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QN9080-001-M17 OOB Demo Application

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Application note

Document information

Info	Content
Keywords	QN9080, QN9080-001-M17, Bluetooth Low Energy, BTLE, NTAG, I ² C, OOB, OOB Pairing
Abstract	This Application note describes in brief the integration of QN9080-001-M17 and the procedure to enable OOB pairing.



Revision history

Rev	Date	Description
1.0	03 January 2019	Initial draft

Contact information

For more information, please visit: <http://www.nxp.com>

1. Introduction

QN9080-001-M17 is a SIP package of QN9080 and NTAG dies with the advantages of low-power consumption, good phone interoperability, easy and fast connection, eavesdropping immunity, long TK of pairing, and more. QN9080-001-M17 is also a single-chip solution with all external components such as antenna, crystals, and capacitors normally soldered on the PCB integrated with QN9080 in one package. All the above features make QN9080SIP a good fit for applications sensitive to space, time to market, and consistency.

2. QN9080-001-M17 DK

The QN9080-001-M17 DK board is designed to ease the evaluation and development of the QN9080-001-M17. Figure 1 shows the buttons used for input and LEDs used for status indication. A debugger based on the LPC4322 is also provided, which acts as a CDC device to provide a virtual COM port and SWD debugging. For jumper settings and other detailed information, refer to the QN9080-001-M17 DK user's guide.

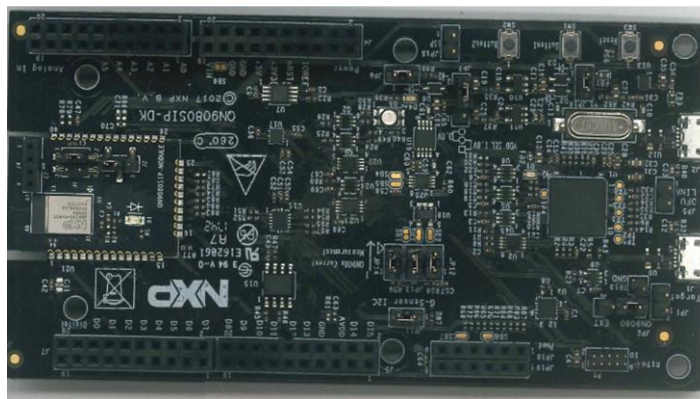


Figure 1 QN9080-001-M17 DK

3. Hardware Design Considerations

QN9080-001-M17 integrates all the necessary components into one package for both Bluetooth Low Energy and NTAG functions, except for the NTAG antenna. This keeps the hardware design simple, as only a power supply and an NTAG antenna are needed externally. See Figure 2 for the reference design.

