ESWIN

GPU User Guide

EIC7x series AI Digital SoC

Rev 0.6

March 5, 2025

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Notice

Change History

Version	Date	Descriptions
V0.6	March 5, 2025	Introduce the basic information of EIC770x GPU

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1. Product Overview

The EIC770x uses the AXM-8-256 GPU from Imagination. This product is mainly targeted at mid-range mobile devices. It has 3D rendering capability of 0.25 TFLOPS and 8 GPixels per second. It supports OpenCL programming, and the general computing power is 1 TOPS.

1.1 Features

EIC770x GPU supports following APIs

- OpenGL ES 3.2
- EGL 1.5
- OpenCL 3.0
- Vulkan 1.3

1.2 Function Overview

- Support 2D/3D hardware acceleration
- Support general computing with OpenCL

2. Software Function Description

The GPU software can be roughly divided into three main parts: user-mode library and driver, kernel-mode driver, and firmware.

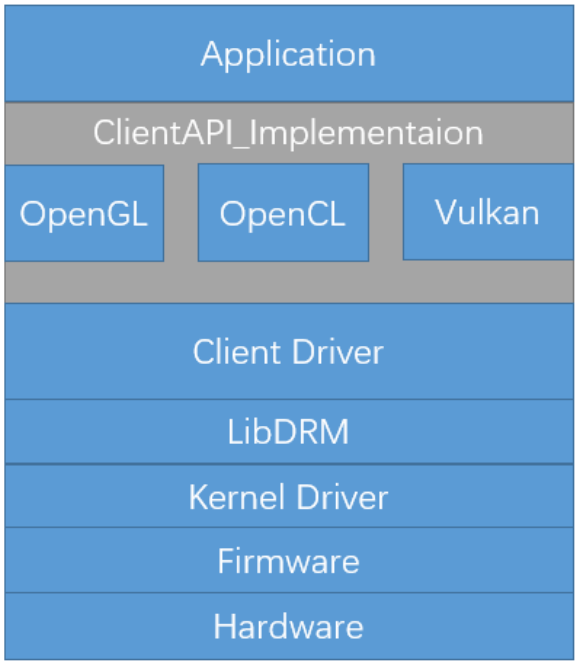

Figure 2-1 GPU software stack

2.1 User-mode Library and Driver

OpenGL, OpenCL, and Vulkan library implement standard API calls, dispatching these APIs to the underlying Client Driver.
The Client Driver, also known as the User Mode Driver (UMD), runs in user mode. It interfaces with various graphics API implementations above and with LibDRM below. The Client Driver and Kernel

Driver are implemented in a client-server model. The Client Driver submits various service requests to the Kernel Driver through LibDRM's ioctl interface.

2.2 Kernel Mode Driver

The GPU kernel-mode driver (KMD) is named "pvrsrvkm.ko". The role of this module is to forward all commands to the GPU hardware or firmware, and maintains the corresponding state. Once the GPU hardware completes rendering or encounters an error, it informs to KMD via interrupts. KMD handles these interrupts and updates the state to the user-mode driver.

2.3 Firmware

The firmware runs directly on the GPU. It receives command requests from the Kernel Driver and provide rendering feedback to the Kernel Driver.

3. Delivery Method

The delivery to end-users consists of Debian packages. Therefore, end-users can obtain it via "apt install eswin-eic7x-gpu." The corresponding Debian package source code is available at https://github.com/rockos-riscv/eswin-eic7x-gpu.
The delivery to ESWIN partners is provided in the form of TAR packages, containing the following components. Partners can generate corresponding delivery packages based on the target operating system, such as Debian release packages.

- GPU firmware: Binary file rgx.fw.<B.V.N.C>, where <B.V.N.C> represents four decimal digits indicating the firmware version. For example, on Ubuntu systems, the corresponding file can be found at /lib/firmware/rgx.fw.30.3.408.101.
- Kernel Mode driver source code can be downloaded from https://github.com/eswincomputing/linux-stable/tree/linux-6.6.18-EIC7X/drivers/gpu/drm/img, and then compiled into pvrsrvkm.ko as a standalone module, or compiled into the kernel image.
- User-mode library functions and header files, which consist of the following so files (dynamic link libraries, not open source) and corresponding header files.

Table 3-1 release components

Name	Header File	Dynamic Library	Notes
Low level JIT	NA	libusc.so	libusc.so
High level JIT	NA	libufwriter.so	Uniflex core function
openGL ES2	Standard	libGLESv2.so	
egl	Standard	libEGL.so, libIMGegl.so	
openCL	Standard	libPVROCL.so	
vulkan	Standard	libvulkan.so	
UM service wrapper	NA	libsrv_um.so	User mode service