



N™ It's NFC



3alogics
E book 바로가기

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Smart NFC choice for your life

3ΛLogics

CEO Message

NFC has become a core technology in making the IoT World a reality.

With extensive IT SoC experiences, 3ALogics is dedicated in development of NFC IC & Dynamic Tag IC and making the IoT-World (BLE, Wireless Charging) a part of our lives. With our focus in NFC & IoT, 3ALogics is taking necessary steps to become a global leader in NFC SoC development.

Technology is changing quite rapidly turning yesterday's technology into an useless item overnight.

NFC technology is the same. Therefore, all our executives and employees are constantly updating technology movements while maintaining creativity in our new technology development and making efforts.

In addition, 3ALogics puts customer satisfaction the number one priority, believing that each customer's success is our own success story, therefore, emphasizing customer technical service.

Moreover, 3ALogics has implemented an internal management system to track business ethics for both executives and employees.

Corporate profits that transparently turns to profits for both employees and stockholders that is the system that I believe is a key success factor in making 3ALogics a global leader in NFC SoC.

Thank you

Best Regards, 3ALogics Inc.

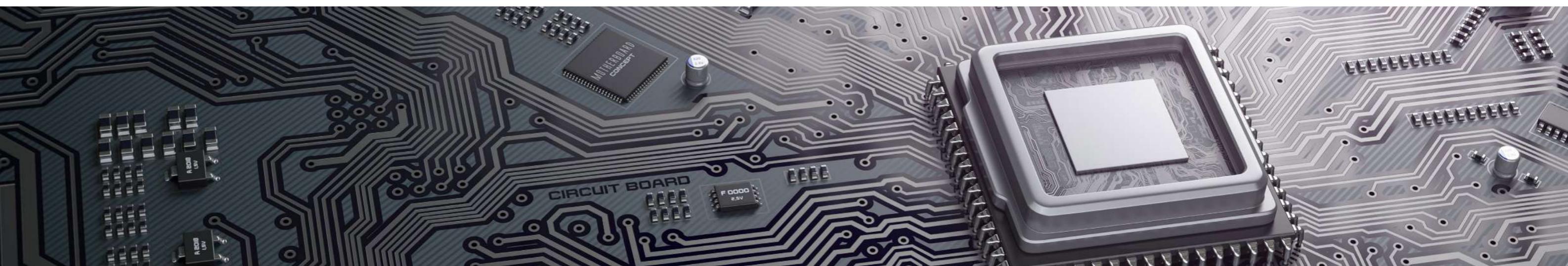
Co-representative

Pyeong-Han Lee. Kwang-Beom Park

CONTENTS



-
- 6 **NFC Reader IC**
TRH031M-S / TRH033M-S / TNR100 / TNR200
- 8 **NFC Tag IC**
TNB122M / TNB132M / TNP200M / TDP200M
TNB133M / TDB124M
- 10 **BLE + NFC IC**
TBL1000 / TSS1000
- 11 **IoT Module**
TBM-N200S / T4M-C200SD / TWM-D340S
- 12 **NFC Reader Module**
TRM-500 / TRM-700 / TRM-800N / TRM-900N
- 14 **NFC Study Kit**
RSK-100 / RSK-300 / NDK-100 / NBK-200
NBK-300
- 16 **NFC Label Tag**
TLTC1 / TLTC2 / TLTR1 / TTPLTR1 / TTPLTC1
-



TRH031M-S

13.56MHz HF Reader IC



Specifications		Features
Frequency	13.56MHz	· Performs Analog and Digital mixed operations as standards indicated
Protocol	ISO/IEC 14443 A/B, 15693, Tag-it Protocols	· Power consumption minimization - Hardware/Software power down function
Modulation Type	ASK 5~35% & ASK 100%	- Minimized leakage and stand-by current
Operating Range	Up to 10cm	· Functions for microprocessor interface
Supply Voltage	2.9V ~ 3.6V	- 128bytes FIFO buffer for immediate data storage - 4 type of Parallel interface and SPI Serial interface
Package	32pin LQFP (7.0mm x 7.0mm)	· Two Transmit driver can be configured - Auto calibration function for the analog receiver
		- Transmit power and modulation index configuration - Adjustable receiver sensitivity depends on noise condition - Data rate and pulse width configuration according to protocol standards

