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JN517x-USB-Dongle Reference Manual

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Reference Manual

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1. Introduction

This manual provides a detailed reference for NXP's JN517x USB dongle (OM15021) and forms part of the *JN517x USB Dongle Reference Design (JN-RD-6053)*. This USB dongle features a JN517x wireless microcontroller and allows communication with this JN517x device from a USB connection. With suitable embedded software running on the JN517x device, the dongle can then communicate with an IEEE 802.15.4, ZigBee 3.0, ZigBee PRO (LL, SE, HA) and ZigBee-RF4CE wireless network.

OM15021 is the official reference for any order of the JN5179 USB dongle.

This chapter introduces the NXP JN517x USB dongle (OM15021), which provides a hardware development platform for wireless microcontroller applications with a USB interface.

1.1 Overview

The JN517x USB Dongle features a JN517x wireless microcontroller and allows communication with this JN517x device from a USB connection. The JN517x device can act as a node of a wireless network. Thus, the dongle provides an easy way of interfacing a host machine (such as a PC) to a wireless network based on the IEEE802.15.4, ZigBee Smart Energy or ZigBee-Home Automation networking protocol. An FTDI device provides the USB connection between the host machine and the JN517x device, which in turn provides the radio interface to the wireless network.

Note: The JN517x device used in this USB dongle design can be an NXP JN5179, JN5178 or JN5174 wireless microcontroller. Full details of the JN517x range of devices can be found in the *JN517x data sheets on the Wireless Connectivity area of the NXP website*.

Typical uses of the dongle include:

- A complete and stable hardware environment for the development of IEEE802.15.4, ZigBee 3.0, ZigBee Smart Energy and ZigBee-Home Automation networking applications, facilitating an accelerated time-to-market for wireless network products
- The basis of a packet sniffer for IEEE 802.15.4-based wireless communications
- A means of integrating the host machine into a wireless network, typically as the network coordinator

The small-footprint PCB of the dongle provides all the necessary components for a wireless microcontroller with access to a USB connection. All RF layout and decoupling issues are handled by the design of this dongle. Therefore, this design is ready for application development without the necessity of hardware development.

The JN517x USB dongle, shown [Fig 1](#), is supplied in the JN517x- Development Kit.



Fig 1. JN517X USB dongle (OM15021)

1.2 Features

The dongle has the following features:

- USB 2.0 Full-Speed Compatible Interface
- IEEE 802.15.4-based wireless microcontroller (JN517x) with the following radio characteristics:

JN5179 USB Dongle:

- Transmit power: 8.3 dBm (typ.), can be increased to 10 dBm (typ.)
- Transmit current: 29.7 mA (typ.) at 8.3 dBm/33 mA (typ.) at 10 dBm
- Receive sensitivity: -96dBm (typ.)
- Receive current: 23.4 mA (typ.)
- Integrated printed RF antenna
- General-purpose LEDs (one green, one orange)
- Serial Flash memory device (4 Mbits)

1.3 Reference design

The reference design JN-RD-6053 for the JN517x USB dongle is available from the connectivity area of the website.

This reference design comprises a ZIP file containing the following files:

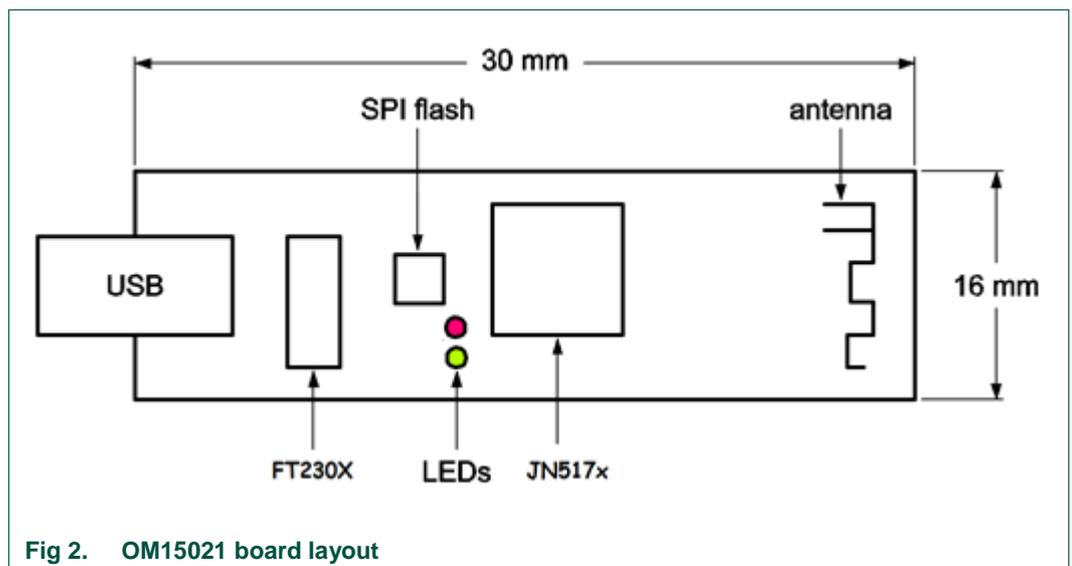
- This reference manual
- HW packages for JN5179:
 - The schematic diagram for the board
 - The BOM (Bill Of Materials) for the board
 - Gerbers for the board

