

Safety Certifiable Application Components for Intel's Tiger Lake SoC

INTRODUCTION

The Tiger Lake Platform for Safety Certifiable Applications available from CoreAVI comprises safety certifiable COTS-D hardware IP, development hardware, safety critical Vulkan® drivers, OpenGL® SC libraries, OpenVX™ 1.3 SC, safe GPU compute libraries and safety certifiable bootloader, BIOS and SoC tools, which have been pre-integrated and validated together to significantly de-risk the 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.

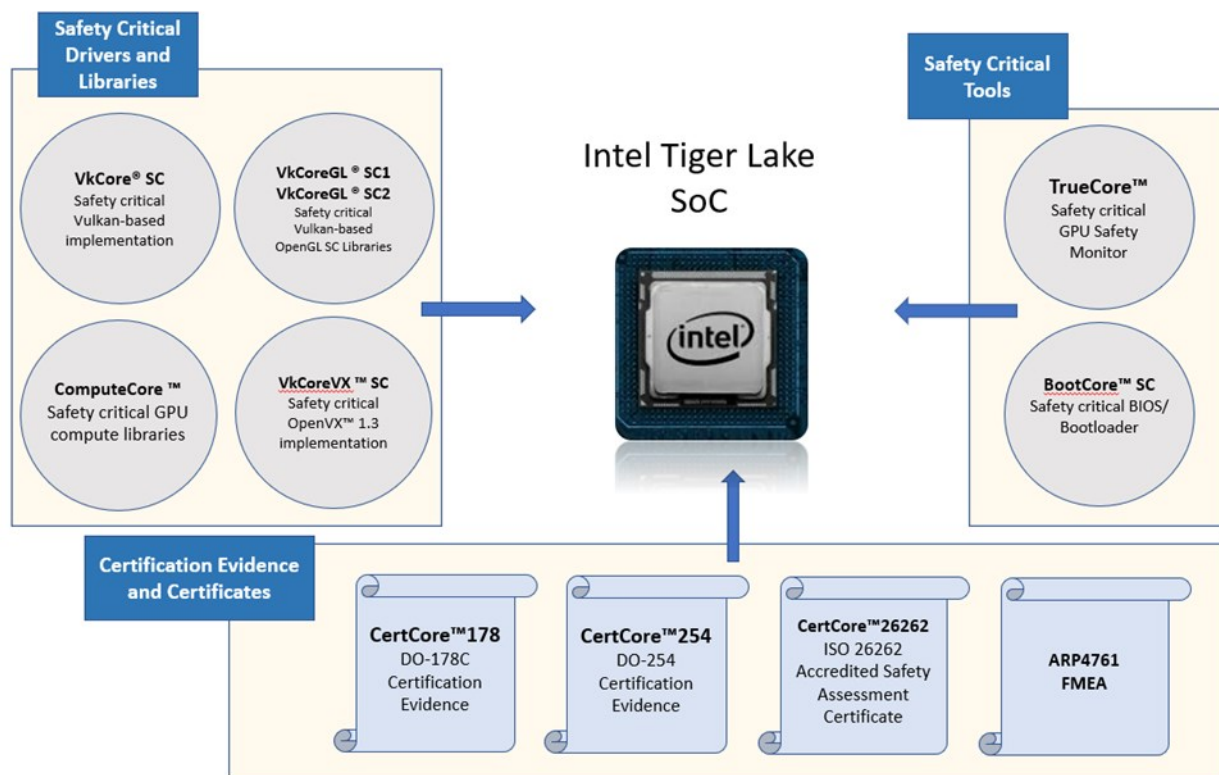


Figure 1: Intel Tiger Lake Platform for Safety Certifiable Applications

EXTENDED TEMPERATURE RANGE

CoreAVI provides extended temperature versions of the Tiger Lake UP3 SoC to facilitate its use in rugged embedded applications. CoreAVI offers a special version of the Tiger Lake SoC that is temperature screened over -40°C Tj to beyond $+100^{\circ}\text{C}$ Tj, increasing the manufacturing yield for hardware suppliers while reducing supply delays to end customers.

SBC3005 COTS-D Intel Tiger Lake UP3 Processing Module

The SBC3005 is the latest generation of CoreAVI standard product COTS-D 3U VPX single board computer hardware IP based on the Tiger Lake UP3 SoC. Like all COTS-D solutions, the SBC3005 is available with certification evidence to support system certification to the highest levels.

