



# GWU2U Datasheet

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## Revision History

| Date       | Version | Description                                                                                                  |
|------------|---------|--------------------------------------------------------------------------------------------------------------|
| 06/29/2021 | 1.0E    | Initial version published.                                                                                   |
| 01/05/2023 | 1.0.1E  | The figures in Chapter 6.1 "USB to RS232 Application" and Chapter 6.2 "USB to MCU UART Application" updated. |

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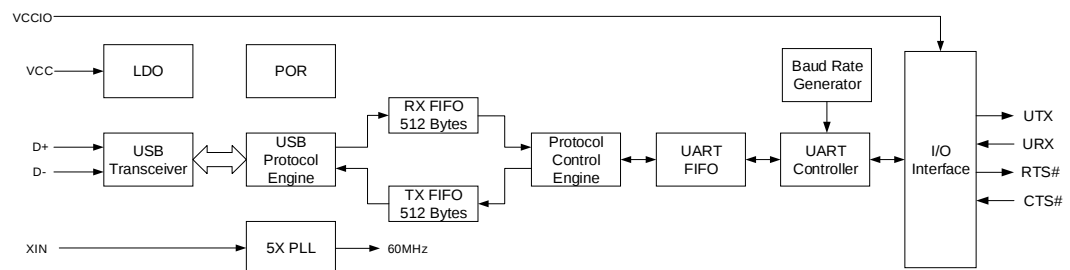
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# 1 General Description

## 1.1 Overview

GWU2U is an ASSP bridge chip in the Gowin Gobridge family that converts USB to/and from UART peripheral interfaces. It is a highly integrated, low-power, and single-chip solution for communicating with a UART peripheral interface over USB. The structure view is as shown in Figure 1-1.

Figure 1-1 GWU2U Structure View



## 1.2 Features

- Supports full-speed USB device interface, compatible with the USB v1.1 specification.
- Built-in USB protocol processing, without device firmware programming.
- Supports USB to UART function;
- Supports full-duplex asynchronous communication with built-in independent transceiver buffers.
- Supports data baud rate: 64bps~4Mbps.
- Supports 5/6/7/8 bit width.
- Supports parity mode: none/even/odd/space/mark.

- Independent I/O power supply, supports multiple level standards.
- API provided for host device usage.

## 1.3 Typical Applications

- USB products field upgrading
- USB Industry control
- USB-based instruments
- USB to UART bus interface

## 1.4 Driver Supported

GWU2U supports the WinUSB drivers as below:

- Windows XP 64 bits
- Windows 7/Windows 10 32 bits, 64 bits

# 2 Package

GWU2U package information is described in Table 2-1 as below.

**Table 2-1 Product Package Resources**

| Package | Pitch (mm) | Size (mm) |
|---------|------------|-----------|
| QN32    | 0.5        | 5 x 5     |

