

Model Specifications / User Manual

Project Name: DFIN-H11

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Revision History

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V1.0.1	Tim Yen(顏誌廷)	Update 1. I2C address, 2. Reference circuit for Intel/AMD platform	2025/08/05
V1.0.1.1	Tim Yen(顏誌廷)	Update antenna reference schematic	2025/08/13
V1.0.2	Tim Yen(顏誌廷)	Update pin define reference and common reference circuit	2025/11/13
V1.0.3	Tim Yen(顏誌廷)	Update VBAT voltage information	2025/12/12
V1.0.4	Tim Yen(顏誌廷)	Add certification and regulatory notice information	2025/12/18
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1. Introduction

DFIN-H11 is a kind of NFC (Near Field Communication) module that could be embedded in one Windows PC and Windows mobile system by simply connecting the module through I²C interface and start developing his application software.

2. Hardware Block Diagram

DFIN-H11 is a full feature NFC module and compliant with NFC standards (NFC Forum), EMVCo, ISO/IEC15693VCE, FeliCa, ETSI SWP/HCI. DFIN-H11 has an optimized architecture for low-power consumption in different operation modes. The RF contactless front-end is supporting various transmission modes according to card mode, a. EMVCo PICC compliant with NFC forum device requirement for Type 4 tag (T4T)/ISO14443A and ISO/IEC 14443B PICC mode, b. NFC forum compliant embedded T4T for NDEF short record, c. MIFARE PICC mode. And the reader mode of specifications, a. NFC Forum Reader/Writer mode for Type 1 Tag (T1T), Type 2 Tag (T2T), Type 3 Tag (T3T) and Type 5 Tag (T5T), b. EMVCo PCD compliant with ISO/IEC 14443A and ISO/IEC 14443B PCD modes, c. MIFARE PCD encryption mechanism (MIFARE 1K/4K), d. FeliCa PCD mode, and e. ISO/IEC 15693/ICODE PCD mode . The major internal components are illustrated in Figure 1-1.

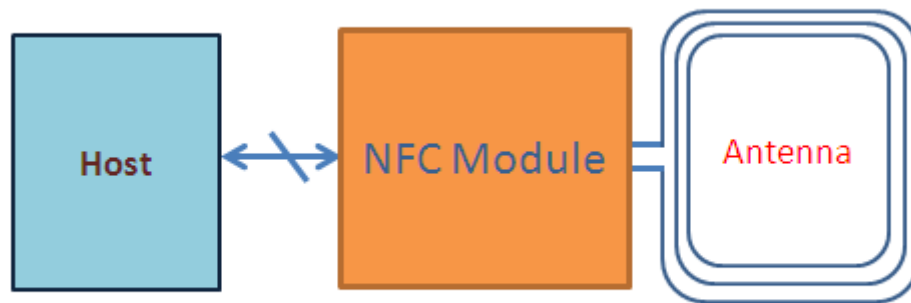


Figure 1-1 NFC module Major Component and System Interface

3. Pin Definition

3.1 FPC/FFC connector type

Host connector

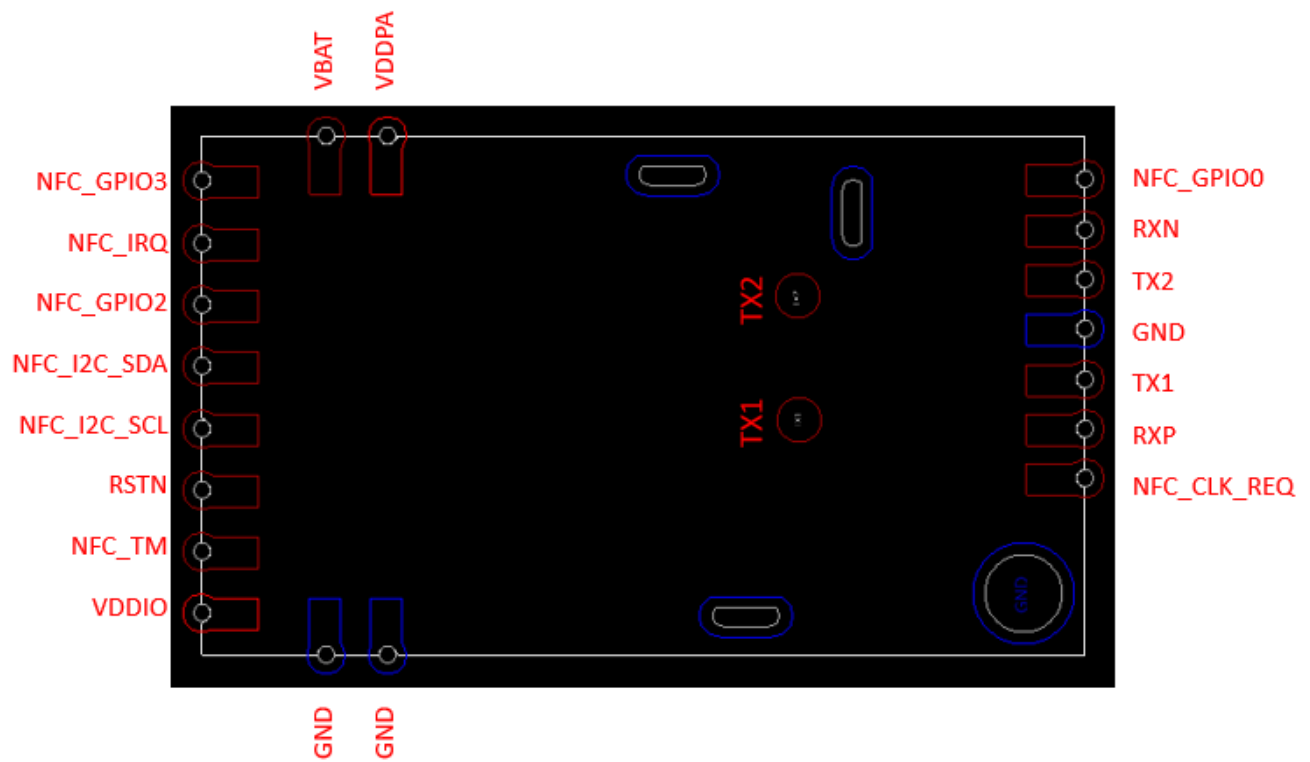
Pin No.	Name	Configuration	Description
1	VBAT (MOD_VDD)	Power Supply Input	Module power supply
2	(MOD)_GND	Power Supply Ground	Module ground
3	NFC_GPIO0	Input/ Output (N.C.)	NFCC general purpose In/Out 0 (N.C. for Windows Platform).
4	NFC_CLK_REQ	Input/ Output (N.C.)	the system clock request pin (N.C. for Windows Platform)
5	IRQ	Output	Interrupt request from module to platform
6	N.C	N.C	No Connection.
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 (RSTN)	Input	Reset pin input from the host to wake up the device from standby and also to reset the device.
11	N.C	N.C	No Connection.
12	N.C	N.C	No Connection.
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
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Antenna connector

