

Hardware Manual: NTAG I²C *plus* Explorer Kit OM5569/NT322E

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Document information

Info	Content
Author	Pavel Slamnik
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1. NTAG I²C *plus* Explorer Kit OM5569/NT322E: Photo

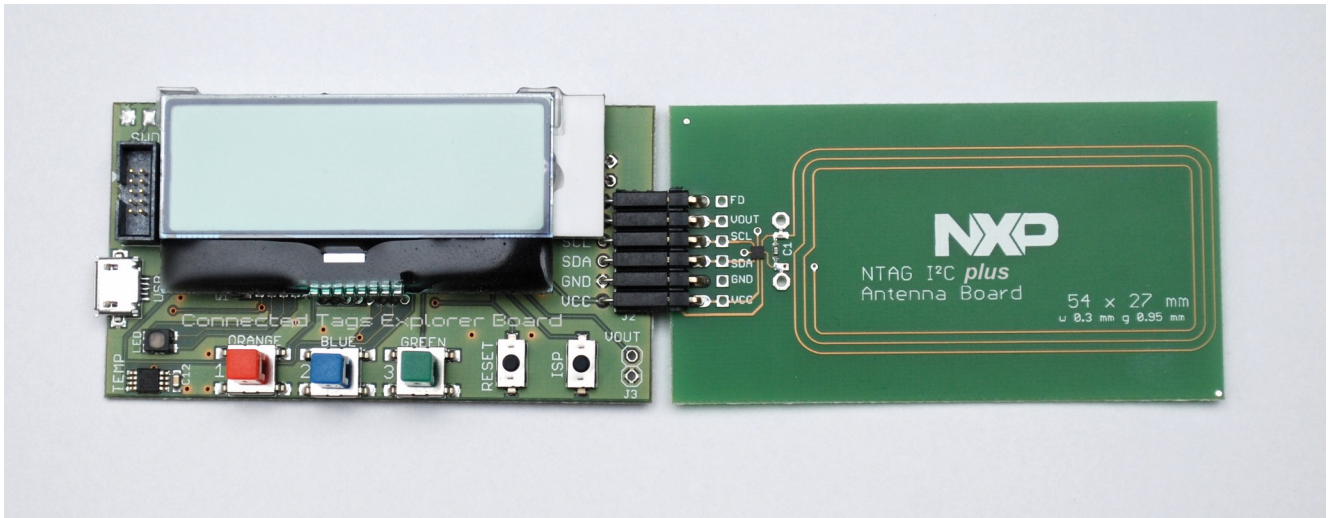


Figure 1: NTAG I²C *plus* Explorer Kit OM5569/NT322E – Connected Tags Explorer Board with NTAG I²C *plus* Antenna Board 54 x 27mm (pcb type).

