Smart NFC Choice for your Life

Bridge N™

TNB131M IC Overview

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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.

- Carrie frequency : 13.56Mz
- 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)

Touch / Tap / Close on

Peer to Peer Communication (Device to Device)
NFCIP-1, NFCIP-2 (ISO/IEC 18092, ISO/IEC 21481)

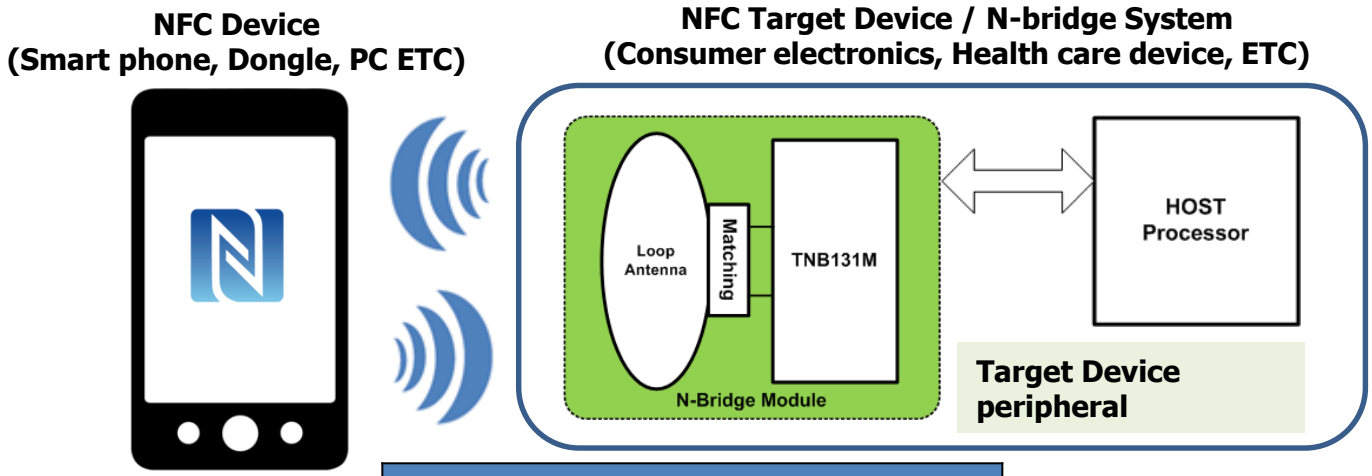
Card Emulation (Secure Element)
EMVCo, ISO/IEC 14443, JIS X 6319-4/Felica

Close communication

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

√ **N-Bridge Concept** : NFC Device와 Target Device 사이의 RF 통신이 가능하도록 RF interface를 제공
- Host interface 를 가진 Active Type NFC TAG
  - SPI / I2C
- Load modulation의 Passive Type 통신 (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



Card Emulation
NFC Forum Type3 Tag (Type F)

Peer to Peer / Data exchange
NFCIP-1, ISO/IEC18092 Passive mode 212kbps or 424kpbs

*Host – NFC Device
*Slave – Target Device

■ 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
: Target device에 원하는 정보를 쓰거나 읽어옴.

√ System Wake up
: Sleep mode Target Device를 Smart phone 과 같은 NFC Host Device로 Wake up
*Target Device (Power save mode)

■ N-Bridge Use case (Example)

Camera/mp 3player
BT Speaker

- Target Device에 Device ID와 고객 정보 및 기타 정보 등록
- NFC Touch에 의하여 Handover mode에서 Bluetooth 또는 Wi-Fi 를 통하여 원하는 사진이나 동영상, 음성, 음악 정보를 전송
- 스마트폰에서 밧데리 정보, 메모리 잔량 정보 등등 확인
- 스마트폰에서 Target device의 결함 정보 및 수리요청을 확인

Home appliances

- Target Device에 Device ID와 고객 정보 및 기타 정보 등록
- 스마트폰으로 Target Device 제어 (새로운 조리법, 기기 예약, 기기 제어등등)
- 스마트폰에서 ECO (Power consumption 등등) 정보 확인
- 스마트폰에서 Target device의 결함 정보 및 수리요청을 확인

Printer
Business equipment

- Target Device에 Device ID와 고객 정보 및 기타 정보 등록
- Handover mode에서 표시하거나 출력하고 싶은 정보를 NFC Touch에 의하여 printer 또는 Projector등으로 출력
- 스마트폰에서 잉크상태 및 프로젝터의 램프 수명 등등의 변수 확인
- 스마트폰에서 Target device의 결함 정보 및 수리요청을 확인