Note: The CAD source file in the Reference Design does not include the PCB antenna. This must be obtained from the Gerber files.

2. Hardware overview

This chapter provides an overview of the hardware design and the main hardware components of the JN517x USB dongle.

2.1 Dongle layout



2.2 Dongle block diagram

The Fig 3 illustrates the main hardware blocks of the dongle in the case when a JN5179 device is fitted to the board.

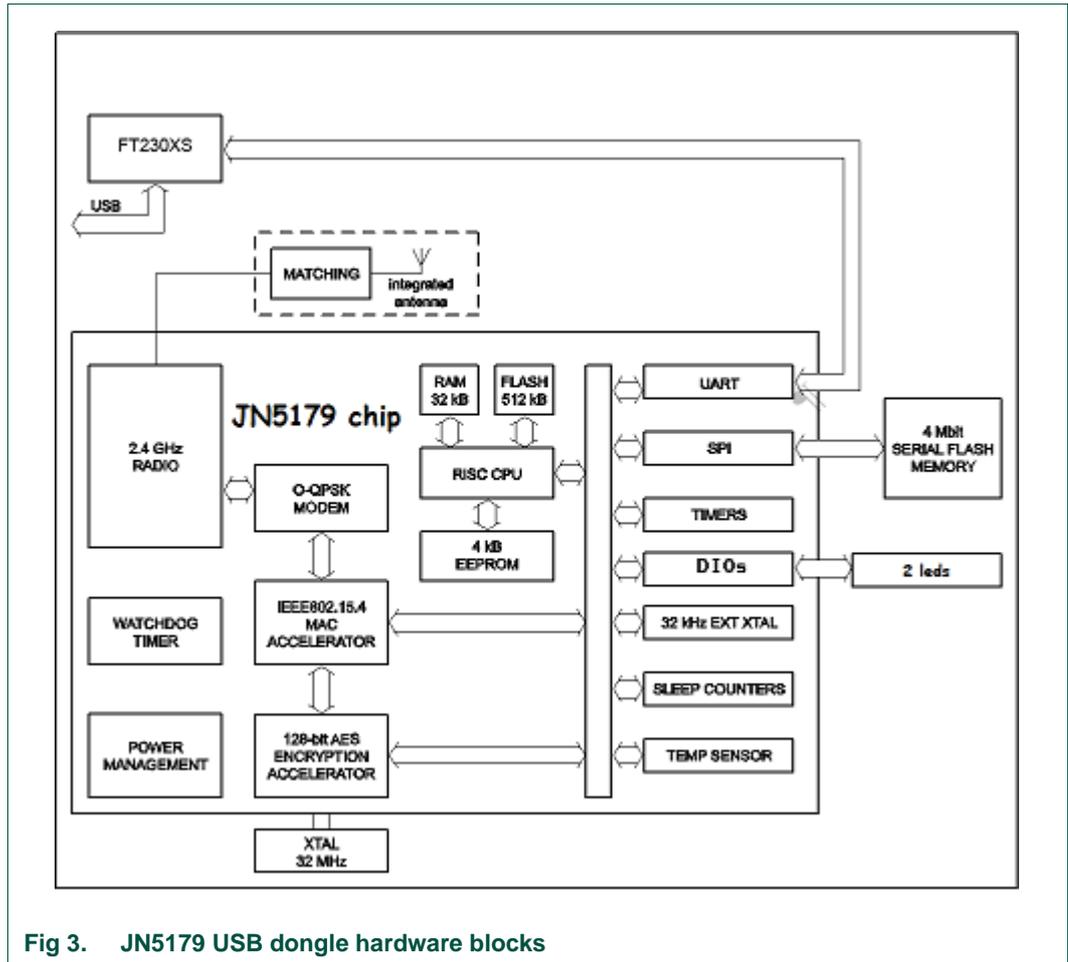


Fig 3. JN5179 USB dongle hardware blocks

2.3 Hardware components

The hardware components on the board are described in the following sub-sections.

- JN517x wireless microcontroller – see [section 2.3.1](#)
- FTDI FT230XS driver device – see [section 2.3.2](#)
- LEDs – see [section 2.3.3](#)

2.3.1 JN517x device

The JN517x wireless microcontroller used in the dongle design can be an NXP JN5179 JN5178 or JN5174 device. The JN517x range of wireless microcontrollers is detailed in the *JN517x data sheet*.

The JN517x circuit on the board is based around the standard *JN517x Module Reference Design (JN-RD-6053)*. However, it is built on a 2-layer board, as the DIOs do not need to be externally available.

Note1: The JN517x device uses an integrated antenna on the PCB of the dongle. Note that in the reference design JN-RD-6053, the CAD source file does not include the PCB antenna - it must be obtained from the Gerber files.

Note 2: Bill Of Material is depicted in the RD6053 package.

2.3.2 FT230XS device

The FT230XS device is connected to the USB connector and acts as an interface between the PC and the JN517x device. The FT230XS will enumerate on the PC as a virtual COM port connected directly to UART0 on the JN517x device.

The IO controls C2 and C3 in the FT230XS device need to be set to 'GPIO' to allow the RESET and PGM signals to operate correctly. To do this, execute the following instructions.

1. Download the application FT_Prog from the FTDI website www.ftdichip.com
2. Insert the JN517x USB dongle into a USB port of your computer and wait for the device to enumerate
3. Start FT_Prog and click Scan and Parse (the magnifying glass button)
4. Update the IO controls C2 and C3 to GPIO – see [Fig 4](#)