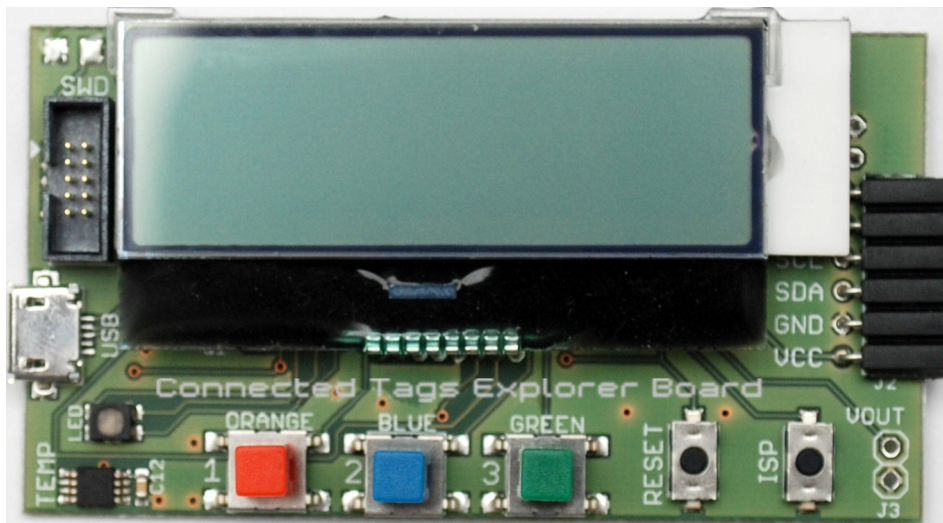
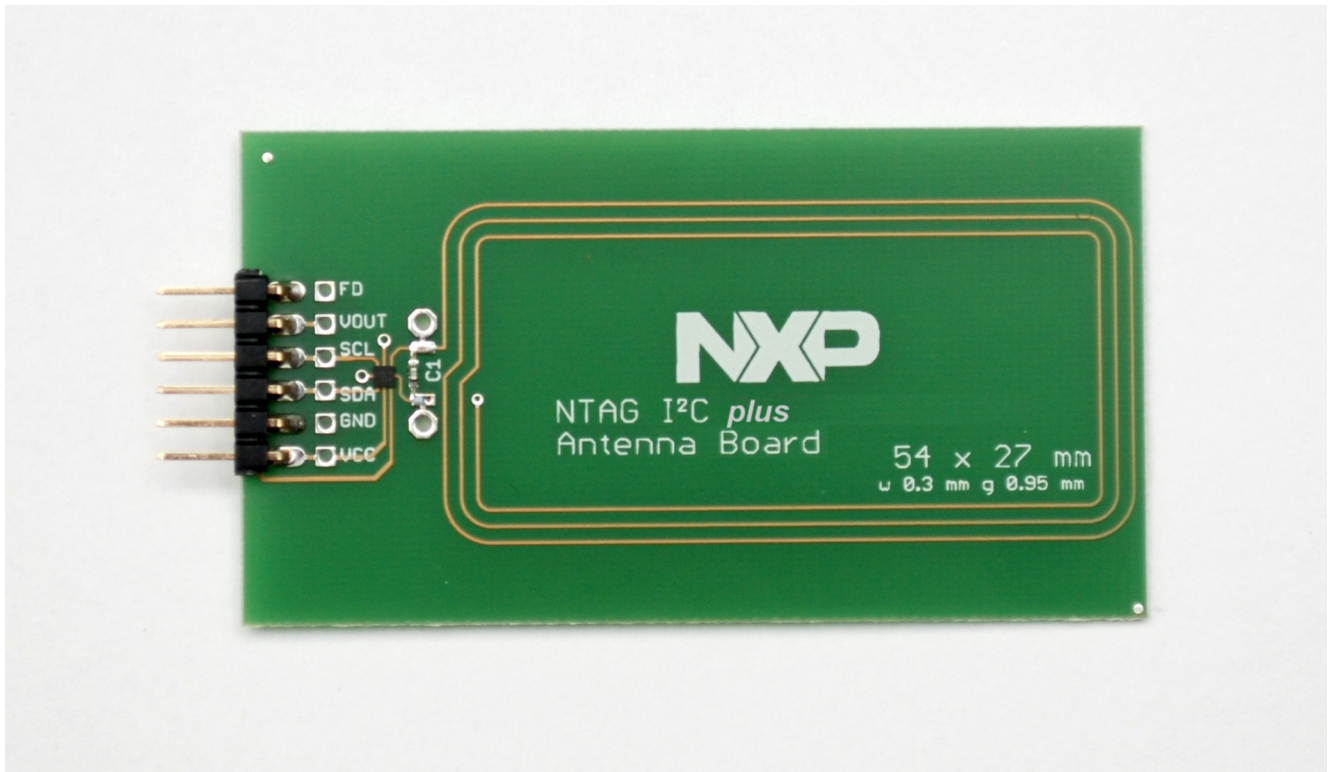


Figure 2: Connected Tags Explorer Board OM5569, Rev 2.0.

Figure 3: NTAG I²C plus Antenna Board OM5569/NT322E, 54 x 27 mm.



2. NTAG I²C plus Explorer Kit OM5569/NT322E: Description

2.1. Operational description

To demonstrate the unique properties of the NTAG I²C tag chip, NXP developed the NTAG I²C plus Explorer Kit OM5569/NT322E which consists from Connected Tags Explorer Board OM5569 and one NTAG I²C plus Antenna Board OM5569/NT322E (54 x 27 mm).

NXP's NTAG I²C plus Explorer Kit is an all-in-one demonstration/development resource for NFC connected tags. Designed to emulate using an NTAG I²C tag chip in an embedded electronic system, the kit centers around a multi-purpose microprocessor-based development/Explorer board, and includes a full complement of hardware and software tools to support investigation of the NTAG I²C chip operation, the NFC RF communication link, and the I²C serial bus connected link; perform a variety of demonstrations; and develop/test your own applications.

NTAG I²C tag chips mounted on a variety of different antenna types (FR4 PCB-based with separate antenna pads for custom antenna use, as well as a Flex antenna board based for easier product insertion testing) and with built-in I²C serial bus interface connectors.

