

# NT3H1101/NT3H1201

NTAG I<sup>2</sup>C, NFC Forum type 2 Tag compliant IC with I<sup>2</sup>C interface

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257710

Objective short data sheet  
COMPANY PUBLIC

## 1. General description

The NTAG I<sup>2</sup>C is the first product of NXP's NTAG family offering both contactless and contact interfaces (see [Figure 1](#)). In addition to the passive NFC Forum compliant contactless interface, the IC features an I<sup>2</sup>C contact interface, which can communicate with a microcontroller if the NTAG I<sup>2</sup>C is powered from an external power supply. An additional externally powered SRAM mapped into the memory allows a fast data transfer between the RF and I<sup>2</sup>C interfaces and vice versa, without the write cycle limitations of the EEPROM memory.

The NTAG I<sup>2</sup>C product features a configurable Field Detection Pin, which provides a trigger to an external device depending on the activities at the RF interface.

The NTAG I<sup>2</sup>C product can also supply power to external (low power) devices (e.g., a microcontroller) via the embedded energy harvesting circuitry.

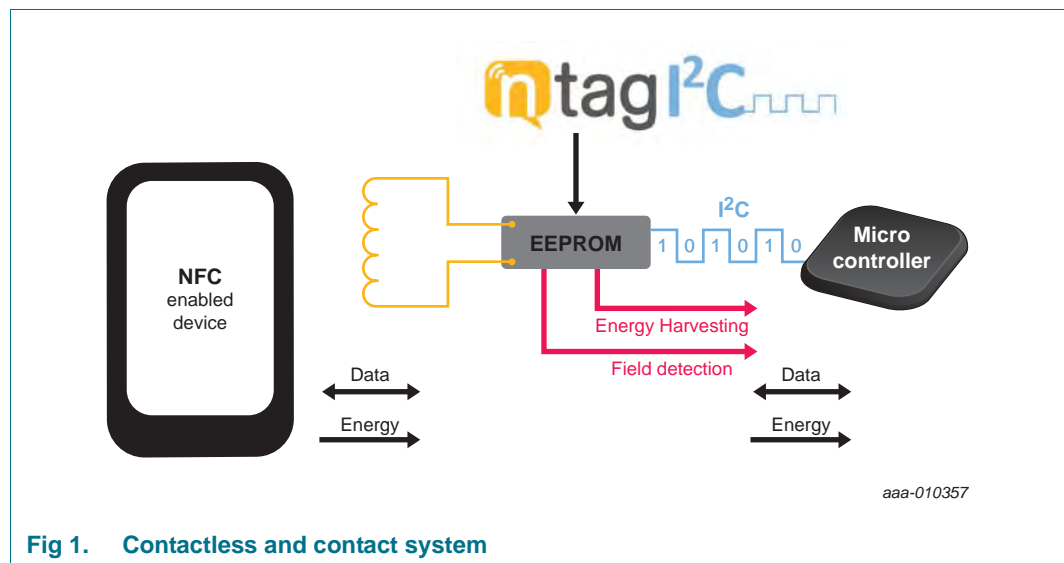


Fig 1. Contactless and contact system

## 2. Features and benefits

### 2.1 Key features

- RF interface NFC forum Type 2 Tag compliant
- I<sup>2</sup>C interface
- Configurable field detection pin based on open drain implementation that can be triggered upon the following events:
  - ◆ A RF field presence
  - ◆ The first Start-of-Frame
  - ◆ The selection of the tag only
- 64 byte SRAM buffer for fast transfer of data (Pass-through mode) between the RF and the I<sup>2</sup>C interfaces located outside the User Memory
- Wake up signal at the field detect pin when:
  - ◆ New data has arrived from one interface
  - ◆ Data has been read by the receiving interface
- Clear arbitration between RF and I<sup>2</sup>C interfaces:
  - ◆ First come, first serve strategy
  - ◆ Status flag bits to signal if one interface is busy writing to or reading data from the EEPROM
- Energy harvesting functionality to power external devices (e.g. microcontroller)
- FAST READ command for faster data reading

