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## SZFPGA HW-USBN-2B DATASHEET



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V1.0	Created 5 June 2021
V1.1	Changed on 16 April 2023, no need to select Channel 1

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#### Technical Support with Feedback

Shenzhen Feilu Technology Co., Ltd. provides a full range of technical support, in the process of use if you have any questions or suggestions,

You can contact the company directly:

Website: [www.szfpga.com](http://www.szfpga.com)

E-mail: [support@szfpga.com](mailto:support@szfpga.com)

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## 1. Overview

HW-USB-2B is a chip programming burning device for Lattice. The design is completed by Diamond and Isplever, the programming file is generated, and then the Diamond Programmer or ispVM System software is used to program the onboard chip. Diamond Programmer or ispVM System software automatically generates programming instructions, programming addresses, and programming data through the generated programming files. The computer's USB connection HW-USB-2B programmer device generates programming signals JTAG, SPI, I2C, GPIO to burn the chip.

Diamond Programmer or ispVM System software download address at [www.latticesemi.com/programmer](http://www.latticesemi.com/programmer)

## 2. Features

- Support all Lattice chips.
- I2C programming, voltage range from 1.5V-3.3V
- JTAG and SPI are programmed with voltage range from 1.0V to 5.5V
- It is used for protocol debugging and Debug testing, and the online simulation speed is fast.
- USB TYPE B interface connection, strong and durable
- Easy to use, 2\*7 (2.54mm) mark flywire connect
- The USB cable is 1.5m long and can support 2A current.
- High-speed JTAG mode, more than 10 times faster than HW-USB-2A.
- High resistance state protection, support hot swap protection.

### 3. Program pin definition

Pin function definition, specific use depends on the specific chip type. Note the input/output direction. VCC is the reference voltage input to the burner to match the BANK region voltage of the target board. 5V OUT is the output voltage, used for external device power supply.

Table 1.1 indicates functions.

Programming pins	Name	Directions	Color	Description
VCC	Programming voltage	input	Crimson	VCCIO or VCCI connect to VCC. Typical ICC = 20 mA. The target board provides a VCC powered reference to the programming device
TDO/SO	Test data output	Input	Brown	(JTAG/SPI) Programming shift data output
TDI/SI	Test data entry	Output	Gray	(JTAG/SPI) Programming shift data entry
ISPEN/SN	Enable	Output	yellow	SPI's SS selection function
TRST	Test reset	Output	Green	Reset function
DONE	Done signal	Output	Blue	Complete signal indication
TMS	Test mode input	Output	Purple	Controls the state of the JTAG
GND	low	Input	Black	The ground of the target device
TCK/SCLK	Test the clock	Output	White	(JTAG/SPI) clock
I2C:SCL	I2C SCL	Output	Yellow	SCL clock provided with I2C
I2C:SDA	I2C SDA	Both ways	Green	Provide data for I2C's SDA
5V OUT	5V out	Output	Pink	Power supply for external devices.

Table 1 Pin instructions

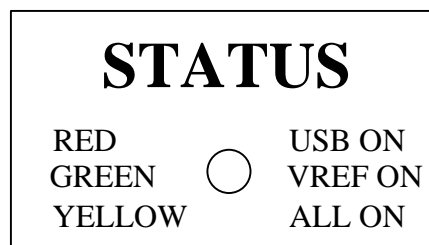
Note: The second row, the last pin is no cable


Figure 1 SZFPGA HW-USBN-2B burner




Lattice PAC-Designer software does not support Hw-USBn-2b programmers. So use HW-USBN-2B programming ispPAC chip, so Diamond Programmer or ispVM System software burned. For the newer version of Radiant, you need to install Windows10 to support the Hw-USB2-2B programmer.

Side test indicator to indicate power supply, target board power supply.



When the red light is on, USB is connected to the computer. 

When the yellow light is on, the VREF power supply and USB power supply of the target board are connected. 

## 4 Program the software

Diamond Programmer and ispVM System are software that can be used for programming management and are available for all chips and downloaders. The final software in lattice official website [www.latticesemi.com/programmer](http://www.latticesemi.com/programmer), please download the software.

