



DFCN-4 User manual

(V0.3)

Model Name: DFCN-4 NFC MODULE
Description: NFC reader/writer module compatible

<i>Edition #</i>	<i>Reason for revision</i>	<i>Issue date</i>
V0.1	Initial Document	2013/12/17
V0.2	For regular document applied	2014/1/2
V0.3	Adding ICES-003 warning	2014/1/27

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I. Introduction

DFCN-4 is a kind of NFC (Near Field Communication) module that could be embedded in one IT system by simply connecting the module through I²C interface and start developing his application software.

II. DESIGN REFERENCE

DFCN-4 build a contactless front-end towards contactless applications available on existing system. Integrated MCU is decoupling the host controller from the timing constrains of RF communication and allowing autonomous operation, it provides flexible and integrated power management unit for RF front-end.

DFCN-4 reference design module consists of the following:

- Reference Design:

When the user wishes to incorporate the DFCN-4 to their device, it is strongly recommended that this reference design is copied “as is” in the final application board to guarantee optimum performance, regulatory compliance and lowest development time and design effort.

- MCU FPC/FFC Connector:

Allow user to connect the DFCN-4 module to the host board via FPC/FFC connector.

- Antenna Connector:

Connected to FPC antenna, please note that matching circuitry should designed on antenna.

III. Hardware Block Diagram

DFCN-4 is a full feature NFC module and compliant with NFC standards (NFC Forum, EMVCo, ETSI/SCP). DFCN-4 has an optimized architecture for low-power consumption in different operation modes. The RF contactless front-end is supporting various transmission modes according to NFCIP-1, NFCIP-2, ISO/IEC14443, ISO/IEC 15693, ISO-14443, MIFARE, and FeliCa specifications. The major internal components are illustrated in Figure 1-1.

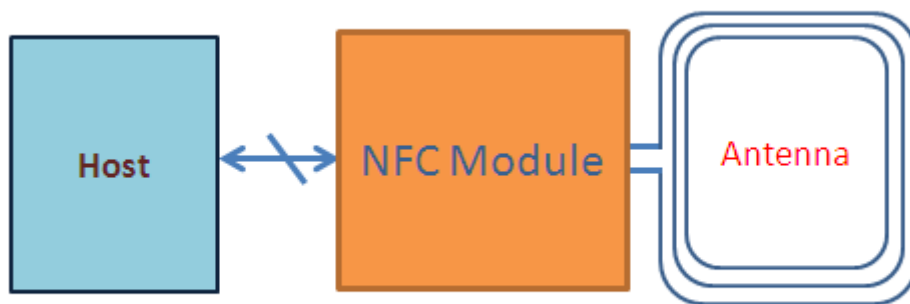


Figure 1-1 NFC module Major Component and System Interface

IV. Pin Definition

Host connector

Pin number	Name	Configuration	Description
1	MOD_VDD	Power	3.3V power supply
2	MOD_GND	Ground	Module ground
3	SWP	SWP data	SWP data line to UICC/SIM
4	VCC_BOOST	Power supply	Power rail for Booster
5	IRQ	Output	Interrupt to host
6	PMUVCC	Power supply	Power supply to UICC/SIM
7	I ² C_SDA	Input/ Output	I ² C data line
8	I ² C_SCL	Input	I ² C clock
9	MOD_GND	Ground	Module ground
10	Reset/Wakeup	Input	Wake up the module from standby mode or reset the module
11	DWL_REQ	Input	Firmware download control
12	SIMVCC	Power	The power rail used to power UICC/SIM.
13	MOD_VDD	Power	3.3V power supply
14	VDD_IO	Power	3.3V for host IO reference voltage
15	MOD_GND	Ground	Module ground

Antenna connector

Pin number	Name	Configuration	Description
1	ANT1	Power	Antenna connection for Card emulation
2	RXP	Input	Contactless receiver input
3	TX1		Contactless receiver output 1
4	GND	Ground	Transmitter ground
5	TX2		Contactless receiver output 2
6	RXN	Input	Contactless receiver input
7	ANT2	Power	Antenna connection for Card emulation

