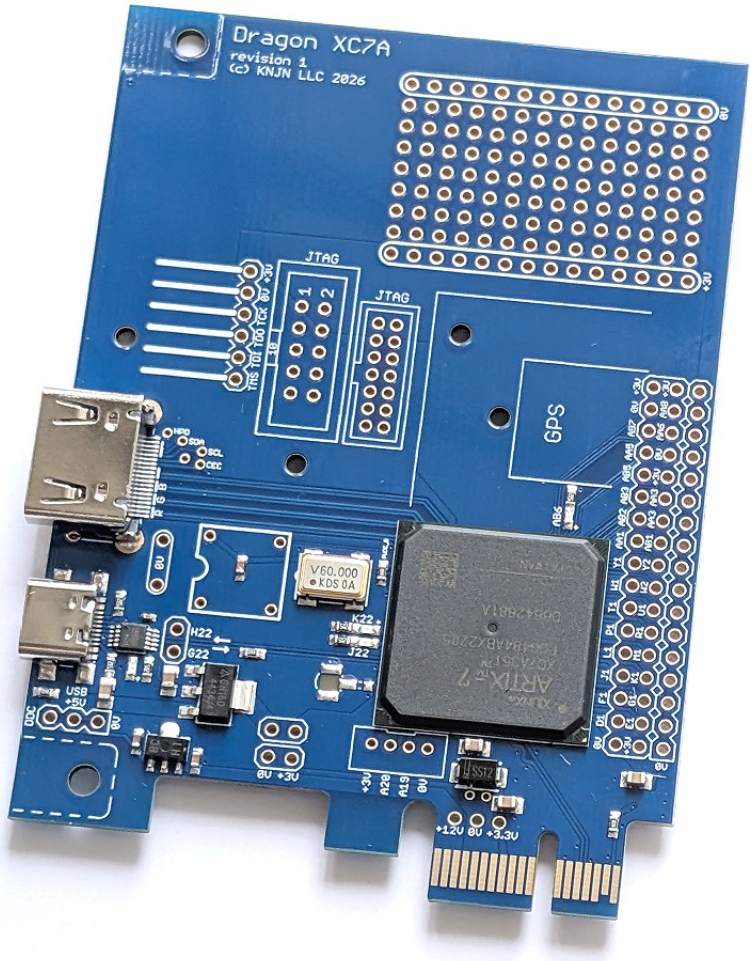
Dragon XC7A & XC7M FPGA development boards

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https://www.knjn.com/

This document applies to the following boards:

- Dragon XC7A
- Dragon XC7M



Document last revision **October 26, 2026**

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1 Introduction

1.1 Features

- Xilinx/AMD XC7A35T FPGA
    - XC7A: Standard-height PCI Express board with 30 GPIOs and 3 LEDs
      XC7M: Low-profile PCI Express board with 28 GPIOs and 3 LEDs
- HDMI output
- USB-C with CH340 serial interface

The XC7A/XC7M boards can be used either standalone or inside a PC (PCI Express).

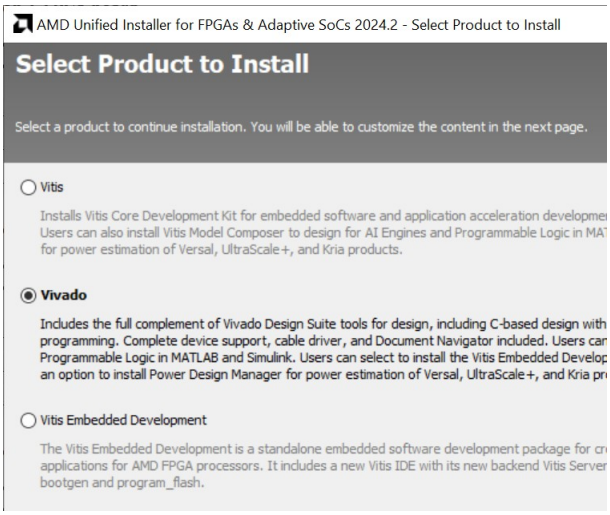
1.2 Software

Once your board has shipped, your order page has links to the FPGA vendor software and to the “startup kit”, which includes utilities and example source code.