Pin number	Name	Configuration	Description
1	N.C	Output	No Connection
2	RXP	Input	The antenna positive receiver input
3	TX1	Output	The antenna driver output 1
4	GND	Ground	Antenna ground
5	TX2	Output	The antenna driver output 2
6	RXN	Input	The antenna negative receiver input
7	N.C	Output	No Connection

3.2 Bottom Test Point



4. Specification

Item	Standard specifications
Main chipset	➤ NXP NPC400
Frequency	➤ 13.56MHz
NFC Standards	➤ ISO/IEC 14443A, ISO/IEC 14443B PCD/PICC Mode ➤ FeliCa PCD mode - JIS X 6319-4 FeliCa (March 2016) ➤ Mifare PCD encryption mechanism (MIFARE 1K/4K) ➤ ISO/IEC 15693/ICODE PCD mode ➤ NFC Forum tags, Type 1 Tag(T1T), Type 2 Tag(T2T), Type 3 Tag (T3T) and Type 5 Tag (T5T) ➤ NFC forum compliant embedded T4T for NDEF short record ➤ EMV Contactless Interface Specification", version 3.0 ➤ NFC Forum Device Requirements V2.1
Host interface	➤ NCI protocol interface according to NFC Forum NCI 2.1 standardization ➤ I²C High-speed mode supported ➤ I²C Fast mode supported
I²C Address	➤ 0x50* in 8bits
Host connector	➤ 15 pin FPC/FFC
Antenna connector	➤ 7 pin FPC/FFC
Operation temperature	➤ -25 ~ 80° C
Storage temperature	➤ -30° ~ 125° C
Weight	➤ 8.3g

Note* NFCC NFC_I2C_SDA and NFC_I2C_SCL pins are to be used as I2C lines. If I2C host interface is selected, device will answer to a specific I2C slave address configured in flash. Pull-up resistors to VDDIO are required on SDA and SCL lines. Resistors value must be

selected to meet I2C timing requirements based on the line capacitance, VDDIO level and the targeted I2C clock speed. On its demo board, WNC uses 4.7 kOhm but these values need to be adapted according to the final application.

5. Electrical Characteristics

5.1. Recommended Operating conditions

Symbol	Parameter	Conditions	Min	Typical	Maximum	Unit
V _{BAT} (MOD_VDD)	Power supply input		2.8 ^[1]		5	V
V _{DD_IO}	IO power supply	1.2V host Supply	1.08	1.2	1.32	
		1,8V host supply	1.65	1.8	1.95	

[1] Reader, VSS = 0 V

5.2. Current consumption characteristics

Symbol	Min	Typical	Maximum	Unit
I _{MOD_VDD}	--	--	560 ^[1]	mA
I _{VDD_IO}	--	--	1 ^[1]	μA

[1] MOD_VDD=3.6V

6. Power Consumption

Test condition: MOD_VDD = 3.3V, VDD_IO= 1.8V

6.1. Test conditions

PCB P/N	55DFIN01.SG1/ 55DFIN01.SG2
Hardware version	B
Firmware version	10.01.11
Antenna Impedance	50 Ω
Transfer Board Consumption (mA) @ 5V	94.5

6.2. Power Consumption

3.3V Power Rail Current (mA)					
(MOD_VDD(VBAT) + VDD_IO) ^{*1}					
Standby (RF OFF)	AVG	0.586			
	Peak	N/A			
Polling Mode ^{*2}	AVG	14.38			
	Peak	1.012			
Detected Test Tag type		Type 1	Type 2	Type 3	Type 4
		Topaz	Mifare	Felica	Mifare Desfire
Communicating	AVG	1.061	0.979	1.092	1.173
	Peak	23.97	22.44	26.21	24.30

*1: Means NFC module “Digital part” power consumption

*2: Means “Normal” polling mode.

