HORUS430

GPGPU-Based Radar Subsystem by NVIDIA RTX A2000/ RTX A4500 and Intel Gen 9TH/11TH Processor


MIL-STD 461/1275

MIL-STD 810G

- Intel® Core™ i7-9850HE/i7-11850HE Processor
- NVIDIA MXM Graphic Engine support up to RTX A2000 (CUDA 2560) / RTX A4500 (CUDA 5888)
- Operating Temperature -40℃ to +55℃(By GPU Option)
- MIL-STD 461/1275 EMI Filter 18V~36V
- DTL38999 Military Connector
- IP65

1. Technical Profile

1.1 Introduction

Artificial intelligence (AI) is quickly becoming one of the most crucial components to business success now and in the foreseeable future. Today, the necessity of deploying powerful computing platforms that can accelerate and cost-effectively scale their AI-based products and services has become vital for successful enterprises.
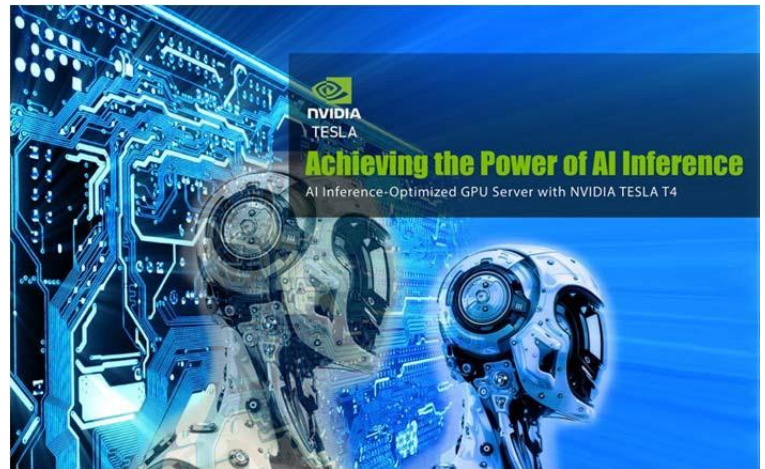
7STARLAKE is innovating to address the rapidly emerging high-throughput inference market driven by technologies such as 5G, Smart Cities and IOT devices, which are generating huge amounts of data. The combination of NVIDIA Tensor RT and the new architecture based GeForce Accelerator as the ideal combination for these new demanding and latency-sensitive workloads and are aggressively leveraging them in GPU system.

1.2 Edge AI Inference GPU System

Intel i7-9850HE Specification		Intel i7-11850HE Specification	
Code Name	Coffee Lake	Code Name	Tiger Lake
CPU Cores	6	CPU Cores	8
CPU Threads	12	CPU Threads	16
Frequency	2.70GHz	Frequency	2.60GHz
Max Turbo Frequency	4.40GHz	Max Turbo Frequency	4.70GHz
TDP	45W	TDP	45W
Max Memory Size	64 GB	Max Memory Size	128 GB
Memory Types	DDR4-2666	Memory Types	DDR4-3200

With more threads and more cores, 9th/11th Gen Intel® Core™ H-series processors for IoT bring high performance and connectivity to the edge—all in an efficient package with long-life availability that's ideal for embedded use conditions. These processors are the first in the Intel® Core™ IoT family to offer up to eight cores, delivering dramatic improvements over the previous generation. New features include integrated graphics and even more robust connectivity to support the most demanding IoT use cases—all on the latest 14 nm technology. And with TDP 45W, form factors can vary without compromising performance.

HORUS430 is installed with graphics card NVIDIA RTX A2000 (CUDA 2560)/ RTX A4500 (CUDA 5888) , allowing generate excellent resolution and supports high efficiency and fluency of image processing with competitive G3D Mark and low power consumption. The GPGPU provides a simple and easily implementable parallel software architecture paradigm using general purpose programming languages like C / C++. The entire data / signal processing task can be realized as a sequence of software activities taking the advantage of very high throughput possible with the GPUs. The system possess great superiority for image computing utilization, including 2D/3D mapping and real-time image process for autonomous vehicle, surveillance system for control room, other navigation, radar, detection, sensor and laser systems on all maritime, ground, and aerial applications in both defense and industrial fields.

