XRCI (PN7150) NFC Module

Operation Description

(V0.5.1)

Model Name:	**XRCI NFC MODULE**
Description:	**NFC reader/writter module compatible**
Version :	**V 0.5.1**

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1. Introduction

PN7150 is a kind of NFC (Near Field Communication) module that could be embedded in one IT system by simply connecting the module through I^2C interface and start developing his application software.

2. Hardware Block Diagram

PN7150 is a full feature NFC module and compliant with NFC standards (NFC Forum, EMVCo, ETSI/SCP). PN7150 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.
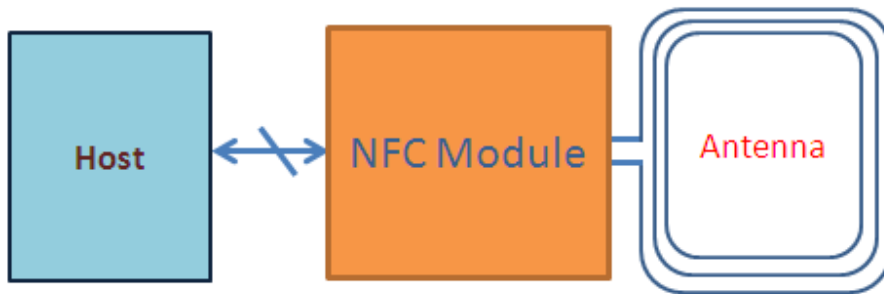

Figure 1-1 NFC module Major Component and System Interface

3. Pin Definition

▪ Host connector

Pin number	Name	Configuration	Description
1	MOD_VDD	Power Supply Input	Module power supply
2	GND	Power Supply Ground	Module ground
3	n.c.		
4	MOD_VUP	Power Supply Input	Power supply for RF Front-end
5	IRQ	Output	Interrupt request from module to platform
6	n.c.		
7	I²C_SDA	Input/ Output	I²C data
8	I²C_SCL	Input	I²C clock
9	GND	Input	Used for extra GND for signal integrity
10	RESET	Input	Reset pin input from the host to wake up the device from standby and also to reset the device
11	n.c.		
12	n.c.		
13	MOD_VDD	Power supply input	Additional pin for module power supply to support higher current capacity
14	VDD_IO	Power supply input	Host IO reference voltage
15	GND	Power Supply Ground	Module ground

▪ Antenna connector

Pin number	Name	Configuration	Description
1	n.c.		
2	RXN	Input	Antenna reception path #2
3	TX2	Output	Antenna transmission line #2
4	GND	Ground	Antenna ground
5	TX1	Output	Antenna transmission line #1
6	RXP	Input	Antenna reception path #1
7	n.c.		

4. Specification

Item	Standard specifications
Main chipset	➢ NXP PN7150
Frequency	➢ 13.56MHz
NFC Standards	➢ ISO/IEC 14443A, ISO/IEC 14443B PCD mode ➢ FeliCa PCD mode ➢ MIFARE PCD encryption mechanism (MIFARE Classic 1K/4K) ➢ ISO/IEC 15693/ICODE VCD mode ➢ NFC Forum tags 1 to 5 ➢ NFCIP-1/NFCIP-2 protocol
Host interface	➢ NCI protocol interface according to NFC Forum standardization ➢ I^{2}C High-speed mode supported
I^{2}C Address	➢ 0x28
Host connector	➢ 15 Pin FPC/FFC
Antenna connector	➢ 7 Pin FPC/FFC
Ambient temperature	➢ -25 ~ 80º C (Typical: 25 º C)
Storage temperature	➢ -25º ~ 125º C
Weight	➢ TBD

5. Electrical Characteristics

Recommended Operating conditions

Symbol	Parameter	Min	Typical	Maximum	Unit
MOD_VDD	Power supply input	2.7	3.3	5.5	V
MOD_VUP	Power supply input	2.7	3.3	5.5	
VDD_IO	IO power supply	1.65	1.8	1.95	
		3.0	3.3	3.6	

Current consumption characteristics

Symbol	Min	Typical	Maximum	Unit
I$_{MOD\_VDD}$	--	--	190[1]	mA
I$_{VDD\_IO}$	--	--	15	