The Connected Tags Explorer board contains an NXP microcontroller (LPC11U24 Cortex-M0), a RGB (red - green - blue) LED and OBG (orange – blue – green) push button as well as an NXP temperature sensor (PCT 2075) and an LCD screen to show the messages coming from the NTAG and the application. NTAG I²C plus Antenna Board contains NTAG I²C integrated circuits (NT3H1101/NT3H1201) and pcb wired (or flex) antenna. Connection between these two boards is via I2C serial link.

The Android application, called NTAG I²C Demo, can be found and freely downloaded from the Google Play Store. This document applies to the NTAG I2C Demoboard application version 1.5 and above. The Android application is intended to operate on devices running Android version 4.0 and beyond. The application has been optimized for a correct visioning of the graphical elements in smartphones featuring different resolutions.

The NTAG I²C Android App is meant to be working with the Connected Tags Explorer board, and an adjacent PCB or flex antennas to test all the features and functionalities the NTAG I²C is offering.

USB port and JTAG port are used only for writing firmware into LPC11U24 microcontroller and for debbuging purposes.

The below picture is a view of the Connected Tags Explorer board and the NTAG I²C plus Antenna Board 54 x 27 mm.

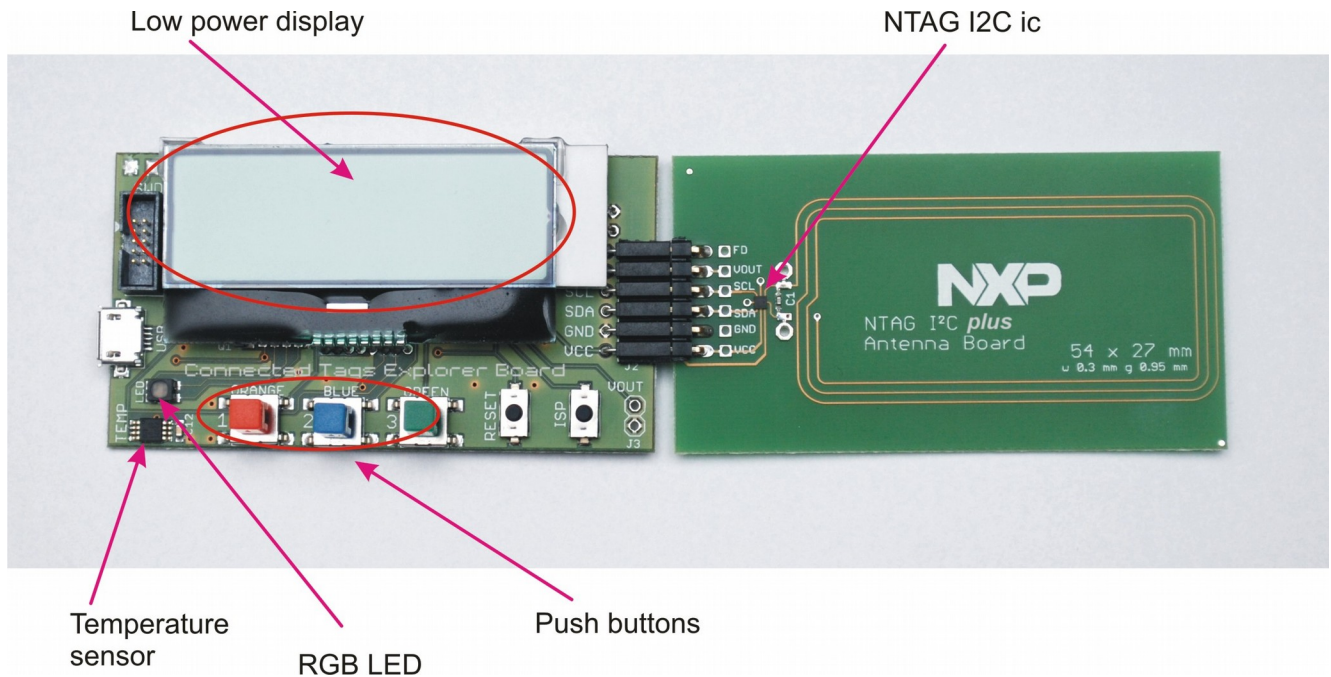


Figure 4: Connected Tags Explorer board with NTAG I²C plus Antenna Board 54 x 27 mm.

