

nRF52832_DM-S Module

Rev 1.2

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Contributors

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Document History

Version	Date	Title
Rev 1.0	Mar. 15, 2021	- Initial Document
Rev 1.1	Mar. 30. 2021	- Reflow
Rev 1.2	Sep. 30. 2021	- KC Registration



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1. Introduction

Nordic 사의 nRF52832 을 이용한 BLE5.x SMD Type module 이다.

nRF52832_DM_REV1.0 은 nRF52832 chipset 을 기본으로 하여 mobile 제품, 또는 smart watch 등과 같이 소형화를 요구하는 제품에 적용하기에 적합하도록 구성하여 제공할 수 있도록 디자인되었다.

이 module 은 nRF52832-QFAA 를 장착하여 one chip solution 을 기반으로 설계되었고, SPI 통신을 통해 external core 를 사용하여 제어가 가능하도록 설계되었다. 기존의 nRF52832_DM-S_REV1.0 에서 HID, Central, Peripheral 기능을 추가하여 재개발하게 되었으며 이로 인해 적용범위를 넓히고자 한다.

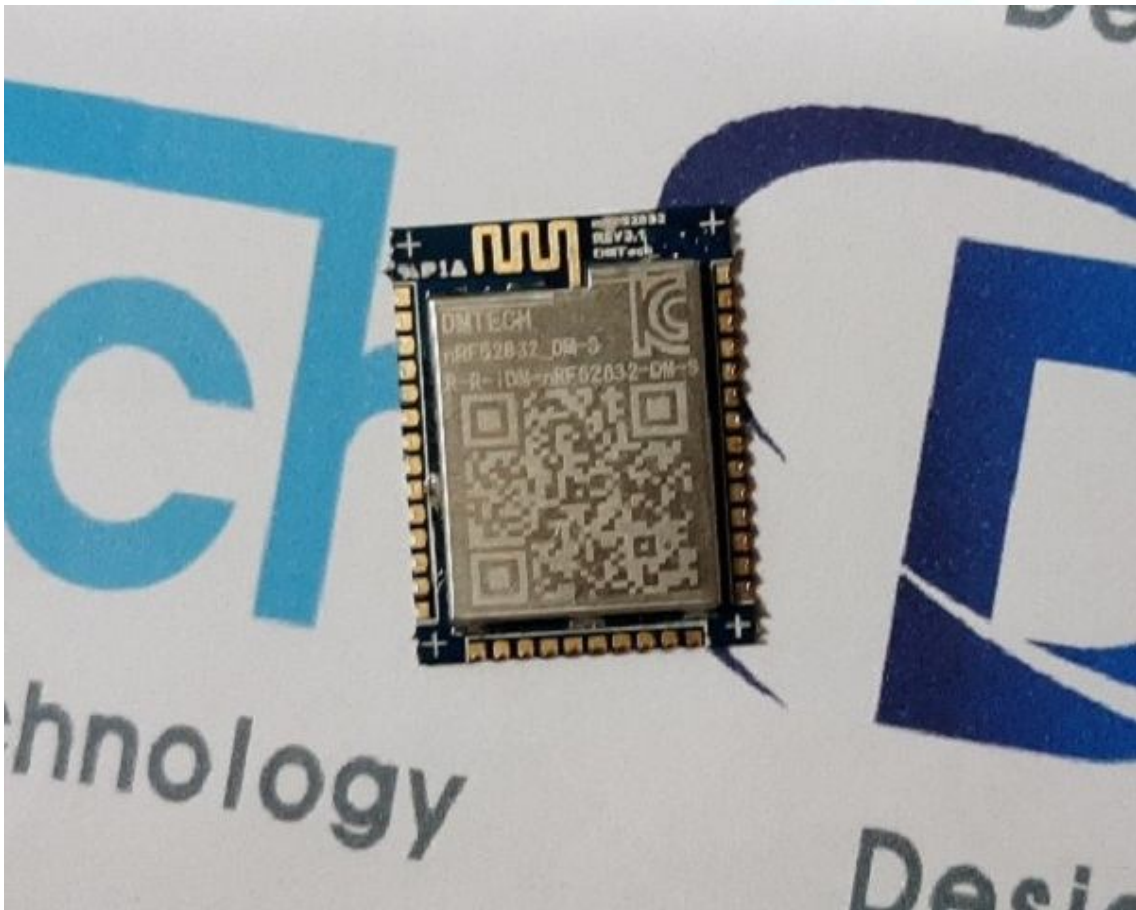


Figure 1 nRF52832_DM-S Module

nRF52832 의 기본적인 사양은 Nordic 사 <http://www.nordicsemi.com> 를 통해서 확인 할 수 있다.

