XRAV-1 USER MANUAL

(V0.9)

Model Name: **XRAV-1 NFC MODULE**
Description: **NFC reader/writter module compatible**
Version :   **V 0.9**

1. Introduction

XRAV-1 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

XRAV-1 is a full feature NFC module and compliant with NFC standards (NFC Forum, EMVCo, ETSI/SCP). XRAV-1 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.
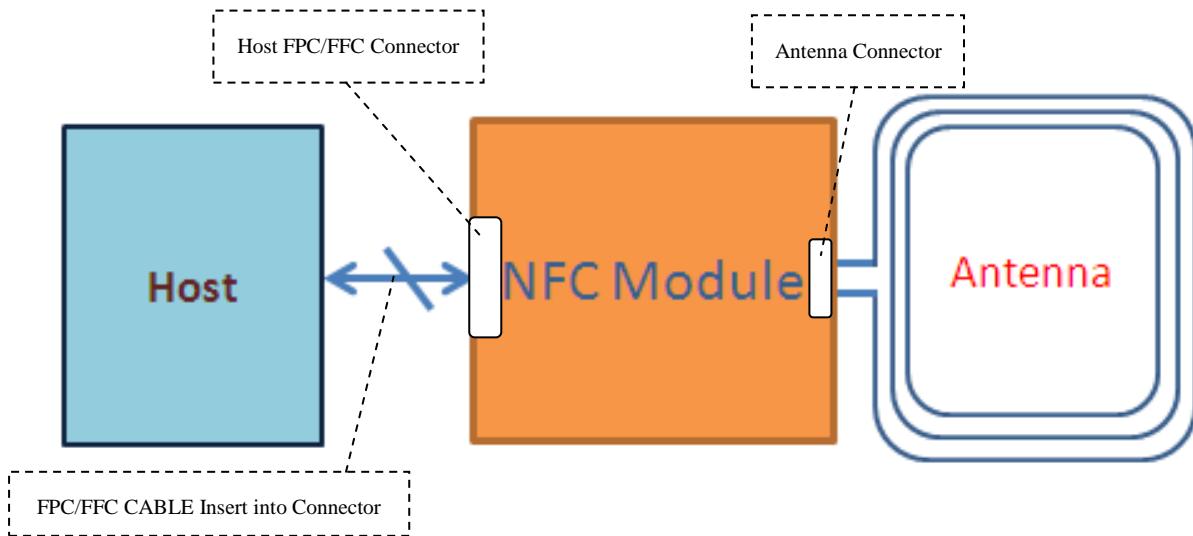

Figure 1-1 NFC module Major Component and System Interface (Assembly Guide)

Note:

 • Host FPC/FFC Connector:

Allow user to connect the XRAV-1 module to the host board via FPC/FFC connector.

• Antenna Connector:

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

3. Pin Definition

3.1 FPC/FFC connector type

Host connector

Pin number	Name	Configuration	Description
1	MOD_VDD	Power Supply Input	Module power supply
2	MOD_GND	Power Supply Ground	Module ground
3	SWP	Input/ Output	Single Wire Protocol line to UICC/ SIM
4	MOD_VUP	Power Supply Input	Power supply for RF Front-end
5	IRQ	Output	Interrupt request from module to platform
6	VDD_SIM (PMUVCC)	Power supply input	The power rail used to power UICC/ SIM. Applicable in a system where NFC module used SWP to communicate with an UICC/SIM in the platform
7	I^{2}C_SDA	Input/ Output	I^{2}C data
8	I^{2}C_SCL	Input	I^{2}C clock
9	MOD_GND	Input	Used for extra GND for signal integrity
10	Reset/ WakeUp	Input	Reset pin input from the host to wake up the device from standby and also to reset the device
11	DWL_REQ	Input	Control pin to set the NPC300 in firmware download mode
12	SWP_PWR (SIM_VCC)	Power Supply Output	Power supply to UICC/ SIM or power supply 'request' to PMIC. Applicable in a system where NFC module uses SWP to communicate with an UICC/ SIM in the platform.
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	MOD_GND	Power Supply Ground	Module ground

Antenna connector

Pin number	Name	Configuration	Description
1	ANT1	Output	Connection for antenna load modulation #1
2	RXP	Input	Antenna reception path #1
3	TX1	Output	Antenna transmission line #1
4	GND	Ground	Antenna ground
5	TX2	Output	Antenna transmission line #2
6	RXN	Input	Antenna reception path #2
7	ANT2	Output	Connection for antenna load modulation #2