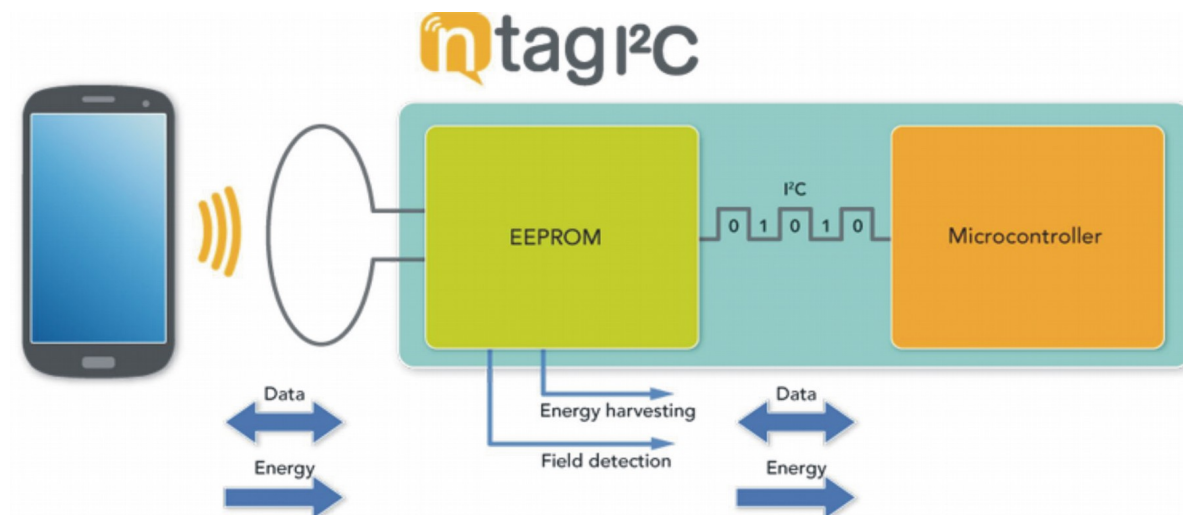


Figure 5: Connected Tags Explorer Board with NTAG I²C plus Antenna Board and NFC device – principle of operation.

Disclaimer:

This module is intended only for development and evaluation purposes, and cannot be used in a finished product.

