



**Future Technology Devices International Ltd.**

**Application Note AN\_144**

**VINCULUM-II IO\_Mux Configuration**

**Utility User Guide**

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This application note is a User guide illustrating the use of the Vinculum-II IOMux Configuration Utility.

**Future Technology Devices International Limited (FTDI)**

Unit 1,2 Seaward Place, Glasgow G41 1HH, United Kingdom  
Tel.: +44 (0) 141 429 2777 Fax: + 44 (0) 141 429 2758  
E-Mail (Support): [support1@ftdichip.com](mailto:support1@ftdichip.com) Web: <http://www.ftdichip.com>

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## 1 Introduction

VNC2 comes with a variety of peripheral interfaces including UART, SPI and FIFO. The IC is available in 32-pin, 48-pin or 64-pin packages. Each of the peripheral interfaces on the chip can be routed for all the available package types. Routing of interfaces on VNC2 is achieved through the use of an I/O Multiplexer (IOMux). The IOMux provides a simple interface to route signals to their required pins.

To aid with routing signals using the IOMux interface FTDI provide an IOMux Configuration Utility. The utility provides a visual representation of all of the available package types and allows for available signals to be routed on individual pins. The utility will generate C code that can be cut and paste into the designer's application.

### 1.1 Launching Application

The IOMux utility comes as part of the VNC2 toolchain installation. The application is installed, along with the IDE, in the start menu shortcut for the toolchain under FTDI/Vinculum II Toolchain. To launch the application click on the *Vinculum II IOMux Configuration Utility* icon. Figure 1 shows the main screen after launching the application.