[1] MOD_VDD=3.3V

6. Power Consumption (TBD)

Test condition: MOD_VDD = 3.3V, VDD_IO= 3.3V, MOD_VUP =5V (continuously TX mode)

6.1 Test conditions

PCB P/N	
Hardware version	
Firmware version	
Antenna Impedance	
Transfer Board Consumption (mA) @ 5V	

6.2 Power Consumption

3.3V Power Rail Current (mA), RF TxLDO=3.3V (MOD_VDD + VDD_IO + VDD_SIM) *1					
Standby (RF OFF, VEN Pull Low)	AVG				
	Peak				
Polling Mode *2	AVG				
	Peak				
Detected Test Tag type		Type 1 Topaz	Type 2 Mifare	Type 3 Felica	Type 4 Mifare Desfire
Communicating	AVG				
	Peak				

*1: Means NFC module "Digital part" power consumption
*2: Means "Normal" polling mode.

3.3V Power Rail Current (mA), RF TxLDO =4.7V (MOD_VDD + VDD_IO + VDD_SIM)					
Standby (RF OFF, VEN Pull Low)	AVG				
	Peak				
Polling Mode	AVG				
	Peak				
Detected Test Tag type		Type 1 Topaz	Type 2 Mifare	Type 3 Felica	Type 4 Mifare Desfire
Communicating	AVG				
	Peak				

5V Power Rail Current (mA), RF TxLDO=3.3V (MOD_VUP) [*3]					
Standby (RF OFF, VEN Pull Low)	AVG				
	Peak				
Polling Mode	AVG				
	Peak				
Detected Test Tag type		Type 1 Topaz	Type 2 Mifare	Type 3 Felica	Type 4 Mifare Desfire
Communicating	AVG				
	Peak				

*3: Means NFC module "RF part" power consumption

5V Power Rail Current (mA), RF TxLDO=4.7V (MOD_VUP)					
Standby (RF OFF, VEN Pull Low)	AVG				
	Peak				
Polling Mode	AVG				
	Peak				
Detected Test Tag type		Type 1 Topaz	Type 2 Mifare	Type 3 Felica	Type 4 Mifare Desfire
Communicating	AVG				
	Peak				

7. Recommended Operation Temperature

Supply voltage	☐ AC mains	☑DC	
Type of DC Source	☐ Internal DC supply	☑ External DC adapter	☐ Battery
Operational Climatic	☑ Tnom (25℃)	☑ Tmax (80℃)	☑ Tmin (-25℃)

8. Power Sequence

8.1 Power up
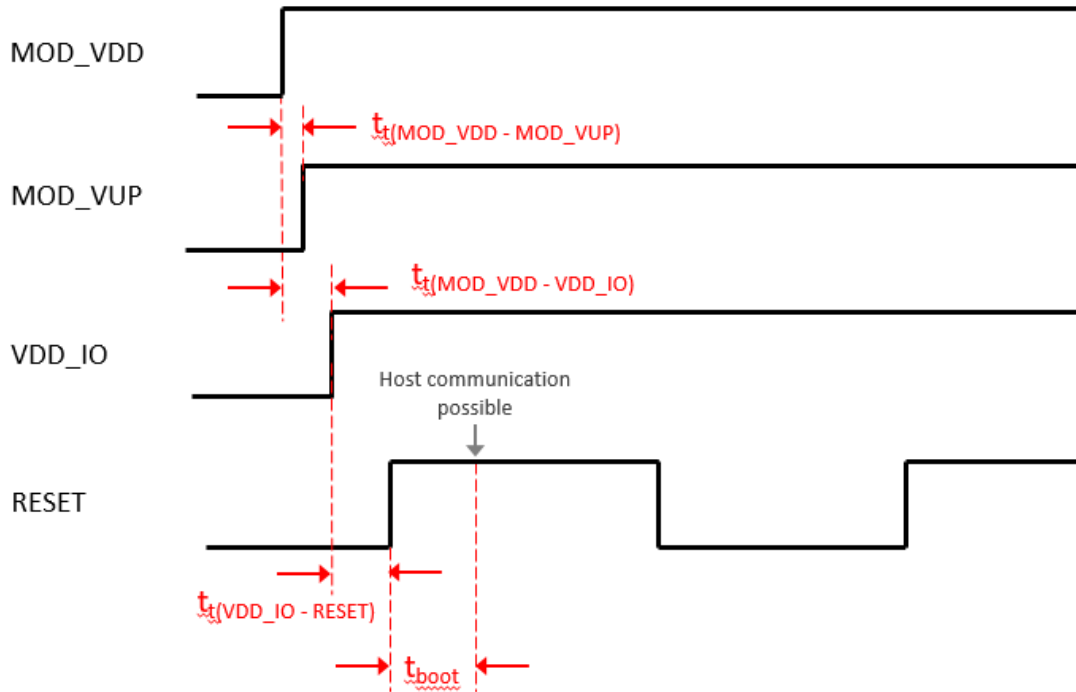
| Symbol	Parameter	Min	Typical	Max	Unit
$t_{t(MOD\_VDD - MOD\_VUP)}$	Minimum time from VDD_MOD high to MOD_VUP high	0	0.5		ms
$t_{t(MOD\_VDD - VDD\_IO)}$	Minimum time from VDD_MOD high to VDD_IO high	0	0.5		ms
$t_{t(VDD\_IO - Reset)}$	Minimum time from VDD_IO high to Reset high	0	0.5		ms