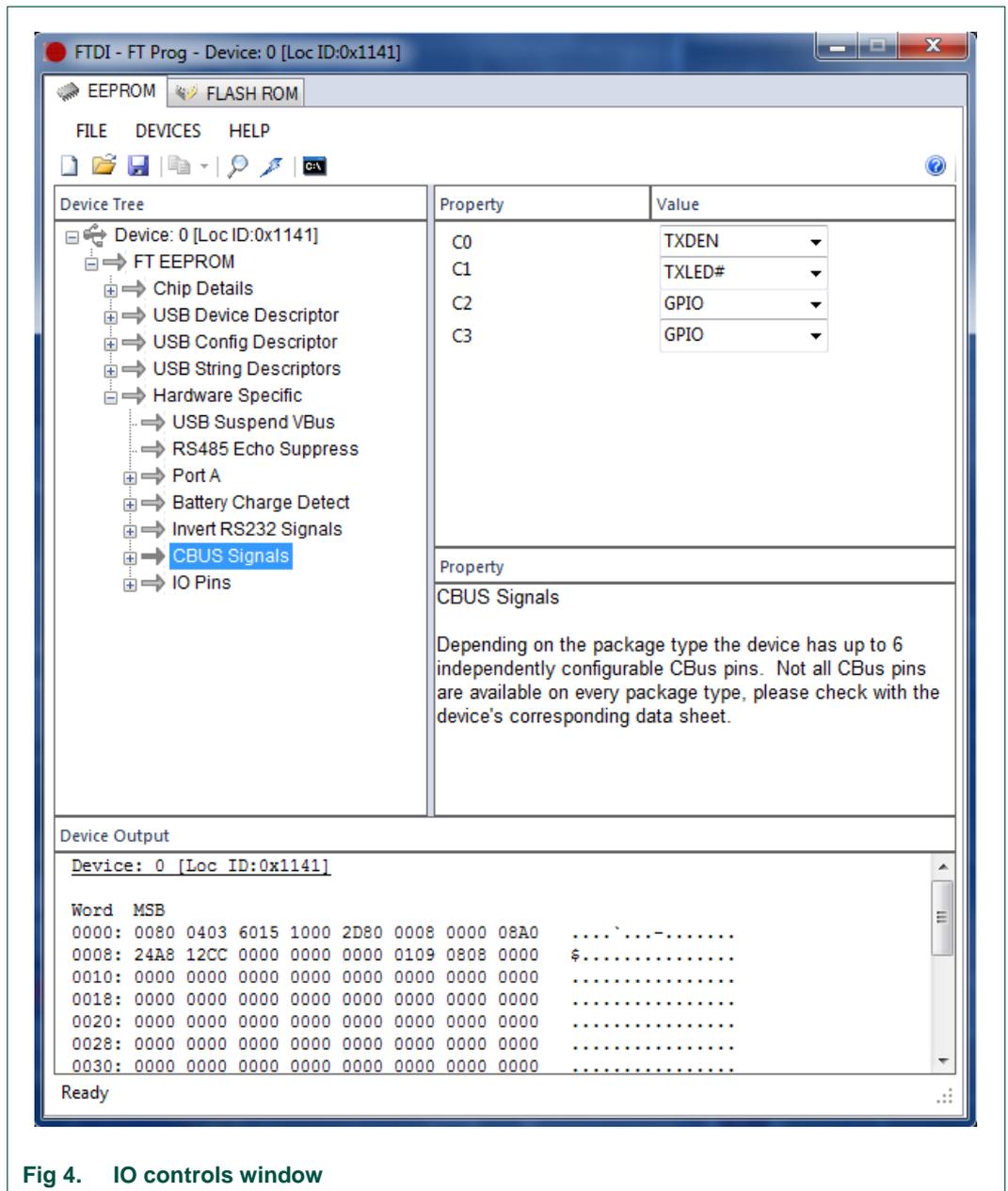


Fig 4. IO controls window

5. Click Program Devices (the lightning button)
6. On the resulting screen, click Program – see [Fig 5](#)

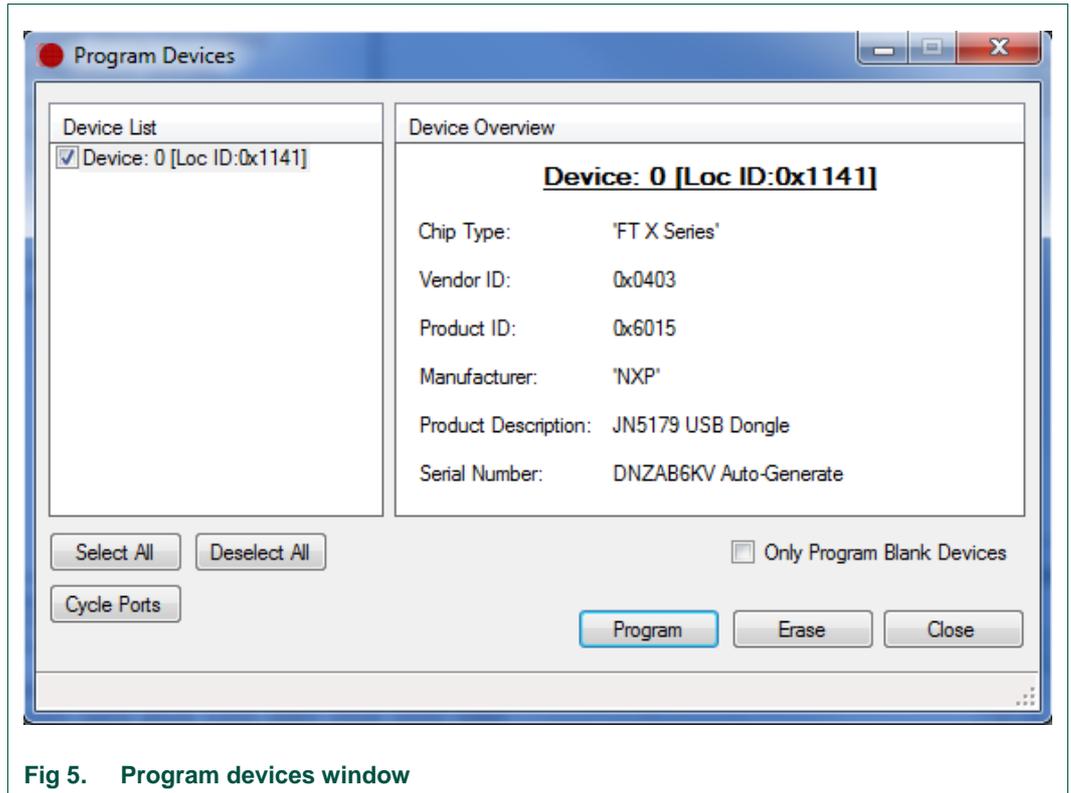


Fig 5. Program devices window

2.3.3 LEDs

There are two surface-mounted LEDs that can be controlled by the JN517x wireless microcontroller (see Fig 2 for locations):

- LED D1 (orange)
- LED D2 (green)

Both LEDs are connected to DIO14 and DIO15. These DIOs can be used to control the LEDs as indicated in the Table 1.

Table 1. DIO control of LEDs

		DIO15	
		Low	High
DIO14	Low	D1: Off	D1: On
		D2: Off	D2: Off
	High	D1: Off	D1: Off
		D2: On	D2: Off

3. Flash programming

When the JN517x USB dongle is powered up, it attempts to run an application from the internal Flash memory of the JN517x device. This may be a self-contained application that sends and receives wireless data, and which does not need to communicate with the host. Alternatively, it may communicate via the USB with an application running on the host, such as a Windows program, and also communicate with a wireless device or network.

In order to program an application binary into Flash memory, the JN51xx Production Flash Programmer can be used, which is described in the JN51xx Production Flash Programmer User Guide (JN-UG-3099). This programming utility will place the JN517x into its programming mode. It will then download the program to the Flash memory and reset the JN517x device, causing the application to be executed. LPCXpresso tools chain could be used to program an application binary into Flash memory also. Description is in the JN-UG-3109-JN517x-LPCXpresso document.