TRH033M-S

13.56MHz HF Reader IC



Specifications		Features
Frequency	13.56MHz	· Performs Analog and Digital mixed operations as standards indicated
Protocol	ISO/IEC 14443 A/B, 15693, Tag-it Protocols	· Power consumption minimization - Hardware/Software power down function
Modulation Type	ASK 5~35% & ASK 100%	- Minimized leakage and stand-by current
Operating Range	Up to 10cm	· Functions for microprocessor interface
Supply Voltage	2.9V ~ 3.6V	- 128bytes FIFO buffer for immediate data storage - 4 type of Parallel interface and SPI Serial interface
Package	32pin LQFP (7.0mm x 7.0mm)	· Two Transmit driver can be configured - Auto calibration function for the analog receiver
		- Transmit power and modulation index configuration - Adjustable receiver sensitivity depends on noise condition - Data rate and pulse width configuration according to protocol standards

TNR100

13.56MHz NFC Reader IC



Specifications		Features
Frequency	13.56MHz	· Basic information
Operating Temp	-40 ~ 125°C	- 13.56MHz Multi-protocol NFC Reader IC
Protocol	ISO/IEC 14443 A/B, 15693 Standards I-CODE, Tag-It, Felica, Jewel Protocols, ISO/IEC 18092	- Internal Card detector (include internal OSC: 50kHz)
Modulation Type	ASK 5~35% & ASK 100%	- Performs Analog and Digital mixed operation as standards indicated
Operating Range	Up to 10cm depending on Tag type	- Modulation/Demodulation, Encoding/Decoding
Supply Voltage	3.3V~5.0V TX Power 3.0V analog and logic power	- Framing and Collision Detection for Anti-collision
ESD(HBM)	8kV	- Functions for microprocessor interface
Host Interface	SPI/I2C	- 256 bytes FIFO buffer for immediate data storage
Internal LDO	Yes	- Configurable interrupt can inform event to microprocessor
Certification	AEC-Q100 (Grade1)	- Configurable and Adjustable timer function can cooperated with transceiver state and interrupt
Package	24pin QFN (4.0mm x 4.0mm)	- Power consumption minimization

TNR200

13.56MHz NFC Reader IC



Specifications		Features
Frequency	27.12MHz	· Operating mode: Reader/Writer and Card emulation, Active and passive peer to peer
Operating Temp	-40 ~ 125°C	- Active and passive peer to peer initiator and target modes, up to 424 kbit/s
Protocol	ISO/IEC 14443 A/B, 15693 Standards I-CODE, Tag-It, Felica, Jewel Protocols, ISO/IEC 18092	- Low power card detection
Modulation Type	ASK 5 ~ 35% & ASK 100%	- Low power NFC active and passive target modes
Operating Range	Up to 10cm depending on Tag type	- Transmitter - Improvement of RF-Power
Supply Voltage	1.62 ~ 5.5V (VBAT)	- RF shape control and Dynamic power control
Package	32pin QFN (4.0mm x 4.0mm)	- Active modulation for P2P - Receiver - Improvement of Sensitivity - I/Q Receiver Architecture - AGC(RSSI) Function - Calibration of Antenna tuning - 512-byte FIFO

NFC Tag IC

TNB122M

NFC Dynamic Tag IC



Specifications		Features
Frequency	13.56MHz	· Functions for microprocessor interface
Operating Temp	-40 ~ 85°C	- I2C slave (up to 400kHz)
Protocol	NFC Forum Type 2 Tag ISO/IEC 14443 A	- IRQ output to advise Tag status monitoring
Data Rate	106kbps	· Energy Harvesting
Supply Voltage	1.62V ~ 3.6V (VCC)	- Rectifier power out (VREC) up to 20mW, Not regulated
Host Interface	I2C	- Depending on external RF and antenna condition
Memory	1Kbyte EEPROM, 64byte SRAM	· Power consumption minimization
Package	8pin XQFN (1.6mm X 1.6mm)	- Optimized Logic and internal gated low frequency clock
		- Minimized leakage and stand by current
		· 32-bit Password protection to prevent unauthorized memory access
		- Lock and Capability Container (CC) byte with anti-tearing protection
		- Lock and CC bytes with OTP access bits

TDP200M

NFC Passive Tag IC



Specifications		Features
Frequency	13.56MHz / 860 ~ 960MHz	· Dual-band RF Interface
Operating Temp	-40~ 85°C	- Embedded 3.6Kbits NVM
Protocol	NFC Forum Type 2 Tag ISO/IEC 14443 A EPC Class1 Generation 2 ISO/IEC 18000-6 mode3	- Shared memory
Data Rate	106kbps (NFC) 640K/UL, 160K/DL (EPC)	· Detection function (3mode)
Interface	Open drain mode port	- RF detection & Tamper detection
Memory	3.6Kbits EEPROM	- LED alarm (Tag Select)
Memory Access Protection	32bit password	- 32bit access and kill passwords
UID	7-byte UID (NFC) 96bit TID (EPC)	
Package	DOW (Die on Wafer) 8pin XQFN (1.6mm X 1.6mm)	