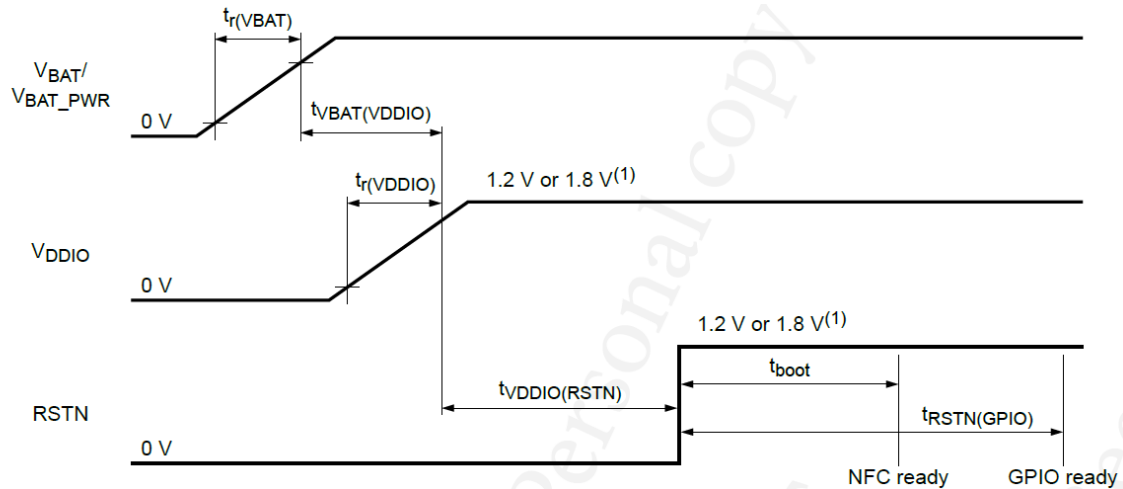
Total power consumption (mW),					
Standby (RF OFF, VEN Pull Low)	AVG	3.404			
	Peak	N/A			
Polling Mode	AVG	54.39			
	Peak	406.5			
Detected Test Tag type		Type 1 Topaz	Type 2 Mifare	Type 3 Felica	Type 4 Mifare Desfire
Communicating	AVG	1.298	1.191	1.119	1.373
	Peak	59.48	50.04	65.79	62.55

