

# NTP53x2

## NTAG 5 link - NFC Forum-compliant I<sup>2</sup>C bridge

Rev. 1.1 — 2 October 2019  
547611

Objective short data sheet  
COMPANY PUBLIC

### 1 General description

Optimized for sensor-driven applications, this highly integrated NFC IC creates a secure, standard-based link from the device to the cloud, in a futureproof way to address and even power sensors.

NXP's NTAG 5 link lets designers of sensor-equipped systems add an NFC interface with a wired host interface that's configurable as an I<sup>2</sup>C master/slave, a pulse width modulator (PWM), or a general-purpose I/O (GPIO). Operating at 13.56 MHz, it is an NFC Forum compliant Type 5 Tag that can be read and written by an NFC-enabled device at close range and by an ISO/IEC 15693-enabled industrial reader over a longer range.

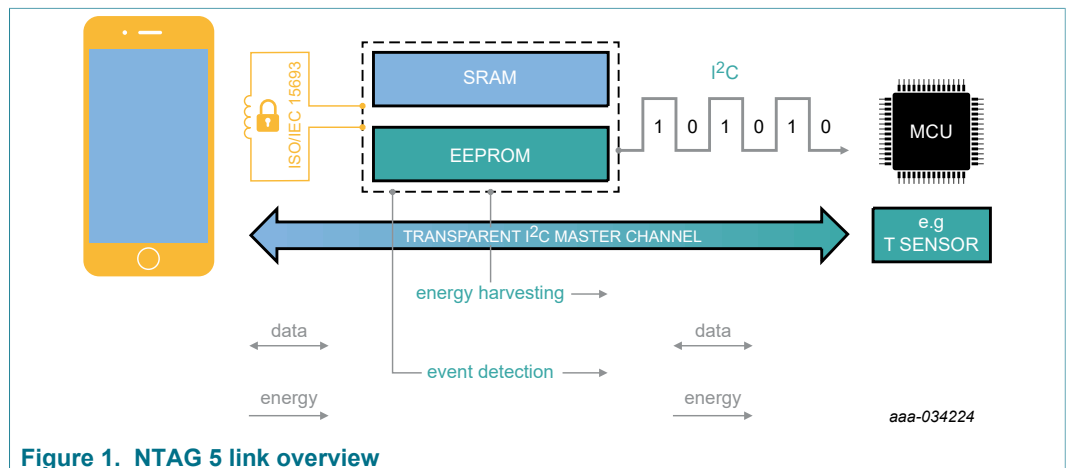


Figure 1. NTAG 5 link overview

The NTAG 5 link can act as a direct bridge between an NFC-enabled device and any I<sup>2</sup>C slave, such as a sensor or external memory. This is especially useful in environments that require zero-power, single-shot measurements.

With NTAG 5 link, the device can connect to the cloud with a single tap. The connection uses an NFC Forum compliant data exchange mechanism involving SRAM to ensure highly interoperable data transfers.

Support for ISO/IEC 15693 lets the NTAG 5 link communicate securely in two ways: with powerful industrial readers, at a range of up to 60 cm and with NFC-enabled devices in proximity range. This duality makes it possible for the device to be calibrated and parameterized automatically while in the factory and then, when putted to be used in the field, safely communicate with contactless devices such as mobile phones.

NTAG 5 link offers 2048 bytes (16384 bits) bytes of memory which can be divided into three areas, and each area can use a different protection level, varying from no protection to 32-/64-bit password-protected read/write access or up to 128-bit-AES mutual authentication protected read/write access.



The NTAG 5 link comes with pre-programmed proof-of-origin functionality to verify authenticity. The ECC based originality signature can be reprogrammed or locked by the customer.

The NTAG 5 link can operate without a battery by drawing power from the NFC reader instead. It supports energy harvesting, which means it can be used to supply power to other components in the system. When sufficient energy is available, NTAG 5 link can supply a fixed, configurable voltage level to ensure a stable overall system.