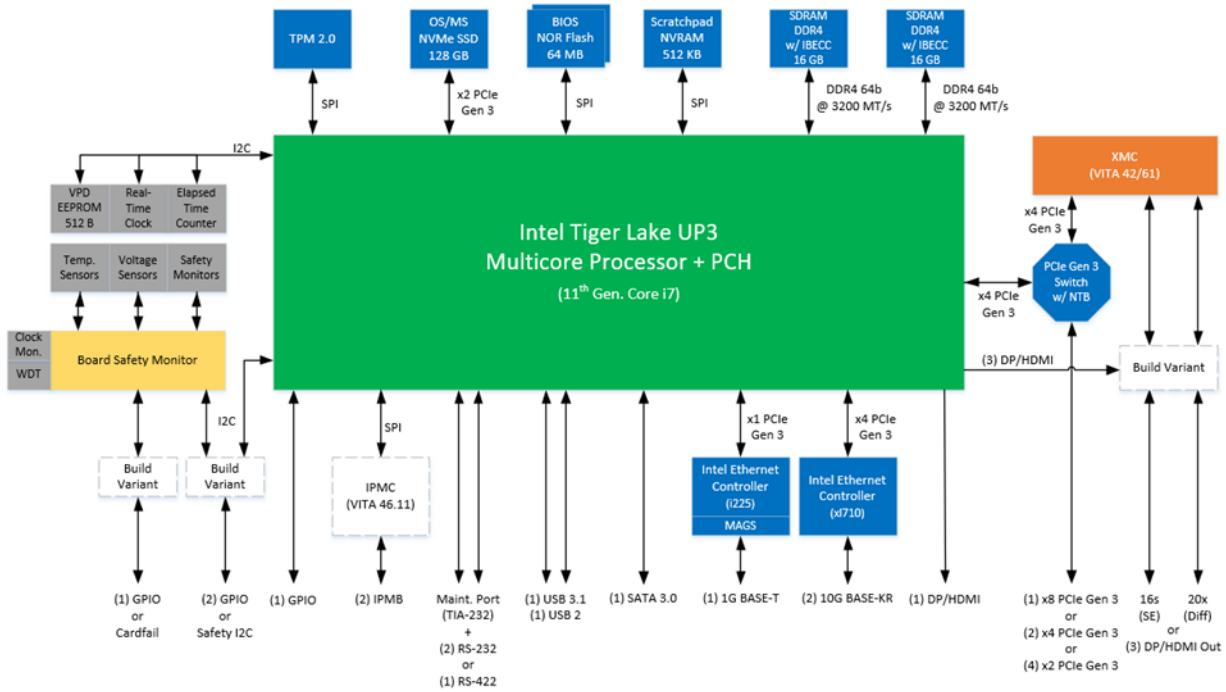


Figure 2: SBC3005 COTS-D 3U VPX Single Board Computer Architecture

HARDWARE FEATURES

The key features of the SBC3005 module:

- Designed to DO-254/ED-80 requirements
- Standard VITA 65 OpenVPX 3U form factor
- SOSA aligned 3U I/O intensive profile
- Supported by DO-254/ED-80 COTS certification evidence
- High-performance PCIe Gen 3 data plane, Intel 12th generation graphics, and mezzanine support
- VITA 61 XMC 2.0 mezzanine site supporting video capture direct to GPU memory, or generic XMC support
- PCIe switch to support high bandwidth direct coupling to the mezzanine site
- Safety monitors
- Conduction-cooled (AFT on request) and air-cooled lab development units

- Operating card edge temperature range of -40 to $+85^{\circ}\text{C}$
- 3U VPX powered from +12 V, +3.3 V Aux, and VBAT

TIGER LAKE UP3 SOC LONG-TERM SUPPLY AND SUPPORT

CoreAVI provides consistent and dedicated support for the supply and use of the Intel Tiger Lake UP3 SoC within the rugged Mil/Aero/Avionics market segments. CoreAVI will ensure that the software, hardware, and long-life support are provided to meet the needs of customers' system lifecycles.

CoreAVI has extensive environmentally controlled storage facilities that are used to store the SoCs supplied to the Mil/Aero/Avionics marketplace, ensuring that a ready supply is available for the duration of any program.

CoreAVI also provides the post Last Time Buy storage of SoCs and is often able to provide additional quantities of components when COTS hardware partners receive increased volume for existing products/systems requiring additional inventory.

EVALUATION SUPPORT

CoreAVI provides lab development hardware for all its COTS-D Hardware IP designs to enable customers to get started early on platform development. To support customers in the development of their Tiger Lake-based applications, CoreAVI offers a standard commercial Tiger Lake UP3 development board, compatible with an industry standard PCIe interface.

VkCore[®] SC drivers as well as VkCoreGL[®] SC1, VkCoreGL[®] SC2, ComputeCore[™] and VkCoreVX[™] SC application libraries are available for Windows 10 and Linux. These products are available on a 12-month evaluation license that includes support. Please refer to these products' respective product briefs for more detailed product information.

Graphics Support — 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 Tiger Lake with a safety-certifiable graphics and compute driver solution for the Intel Iris Xe GPU. Tiger Lake 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 Tiger Lake. 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 and IEC 61508 SIL 4 safety compliance.

