# Kria KV260 Vision AI Starter Kit

## *User Guide*

**UG1089 (v1.0) April 20, 2021**

XILINX®

# Revision History

The following table shows the revision history for this document.

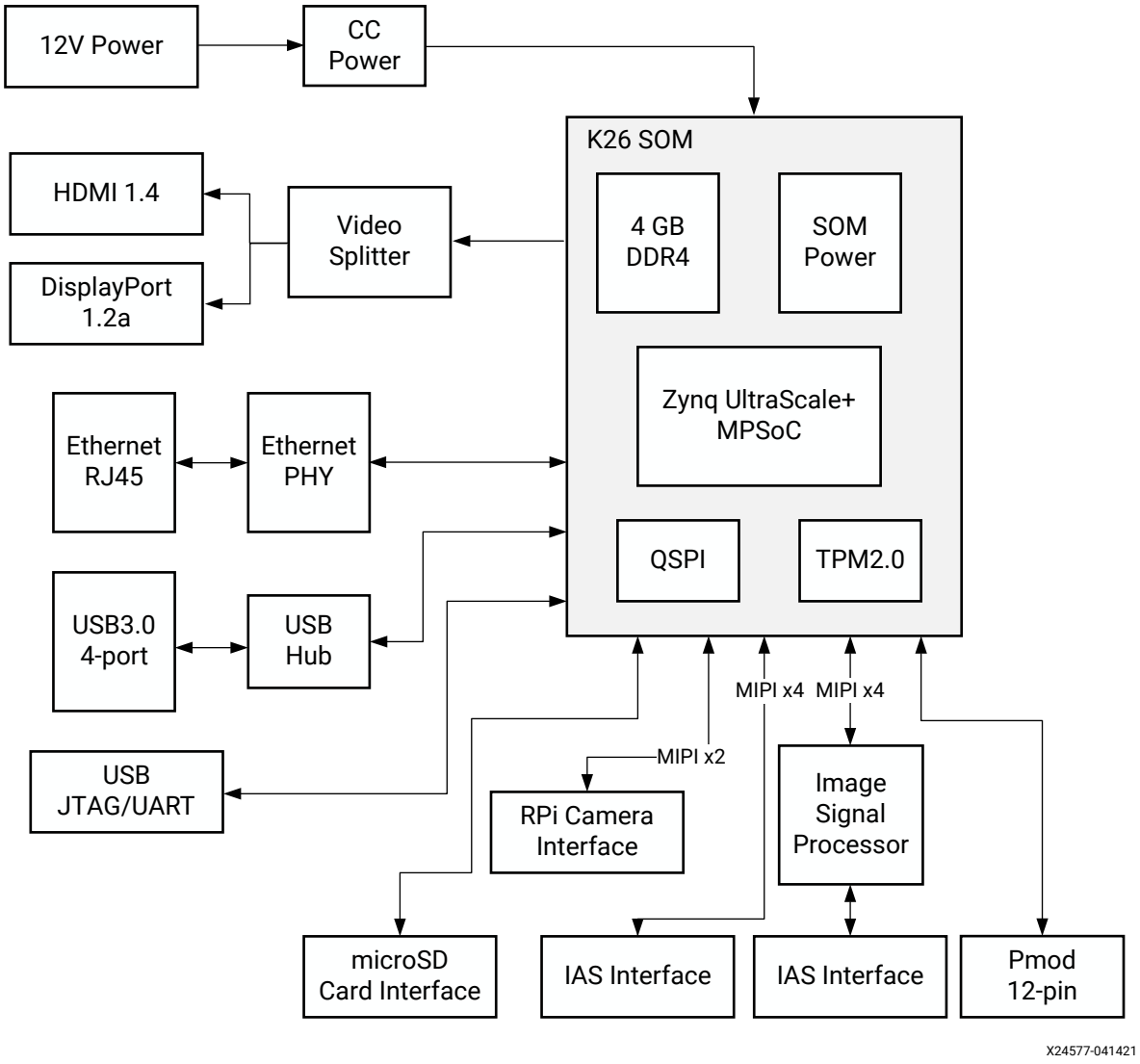
| Section | Revision Summary |
|---|---|
| **4/20/2021 Version 1.0** | |
| Initial release. | N/A |

# Table of Contents

# Summary

The Xilinx® Kria KV260 Vision AI Starter Kit is comprised of a non-production version of the K26 system-on-module (SOM), carrier card, and thermal solution. The SOM integrates core digital hardware components including a Zynq® UltraScale+™ MPSoC, run-time memory, non-volatile boot devices, an integrated power solution, and a security module. The vision-focused KV carrier card provides various application peripheral options including a variety of camera/sensor inputs, video display outputs, USB, SD card, and Ethernet physical interfaces. The thermal solution includes a heat sink, heat sink cover, and fan. The Kria KV260 Vision AI Starter Kit is designed to provide customers a platform to evaluate their target applications and ultimately design their own carrier card with K26 SOMs. Key target applications include smart city, AI/ML computing, security, and future retail.

*Figure 1:* **KV260 Starter Kit Block Diagram**




# What's in the Box?

The Kria KV260 Vision AI Starter Kit includes a K26 SOM, integrated thermal solution, and carrier card. The kit is only meant for SOM platform evaluation with the carrier card providing a variety of interfaces for integrating different peripherals. The box also includes a *Getting Started* card that directs you to the getting started web page and product page. Developer stickers are also included in the box. The KV260 Starter Kit does not include a power supply, SD card, peripherals, or additional accessories. However, this guide lists Power Adapters and Supported Peripherals you can purchase separately.

*Table 1:* **Summary of Box Contents**

| Line Item | Items | Quantity |
|---|---|---|
| 1 | Starter Kit SOM with fansink thermal solution | 1 |
| 2 | Starter kit carrier card | 1 |
| 3 | *Getting Started* card | 1 |
| 4 | Developer stickers | 2 |

# Interfaces

The following figure and table provide an overview of the physical connections, their designators, and relative position on the starter kit. The table uses the following abbreviations to indicate if a specific designator is located on the carrier card or on the SOM.