1.1 Key Features

- 2.4 GHz transceiver
 - -96 dBm sensitivity in *Bluetooth*® low energy mode
 - Supported data rates: 1 Mbps, 2 Mbps *Bluetooth*® low energy mode
 - -20 to +4 dBm TX power, configurable in 4 dB steps
 - On-chip balun (single-ended RF)
 - 5.3 mA peak current in TX (0 dBm)
 - 5.4 mA peak current in RX
 - RSSI (1 dB resolution)
- ARM® Cortex®-M4 32-bit processor with FPU, 64 MHz
 - 215 EEMBC CoreMark® score running from flash memory
 - 58 µA/MHz running from flash memory
 - 51.6 µA/MHz running from RAM
 - Data watchpoint and trace (DWT), embedded trace macrocell (ETM), and instrumentation trace macrocell (ITM)
 - Serial wire debug (SWD)
 - Trace port
- Flexible power management
 - 1.7 V–3.6 V supply voltage range
 - Fully automatic LDO and DC/DC regulator system
 - Fast wake-up using 64 MHz internal oscillator
 - 0.3 µA at 3 V in System OFF mode
 - 0.7 µA at 3 V in System OFF mode with full 64 kB RAM retention
 - 1.9 µA at 3 V in System ON mode, no RAM retention, wake on RTC
- Memory
 - 512 kB flash/64 kB RAM
 - 256 kB flash/32 kB RAM
- Nordic SoftDevice ready
- Support for concurrent multi-protocol

- Type 2 near field communication (NFC-A) tag with wakeup-on-field and touch-to-pair capabilities
- 12-bit, 200 ksps ADC - 8 configurable channels with programmable gain
- 64 level comparator
- 15 level low power comparator with wakeup from System OFF mode
- Temperature sensor
- 32 general purpose I/O pins
- 3x 4-channel pulse width modulator (PWM) unit with EasyDMA
- Digital microphone interface (PDM)
- 5x 32-bit timer with counter mode
- Up to 3x SPI master/slave with EasyDMA
- Up to 2x I2C compatible 2-wire master/slave
- I2S with EasyDMA
- UART (CTS/RTS) with EasyDMA
- Programmable peripheral interconnect (PPI)
- Quadrature decoder (QDEC)
- AES HW encryption with EasyDMA
- Autonomous peripheral operation without CPU intervention using PPI and EasyDMA
- 3x real-time counter (RTC)
- Single crystal operation
- Package variants
 - QFN48 package, 6 × 6 mm
- nRF52832_DM-S Package Type
 - half through hole SMD Type 1.27mm Pitch 38Pin
 - SIZE : 23(L) x 18(W) x 2.9(H) mm Compact Size

1.2 Applications

- Internet of Things (IoT)
 - Home automation
 - Sensor networks
 - Building automation
 - Industrial
 - Retail
- Personal area networks
 - Health/fitness sensor and monitor devices
 - Medical devices
 - Key fobs and wrist watches
- Interactive entertainment devices
 - Remote controls
 - Gaming controllers
- Beacons
- A4WP wireless chargers and devices
- Remote control toys
- Computer peripherals and I/O devices
 - Mouse
 - Keyboard
 - Multi-touch trackpad
 - Gaming

2. nRF52832_DM-S Module 의 사양

nRF52832_DM-S module 은 Nordic 사의 nRF52832_QFAA chipset 을 사용하여 설계하였다.

2.1 nRF52832_DM-S Module

Module 사이즈는 23.0*18.0mm, 0.8T 로 제작하여 mobile type 에 적용가능 하도록 소형화 하는데 목적을 두고 제작하였다.

Pin out 은 최대한 가용할 수 있는 Pin 을 사용 가능하도록 설계 하였다.

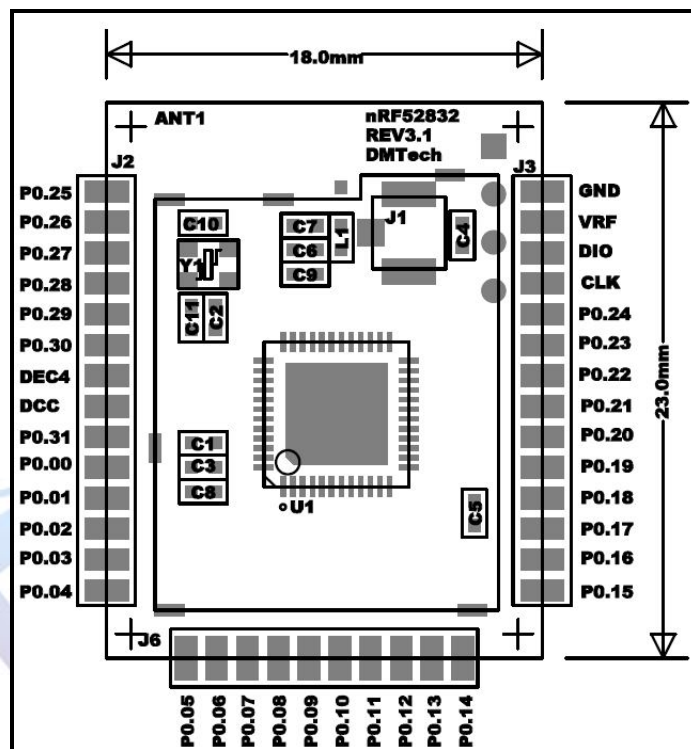


Figure 2 nRF52832_DM-S Module Dimension

2.2 nRF52832_DM-S Pin Assignment

Table 1 Supply & Programming Terminal Description

Pin Name	Pin Number	Type	DESCRIPTION
GND	38	GND	GND
VRF	37	VRF	Supply voltage range 1.8 V to 3.6 V
DIO	36	Digital Input	Hardware debug and flash programming I/O.
CLK	35	Digital I/O	Hardware debug and flash programming I/O.