Note that to support discontinued chips for the Standalone version of diamond Programmer, you need to register a license at [www.latticesemi.com](http://www.latticesemi.com). The license is free, but requires a network

adapter mac address.

## 5. Design reference

TCK recommends 4.7 pull-down resistors on the designed board. Pull-down resistors avoid burr clocks. Pull-down resistors are recommended for all chips.

I2C's SCL and SDA are open leak outputs. 2.2K $\Omega$  pull up to the VCC, the power supply VCCIO on the target board needs to be connected to the HW-USBN-2B above the VCC. The voltage range can be in the 1.5-5V range.

For Lattice low power chips, a 500 ohm resistor from VCCJ to GND is recommended.

JTAG programming port speeds need to be adjusted, especially for long distance PCBs or multiple cascaded chips, as well as older chips. Adjust TCK, in the lattice Programmer software, set the TCK frequency division factor.

Burn Power ManagerPower (POWR604, POWR1208, POWR1208P1) and ispClock chip, TCK must speed set frequency division coefficient 2 as well as below.

For older lattice chips, to use the ISPEN, add 0.1uF capacitance to the ISPEN pin of the chip.

## 6. Fly wire and chip connection reference

In the table, is used to identify the Lattice chip, how to connect the device signal of HW-USBN-2B. JTAG, SPI and I2C are represented separately.

**JTAG port connection: Table 2 must be the chip connection to HW-USBN-2B device pin requirements, please refer to the chip pin table, find the relevant IO pins.** The burning process must ensure that the pins correspond to the connection, otherwise the burning will not work.

Chip type \ Pin name	TDI	TDO	TMS	TCK	VCC	GND
ECP5	TDI	TDO	TMS	TCK	VCC	GND
ECP3/ECP2M	TDI	TDO	TMS	TCK	VCC	GND
ECP2/ECP	TDI	TDO	TMS	TCK	VCC	GND
XP2/XP	TDI	TDO	TMS	TCK	VCC	GND
SC/SCM	TDI	TDO	TMS	TCK	VCC	GND
MACHXO2/XO3/XO3D	TDI	TDO	TMS	TCK	VCC	GND
MACHXO	TDI	TDO	TMS	TCK	VCC	GND
ORCA/FPSC	TDI	TDO	TMS	TCK	VCC	GND

ispXPGA/ispXPLD	TDI	TDO	TMS	TCK	VCC	GND
ispMACH400/ispMACH/ispLSI 5000	TDI	TDO	TMS	TCK	VCC	GND
MACH 4A	TDI	TDO	TMS	TCK	VCC	GND
ispGDx2	TDI	TDO	TMS	TCK	VCC	GND
ispPAC/ispClock	TDI	TDO	TMS	TCK	VCC	GND
Platform Manager /Power Manager /Power Manager II /Platform Manager II	TDI	TDO	TMS	TCK	VCC	GND

Table 2 JTAG Device Description

**Slave SPI's devices**

Chip type \ Pin name	TDI	TDO	TMS	TCK	ISPEN	VCC	GND
ECP5	MOSI	MISO	-	CCLK	SN	VCC	GND
ECP3	MOSI	MISO	-	CCLK	SN	VCC	GND
MACHXO2/XO3/XO3D	SI	SO	-	CCLK	SN	VCC	GND
Crosslink LIF-MD6000	MOSI	MISO	-	SPI_SCK	SPI_SS	VCC	
iCE40/iCE40LM/iCE40 Ultra/iCE40 UltraLite	SPI_SI	SPI_SO	-	SPI_SCK	SPI_SS_B	VCC	

Table 3 slave SPI Device description

**I2C mode device**

Chip type	VCC	GND	TRST	I2C:SCL	I2C:SDA
Chip type					
Programming device name					
MACHXO2/XO3/XO3D	VCC	GND	-	SCL	SDA
Crosslink LIF-MD6000	VCC	GND	CRESET_B	SCL	SDA
Platform Manager II	VCC	GND	-	SCL_M+SCL_S	SDA_M+SDA_S
L-ASC10	VCC	GND	-	SCL	SCL

Table 4 I2C Device Description



## 7 Apply for a license

Diamond programmer does not require license support for older chips that you're using. However, some programs require older chips. A stand-alone version of Diamond programmer will need to be installed. A separate free license is also required so that the older chip burning function can be enabled.

