



Human Counting using Mobilenet on EVDK Demonstration

User Guide

FPGA-UG-02093-1.0

October 2019

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Acronyms in This Document

A list of acronyms used in this document.

Acronym	Definition
CKPT	Checkpoint
CNN	Convolutional Neural Network
EVDK	Embedded Vision Development Kit
FPGA	Field-Programmable Gate Array
LED	Light-emitting diode
ML	Machine Learning
MLE	Machine Learning Engine
NN	Neural Network
NNC	Neural Network Compiler
SD	Secure Digital
SDHC	Secure Digital High Capacity
SDXC	Secure Digital eXtended Capacity
SPI	Serial Peripheral Interface
VIP	Video Interface Platform
USB	Universal Serial Bus

1. Introduction

This document provides technical information and instructions on setting up and running the EVDK Based Human Counting Demo.

Refer to the following documents for detailed information on Lattice development boards and kit:

- [Lattice Embedded Vision Development Kit User Guide \(FPGA-UG-02015\)](#)
- [CrossLink VIP Input Bridge Board Evaluation Board User Guide \(FPGA-EB-02002\)](#)
- [ECP5 VIP Processor Board Evaluation Board User Guide \(FPGA-EB-02001\)](#)
- [HDMI VIP Output Bridge Board Evaluation Board User Guide \(FPGA-EB-02003\)](#)

2. Functional Description

The EVDK Based Human Counting Demo is designed to utilize the Lattice Embedded Vision Development Kit with MicroSD card Adapter Board, as shown in [Figure 2.1](#).

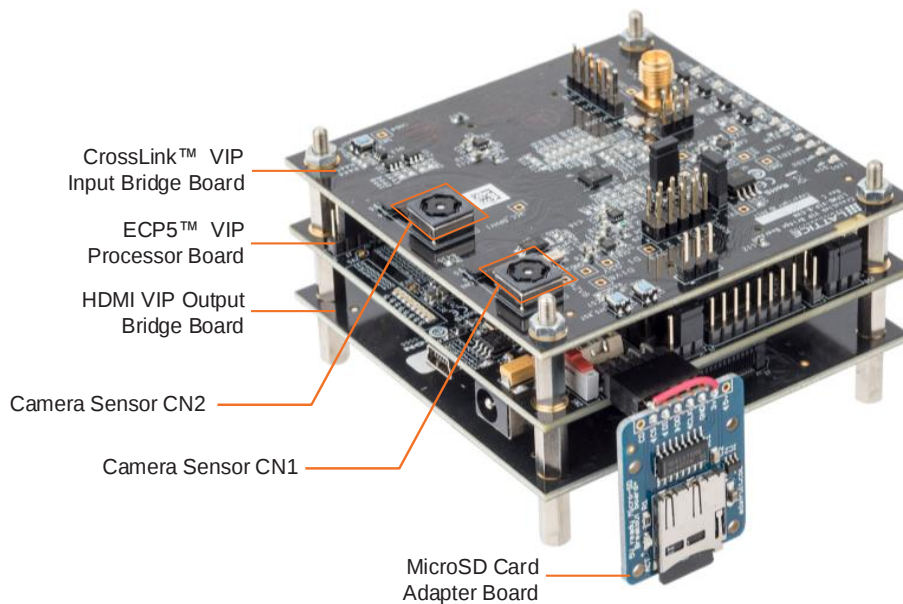


Figure 2.1. Lattice EVDK with MicroSD Card Adapter

The Lattice Embedded Vision Development Kit features a stackable modular architecture consisting of three boards:

- CrossLink Video Interface Platform (VIP) Input Bridge Board
- ECP5 VIP Processor Board
- HDMI VIP Output Bridge Board

3. Demo Setup

This section describes the demo setup.

3.1. Hardware requirements

- Lattice Embedded Vision Development Kit
 - Mini-USB Cable
 - 12 V Power Supply
- HDMI Cable
- HDMI Monitor (1080p30)
- Machine Learning Adapter Card (ML-EVN-ADP)
 - The microSD Card Adapter (MICROSD-ADP-EVN) has been replaced by the Machine Learning Adapter Card (ML-EVN-ADP). The Machine Learning Adapter card includes an optional microphone input, but is otherwise a 100% functional replacement for the microSD Card Adapter.
- MicroSD Card

3.2. Software Requirements

- Lattice Diamond Programmer (refer to <http://www.latticesemi.com/programmer>)
- Win32 MicroSD Disk Imager (refer to <https://sourceforge.net/projects/win32diskimager/>)

4. Programming the Demo

Both the CrossLink VIP Input Bridge Board and the ECP5 VIP Processor Board must be configured and programmed. Also, the demo design firmware must be programmed onto the MicroSD card which is plugged into the MicroSD Card Adaptor Board.