Table 2 I/O terminal Description_1

Pin Name	Pin Number	Type	DESCRIPTION
P0.25	1	Digital I/O	General purpose I/O pin.
P0.26	2	Digital I/O	General purpose I/O pin.
P0.27	3	Digital I/O	General purpose I/O pin.
P0.28	4	Digital I/O Analog input	General purpose I/O pin. ADC/LPCOMP input 4.
P0.29	5	Digital I/O Analog input	General purpose I/O pin. ADC/LPCOMP input 5.
P0.30	6	Digital I/O Analog input	General purpose I/O pin. ADC/LPCOMP input 7.
DEC4	7	Digital I/O Analog input	General purpose I/O pin. ADC/LPCOMP input 7.
DCC	8		
P0.31	9	Digital I/O Analog input	General purpose I/O pin. ADC/LPCOMP input 7.
P0.00	10	Digital I/O XL1	General purpose I/O pin. Connection for 32.768 kHz crystal.
P0.01	11	Digital I/O XL2	General purpose I/O pin. Connection for 32.768 kHz crystal
P0.02	12	Digital I/O Analog input	General purpose I/O pin. SAADC/COMP/LPCOMP input.
P0.03	13	Digital I/O Analog input	General purpose I/O pin. SAADC/COMP/LPCOMP input.
P0.04	14	Digital I/O Analog input	General purpose I/O pin. SAADC/COMP/LPCOMP input.
P0.05	15	Digital I/O Analog input	General purpose I/O pin. SAADC/COMP/LPCOMP input.
P0.06	16	Digital I/O	General purpose I/O pin.
P0.07	17	Digital I/O	General purpose I/O pin.
P0.08	18	Digital I/O	General purpose I/O pin.
P0.09 NFC1	19	Digital I/O NFC Input	General purpose I/O pin. NFC antenna connection.

Table 3 I/O terminal Description_2

Pin Name	Pin Number	Type	DESCRIPTION
P0.09 NFC2	19	Digital I/O NFC Input	General purpose I/O pin. NFC antenna connection.
P0.11 UART_TX	21	Digital I/O	General purpose I/O pin. UART RX Port, PULL-UP
P0.12 UART_RX	22	Digital I/O	General purpose I/O pin. UART TX Port.
P0.13	23	Digital I/O	General purpose I/O pin.
P0.14	24	Digital I/O	General purpose I/O pin.
P0.15	25	Digital I/O	General purpose I/O pin.
P0.16	26	Digital I/O	General purpose I/O pin.
P0.17	27	Digital I/O	General purpose I/O pin.
P0.18	28	Digital I/O	General purpose I/O pin.
P0.19	29	Digital I/O	General purpose I/O pin.
P0.20	30	Digital I/O	General purpose I/O pin.
P0.21	31	Digital I/O	General purpose I/O pin.
P0.22	32	Digital I/O	General purpose I/O pin.
P0.23	33	Digital I/O	General purpose I/O pin.
P0.24	34	Digital I/O	General purpose I/O pin.

3. AT Command List

3.1 UART 통신 TEST

Table 4 통신 TEST

	CAMMAND	RESPONSE
예제)	AT+	OK

3.2 BAUD RATE / PARITY 변경

Table 5 BAUD RATE / PARITY 변경

	CAMMAND	RESPONSE
	AT+B_<X><Y>	OK_<R><P>
예제)	AT+B_6N	OK_19200None

Table 6 Baud Rate

<X>	<R>
1	1200
2	2400
3	4800
4	9600
5	14400
6	19200 (Default)
7	38400
8	57600
9	115200

Table 7 Parity

<Y>	<P>
N	None
E	Even

3.3 DEVICE NAME 변경

Table 8 DEVICE NAME 변경

	CAMMAND	RESPONSE
	AT+N_<NAME>	OK_<NAME>
예제)	AT+N_DM-123456789A	OK_DM-123456789A

<NAME> : 영문자(대/소문자 구분), 숫자, 기호를 포함하여 13글자까지 가능하다.

3.4 DEVICE 정보 (VERSION/NAME) 가져오기

Table 9 DEVICE 정보(VERSION/NAME) 가져오기

	CAMMAND	RESPONSE
	AT+V	OK_<Ver> <NAME>
예제)	AT+V	OK_V1.0.0/DM-123456789A

3.5 기타

Factory Default UART Setting : 19200, N, 8, 1

모든 명령의 마지막에는 0x5C(W)를 추가해야 한다.

AT COMMAND 실행 후 전원을 재 인가해야 변경 내용이 적용된다.

