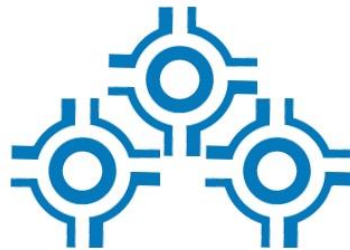


Smart NFC Choice for your Life



TNB131M IC Overview

(Document : 3AD - SDS - Rev 1.1)



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■ NFC Introduction

What is NFC

Near field communication (NFC) is a set of standards for smart-phones and similar devices to establish radio communication with each other by touching them together or bringing them into proximity, usually no more than a few inches.

- Carrier frequency : 13.56Mhz
- Communication method :
Inductive coupling, Magnetic field energy
- Communication Distance (~ 10cm)
: Smart phone ~ 3cm
- Communication Speed
: 106, 212, 424, (848) kpbs

NFC 3 communication mode / 3 Actions

- | | |
|-------------------|----------------------------|
| - Reader / Writer | *Reading Tags |
| - Peer to Peer | *Making Connections |
| - Card Emulation | *Card in a phone |

Tag(Card) Reader / Writer (Terminal)

Multi-standard (ISO/IEC 14443, JIS X 6319-4/Felica, ISO/IEC 15693)

**Peer to Peer Communication (Device to Device)**

NFCIP-1, NFCIP-2 (ISO/IEC 18092, ISO/IEC 21481)



Touch / Tap / Close on

**Card Emulation (Secure Element)**

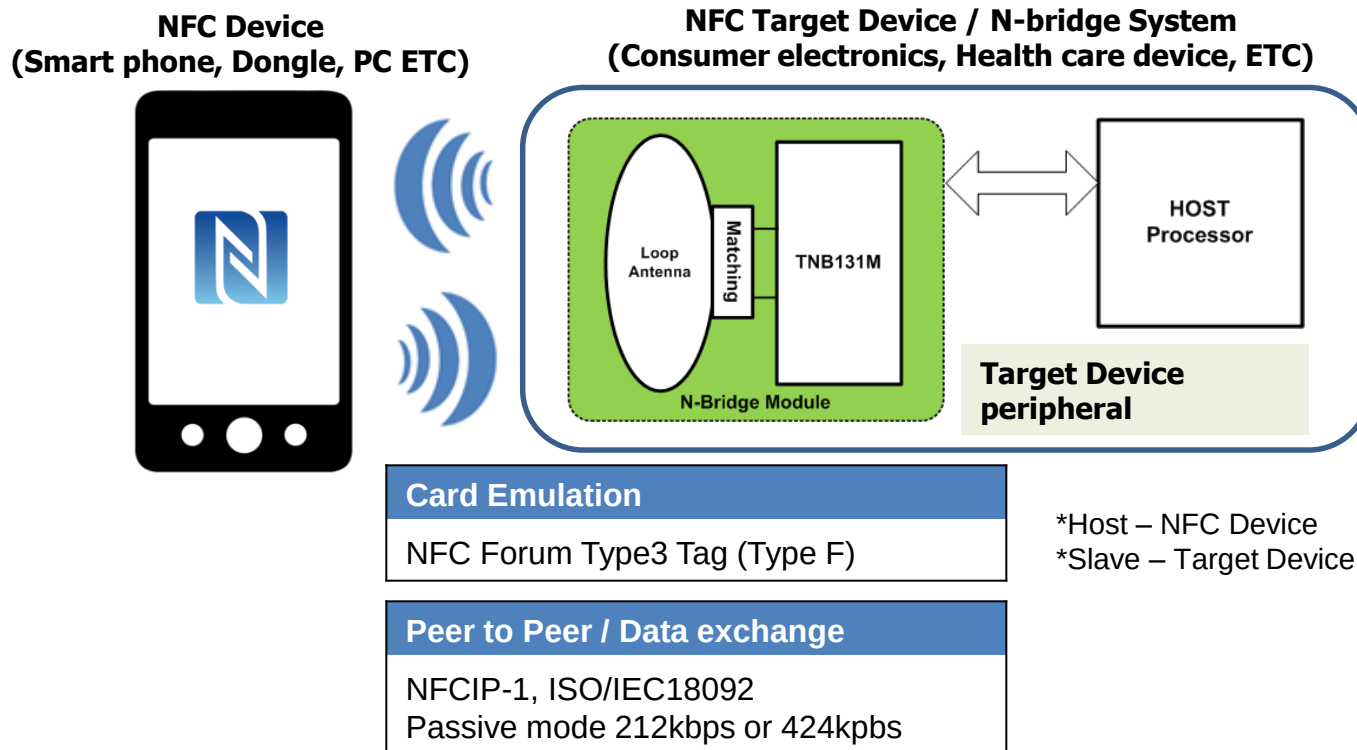
EMVCo, ISO/IEC 14443, JIS X 6319-4/Felica