8.2 Reset (via RESET pin)
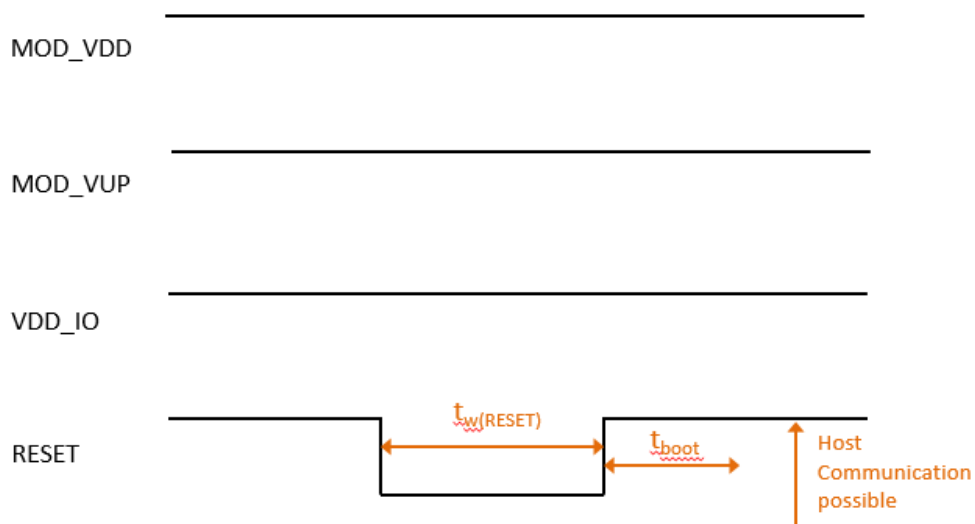
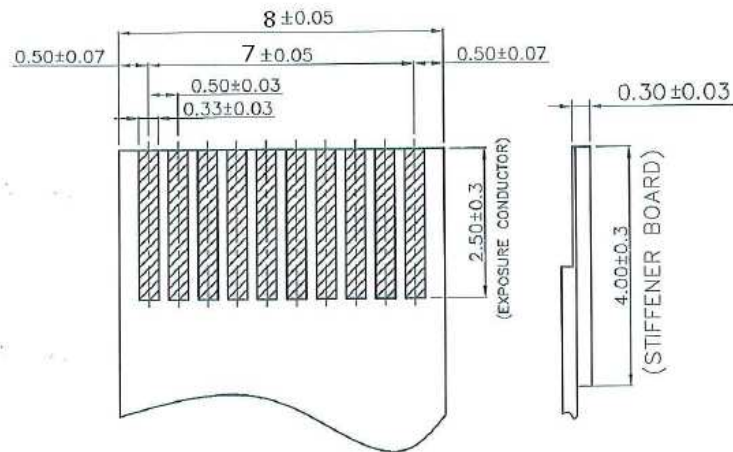| Symbol	Parameter	Conditions	Min	Typical	Max	Unit
$t_{W(RESET)}$	RESET pulse width	to reset	10	-	-	µs
t_{boot}	Boot time		-	-	2.5	ms