3.6 AT COMMAND 예제

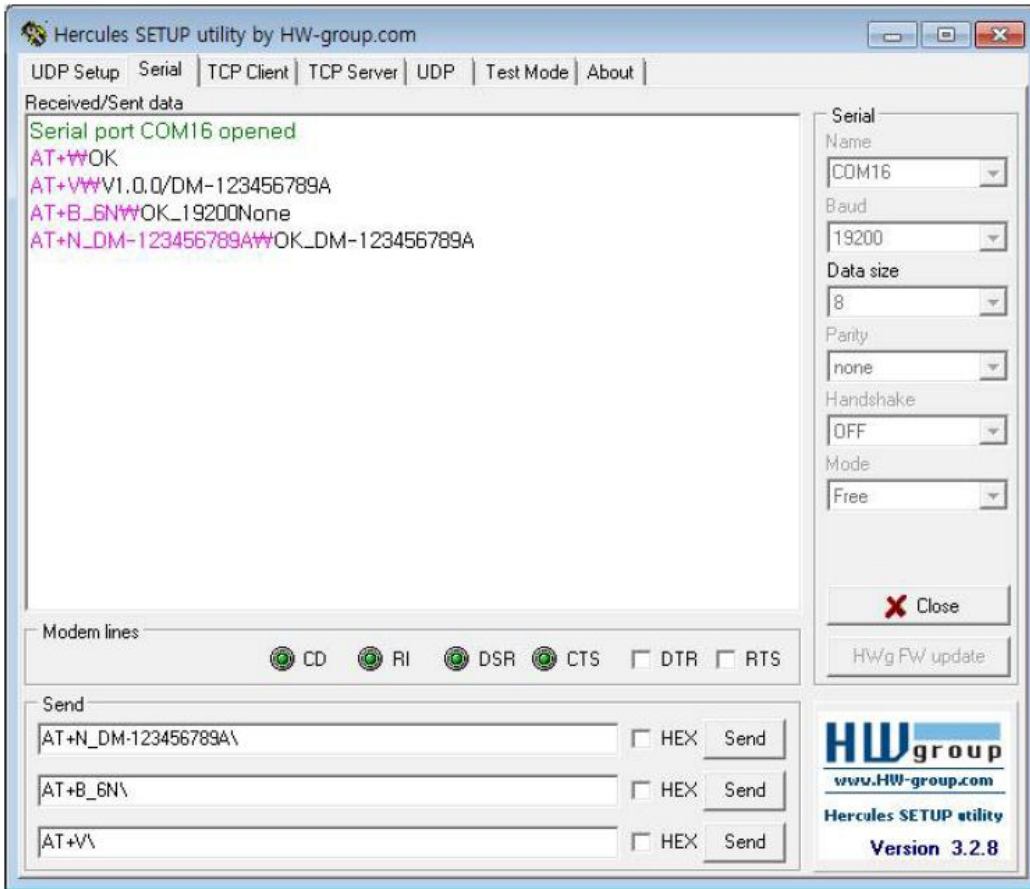


Figure 3 AT Command 예제

4. Dimension

4.1 nRF52832_DM-S Module ㄹ Dimension

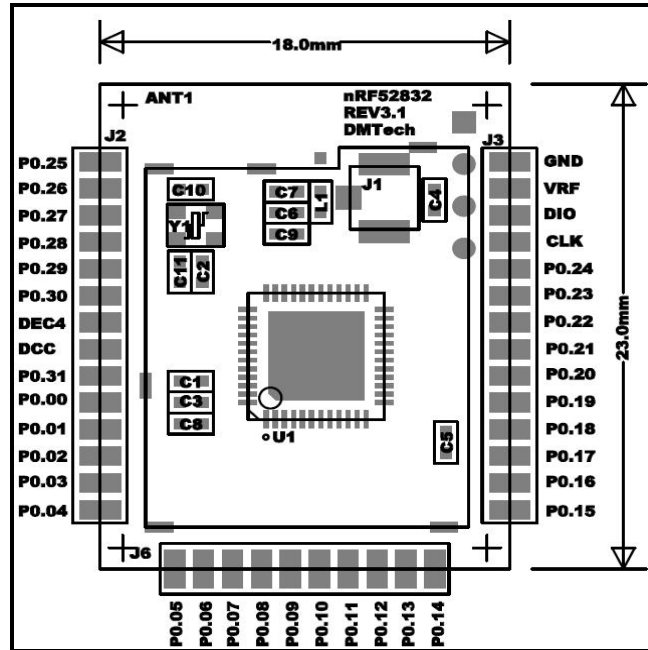


Figure 4 Dimension

4.2 nRF52832_DM-S Module ㄹ REFERENCE NUMBER SILK

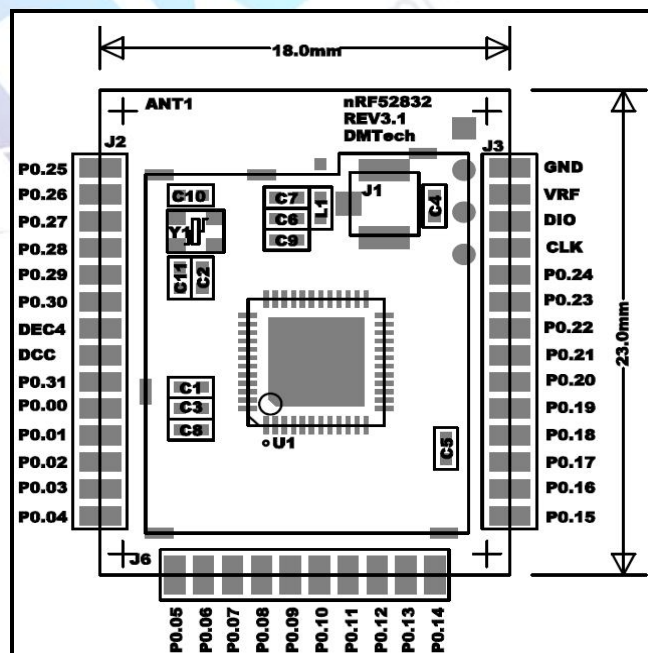