Close communication

What is N-Bridge ? (Action of N-Bridge)

- ✓ **N-Bridge Concept** : Providing RF interface to RF communicate between NFC Device and Target Device
 - Active Type NFC TAG that has Host interface
 - SPI / I2C
 - Passive Type communication of Load modulation (None RF Generation)
- ✓ **N-Bridge Operating mode**
 - NFC Forum Tag Type3 mode (T3T mode)
 - NFC Data Exchange Protocol mode (NFC-DEP mode) / Peer to Peer target



■ N-Bridge Target Application / Target Device

N-Bridge Target Device/Application



- ✓ **Handover/Making connections**
: Bluetooth simple pairing, Wi-Fi set-up
- ✓ **Read/Write the information of Set device**
: Writing and reading information needed in Target device.
- ✓ **System Wake up**
: Wake up Sleep mode Target Device to NFC Host Device like a Smart phone.
*Target Device (Power save mode)

■ N-Bridge Use case (Example)

Camera/mp 3player BT Speaker



- To Register Device ID and customer information and other information in Target Device
- To Transmit pictures, video, voice and music information wanted via Bluetooth or Wi-Fi in Handover mode by NFC Touch
- To check battery, memory capacity, etc in smart phone
- To check information of defect of Target device and request for repair in smart phone

Home appliances



- To Register Device ID and customer information and other information in Target Device
- To control Target Device by smart phone. (New menu, equipment reservation, device control, etc)
- To check ECO (Power consumption, etc) information in smart phone
- To check information of defect of Target device and request for repair in smart phone

Printer Business equipment



- To Register Device ID and customer information and other information in Target Device
- To Output information wanted to mark or output in Handover mode with printer or Projector, etc by NFC Touch
- To check variable such as ink and lamp life of projector, etc in smart phone
- To check information of defect of Target device and request for repair in smart phone

Health care device



- To Register Device ID and customer information and other information in Target Device
- To check health information, and store and manage them in server or memory by smart phone.
- To control operation by smart phone.
- To check information of defect of Target device and request for repair in smart phone

ESL/E-paper



- To Register Device ID and customer information and other information in Target Device
- To control price information(display information) by smart phone
- To check price information, and store and manage them in server by smart phone

■ 3ALogics NFC Solution

Application	NFC function	Direction	Host Interface	Recommend		Remark
				IC	Module	
Traceability (History/record management)	Tag	NFC Device --> OD	X	Commercial NFC Tag IC	TAG	
BT paring / Wi-Fi setup	Tag	NFC Device --> OD	X	Commercial NFC Tag IC	TAG	*Mobile Printer
BT paring / Wi-Fi setup System Wake up	Tag emulator & RF detection	NFC Device --> OD	O	TNB131M	NTM	*BT portable speaker
BT paring / Wi-Fi setup System Wake up	Tag emulator & RF detection Or P2P passive target	NFC Device --> OD	O	TRH033M-S	ATM	
Payment	R/W	OD --> RF Payment Card	O	TRH033M-S	ATM	
Personal authentication	R/W	OD --> ID Card	O	TRH033M-S	ATM	
Device Initializing	P2P active target or P2P passive target	NFC Device --> OD	O	TNB131M	NTM	
Data exchange transmission/reception & reception/transmission (Master & Slave)	P2P initiator & target	OD <--> NFC Device	O	TRH033M-S	ATM	*Smart rice cooker
Data exchange reception/transmission (Slave)	P2P target	NFC Device --> OD	O	TNB131M	NTM	

