NFC click

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IC/Module	PN7120 datasheet [1]
Interface	I2C
Power supply	3.3V
Product page	www.mikroe.com/click/NFC [2]
Schematic	NFC click schematic [3]

NFC click is a an add-on board with a versatile near field communications controller from NXP — the PN7120 IC. NFC devices are used in contactless payment systems, electronic ticketing, smartcards, but also in retail and advertising — inexpensive NFC tags can be embedded into packaging labels, flyers or posters.

This board has full compliancy with NFC Forum specifications which means that you will be able to use the full potential of NFC and its three distinct operating modes.

Features and usage notes

NFC is designed to be intuitive for users. Communication between two devices is established in the simplest way possible — by bringing them close to each other. The standards are dictated by the NFC Forum. NFC frontends, like the one on this click, can operate in three distinct modes:

1. **Card emulation mode** — where NFC click behaves like a smartcard or a tag

In this mode, NFC click emulates an NFC tag. It doesn't initiate the communication, it only responds to an NFC reader. A typical application of the card emulation mode is how people use NFC in their smartphones to replace several cards, badges and tags at once (using the same phone for tollgate checkins, contactless payments and so on). Card emulation mode, however, is not useful just for smartphones, but for any type of portable device.

2. **Read/Write** — where NFC click behaves as an NFC Reader

Here, NFC click communicates with a passive tag, smartcard, or an NFC device operating in card emulation mode. It can both read or write to a tag (although reading is a more common use-case because tags will often be write protected). In this mode, it is NFC click that generates the RF field, while a tag or card only modulates it.

3. **Peer-to-peer —** for more complex interactions

Peer-to-peer mode establishes a two-way communication channel between a pair of NFC-enabled devices. More complex interactions are possible in this mode, such as simplifying bluetooth pairing. When a user brings two devices close to each other, the two NFC chips establish a P2P connection and exchange data that facilitates the Bluetooth pairing, seamlessly — the user doesn't have to type passwords or set configurations.

The following diagram shows the protocols that correspond to each operating mode:
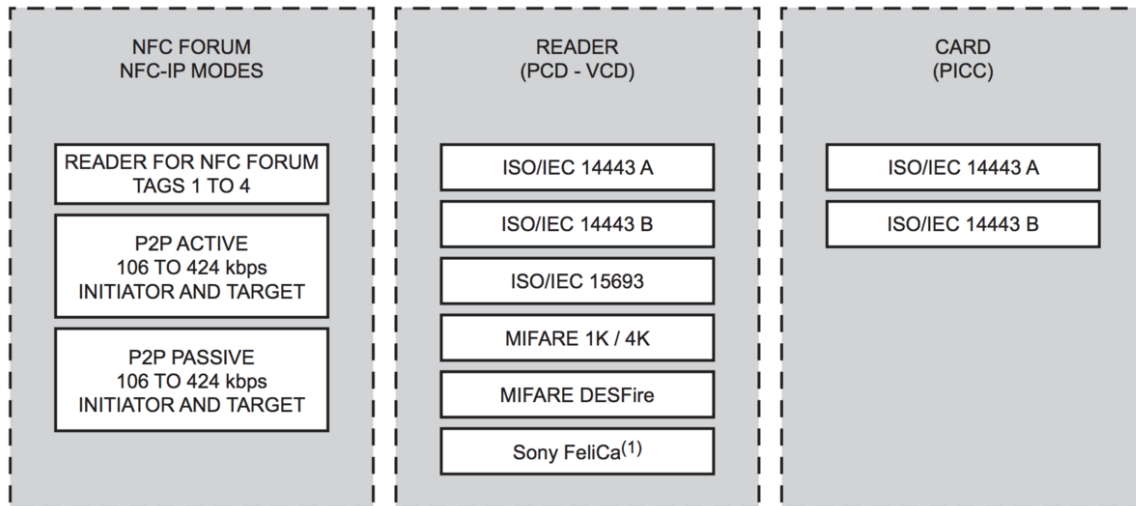
RF protocols supported:

- NFCIP-1, NFCIP-2 protocol
- ISO/IEC 14443A, ISO/IEC 14443B PICC mode via host interface
- ISO/IEC 14443A, ISO/IEC 14443B PCD designed according to NFC Forum digital protocol T4T platform and ISO-DEP
- FeliCa PCD mode
- MIFARE PCD encryption mechanism (MIFARE 1K/4K)
- NFC Forum tag 1 to 4 (MIFARE Ultralight, Jewel, Open FeliCa tag, DESFire)
- ISO/IEC 15693/ICODE VCD mode

Supported host interfaces:

- NCI protocol interface according to NFC Forum standardization
- I2C-bus High-speed mode

Additional notes

Note that NFC is a subset of RFID working on 13.54 MHz. Therefore, an NFC IC can read/write ISO14443 RFID tags, and vice verca — compatible RFID readers (such as RFID click can read NFC tags or NFC devices functioning in card emulation mode.

The board has one SMD Jumper (ADDR SEL.) which is used to determine the I2C address. By default is on 0.

Pinout diagram

This table shows how the pinout on NFC click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS™		Pin	Notes
	NC	1 AN	PWM 16	NC	
Reset of the PN7120	**RST**	2 RST	INT 15	**INT**	Interrupt request output
	NC	3 CS	RX 14	NC	
	NC	4 SCK	TX 13	NC	
	NC	5 MISO	SCL 12	**SCL**	I2C-bus serial clock input
	NC	6 MOSI	SDA 11	**SDA**	I2C-bus serial data
+3.3V power input	**+3.3V**	7 +3.3V	+5V 10	NC	*This click supports 3.3V only*
Ground	**GND**	8 GND	GND 9	**GND**	Ground

Programming

The Libstock example shows the Read/Write and Card Emulation modes of NFC click. A tag or phone is detected when it approaches the field of NFC click (2-3cm). The example is available for both clicker 2 and Hexiwear.

```c
const char NDEF_RECORD[] = { 0xD1,                 // MB / ME / CF / 1 /
IL / TNF
                             0x01,                 // TYPE LENGTH
                             51,                   // PAYLOAD LENTGH
                             'T',                  // TYPE
                             0x02,                 // Status
                             'e', 'n',             // Language
                             13, 10, 13, 10, 32, 32, 32, 32, 32,
                             'M', 'i', 'k', 'r', 'o', 'E', 'l', 'e',
'k', 't', 'r', 'o', 'n', 'i', 'k', 'a',
                             13, 10, 13, 10, 32, 32, 32, 32, 32, 32,
32, 32, 32, 32,
                             'N', 'F', 'C', ' ', 'c', 'l', 'i', 'c',
'k'
};
```

Code examples for NFC click, written for MikroElektronika hardware and compilers are available on Libstock [4].

Resources

- PN7120 data sheet [1]
- Demo code / Library [4]
- RFID tutorial (relevant to NFC as well) [5]
- mikroBUS™ standard specifications [6]

References

[1] http://www.nxp.com/documents/data_sheet/PN7120.pdf

[2] http://www.mikroe.com/click/nfc/

[3] http://cdn-docs.mikroe.com/images/f/ff/Nfc-click-schematic_v101.pdf

[4] http://libstock.mikroe.com/projects/view/1943/nfc-click

[5] http://learn.mikroe.com/what-is-rfid/

[6] http://www.mikroe.com/mikrobus/

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