2 Vivado

2.1 Vivado installation

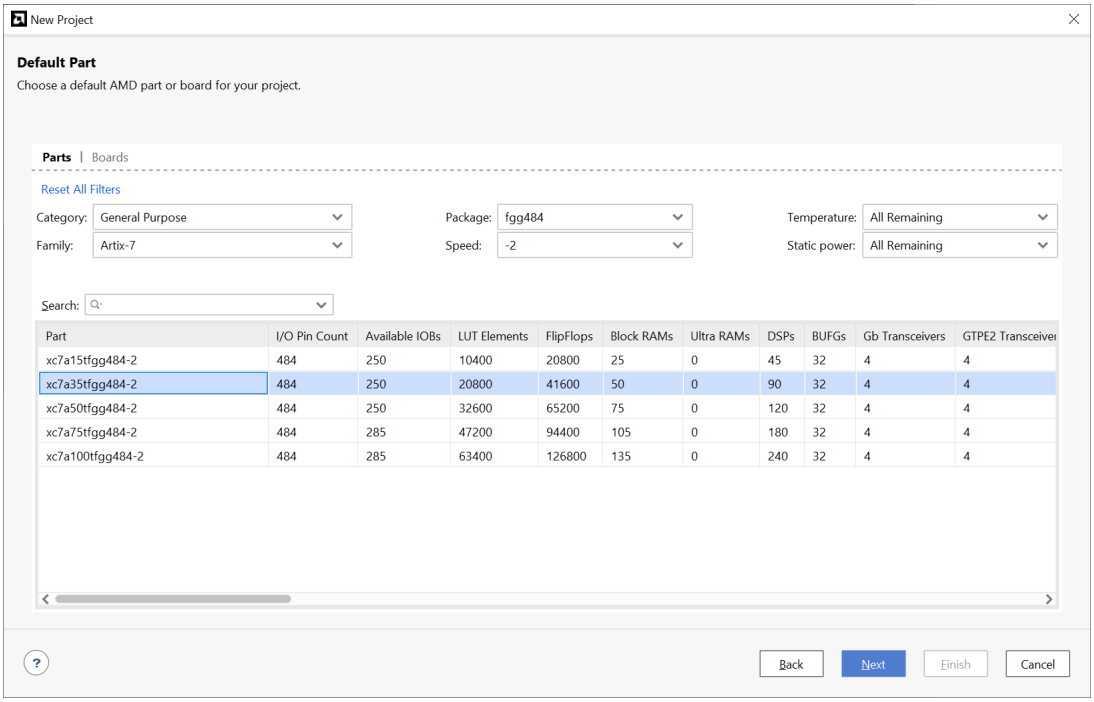
Download and install the free version of Vivado





2.2 Vivado project

Once Vivado is installed, you are ready to create a new FPGA project.
Select the XC7A35T in the FGG484 package.



3 FPGA configuration

The board is configured with either a Xilinx/AMD or a KNJN JTAG cable:

- Xilinx/AMD: use a DLC10 or compatible cable.
- KNJN: use the KNJN USB JTAG cable (KNJN item#5179) with the FPGAconf software.

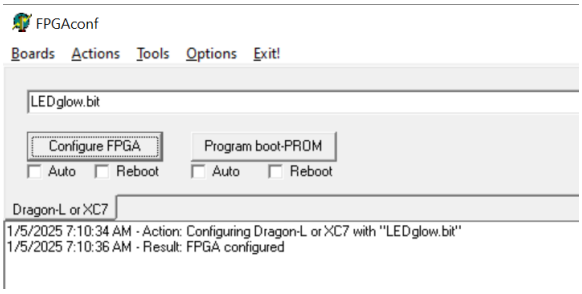
3.1 FPGAconf USB driver

The driver is signed and compatible with Windows 10/11.