√ NTM : Normal Type Module – cost effective / ATM : Advanced Type Module

√ NFC Device : Smart phone / OD : Other device, Target Device

TNB131M Overview

Feature

Basic information

- NFC Forum Type3 Active Tag and NFCIP-1 Passive Target
- 1.62~ 3.6V operation voltage, 16pin QFN Package

Basic functions

- NFCIP-1 passive target bridge at 212/424 kbps with host processor
- NFC Forum tag type 3 bridge at 212/424kbps with host processor
- Stand alone NFC Forum active tag type3 at 212/424kbps
- Selective data rate (212/424kbps)
- Host wakeup interrupt by external RF field
- Analog RF field detection
- Integrated RF tuning capacitor
- Internal 1.8V LDO
- Internal 256 byte SRAM for FIFO or Tag memory

Functions for microprocessor interface

- I2C slave (up to 400KHz)
- SPI slave (up to 1MHz)
- IRQ output to advise tag status monitoring

Power consumption minimization

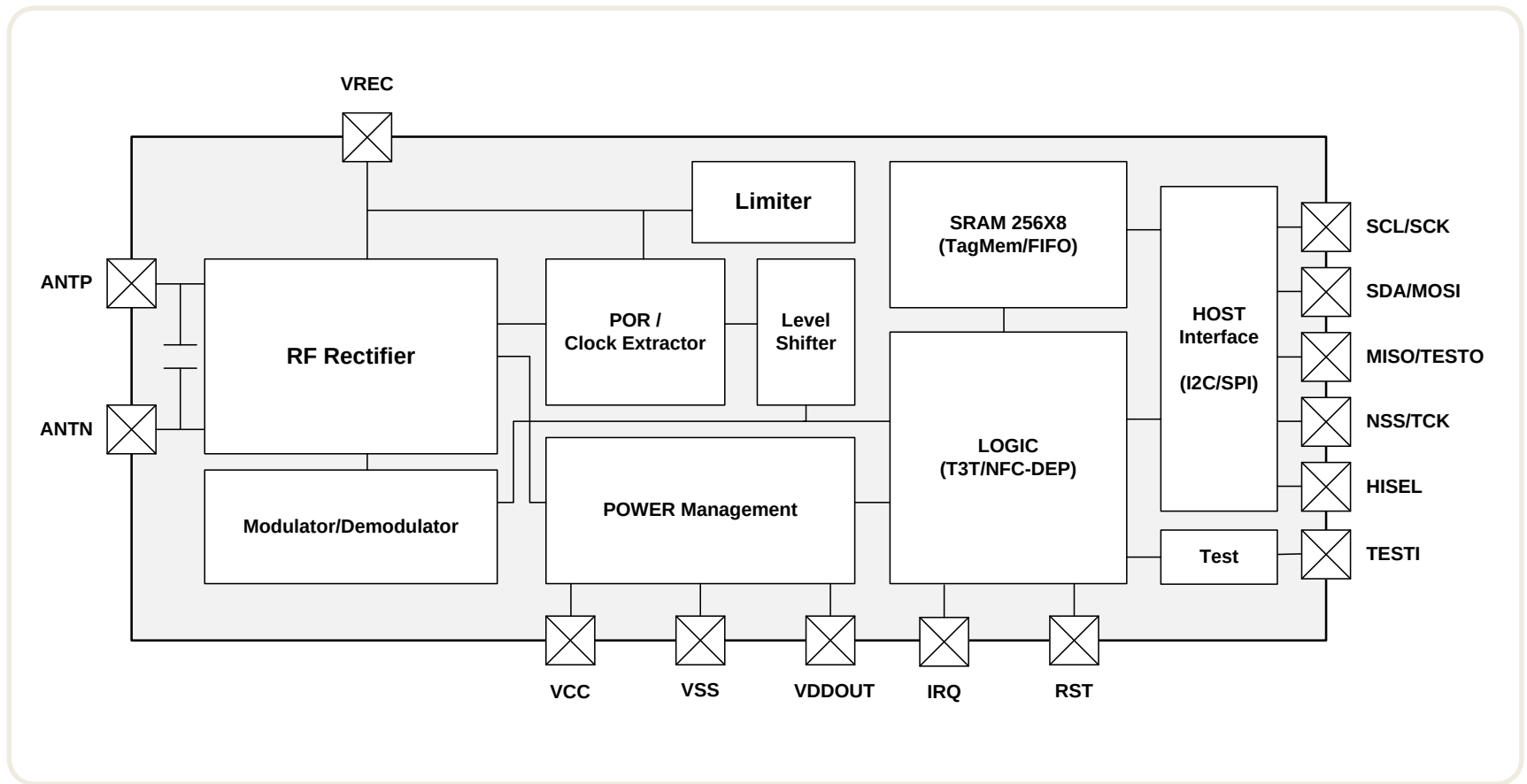
- Optimized Logic and internal gated low frequency clock
- Minimized leakage and stand-by current

