Dragon XC7M FPGA development board

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This document applies to the following board.

• Dragon XC7M revision 1



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1 Introduction

1.1 Features

- Xilinx/AMD XC7A35T FPGA, 28 GPIOs and 3 LEDs
- PCI Express
- HDMI output
- USB-C with CH340 serial interface
- DIL-8, SMD5x7 and SMD3x2 optional clock oscillators
- JTAG

1.2 FPGA configuration

The FPGA is configured using either a Xilinx/AMD or KNJN JTAG cable.

- Xilinx/AMD: use a <u>DLC10</u> or compatible cable.
- KNJN: use the KNJN JTAG cable for Dragon XC7M (KNJN item#5165)

1.3 FPGA software

Download and install the latest <u>Vivado</u> software. When using the KNJN JTAG cable, we also provide <u>FPGAconf</u>.

1.4 Board power

The board can be powered in multiple ways.

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

1.5 Purchase

Want one? Go to KNJN's PCI FPGA development boards shopping page.

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 FGG484 package.

ose a defa	ault AMD part or board for	your project.								
Parts	Boards									
Reset All	Filters									
Category:	tegory: General Purpose 🗸 🗸		Package:	ge: fgg484 🗸		Temperature:		All Remaining		~
amily:	amily: All Remaining 🗸		Speed:	-2 🗸		Static power:		All Remaining		~
ct.	0-									
Search:	Q.	I/O Pin Count	Available IOBs	LUT Elements	ElinElons	Block RAMs	Ultra RAMs	DSPs	BUEGs	Gb Tran
xc7a15tf	faq484-2	484	250	10400	20800	25	0	45	32	4
xc7a35tfgg484-2		484	250	20800	41600	50	0	90	32	4
xc7a50tf	fgg484-2	484	250	32600	65200	75	0	120	32	4
xc7a75tfgg484-2		484	285	47200	94400	105	0	180	32	4
xc7a100	tfgg484-2	484	285	63400	126800	135	0	240	32	4
/										

3 FPGAconf

FPGAconf is a software used with the KNJN JTAG cable for FPGA configuration and boot-PROM programming.

3.1 USB driver

The KNJN JTAG cable comes with a USB driver. The driver is signed and compatible with Windows 10/11.

- 1. Plug-in the KNJN JTAG cable in your PC's USB port.
- 2. Go to the Device Manager and find the new unrecognized device in the USB section. Click on "Update Driver" and select the driver folder.

3.2 FPGA configuration

Run FPGAconf.

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

🗊 FPGAconf	
<u>Boards</u> <u>Actions</u> <u>T</u> ools <u>Optic</u>	ons <u>E</u> xit!
LEDglow.bit Configure FPGA Pr Auto Reboot A	ogram boot-PROM uto ┌── Reboot
Dragon-L or XC7	
1/5/2025 7:10:34 AM - Action: Config 1/5/2025 7:10:36 AM - Result: FPGA	guring Dragon-L or XC7 with "LEDglow.bit" configured

3.3 Boot-PROM programming

Select a bitfile and click on "Program boot-PROM".

🗊 FPG.	Aconf			
Boards	Actions	Tools	Options	<u>E</u> xit!
LEDg	glow.bit			
Co	onfigure FPI	ia	Progra	m boot-PROM
	uto 🗆 R	eboot	T Auto	T Reboot
Dragon-l	L or XC7			
1/5/2025 1/5/2025	7:15:00 AN	- Action	Programm Erasing 16	ing Dragon-L or XC7 with "LED glow.bit" Mbit boot-PROM
1/5/2025	7:15:07 AM	1 - Action 1 - Result	Programm 16Mbit bo	ing 16Mbit boot-PROM ot-PROM programmed and verified OK.

4 HDMI

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

5 PCI Express

The simplest way to get started is with the PIO example.

https://www.youtube.com/watch?v=1YgviyNfLYY

- 1. Create a PIO example project with a 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 VCC0 [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 bit file.

- 3. Program the bit file in the boot-PROM.
- Insert the Dragon board into a PCI express socket of your test PC (while the PC is un-powered). Boot the test PC. The board should be recognized by your OS.



6 Board layout



Check also "Dragon XC7M IO schematic.pdf" in the board's startup-kit.

7 Useful items

Item name	KNJN item#
KNJN USB JTAG cable for Dragon XC7M	<u>5165</u>
Xilinx style JTAG 2x7 shrouded connector for use with DLC10	<u>2189</u>
DIL-8 oscillator socket	<u>2187</u>
Oscillators DIL-8 or SMD5x7	<u>7000~7999</u>