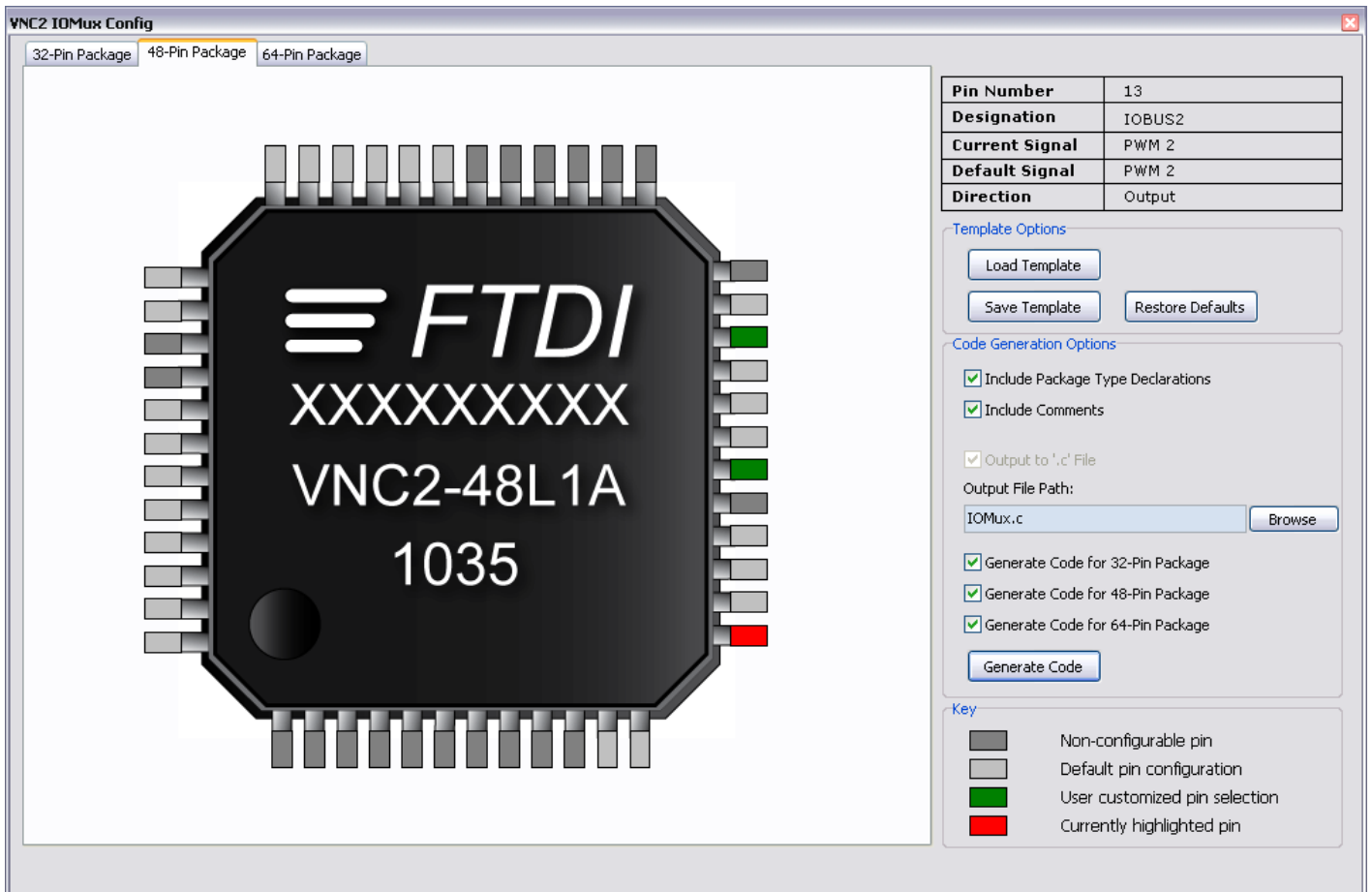


Figure 1 - Screen Overview

### 1.2 Configuring Pins

Each VNC2 package has a default pin state following a hard reset. Rolling the mouse over individual pins within the utility will change the pin information in the top right hand corner of the screen to reflect the default signal currently routed to each pin. Signals that cannot be re-routed (GND, VCC, Prog etc) are displayed in dark grey, configurable pins will highlight red upon mouse over.

Individual signals have different attributes regarding the flow of data through them. For example, the UART transmit signal (UART TXD) only allows data to flow as an output signal whereas the UART receive

signal (UART RXD) only allows data to flow as an input signal. Certain signals allow for data to be transferred in both directions. An example of this would be the GPIO signals.

To configure a routable pin: left-click on the desired pin; select whether this should be an input, output or bi-directional signal; finally, choose the required signal from the available list. Pins that are no longer routed to their default signal will turn **Green**. To return a pin to its default signal, left-click the pin and select *Restore Default* from the menu.

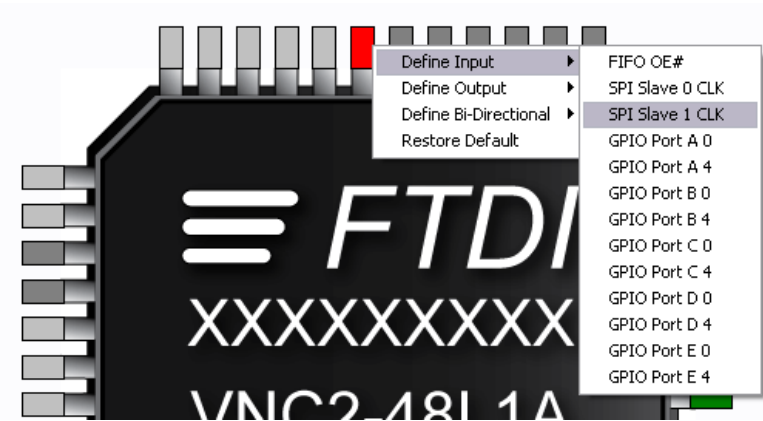


Figure 2 - Pin Configuration

### 1.3 Using Templates

It is possible to save IOMux configurations in xml template form, allowing for configurations to be altered at a later date. To save a configuration in template form, select *Save Template* from the *Template Options* section and enter the desired template name within the save dialog box. Previous templates can be loaded into the utility by selecting *Load Template*, again from the *Template Options* section. To completely clear all re-routed signals from the current template on all package types click *Restore Defaults* which will return all pins to their default signal state.

### 1.4 Generating Code

The utility will generate C code that can be cut and pasted into the designer's application. Code can be generated for all or only one of the available package types. The *Code Generation Options* section contains a list of packages that the application will generate code for.

Currently the application generates C code in a separate .c file as shown in Figure 3. To use the code within an application copy the `SetupIOMUX()` function and paste this into the C file containing the main function within the application. To configure the IOMUX, call the `SetupIOMUX` function from the main function within the application. Figure 4 shows the `SetupIOMUX` function being called from the main line of the application.

```
IOMux.c [X]
1  /**
2  ** IOMux.c
3  **
4  ** C Source file for Vinculum II IOMUX Configuration
5  **
6  ** Author: FTDI IOMUX Configuration Application
7  ** Project:
8  ** Module:
9  ** Requires: VOS
10 ** Comments: Automatically Generated File
11 **
12 ** History:
13 ** 1 Initial version
14 **
15 **/
16 #include "vos.h"
17
18 void SetupIOMUX()
19 {
20     unsigned char packageType;
21
22     packageType = vos_get_package_type();
23
24     //*****
25     //Initialise the IOMUX parameters
26     //*****
27
28     if(packageType == VINCULUM_II_48_PIN)
29     {
30         // SPI Master MISO to pin 18 as Input.
31         vos_iomux_define_input(18, IOMUX_IN_SPI_MASTER_MISO);
32         // GPIO Port A 6 to pin 22 as Bi-Directional.
33         vos_iomux_define_bidi(22, IOMUX_IN_GPIO_PORT_A_6, IOMUX_OUT_GPIO_PORT_A_6);
34         // GPIO Port A 2 to pin 43 as Bi-Directional.
35         vos_iomux_define_bidi(43, IOMUX_IN_GPIO_PORT_A_2, IOMUX_OUT_GPIO_PORT_A_2);
36         // GPIO Port E 6 to pin 47 as Bi-Directional.
37         vos_iomux_define_bidi(47, IOMUX_IN_GPIO_PORT_E_6, IOMUX_OUT_GPIO_PORT_E_6);
38     }
39 }
```

