

# AN11383

## NTAG21xF, Field detection and sleep mode feature

Rev. 1.0 — 18 July 2013  
270910

Application note  
COMPANY PUBLIC

### Document information

Info	Content
<b>Keywords</b>	NTAG, Field detection pin, Sleep mode
<b>Abstract</b>	It is shown how the field detection pin and its associated sleep mode function can be used on the NTAG21xF-family of tags



## Revision history

Rev	Date	Description
1.0	20130718	Initial revision

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## 1. Introduction

This document describes the use of the NTAG213F and NTAG216F (NTAG21xF) field-detection pin as signal for an external circuit – e.g. a microcontroller and the use of this pin as an input to send the NTAG21xF into sleep-mode.

## 2. Field detection circuit

The NTAG21xF has additional to the two antenna pins two extra pins which can be used to signal activity from a NFC-reader to an external circuit. One pin is GND (VSS) and the other is an open-drain output called field-detect (FD).

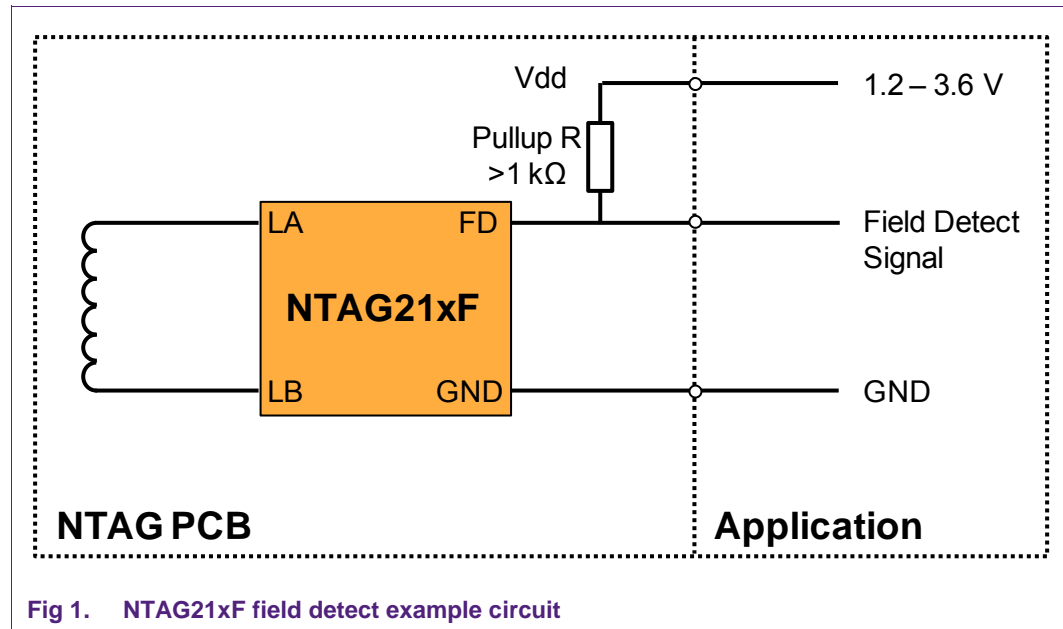


Fig 1. NTAG21xF field detect example circuit

The signal on the field detect pin is digital and set when the configured event occurs. Due to the open drain implementation with an external pullup resistor, the resulting signal is high when field detect is not set and low when field detect is set respectively active. The pullup resistor should have a resistance above 1 kOhm to limit the current through the field detect pin.

## 3. Field detection feature options

The field-detect feature can be configured to react on different events. Whenever this event happens, the field-detect signal is set/activated and stays active until power down of the transponder.

### 3.1 Field detect options

The configuration of the field-detect-pin can be either:

- RF-field On  
When a RF-field is present, field detect is activated.
- Start of Frame  
In ISO14443-A ([1], [2]) every transferred command starts with a special signal called “Start of Frame” (SOF). Here field detect is activated when a valid ISO14443-A SOF is detected.

- State "ACTIVE"  
 In ISO14443-A the first action of a reader is the anticollision loop. After a successful anticollision the tag is in the state "ACTIVE" and is then able to process for example read and write commands on the memory. In Fig 2 the possibilities to reach the state "ACTIVE" are shown.

The field-detect-signal is reset only on a RF-reset or power down of RF-field.