## 2 Features and benefits

- Reading distance with long-range reader > 60 cm (> 25 inches)
- Zero-power readout of an I<sup>2</sup>C sensor
- Adjustable security levels up to mutual AES authentication (NTP5332 only)
- Flexible split between three open and/or protected memory areas
- Ensured authenticity of product through value chain
- Interoperable data exchange according to NFC Forum standards
- Energy-efficient design with reduced bill of material
- Interoperable and high performance NFC interface
  - [ISO/IEC 15693](#) and NFC Forum [Type 5 Tag](#) compliant
  - 64-bit Unique IDentifier
- Reliable and robust memory
  - 2048 bytes (16384 bits) user EEPROM on top of configuration memory
  - 256 bytes (2048 bits) SRAM for frequently changing data and pass-through mode
  - 40 years data retention
  - Write endurance of 1 000 000 cycles
- Configurable contact interface
  - [I<sup>2</sup>C slave](#) standard (100 kHz) and fast (400 kHz) mode
  - NTP5332 offers a Transparent I<sup>2</sup>C master channel (for example, read sensors without an MCU)
  - One configurable event detection pin
  - Two GPIOs as multiplexed I<sup>2</sup>C lines
  - Two Pulse Width Modulation (PWM) channels as multiplexed GPIOs and/or ED pin
  - 1.62 V to 5.5 V supply voltage
- Scalable security for access and data protection
  - Disable NFC interface temporarily
  - Disable I<sup>2</sup>C interface temporarily
  - NFC PRIVACY mode
  - Read-only protection as defined in NFC Forum Type 5 Tag Specification
  - Full, read-only, or no memory access based on 32-bit password from both interfaces
  - Optional 64-bit password protection from NFC perspective
  - 128-bit AES authentication as defined in [ISO/IEC 15693](#) for NTP5332
  - ECC-based reprogrammable originality signature
- Multiple fast data transfer mode
  - Pass-through mode with 256 byte SRAM buffer
  - Standardized data transfer mode (PHDC, TNEP)
- Low-power budget application support
  - Energy harvesting with configurable output voltage up to 30 mW
  - Low-power standby current <6 μA
  - Hard power down current <0.25 μA
- Very robust architecture
  - -40 °C to 85°C
- Extensive product support package
  - Feature specific application notes
  - Development board including software and source code
  - Hands-on training

### 3 Applications

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- Use cases
  - Simple dynamic secure pairing
  - Commissioning
  - Parameterization
  - Diagnosis
  - Firmware download
  - Low BoM and low-power data acquisition for sensors
  - Calibration
  - Trimming
  - Authenticity check and data protection
  - Late "in the box" configuration
  - LED driver configuration
  - NFC Charging
- Applications
  - Lighting
  - Smart home
  - Hearable and Wearable
  - Consumer
  - Industrial
  - Gaming
  - Smart sensor
  - Smart metering

## 4 Quick reference data

Table 1. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
General						
f <sub>i</sub>	input frequency	ISO/IEC 15693	13.553	13.56	13.567	MHz
Operating conditions						
T <sub>amb</sub>	ambient temperature		-40	25	85	°C
V <sub>CC</sub>	supply voltage	on pin V <sub>CC</sub>	1.62	-	5.5	V
Current consumption						
I <sub>VCC</sub>	V <sub>CC</sub> supply current	V <sub>CC</sub> = 1.8 V	-	150	-	μA
Energy harvesting VOUT pad						
V <sub>out</sub>	output voltage	load current ≤ configured output current	1.62	-	3.3	V
C <sub>L</sub>	load capacitance	needs to come from calculation	-	1.1	-	μF