4.1. Programming the CrossLink SPI Flash

4.1.1. Erasing the CrossLink SRAM Prior to Reprogramming

If the CrossLink is already programmed (either directly or loaded from SPI Flash), erase the CrossLink SRAM before reprogramming the CrossLink SPI Flash. Keep the board powered on to prevent reloading on reboot.

To erase CrossLink:

1. Launch Diamond Programmer with **Create a new blank project**.
2. Select **LIFMD** for **Device Family** and **LIF-MD6000** for **Device** as shown in Figure 4.1.

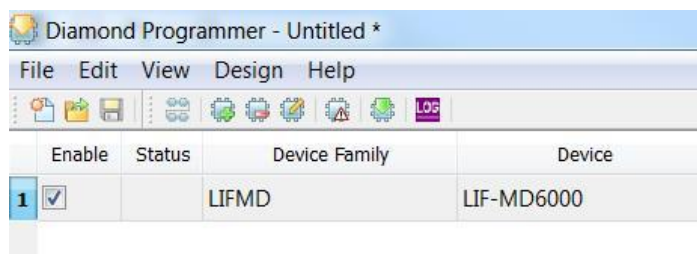


Figure 4.1. Select Device

3. Right-click and select **Device Properties**.
4. Select **SSPI SRAM Programming** for Access Mode and **Erase Only** for Operation.



Figure 4.2. Device Operation

5. Click **OK** to close the Device Properties window.
6. Click the **Program** button  in Diamond Programmer to start the erase sequence.

4.1.2. Programming the SPI on the CrossLink VIP Input Bridge Board

To program the SPI on the CrossLink VIP Input Bridge board:

1. Ensure the CrossLink device is erased by performing Steps 1-6.
2. Right-click and select **Device Properties**.
3. Select **SPI Flash Programming** for **Access mode** and make the following selections:
 - a. For **Programming File**, browse and select the CrossLink bit file (*.bit), *Dual_Camera_to_Parallel_Crosslink.bit*.
 - b. For **SPI Flash Options**, refer to [Table 4.1](#).

Table 4.1. SPI Flash Options Selection Guide

Item	Rev B	Rev C – Option 1	Rev C – Option 2
Family	SPI Serial Flash	SPI Serial Flash (SPI Serial Flash Beta for Diamond 3.10 SP1 or earlier)	SPI Serial Flash (SPI Serial Flash Beta for Diamond 3.10 SP1 or earlier)
Vendor	Micron	Micron	Macronix
Device	SPI-M25PX16	SPI-N25Q128A	MX25L12835F
Package	8-pin S08W	8-pin SOP2	8-Land WSON