- CC = Device or interface is located on the carrier card
- SOM = Device or interface is located on the SOM

*Figure 2:* **Interfaces and Connectors**

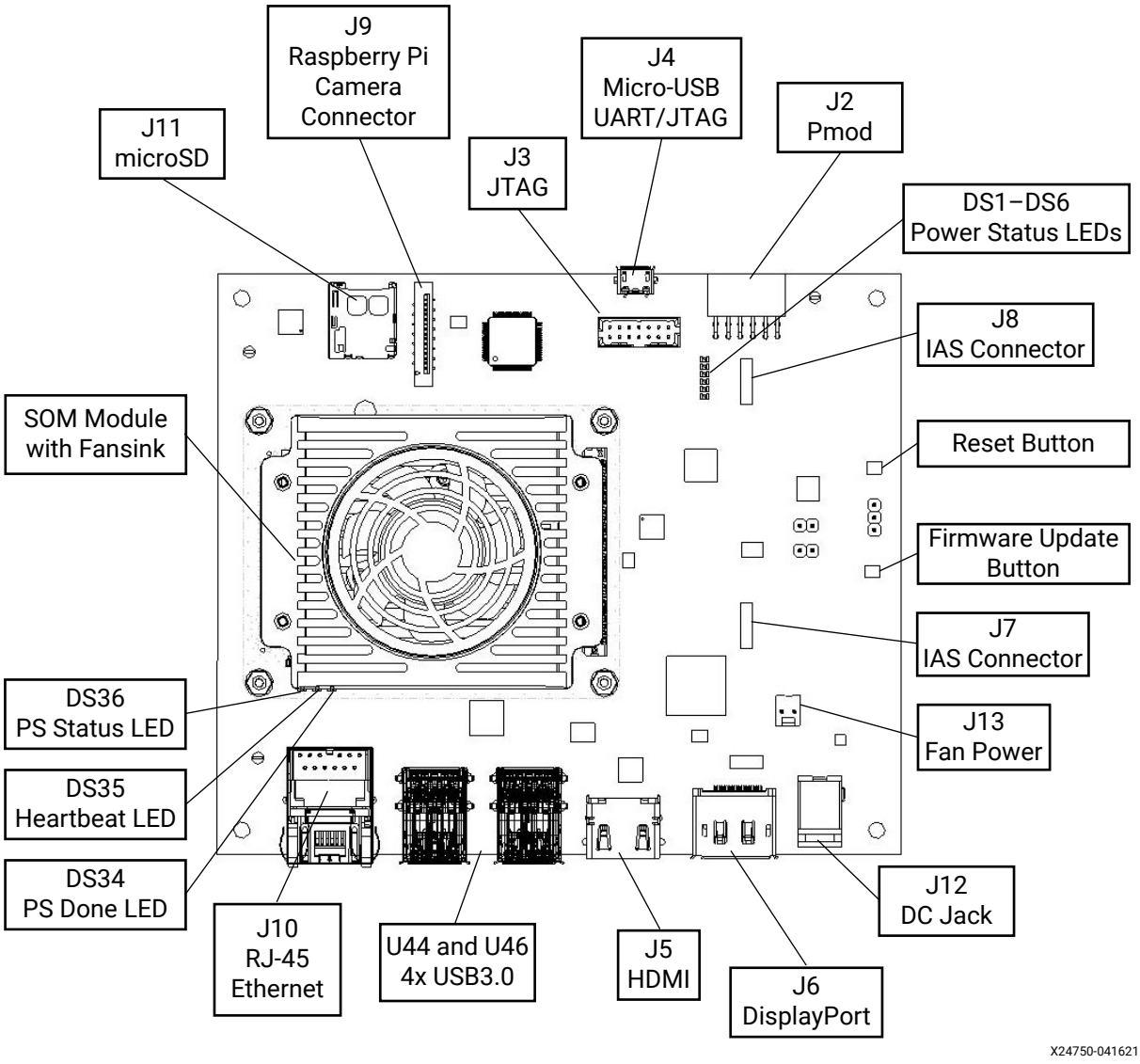


*Table 2:* **Descriptions and Locations**

| Location | Name | Description |
|---|---|---|
| SOM DS34 | PS done LED | Lit indicates that the PS has successfully loaded a PL design. |
| SOM DS35 | Heartbeat LED | Periodic flashing greene LED driven by the Zynq UltraScale+ MPSoC APU processor. |
| SOM DS36 | PS status LED | Status LED, when lit indicates a successful application load. |
| CC DS1-DS6 | Power status LEDs | Indicates various power supply and power domain status. Green LED indicates *good* status. |
| CC J2 | Pmod | Digilent Pmod 2x6 expansion header |
| CC J3 | JTAG | Direct JTAG interface, bypasses the FTDI device. |
| CC J4 | FTDI USB2.0 UART and JTAG | Integrated JTAG and device UART interface via USB2.0 |
| CC J6 | DisplayPort | DisplayPort video output |
| CC J5 | HDMI | HDMI video output |
| CC J7 | IAS0 | OnSemi image access system (IAS) camera module interface supporting four MIPI lanes. Connects to OnSemi AP1302 ISP device sensor 0 interface. |
| CC J8 | IAS1 | OnSemi IAS camera module interface supporting four MIPI lanes. Connected directly to the Zynq UltraScale+ MPSoC HPA bank. |
| CC J9 | RPi camera | Raspberry Pi camera module interface. 15-pin variant supporting two MIPI lanes directly connected directly to the Zynq UltraScale+ MPSoC HPA bank. |
| CC J10 | Ethernet RJ45 jack | 1 Gb/s Ethernet interface |
| CC J11 | microSD card | microSD card boot device |
| CC J12 | 12V power input | 12V power input jack |
| CC J13 | Fan power | 12V SOM fan power interface. |
| CC SW1 | Firmware update button | Push button used during the boot firmware update process. |
| CC SW2 | Reset button | Push button that resets the SOM via the device POR_B signal. |
| CC U44, CC U46 | USB | 4x USB 3.0 and USB 2.0 compatible interfaces |

# Initial Setup

## Powering the Starter Kit and Power Budgets

The Kria KV260 Vision AI Starter Kit requires a 12V, 3A power supply adapter to power the kit.