Figure 5 Reference Number Silk

4.3 nRF52832_DM-S Module PCB Footprint

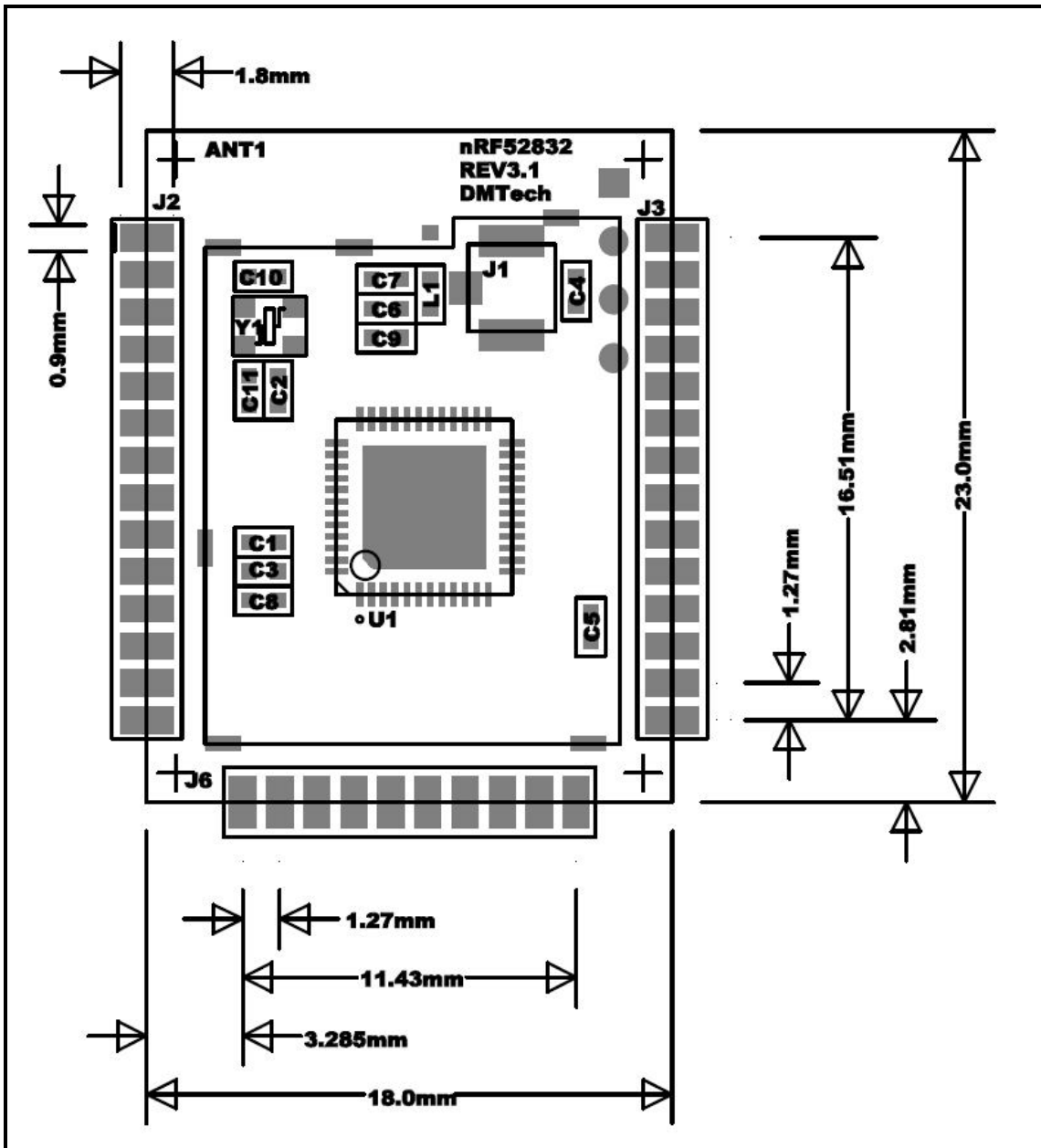


Figure 6 PCB Footprint

4.4 Reflow Soldering

일반적인 증가 속도는 최대 3°C / 초입니다.
Reflow 최대 온도는 250 ° C를 초과하지 않아야 합니다.
최소 3-zone 이상의 열전대를 사용하는 것이 좋습니다.
무 세정 페이스트를 권장합니다.