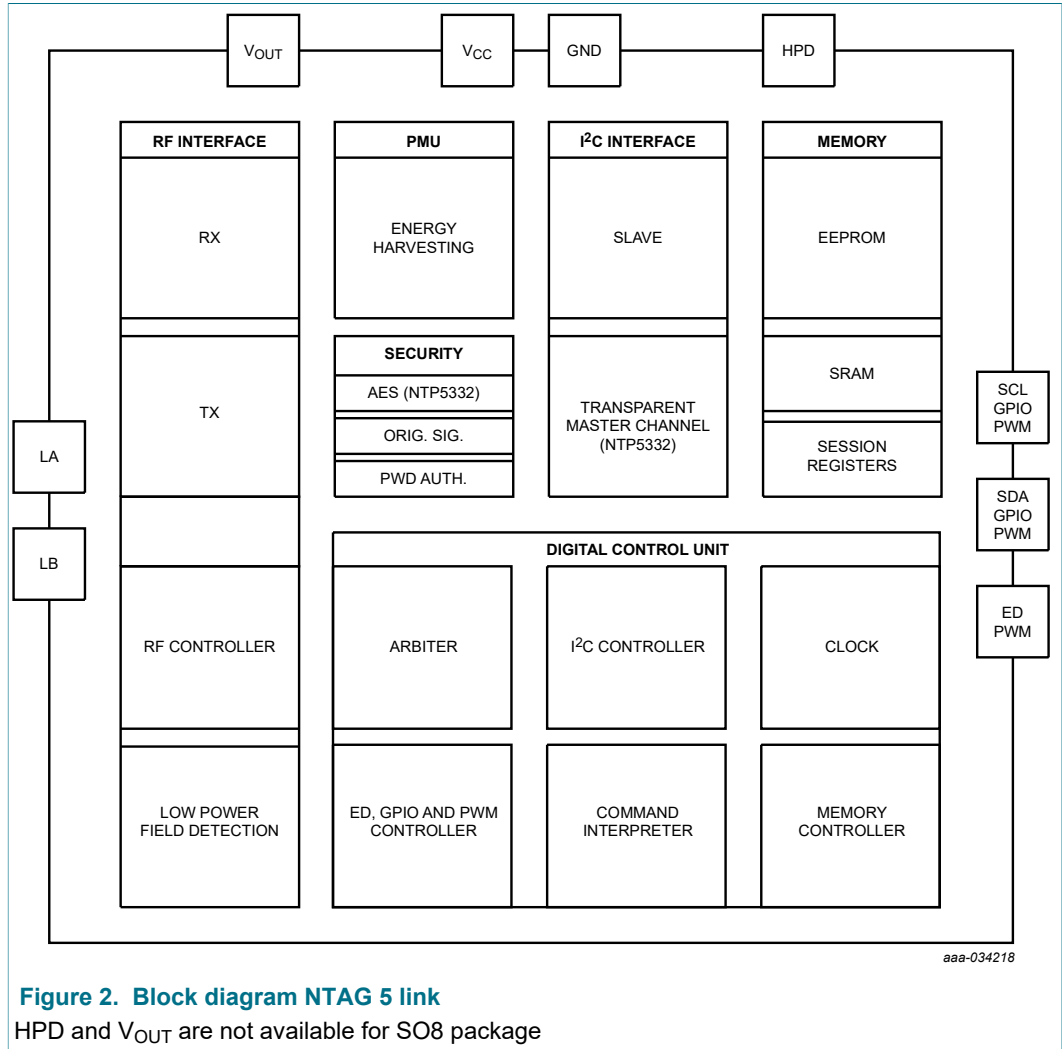
## 5 Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
NTP53121G0JHK	XQFN16	NTAG 5 link; with I <sup>2</sup> C interface and 2048 bytes user EEPROM plastic, extremely thin quad flat package; no leads; 16 terminals	SOT1161-2
NTP53121G0JTT	TSSOP16	NTAG 5 link; with I <sup>2</sup> C interface and 2048 bytes user EEPROM plastic, thin shrink small outline package; 16 leads; 0.65 mm pitch; 5 mm x 4.4 mm x 1.1 mm body	SOT403-1
NTP53121G0JT	SO8	NTAG 5 link; with I <sup>2</sup> C interface and 2048 bytes user EEPROM plastic, small outline package; 8 leads; 1.27 mm pitch; 4.9 mm x 3.9 mm x 1.75 mm body	SOT96-1
NTP53121G0FUA	Wafer	NTAG 5 link; 8 inch wafer, 150 μm thickness, on film frame carrier, electronic fail die marking according to SECS-II format)	-
NTP53321G0JHK	XQFN16	NTAG 5 link with I <sup>2</sup> C master/slave interface, AES authentication and 2048 bytes user EEPROM plastic, extremely thin quad flat package; no leads; 16 terminals	SOT1161-2
NTP53321G0JTT	TSSOP16	NTAG 5 link with I <sup>2</sup> C master/slave interface, AES authentication and 2048 bytes user EEPROM plastic, thin shrink small outline package; 16 leads; 0.65 mm pitch; 5 mm x 4.4 mm x 1.1 mm body	SOT403-1
NTP53321G0JT	SO8	NTAG 5 link with I <sup>2</sup> C master/slave interface, AES authentication and 2048 bytes user EEPROM plastic, small outline package; 8 leads; 1.27 mm pitch; 4.9 mm x 3.9 mm x 1.75 mm body	SOT96-1
NTP53321G0FUA	Wafer	NTAG 5 link; 8 inch wafer, 150 μm thickness, on film frame carrier, electronic fail die marking according to SECS-II format)	-