***Note*:** The power supply adapter is not included in the KV260 Starter Kit. The following table lists the suggested power supply adapter that must be purchased separately.

*Table 3:* **Power Adapters to Purchase for the KV260 Starter Kit**

| Vendor | Model | Description |
|---|---|---|
| CUI Inc. | SMI36-12-V-P6 | +12V, 3A DC adapter using a center-pin positive barrel connector (2.5 mm ID, 5.5 mm OD) |

The power supply adapter barrel connector plugs into the DC jack (J12) to supply the +12V power source to KV260 Starter Kit.

### Powering the K26 SOM

- The KV260 Starter Kit carrier card on-board regulator generates a 5V supply and provides power to other voltage regulators.
- The SOM power rail ($V_{CC\_SOM}$) is powered by the 5V supply.
- Next, the SOM on-board power-on sequencing starts.
- The carrier card provides the processing system (PS) and programmable logic (PL) the $V_{CCO}$ voltage rails after the SOM asserts the $V_{CCOEN\_S\_M2C}$ and $V_{CCOEN\_PL\_M2C}$ signals

### Power Telemetry

A current sense device is available on the SOM power rail ($V_{CC\_SOM}$). You can access the total power consumed by the SOM module through the I2C bus and Xilinx provided utilities.

### Powering Peripherals

The KV260 Starter Kit supplies power to the I/O peripherals as specified by the following interface specifications.

### USB3.0

There are four USB3.0 interface ports available on the KV260 Starter Kit carrier card. Each port can deliver a 5V supply to the attached I/O peripherals with up to 900 mA per port. All ports are protected against an over-current event through individual 900 mA power switches per port.

***Note*:** The total current (across all four ports) is allocated at 2.1A.

### Pmod Connector

The Pmod interface (from Digilent Inc.) is supported by the 3.3V, 100 mA capacity on the supply pin.

### Raspberry Pi Camera Interface

The Raspberry Pi camera 15 pin interface connector is supported by the 3.3V supply voltage on the supply pin.

### IAS Module Connector

The SOM supports two IAS module connectors, as defined by the ON Semiconductor IAS module definition standard. The KV260 Starter Kit carrier card provides 2.75V, 1.8V, and 1.2V supply rails on specified power pins.

# Fan and Heat Sink

The KV260 Starter Kit is built with an integrated active cooling solution (see Figure 2). The integrated fansink allows you to exercise the full 10W Zynq UltraScale+ MPSoC application power budget without any additional accessories.

Out of the box, the 12V fan should already be plugged into the starter kit. If it is not, be sure that the fan is plugged into the connector designated in Table 2. The fan connector is keyed to ensure proper orientation.

By default, the fan runs at a constant speed. Variable fan speed control can be implemented through a FPGA based PWM fan controller. The fan gating signal is connected to a FPGA HD I/O bank pin for control. Consult the corresponding KV260 Starter Kit carrier card schematic for specific pin assignment and Xilinx SOM source code repositories for an RTL implementation that can be integrated with your design.

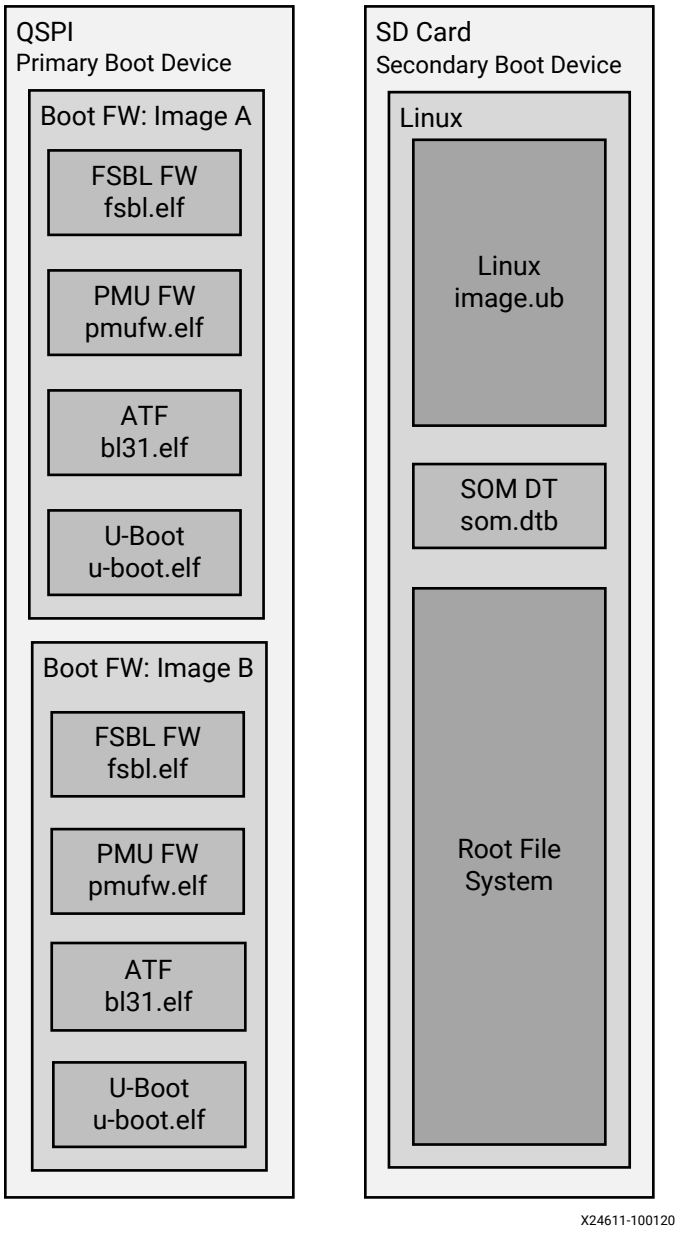
# Boot Devices and Firmware Overview

The Kria KV260 Vision AI Starter Kit has a primary and secondary boot device that provides isolation of platform-specific boot firmware from the run-time operating system and application. This allows you to focus on developing and updating your application code within the application image without having to rebuild and flash boot firmware. The primary boot device is a QSPI memory located on the SOM and the secondary boot device is an SD card interface on the carrier card. By default, the KV260 Starter Kit carrier card sets the XCK26 boot mode to QSPI32. The SOM boots up to U-Boot using the QSPI contents and then U-Boot does a hand-off to the secondary boot device.