### 2.2 RF interface

- Contactless transmission of data
- NFC Forum Type 2 tag compliant (see [Ref. 1](#))
- Operating frequency of 13.56 MHz
- Data transfer of 106 kbit/s
- 4 bytes (one page) written including all overhead in 4,8 ms via EEPROM or 0,8 ms via SRAM (Pass-through mode)
- Data integrity of 16-bit CRC, parity, bit coding, bit counting
- Operating distance of up to 100 mm (depending on various parameters, such as field strength and antenna geometry)
- True anticollision
- Unique 7 byte serial number (cascade level 2 according to ISO/IEC 14443-3 (see [Ref. 2](#)))

### 2.3 Memory

- 1904 bytes freely available with User Read/Write area (476 pages with 4 bytes per pages) for the NTAG I<sup>2</sup>C 2k version
- 888 bytes freely available with User Read/Write area (222 pages with 4 bytes per pages) for the NTAG I<sup>2</sup>C 1k version
- Field programmable read-only locking function with static and dynamic lock bits
- Write protection configurable from both I<sup>2</sup>C and NFC interfaces
- 64 bytes SRAM volatile memory without write endurance limitation

- Data retention time of 20 years
- Write endurance 200,000 cycles

## 2.4 I<sup>2</sup>C interface

- I<sup>2</sup>C slave interface supports Standard (100 kHz) and Fast (up to 400 kHz) mode (see [Ref. 3](#))
- 16 bytes (one block) written in 4,5ms (EEPROM) or 0,4ms (SRAM - Pass-through mode) including all overhead
- RFID chip can be used as standard I<sup>2</sup>C EEPROM

## 2.5 Security

- Manufacturer-programmed 7-byte UID for each device
- Capability container with one time programmable bits
- Field programmable read-only locking function per page (per 32 pages for the extended memory section)

## 2.6 Key benefits

- The Pass-through mode allows fast download and upload of data from RF to I<sup>2</sup>C and vice versa without the cycling limitation of EEPROM
- NDEF message storage up to 1904 bytes (2k version) or up to 888 bytes (1k version)
- The mapping of the SRAM inside the User Memory buffer allows dynamic update of NDEF message content

## 3. Applications

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With all its integrated features and functions the NTAG I<sup>2</sup>C is the ideal solution to enable a contactless communication via an NFC device (e.g., NFC enabled mobile phone) to an electronic device for:

- Zero power configuration (late customization)
- Smart customer interaction (e.g., easier after sales service, such as firmware update)
- Advanced pairing (for e.g., WiFi or Blue tooth) for dynamic generation of sessions keys

Easier product customization and customer experience for the following applications:

- Home automation
- Home appliances
- Consumer electronics
- Healthcare
- Printers
- Smart meters

## 4. Quick reference data

**Table 1. Quick reference data**

In accordance with the Absolute Maximum Rating System (IEC 60134).<sup>[1][2][3]</sup>

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C <sub>i</sub>	input capacitance	LA - LB <sup>[4]</sup>	44	50	56	pF
f <sub>i</sub>	input frequency		-	13.56	-	MHz
<b>Energy harvesting characteristics</b>						
V <sub>out</sub>	Voltage generated at the V <sub>out</sub> pin		-	-	3.2	V
<b>I<sup>2</sup>C interface characteristics</b>						
VCC	Supply voltage	I <sup>2</sup> C on VCC input	1.8	-	3.6	V <sub>m</sub>
I <sub>DD</sub>	Supply current		-	155	-	μA
<b>EEPROM characteristics</b>						
t <sub>ret</sub>	retention time	T <sub>amb</sub> = 22 °C	20	-	-	year
N <sub>endu(W)</sub>	write endurance	T <sub>amb</sub> = 22 °C	200000	-	-	cycle

[1] Stresses above one or more of the limiting values may cause permanent damage to the device.

[2] These are stress ratings only. Operation of the device at these or any other conditions above those given in the Characteristics section of the specification is not implied.