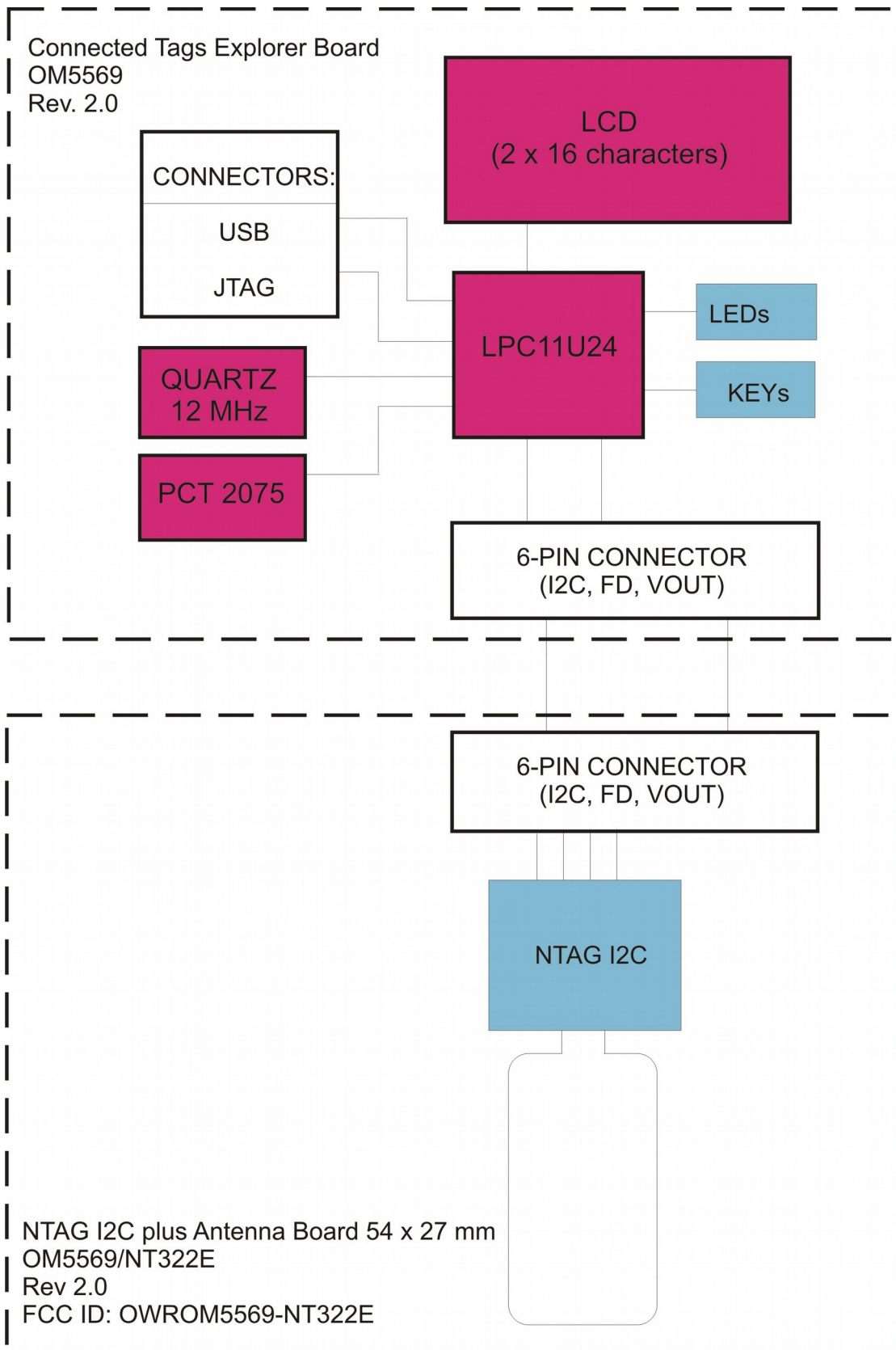


Figure 6: Connected Tags Explorer Board Rev. 2.0 with NTAG I²C plus Antenna Board – Block diagram.



Figure 7: Connected Tags Explorer Board OM5569, Rev. 2.0: dimensions and equipped pcb with connectors.