***Note*:** You must burn the SD card image and populate the SD card in the carrier card for the kit to successfully boot to Linux.

The overall boot device definition and firmware contents are outlined in the following figure.

*Figure 3:* **Boot Devices**




**IMPORTANT!** *Production SOMs provide both QSPI and eMMC devices on the SOM PCB to support integrated primary and secondary boot configurations.*

# Primary Boot Device

The primary boot device is a QSPI device located on the SOM. The necessary elements are packaged in a Zynq UltraScale+ MPSoC specific format and file captured as `BOOT.BIN`. The `BOOT.BIN` file contains the board-specific boot firmware that consists of the following elements:

- **FSBL:** First-stage boot-loader firmware
- **PMU:** Platform management unit firmware
- **ATF:** Arm® trusted firmware
- **U-Boot:** Second-stage boot loader

U-Boot provides the functionality for the hand-off between the primary boot device and the secondary boot device. It will search for both the SD card and eMMC secondary boot devices; if both are detected it will provide a menu interface to you to select the desired Linux boot target.

The primary boot device provides a redundant copy of boot firmware arranged in an A/B configuration. The A/B configuration provides a dynamic primary and secondary image operation with corresponding update mechanisms. On boot, the system automatically boots from the defined primary image, and, if boot fails, it falls back to the previously known good boot image.

# Secondary Boot Device

The secondary boot device on the KV260 Starter Kit is the SD card. It contains the operating system image and associated application files. The KV260 Starter Kit accelerated application references are built on the Linux operating system. The *Getting Started* webpage provides a pre-built reference image that can be written to a microSD card for out-of-the-box functionality. SOM board support packages (BSPs) are also available if you want to customize your OS.

**RECOMMENDED:** *The SOM is designed to use SDHC standard microSD cards.*

Chapter 4

# Software Getting Started

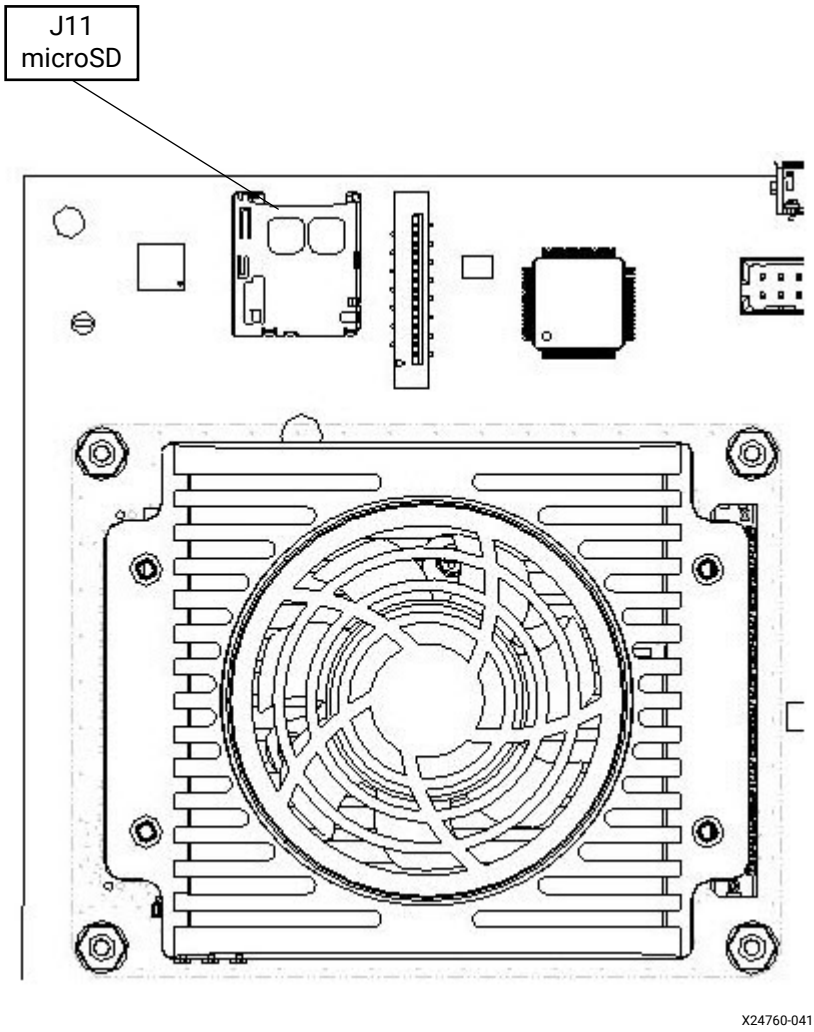
To get started with the KV260 Starter Kit, prior to powering, booting the board, and running your first application, you need to download and write the `Xilinx SOM Starter Linux` image to a microSD card. You can then run a number of pre-built accelerated applications to start evaluation of the platform capabilities. The following steps provide instructions on how to write a boot-able microSD card.

## Loading an SD Card Image

To load an SD card, follow these directions:

1. Identify a 16 GB or 32 GB compatible SDHC microSD card.
2. Download the `Xilinx SOM Starter Linux` image from the URL identified on the *Xilinx SOM Getting Started* card.
3. Write the image to the microSD card using one of the following tools:
   a. BalenaEtcher
   b. Win32 Disk Imager
4. Upon successful write of the `Xilinx SOM Starter Linux` image, plug the microSD card into J11.