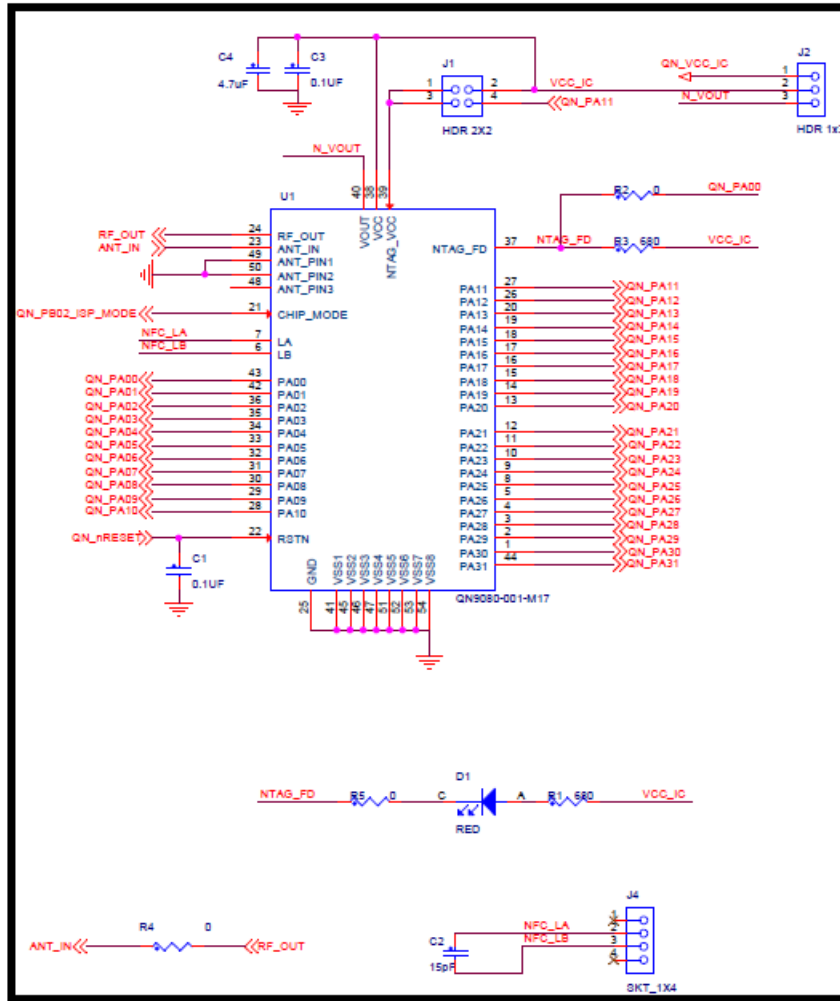


Figure2 QN9080-001-M17 Reference Design

The resistor R4 connects the RF signal with the internal antenna and is used as a point for RF and antenna testing.

The J4 header is used to connect the NTAG antenna

The LED D1 is used for field detection to indicate whether an NTAG reader is close to the chip.

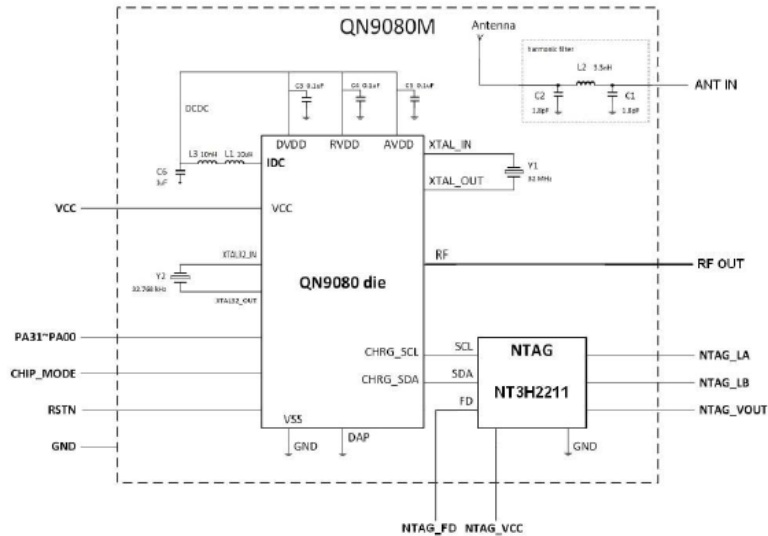
4. Software Implementation Considerations

As the QN9080 die is inside the device the QN9080-001-M17 shares SDK with the QN9080 system.

Download the QN9080 SDK for QN9080-001-M17 from the link below:
<https://mcuexpresso.nxp.com/en/select?device=QN908XCDK>

Figure 3 shows how the QN9080 die relates to the NTAG die by an I²C bus.

There is no driver example for using the NTAG available in the QN9080 SDK. Instead an example project demonstrating the NTAG feature can be downloaded from the NXP QN9080-001-M17 website.



5. Connection Handover by NTAG

Using Connection Handover leverages the advantages of both NFC and Bluetooth Low Energy. NFC provides easy and fast communication but has low throughput and short communication distance. Bluetooth Low Energy provides high throughput and long-range communication, but takes time to scan and establish connection or pairing. By combining the advantages of the two technologies, applications can offer the best user experience.

1. Handover types

There are three Connection Handover types: Negotiated, Static, and Simplified Tag Format. As there is NTAG inside QN9080-001-M17, the Simplified Tag Format Handover is implemented.

2. Tag setup for Handover

The table below lists the recodes that are written into the NTAG for a correct handover.

Table 1 Secure Simple Pairing OOB Data

Name	Offset (Octets)	Size	Mandatory / Optional	Description
OOB Data Length	0	2 octets	M	The total length including the OOB Data Length, the Bluetooth Device Address, and the OOB Optional Data fields (see Section 3.1.1)
Bluetooth Device Address	2	6 octets	M	Bluetooth Device Address of the device (see Section 3.1.2)
OOB Optional Data	8	N octets	O	The remaining optional OOB data, in EIR format (see Section 3.2)

The first two records are mandatory, while the third one is optional. The example code sets up only the first two records. The NFC Data Exchange Format (NDEF) message is written into NTAG by the QN9080 by pressing Button1 on the DK board. Customer can decide when to erase the message or not. There is API function for internal memory operation. The data is read out easily by a third-party device. There are applications that do not want to disclose their data.