[3] Exposure to limiting values for extended periods may affect device reliability.

[4] LCR meter, T<sub>amb</sub> = 22 °C, f<sub>i</sub> = 13.56 MHz, 2 V RMS

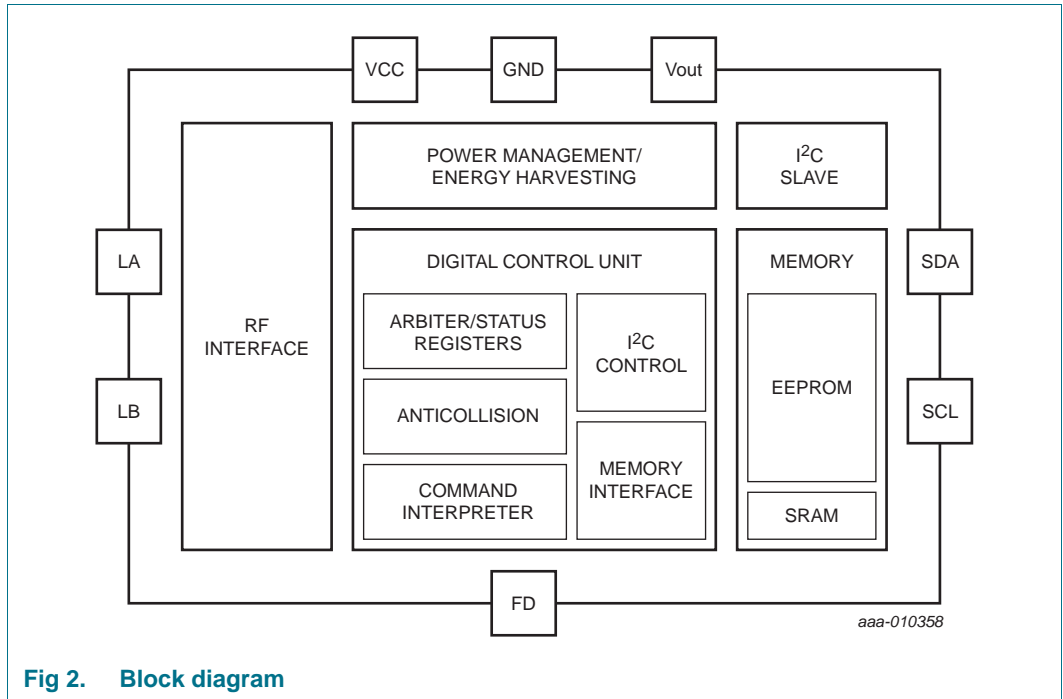
**Remark:** The values above are target values; final values will be available after product characterization and may deviate from these preliminary values.

## 5. Ordering information

**Table 2. Ordering information**

Type number	Package		Version
	Name	Description	
NT3H1101W0FHK	XQFN8	Plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 x 1.6 x 0.6mm; 1k bytes memory, 50pF input capacitance	SOT902-3
NT3H1201W0FHK	XQFN8	Plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 x 1.6 x 0.6mm; 2k bytes memory, 50pF input capacitance	SOT902-3