7. Recommended Operation Temperature

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

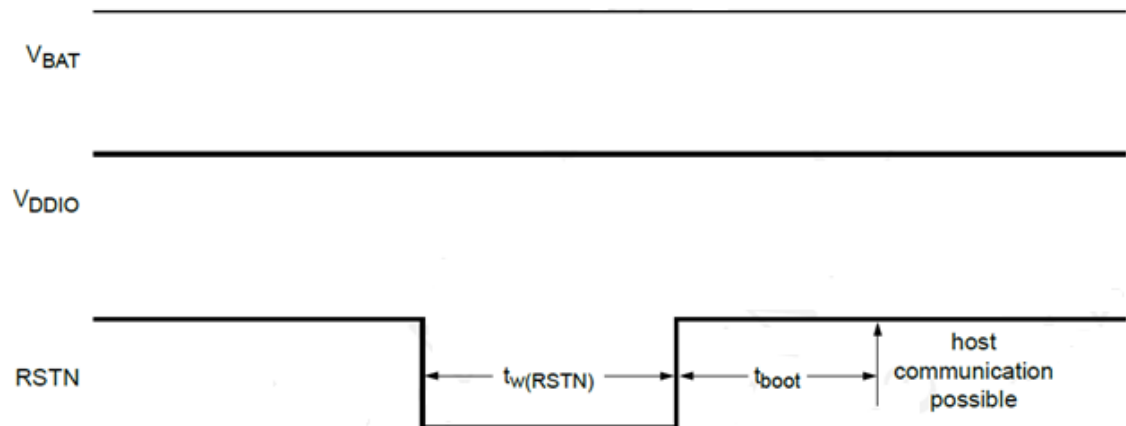
8. Power Sequence

8.1. Power up



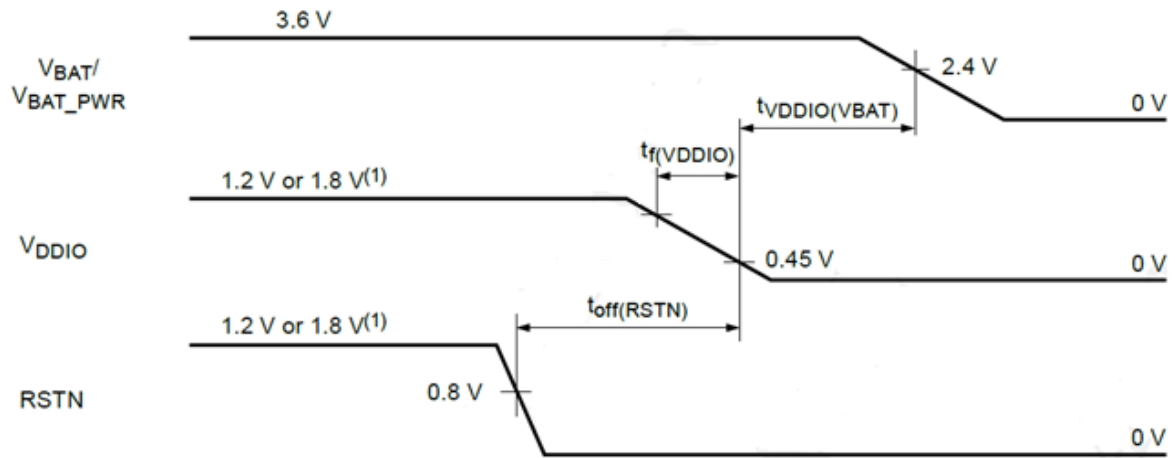
Symbol	Parameter	Conditions	Min	Typical	Max	Unit
$t_r(V_{BAT})$	V_{BAT} rise time	From 2V to 2.5V			5	ms
$t_t(MOD_VDD - VDD_IO)$	VDDIO rise time	VDDIO at 1.2V; from 0.4V to 1.08V			3	ms
		VDDIO at 1.8 V; from 0.4V to 1.65V			3	
$t_{VBAT}(V_{DDIO})$	time from V_{BAT} high to V_{DDIO} high		1			ms
$t_{VDDIO}(RSTN)$	time from V_{DDIO} high to rising edge on RSTN		10			ms
$t_{RSTN}(GPIO)$	time from RSTN high to GPIO's available for use		100			μs

8.2. Reset



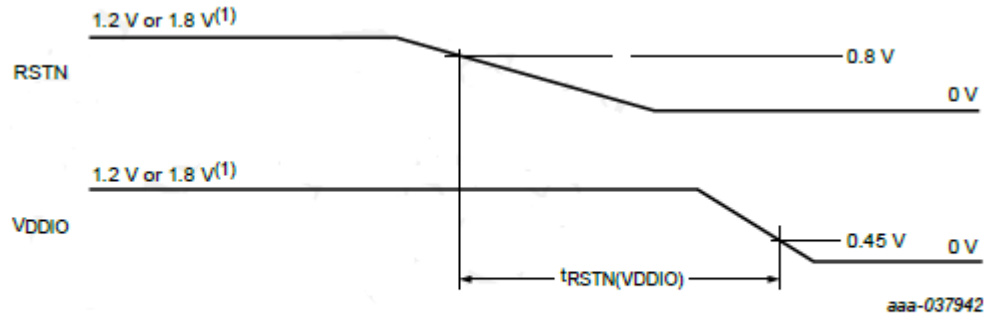
Symbol	Parameter	Min	Typical	Max	Unit
$t_{w(Reset/WakeUp)}$	RSTN pulse width to Reset	10	-	-	μs
t_{boot}	Boot time	-	-	2.5	ms

8.3. Power down



Symbol	Parameter	Conditions	Min	Typical	Max	Unit
$t_{f(VDDIO)}$	Fall time V_{DDIO}	V_{DDIO} at 1.2V; from 1.08V to 0.35V			3	ms
		V_{DDIO} at 1.8 V; from 1.65V to 0.35V			3	ms
$t_{OFF(RSTN)}$	time from RSTN low to V_{DDIO} low		4.5			ms
$t_{VDDIO(VBAT)}$	time from V_{DDIO} low to V_{BAT} low		0			ms
$t_{RSTN(VDDIO)}$	delay time from RSTN low to V_{DDIO} low to enter system low power mode		0			ms

8.4. Entering the Low Power Mode



1. RSTN must be of the same voltage domain than VDDIO

8.5. Download mode

The NPC400 offers the possibility to download FLASH with upgrades using the host interface commands..

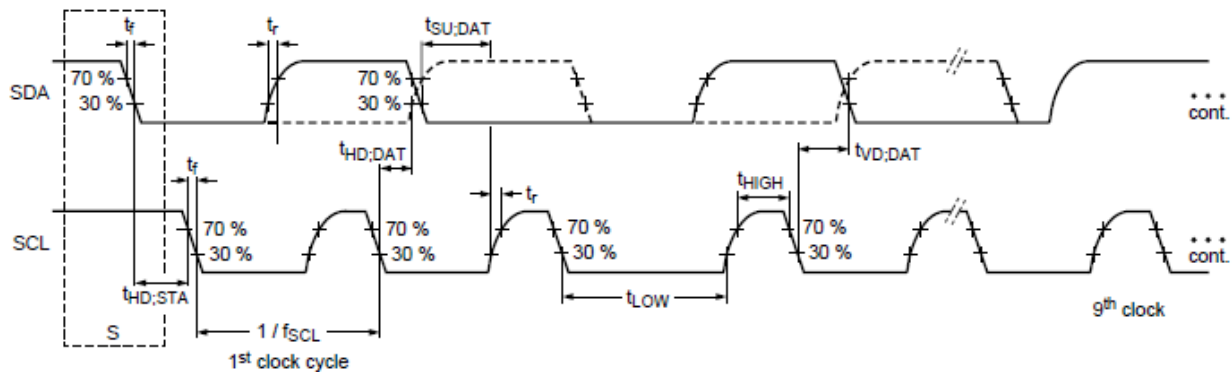
The host has to apply a reset to the NPC400 by driving RSTN to low for a period of $t_W(RSTN)$, and sending the appropriate Firmware Download NCI Command as first command to set the system in download mode and start the download process. Once the firmware download is finished, the host must apply a RSTN pulse to bring the system back to the normal execution environment. Note that the first download frame has to be sent before expiration of the configurable Firmware download time-out