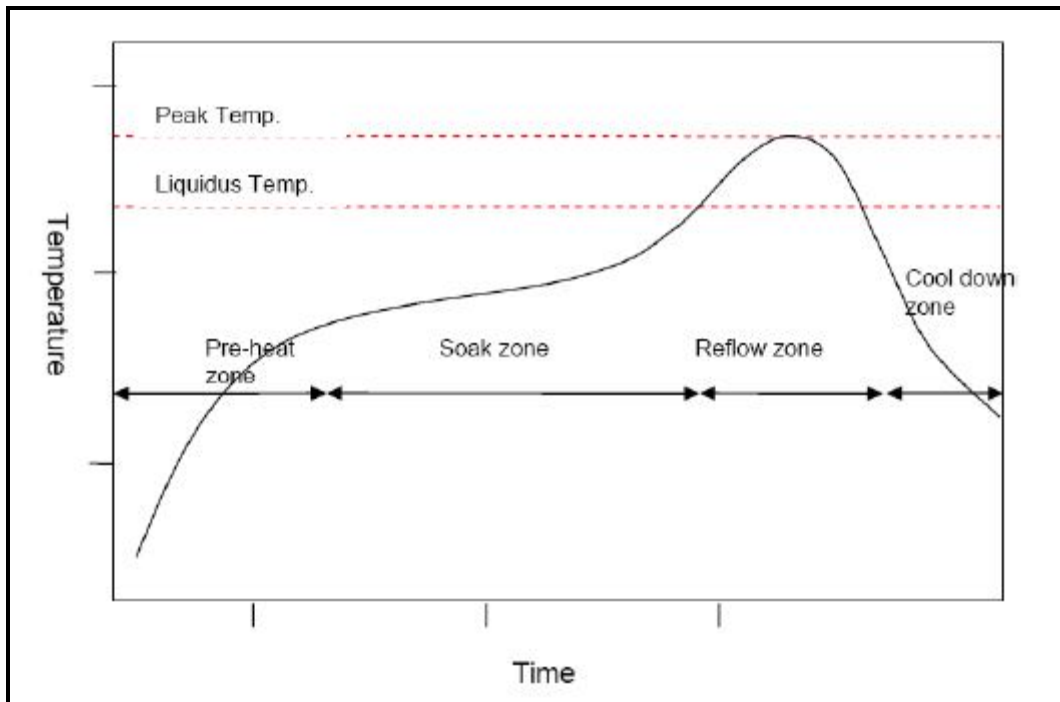


Figure 7 Typical convection reflow soldering phases and profile.