Key Application

- NFC P2P target mode device
(and Tag Emulation mode device)
- Smart home appliances
or other applications with built-in microcontroller
- NFC Application (NFC Forum SIGs)
 - Health-care
 - consumer electronics

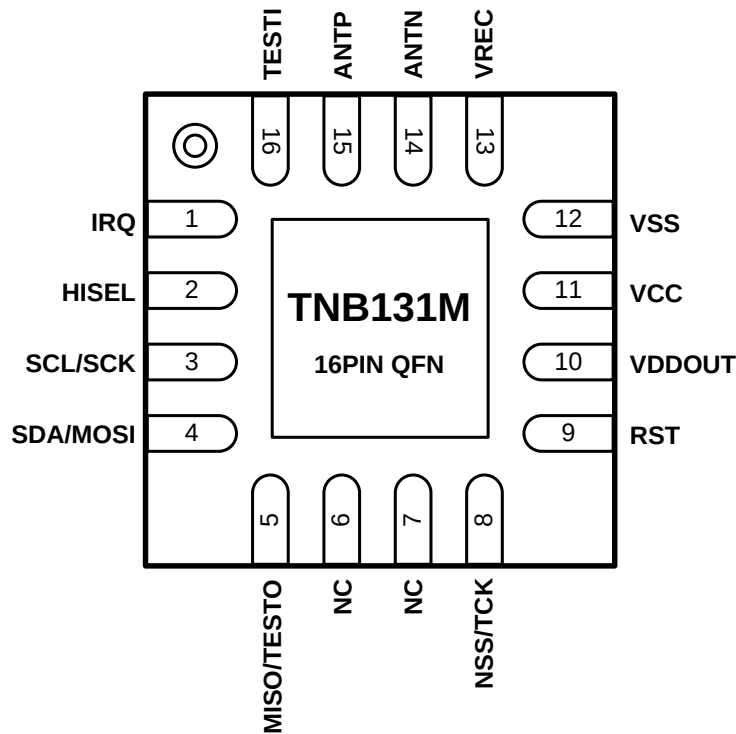
Frequency		13.56MHz
Protocol		ISO/IEC 18092 (JIS 6319-4)
Operating Temperature		-40 ~ 85°C
Power		1.6 ~ 3.6V
Host interface		I2C / SPI
NFC mode		NFCIP-1 target Type 3 tag emulation
Modulation		Load modulation
Memory	Type	SRAM / FIFO
	Size	256bytes
Data rate		212 / 424kbps (Selective data rate)
Special feature		Host Wake-up interrupt by External RF field *Analog RF field detection
Integrated capacitor		RF tuning capacitor Analog Rectifier output and Regulator Output capacitor
Packaging		QFN16 (3mm X 3mm)
Resonance Capacitance		23.5pF

■ TNB131M Block Diagram



TNB131M PIN Information

TNB131M uses 16pin QFN package. (3mm X 3mm)
Package physical dimension is as below.