9. I²C-bus specification and user manual^[1]

9.1. Characteristics of the SDA and SCL bus lines for I²C-bus devices^[1]

Symbol	Parameter	Conditions	Standard-mode		Fast-mode	
			Min	Max	Min	Max
f _{SCL}	SCL clock frequency		0	100	0	400
t _{HD;STA}	hold time (repeated) START condition	After this period, the first clock pulse is generated.	4.0	-	0.6	-
t _{LOW}	LOW period of the SCL clock		4.7	-	1.3	-
t _{HIGH}	HIGH period of the SCL clock		4.0	-	0.6	-

9.2. Definition of timing for F/S-mode devices on the I²C-bus^[2,3]



Definition of timing for F/S-mode devices on the I²C-bus^[2,3]

9.3. Host interface minimum and maximum speeds

Symbol	Parameter Min	Conditions	Min	Typ	Max	Unit
FI2C	I2C-bus frequency	Slave	0.1	-	3.4	MHz

[1]Refer from NXP UM10204 I²C-bus specification and user manual.

[2]Check I2C-bus characteristics from Module side.

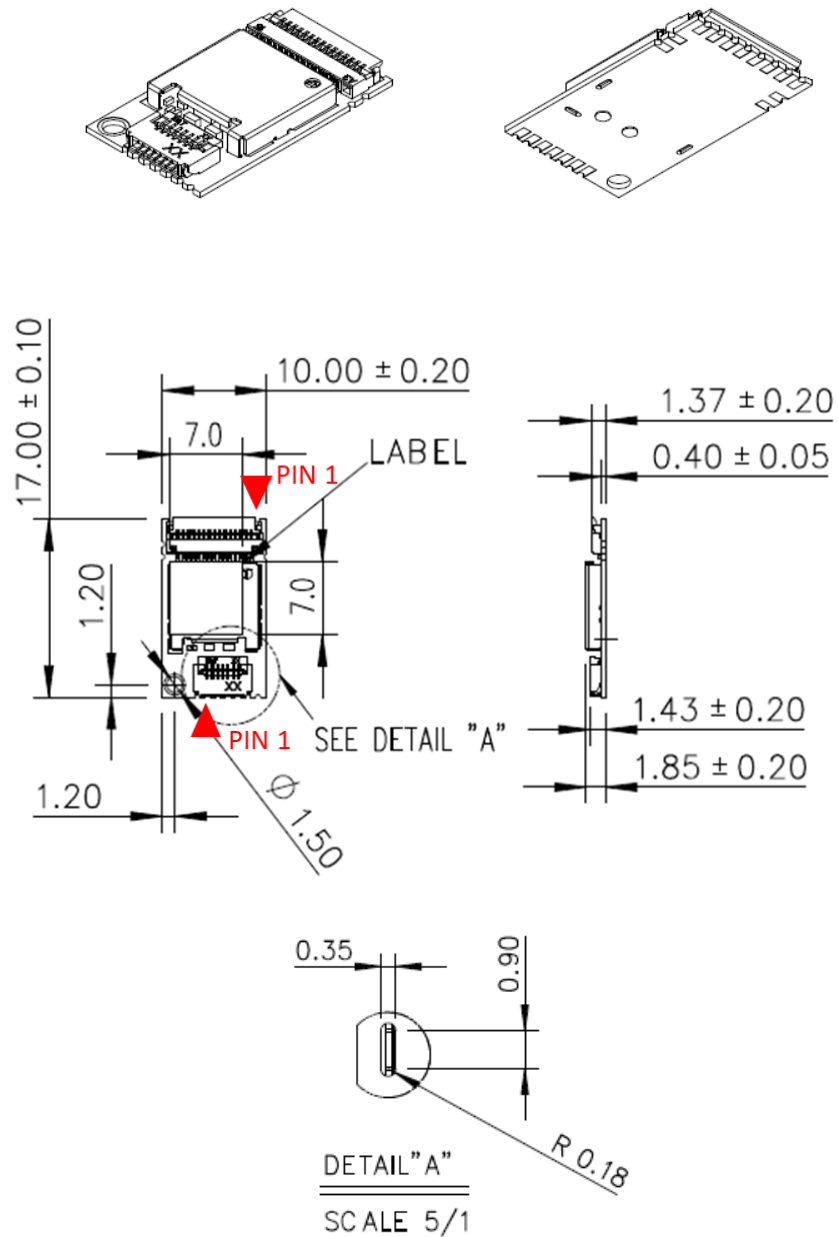
[3] In standard (100 kHz) and fast mode (400 kHz), the typical duty cycle is designed to be approximately 50%, meaning the clock high time (t_{HIGH}) is equal to the clock low time (t_{LOW}).