TNB132M

NFC Dynamic Tag IC



Specifications		Features
Frequency	13.56MHz	· Functions for microprocessor interface
Operating Temp	-40 ~ 85°C	- I2C slave (up to 400kHz)
Protocol	NFC Forum Type 3 Tag JIS 6319-4	- IRQ output to advise Tag status monitoring
Data Rate	214 / 424kbps	· Energy Harvesting
Supply Voltage	2.0V ~ 3.6V (VCC)	- Rectifier power out (VREC) up to 20mW, Not regulated
Host Interface	I2C	- Depending on external RF and antenna condition
Memory	1Kbyte EEPROM, 64byte SRAM	· Power consumption minimization
Package	8pin XQFN (1.6mm X 1.6mm)	- Optimized Logic and internal gated low frequency clock
		- Minimized leakage and stand by current

TNB133M

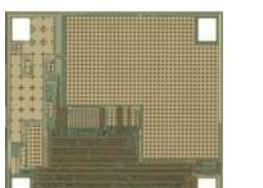
NFC Smart Tag IC



Specifications		Features
Frequency	13.56MHz	· 4 stage pipeline architecture, 12 times faster than the legacy 80C51/52
Operating Temp	-40~ 85°C	· Analog RF field detection and Wakeup
Protocol	NFC Forum Type 3 Tag JIS 6319-4	· Integrated RF tuning capacitor
Data Rate	212kbps	· 4-Channel 12bit-ADC with sensor trigger interface
Supply Voltage	2.0V ~ 3.6V	· Internal 1.8V LDO
Em-MCU	Flip8051-Cyclone	· Integrated PWM and Current Drive Sensor Interface Controller
Host Interface	UART/I2C	· Energy Harvesting
Memory	6Kbyte EEPROM, 2Kbyte RAM	- Up to 5.0mA @ 3.0 V (Harvesting VREC)
ETC Information	Em-12bit ADC, Sensor Interface, Internal LDO	- Depend on external antenna and RF Condition
Package	16pin QFN (4mm X 4mm)	

TNP200M

NFC Dynamic Tag IC



Specifications		Features
Frequency	13.56MHz	· Configurable RF field or Tamper detection Pin RTP
Operating Temp	-40~ 85°C	· True Anticollision
Protocol	NFC Forum Type 2 Tag	· Non-Volatile Memory
Data Rate	106kbps	- 184 bytes organized in 46 pages with 4 bytes per page
Interface	Open drain mode port	- 144 bytes for user data area (36 pages)
Memory	184byte LogicNVM(100,000 cycle endurance)	- 40 bytes for UID/CC/LO CK/System configuration area (10 pages)
Memory Access Protection	32bit password	- Password protection with optional limit of unsuccessful attempts
UID	7-byte UID	- Lock and Capability Container (CC) byte with anti-tearing protection
Package	DOW (Die on Wafer) *Au bump / 120μm thickness / On film carrier	- Lock and CC bytes with OTP access bits
		- Data retention of 10 years