8.3 Power down
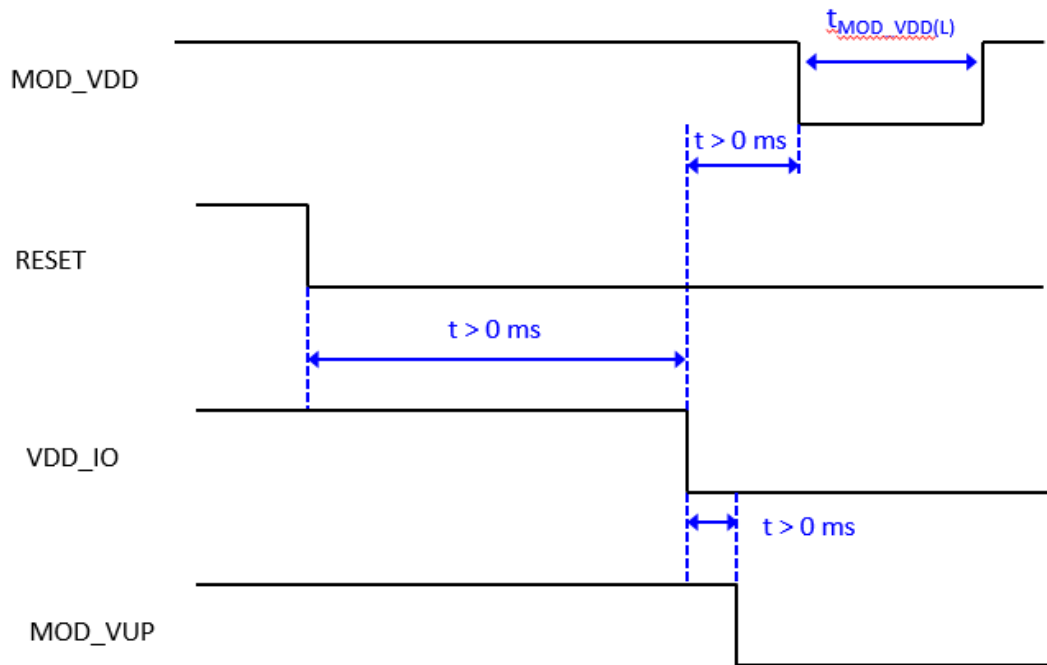
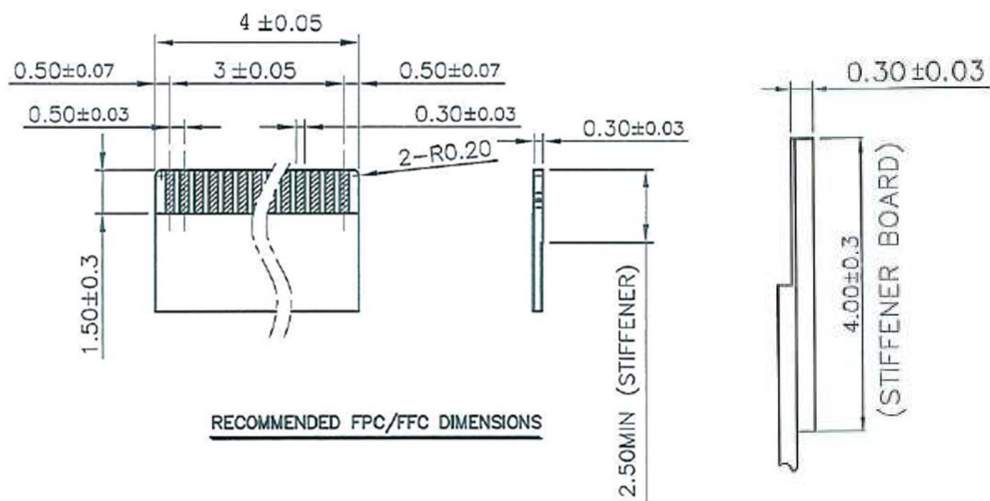# 9. Mechanical Dimension
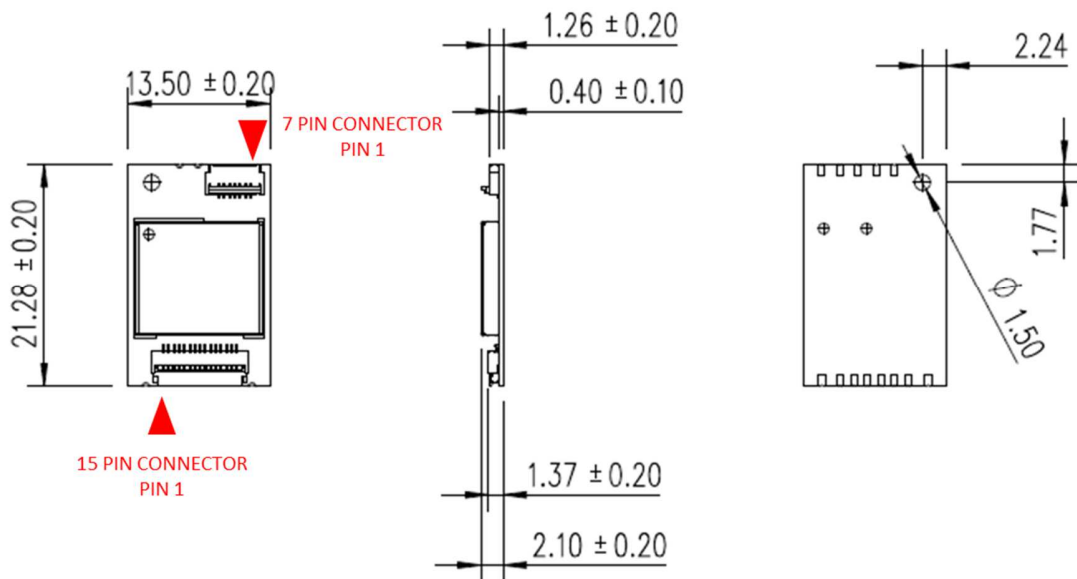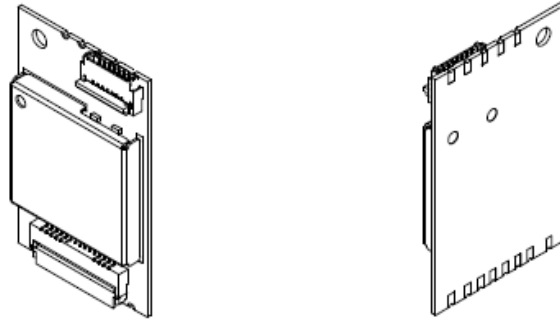
10. FPC/FFC Specifications