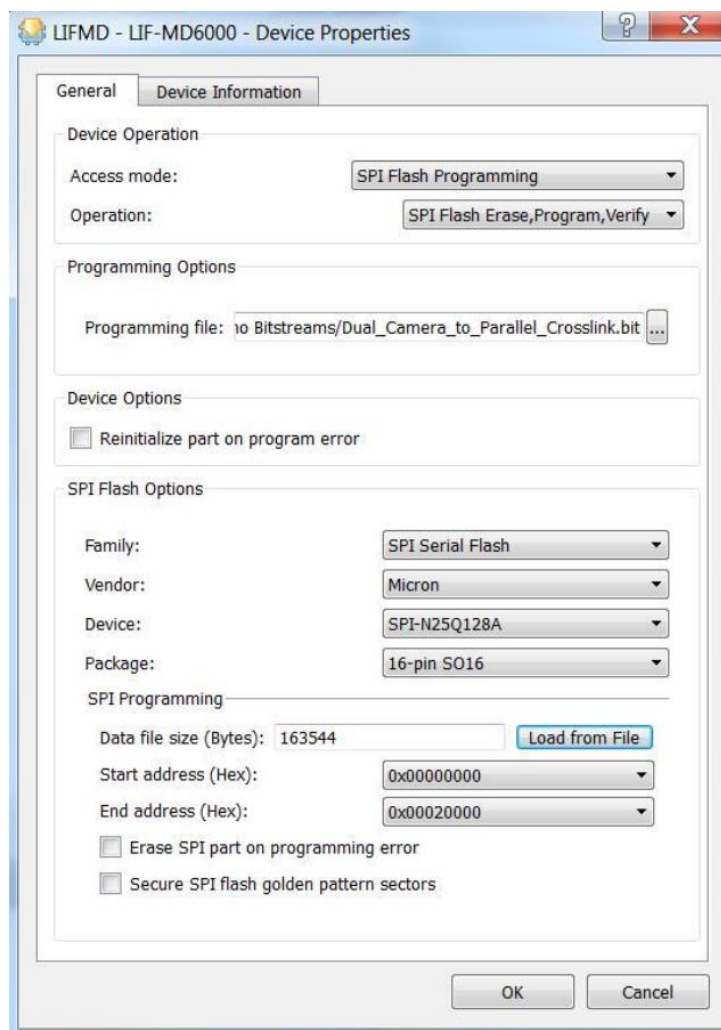


Figure 4.3. Device Properties

4. Click **OK** to close the **Device Properties** window.
5. Click the **Program** button  in Diamond Programmer to start the programming sequence.
6. After successful programming, the **Output** console displays the results as shown in [Figure 4.4](#).



Figure 4.4. Output Console

4.2. ECP5 VIP Processor Board

4.2.1. Erasing the ECP5 Prior to Reprogramming

If the ECP5 and CrossLink VIP Processor Boards are already configured and programmed, erase first the ECP5 SRAM memory, then program the ECP5's SPI Flash in the next section. The demo design firmware must also be programmed onto the MicroSD card, which is plugged into the MicroSD Card Adaptor Board.

Keep the board powered when re-programming the SPI Flash in the next section.

To erase the ECP5:

1. Launch Diamond Programmer with **Create a new blank project**.
2. Select **ECP5UM** for **Device Family** and **LFE5UM-85F** for **Device**.

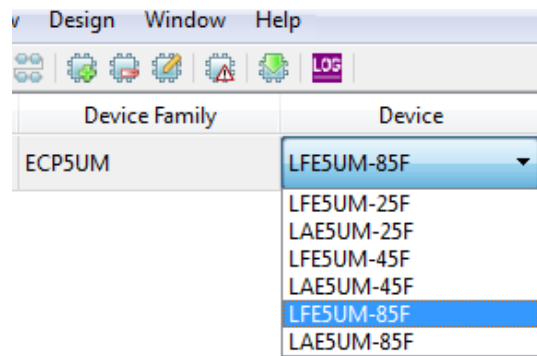


Figure 4.5. Selecting Device

3. Right-click and select **Device Properties**.
4. Select **JTAG 1532 Mode** for **Access Mode** and **Erase Only** for **Operation**.

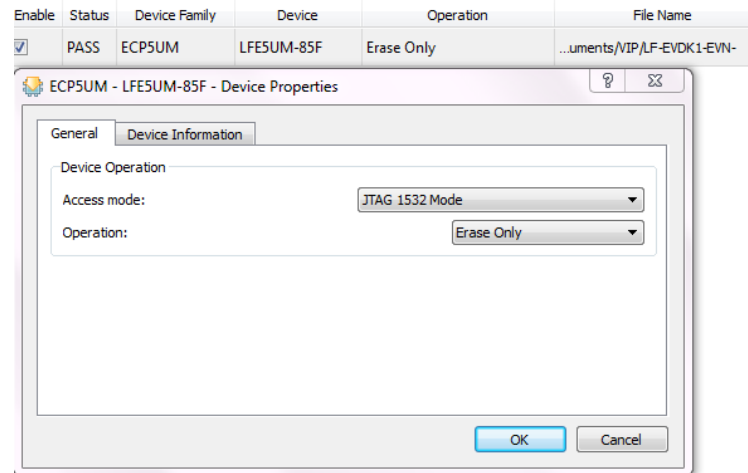


Figure 4.6. Device Operation

5. Click **OK** to close the Device Properties window.
6. Click the **Program** button  in Diamond Programmer to start the Erase sequence.

4.2.2. Programming the SPI on the ECP5 VIP Processor Board

To program the SPI:

1. Ensure the ECP5 device is erased by performing Steps 1-6.
2. Right-click and select **Device Properties**.
3. Select **SPI Flash Background Programming** for **Access mode** and make the following selections:
 - a. For **Programming file**, browse and select the Human Counting Demo bit file (*.bit) *Humancount_mobilenet_bitstream.bit*.
 - b. For **SPI Flash Options**, refer [Table 4.2](#).

