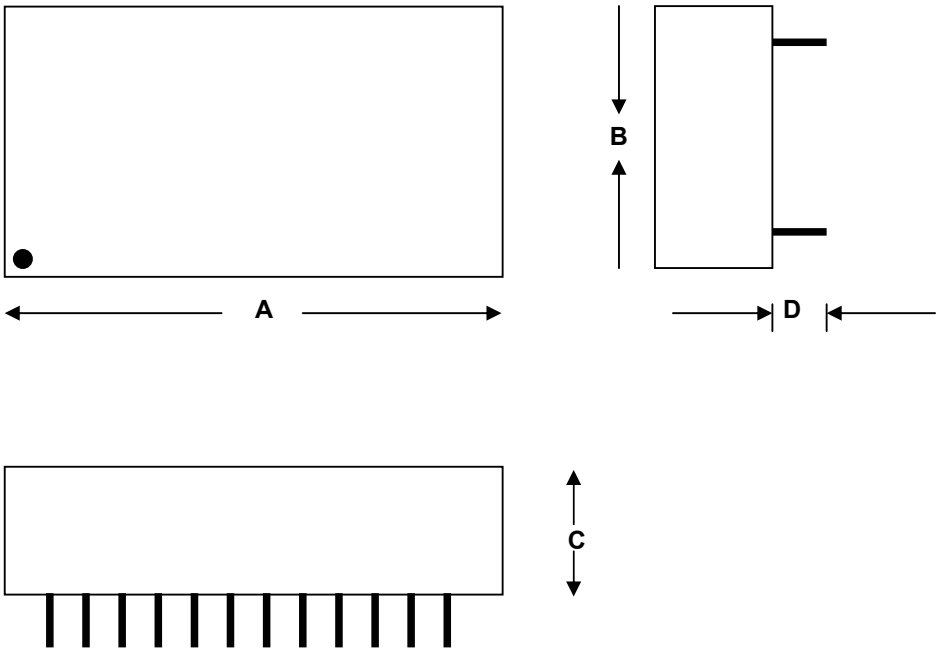



+5V
2
+5V
µRWD2
Input1
8
S/W
+5V
O/P2
O/P1
LED1
LED2
CTS
TXD
RXD
11
12
9
10
5
3
4
RELAY2
RELAY1
+5V
LED1
LED2
TTL
To
RS232
Converter
To DB9
GND
GND
GND
GND
1
6
7
13


+5V
2
+5V
µRWD3
Input1
8
S/W
+5V
O/P2
O/P1
LED1
LED2
CTS
TXD
RXD
11
12
9
10
5
3
4
RELAY2
RELAY1
+5V
LED1
LED2
To DB9
GND
GND
GND
GND
1
6
7
13

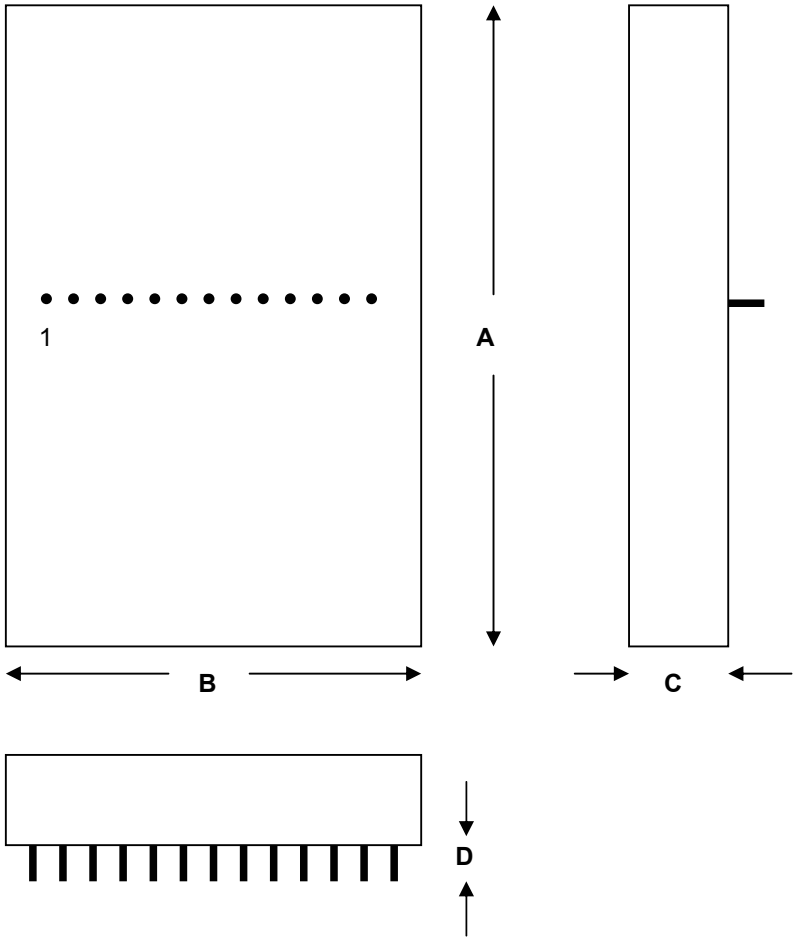
Physical Dimensions

µRWD0 and µRWD1



A	33.00 mm
B	21.00 mm
C	09.00 mm
D	04.00 mm

µRWD2 and µRWD3



A 80.00 mm

B 50.00 mm

C 09.00 mm

D 04.00 mm

Version History

Version 1.01 29-07-2003