Health care
device

- Target Device에 Device ID와 고객 정보 및 기타 정보 등록
- 스마트폰으로 건강 정보 확인하고 관련 정보를 서버 또는 스파트폰의 메모리에 저장, 관리
- 스마트폰으로 동작 제어
- 스마트폰에서 Target device의 결함 정보 및 수리요청을 확인

ESL/E-paper

- Target Device에 Device ID와 고객 정보 및 기타 정보 등록
- 스마트폰 or 전용 단말기로 가격 정보 제어 (display information)
- 스마트폰으로 동작 제어 후 server로 가격 정보 수정

■ 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

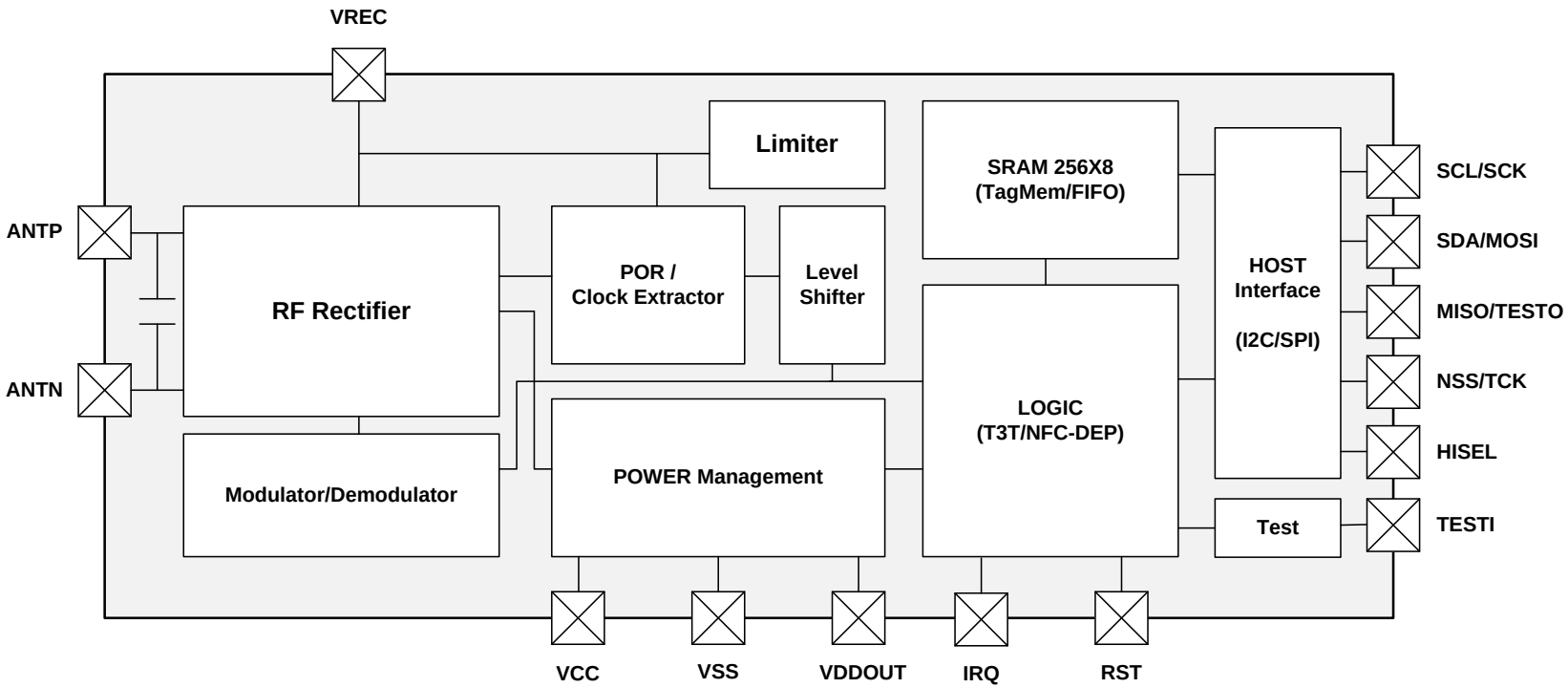
Power consumption minimization
- Optimized Logic and internal gated low frequency clock
- Minimized leakage and stand-by current