## 2.1 QN32 Pin Description

Figure 2-1 QN32 Pin-Out

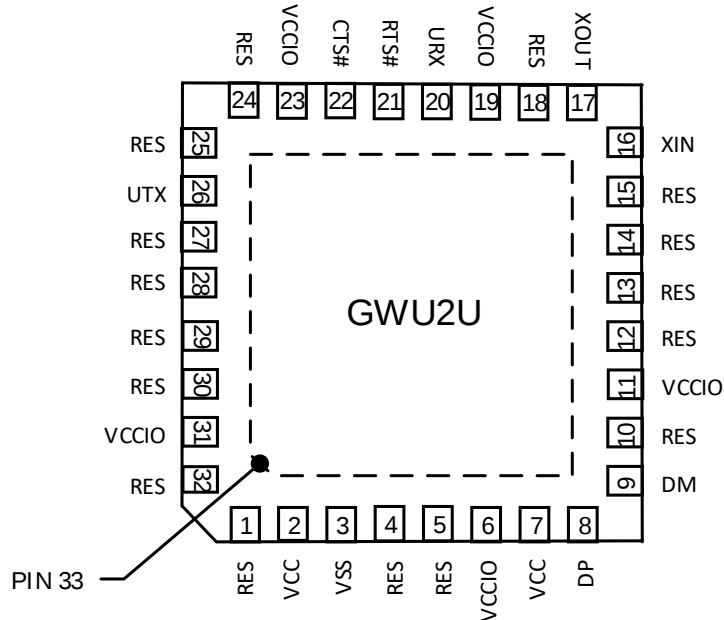


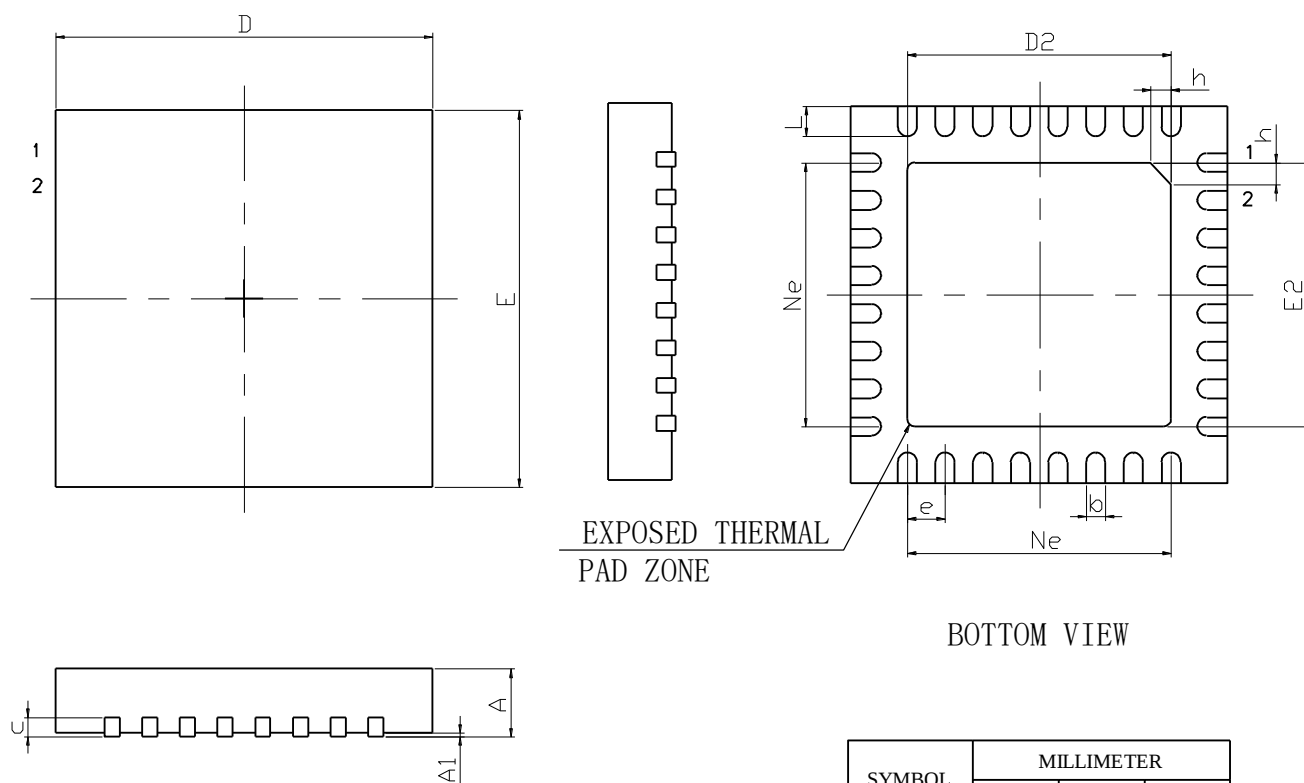
Table 2-2 QN32 Pin Description

| Pin No.           | Pin Name | Type         | Description                                                                                  |
|-------------------|----------|--------------|----------------------------------------------------------------------------------------------|
| 2/7               | VCC      | Power Supply | Power Input                                                                                  |
| 6/11/<br>19/23/31 | VCCIO    | Power Supply | Input/Output Pin Voltage                                                                     |
| 3/33              | VSS      | Power Ground | Common Ground                                                                                |
| 16                | XIN      | Clock        | Input of crystal oscillation,<br>external crystal and oscillation<br>capacitor               |
| 17                | XOUT     | Clock        | Reverse output of crystal<br>oscillation, with external crystal<br>and oscillation capacitor |
| 8                 | DP       | Two-Way      | USB Data signal D+; 1.5K pull-up<br>resistor needs to be connected                           |
| 9                 | DM       | Two-Way      | USB data signal D-                                                                           |
| 21                | RTS#     | Output       | Request to send                                                                              |
| 22                | CTS#     | Input        | Clear to send                                                                                |
| 26                | UTX      | Output       | Serial data output                                                                           |

| Pin No.                                              | Pin Name | Type  | Description                             |
|------------------------------------------------------|----------|-------|-----------------------------------------|