*Figure 4:* **microSD Card on Carrier Card**




5. The KV260 Starter Kit uses an FTDI USB to COM port device that requires the FTDI virtual COM (VCOM) port driver to be installed on your machine. Set-up your USB-based UART connection via the J4 carrier card interface with the following configuration using a terminal program (e.g., TeraTerm, PuTTY). The Linux UART is enumerated as the lower of two VCOM ports.
   a. Baud rate = 115200
   b. Data bits = 8
   c. Stop bits = 1
   d. Flow control = None
   e. Parity = None
6. Connect the KV260 Starter Kit Ethernet port to the a network port with Internet access.
7. Power on the board by plugging in the 12V supply. The green power LEDs should illuminate.

# Initial Boot

After initial boot of the platform requires you to log in as a non-root user, a user `petalinux` is created by default on the platform. Log in as a `petalinux` user and you will be required to set a password, and then select the Xilinx provided accelerated application designs you want to include on the platform. The reference designs are maintained in a Xilinx hosted package feed.

1. After power-on, the SOM should automatically boot to Linux. You should see the green heartbeat LED flashing, and observe the Linux UART response on the terminal program interface. If you see the heartbeat LED active but no UART response, verify that your machine has the FTDI driver installed and that the terminal program is connected to the correct COM port.
2. At initial log-in, the platform requires you to set a password. The default user name is `petalinux`. Make note of the password for future use.
3. Verify Internet connectivity via ping, DNS lookup, or similar.

***Note:*** The default log-in is a predefined user. You cannot SSH into the platform until a password is set via console. Many commands require you to use *sudo* to elevate privileges.

# Platform Management Utility

The following section outlines the platform management utility called `xmutil` that is included in the SOM Linux image to help you configure and work with the SOM. The table provides a list and description of the functions available from Xilinx. You should use the `-h` or help functions with each utility to get detailed use instructions. Using *sudo* is required with many of the `xmutil` functions.

*Table 4:* **SOM `xmutil` Utility Functions**

| Utility Function | Description |
|---|---|
| xmutil boardid | Reads all board EEPROM contents. Prints information summary to command line interface. |
| xmutil bootfw_status | Reads primary boot device information. Prints A/B status information, image IDs, and checksums to command line interface. |
| xmutil bootfw_update | Tool for updating the primary boot device with a new boot image in the inactive partition. |
| xmutil getpkgs | Queries Xilinx package feeds and provides a summary to the debug interface of relevant packages for the active platform based on board ID information. |
| xmutil listapps | Queries on the target hardware resource manager daemon of pre-built applications that are available on the platform and provides a summary to the debug interface. |
| xmutil loadapp | Loads the integrated HW+SW application inclusive of the bitstream, and starts the corresponding pre-built application software executable. |
| xmutil unloadapp | Removes accelerated application inclusive of unloading its bitstream. |
| xmutil platformstats | Reads and prints a summary of the following performance related information: CPU frequency, RAM usage, temperature, and power information. |

*Table 4:* **SOM `xmutil` Utility Functions** *(cont'd)*

| Utility Function | Description |
|---|---|
| xmutil ddrqos | Utility for changing configuration of PS DDR quality of service (QoS) settings. Initial implementation focuses on PS DDR memory controller *traffic class* configuration. |
| xmutil axiqos | Utility for changing configuration of PS/PL AXI interface quality of service (QoS) settings. Initial implementation focuses on AXI port read/write priority configurations. |

# Accelerated Applications

The Xilinx SOM platforms are enabled with a number of accelerated applications that can be dynamically installed on the SOM platform. The SOM starter Linux image is application agnostic and provides a set of utilities for pulling the hardware accelerated application examples from the SOM Linux package feeds.

Accelerated applications are software controllable, application-specific reference designs for AI developers, embedded developers, and system architects to customize and enhance the functionality through software control or updating the AI models. The following table outlines some featured accelerated applications available for the KV260 Starter Kit. Consider this list as a starting point because the SOM *Getting Started* webpage contains the most up-to-date accelerated applications availability.

*Table 5:* **KV260 Accelerated Applications**

| Name | Description |
|---|---|
| Smart camera | Configurable camera/sensor input options with hardware accelerated ML inference with face detection and other models that can be dynamically loaded. Inference information is outputted to a monitor or network via RTSP. |
| AI box-ReID | Multi-stream IP camera RTSP inputs with hardware accelerated ML inference models supporting face detection and re-identification (ReID) models. Outputs are displayed to monitor. |
| Defect detection | Hardware accelerated machine vision application as applied in defect detection. |

# Accelerated Application Package Selection

**RECOMMENDED:** *Public Ethernet connectivity is necessary to dynamically pull down the latest accelerated application designs.*

1. If you have not already verified Internet connectivity do so before proceeding via ping test or DNS lookup (e.g., nslookup).

2. The `sudo xmutil getpkgs` lists a series of package groups that apply to your platform. The package group naming convention is: `packagegroup-kit_name-application_name`. For example, the *Smart Camera* application for the KV260 platform has the following package group name `packagegroup-kv260-smartcamera`. You can install any number of matching accelerated applications to your platform by executing a DNF install for the chosen application package group. For example, to install the smart camera application, run `sudo dnf install packagegroup-kv260-smartcamera`.

   ***Note***: You should only install package-groups that are compatible with your particular starter kit configuration.

3. For any applications installed on the local file system via the DNF install, the platform can now dynamically load and swap those applications. To see a list of the applications local to the system, execute `sudo xmutil listapps`. You can also see what applications are local by manually exploring the `/opt/xilinx` directory.

4. By default, kv260-dp is loaded on boot. From the applications list, check for an active application loaded (active = 1 in the `xmutil listapps` output). If there is a loaded application, unload it by running the `sudo xmutil unloadapp` command to unload the current application before proceeding to the next step.