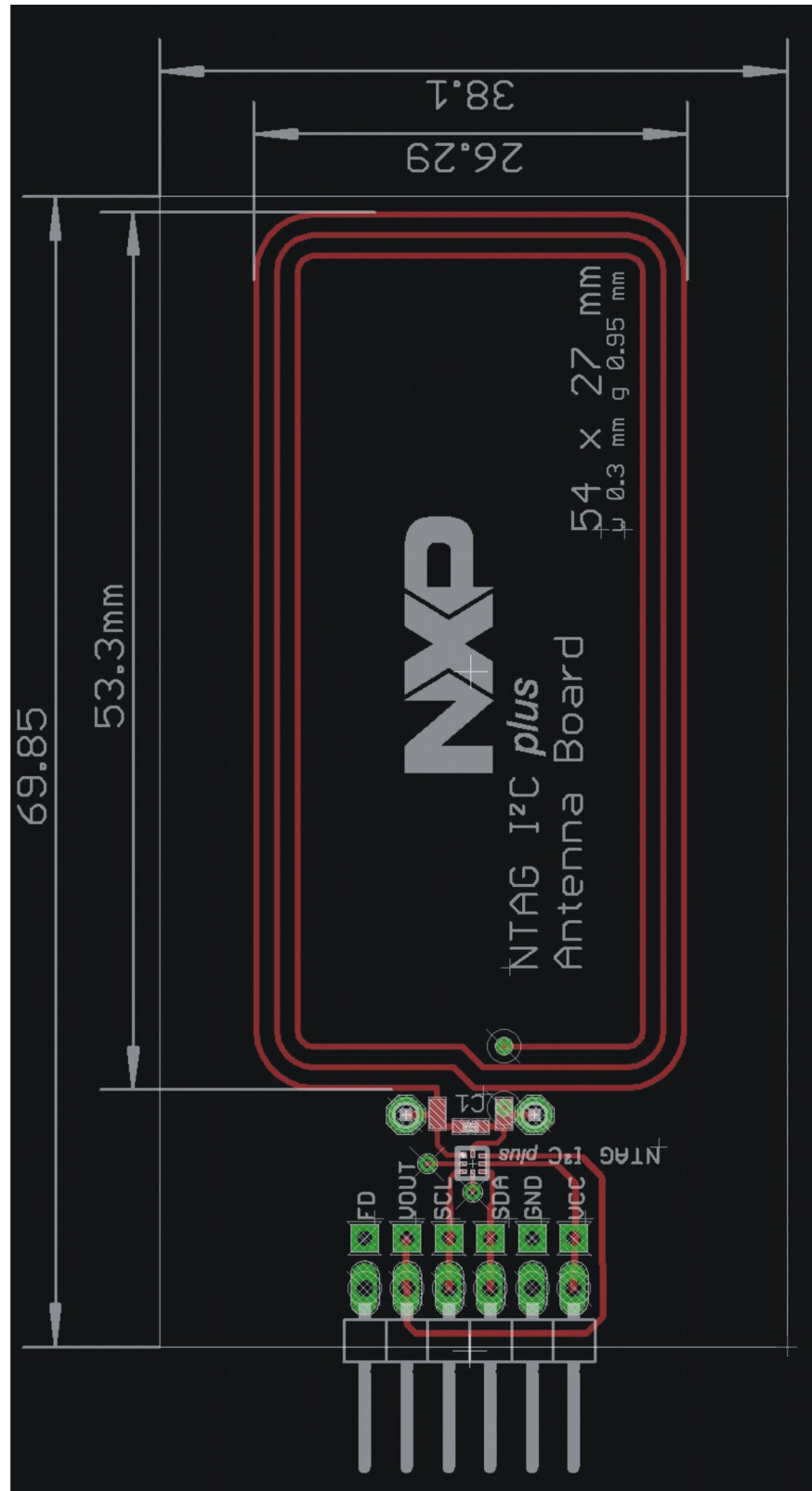


Figure 8: NTAG I²C plus Antenna Board OM5569/NT322E, 54 x 27mm, Rev. 2.0: dimensions and equipped pcb with connector.

3. NTAG I²C plus Expolorer Kit OM5569/NT322E: SPECIFICATION

3.1. Connected Tags Explorer Board OM5569: Specifications

Table 1: Connected Tags Explorer Board OM5569, Rev. 2.0 – specifications:

Low Power Microcontroller	
	LPC11U24 (Cortex - M0)
Oscillator	
	Internal oscillator (in LPC11U24) up to 12 MHz, Quartz 12 MHz
On-board sensor	
Temperature Sensor	PCT2075
Output/Input	
Outputs	3 x LED (orange, green, blue)
Inputs	3 x key
Supported Interfaces (6-pin connector to NTAG I2C Antenna Board)	
I2C	I2C-bus interface to up to 100 kBd (Standard mode), up to 400 kBs (Fast mode)
LCD display	
	2 x 16 character, WLED backlight, I2C serial communication, 3V3 power supply
Supported Interfaces	
USB serial interface	USB 2.0 interface (also supported Usb 1.1), 12 Mbps (USB 2.0 full speed), micro usb connector
ISP	JTAG interface (10-pin header) for ISP programming with LPCXpressoBoard
Electrical and Mechanical Specifications	
Power Supply	Board is powered from NTAG I2C Antenna Board (from NTAG I2C tag ic); usb power is used only for powering lcd backlight (20 mA)
PCB Dimensions (L x W x H)	70 mm x 38 mm x 14 mm
Weight	approx. 22 g
Operating Temperature	0... + 50 °C (without condensing)
Operating Humidity	5 ... 95% RH
Certificates	CE, FCC

Note:

USB port and JTAG port are used only for writing firmware into LPC11U24 microcontroller and for debugging purposes.

3.2. Connected Tags Explorer Board OM5569, Rev. 2.0: Electrical characteristics

Table 2: Connected Tags Explorer Board OM5569, Rev. 2.0 – electrical characteristics:

Operating Range

Symbol	Description	Conditions	Min	Typ	Max	Unit
VCC	DC Power Supply (from NTAG I2C tag ic)	NTAG Active (on NTAG I2C Antenna Board)	3.0	-	4.6	V
VBUS	USB Power Supply (only for LCD backlight)	NTAG Active (on NTAG I2C Antenna Board)	4.5	-	5.5	V
T _{amb}	Ambient Temperature	/	0	+25	+50	°C

Current Consumption

Symbol	Description	Conditions	Min	Typ	Max	Unit
I	Supply Current (only LPC11U24)	Power Down Mode, I2C off	-	-	0.9	µA
I	Supply Current (LPC11U24, LCD display, temp. sensor, LEDs)	Active, I2C on, RF on (on NTAG I2C Antenna Board)	-	-	5	mA
I	USB Supply Current (only for LCD backlight)	Active, I2C on, RF on (on Class 5 Antenna Board)	-	20	-	mA

Operating Distance

Symbol	Description	Conditions	Min	Typ	Max	Unit
DST	Operating Distance	Measured from the center of the antenna (depending on connected antenna and phone NFC antenna)	-	0 – 30	-	mm