V. Specification/Feature

Item	Standard specifications
Main chipset	➤ NXP NPC100
Frequency	➤ 13.56MHz
NFC Standards	<ul style="list-style-type: none"> ➤ ISO/IEC 14443A, ISO/IEC 14443B PCD ➤ FeliCa PCD mode ➤ Mifare PCD encryption mechanism ➤ ISO/IEC 15693/ICODE VCD mode ➤ NFC Forum tags ➤ NFCIP-1/NFCIP-2 protocol ➤ EMVCo 2.0.1 for PICC and PCD mode ➤ NFC Forum Wave 1 and Wave 2 ➤ ETSI/SCP 102 613 and 102 622 for SWP/HCI
Host interface	<ul style="list-style-type: none"> ➤ NCI protocol interface according to NFC Forum NCI 1.0 standardization ➤ I²C High-speed mode supported
Host connector	➤ 15 pin FPC/FFC
Antenna connector	➤ 7 pin FPC/FFC
Operation temperature	➤ 0° ~ 85° C
Storage temperature	➤ -20° ~ 125° C

VI. Electrical Characteristics

Symbol	Parameter	Min	Typical	Maximum	Unit
MOD_VDD	Power supply input	2.7	3.3	5.5	V
VDD_IO	IO power supply	3.0	3.3	3.6	
VCC_BOOST	Power supply input	-	5.0	5.5	
VDD_SIM	Power supply for SWP interface	1.62		3.6	

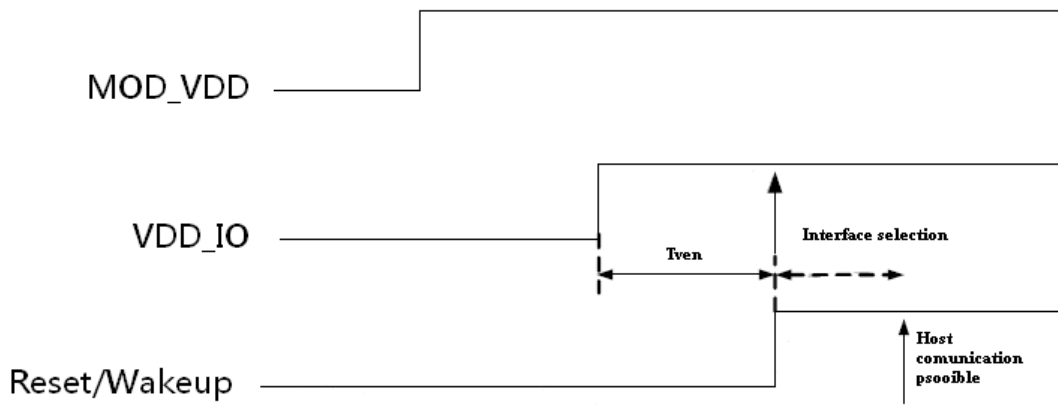
Note. Test without operating booster

VII. Recommended Operation Conditions

Supply voltage	<input type="checkbox"/> AC mains	<input checked="" type="checkbox"/> DC	
Type of DC Source	<input type="checkbox"/> Internal DC supply	<input checked="" type="checkbox"/> External DC adapter	<input type="checkbox"/> Battery
Operational Climatic	<input checked="" type="checkbox"/> Tnom (20°C)	<input checked="" type="checkbox"/> Tmax (85°C)	<input checked="" type="checkbox"/> Tmin (-25°C)

VIII. Power sequence

i. Power up



Symbol	Parameter	Min	Typical	Maximum	Unit
$T_{VBATVEN}$	Minimum time from VBAT high to V_{EN} high	0	-	-	ms
$T_{PVDDVEN}$	Minimum time from PVDD high to V_{EN} high	0	-	-	ms

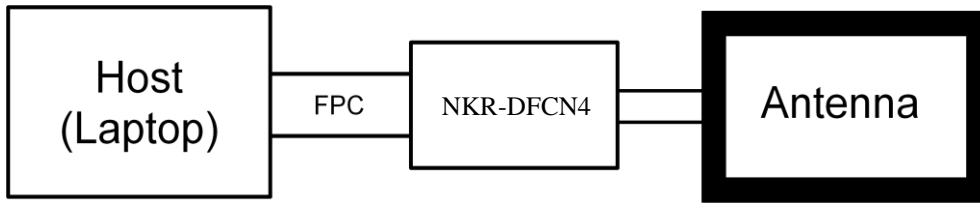
ii. Reset

Symbol	Parameter	Min	Typical	Maximum	Unit
$T_{RESETVEN}$	VEN pulse width to rest	3	-	-	us
T_{BOOT}	Boot time	-	-	2.5	ms