| 20                                                   | URX      | Input | Serial data input                       |
| 1/4/5/10/12/13/<br>14/15/18/24/25/<br>27/28/29/30/32 | RES      | -     | Reserved port. Need to be left floating |

## 2.2 QN32 Package Outline

Figure 2-2 QN32 Package Outline

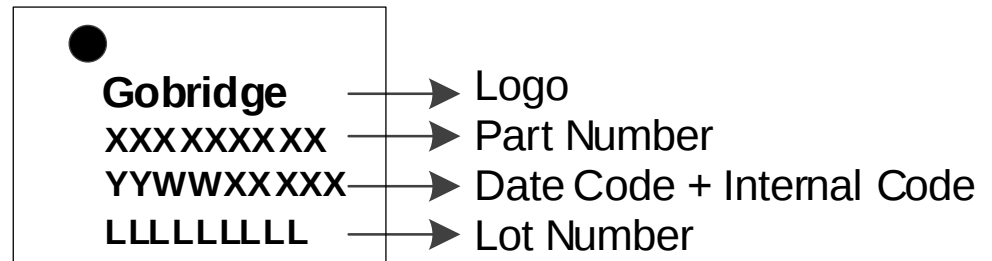


BOTTOM VIEW

| SYMBOL | MILLIMETER |      |      |
|--------|------------|------|------|
|        | MIN        | NOM  | MAX  |
| A      | 0.70       | 0.75 | 0.80 |
| A1     | 0          | 0.02 | 0.05 |
| b      | 0.18       | 0.25 | 0.30 |
| c      | 0.18       | 0.20 | 0.25 |
| D      | 4.90       | 5.00 | 5.10 |
| D2     | 3.40       | 3.50 | 3.60 |
| e      | 0.50BSC    |      |      |
| Ne     | 3.50BSC    |      |      |
| E      | 4.90       | 5.00 | 5.10 |
| E2     | 3.40       | 3.50 | 3.60 |
| L      | 0.35       | 0.40 | 0.45 |
| h      | 0.30       | 0.35 | 0.40 |

## 2.3 Package Marking

Figure 2-3 Package Mark Meaning



# 3 Function Description

## 3.1 Hardware Description

- Both VCC and VCCIO need to be provided for the GWU2U chip to work normally. It is suggested to connect a power decoupling capacitor with a capacity of  $0.01\mu\text{F} \sim 0.1\mu\text{F}$  to the power pin of each chip. The synchronous serial interface voltage can be adjusted dynamically through VCCIO, with the range of  $2.5\text{V} \sim 3.4\text{V}$ .
- A 12MHz external clock signal to the XIN pin is required for normal operation of the GWU2U chip. Normally, the clock signal is generated by the GWU2U built-in inverter via crystal frequency stabilization oscillation. The peripheral circuit only requires a 12MHz crystal connected between the XIN and XOUT pins and oscillation capacitors connected to ground for the XIN and XOUT pins, respectively.
- GWU2U chip has built-in power on reset circuit, and no external reset is required.
- The USB port of GWU2U chip has no built-in pull-up resistor, and additional 1.5K pull-up resistor needs to be provided at the DP end. It is recommended to connect the insurance resistor or inductor or ESD protection device in series for safety, and the AC-DC equivalent series resistance should be within  $5\Omega$ .