#	Name	Dir.	Description
1	IRQ	O	N-Bridge interrupt request
2	HISEL	I	Host Interface select (low: I2C, high: SPI)
3	SCL/SCK	I	I2C SCL / SPI SCK
4	SDA/MOSI	I/O	I2C SDA / SPI Master out Slave in
5	MISO/TESTO	O	SPI Master In Slave Out / Test output(*I2C)
6	NC	-	No Connection
7	NC	-	No Connection
8	NSS/TCK	I	SPI Negative Slave Select /Test clock (*I2C)
9	RST	I	IC RESET (High active)
10	VDDOUT	PWR	Logic Power / Regulator output (1.8V)
11	VCC	PWR	TNB131M Main Power / IO Power (3.3V)
12	VSS	GND	Ground
13	VREC	PWR	Rectifier output
14	ANTEN	I	Antenna negative input
15	ANTP	I	Antenna positive input
16	TESTI	I	Test input

SRAM(256 Bytes) Configuration by TNB131M Operating mode

Physical
Byte Address

0x00	Block No.00 : Attribute(16Bytes)	0x0F
0x10	User Block No.01 : NDEF	0x1F
0x20	User Block No.02 : NDEF	0x2F
0x30	User Block No.03 : NDEF	0x3F
0x40	User Block No.04 : NDEF	0x4F
0x50	User Block No.05 : NDEF	0x5F
0x60	User Block No.06 : NDEF	0x6F
0x70	User Block No.07 : NDEF	0x7F
0x80	User Block No.08 : NDEF	0x8F
0x90	User Block No.09 : NDEF	0x9F
0xA0	User Block No.10 : NDEF	0xAF
0xB0	User Block No.11 : NDEF	0xBF
0xC0	User Block No.12 : NDEF	0xCF
0xD0	User Block No.13 : NDEF	0xDF
0xE0	User Block No.14 : NDEF	0xEF
0xF0	User Block No.15 : NDEF	0xFF

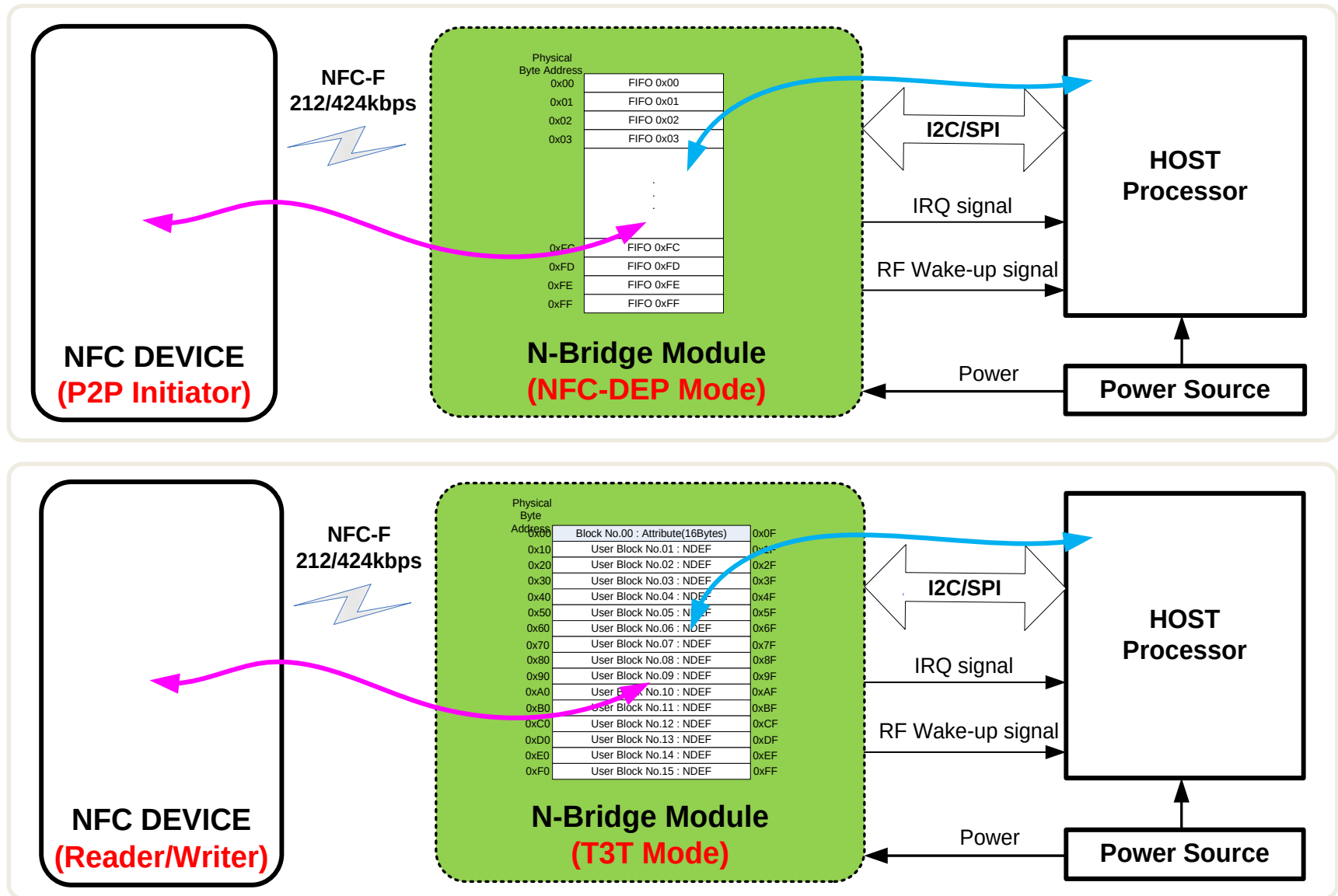
Type3 Tag Mode(T3T Mode)