10.1 15 pin FFC

▪Connector Vendor: CVILUX
▪Connector Vendor P/N: CF39152D0R0-NH

10.2 7 pin FPC/FFC

▪Connector Vendor: CVILUX
▪Connector Vendor P/N: CF4207FH0R0-05-NH

RECOMMENDED FPC/FFC DIMENSIONS

11. Antenna Reference Matching Circuit

Reference impedance range: 13.56MHz

12. Device Host Reference Circuit

13. Revision History

低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信法規定作業之無線電通信。
低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

1. 本模組於取得認證後將依規定於模組本體標示審驗合格標籤。
2. 系統廠商應於平台上標示「本產品內含射頻模組：XXXyyyLPDzzzz-x」字樣。

Federal Communication Commission Interference Statement

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 equipment 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 radiate 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 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:

KDB 996369 D03 OEM Manual v01 rule sections:

2.2 List of applicable FCC rules

This module has been tested for compliance to FCC Part 15

2.3 Summarize the specific operational use conditions

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

2.4 Limited module procedures

Not applicable.

2.5 Trace antenna designs

Not applicable.

2.6 RF exposure considerations

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

2.7 Antennas

The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

Brand	Model No.	Frequency Range (MHz)	Antenna Type	Connector Type
WNC	48XRAKA1.SGA	13.56	loop antenna	7 Pin FPC/FFC

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: "Contains FCC ID: **NKR-XRCl**". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

2.9 Information on test modes and additional testing requirements

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.

2.10 Additional testing, Part 15 Subpart B disclaimer

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

OEM/Host manufacturer responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.