5. Basic Application Schematic

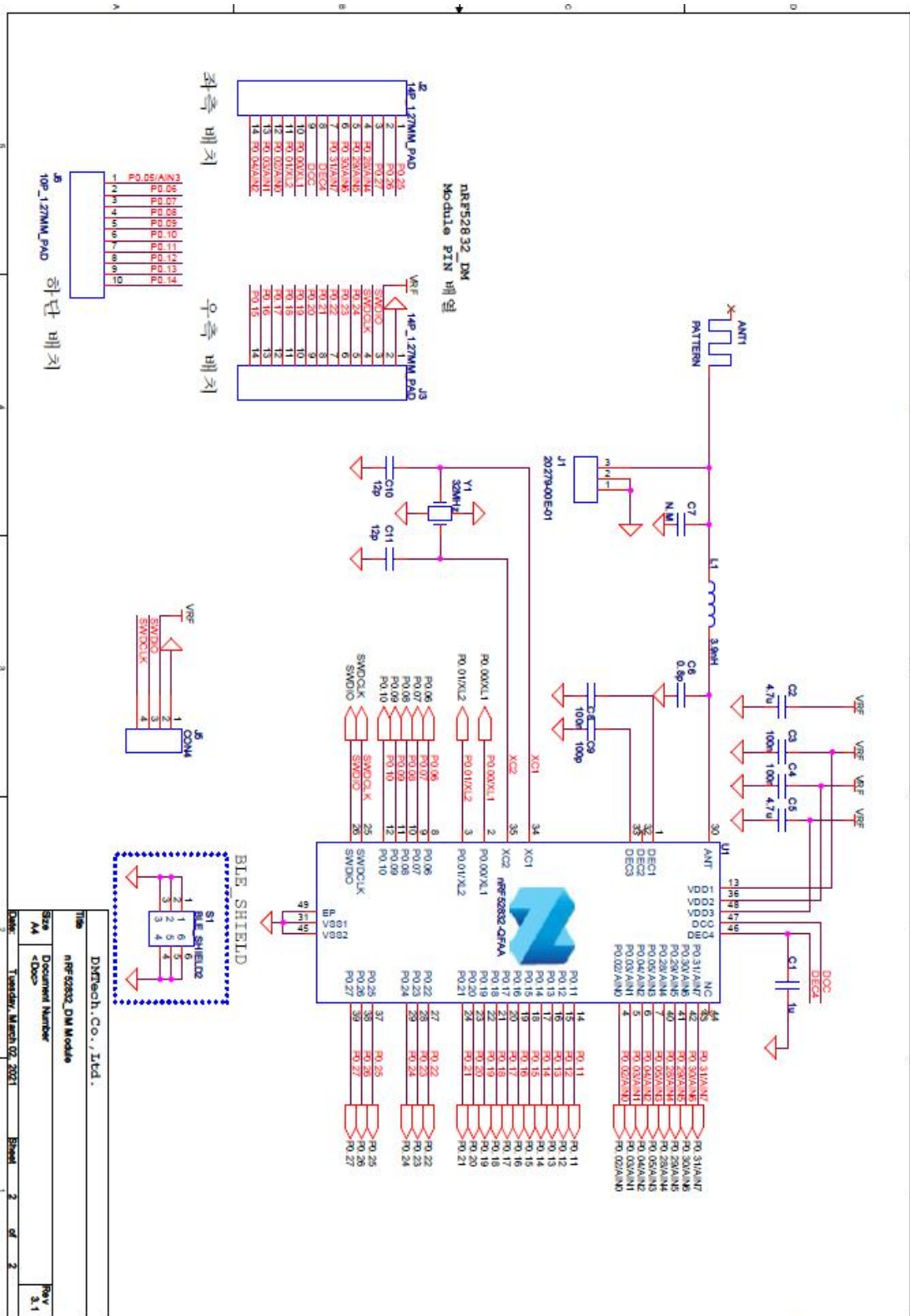


Figure 8 Schematics

5.1 ISP Connector

1.27mm 4Pin Connector

Program Download 용 으로 사용

공장 출하 시 UART 용 Firmware Download 되어 출하

5.2 RS232 to USB

Serial to USB 단자로 사용

UART 또는 AT Command 용으로 사용

P0.12 (UART RX) : TTL TX Pull up 필요

P0.11 (UART TX) : TTL RX Pull up option

5.3 전원 및 GND

nRF52832 의 공급 전원이 MAX 3.6V 이므로 LDO 를 사용하여 인가한다.

GND 는 Main GND 와 RF GND 를 분리하여 사용한다

5.4 BLE DATA

Supports 1 Mbps and 2 Mbps Bluetooth LE modes

Wide supply voltage range (1.7 V to 3.6 V)

UART 로 송신하는 Data 마지막에 0x0D 추가 필요

UART 로 송신하는 Data 에는 0x5C(W) 사용 불가. (AT Command 와 중복)

6. Marking on Metal Shield

6.1 LABEL



Figure 9 LC QR Code

6.2 KC Registration No.

DMTECH nRF52832DM-S R-R-iDM-nRF52832-DM-S

Figure 10 KC Registration No.

6.3 KC Certification (South Korea)

E758-1236-E933-2298

방송통신기자재등의 적합등록 필증 <i>Registration of Broadcasting and Communication Equipments</i>	
상호 또는 성명 <i>Trade Name or Registrant</i>	디엠테크
기자재명칭(제품명칭) <i>Equipment Name</i>	BLUETOOTH BLE 5.x Module
기기부호/추가 기기부호 <i>Equipment code /Additional Equipment code</i>	LARN8
기본모델명 <i>Basic Model Number</i>	nRF52832_DM-S
파생모델명 <i>Series Model Number</i>	
등록번호 <i>Registration No.</i>	R-R-iDM-nRF52832-DM-S
제조사/제조국가 <i>Manufacturer/Country of Origin</i>	디엠테크 / 한국
등록연월일 <i>Date of Registration</i>	2021-09-16
기타 <i>Others</i>	
<p>위 기자재는 「전파법」 제58조의2 제3항에 따라 등록되었음을 증명합니다. It is verified that foregoing equipment has been registered under the Clause 3, Article 58-2 of Radio Waves Act.</p> <p style="text-align: right;">2021년(Year) 09월(Month) 16일(Day)</p> <p style="text-align: center;">국립전파연구원장 <i>Director General of National Radio Research Agency</i></p> <p style="text-align: center;">※ 적합등록 방송통신기자재는 반드시 "적합성평가표시" 를 부착하여 유통하여야 합니다. 위반시 과태료 처분 및 등록이 취소될 수 있습니다.</p>	



