DATA SHEET

NCD1015-50RO

HDX robust 50 mm transponder

Product data 2013 **Nov 2013**

Production

NCD1015-50RO

HDX robust 50mm transponder

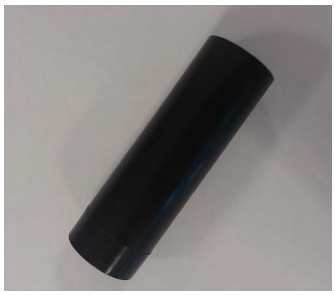
1 GENERAL DESCRIPTION

NCD1015-50RO is a contact-less Read Only RFID device for single transponder applications in the area of electronic identification operating in the low frequency (134.2 kHz) range, supporting ISO 11784/85 standards.

The NCD1015-50RO contains 64 bit identification data page 1 which is secured by an associated 16 bit CRC.

The passive transponder uses the supplied RF signal to obtain the energy needed to send the 64-bit ID code to the reader.

Return data transmission from the transponder to the reader utilises FSK encoded modulation.



FEATURES

Air Interface:	Contact-less, sequential power & data transmission (HDX)
Radio Frequency f_C :	134.2 kHz ± 1kHz
Tag ➔ Reader transmission:	FSK modulation, NRZ: '0'~134.2kHz; '1'~124.2kHz
Tag ➔ Reader data rate:	RF/16 (~ 8 kbit/s)
On chip 16 bit CRC generator:	Reverse CRC-CCITT as used in ISO/IEC 11785
Identification data page:	64 bits data + associated 16 bits CRC

2 FUNCTIONAL OVERVIEW AND DESCRIPTION

2.1 POWER TRANSFER

Power transfer to the tag is accomplished by magnetic coupling of the transponder and reader antenna. The reader and the transponder operate in a sequential mode with timely separated power and data transmission cycles. The RF operating field supplies power at the beginning of the request from the reader to the HDX transponder. During the charge (or powering phase) of between 15 and typically 50 ms the reader generates an electromagnetic field using a frequency of 134.2 kHz. The resonant circuit of the transponder is energised and the induced voltage is rectified by the integrated circuit to charge the capacitor C_L. The transponder detects the end of the charge burst (EOB) and transmits its data using Frequency Shift Keying (FSK), utilising the energy stored in the capacitor C_L. The charge phase is followed directly by the read phase.

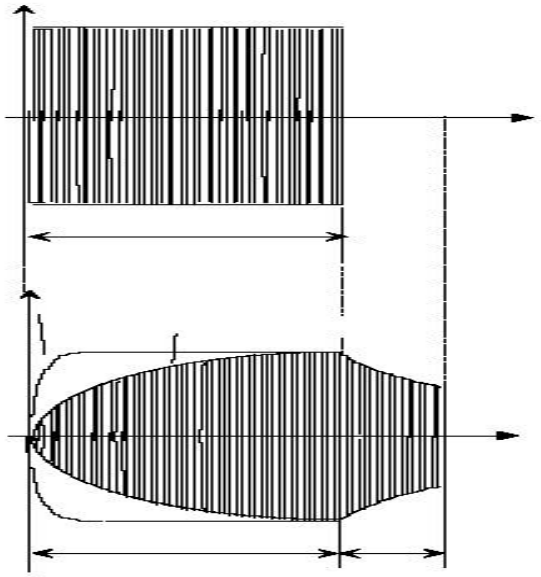


Figure 1: Charge and Read Phase - Voltage at the reader's exciter and transponder coil

2.2 COMMUNICATION SIGNAL INTERFACE - TAG TO READER

2.2.1 FREQUENCY

The tag shall be capable to communicate with the reader via an inductive coupling, whereby the power is switched off and the data are FSK modulated using the frequencies:

f_0 = 134.2 for the data "Low Bit" encoding **(ISO 11785 tolerance)**

f_1 = 124.2 for the data "High Bit" encoding **(ISO 11785 tolerance)**

f_1 represents the frequency for data bit '1' ($T_{d1} = 16/f_1$) and f_0 for the data bit '0' ($T_{d0} = 16/f_c$).