Physical
Byte Address

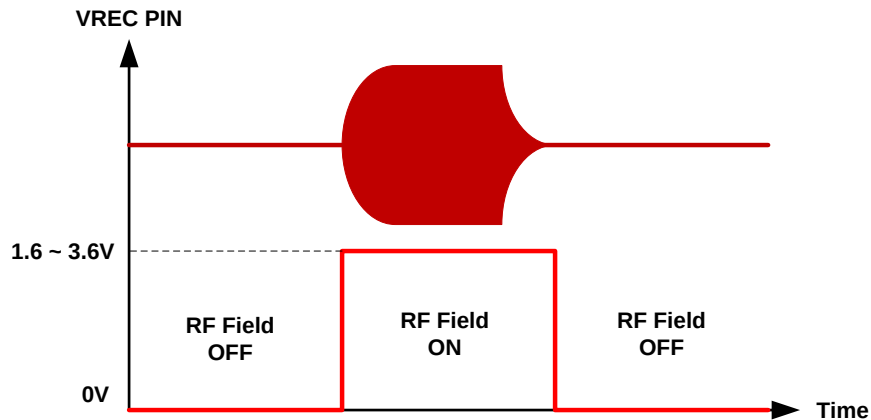
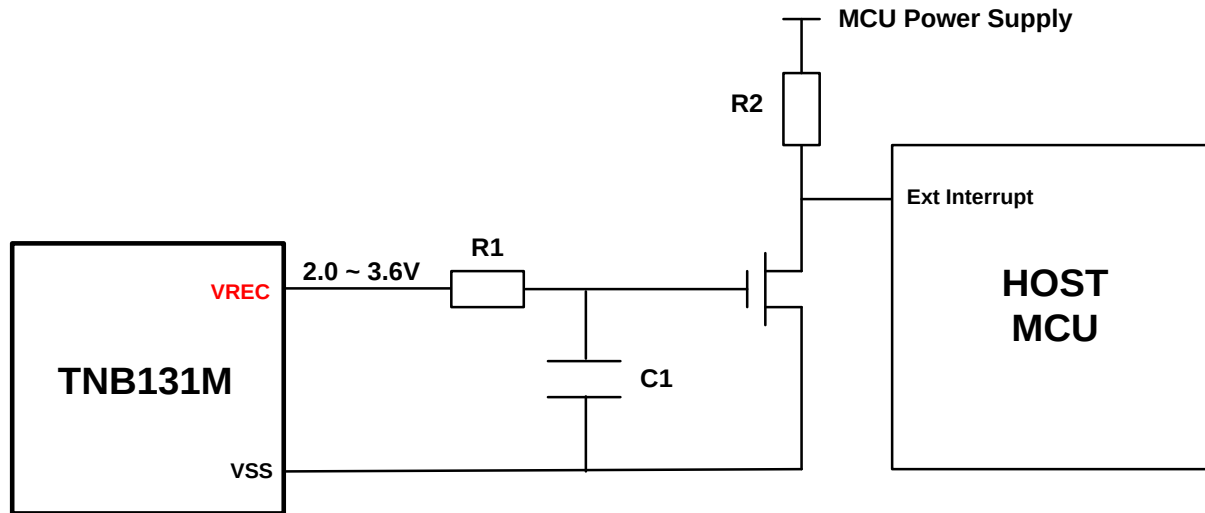
0x00	FIFO 0x00
0x01	FIFO 0x01
0x02	FIFO 0x02
0x03	FIFO 0x03
⋮	
0xFC	FIFO 0xFC
0xFD	FIFO 0xFD
0xFE	FIFO 0xFE
0xFF	FIFO 0xFF