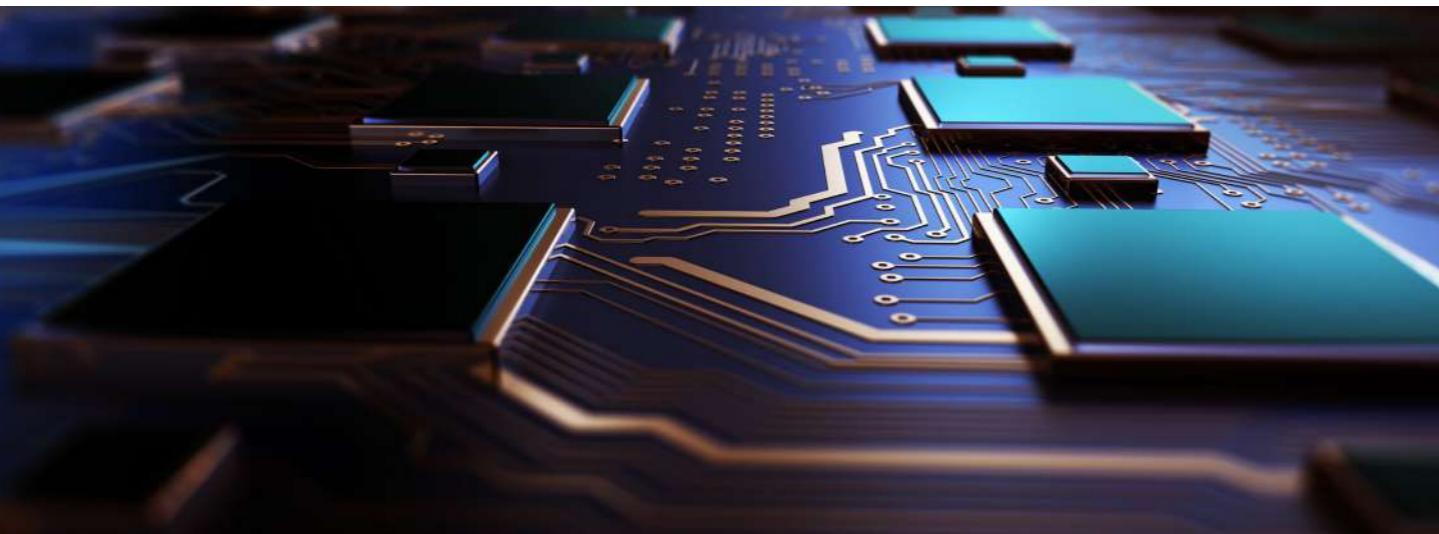
TDB124M

NFC Smart Tag IC



Specifications		Features
Frequency	13.56MHz / 860 ~ 960MHz	· Dual-band RF Interface
Operating Temp	-40 ~ 85°C	- Embedded NVM Memory
Protocol	NFC Forum Type 2 Tag ISO/IEC 14443 A EPC Class1 Generation 2 ISO/IEC 18000-6 mode3	- Shared memory (3.6Kbits)
Data Rate	106kbps(NFC) 640K/UL, 160K/DL(EPC)	- EEPROM 326bytes (Code & Data Configurable memory: default 32KB/4KB)
Supply Voltage	2.0V ~ 3.6V	· Internal Temperature Sensor / RTC
Em-MCU	RISC-V E20 Core	- Temperature range: -40~ 85°C / accuracy : ±0.5°C
Host Interface	UART, I2C	- RTC Clock accuracy: ±2%
Memory	32KB Program, 4KB data 8KB SRAM / 3.6Kbits Tag memory	- Configurable Temperature interval
ETC Information	12bit ADC, Sensor IO (ROIC) Temperature Sensor	- Embedded 12bit SAR ADC
Package	32pin QFN (4mm x 4mm)	- Embedded ROIC - Resistance / Capacitance / Inductance
		- Embedded LDO

BLE + NFC IC



TBL1000

BLE 5.0 SoC with NFC Dynamic Tag



Specifications		Features
Protocol	BLE5.0/802.15.4/2.4GHz Transceiver	<ul style="list-style-type: none"> Low Power Management: Rx 5.3mA, Tx 4.8mA @ 0dBm USB 2.0 Full speed
Tx Power	Up to +10dBm	<ul style="list-style-type: none"> Support ISP (In-System Programming) via USB
	-96/-93dBm@BLE 1/2Mbps	<ul style="list-style-type: none"> Embedded hardware AES and ECC
Rx Sensitivity	-101/-99dBm@BLE 125/500kbps	<ul style="list-style-type: none"> 14-bit 10-channel SAR-ADC Quadrature decoder
	-99.5dBm@IEEE802.15.4 250kbps	<ul style="list-style-type: none"> Embedded Temperature sensor NFC Type 3 dynamic Tag with I2C Slave interface with 1KB on-chip EEPROM
Memory	Flash 512KB, SRAM 64KB	
NFC Tag	13.56MHz NFC type 3 dynamic tag	
MCU	32-bit RISC	
Peripherals / Digital Interface	ADC, Temperature sensor / I2C, SPI, UART, GPIO	
Package	56pin QFN (7.0mm X 7.0mm)	

TSS1000

BLE 5.1 SoC with NFC Dynamic Tag & EPD Driver



Specifications		Features
Protocol	BLE5.1/802.15.4/2.4GHz Transceiver	<ul style="list-style-type: none"> BLE5.1 + IEEE802.15.4 RF Transceiver NFC Dynamic Tag
Tx Power	Up to +4dBm	<ul style="list-style-type: none"> EPD Driver Controller EPD DCDC Booster circuit
	-97dBm@BLE 1Mbps	<ul style="list-style-type: none"> Xtal-32MHz
Rx Sensitivity	-104dBm@BLE 125kbps	<ul style="list-style-type: none"> ARM Cortex-M4 32-bit processor & 192 KB Flash and 24 KB RAM
	-101dBm@IEEE802.15.4 250kbps	<ul style="list-style-type: none"> Analog and digital interfaces - Comparator, 14-bit SAR-ADC, I2C, SPI, UART, and GPIO.
Memory	Flash 192KB, SRAM 24KB	
NFC Tag	13.56MHz NFC type 3 dynamic tag	
MCU	ARM Cortex-M4 32-bit Processor	
Package	48pin LGA (9.0mm X 6.0mm)	