If there is no web site account, please register your account in <https://www.latticesemi.com/Accounts/AccountRegister>.

Then log into your account at youdaoplaceholder0  
<https://www.latticesemi.com/Support/Licensing/DiamondAndiCEcube2SoftwareLicensing/DiamondFree> to apply for a free license.

Please follow these steps to request your Lattice Diamond Free Software license:

1. Review your Web Account information below. [ [Edit](#) ]

**Name:** \_\_\_\_\_

**Email:** \_\_\_\_\_

2. Fill in the Software License Request Form and Submit.

**Finding the Host NIC:**

For Windows, from an MS-DOS window, use the ipconfig /all command

For Linux, from the command prompt, use the ifconfig -a command

The Physical Address is a 12-digit hexadecimal value split into pairs with dashes, like this: **00-01-02-66-1D-E0** depending on

After you successfully complete and submit this form, a new license file with instructions on how to install it will be emailed to

For more information about Licensing, please go to <http://www.latticesemi.com/en/Support/Licensing> and raise a Support Case technical issues

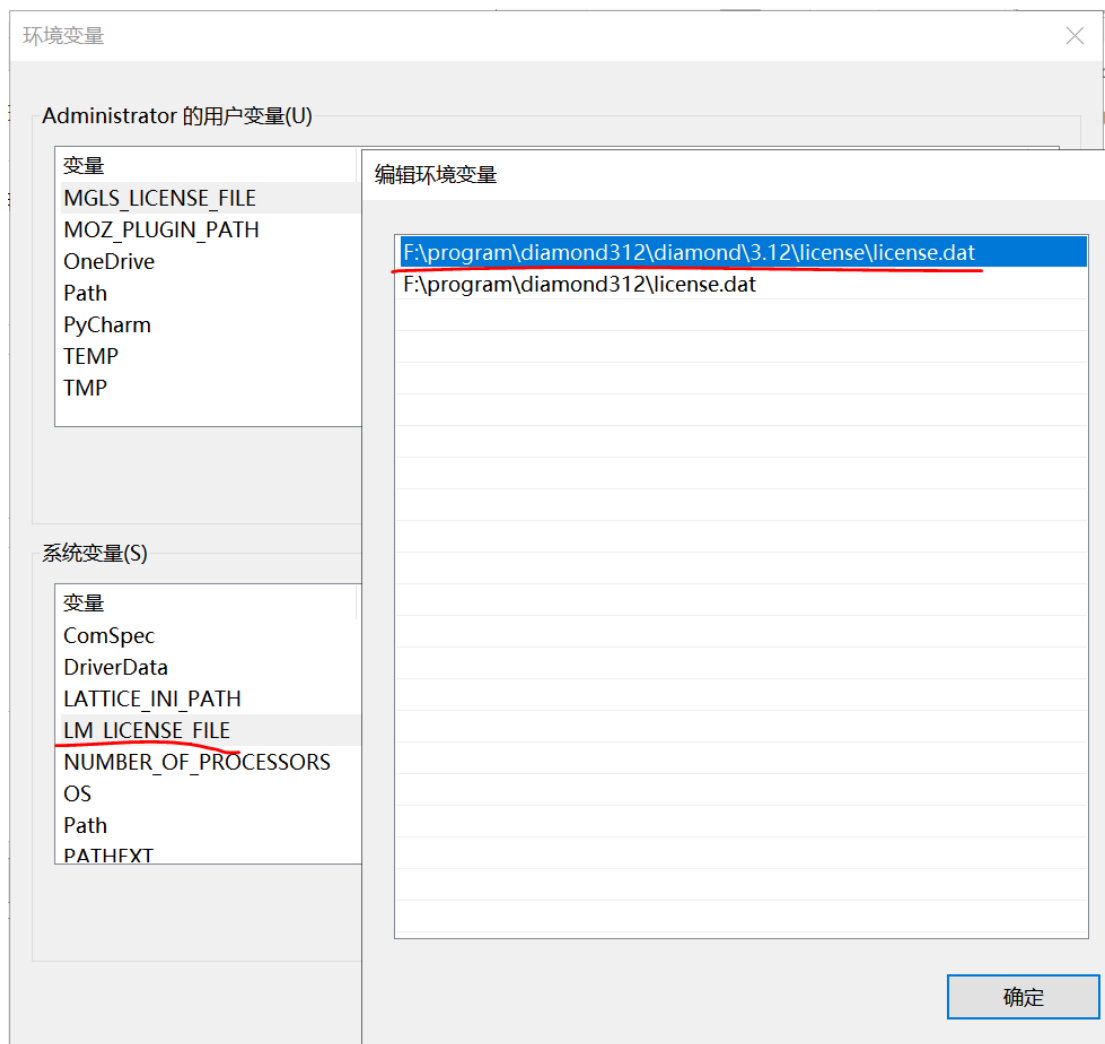
### Software License Request Form

**Note:** The license file will be sent to the web account email address: [lichenlin@szfpga.com](mailto:lichenlin@szfpga.com)

Host NIC (physical address) \*

☐ I verify that I am not an employee of Cadence Design Systems, Mentor Graphics Corporation, or Synopsys, Inc.

Enter your MAC address in NIC. And select "I Verify" to confirm.  
You will get the license file at the email address you registered.



In the system variable of your computer, set the license location.

If you have diamond's license before, you can copy the new license content to the old license content.

## 8 Connect the programming device

Connect the HW-USBN-2B device and disconnect the HW-USBN-2B device, the target board must power off mode. And you need to connect the GND pins first before connecting the other cables. If you do not follow this order, the chip may be damaged.

When the HW-USBN-2B device is connected to the computer, in normal working mode, on the computer "**Device Management**" will display two USB Serial Converter A and USB Serial Converter B.

diamond or ispVM System software is installed by default, and the system will install the driver automatically.

If "**Unknown Device**" is displayed, follow the steps to install the driver.

- 1) In the "**Unknown Device Properties**" dialog box, select "**Reinstall Driver**".
- 2) Select "**Browse My Computer Install Driver**".

- 3) Select "Browse My Computer Install Drivers"
- 4) For **ispVM System**, select "**ispvmsystem\Drivers\FTDIUSBDriver**" to install the driver
- 5) for **Diamond Programmer** to choose "**Diamond\data/vmdata/drivers**" install the driver