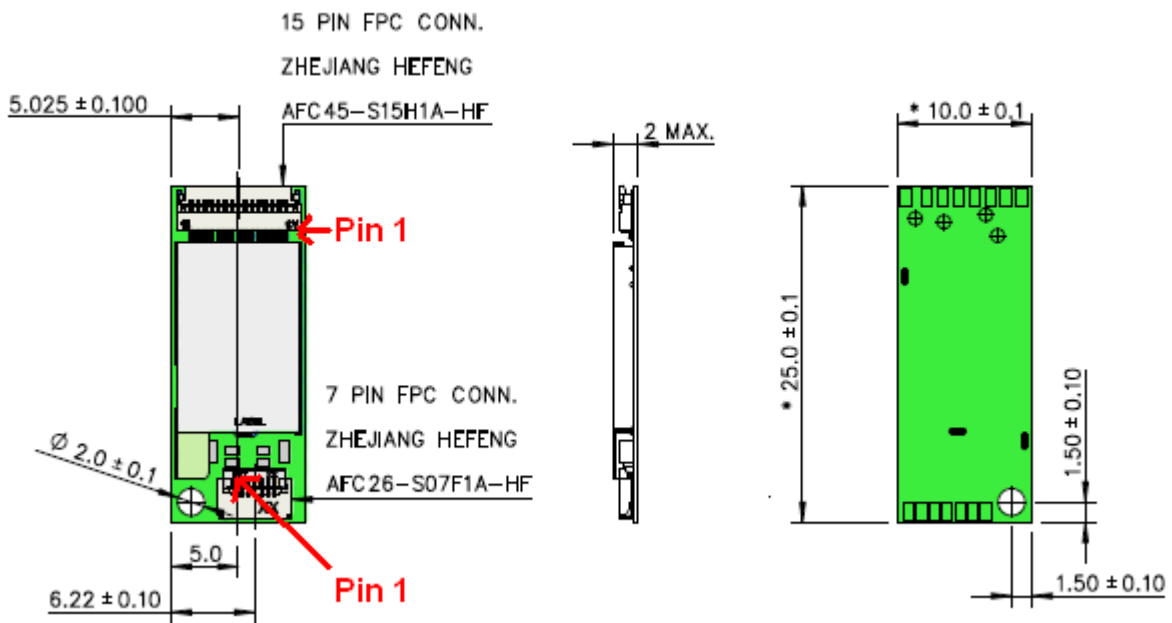
iii. Down load mode

Symbol	Parameter	Min	Typical	Maximum	Unit
$T_{GPIO4VEN}$	DWL_REQ voltage high to V_{EN} high	0	-	-	ms