Table 4.2. SPI Flash Options Selection Guide

Item	Rev B	Rev C
Family	SPI Serial Flash	SPI Serial Flash
Vendor	Micron	Macronix
Device	SPI-N25Q128A	MX25L12835F
Package	8-pin SO8	8-Land WSON

ECP5UM - LFE5UM-85F - Device Properties

General | **Device Information**

Device Operation

Access mode: SPI Flash Background Programming

Operation: SPI Flash Erase, Program, Verify

Programming Options

Programming file: Mobilenet Demo Bitstream v2.1/Humancount_mobilenet_bitstream.bit

Device Options

☐ Reinitialize part on program error

SPI Flash Options

Family: SPI Serial Flash

Vendor: Micron

Device: SPI-N25Q128A

Package: 8-pin SO8

SPI Programming

Data file size (Bytes): 1939633 Load from File

Start address (Hex): 0x00000000

End address (Hex): 0x001D0000

☐ Erase SPI part on programming error

☐ Secure SPI flash golden pattern sectors

OK Cancel

Figure 4.7 Device Properties

- Click **OK** to close the **Device Properties** window.
- Click the **Program** button  in Diamond Programmer to start the programming sequence.

- After successful programming, the **Output** console displays the results as shown in Figure 4.8.



Figure 4.8 Output Console

4.2.3. Programming the MicroSD Card Firmware

To write the image to the MicroSD Card:

- Download and install the Win32diskimager Image Writer software from the following link:
<https://sourceforge.net/projects/win32diskimager/>.
- Use Win32diskimager to write the appropriate Flash image file to the SD memory card. Depending on your PC, you may need a separate adapter (not described in this document) to physically connect to the card.
- In Win32 Disk Imager, select the **Image File** (*Humancount_mobilenet.bin*) and **Card Reader** as shown in Figure 4.9

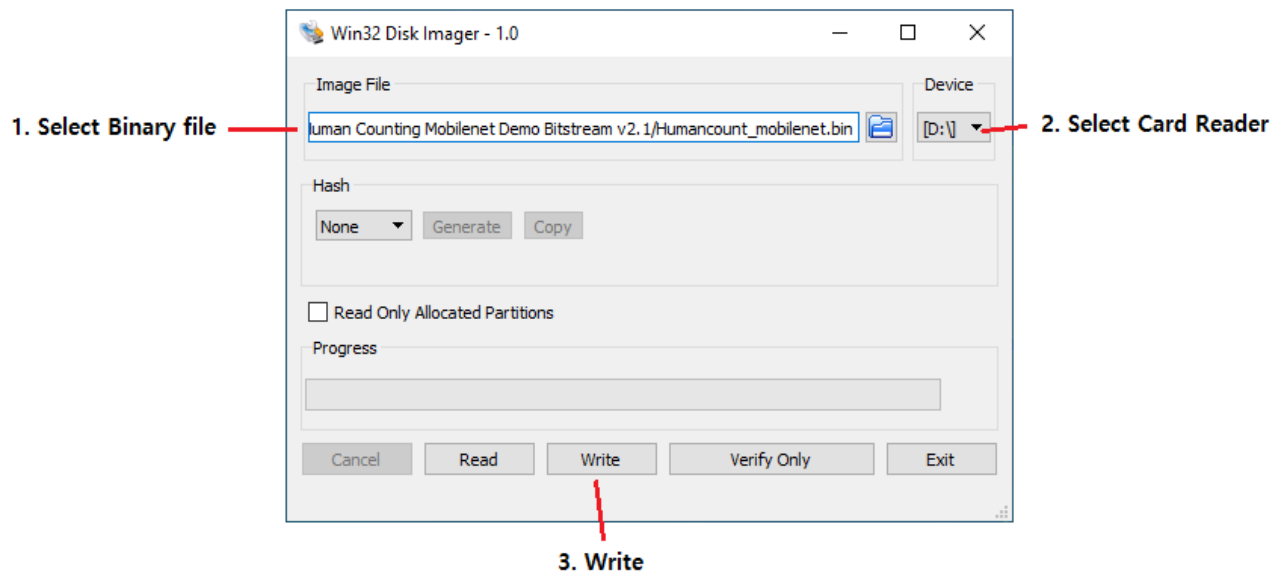


Figure 4.9 Win32 Disk Imager

- Click **Write**.

5. Running the Demo

To run the demo:

1. Insert the configured MicroSD Card into the MicroSD Card Adapter, and connect it to the Embedded Vision Development Kit.
2. Cycle the power on the Embedded Vision Development Kit to allow ECP5 and CrossLink to be reconfigured from Flash.
3. Connect the Embedded Vision Development Kit to the HDMI monitor. The camera image should be displayed on monitor as shown in [Figure 5.1](#).



Figure 5.1 Human Counting Demo Result

Technical Support Assistance

Submit a technical support case through www.latticesemi.com/techsupport.

Revision History

Revision 1.0, October 2019

Section	Change Summary
All	Initial release



www.latticesemi.com