3.2 SMT type

Pin number	Name	Configuration	Description
1	MOD_VUP	Power Supply Input	Power supply for RF Front-end
2	IRQ	Output	Interrupt request from module to platform
3	VDD_SIM (PMUVCC)	Power supply input	The power rail used to power UICC/ SIM. Applicable in a system where NFC module used SWP to communicate with an UICC/SIM in the platform
4	I^{2}C_SDA	Input/ Output	I^{2}C data
5	I^{2}C_SCL	Input	I^{2}C clock
6	Reset/ WakeUp	Input	Reset pin input from the host to wake up the device from standby and also to reset the device
7	DWL_REQ	Input	Control pin to set the NPC300 in firmware download mode
8	VDD_IO	Power supply input	Host IO reference voltage
9	MOD_GND	Power Supply Ground	Module ground
10	MOD_GND	Power Supply Ground	Module ground
11	ANT1	Output	Connection for antenna load modulation #1
12	RXP	Input	Antenna reception path #1
13	TX1	Output	Antenna transmission line #1
14	GND	Ground	Antenna ground
15	TX2	Output	Antenna transmission line #2
16	RXN	Input	Antenna reception path #2
17	ANT2	Output	Connection for antenna load modulation #2
18	MOD_VDD	Power Supply Input	Module power supply
19	SWP	Input/ Output	Single Wire Protocol line to UICC/ SIM

4. Specification

Item	Standard specifications
Main chipset	➢ NXP NPC300
Frequency	➢ 13.56MHz
NFC Standards	➢ 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	➢ NCI protocol interface according to NFC Forum NCI 1.0 standardization ➢ I^{2}C High-speed mode supported
I^{2}C Address	➢ 0x29
Host connector	➢ 15 pin FPC/FFC
Antenna connector	➢ 7 pin FPC/FFC
Operation temperature	➢ -25 ~ 80° C
Storage temperature	➢ -25° ~ 125° C

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	1.62	1.8	1.98	
		3.0	3.3	3.6	
VDD_SIM	Power supply input	1.62	1.8	1.98	
		3.0	3.3	3.6	
SWP_PWR[1]	Power supply for SWP interface	1.62	1.8	1.98	

[1] No VDD_SIM power supply input.

Current consumption characteristics

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

[1] MOD_VDD=3.3V

6. Recommended Operation Temperature

Supply voltage	☐ AC mains	☑DC	
Type of DC Source	☐ Internal DC supply	☑ External DC adapter	☐ Battery
Operational Climatic	☑ Tnom (20℃)	☑ Tmax (80℃)	☑ Tmin (-25℃)