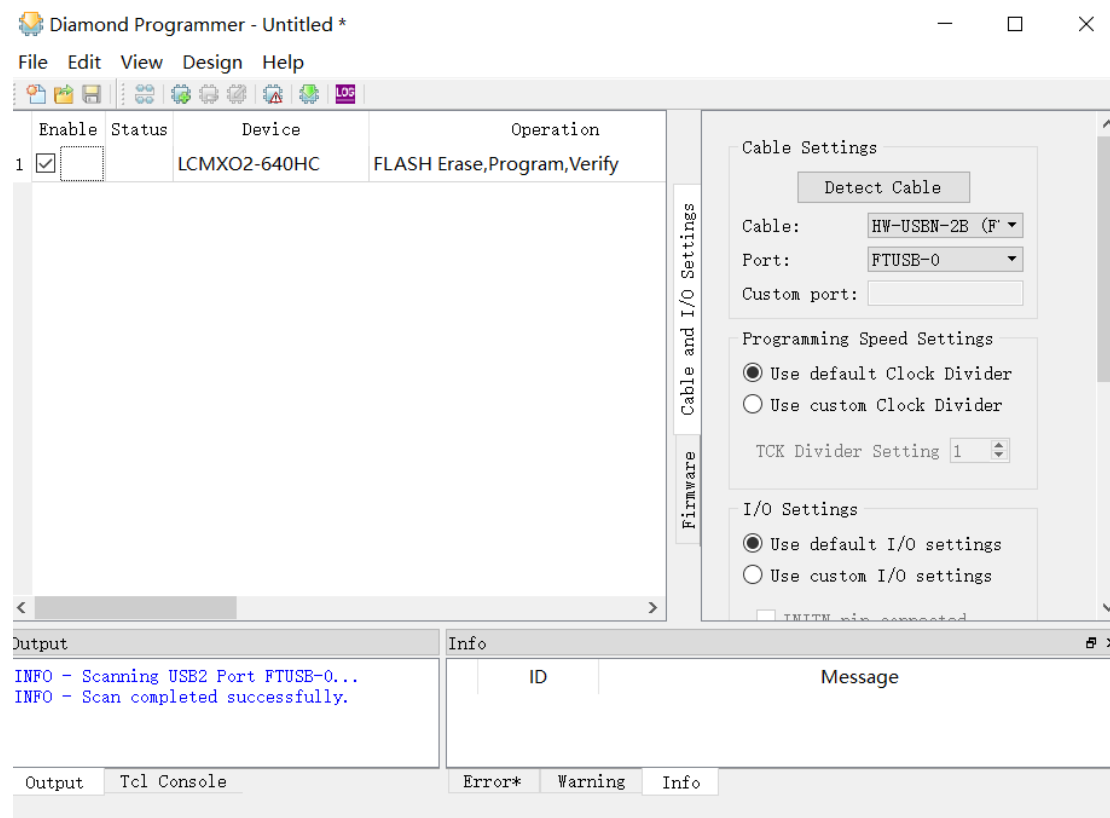
## 9. Test the device

Open the Diamond programmer software and select Detect Cable. Two HW-USBN-2B devices can be detected.

Select channel FTUSB-0 channel, for SPI and JTAG, for I2C channel burning.

In Windows 10, muse select a000 channel, Because channel may initial to FTUSB-1.

For the newly upgraded version, SPI and JTAG and I2C channels are in channel 0, no need to select.(that meaning only one channel , for older version you can detect two channels).



For some chips need to adjust the speed, you can TCK operation. **TCK Divider Setting**, which sets the frequency division factor

Settings

Cable Settings

Detect Cable

Cable: HW-USBN-2B (F) ▼

Port: FTUSB-0 ▼

Custom port:

Programming Speed Settings

☐ Use default Clock Divider

☒ Use custom Clock Divider

TCK Divider Setting 3

I/O Settings

## 10 Frequently Asked Questions

### A). Can't find the device?

First confirm whether the download is recognized by the system, normally in the device manager is two USB Serial names. Then Detect Cable and make sure to operate on Channel A. Scan the chip again. If the yellow prompt appears, manually select and click the chip first, select the download file, and choose to save the project.

For the newly upgraded version, SPI and JTAG and I2C channels are in channel 0, no need to select.

For old chips or chips with too long wiring, reduce TCK speed to test, set the TCK Divider to above 3, and then test.

Note: please don't burn the Lattice bring FT2232HL development board chips, there will be conflicts.

### B) what is the VCC wire, burning device need to connect ?

The download belongs to the online burner, need the target board support, does not support off-line single chip burning. VCC is the port reference voltage of the JTAG of the download, because the chip JTAG port voltage can be from 1.2V to 5V voltage, so it must be consistent with the circuit reference voltage of the JTAG of the target board chip, so as to ensure the burning. In JTAG, SPI, I2C, the three modes should ensure that the VCC, GND connection is normal. The downloader status light is displayed in yellow.

### C) I2C burning how to link?

I2C link, SCL,SDA,VCC,GND need to be linked. Also make sure that the burning chip is SCL, SDA pull-up resistor. And the chip needs blank chip or wipe clean chip, otherwise I2C function can not be used. After the JTAG is wiped clean, please power it on again to ensure that the chip is in open I2C interface.

### D) Crosslink, Ice40 How to link

burning device name ----- chip Name of the chip pin

VCC < ----- > chip VCCIO 0 voltage

TDO < ----- > SPI - MISO

TCK < ----- > SPI - SCK

TRST< ----- > CRESET - B

ISPEN< ----- > SPI - SS

TDI< ----- > SPI - MOSI

GND< ----- > GND

only support in plate chip burn, Please ensure that the chip circuit is normally powered, SPI-SS pull up, CRESET-B pull up.

If the cable is inserted incorrectly, be sure to replace it after power off, and then power it on for detection. Because Crosslink has a special power-on process. See the chip documentation for details.

## 11. Packaging information

- 1). SZFPGA HW-USBN-2B emulator.
- 2). USB to TYPE B USB cable.
- 3). 2.54mm 2\*7P Color DuPont cable.



## 12. Order information

Product model
SZFPGA HW-USBN-2B