5. From the application list, start the new application by running `sudo xmutil loadapp application_name`. The platform configuration is automatically handled and starts the application.

6. Applications with a Jupyter-based cockpit will start-up automatically. You need to point your web-browser to the associated IP address and port. The associated IP address and port information is printed to the UART at boot. To query your Jupyter lab server URL after the initial boot, run: `sudo jupyter notebook list`.

# Supported Peripherals

The following table outlines external peripherals that are tested with the corresponding accelerated applications. It is recommended that you use a peripheral from the list to ensure that you realize maximum platform performance.

*Table 6:* **Accelerated Application Peripherals**

| Accelerated Application | Peripheral | Part Number |
|---|---|---|
| Smart camera | IAS camera sensor ISP interface (J7) | OnSemi AR1335 sensor module. Avnet part number: CAVBA-000A |
| Smart camera | USB camera | Logitech BRIO |
| Smart camera | Audio Codec I2S PMOD (J2) | Digilent PMOD SKU 410-379 |
| AI-Box-ReID | IP camera | Amcrest IP8M-2493EW |

The following table outlines external peripherals that are functionally verified with the KV260 Starter Kit.

*Table 7:* **KV260 Starter Kit Functionally Tested Peripherals**

| Peripheral | Part Number |
|---|---|
| IAS camera sensor ISP interface (J7) | OnSemi AR0144 |
| IAS camera sensor ISP interface (J7) | OnSemi AR1335 |
| IAS camera sensor direct interface (J8) | OnSemi AR1335 |
| RPi camera interface (J9) | Raspberry Pi camera module v2 |

# Xilinx Tools Integration

The K26LTD SOM and KV260 Starter Kit are integrated with the Vitis software development platform and Vivado Design Suite for rapid development of your unique applications on the platform.

## Vitis Platforms

Vitis base platforms are available in the kv260-vitis GitHub repository. For the KV260 Starter Kit, the following Vitis base platforms are available. Because additional KV260 base platforms are added and updated over time, be sure to reference the repository for the most up to date list of platforms before starting your design work.

- **kv260_ispMipiRx_vcu_DP:**
  - Video capture using the IAS ISP MIPI interface for a AR1335 sensor module configuration
  - Display using standard DisplayPort and/or HDMI
  - Audio transmit and receive (I2S) via PMOD audio codec
  - Video codec unit (VCU) encode/decode and one stream encode buffer
  - Support for 4k30 and 1080p30 in NV12 video formats
- **kv260_vcuDecode_vmixDP:**
  - VCU decode of four input streams
  - Display using video mixer (VMIX) to DisplayPort and/or HDMI for 2x2 display configuration
  - Resolution support for 1080p30 for each stream
- **kv260_ispMipiRx_vmixDP:**
  - Video capture using the IAS ISP MIPI interface for a AR0144 sensor module configuration
  - VCU decoding of four streams
  - Display using video mixer (VMIX) to DisplayPort and/or HDMI for 2x2 display configuration

Vitis base platforms are built within the context of a specific hardware target and the physical peripheral interfaces they enable.

```
starter-kit-name_interface1_interface2
```

For example, the kv260_ispMipiRx_vcu_DP base platform targets the KV260 Starter Kit and enables a MIPI receive interface to the ISP on the carrier card and a standard single video stream to the DisplayPort.

For additional information about the Vitis tools and Vitis base platform work flows, see *Vitis Unified Software Platform Documentation: Application Acceleration Development* (UG1393).

# Vivado Board Flow

The K26LTD SOM is enabled in the Vivado Design Suite through the Vivado Board Flow functionality. Vivado Board Flow enables a level of hardware abstraction that automatically configures peripherals fixed on the SOM card (e.g., DDR4), defines associated timing constraints, and presents the customizable physical I/O available on the SOM connector(s).

The Vivado SOM board model is available through the Vivado installation process as well as on the Vivado board file GitHub repository. The following KV260 related Vivado board files are available.

- **KV260 Starter Kit:** Configured K26 SOM with Vision Starter Kit companion card
- **SM-K26-XCL2GC:** K26 commercial grade production SOM
- **SM-K26-XCL2GI:** K26 industrial grade production SOM

The Xilinx SOM board flow infrastructure provides starter kit carrier card awareness through the Vivado tools *companion card* mechanism. Automation for I/O connection and peripheral IP configuration when selecting a SOM and an associated carrier card, such as the KV260 Starter Kit, is used to create a hardware configuration.

For additional information on using the Vivado tools and the Vivado board flow, refer to the *Model Composer and System Generator User Guide* (UG1483).

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*Chapter 6*

# Board Reset, Firmware Update, and Recovery

This section outlines the update and recovery mechanisms built into the KV260 Starter Kit. Two tools are provided for firmware updates. The first is a Linux based A/B update tool that supports remote and redundant firmware updates to the A/B firmware partitions of the QSPI device with custom or Xilinx provided updates. The second tool is the Ethernet recovery tool that is intended to be used only when recovering a full platform to the original factory firmware.

