

Safety Certifiable Application Components for NXP's i.MX 8

INTRODUCTION

The i.MX 8 Platform for Safety Certifiable Applications available from CoreAVI is comprised of safety certifiable Vulkan® drivers, OpenGL® SC libraries and safety certifiable GPU tools which have been pre-integrated and validated together to significantly de-risk the integration challenges typically faced when integrating hardware and software components from multiple suppliers. The platform is an off the shelf foundation upon which safety certifiable applications can be built with confidence.

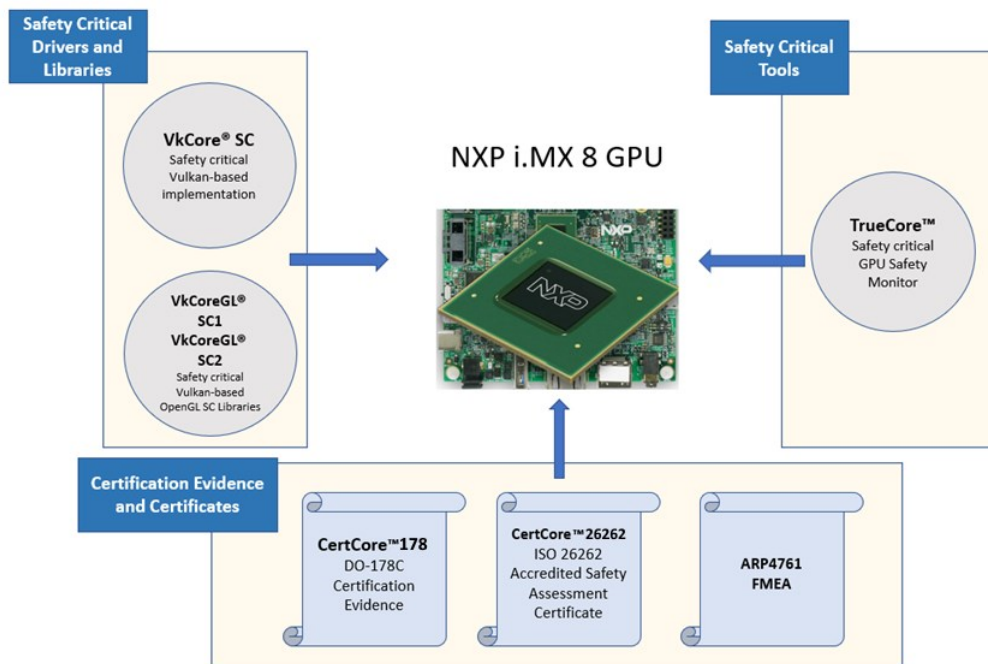


Figure 1: i.MX 8 Platform for Safety Certifiable Applications

VKCORE® SC DRIVER AND VKCOREGL® SC LIBRARIES

Vulkan is a thin but wide, low-overhead graphics and compute API targeting high performance applications by offering higher performance than OpenGL as well as a more balanced CPU/GPU usage. The Vulkan API enables programmers to access the hardware efficiently through a common API that can be used to support both graphics and compute needs.

CoreAVI supports the i.MX 8 with a safety certifiable graphics and compute driver solution for the integrated Vivante GC7000 XSVX GPU. The i.MX 8 is supported by CoreAVI's safety critical Vulkan implementation, named **VkCore SC**, as well as OpenGL SC 1.0.1 and SC 2.0 certifiable graphics driver library suites, named **VkCoreGL SC1** and **VkCoreGL SC2**. The drivers are available as standard product, developed by CoreAVI as part of its roadmap R&D investments.

The OpenGL driver library operates through the Vulkan API and will allow legacy applications to run on the i.MX 8. Supported shaders include Vertex, Fragment, and Geometry. The drivers are available with certification evidence to support avionics certification to RTCA DO-178C and EUROCAE ED-12C, up to DAL A as well as accredited safety assessment certificates to support ISO 26262 ASIL D safety compliance.

Please refer to the VkCore SC and VkCoreGL SC datasheets for more detailed information on these products.

TRUECORE™

TrueCore™ is a COTS Graphical Processor (CGP) software safety monitor library that interfaces to a CGP through CoreAVI's VkCore SC Vulkan-based graphics drivers to assist applications in providing a comprehensive solution to address Hazardously Misleading Information (HMI) safety requirements.

TrueCore is a suite of tests designed to monitor the graphics rendering operations of a CGP and detect design errors addressing CAST 29 section 2.2 and CM-SWCEH-001 section 10.3.1 related to CGP design errors that may lead to HMI. This is an effective software alternative to hardware monitoring solutions providing Size, Weight and Power as well as Cost (SWaP-C) benefits. By providing effective CGP design error detection, TrueCore can eliminate the need for dissimilar CGP solutions in DAL A systems.