IoT Module

TBM-N200S

BLE Module



Specifications

Protocol	Bluetooth Low Energy 5.0
MCU	64MHz ARM Cortex-M4
Memories	192KB Flash, 24KB RAM
Power Management	3.0 ~ 3.6V Operation voltage 4.6mA Tx(0dBm), 4.6mA Rx(1Mbps)
Digital Interface	1UART, 4GPIOs (3.3V TTL Level)
Antenna	PCB Pattern Antenna
PCB Size	12mm x 24mm x 2.4mm

T4M-C200SD

447MHz Module



Specifications

Center Frequency	447.275MHz
MCU	8bit 8051
Max Tx Power	9dBm
Rx Sensitivity	-115 dBm
Operation Power	+3.3v
Operating Temperature	-10~ 50°C
PCB Size	58mm x 20mm x 6mm
Range	150m

TWM-D340S

Wi-Fi Module

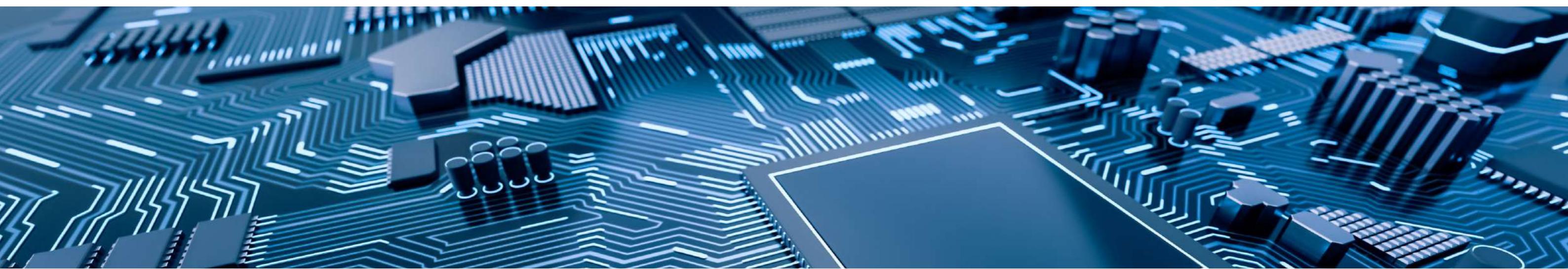


Specifications

Protocol	IEEE 802.11b/g/n
Wi-Fi Mode	Station, Soft AP
Frequency Range	2.4GHz, 20MHz channel bandwidth
Max Tx Power	19 dBm@1Mbps DSSS
Rx Sensitivity	-98dBm (802.11b 1Mbps)
MCU	40MHz Cortex-M4
ROM/SRAM/FLASH	256KB / 512KB / 4MB
Interface	2UARTs, SPI, I2C, GPIOs
Supply Voltage	3.0V ~ 3.6V
Antenna	PCB patch
PCB Size	54mm X 20.5mm X 6.8 mm



NFC Reader Module



TRM-500

13.56MHz Multi-Protocol Reader Module



Specifications		Features
Frequency	13.56MHz	· Supports Protocol
Protocol	ISO/IEC 14443 A/B, ISO/IEC 15693, Felica	- ISO/IEC 14443 A, B, ISO/IEC 15693, Felica
PCB Size	39mm x 20mm x 6.5mm	· 13.56MHz RFID Reader module
DC Power	5V	· Based on the TRH033M-S
TX driver Power	Max. 80mA	· Microcontroller – 8K byte Flash, 1K byte SRAM, 512byte EEPROM
Antenna	HF Loop antenna, 42mm x 27mm x 6.5mm Antenna cable 200 mm	· Separated antenna with board
Interface	RS232	· RS-232 Serial interface
Operating Range	Up to 70mm	
Operating Temp	-20 ~ 65°C	

TRM-800N

NFC Reader Module (Support ISO/IEC 18092-active P2P)



Specifications		Features
Frequency	13.56MHz	· Based on the TRH033M-S
PCB Size	52mm x 67mm x 4.5mm	· Separated antenna with board
DC Power	5V Max	· Supports Protocol
TX Driver Power	80mA	- ISO/IEC 14443 A, B, ISO/IEC 15693, Felica, Topaz, ISO/IEC 18092 (Active P2P)
Antenna	HF Loop antenna, 50mm x 37mm x 4.5mm Antenna cable 200 mm	· Support ISO/IEC 18092 (NFCIP-1) / ECMA 340
Interface	USB	- RFID Reader and Writer mode
Operating Range	Up to 70mm	- Peer to Peer mode
Operating Temp	-20 ~ 65°C	· Support all NFC Forum tags (Type1 , 2, 3, 4)
		· Active initiator and Active/Passive target mode according to ISO/ IEC 18092
		· Microcontroller- 8k byte Flash, 1K byte SRAM, 512byte EEPROM