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

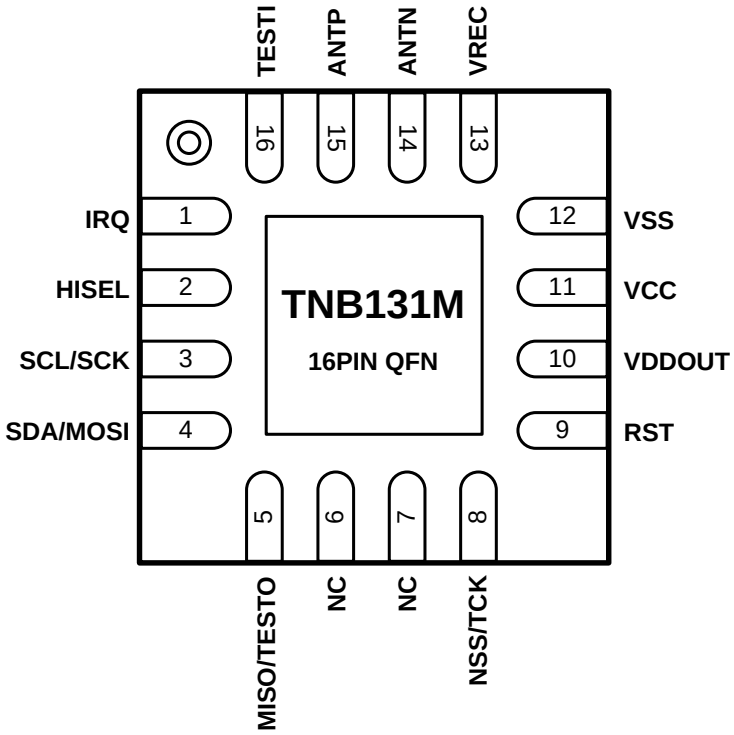
Frequency		13.56MHz
Protocol		ISO/IEC 18092 (JIS 6319-4)
Operating Temperature		-40 ~ 85°C
Power		1.6 ~ 3.6V
Host interface		I2C / SPI
NFC mode		NFCIP-1 target Type 3 tag emulation
Modulation		Load modulation
Memory	**Type**	SRAM / FIFO
	Size	256bytes
Data rate		212 / 424kbps (Selective data rate)
Special 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

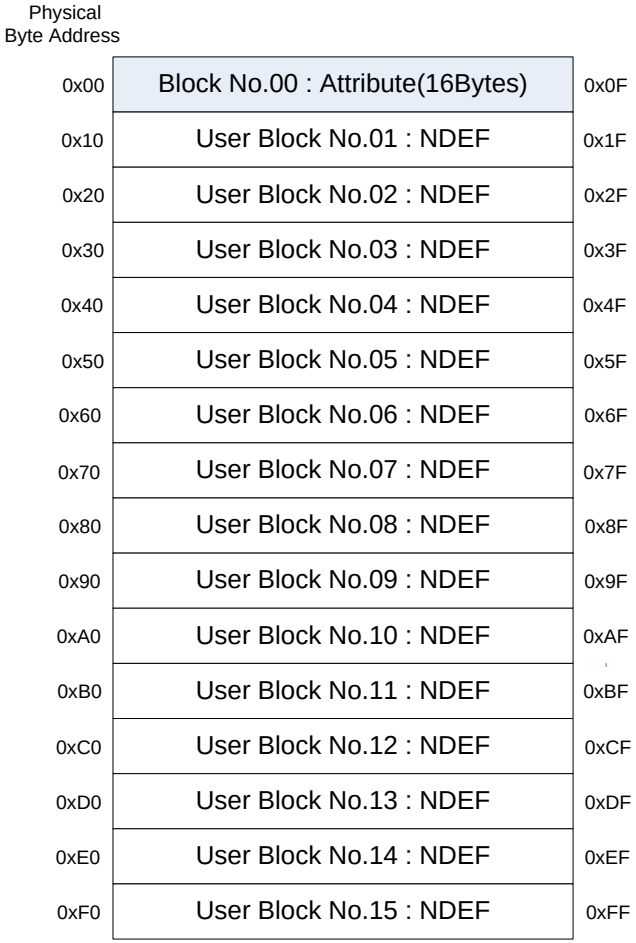
TNB131M uses 16pin QFN package. (3mm X 3mm)
Package physical dimension is as below.