The low and high bits have different duration, because each bit takes 16 RF cycles to transmit. The high bit has a typical duration of ~130 µs, the low bit of ~120 µs. Figure 2 shows the FSK encoding principle used.

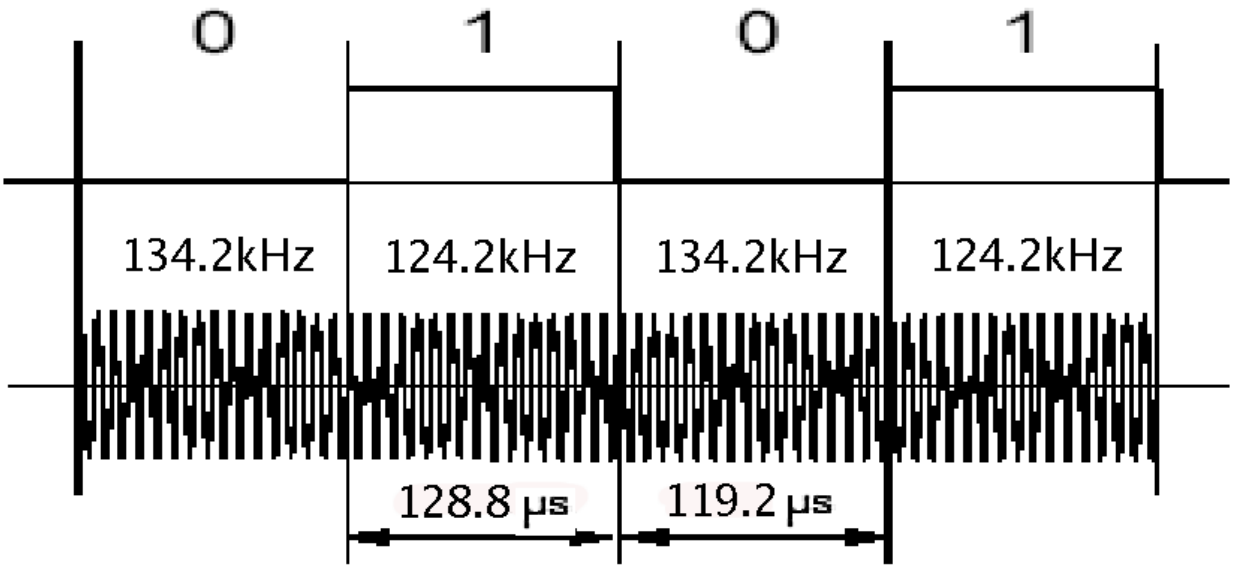


Figure 2: FSK transmission used during the read phase

2.2.2 TRANSPONDER DATA RATE AND DATA CODING

The data coding is based on the NRZ method thus achieving an average data rate of ~ 8 kbit/s based on an equal distribution of '0' and '1' data bits.

3 TRANSMISSION PROTOCOL

3.1 TRANSPONDER – RESPONSE DATA FORMAT

Any RFID answer is framed as shown in Figure 3 and it has a fixed length of 128 bits. Depending on the type of answer the STOP and POST bits change.

START	DATA	CRC	STOP	POST
1 8	9 – LSB 72	73 - LSB 88	89 96	97 112

Figure 3: Tag Response Frame format

All signals are coded [MSB;LSB].

START – Start Byte [7;0] := $7E_{hex}$

DATA – Data [63;0] := Data

CRC – DCRC [15;0] := Data CRC

STOP – Stop Byte [7;0] := $7E_{hex}$ – if bit 16 of ISO11785 ='0' and page 1 locked

:= $1E_{hex}$ – if bit 16 of ISO11785 ='1' and page 1 locked

POST – Post Bits [15;0] := 0000_{hex}

3.2 CRC-CCITT Error Checking

The CRC error checking circuitry generates a 16 bits CRC to ensure the integrity of transmitted and received data packets. The reader and transponder use the CRC-CCITT (Consultative Committee for International Telegraph and Telephone) for error detection.