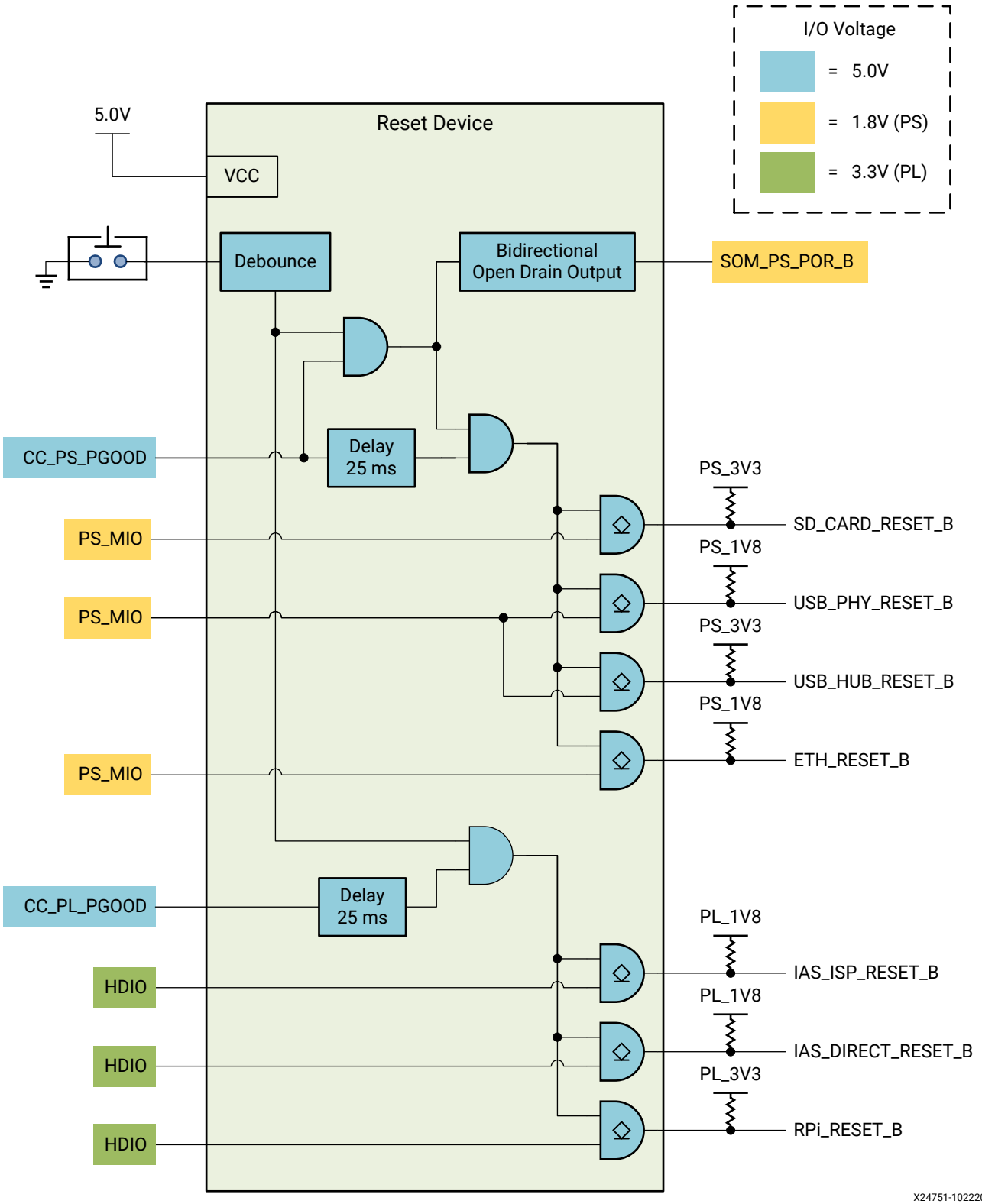
## Board Reset

### Power-on Reset

1. The SOM reset signal (PS_POR_L) is held in reset until the CC_PS_PGOOD signal is asserted on the carrier card.
2. All the PS and PL I/O device reset signals on the carrier card are held in reset until 25 ms after the PS and PL power domain are powered up and stable.
3. You can perform a hard reset on the KV260 Starter Kit by pressing the reset button (CC SW2) or by commanding a reset through software.

The following figure shows the reset functions supported on the KV260 Starter Kit.

*Figure 5:* **Device Reset**



# Firmware Update

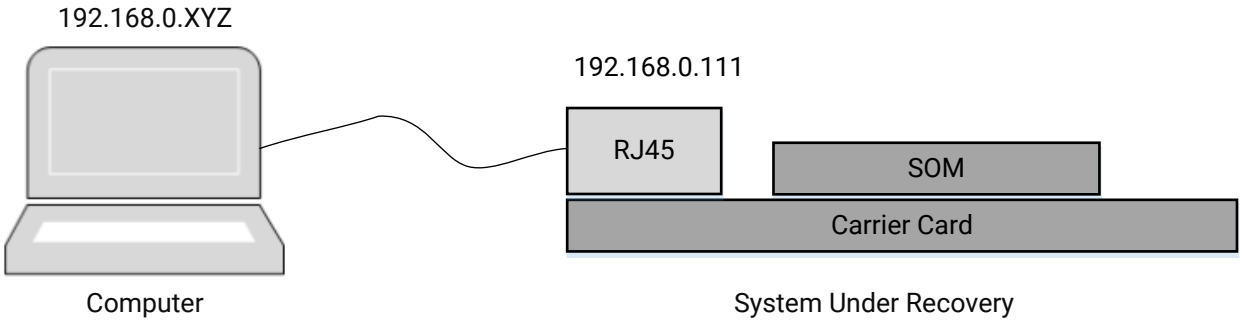
The firmware update button is the physical SW1/FWUEN push button located on the KV260 Starter Kit carrier card. The button is used to support two features:

1. To force the platform into a recovery mode application during power-on. The recovery application is described in the Ethernet Recovery Tool section of this document.
2. Security mechanism to prevent remote update of the boot firmware, without the user being physically present.

# Ethernet Recovery Tool

The Ethernet recovery tool is a small application included in the Xilinx provided KV260 Starter Kit QSPI image. It provides a simple Ethernet-based interface and application for updating the boot firmware. This application and interface is initiated by holding the firmware update button during the power-on sequence. The application uses a fixed IP address of 192.168.0.111. The following figure shows an overview of the set-up.