7. Host Reference Circuit

7.1 No SIM Card used
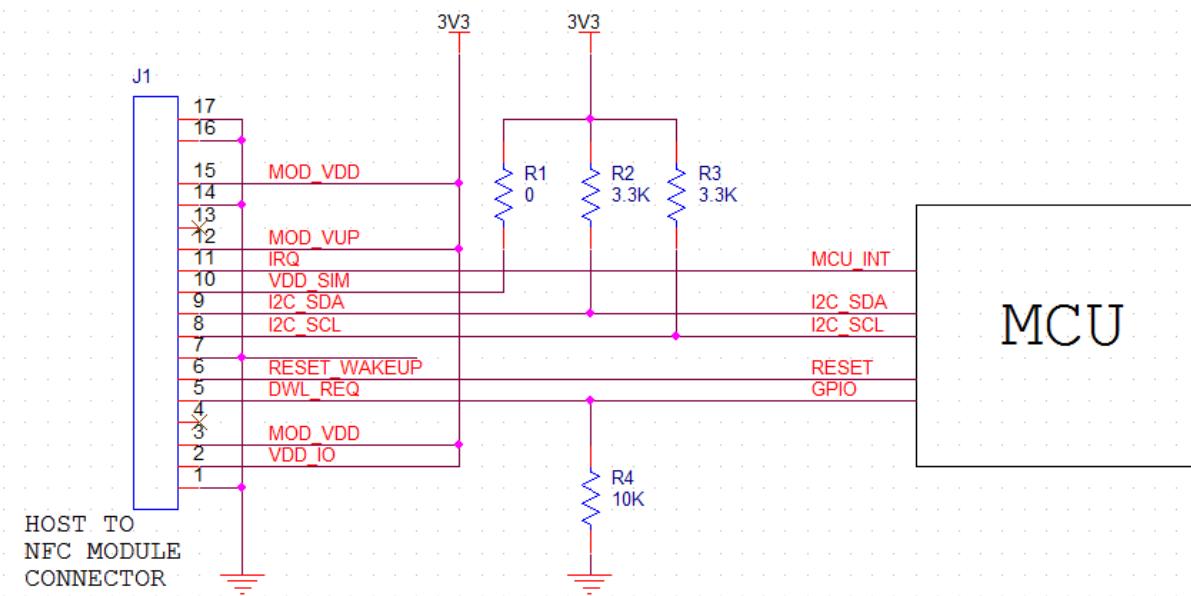
7.2 SIM Card used on mother board
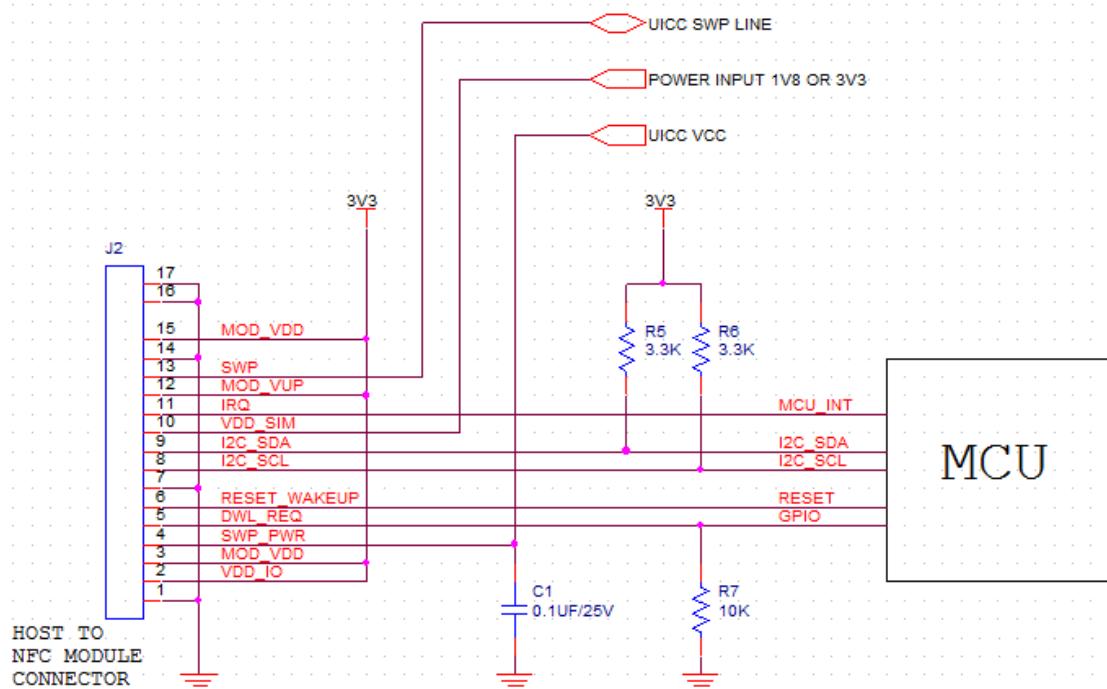
8. Certifications and Regulatory

Item	Feature	Description
14.1	FCC	RF: FCC part 15C EMI: FCC part 15B
14.2	IC	RSS-210 ISSUE 8 RSS-GEN ISSUE 4
14.3	CE	RF: EN 302 291-1 V1.1.1, EN 302 291-2 V1.1.1 　　 EN 300 330-1 V1.8.1, EN 300 330-2 V1.6.1 EMC: EN 301 489-1 V1.9.2, EN 301 489-3 V1.6.1 Safety: EN 60950-1:2006/A11:2009+A1:2010+A12:2011+A2:2013
14.4	NCC	RF: LP0002 EMI: CNS 13438
14.5	SAR	EN62311

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.

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

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-XRAV1_____

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.

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

Module Integration Restriction:

This device is intended only for OEM integrators under the following conditions:

(1) The antenna must be installed such that 20 cm is maintained between the antenna and users,

(2) The transmitter module may not be co-located with any other transmitter or antenna.

(3) The Loop antenna was verified in the conformity testing. Radiated transmit power must be equal to or lower than that specified in the FCC/IC Grant of Equipment Authorization for FCC ID: NKR-XRAV1 and IC: 4441A-XRAV1. A separate approval is required for all other antenna type, or higher gain antenna.

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/IC authorization is no longer considered valid and the FCC ID/IC ID cannot 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/IC authorization.

Radiation Exposure Statement

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

R&TTE Regulation:

In all cases assessment of the final product must be met against the Essential requirements of the R&TTE Directive Articles 3.1(a) and (b), safety and EMC respectively, as well as any relevant Article 3.3 requirements.

1. The Loop antenna (gain: N/A dBi) 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 CE equipment certification is required.

CE RF Exposure Compliance

This device meets the EU requirements and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) on the limitation of exposure of the general public to electromagnetic fields by way of health protection. To comply with the RF exposure requirements, this equipment must be operated in a minimum of 20 cm separation distance to the user.

CE 1177

End Product Labeling (IC)

Labeling Requirements for the Host Device (Section 3.2, RSP-100, Issue 11, January 2016): 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-XRAV1___.

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

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

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.

・ 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."

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.

NCC remind

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。

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