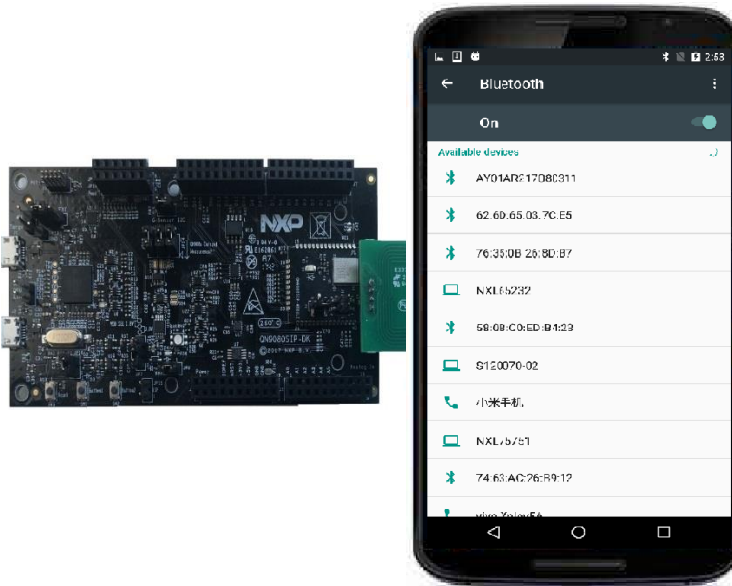
1. User experience enhancement with the Handover feature

With the Handover feature, the user experience of the following is improved in an application.

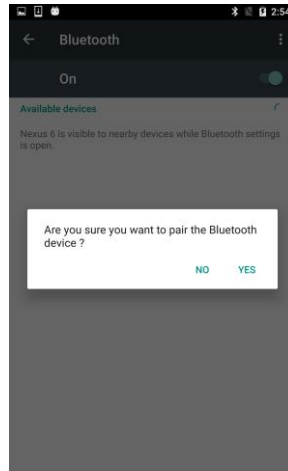
- 1) Device selection
- 2) Fast and securely connect
- 3) Start an application.

2. Demo with phone setup

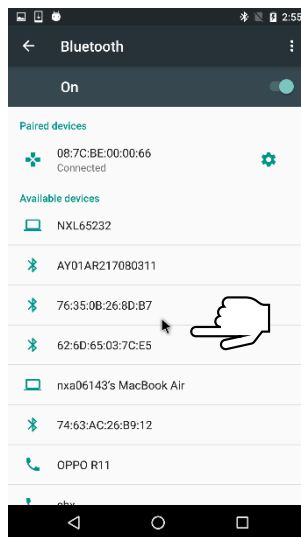
- 1) Attach the NTAG antenna using the J4 connection header.
- 2) Press Button1 which writes the NDEF message and start Bluetooth Low Energy advertising as a HID device.
- 3) Approach the antenna of QN9080-001-M17 with an NFC enabled phone.



- 4) The phone reads the NDEF message and confirms whether you want to accept the pairing request message. The message in the demo is Bluetooth Low Energy name and Mac address. It could be a secure connection, but still not work for a passcode in NDEF message due to phone limitation.



- 5) A mouse cursor is shown on the phone after successfully pairing.



Note:

- Do not enable energy harvesting in OOB demo to avoid the phone turning off the NFC after getting NDEF message.
- The pairing process is still via Bluetooth LE signal after getting NDEF message by NFC.

6. NTAG Access Functions

The NTAG access APIs resides in the demo project of QN9080-001-M17 demo. Following the spec of NDEF message for OOB, it is very easy to edit the data on NTAG. Refer to the link below for the demo project.

7. Phone Application Support

In addition to the demo app of NTAG access, such as NTGA I²C Demo Board, the App IoT Toolbox is integrated with both Bluetooth Low Energy and NTAG functions.



With the tool, the data inside NTAG can be edited easily. Current demo shows a way to modify the payload of QN9080-001-M17 advertising by phone touching. It is easily customized to edit any data inside NTAG to fulfill the requirements of customers.

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