10. Mechanical Dimension

10.1.Module weight:

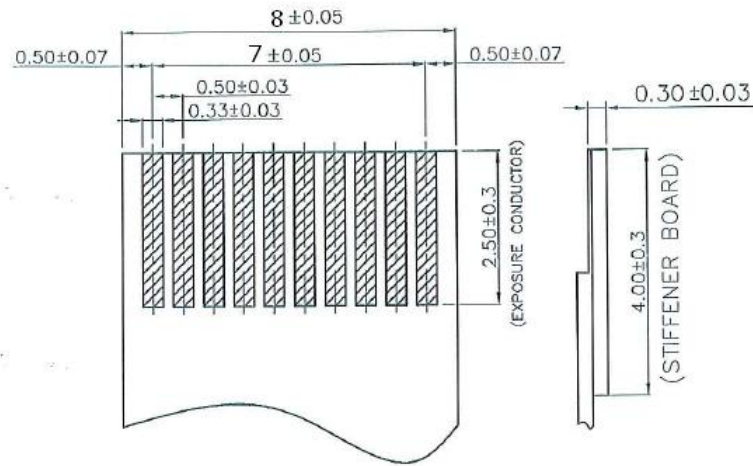
TBD

10.2.FPC/FFC connector type

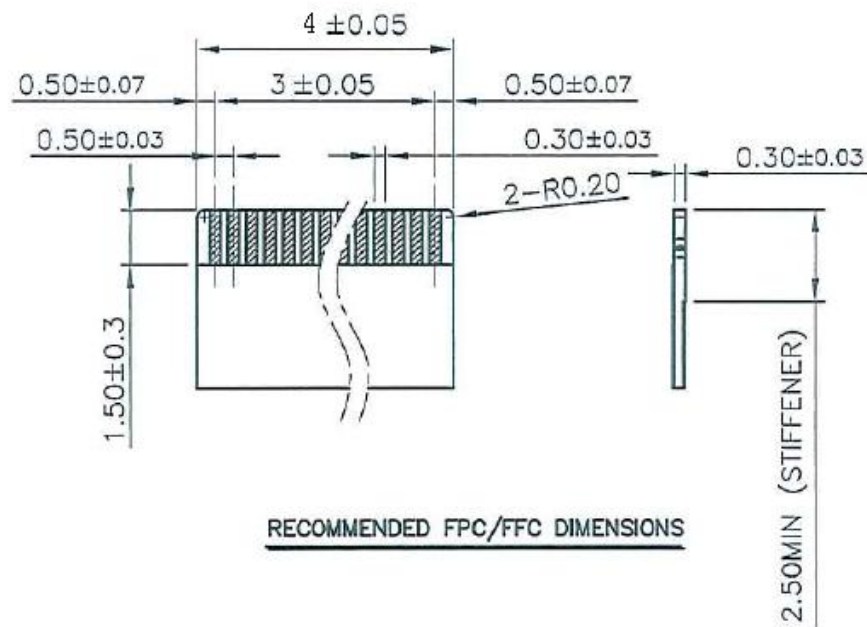


11. FPC/FFC Specifications

11.1. 15 pin FFC

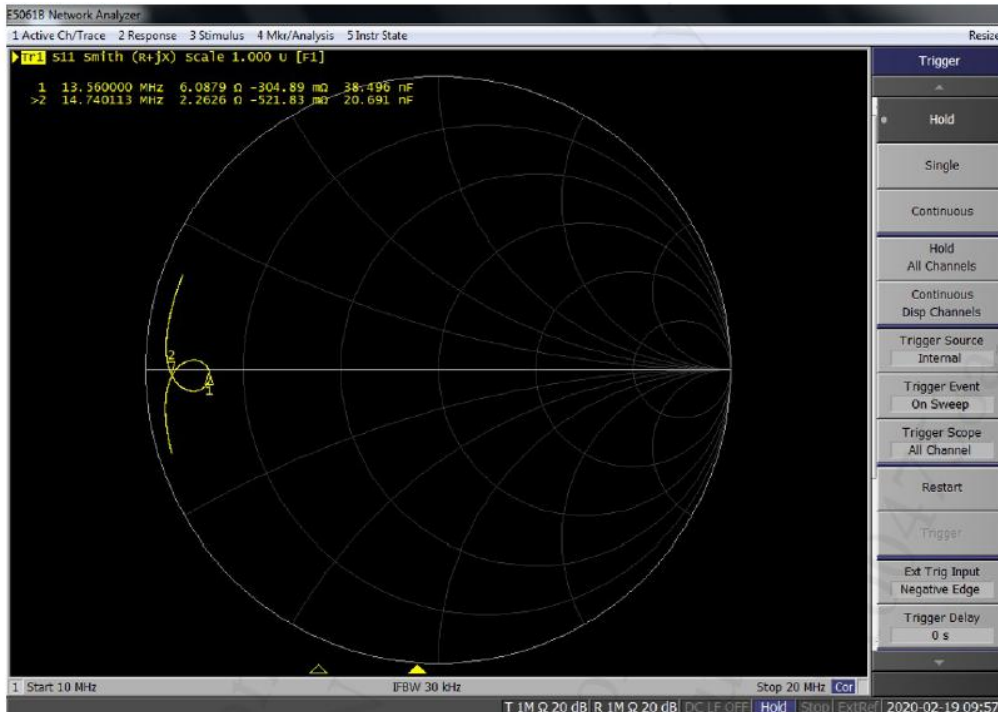