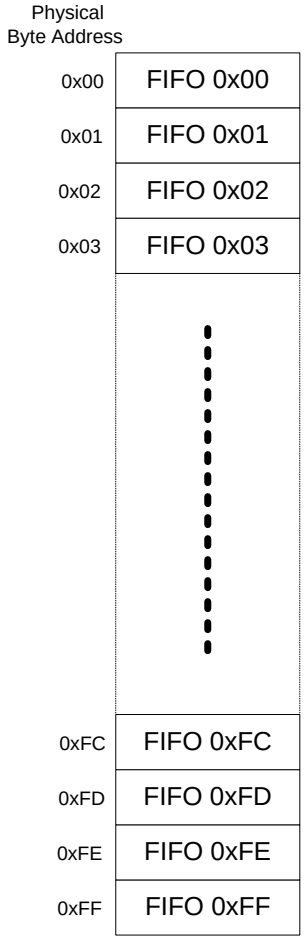
#	Name	Dir.	Description
1	IRQ	O	N-Bridge interrupt request
2	HISEL	I	Host Interface select (low: I2C, high: SPI)
3	SCL/SCK	I	I2C SCL / SPI SCK
4	SDA/MOSI	I/O	I2C SDA / SPI Master out Slave in
5	MISO/TESTO	O	SPI Master In Slave Out / Test output(*I2C)
6	NC	-	No Connection
7	NC	-	No Connection
8	NSS/TCK	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	ANTN	I	Antenna negative input
15	ANTP	I	Antenna positive input
16	TESTI	I	Test input

TNB131M SRAM Configuration

■ TNB131M Operating mode 별 SRAM(256 Bytes) Configuration



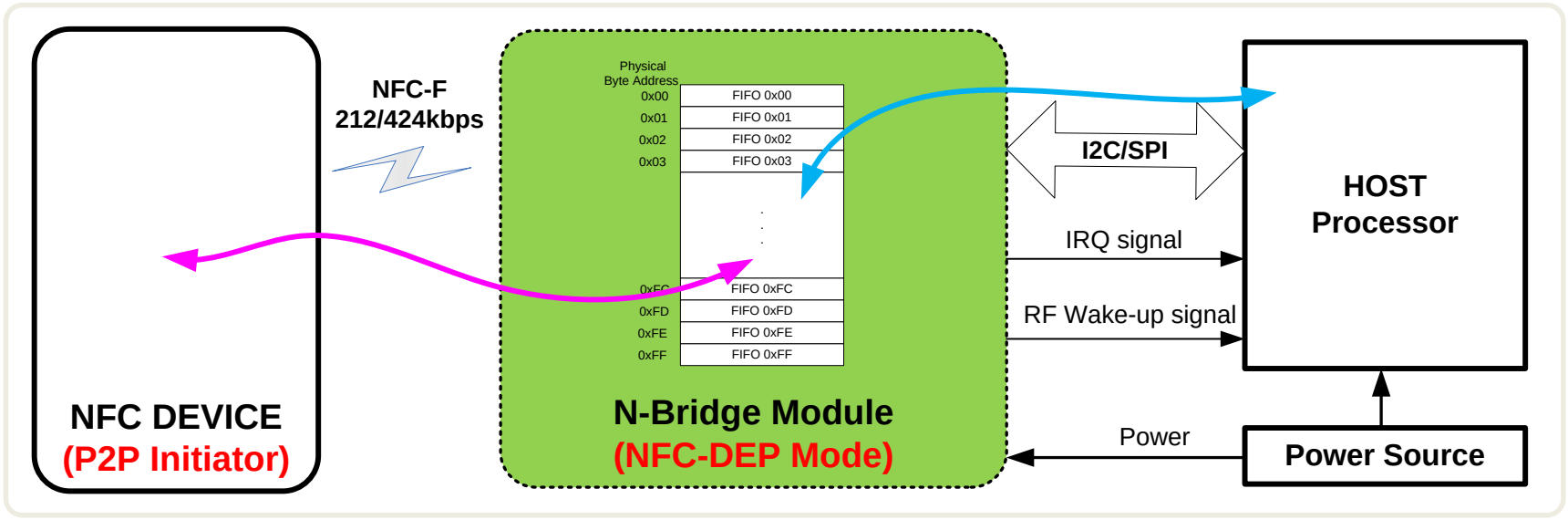
Type3 Tag Mode(T3T Mode)