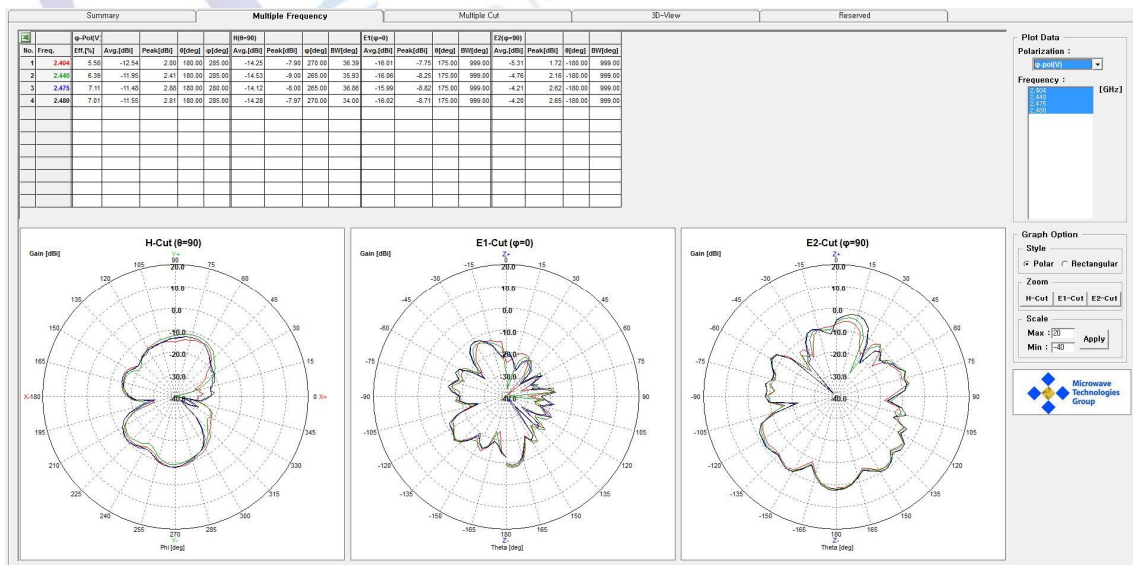
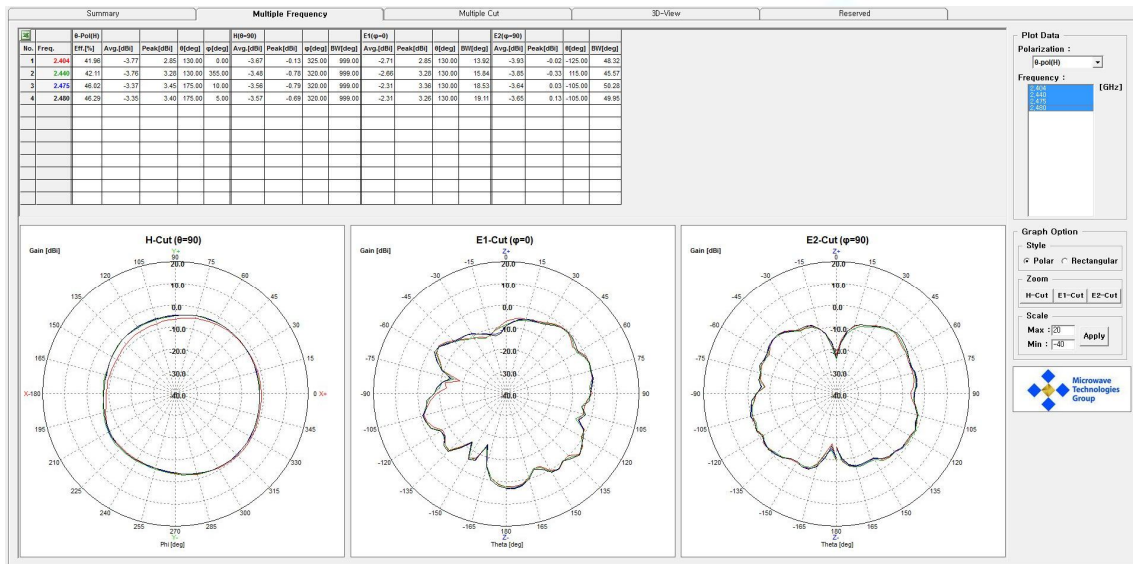
Figure 11 KC Certification

7. ANTENNA

7.1 nRF52832_DM-S

Table 10 Test Result

Freq.[GHz]	θ-Pol(H)					φ-Pol(V)					PwrSum				
	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]
2.404	48.53	-3.14	2.85	130.00	0.00	10.65	-9.73	2.00	180.00	285.00	59.18	-2.28	2.89	130.00	0.00
2.440	49.61	-3.04	3.28	130.00	355.00	11.95	-9.23	2.41	180.00	285.00	61.55	-2.11	3.34	130.00	355.00
2.475	52.97	-2.76	3.45	175.00	10.00	13.47	-8.71	2.88	180.00	280.00	66.44	-1.78	3.49	175.00	10.00
2.480	52.93	-2.76	3.40	175.00	5.00	13.47	-8.71	2.81	180.00	285.00	66.40	-1.78	3.57	175.00	355.00



8. Order Code

Table 11 Ordering Code

Model	Description	MOQ	Ordering Code
nRF52832_DM-S	BLE5.x Module Reel	500Pcs	nRF52832_DM-S-500R
nRF52832_DM-S	BLE5.x Module Tray	300Pcs	nRF52832_DM-S-300T
nRF52832_DM-S	BLE5.x Module		nRF52832_DM-S

9. References

- [1] nRF52832_Product Specification V1.4 for NORDIC.
- [2] nRF52 BLE Module AT Command List (V1.0.1)



10. Contact Information

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