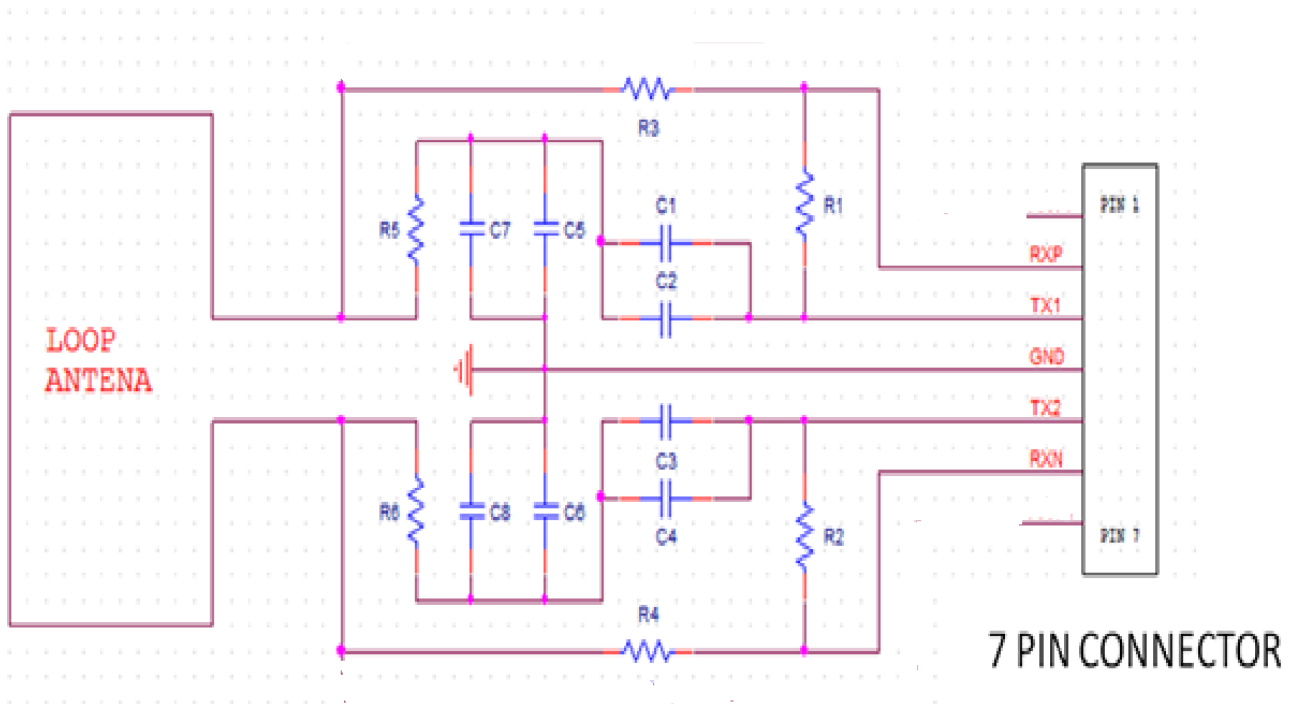


11.2. 7 pin FPC/FFC



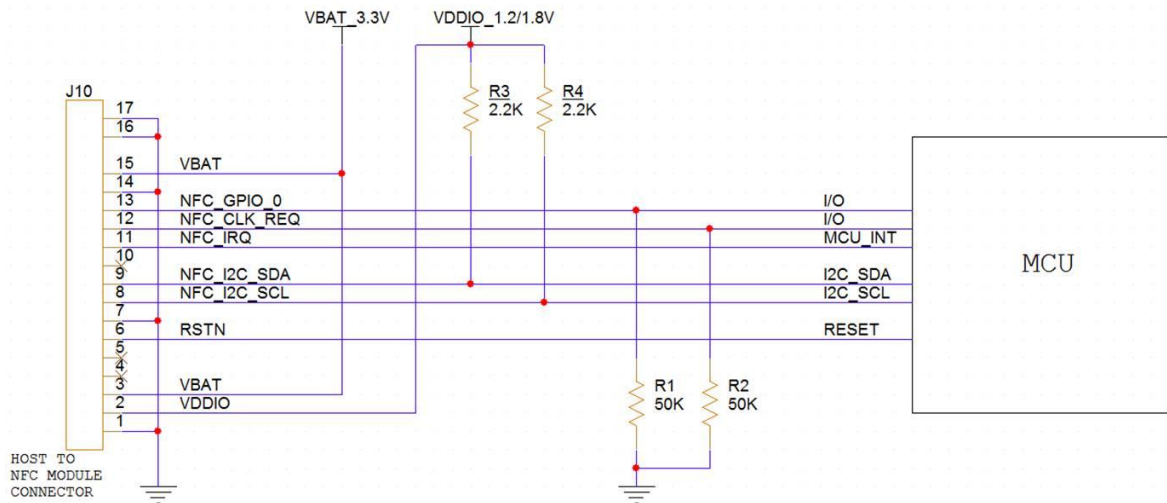
12. Antenna Reference Matching Circuit

When $VDD_{PN}=3.3V$ or below a symmetric impedance curve with $Z_{match}=6\Omega$ at 13.56 MHz shall be seen on the network analyzer