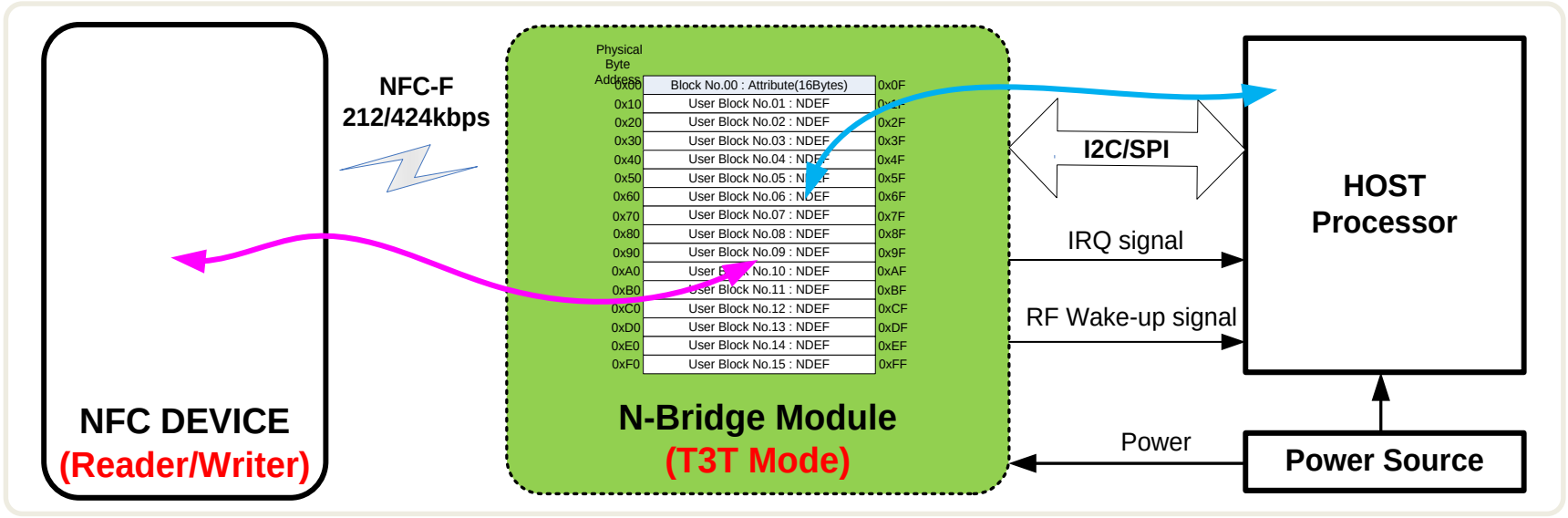


NFC-DEP Mode(P2P-Target)