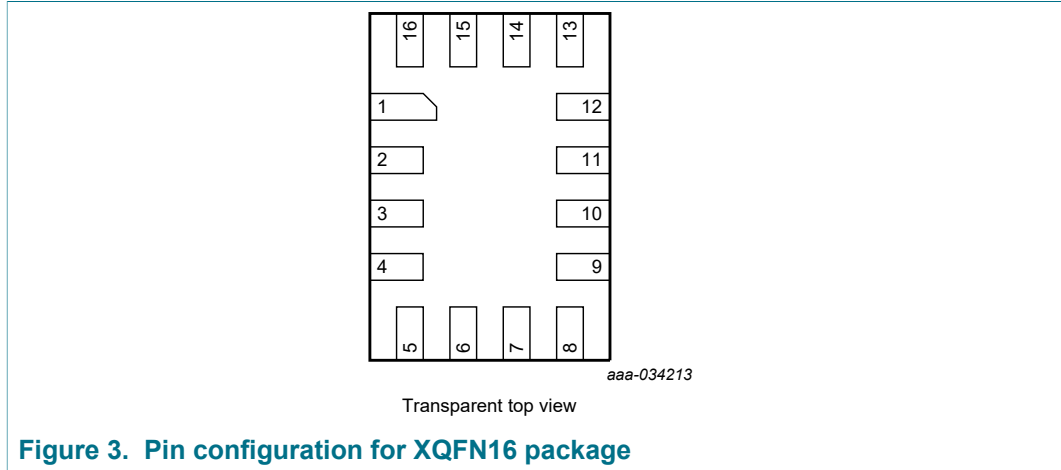
**REMARK:** Wafer specification addendum is available after exchange of a non-disclosure agreement (NDA)

6 Block diagram



**Figure 2. Block diagram NTAG 5 link**  
 HPD and V<sub>OUT</sub> are not available for SO8 package

## 7 Pinning Information



**Figure 3. Pin configuration for XQFN16 package**

**Table 3. Pin description for XQFN16**

Pin	Symbol	Description	When unused
1	GND	Ground	connect to GND
2	GND	Ground	connect to GND
3	N.C.	not connected	keep floating
4	N.C.	not connected	keep floating
5	N.C.	not connected	keep floating
6	SDA/GPIO1/PWM1	Multiplexed serial data I <sup>2</sup> C, GPIO1 and PWM1	keep floating
7	SCL/GPIO0/PWM0	Multiplexed serial clock I <sup>2</sup> C, GPIO0 and PWM0	keep floating
8	ED/PWM0	Multiplexed event detection and PWM0	keep floating
9	V <sub>CC</sub>	External power supply	keep floating
10	HPD	Hard power down	keep floating
11	GND	Ground	connect to GND
12	V <sub>OUT</sub>	Energy harvesting voltage output	keep floating
13	N.C.	not connected	keep floating
14	LB	Antenna connection	keep floating
15	LA	Antenna connection	keep floating
16	N.C.	not connected	keep floating