## 3.2 Asynchronous High-Speed Serial Interface

The pins of the GWU2U chip in asynchronous serial mode include: data transmission pins and hardware flow control pins, where the data transmission pins are UTX and URX, and the hardware flow control pins are RTS# and CTS#.

The chip contains an independent data buffer internally and supports full-duplex asynchronous serial communication. It supports 5~8 data bits; supports 1/2 stop bits; supports parity mode including none, even, odd, space, mark; supports baud rate ranging from 64 to 4000000. The baud rate error of the serial port transmit signal is less than 0.3%, and the allowable baud rate error of the serial port receive signal is about 2%.

The GWU2U driver enables the emulation of standard serial ports under the Windows operating system on the computer side, thus most of the original serial applications are fully compatible and usually do not require any modification. The GWU2U can be used to upgrade the original serial peripherals or to add additional serial ports to the computer via the USB bus. Further interfaces such as RS232, RS485, RS422, etc. can be provided by adding level conversion devices.

# 4 Driver Description

For more information about the driver, please refer to the following manuals:

- [UG1006, GWU2U Driver \(libusb+WinUSB based\) User Guide](#)
- [UG1007, GWU2U Driver \(Windows VCP\) User Guide](#)

# 5

## Device Characteristics and Parameters

### 5.1 Absolute Max. Parameters

Table 5-1 Absolute Max. Parameters

| Parameter | Description of Parameter           | Min. | Max. | Unit |
|-----------|------------------------------------|------|------|------|
| TA        | Ambient temperature during work    | -40  | 85   | °C   |
| TS        | Ambient temperature during storage | -65  | 150  | °C   |
| VCC       | Power voltage                      | -0.5 | 3.75 | V    |
| VCCIO     | Input/Output Pin Voltage           | -0.5 | 3.75 | V    |

### 5.2 Electrical Parameters

Table 5-2 Electrical Parameters

| Parameter | Description of Parameter                          | Min.      | Typ. | Max.      | Unit |
|-----------|---------------------------------------------------|-----------|------|-----------|------|
| VCC       | Power voltage                                     | 3         | 3.3  | 3.6       | V    |
| VCCIO     | Input/Output Pin Voltage                          | 2.5       | -    | 3.4       | V    |
| Icc1      | Total power supply current during operation       | -         | 35   | -         | mA   |
| VIL       | Low-level input voltage                           | -0.3      | -    | 0.35*VCCO | V    |
| VIH       | High-level input voltage                          | 0.65*VCCO | -    | 3.6       | V    |
| VOL       | Low-level output voltage<br>(Drive current = 8mA) | -         | -    | 0.4       | V    |
| VOH       | High-level output voltage                         | VCCO-0.4  | -    | -         | V    |

| Parameter | Description of Parameter       | Min. | Typ. | Max. | Unit |
|-----------|--------------------------------|------|------|------|------|
|           | (Drive current = 6mA)          |      |      |      |      |
| UVOL      | USB Low-level output voltage   | -    | -    | 0.4  | V    |
| UVOH      | USB High-level output voltage  | 2.8  | -    | -    | V    |
| UVse      | Single-ended receive threshold | 0.8  | -    | 2.0  | V    |

## 5.3 Timing Parameters

Table 5-3 Timing Parameters

| Parameter | Description of Parameter                    | Min. | Typ. | Max. | Unit |
|-----------|---------------------------------------------|------|------|------|------|
| FCLK      | The Input clock signal frequency of XIN pin | -    | 12   | -    | Mhz  |
| TPR       | Reset time of power on                      | -    | 5    | -    | mS   |