NFC-DEP Mode(P2P-Target)

■ N-Bridge Operating mode Architecture



■ N-Bridge Wake up System used RF Detection

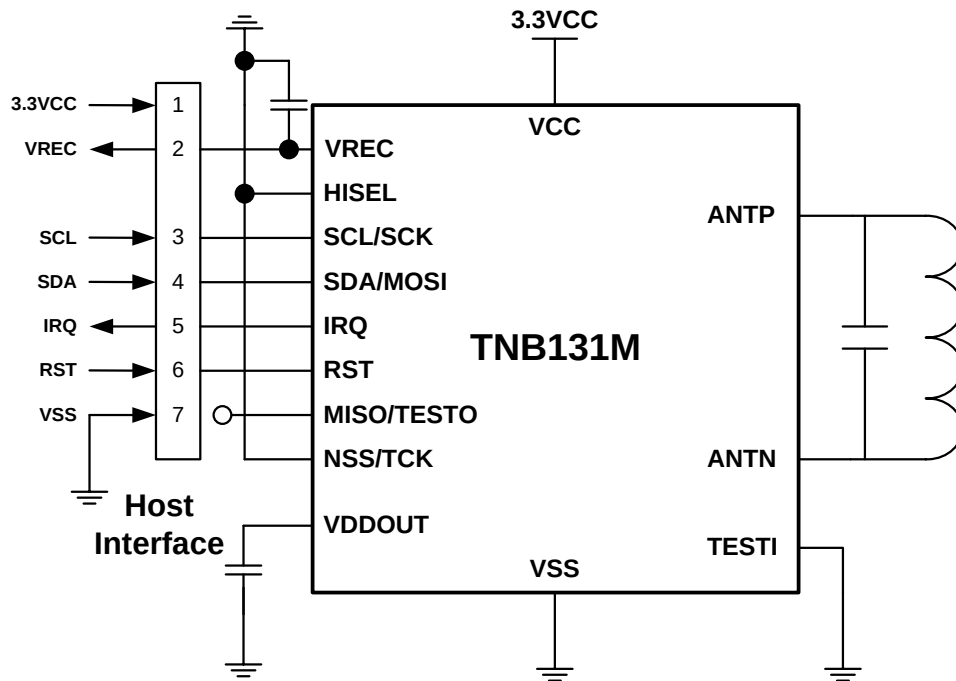


One of the important functions of TNB131M is generally to keep Host System in Stop/Idle or Sleep mode state and Wakeup Host System by using RF detection function.

VREC PIN of TNB131M outputs rectified voltage (2.0~3.6V) as the input of outside RF with Rectifier Block output PIN. Host MCU can wake up in Stop/Idle or Sleep mode by using VREC Pin.

■ N-Bridge system (Module *H/W Example)

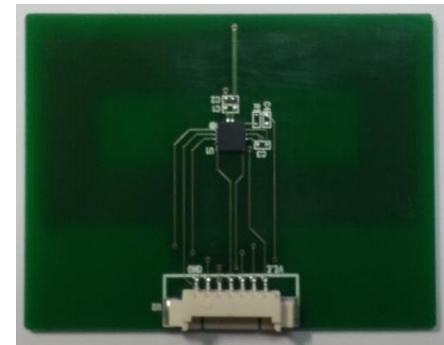
N-Bridge module H/W (I2C interface)



TOP



Bottom



- Physical dimension :
: 45mm X 35mm
(antenna : 40mm X 20mm)

Thank You !

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Disclaimer

3alogics shall not be liable for the incidental or consequential losses of damage to tangible property and injury in connection with the use of this device. Although the examples in this guide have been tested with care, they may contain errors and they are not guaranteed for any particular purpose. 3alogics reserves rights to change any contents to this documents at anytime without any prior notice.

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