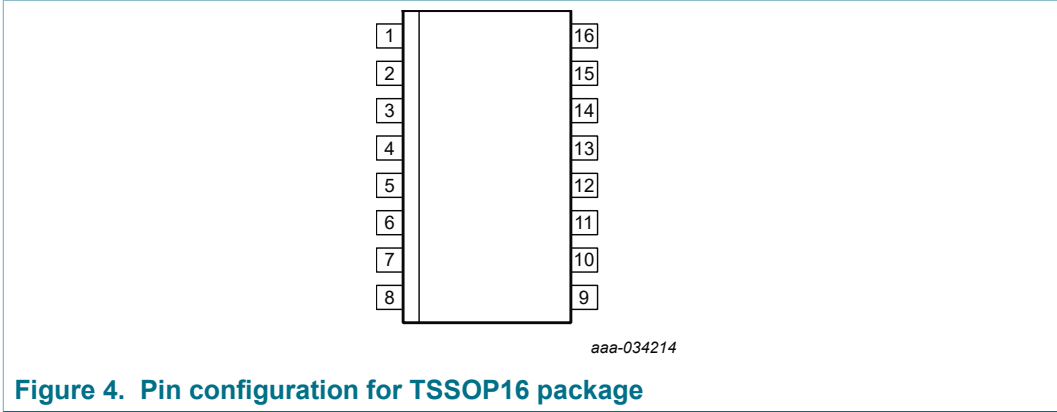


Figure 4. Pin configuration for TSSOP16 package

Table 4. Pin description for TSSOP16

Pin	Symbol	Description	When unused
1	LA	Antenna connection	keep floating
2	N.C.	not connected	keep floating
3	GND	Ground	connect to GND
4	GND	Ground	connect to GND
5	N.C.	not connected	keep floating
6	N.C.	not connected	keep floating
7	N.C.	not connected	keep floating
8	SDA/GPIO1/PWM1	Multiplexed serial data I <sup>2</sup> C, GPIO1 and PWM1	keep floating
9	SCL/GPIO0/PWM0	Multiplexed serial clock I <sup>2</sup> C, GPIO0 and PWM0	keep floating
10	ED/PWM0	Multiplexed event detection and PWM0	keep floating
11	V <sub>CC</sub>	External power supply	keep floating
12	HPD	Hard power down	keep floating
13	GND	Ground	connect to GND
14	V <sub>OUT</sub>	Energy harvesting voltage output	keep floating
15	N.C.	not connected	keep floating
16	LB	Antenna connection	keep floating

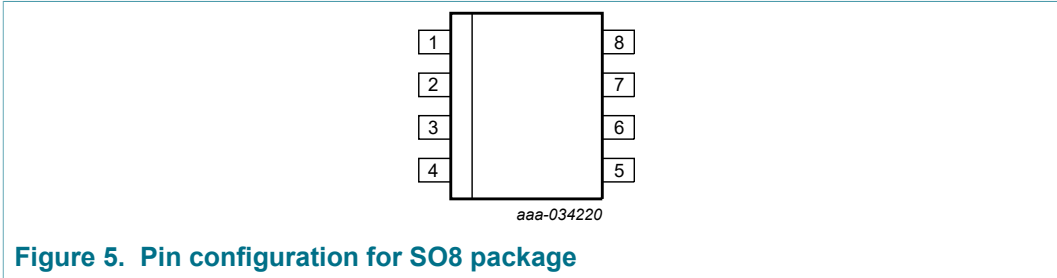


Figure 5. Pin configuration for SO8 package

Table 5. Pin description for SO8

Pin	Symbol	Description	When unused
1	GND	Ground	connect to GND
2	LA	Antenna connection	keep floating
3	LB	Antenna connection	keep floating
4	GND	Ground	connect to GND
5	SDA/GPIO1/PWM1	Multiplexed GPIO1 and PWM1	keep floating
6	SCL/GPIO0/PWM0	Multiplexed GPIO0 and PWM0	keep floating
7	ED/PWM0	Multiplexed event detection and PWM0	keep floating
8	V <sub>CC</sub>	External power supply	keep floating