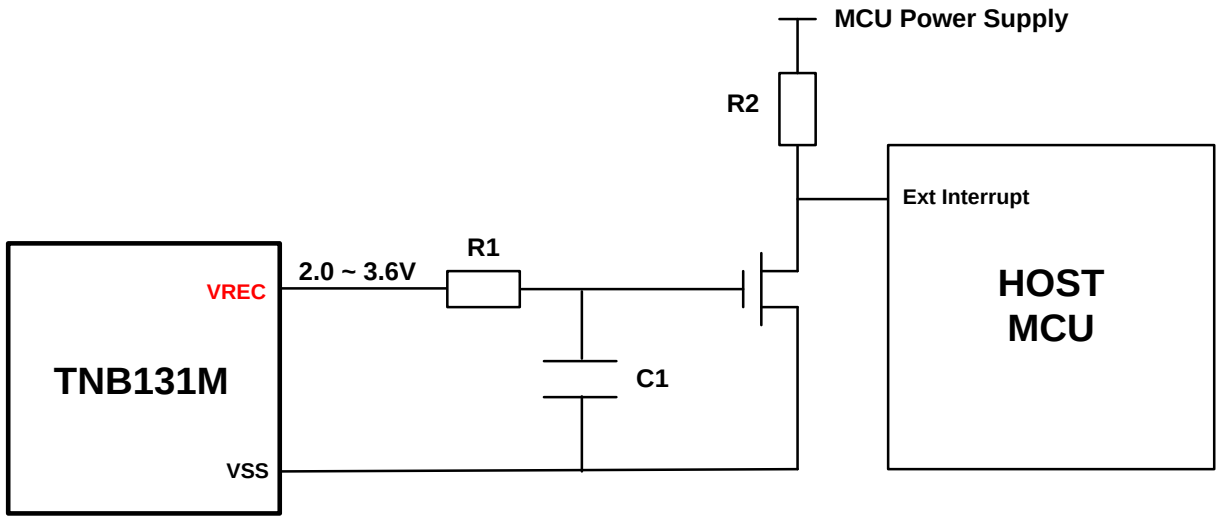
TNB131M Operating mode Architecture

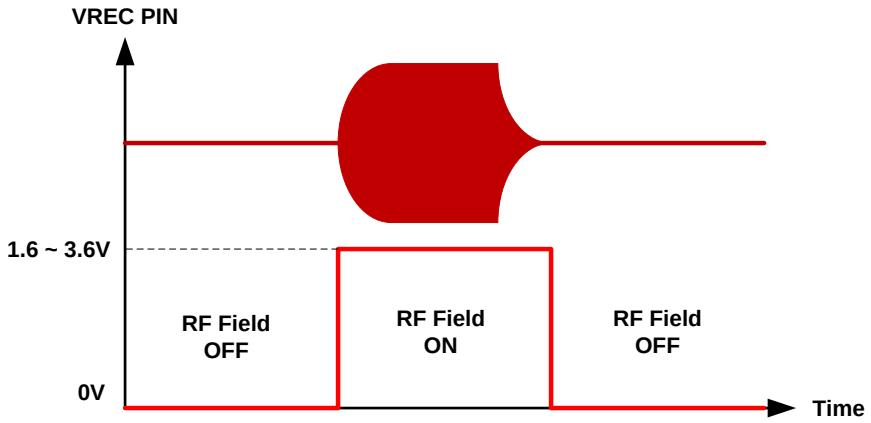
■ N-Bridge Operating mode Architecture





N-Bridge Wake up System used RF Detection



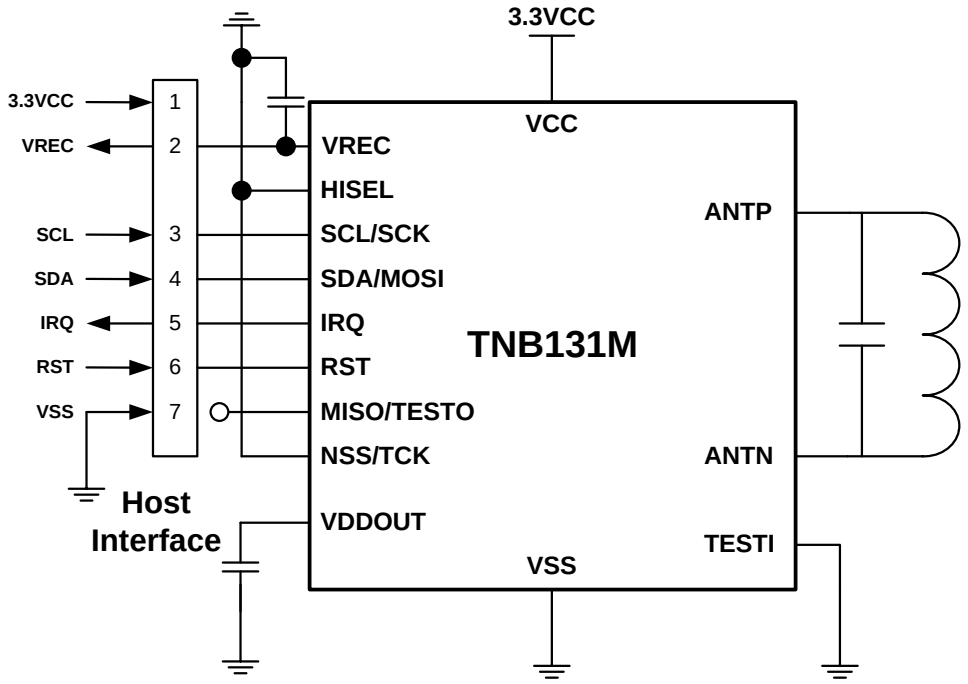


One of the important functions of TNB131M is generally to keep Host System in Stop/Idle or Sleep mode state and Wakeup Host System by using RF detection function.

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.

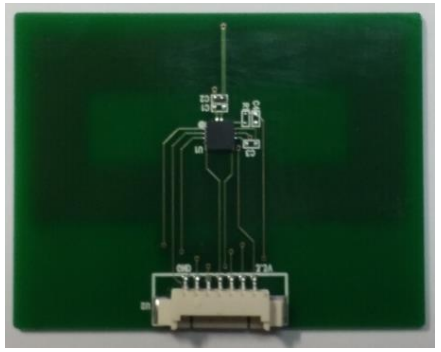
■ N-Bridge system (Module *H/W Example)

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

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