1. Plug the KNJN JTAG cable into a USB port of your PC.
2. In the Device Manager, find the new unrecognized device in the USB section. Click “Update Driver” and select the driver folder.

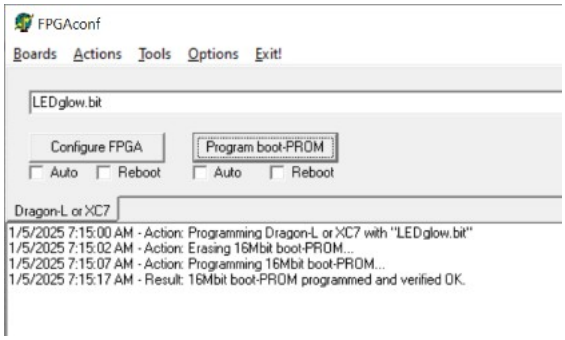
3.2 FPGAconf FPGA configuration

In the “Boards” menu, select “Dragon-L or XC7 (JTAG)”.
Then select a bitfile and click “Configure FPGA”.



3.3 FPGAconf boot-PROM programming

Select a bitfile and click “Program boot-PROM”.



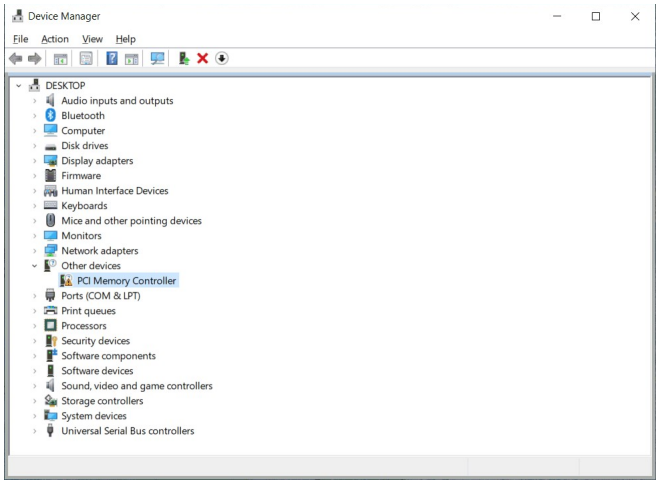
4 PCI Express

The simplest way to get started is the PIO example:
https://www.youtube.com/watch?v=1YgviyNfLYY

1. Create a PIO example project for an XC7A35TFGG484-2.
2. Add these lines to the XDC file:

```
set_property PACKAGE_PIN A8 [get_ports pci_exp_rxn[0]]
set_property PACKAGE_PIN A4 [get_ports pci_exp_txn[0]]
set_property CFGBVS VCCO [current_design]
set_property CONFIG_VOLTAGE 3.3 [current_design]
set_property BITSTREAM.GENERAL.COMPRESS true [current_design]
set_property BITSTREAM.CONFIG.UNUSEDPIN pullup [current_design]
set_property BITSTREAM.CONFIG.SPI_BUSWIDTH 2 [current_design]
set_property BITSTREAM.CONFIG.CONFIGRATE 50 [current_design]
```

   and compile the design to get a bitfile.
3. Program the bitfile into the boot-PROM.
4. With the test PC powered off, insert the Dragon board into a PCI Express slot. Boot the test PC: your OS should recognize the board.



5 HDMI

The HDMI source code is ported from https://github.com/hdl-util/hdmi

6 Clock sources

The boards accept DIL-8, SMD 5x7 and SMD 3x2 clock oscillators, which drive different FPGA clock inputs.

Board	DIL-8	SMD 5x7	SMD 3x2
XC7A	To solder	60MHz	To solder
XC7M rev 1	To solder	To solder	To solder
XC7M rev 2	To solder	To solder	25MHz

Other clock sources include the PCI Express interface and the internal configuration clock. See the LEDglow source code example for details.