Serial Interface Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
I2C	Baudrate	6-pin Connector	-	100	400	kBd
USB	Baudrate	Micro B USB Connector	-	12	-	MBd

3.3. NTAG I²C Antenna Board OM5569/NT322E, Rev 2.0 (54 x 27 mm) – specifications

Table 3: NTAG I²C plus Antenna Board OM5569/NT322E, Rev 2.0 (54 x 27 mm) – specifications:

Antenna	
	PCB type, 54 mm x 27 mm
Contactless operating frequency	
	13.56 MHz
Card reading/writing distance	
	Up to 30 mm
Contactless (RF) Interface	
	NFC forum Type 2 Tag compliant with data transfer 106 Kbps transmission rate
	64 byte SRAM buffer for fast transfer of data between the RF and the I2C interfaces
	Unique 7 byte serial number (cascade level 2 according to ISO/IEC 14443-3)
	True anticollision
Supported Interfaces (via 6-pin connector to NATG I2C Main Board)	
I2C	I2C-bus interface to up to 100 kBd (Standard mode), up to 400 kBs (Fast mode)
Supported HW Functions (NTAG I2C ic)	
FD	Field Detect function – wake up signal at the Field Detect pin
EH	Energy Harvesting function for power external devices (low power microcontroller)
Electrical and Mechanical Specifications	
Power Supply	NTAG I2C tag ic is powered from RF Field (from NFC phone)
PCB Dimensions (L x W x H)	70 mm x 38 mm x 7 mm
Weight	approx. 9 g
Operating Temperature	0 ... + 50 °C (without condensing)
Operating Humidity	5 ... 95% RH
Certificates	CE, FCC

4. INSTALLING MANUAL

4.1. Desktop use

NTAG I²C plus Explorer Kit OM5569/NT322E consists from Connected Tags Explorer Board OM5569 with NTAG I²C plus Antenna Board OM5569/NT322E 54 x 27 mm.

It is intended for development use in development environment such as development departments in factories, at institutes, etc. It demonstrates the unique properties of the NTAG I²C tag chip.

External power supply is not required (only for LCD backlight – but it is not necessary for operating Connected Tags Explorer Board).

Firmware is already written in LPC11U24 microcontroller and no extra programming via JTAG interface is needed. A NFC mobile phone is needed for demonstration (an application for mobile phone is available on Android market). User can write his own application and write it via JTAG interface into microcontroller.

4.2. Power supply

Connected Tags Explorer Board with NTAG I²C plus Antenna Board is powered via RF field from NFC mobile phone (13,56 MHz). It is no need for external power supply or battery (only for LCD backlight - but it is not necessary for operating NTAG I²C Explorer Board).

NTAG I²C tag ic on NTAG I²C plus Antenna Board provides up to 2V with 5 mA current output (typical) on Vout pin. This is enough to power low power microcontroller LPC11U24, LCD display, temperature sensor and LED.

Note 1:

Power supply from USB port on personal computer has to comply with LPS requirement of IEC60950-1.

Maximum length for USB cable is 3 meter.

5. USER MANUAL

The NTAG I²C plus Explorer Kit is developed to demonstrate the unique properties of the NTAG I²C tag chip.

The NTAG I²C plus Explorer Kit consists from two boards: Connected Tags Explorer Board and NTAG I²C plus Antenna board. The Connected Tags Explorer Board contains an NXP microcontroller (LPC11U24 Cortex-M0), three LEDs (orange, blue and green), three buttons as well as an temperature sensor (PCT 2075), LCD display. The NTAG I²C plus Antenna board contains NTAG I²C intergated circuit and pcb wired antenna. Connection between these two boards is via I2C serial link.

The Android application, called NTAG I2C Demo, can be found and freely downloaded from the Google Play Store. The Android application is intended to operate on devices running Android version 4.0 and beyond. The application has been optimized for a correct visioning of the graphical elements in smartphones featuring different resolutions.

How to test functionality of NTAG I²C tag ic with android application is written in detail in document: *NTAG I2C Explorer Board Programming and Testing.pdf*.

CAUTION

The NTAG I²C plus Explorer Kit contains components that can be potentially damaged by electrostatic discharge. Always store and transport the NTAG I²C plus Explorer Kit in the supplied ESD bag when not in use. Always handle the NTAG I²C plus Explorer Kit in an ESD controlled environment.