CoreAVI has reviewed the details of TrueCore with Federal Aviation Administration (FAA) chief scientists who concur that TrueCore addresses the identified certification concerns with the use of a CGP in systems requiring level A compliance.

CERTIFICATION SUPPORT

CoreAVI's CertCore™ 178 provides complete FAA DO-178C /EASA ED-12C Level A certification data packages to aid in FAA DO-178C / EASA ED-12C avionics software safety certification.

CoreAVI's CertCore™ 26262 is available for programs requiring an accredited safety assessment certificate to support the automotive and advanced driver assistance systems (ADAS) safety certification of CoreAVI's graphics and video software products. CertCore 26262 includes an accredited safety assessment certificate to support ISO 26262 ASIL D safety compliance.

CoreAVI provides support ARP4761 processes and AC 20-152A objective COTS-6 with a CoreAVI developed Failure Modes & Effects Analysis (FMEA) identifying the failure modes and detection for the GC7000XSVX GPU used on the i.MX 8 family.

I.MX 8

Features and Benefits

- An application processor from NXP, the i.MX 8 QuadMax is built for advanced media processing, secure domain partitioning and innovative image processing.
 - Two Arm Cortex A72 CPU cores at 1.8 GHz
 - Shared 1MB L2 cache (w/ ECC)
 - Four Arm Cortex A53 CPU cores at 1.2 GHz
 - Shared 1MB L2 cache (w/ ECC)

- Two Arm Cortex M4F cores at 266 MHz
- Dual Vivante GC7000 XSVX GPUs
 - 8 Vec4 shaders
 - Up to 128 GFLOPS
 - Pixel fillrate of 6.4 Gpixels/second and Texel fillrate of 3.2 Gtexels/second
- Two display processors with SafeAssure
 - (1) HDMI output
 - (2) LVDS outputs
 - Failover display path
- Up to 4K video decode using H.264/H.265
- Up to 1080p video encode using H.264
- Available with extended temperature range from NXP to meet the needs of rugged embedded systems
- Supported with CoreAVI's VkCore SC Vulkan-based graphics and compute driver, VkCoreGL SC1 and VkCoreGL SC2 OpenGL libraries
- TrueCore GPU safety monitor to support CAST 29/EASA CM-SWCEH-001 HMI concerns with using a COTS Graphical Processor (CGP)

Please contact NXP for a full list of connectivity and security features.

The NXP i.MX 8 SoC is the next generation in application processors from NXP that is targeted towards the embedded rugged Mil/Aero/Avionics and automotive markets. The i.MX 8 offers a high degree of functional integration for advanced multi-display eCockpit systems with low virtualization software overhead.

The i.MX 8 SoC is comprised of two Arm Cortex A72 cores and four Arm Cortex A53 cores with two Vivante GC7000 XSVX GPUs. The high level of integrated processing and connectivity makes it a very compact, power efficient solution ideal for embedded applications and for use on space constrained modules.

The many feature and performance benefits offered by the i.MX 8 make it a compelling solution for any embedded application that is in development now and which has a long lifecycle requirement. With the i.MX 8 just being introduced to the market it offers the longest lifecycle of any embedded high-performance graphics/compute solution.

The i.MX 8 is a natural replacement for any system currently using the i.MX 6 or S32V234. The table on the following page provides a comparison between the i.MX 8 and previous generation SoC solutions.

DEVICE	S32V234	I.MX 6 QUAD	I.MX 6 QUAD PLUS	I.MX 8 QUAD	I.MX 8 QUADMAX
Processor Core Complex 1					
Processor Type	ARM Cortex-A53	ARM Cortex-A9	ARM Cortex-A9	ARM Cortex A53	ARM Cortex A53
Number of Cores	4	4	4	4	4
Max frequency (MHz)	1000	1000	1200	1200	1200
DMIPS/SoC	8960	10000	12000	10752	10752
Cache L2	512KB shared	1MB shared	1MB shared	1MB shared	1MB shared
Processor Core Complex 2					
Processor Type	N/A	N/A	N/A	N/A	ARM Cortex A72
Number of Cores					2
Max frequency (MHz)					1800
DMIPS/SoC					16992
Cache L2					1MB shared
Processor Core Complex 3/4					
Processor Type	Arm Cortex M4	N/A	N/A	ARM Cortex M4F	ARM Cortex M4F
Number of Cores	1			2	2
Max frequency (MHz)	133			266	266
Graphics Processing Complex					
GPU Core	VIVANTE GC3000	VIVANTE GC2000	VIVANTE GC2000+	VIVANTE GC7000	VIVANTE GC7000 XSVX
Number of Independent GPUs	1	1	1	2	2
Pixel Fillrate (Gpixels/sec)	1.6	1.25	1.6	6.4	6.4
Texel Fillrate (Gtexels/sec)		0.2		3.2	3.2
Resolution @60fps	1080P	1080P	1080P	4K	4K

For more information on CoreAVI's support for the i.MX 8 SoC, contact Sales@CoreAVI.com.

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