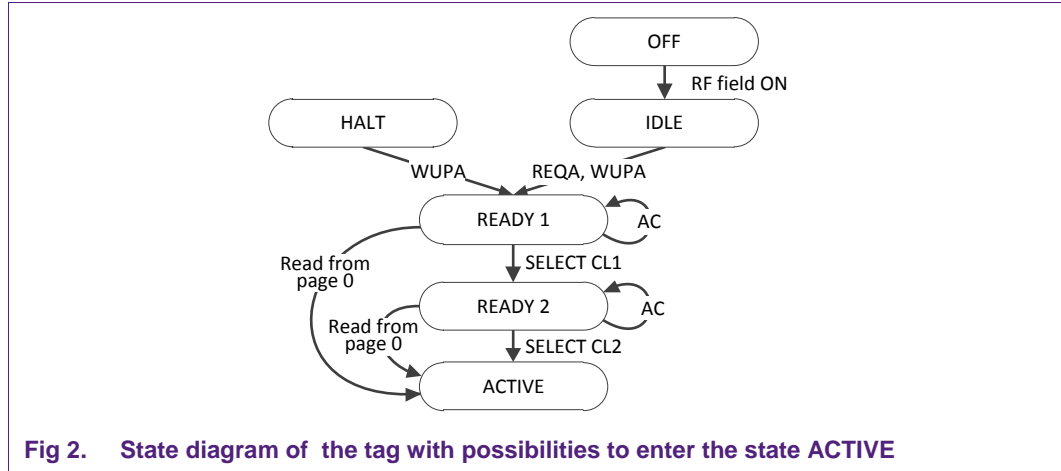


Fig 2. State diagram of the tag with possibilities to enter the state ACTIVE

### 3.2 Timing and signal form

The signal on the field detect pin is digital, it has only two states. The high level is determined by the Vdd voltage on the pullup resistor.

The timing of the different modes is shown in the following graph:

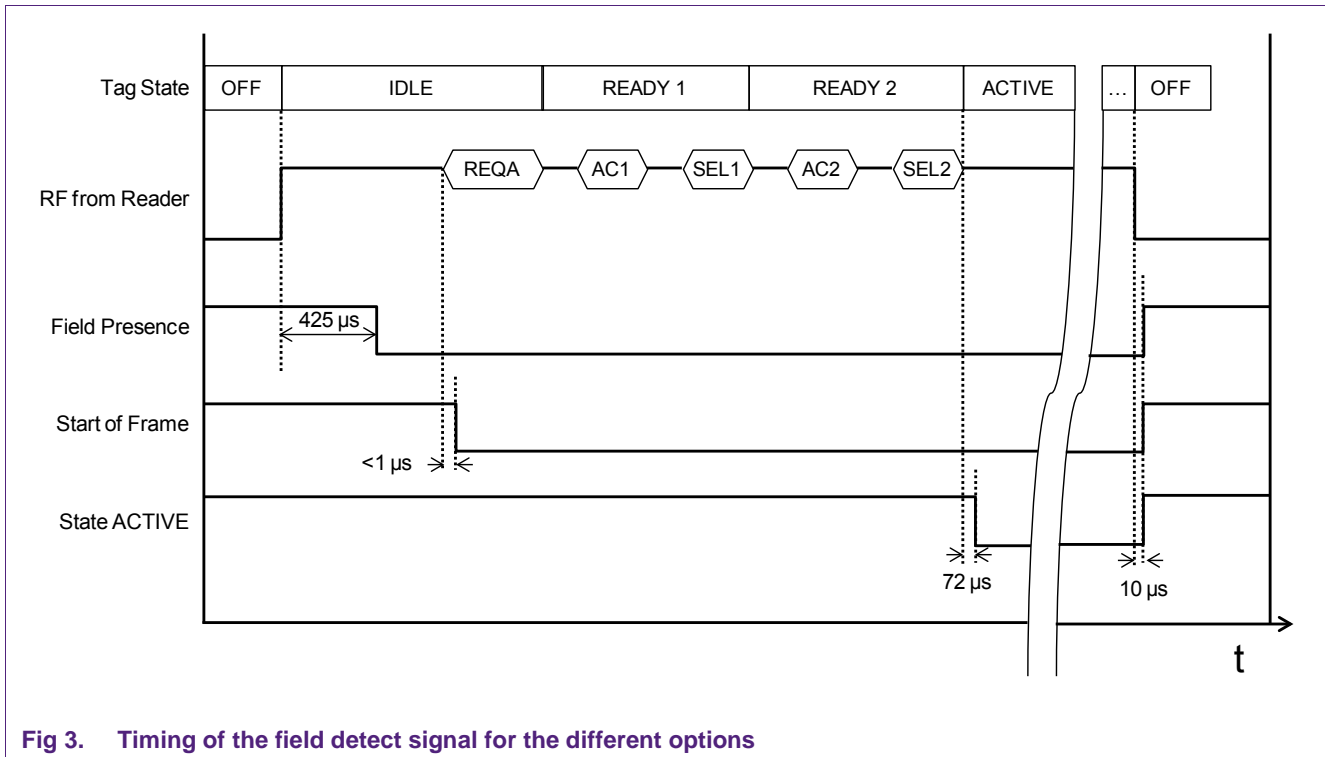


Fig 3. Timing of the field detect signal for the different options

### 4. Sleep mode feature

The sleep mode disables all tag reactions on RF commands. If the tag is in the sleep mode, it cannot be read and not detected by a Reader.