The 16 bits Write Frame BCC is generated by the transponder on reception of the complete write data stream to validate the correct data transmission.

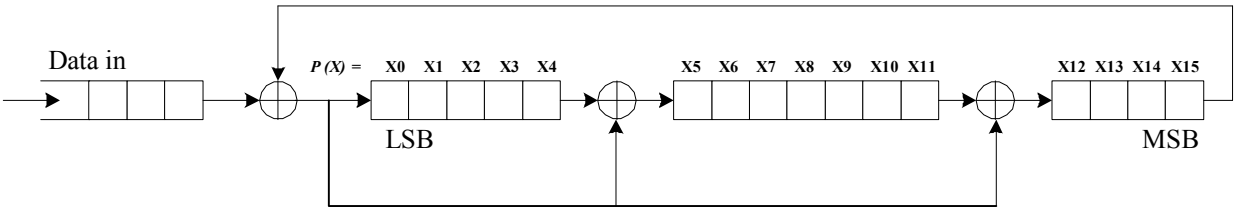


Figure 4: Schematic diagram of the 16 bits CRC-CCITT generator

The 16 bits cyclic redundancy code is calculated using the following polynomial with an initial value of 0000_{HEX}:

$P(X) = x^{16} + x^{12} + x^5 + x^0$

The implemented version of the CRC check has the following characteristics:

- Reverse CRC-CCITT 16 as described in ISO/IEC 13239 and used in ISO/IEC 11784/11785
- The CRC 16 bit shift register is initialised to all zeros at the beginning of a request
- The incoming data bits are XOR-ed with the MSB of the CRC register and is shifted into the register's LSB
- After all data bits have been processed, the CRC register contains the CRC-16 code.
- Reversibility - The original data together with associated CRC, when fed back into the same CRC generator will regenerate the initial value (all zero's).

4 SPECIFICATIONS

4.1 MECHANICAL DATA

4.1.1 DIMENSIONS

Parameter	Limits NCD1015-50RO			Unit
	min	typ	max	
Length		52.47		mm
Diameter		11.60		mm
Case Material	PA66GF & polyurethane			
Protection Class	Hermetically sealed			

4.1.2 MECHANICAL SHOCK

1) Drop test (qualified by similarity)

10 times at 150cm (both orientations)

4.1.3 THERMAL STRESS

Temperature cycling: 200 times 90°C -> -40°C -> 90°C (transition time: few seconds, storage time at 90°C and -40°C: 20 minutes).

4.2 ELECTRICAL DATA

4.2.1 OPERATING CONDITIONS

	Parameter		Limits
	min	max	unit
Operating Temperature	-25	+70	°C
Storage Temperature	-40	+100	°C

	Parameter			Limits
	min	typ	max	unit
Charge duration	15	50		ms
Low bit frequency fl	133.7	134.7	135.7	kHz
High bit frequency fh	120.1	123.7	126.4	kHz
FSK modulation index	9	11	15	kHz
Data retention	10			years

5 ORDERING INFORMATION

MPN	Description	Order code	Package
NCD1015-50RO	HDX 50mm robust transponder	NCD1015-50RO	Standard

Level	Data Sheet Status [1]	Product Status [2] [3]	Definitions
I	Objective data	Development	This data sheet contains data for the objective specification for product development.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be updated at a later date
III	Product data	Production	This data sheet contains data from the product specification

[1] Please consult the most recently issued data sheet before initiating of completing a design

[2] The product status of the device[s] described in this data sheet may have changed since this datasheet was published. The latest information is available by contacting IXYS San Sebastian.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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