5.1. Main Functions

- Sending and receiving data to/from NTAG I²C tag ic to NFC Mobile Device via RF contactless communication (13,56 MHz).
- Supportting contactless RF communication ic according NFC Forum Type 2 tag compliant protocol.
- Supportting RF data transmission with 106 Kbps transmission rate.
- Communicatin with NFC Mobile device in distance up to 30 mm.
- The data exchange from Explorer Board to NTAG I²C plus Antenna Board (via I2C serial communication).
- NTAG I²C plus Explorer Kit is powering via RF field from NFC Mobile Device.

5.2. General functions

- Reading/writing to/from NTAG I²C tag ic is possible with NFC mobile phone with android application.
- Explorer Board with NTAG I²C plus Antenna Board can communicate with NFC mobile phone in distance up to 30 mm from the center of the NTAG I²C plus Antenna Board to the center of phone NFC antenna.
- Data transfer from/to NTAG I²C tag ic is possible in RF electromagnetic field (created from NFC phone). Nonmetal material between phone antenna and NTAG I²C plus Antenna Board has no influence to reading distance or reading reliability.
- Reading/writing to/from NTAG I²C tag ic is very simple: user approaches his Connected Tags Explorer Board with NTAG I²C plus Antenna board to NFC phone antenna. The android application, called NTAG I2C Demo NFC, must be started on mobile phone. User can turn on/off LEDs on NTAG I²C plus Explorer Kit (with android application) to demonstrate communication with NTAG I²C tag ic or can press the switches on Connected Tags Explorer Board (and see pressed switches on android application).

5.3. Instructions for safe work, maintaining and care

- Be careful not to damage the connectors, antenna, PCB, ICs and other connected parts.
- Because of the specifics of the device and the damage, only qualified staff, authorized by the producer, are allowed to repair the device. All interventions of the unauthorized person and mechanical damage means repealing of the guarantee.

6. ELECTROMAGNETIC COMPATIBILITY

NTAG I²C plus Explorer Kit fulfils the following requirements of electromagnetic compatibility:

FCC, Part 15.

6.5.1. FCC Compliance Statement

NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution!

The Federal Communications Commission warns the users that changes or modifications to the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

6.5.2. COMPLIANCE INFORMATION according to 47CFR 2.1033

We, declare that the product

NTAG I²C plus Explorer Kit OM5569/NT322E

FCC 12.225, FCC ID: OWROM5569-NT322E

is in conformity with Part 15 of the FCC Rules.

Operation of this product is subject to the following conditions:

- (1) this device may not cause harmful interference
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Note:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NTAG I²C plus Explorer Kit OM5569/NT322E consists from Connected Tags Explorer Board and NTAG I²C plus Antenna Board (54 x 27 mm). FCC certified is Connected Tags Explorer Board OM5569 with NTAG I²C plus Antenna Board OM5569/NT322E 54 x 27 mm.

FCC ID number is written only on NTAG I²C plus Antenna Board OM5569/NT322E 54 x 27 mm.

WARRANTY, LIMITATIONS OF LIABILITY

WARRANTY POLICY

Manufacturer warrants that any product ("Product") sold by Manufacturer to an end user ("User") shall be free of defects in material and workmanship for a period a one year (or other period if specified) from date of sale by Manufacturer.

If any Product, Product's part fail to conform or is defective then Manufacturer, at its option, will repair or replace it at the premises of the User (On-Site).

To obtain warranty service, you must send the Product in either its original packaging or packaging offering an equal degree of protection directly to Manufacturer. Please contact Manufacturer for warranty replacement fee information.

LIMITATIONS AND EXCLUSIONS

This warranty does not cover customer instruction, installation, set up adjustments or signal reception problems (RFID readers).

This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of, or to any part of the Product, including the antenna. This warranty does not cover damage due to improper operation or maintenance, connection to improper voltage supply, or attempted repair by anyone other than a facility authorized by Manufacturer to service the Product.

Proof of purchase in the form of a bill of sale or receipted invoice which is evidence that the unit is within the Warranty period must be presented to obtain warranty service.

This warranty is invalid if the factory applied serial number has been altered or removed from the Product.

THIS WARRANTY REPRESENTS THE ENTIRE AGREEMENT BETWEEN MANUFACTURER AND USER WITH RESPECT TO THE SUBJECT MATTER HEREIN AND SUPERSEDES ALL PRIOR OR CONTEMPORANEOUS ORAL OR WRITTEN COMMUNICATIONS, REPRESENTATIONS, UNDERSTANDINGS OR AGREEMENTS RELATING TO THIS SUBJECT.

End User: _____

Model Number: _____ NATG I²C plus Explorer Kit, OM5569/NT322E _____

Serial Number: _____

Startup Date: _____ Waranty End Date: _____