TRM-700

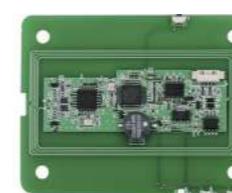
13.56MHz Multi-Protocol Reader Module



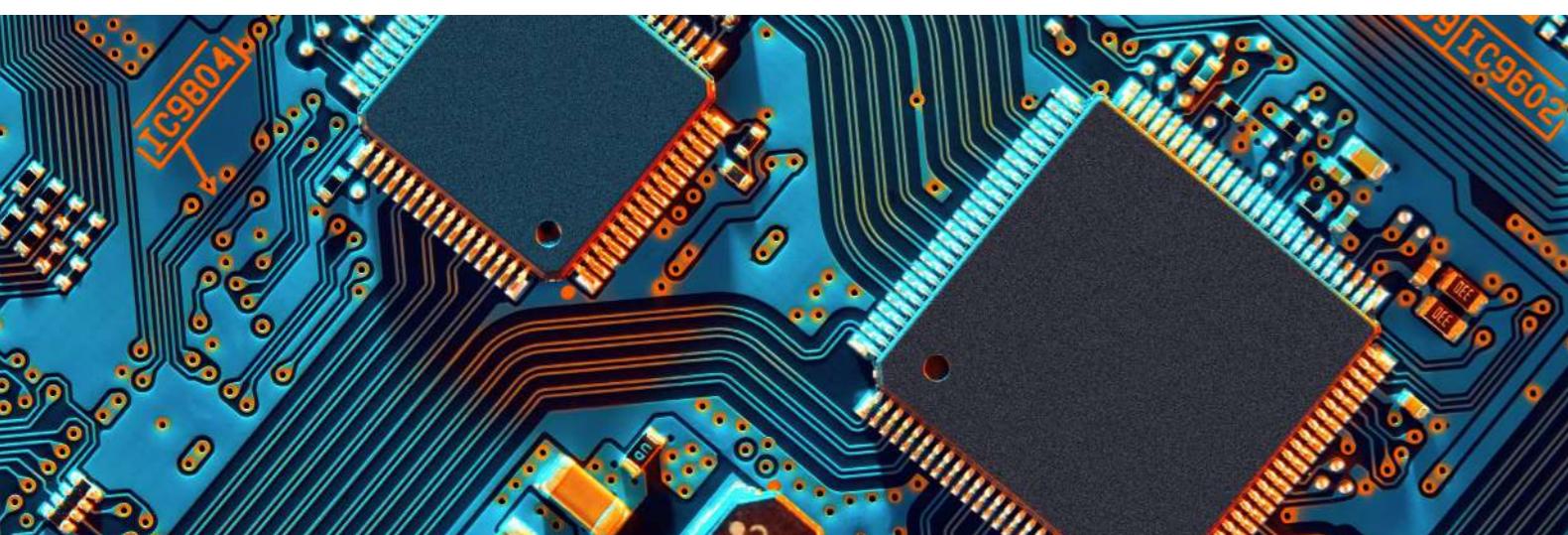
Specifications		Features
Frequency	13.56MHz	· Supports Protocol
Protocol	ISO/IEC 14443 A / B, ISO/IEC 15693 Felica	- ISO/IEC 14443 A, B, ISO/IEC 15693, Felica
PCB Size	30mm X 50mm X 11mm	· 13.56MHz RFID Reader module
DC Power	5V	· Based on the TRH033M-S
TX driver Power	Max. 80mA	· Microcontroller – 8k byte Flash, 1K byte SRAM, 512byte EEPROM
Antenna	HF Loop antenna, 28mm X 48mm	· On board HF Loop antenna
Interface	RS232	· RS-232 Serial interface
Operating Range	Up to 50mm	
Operating Temp	-20 ~ 65°C	

TRM-900N

NFC Reader Module (Support ISO/IEC 18092-active P2P)



Specifications		Features
Frequency	13.56MHz	· Based on the TRH033M-S
PCB Size	64mm x 84mm x 4.5mm	· On board HF Loop antenna
DC Power	5V Max	· Supports Protocol
TX Driver Power	100mA	- ISO/IEC 14443 A, B, ISO/IEC 15693, Felica, Topaz, ISO/IEC 18092 (Active P2P)
Antenna	HF Loop antenna 56mm x 62mm	· Support ISO/IEC 18092 (NFCIP-1) / ECMA 340
Interface	USB	- RFID Reader and Writer mode
Operating Range	Up to 50mm	- Peer to Peer mode
Operating Temp	-20 ~ 65°C	· Support all NFC Forum tags (Type1 , 2, 3, 4)
		· Active initiator and Active/Passive target mode according to ISO/ IEC 18092
		· Microcontroller- 8k byte Flash, 1K byte SRAM, 512byte EEPROM