## 8 Limiting values

Table 6. Limiting values In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
T <sub>stg</sub>	storage temperature	all packages	-65	+150	°C
T <sub>j</sub>	junction temperature		-	+95	°C
V <sub>ESD</sub>	electrostatic discharge voltage	Charge Device Model <sup>[1]</sup>	-2	2	kV
		Human Body Model <sup>[2]</sup>	-2	2	kV
V <sub>CC</sub>	supply voltage	on pin V <sub>CC</sub>	-0.5	7.15	V
V <sub>i</sub>	input voltage	on pin SDA, SCL, ED, HPD	-0.5	7.15	V
V <sub>i(RF)</sub>	RF input voltage	on pin LA/LB	-0.5	5.2	V <sub>p</sub>
V <sub>i</sub>	input voltage	on pin LA; LB is 0 V; sine wave of 13.56 MHz	-0.5	5.2	V <sub>p</sub>
		on pin LB; LA is 0 V; sine wave of 13.56 MHz	-0.5	5.2	V <sub>p</sub>
I <sub>i(max)</sub>	maximum input current	La/Lb; peak	-168	168	mA

[1] CDM: ANSI/ESDA/JEDEC JS-002

[2] HBM: ANSI/ESDA/JEDEC JS-001

9 Package outline

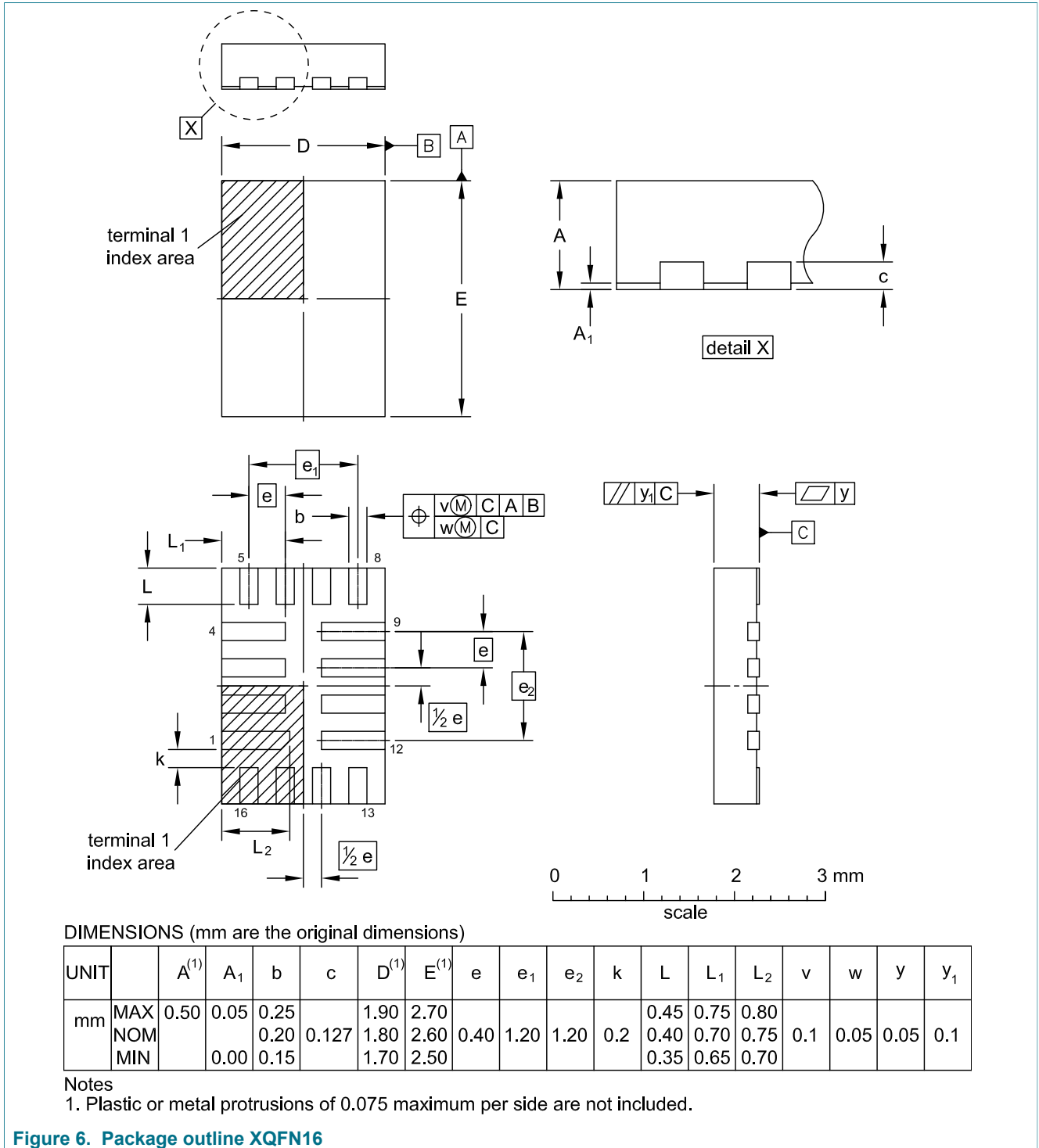
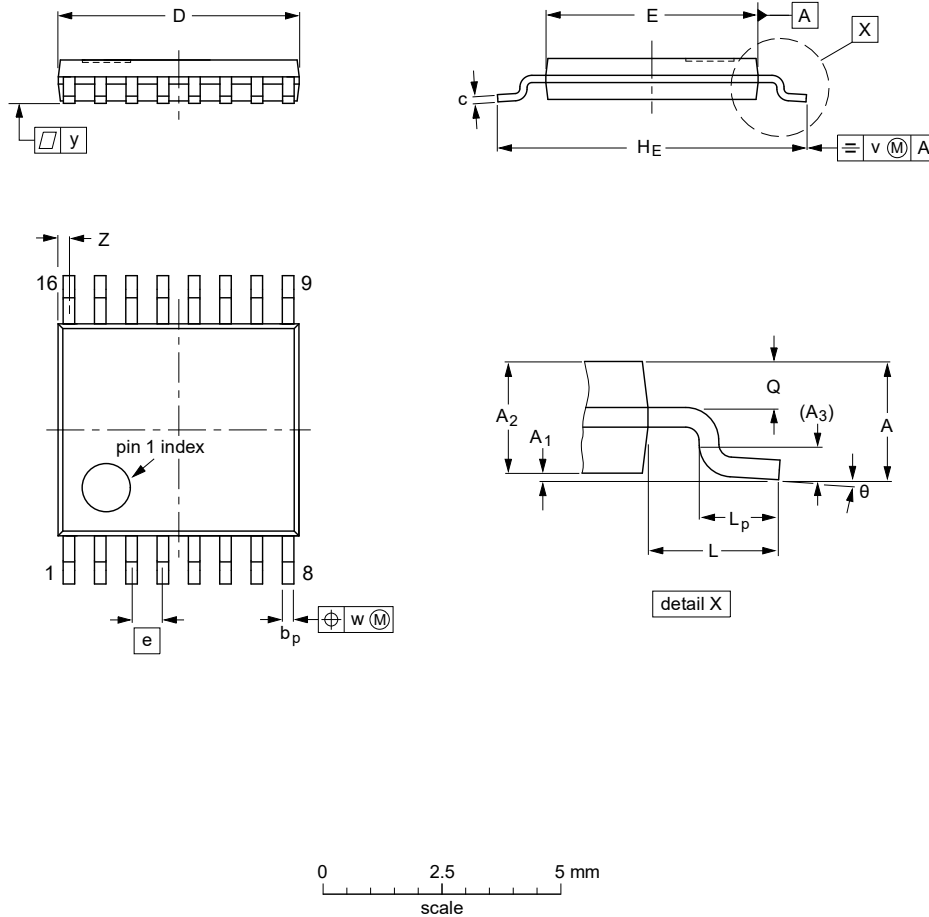