*Figure 6:* **Ethernet Recovery Tool Setup**

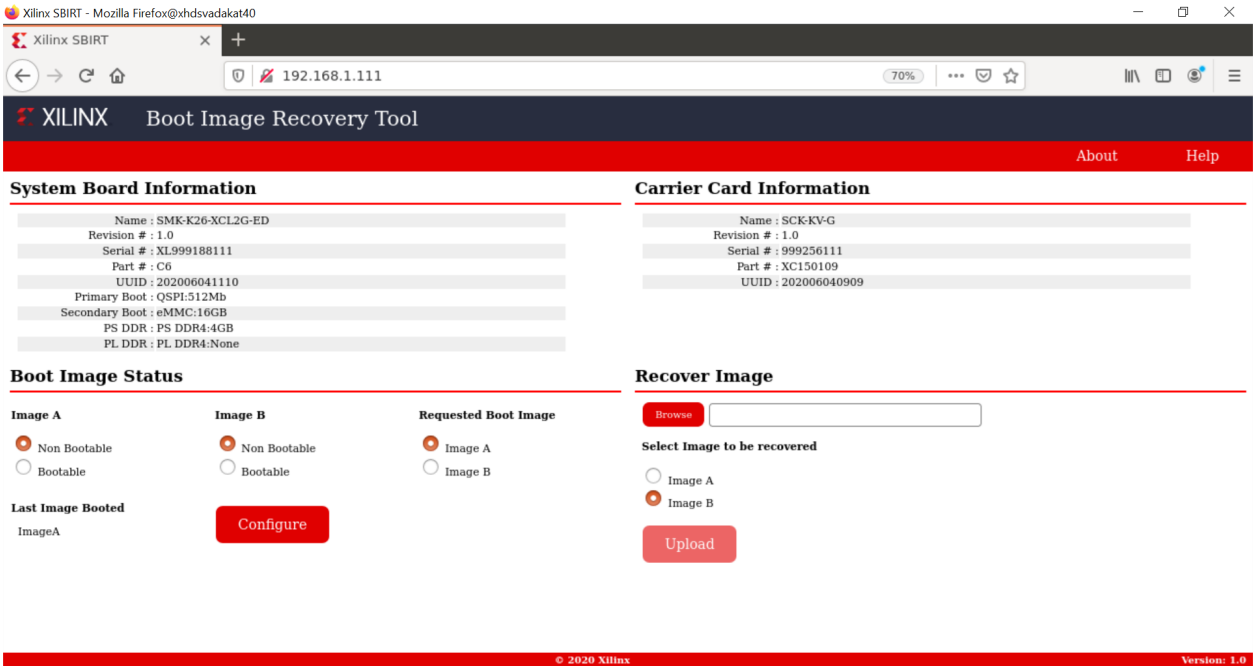



The Ethernet recovery tool provides a mechanism for updating either of the dynamic boot partitions within the primary boot device if Linux is not functional. If Linux is functional, the recommendation is to update the boot firmware using the `xmutil` boot firmware update utilities. The associated update content is a Xilinx XCK26 binary boot image captured as `BOOT.BIN`. To support platform recovery, the KV260 Starter Kit factory `BOOT.BIN` image is made available on the Xilinx SOM *Getting Started* web page. You can also use this tool when customizing the platforms boot firmware with your own `BOOT.BIN` generated through the Xilinx Vitis and PetaLinux tools.

To use the Ethernet recovery tool, follow these steps:

1. Connect the PC to the KV260 Starter Kit via Ethernet as shown in Figure 6.
2. Set the PC to a static IP address that is on the same subnet as the recovery tool (192.168.0.XYZ), but not 192.168.0.111.
3. Hold the firmware update button when powering on the device. You should also see the UART print outs from the recovery application.
4. Use a web-browser (e.g., Chrome or Firefox) on the PC to navigate to the URL `http://192.168.0.111` for access to the Ethernet recovery tool.
5. Use the Ethernet recovery tool GUI in the web-browser to update either the A or B boot firmware partitions with a `BOOT.BIN` file from the file system on the PC. The Ethernet recovery tool interface is shown in the following figure.

*Figure 7:* **Ethernet Recovery Tool Interface**




# Boot Firmware A/B Update

As outlined in the Chapter 3: Boot Devices and Firmware Overview section, the Xilinx starter kit and SOM provide two copies of the boot firmware in the QSPI device. This mechanism has a robust update infrastructure through a ping-pong methodology, where the last known good boot image is always kept available in the platform. The Xilinx starter kit Linux provides a utility for doing these updates entirely on-target. The steps for using the Xilinx SOM A/B update tool are:

1. Place the new `BOOT.BIN` in the Linux file system.

2. Execute the A/B update process through these steps:
   a. Go to the directory where you copied the `BOOT.BIN` in step 1.
   b. Type `sudo xmutil bootfw_update <location of new BOOT.BIN>`.
   c. The tool returns the image (A or B) that is updated, and is marked for boot on the next boot.
   d. You can verify the updated status of the boot firmware using the `sudo xmutil bootfw_status` utility.
3. Power cycle the device or press the board reset button.

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*Appendix A*

# Additional Resources and Legal Notices

## Xilinx Resources

For support resources such as Answers, Documentation, Downloads, and Forums, see Xilinx Support.

## Documentation Navigator and Design Hubs

Xilinx® Documentation Navigator (DocNav) provides access to Xilinx documents, videos, and support resources, which you can filter and search to find information. To open DocNav:

- From the Vivado® IDE, select **Help → Documentation and Tutorials**.
- On Windows, select **Start → All Programs → Xilinx Design Tools → DocNav**.
- At the Linux command prompt, enter `docnav`.

Xilinx Design Hubs provide links to documentation organized by design tasks and other topics, which you can use to learn key concepts and address frequently asked questions. To access the Design Hubs:

- In DocNav, click the **Design Hubs View** tab.
- On the Xilinx website, see the Design Hubs page.

***Note:*** For more information on DocNav, see the Documentation Navigator page on the Xilinx website.

## References

These documents provide supplemental material useful with this guide:

1. Kria SOM GitHub.io documentation
2. *Kria KV260 Vision AI Starter Kit Data Sheet* (DS986)
3. *Kria K26 SOM Data Sheet* (DS987)
4. *Kria SOM Carrier Card Design Guide* (UG1091)
5. *Model Composer and System Generator User Guide* (UG1483)
6. *Vitis Unified Software Platform Documentation: Application Acceleration Development* (UG1393)

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