RSK-100

13.56MHz Multi-Protocol Reader Kit / TRH031M-S Evaluation Kit



Specifications		MCU Feature
Frequency	13.56MHz	· Microcontroller with 256K byte RAM, 64K byte ROM
Protocol	ISO/IEC 14443 A/B, 15693, Tag-it	· On board HF Antenna Coil · 16 X 2 Character LCD module
Reader Size	Standards 110mm x 74mm (L x W)	
Antenna Size	80mm x 53mm (L x W)	
DC Power	5V (DC jack)	
Interface	RS232	
Operating Range	Up to 10cm depending on Tag type	

RSK-300

13.56MHz Multi-Protocol Reader Kit / TRH033M-S Evaluation Kit



Specifications		MCU Feature
Frequency	13.56MHz	· Microcontroller with 256K byte RAM, 64K byte ROM
Protocol	ISO/IEC 14443 A/B, 15693, Standards I-CODE, Tag-it, Felica, Jewel Protocols	· On board HF Antenna Coil · 50ohm Matching Antenna system
Reader Size	110mm x 74mm (L x W)	
Antenna Size	80mm x 53mm (L x W)	
Balun Module Size	20mm x 20mm (L x W)	
DC Power	5V (DC jack)	
Interface	RS232	
Operating Range	Up to 10cm depending on Tag type	

NDK-100

13.56MHz Multi-Protocol Reader Kit / TNR100 Evaluation Kit



Specifications	MCU Feature
Frequency	13.56MHz
Protocol	ISO/IEC14443 A/B, ISO/IEC15693, ISO/IEC18092, Felica, Tag-It, Jewel, HCE
PCB Size	172mm x 60mm (L x W)
DC Power	5V (USB)
Interface	USB
Operating Range	Up to 10cm depending on Tag type

NBK-200

13.56MHz NFC Dynamic Tag / TNB132M Evaluation Kit



Specifications	MCU Feature
Frequency	13.56MHz
Protocol	NFC Forum's NFC-F Technology & Tag Type3
Operating Temp	-40 ~ 85°C
Power	5V USB or 3.3V DC Power
Host interface	UART interface (3.3V TTL Level)
Operating Range	Typ. 5mm ~ 20mm

NBK-300

13.56MHz NFC Dynamic Tag / TNB133M Evaluation Kit



Specifications	MCU Feature
Frequency	13.56MHz
Protocol	NFC Forum's NFC-F Technology & Tag Type3
Operating Temp	-40 ~ 85°C
Power	5V DC Power (USB Power)
Host interface	USB 2.0 full speed interface *Virtual COM (Serial communication)
Dimension	NBK-300Dongle: 45mm X 65mm X 12mm Class3 Antenna: 45mm X 73mm X 9mm