Figure 6. Package outline XQFN16

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1



**DIMENSIONS (mm are the original dimensions)**

UNIT	A <sub>max</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

**Notes**

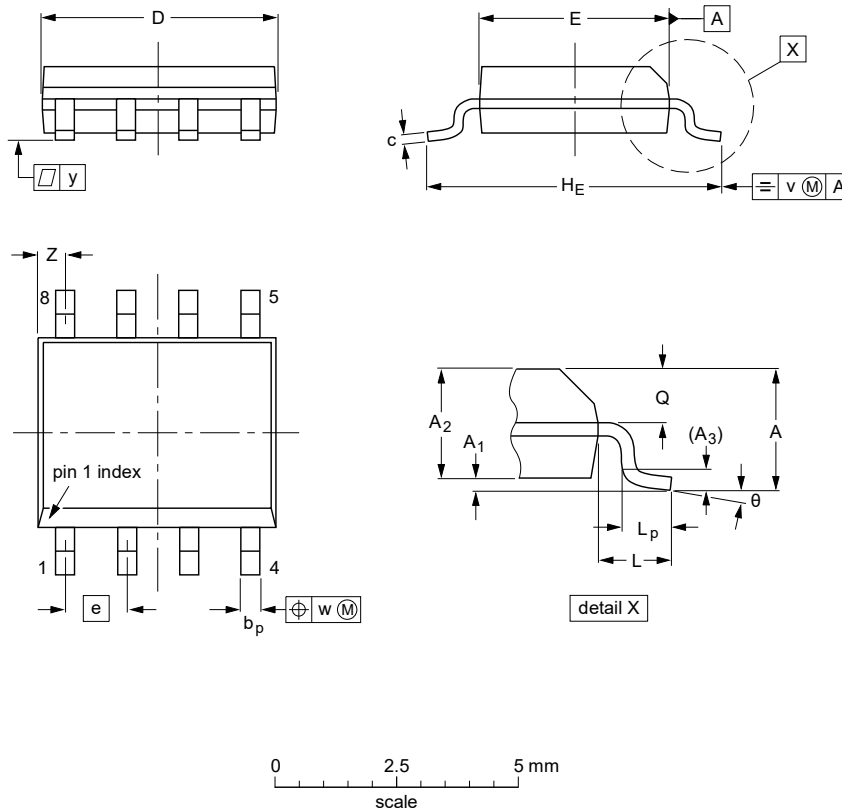
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT403-1		MO-153				99-12-27 03-02-18

Figure 7. Package outline TSSOP16

SO8: plastic small outline package; 8 leads; body width 3.9 mm

SOT96-1



**DIMENSIONS** (inch dimensions are derived from the original mm dimensions)

UNIT	A <sub>max.</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.20 0.19	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

**Notes**

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT96-1	076E03	MS-012				99-12-27 03-02-18

Figure 8. Package outline SO8

## 10 Handling information

### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices. Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

## 11 References

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- [1] NFC Forum specification, Type 5 Tag - Technical Specification Version 1.0  
2018-04-27 [T5T] NFC Forum™  
<https://nfc-forum.org/product-category/specification/>
- [2] ISO/IEC 15693  
<https://www.iso.org/ics/35.240.15/x/>
- [3] UM10204 - I2C-bus specification and user manual  
<https://www.nxp.com/docs/en/user-guide/UM10204.pdf>



## 12 Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
NTP53x2_SDS v.1.1	20191002	Objective short data sheet		v.1.0
NTP53x2_SDS v.1.0	20190528	Objective short data sheet		-
	<ul style="list-style-type: none"><li>Initial version</li></ul>			

## 13 Legal information

### 13.1 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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[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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## Tables

Tab. 1.	Characteristics .....	5	Tab. 6.	Limiting values In accordance with the Absolute Maximum Rating System (IEC 60134). .....	11
Tab. 2.	Ordering information .....	6	Tab. 7.	Revision history .....	17
Tab. 3.	Pin description for XQFN16 .....	8			
Tab. 4.	Pin description for TSSOP16 .....	9			
Tab. 5.	Pin description for SO8 .....	10			

**Figures**

Fig. 1.	NTAG 5 link overview .....	1	Fig. 5.	Pin configuration for SO8 package .....	9
Fig. 2.	Block diagram NTAG 5 link .....	7	Fig. 6.	Package outline XQFN16 .....	12
Fig. 3.	Pin configuration for XQFN16 package .....	8	Fig. 7.	Package outline TSSOP16 .....	13
Fig. 4.	Pin configuration for TSSOP16 package .....	9	Fig. 8.	Package outline SO8 .....	14

Contents

1 General description ..... 1

2 Features and benefits .....3

3 Applications .....4

4 Quick reference data ..... 5

5 Ordering information ..... 6

6 Block diagram ..... 7

7 Pinning Information ..... 8

8 Limiting values ..... 11

9 Package outline ..... 12

10 Handling information ..... 15

11 References ..... 16

12 Revision history ..... 17

13 Legal information ..... 18

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