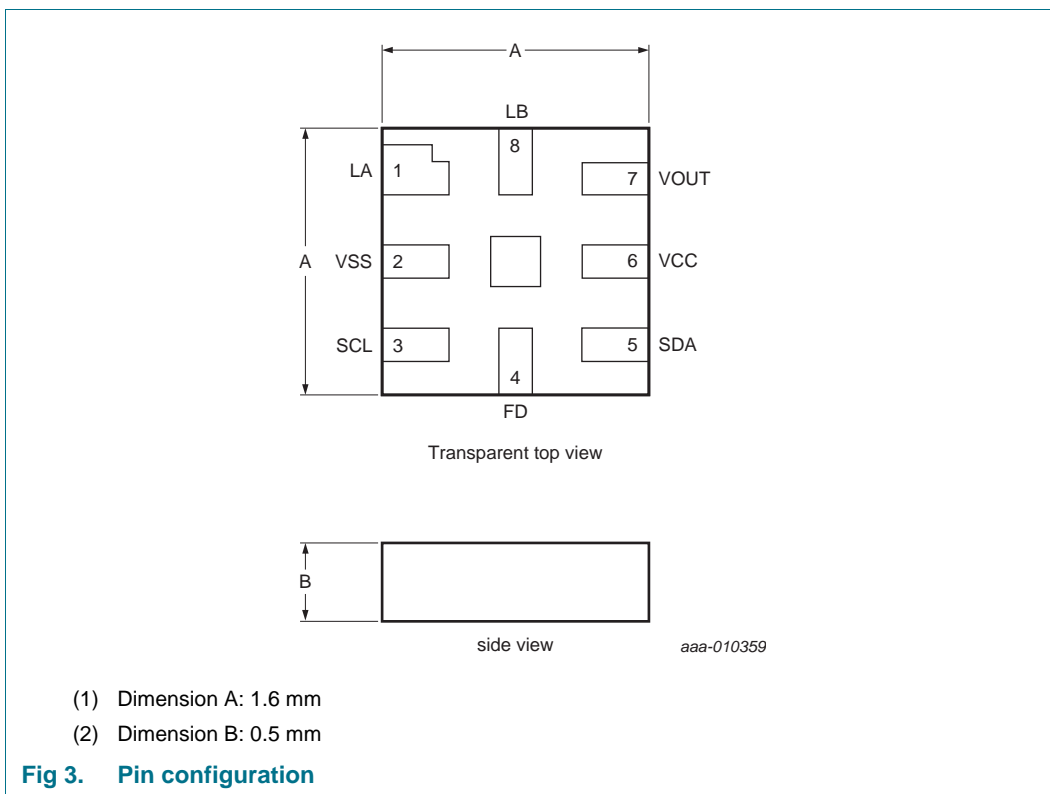
## 6. Block diagram



**Fig 2. Block diagram**

## 7. Pinning information

### 7.1 Pinning



### 7.2 Pin description

**Table 3. Pin description**

Symbol	Pin	Description
Pin	Symbol	Description
1	LA	Antenna connection LA
2	VSS	GND
3	SCL	Serial Clock I <sup>2</sup> C
4	FD	Field detection
5	SDA	Serial data I <sup>2</sup> C
6	VCC	VCC in connection (external power supply)
7	V <sub>out</sub>	Voltage out (energy harvesting)
8	LB	Antenna connection LB

NXP recommends leaving the central pad of the package unconnected.

## 8. Limiting values

Exceeding the limits of one or more values in reference may cause permanent damage to the device. Exposure to limiting values for extended periods may affect device reliability.

**Table 4. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit
T <sub>stg</sub>	storage temperature		-55	+125	°C
T <sub>amb</sub>	ambient temperature		-40	+85	°C
V <sub>ESD</sub>	electrostatic discharge voltage		2	-	kV
V <sub>FD</sub>	Voltage on the FD pin		-	3.6	V
V <sub>SDA</sub>	Voltage on the SDA line		-	3.6	V
V <sub>SCL</sub>	Voltage on the SCL line		-	3.6	V

[1] ANSI/ESDA/JEDEC JS-001; Human body model: C = 100 pF, R = 1.5 kΩ.

**Remark:** The values above are target values; final values will be available after product characterization and may deviate from these preliminary values.