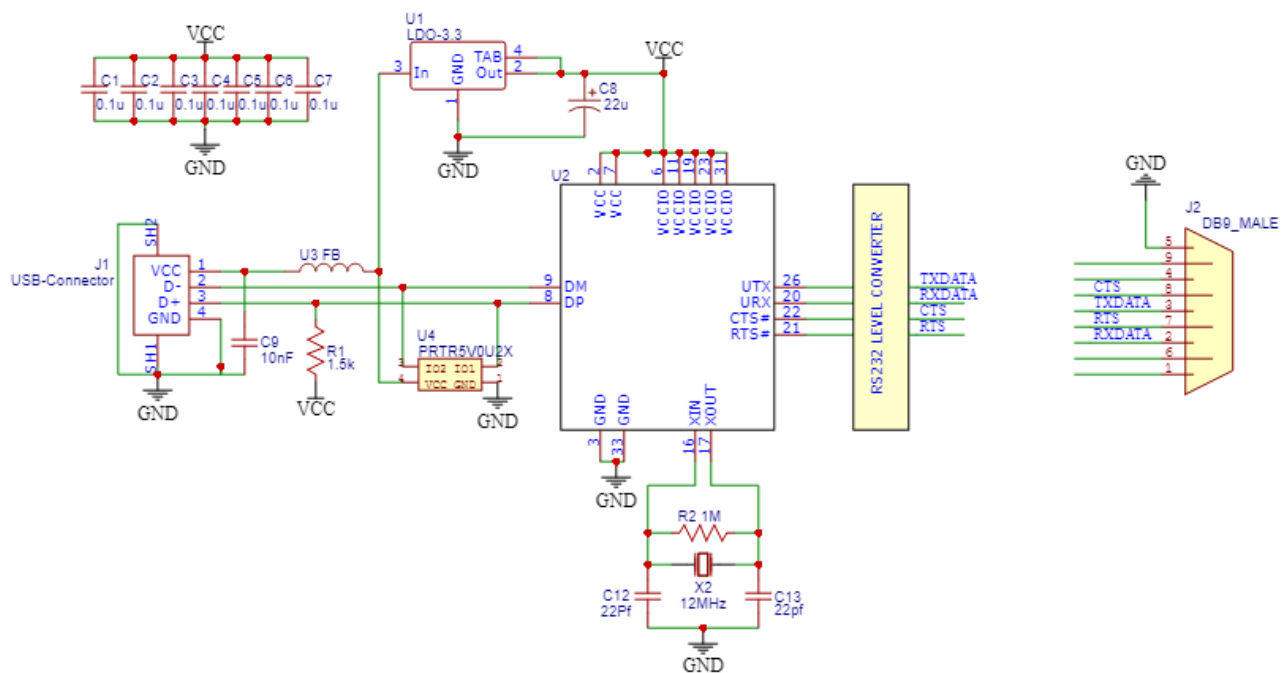
## 5.4 ESD Parameters

Table 5-4 ESD Paramrters

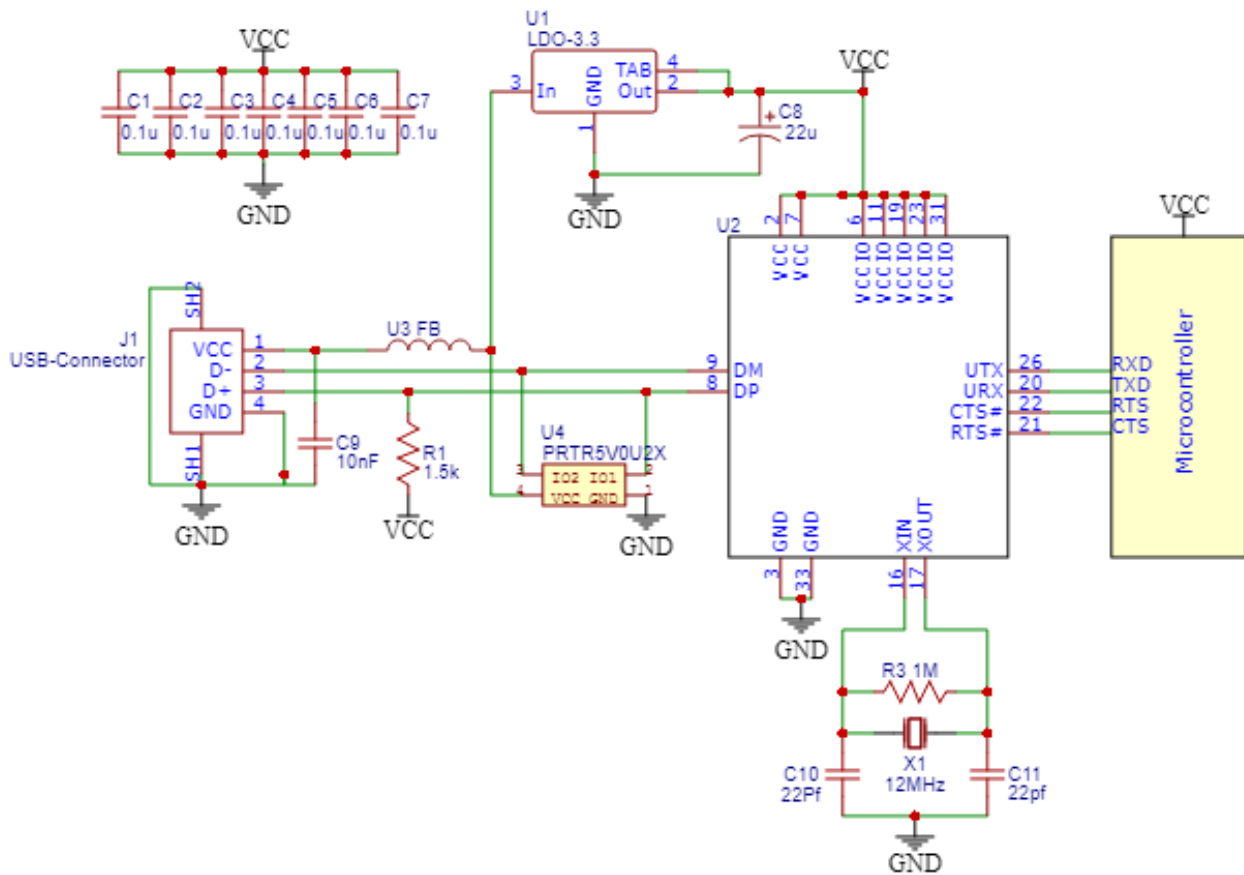
| Parameter | Description of Parameter | Min. | Typ. | Max. | Unit |
|-----------|--------------------------|------|------|------|------|
| HBM       | Human Body Model         | 1000 | -    | -    | V    |
| CDM       | Charged Device Model     | 500  | -    | -    | V    |

# 6 Typical Applications

## 6.1 USB to RS232 Application



## 6.2 USB to MCU UART Application



# Terminology and Abbreviations

The terminology and abbreviations used in this manual are as shown in Table A-1.

**Table A-2 Terminology and Abbreviations**

| Terminology and Abbreviations | Meaning                                     |
|-------------------------------|---------------------------------------------|
| ASSP                          | Application Specific Standard Product       |
| GPIO                          | Gowin Programmable Input/Output             |
| QN                            | Quad Flat No-lead Package                   |
| ESD                           | Electrostatic Discharge                     |
| MCU                           | Microcontroller Unit                        |
| UART                          | Universal Asynchronous Receiver/Transmitter |

# Support and Feedback

Gowin Semiconductor provides customers with comprehensive technical support. If you have any questions, comments, or suggestions, please feel free to contact us directly by the following ways.

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

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