When the feature sleep mode is enabled in the tag-configuration, then applying GND potential (voltage between GND and field detect < 0.8 V) to the field-detect-pin switches the tag to the sleep mode.

The potential on this pin is only sampled on turn-on of the transponder (RF field switch on). So the pin has to be hold on low while switching the field on, otherwise sleep mode is not entered. This mode can only be left with a new power up of the transponder.

If the sleep mode is enabled, caution should be taken to not let the pin floating on startup, because the in this case undefined potential on the pin can cause the sleep mode to be entered unintentionally.

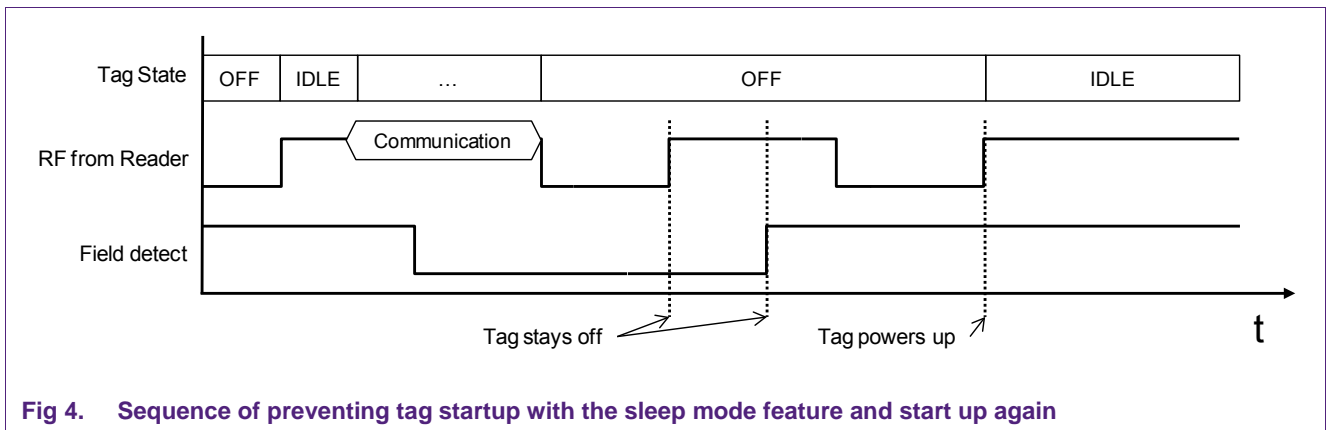


Fig 4. Sequence of preventing tag startup with the sleep mode feature and start up again

## 5. Configuring the field detect and sleep mode feature

The configuration of the field detect pin and the sleep mode is stored in the first byte of the configuration page of the transponder [3]. The configuration page is at the following page-address:

- NTAG213F: page 41 / 29h
- NTAG216F: page 227 / E3h

To set the corresponding option, read the configuration page and write it again with the bits “SLEEP\_EN” and “FDP CONF” from the first byte changed to your needed configuration.

**Table 1. Field detect and sleep mode configuration**

Bit Number							
7	6	5	4	3	2	1	0
MIRROR CONF		MIRROR Byte		SLEEP_EN	STRG MOD_EN	FDP CONF	

The values for “SLEEP\_EN” and “FDP CONF” have the following possibilities:

**Table 2. Explanation of possible settings for field detect and sleep mode**

Field	Bitcount	Default Value	Description
SLEEP_EN	1	0b	Enables the sleep mode function
FDP CONF	2	11b	configuration of the field detect pin 00b ... field detect disabled 01b... enabled by first Start-of-Frame (SoF) 10b... enabled by tag in state “ACTIVE” 11b... enabled by RF-field presence

## 6. References

- [1] ISO/IEC 14443-2:2010, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface*
- [2] ISO/IEC 14443-3:2011, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 3: Initialization and anticollision*
- [3] Datasheet NTAG213F/216F, *NFC Forum Type 2 Tag compliant IC with 144/888 bytes user memory and field detection*

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Date of release: 18 July 2013

270910

Document identifier: AN11383