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

Compute and SAFE AI Support — VkCore SC Compute, ComputeCore, and VkCoreVX SC

CoreAVI provides compute and Safe AI support for Tiger Lake with a variety of implementations. CoreAVI supports Tiger Lake with safety certifiable compute capabilities available in our Vulkan-based VkCore SC driver solution for the Intel Iris Xe GPU. Tiger Lake is also supported by CoreAVI's ComputeCore suite of compute libraries that provide the building blocks to enable accelerated compute and autonomous systems using the Vulkan SC API. Safe AI capabilities are available through CoreAVI's VkCoreVX SC implementation of Khronos' OpenVX 1.3 industry standard API, which provides a feature set for implementing and deploying neural networks in safety critical environments.

Please refer to the VkCore SC, ComputeCore, and VkCoreVX SC product briefs for more information on each product.

Safe Bootloader and Safe BIOS

CoreAVI offers BootCore™ SC, a safe bootloader and safe BIOS built specifically to support Intel's Tiger Lake SoC. For more information, please contact Sales@CoreAVI.com.

TrueCore™

TrueCore is a GPU safety monitor library designed to interoperate with CoreAVI GPU drivers.

TrueCore uses a patented approach to provide a suite of highly engineered Initiated Built-In-Tests (IBIT). These provide test coverage of the intended function of the GPU's graphics rendering pipeline (graphics command to framebuffer memory). Through the use of several tests, each with a unique test pattern that is verified independently by the CPU, applications are provided with flexibility in optimizing test execution and result filtering that may not be present with FPGA-based approaches. In testing the graphics rendering pipeline, TrueCore is testing one or more instances of each functional IP block, thereby providing test coverage for design errors, common-mode failures, and incorrect function caused by unused and undocumented functions.

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™ 254 provides complete FAA DO-254 /EASA ED-80 Level A certification data packages to aid in FAA DO-254 / EASA ED-80 avionics hardware 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. For functional safety support in industrial automation and robotics applications, CoreAVI provides IEC 61508 support up to SIL3.

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 Tiger Lake SoC.

TIGER LAKE SOC

The Intel Tiger Lake UP3 SoC (SKU i7-1185GREC-RT) is the next generation in application processors from Intel that is targeted toward the embedded rugged Mil/Aero/Avionics and industrial markets. The Tiger Lake UP3 offers a high degree of functional integration for advanced multi-display systems with low virtualization software overhead.

The Tiger Lake UP3 SoC is comprised of four CPU cores along with an integrated Iris Xe graphics processing unit. This high level of integrated processing, graphics and connectivity makes it a very compact, power efficient solution ideal for embedded applications and for use on space constrained modules.

The Tiger Lake SoC is particularly well suited to mission/safety-critical applications. Any and all “commercial” features that pose challenges to deterministic operations (like thermal auto-throttle) can be disabled. Tiger Lake offers a wide variety of clock and configuration settings to optimize thermal performance and does so with great confidence that configuration settings remain stable and constant throughout all operating regions.

The many feature and performance benefits offered by the Tiger Lake UP3 make it a compelling solution for any embedded application that is in development now and which has a long lifecycle requirement. With the Tiger Lake UP3 being introduced to the market, it offers the longest lifecycle of any embedded high-performance graphics/compute solution.

Because of its high performance, the Tiger Lake UP3 is a natural replacement for any system currently using discrete CPUs and GPUs, or any integrated System-on-Chip that needs higher performance.

CoreAVI’s Tiger Lake 3U VPX Platform for Safety Certifiable Applications comprises safety certifiable COTS-D hardware IP, development hardware, safety critical 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 a fully integrated, off-the-shelf foundation upon which safety-certifiable applications can be built with confidence.

The Intel Tiger Lake SoC offers the following features and benefits:

- 11th generation of Intel Core™ architecture (Willow Cove, 10 nm)
- 4 CPU cores (8 thread simultaneous execution) at 1.8 GHz (base), 4.4 GHz (turbo)
- AI/DL Instruction Sets including VNNI support for CV/AI and OpenVINO
- 3MB Cache/Core (12 MB Total)
- DDR4 (3.2GHz) / LPDDR (4.267 GHz) memory support with In-Band ECC
- Intel Iris Xe Graphics, 96 EUs, Enhanced Media (AV1 Codec/12b support via 2 VDBOX)
- Four 4 DP/HDMI outputs (four 4K or two 8K resolution display outputs)
- 4 PCIe Gen4 Lanes (CPU)
- 12 HSIO (PCH) – 802.11ac, PCIe Gen 3, Thunderbolt4
- USB4 compliant
- Total Power Dissipation (TDP) 12-15W average, 28W maximum (depending upon CPU clock rate)

- -40°C to 100°C junction temperature range
- 1449 BGA (46.5 x 25 x 1.27 mm) – Integrated CPU and PCH
- 15 year availability

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

For more information on CoreAVI's support for Tiger Lake, please contact Sales@CoreAVI.com.