4. Compliance statements and documentation

The compliance statements and documentation in this chapter apply only to a JN517x USB Dongle fitted with the JN5179 device.

The FCC ID number of the JN5179 USB dongle is XXMJN5179U0

The IC ID number of the JN5179 USB dongle is 8764A-JN5179U0

4.1 FCC statements and documentation

This section contains the Federal Communication Commission (FCC) statements and documents.

4.1.1 FCC interference statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC caution:

User guide mandatory statements

User's instructions of the host device must contain the following statements in addition to operation instructions:

* "This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation"

* "Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment"

WARNING!

FCC radiation exposure statement:

User's instructions of the host device must contain the following instructions in addition to operation instructions:

Avoid direct contact to the antenna, or keep it to a 20 cm minimum distance while using this equipment. This device must not be collocated or operating in conjunction with another antenna or transmitter.

4.2 Industry Canada statement

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This device complies with Industry Canada RF radiation exposure limits set forth for general population (uncontrolled exposure). This device must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) il ne doit pas produire de brouillage, et (2) l'utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

Le présent appareil est conforme aux niveaux limites d'exigences d'exposition RF aux personnes définies par Industrie Canada. Cet appareil doit être installé afin d'offrir une distance de séparation d'au moins 20 cm avec l'utilisateur, et ne doit pas être installé à proximité ou être utilisé en conjonction avec une autre antenne ou un autre émetteur.

isotropic radiated power (e.i.r.p.) is not more than that permitted for successful communication.

4.3 European R & TTE Directive 1999/5/EC Statement

The JN5179-001-U00 are compliant with the following standards:

- Radio - ETSI EN 300 328 V1.7.1 (2006-10),
- EMC - EN 301 489-17 v2.1.1 (2009-02)
- Basic Safety Assessment (BSA) EN 60950-1:2006 (2006-06)

The JN5179-001-U0 are subject to a Notified Body Opinion.

5. Abbreviations

Table 2. Abbreviations

Acronym	Description
BOM	Bill Of Materials
DIO	Digital Input/Output
FCC	Federal Communication Commission
IC	Industry Canada
PCB	Printed Circuit Board
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

6. References

- [1] **JN517x** – JN517x data sheet
- [2] **JN5179** – JN517x data sheet
- [3] **JN-UG-3118** – JN517x Integrated Peripherals API User Guide
- [4] **OM15021_JN5179_USB_Dongle** – OM15021 USB dongle PCB files for JN5174/JN5178/JN5179

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