9. Package outline

XQFN8: plastic, extremely thin quad flat package; no leads;  
8 terminals; body 1.6 x 1.6 x 0.5 mm

SOT902-3

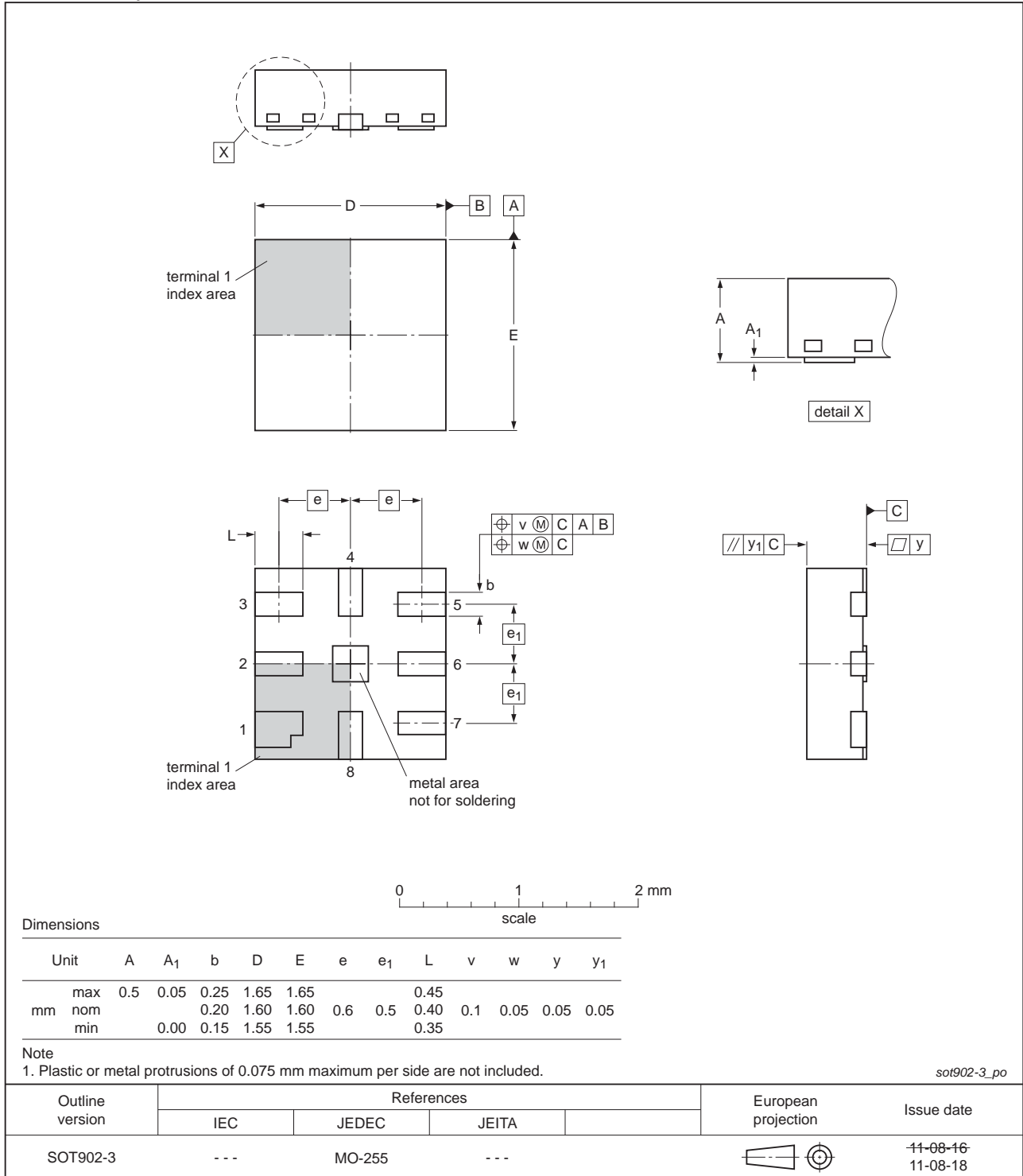


Fig 4. Package outline SOT902-3 (XQFN8)

## 10. References

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- [1] NFC Forum Tag 2 Type Operation, Technical Specification - NFC Forum, 31.05.2011, Version 1.1
- [2] ISO/IEC 14443 - International Organization for Standardization
- [3] I2C-bus specification and user manual (NXP standard UM10204.pdf / Rev. 03 - 19 June 2007)

## 11. Revision history

Table 5. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
NT3H1101_1201_SDS v.1	20131219	Objective short data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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