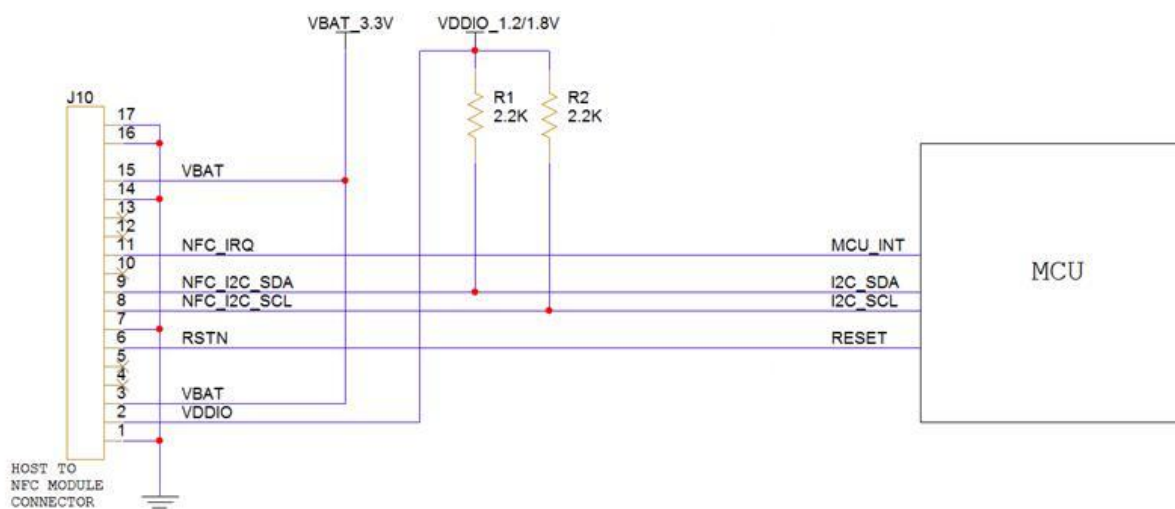
13. Host Reference Circuit

13.1.Reference Circuit to Host for special customer



Note: R3 and R4 by 2.2K is for I2C speed of 400KHz. I2C speed of 1MHz suggest to apply register 1k.

13.2.Reference Circuit to Host for Windows Platform



Note: R3 and R4 by 2.2K is for I2C speed of 400KHz. I2C speed of 1MHz suggest to apply register 1k.

14. Certifications and Regulatory

FCC

15.19

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.

15.105(b)

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 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.

15.21

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment."

FCC RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

FCC Regulatory

This module has been tested and found to comply with the following requirements for Modular Approval.

- Part 15.225 - Operation within the band 13.110-14.010 MHz .

RF exposure considerations

In the end product, the antenna(s) used with this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operation in conjunction with any other antenna or transmitter except in accordance with multi-transmitter product procedures. User and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying the RF exposure compliance.

Antennas

This radio transmitter has been approved by the FCC and ISED to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antennes

Cet émetteur radio a été approuvé par la FCC et ISED pour fonctionner avec les types d'antennes répertoriés ci-dessous avec le gain maximal autorisé indiqué. Les types d'antennes non inclus dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

Operating Frequency	Antenna Part Number	Antenna Type
13.56 MHz	48XRAKA1.SGA	Loop Antenna

Required End Product Labeling

Any device incorporating this module must display an external, visible, permanently affixed label with the FCC ID and the ISED certification number preceded by the term as follows.

“ **Contains FCC ID: NKR-DFINH11** ”

“ **Contains IC: 4441A-DFINH11**”

Obligation d'étiquetage du produit final:

Tout appareil intégrant ce module doit afficher une étiquette externe, visible et apposée en permanence avec le numéro de certification ISDE précédé du terme comme suit.

« **Contient IC: 4441A-DFINH11**»

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 shown in User manual.

Test Modes

This device uses various test mode programs for test set up which operate separate from production firmware. Host integrators should contact the grantee for assistance with test modes needed for module/host compliance test requirements.

Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Note EMI Considerations

Note that a host manufacture is recommended to use KDB996369 D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate

additional non-compliant limits due to module placement to host components or properties

For standalone mode, reference the guidance in KDB996369 D04 Module Integration Guide and for simultaneous mode; see KDB996369 D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

ISED

"This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(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.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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."

Caution: Exposure to Radio Frequency Radiation

1. To comply with the Canadian RF exposure compliance requirements, this device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter."
2. To comply with RSS 102 RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

"Attention: exposition au rayonnement radiofréquence

1. Pour se conformer aux exigences de conformité RF canadienne l'exposition, cet appareil et son antenne ne doivent pas être co-localisés ou fonctionnant en conjonction avec une autre antenne ou transmetteur."

2. Pour se conformer aux exigences de conformité CNR 102 RF exposition, une distance de séparation d'au moins 20 cm doit être maintenue entre l'antenne de cet appareil et toutes les personnes

NCC

根據 NCC LP0002 低功率射頻器材技術規範_章節 3.8.2：

取得審驗證明之低功率射頻器材，非經核准，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。

低功率射頻器材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。

前述合法通信，指依電信管理法規定作業之無線電通信。

低功率射頻器材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。

此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，並要求平台廠商

於平台上標示  或相似含意的標示