6.1 High-stability clock

If you need a high-stability clock, the XC7A board can be fitted with a VCTCXO. These oscillators are very stable, typically ±2.5ppm or better.

Solder a VCTCXO on the SMD 3x2 oscillator footprint below the FPGA, on the back of the board, plus a small 100KΩ 0603 resistor. Or order “XC7A HSC” with the VCTCXO and resistor pre-assembled.

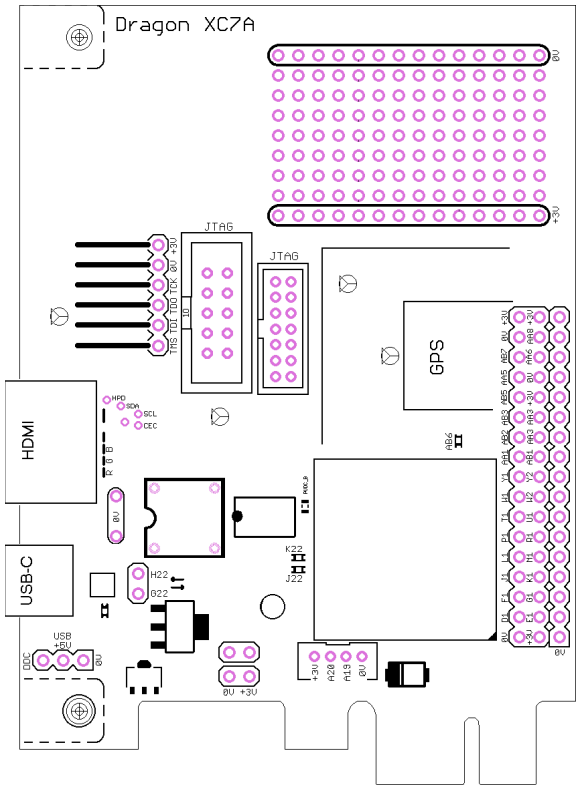
6.2 GPSDO

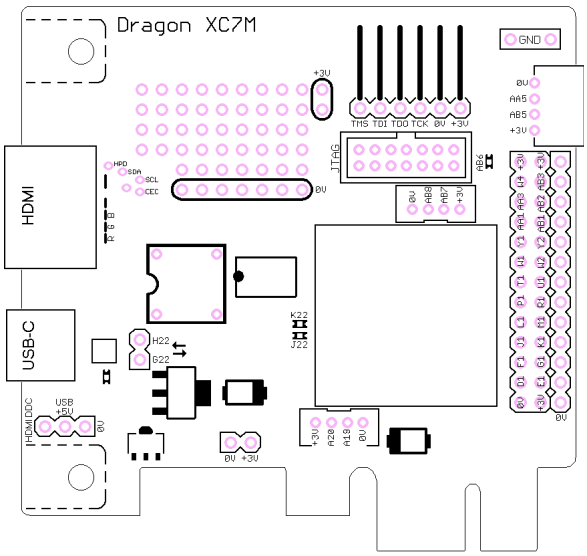
For even better accuracy, a GPS module can control the VCTCXO to create a GPSDO.

Connect a GPS module to the area marked “GPS” on the board. Use a five-pin GPS module (with PPS output), then run the GPSDO example code.

Boards with the VCTCXO and GPS module assembled are available on the FPGA kits page.

7 Board layouts





The IO FPGA pad names are shown on the header pins.

The XC7A and XC7M boards can be powered in several ways:

1. PCI Express
2. USB-C
3. KNJN JTAG cable
4. External lab power supply, either 3.3V or 5V

See also “Dragon XC7A IO schematic.pdf” in the board’s startup kit.

8 Useful items

Item name	item#
DIL-8 oscillator socket	2187
Xilinx style JTAG 2x7 shrouded connector	2189
KNJN USB JTAG cable	5179
Miscellaneous oscillators DIL-8 or SMD 5x7	7000~7999