Figure 3 - Generated Code

```
HelloWorld.c* [X]
35
36 fat_context fatContext;
37
38 void firmware(void);
39
40 void SetupIOMUX()
41 {
42     unsigned char packageType;
43
44     packageType = vos_get_package_type();
45
46     //*****
47     //Initialise the IOMUX parameters
48     //*****
49
50     if(packageType == VINCULUM_II_48_PIN)
51     {
52         // SPI Master MISO to pin 18 as Input.
53         vos_iomux_define_input(18, IOMUX_IN_SPI_MASTER_MISO);
54         // GPIO Port A 6 to pin 22 as Bi-Directional.
55         vos_iomux_define_bidi(22, IOMUX_IN_GPIO_PORT_A_6, IOMUX_OUT_GPIO_PORT_A_6);
56         // GPIO Port A 2 to pin 43 as Bi-Directional.
57         vos_iomux_define_bidi(43, IOMUX_IN_GPIO_PORT_A_2, IOMUX_OUT_GPIO_PORT_A_2);
58         // GPIO Port E 6 to pin 47 as Bi-Directional.
59         vos_iomux_define_bidi(47, IOMUX_IN_GPIO_PORT_E_6, IOMUX_OUT_GPIO_PORT_E_6);
60     }
61 }
62
63 void main(void)
64 {
65     usbhost_context_t usb_ctx;
66     gpio_context_t gpioCtx;
67     vos_init(10, VOS_TICK_INTERVAL, NUMBER_OF_DEVICES);
68     vos_set_clock_frequency(VOS_48MHZ_CLOCK_FREQUENCY);
69
70     SetupIOMUX(); // Call the setup IOMUX function to configure VNC2 pin states...|
71
```

Figure 4 - Calling SetupIOMUX from Main

## 2 Contact Information

### Head Office – Glasgow, UK

Future Technology Devices International Limited  
Unit 1,2 Seaward Place, Centurion Business Park  
Glasgow G41 1HH  
United Kingdom  
Tel: +44 (0) 141 429 2777  
Fax: +44 (0) 141 429 2758

E-mail (Sales) [sales1@ftdichip.com](mailto:sales1@ftdichip.com)  
E-mail (Support) [support1@ftdichip.com](mailto:support1@ftdichip.com)  
E-mail (General Enquiries) [admin1@ftdichip.com](mailto:admin1@ftdichip.com)  
Web Site URL <http://www.ftdichip.com>  
Web Shop URL <http://www.ftdichip.com>

### Branch Office – Taipei, Taiwan

Future Technology Devices International Limited (Taiwan)  
2F, No. 516, Sec. 1, NeiHu Road  
Taipei 114  
Taiwan, R.O.C.  
Tel: +886 (0) 2 8791 3570  
Fax: +886 (0) 2 8791 3576

E-mail (Sales) [tw.sales1@ftdichip.com](mailto:tw.sales1@ftdichip.com)  
E-mail (Support) [tw.support1@ftdichip.com](mailto:tw.support1@ftdichip.com)  
E-mail (General Enquiries) [tw.admin1@ftdichip.com](mailto:tw.admin1@ftdichip.com)  
Web Site URL <http://www.ftdichip.com>

### Branch Office – Hillsboro, Oregon, USA

Future Technology Devices International Limited (USA)  
7235 NW Evergreen Parkway, Suite 600  
Hillsboro, OR 97123-5803  
USA  
Tel: +1 (503) 547 0988  
Fax: +1 (503) 547 0987

E-Mail (Sales) [us.sales@ftdichip.com](mailto:us.sales@ftdichip.com)  
E-Mail (Support) [us.admin@ftdichip.com](mailto:us.admin@ftdichip.com)  
Web Site URL <http://www.ftdichip.com>

### Branch Office – Shanghai, China

Future Technology Devices International Limited (China)  
Room 408, 317 Xianxia Road,  
Shanghai, 200051  
China  
Tel: +86 21 62351596  
Fax: +86 21 62351595

E-mail (Sales) [cn.sales@ftdichip.com](mailto:cn.sales@ftdichip.com)  
E-mail (Support) [cn.support@ftdichip.com](mailto:cn.support@ftdichip.com)  
E-mail (General Enquiries) [cn.admin@ftdichip.com](mailto:cn.admin@ftdichip.com)  
Web Site URL <http://www.ftdichip.com>

**Distributor and Sales Representatives**

Please visit the Sales Network page of the FTDI Web site for the contact details of our distributor(s) and sales representative(s) in your country.

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## **Appendix A - References**

AN\_139 - [Vinculum-II IO Mux Explained](#)

Vinculum II Data Sheet - [Vinculum-II Embedded Dual USB Host Controller IC Data Sheet](#)



## Appendix B - Revision History

Revision History

Version 1.00 Initial Release

11<sup>th</sup> May, 2010