NFC Label Tag

TLTC1

Label Tag



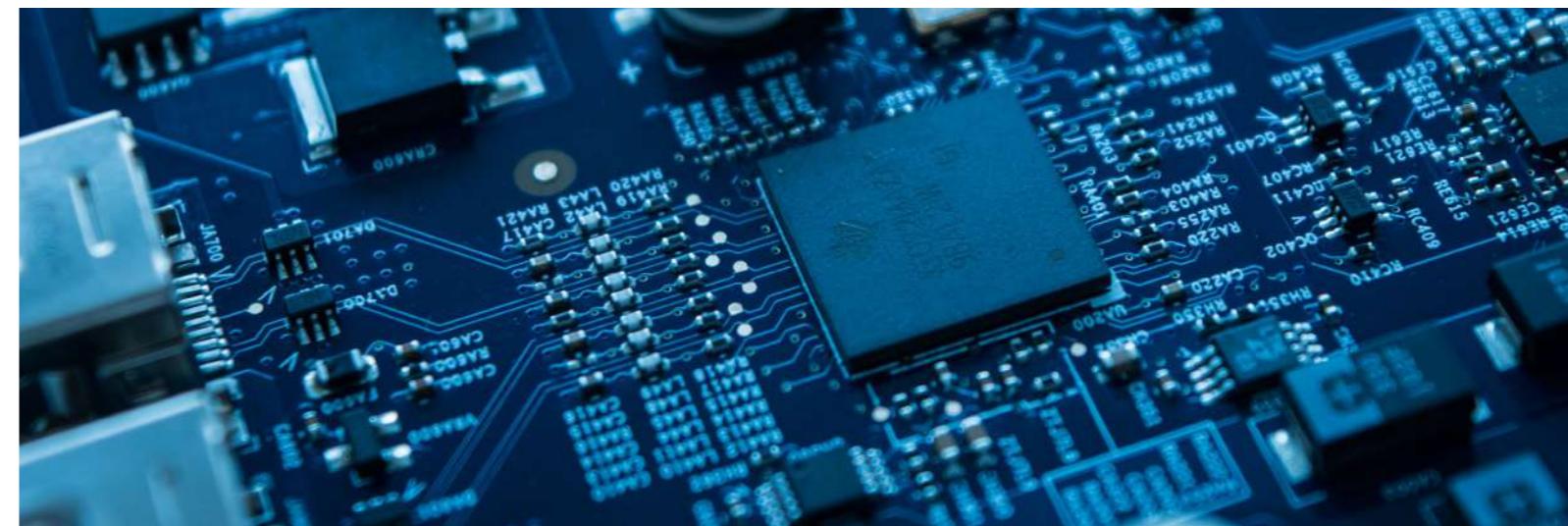
Tag Overview

Antenna Materials	Al foil on PET
Operation Frequency	13.56 (HF)
ACP	AC 265
IC	TNP200M
Antenna size	15Φ (±0.2 Φ)

Side View of Wet Inlay

Inlay Layout (mm)	No.	Thickness	Material
1. Substrate	1		White coated paper 68um
2. Adhesive	2		Acryl 16um
3. Adhesive	3	0.298 mm	Silicone 120um
4. Antenna	4		Aluminum + PET 78um
5. Adhesive	5		Acryl 16um
6. Liner	6	0.053 mm	60g/m ² , Release paper

TLT-Series



TLTC2

Label Tag



Tag Overview

Antenna Materials	Al foil on PET
Operation Frequency	13.56 (HF)
ACP	AC 265
IC	TNP200M
Antenna size	20Φ (±0.2 Φ)

Side View of Wet Inlay

Inlay Layout (mm)	No.	Thickness	Material
1. Substrate	1		White coated paper 68um
2. Adhesive	2		Acryl 16um
3. Chip	3	0.298 mm	Silicone 120um
4. Antenna	4		Aluminum + PET 78um
5. Adhesive	5		Acryl 16um
6. Liner	6	0.053 mm	60g/m ² , Release paper

TTPLTR1 Tamper proof Label Tag



Tag Overview

Antenna Materials	Al foil on PET
Operation Frequency	13.56 (HF)
ACP	AC 265
IC	TNP200M
Antenna size	16mm x 55mm (±0.2 mm)

Side View of Wet Inlay

Inlay Layout (mm)	No.	Thickness	Material
1. Substrate	1		White coated paper 68um
2. Adhesive	2		Acryl 16um
3. Chip	3	0.298 mm	Silicone 120um
4. Antenna	4		Aluminum + PET 78um
5. Adhesive	5		Acryl 16um
6. Liner	6	0.053 mm	60g/m ² , Release paper

TTPLT-Series

TLTR1

Label Tag



Tag Overview

Antenna Materials	Al foil on PET
Operation Frequency	13.56 (HF)
ACP	AC 265
IC	TNP200M
Antenna size	33mm x 33mm (±0.2 mm)

Side View of Wet Inlay

Inlay Layout (mm)	No.	Thickness	Material
1. Substrate	1		White coated paper 68um
2. Adhesive	2		Acryl 16um
3. Chip	3	0.298 mm	Silicone 120um
4. Antenna	4		Aluminum + PET 78um
5. Adhesive	5		Acryl 16um
6. Liner	6	0.053 mm	60g/m ² , Release paper

TTPLTC1 Tamper proof Label Tag



Tag Overview

Antenna Materials	Al foil on PET
Operation Frequency	13.56 (HF)
ACP	AC 265
IC	TNP200M
Antenna size	53mm x 23mm (±0.2 mm)

Side View of Wet Inlay

Inlay Layout (mm)	No.	Thickness	Material
1. Substrate	1		PET 38um
2. Antenna	2		Aluminum 40um
3. IC	3	0.218 mm	Silicone 120um
4. Adhesive	4		Acryl 20um
5. Liner	5	0.065 mm	80g/m ² , White adhesive glassine paper



SMART NFC CHOICE FOR YOUR LIFE



3ALogics is a fabless semiconductor company specializing in 'Near Field Communication (NFC) ICs' and has grown with customers with "customer satisfaction" as its highest value.

3ALogics has numerous titles of "first time in Korea" and has been selected as "Hidden Champion 100(Materials, Components, Equipment)" and "BIG3 (System Semiconductor Field)" in recognition of its core capabilities.

3ALogics will provide NFC ICs and integrated solutions that meet market needs, such as Access Control, Automotive, ESL, Healthcare, Authentication, Cold Chain, Smart Logistics, and become a global IoT enterprise.