IX. Assembly Guidelines

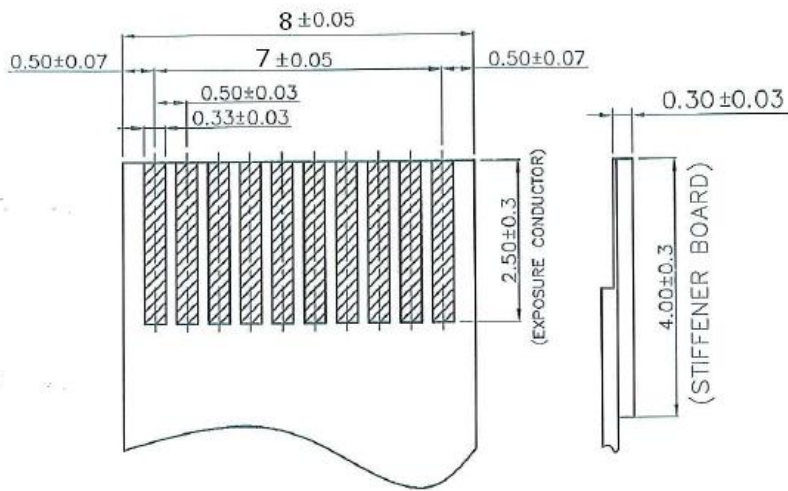


X. Mechanical Dimension

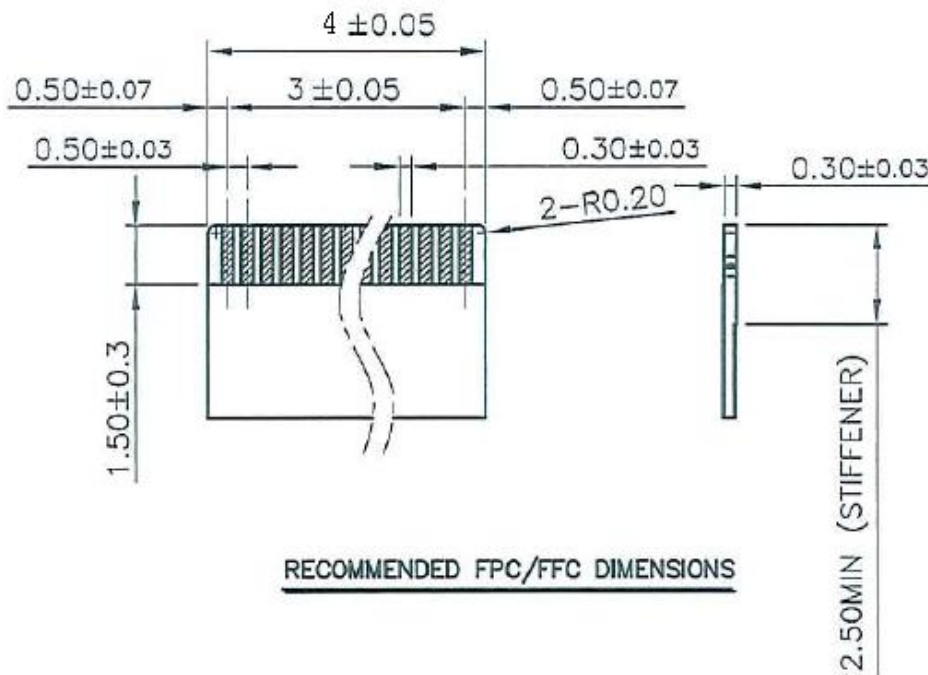


XI. FPC/FFC specifications

i. AFC45-S15H1A-HF : 15 pin FFC



ii. AFC26-S07F1A-HF : 7 pin FFC



XII. Certifications and Regulatory

Item	Feature	Description
6.1	FCC	RF: FCC part 15C EMI: FCC part 15B FCC grant: TCB Filing fee
6.2	CE	RF: EN302291 Class B EMC: EN301489-1/-3 Safety: EN 60950-1:2006/A11:2009
6.3	IC	RSS-210 ISSUE 8 RSS-GEN ISSUUE 3

General:

This modular approval is limited to OEM/Integrators installation only.

OEM integrators are responsible for ensuring that the end-user has no manual instructions to remove or install module.

End Product Labeling (FCC)

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID: **NKR-DFCN4**”

The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Required FCC Compliance Statement for Host Integration

To integrate this module into the host, the host manufacturer is responsible for the applicable FCC rules, including the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.

In the user manual of the host device, the following statements are required to be included.

- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- This device 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 in a residential installation. This equipment generates, uses and can radiated radio frequency energy and, if not installed and used in accordance with the instructions, 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.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Module Integration Restriction:

This module has been certified by FCC as single module approval with the following restrictions:

1. The Loop antenna was verified in the conformity testing, and for compliance the antenna shall not be modified. A separate approval is required for all other operating configurations, including different antenna configurations.
2. If any other simultaneous transmission radio is installed in the host platform together with this module, or above restrictions cannot be kept, a separate RF exposure assessment and FCC equipment authorization is required.

End Product Labeling (IC)

Labeling Requirements for the Host Device (from Section 3.2.1, RSS-Gen, Issue 3, December 2010): The host device shall be properly labeled to identify the module within the host device. The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words —Contains transmitter module, or the word —Contains, or similar wording expressing the same meaning, as follows: "Contains transmitter module IC: **4441A-DFCN4** .

Required IC Compliance Statement for Host Integration

To integrate this module into the host, the host manufacturer is responsible for the applicable Industry Canada rules, including the limits for a Class B digital device, pursuant to ICES-003 of the Industry Canada Rules

In the user manual of the host device, the following statements are required to be included.

- This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:
 - (1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

- This Class B digital apparatus complies with Canadian **4441A-DFCN4**.

- Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
 - (1) l'appareil ne doit pas produire de brouillage, et
 - (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

- Cet appareil numérique de la classe B est conforme à la norme **4441A-DFCN4** du Canada.

IC Module Integration Restriction:

This module has been certified by Industry Canada as modular approval with the following restrictions:

1. The Loop antenna was verified in the conformity testing, and for compliance the antenna shall not be modified. A separate approval is required for all other operating configurations, including different antenna configurations.
2. If any other simultaneous transmission radio is installed in the host platform together with this module, or above restrictions cannot be kept, a separate RF exposure assessment and IC equipment certification is required.

Warning

According to “Administrative Regulations on Low Power Radio Waves Radiated Devices” Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to a approved low power radio-frequency devices.

The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; If found, the user shall cease operation immediately until no interference is achieved. The said legal communications means radio communications is operated in compliance with the Telecommunications Act. The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices”

CAN ICES-3(B)/ NMB-3(B)

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