NVIDIA RTX A2000 Specification	
GPU Architecture	Ampere
CUDA cores	2,560
Memory	4GB/8GB
Memory Type	GDDR6 / 128-bit
Max Power	35W or 60W
Form Factor	MXM3.1 TypeA
Dimension	82 (W) x 70 (D) x 4.8 (H) mm

NVIDIA RTX A4500 Specification	
GPU Architecture	Ampere
CUDA cores	5,888
Memory	8GB/16GB
Memory Type	GDDR6 / 256-bit
Max Power	80W or 115W
Form Factor	MXM3.1 TypeB
Dimension	82 (W) x 105 (D) x 4.8 (H) mm

Modern Radar Sensor systems are being deployed to carry out multi-tasking for detection and tracking of several objects simultaneously. Active Electronically steered phased array technology is the key element being utilized for design and development of these modern radar systems. A radar system receives digitized video data from receivers and carries out a set of highly compute intensive Data / Signal Processing activities. The GPGPU provides a simple and easily implementable parallel software architecture paradigm using general purpose programming languages like C / C++. The entire data / signal processing task can be realized as a sequence of software activities taking the advantage of very high throughput possible with the GPUs.
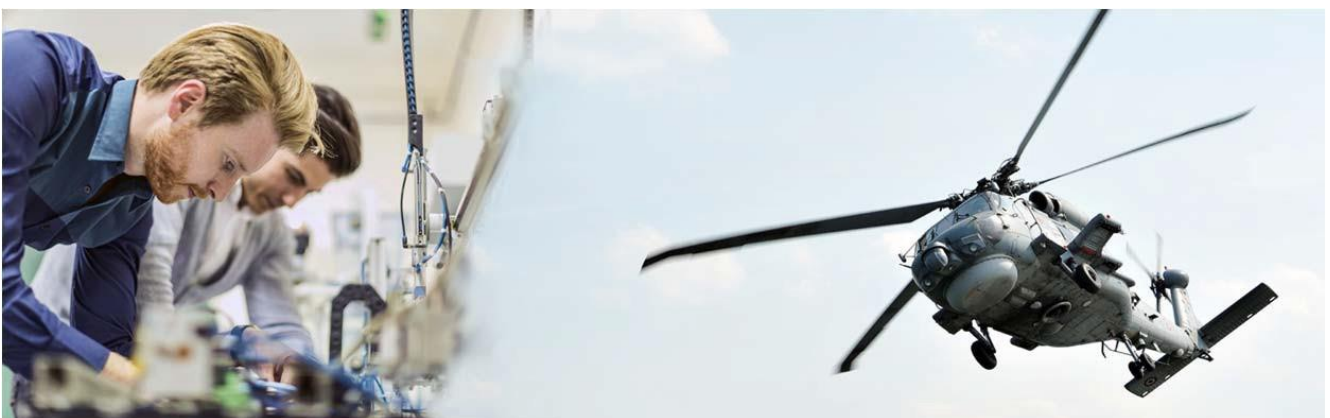
HORUS430X1/X2, Intel® Core™ i7-9850HE Processor, the 6-Core CPU, supports 2.7 GHz, up to 4.4 GHz clock speed /Intel® Core™ i7-11850HE Processor, the 8-Core CPU, supports 2.6 GHz, up to 4.7 GHz clock speed for high-end computing performance. Not only with outstanding CPU performance, HORUS430 has integrated graphics card NVIDIA® RTX A2000/TRX A4500 to apply all sort of applications. HORUS430 has provided rich I/O such as 4 x LAN, 4 x USB, 2 x DVI. HORUS430 is highlighting on rugged design and high functionality, the special dual thermal solution allows powerful system to present supreme performance under harsh environment. HORUS430 is design to withstand the most challenging combat requirements with many being MIL-STD 810G certified for extreme environmental conditions. HORUS430 GPGPU platform are used by the most demanding customers including the US Military, NATO forces and among many others.

1.3   EI/O Expansions

HORUS430 is designed to fulfill demands of mission critical applications. Apart from standard I/O interface, HORUS430 equipped with 4 x LAN, 4 x USB, 2 x DisplayPorts. With these rich interfaces, HORUS430 can be easily applied to targeting & acquisition system to link with diversified sensors, such as thermal image camera, scanned array radar..etc.
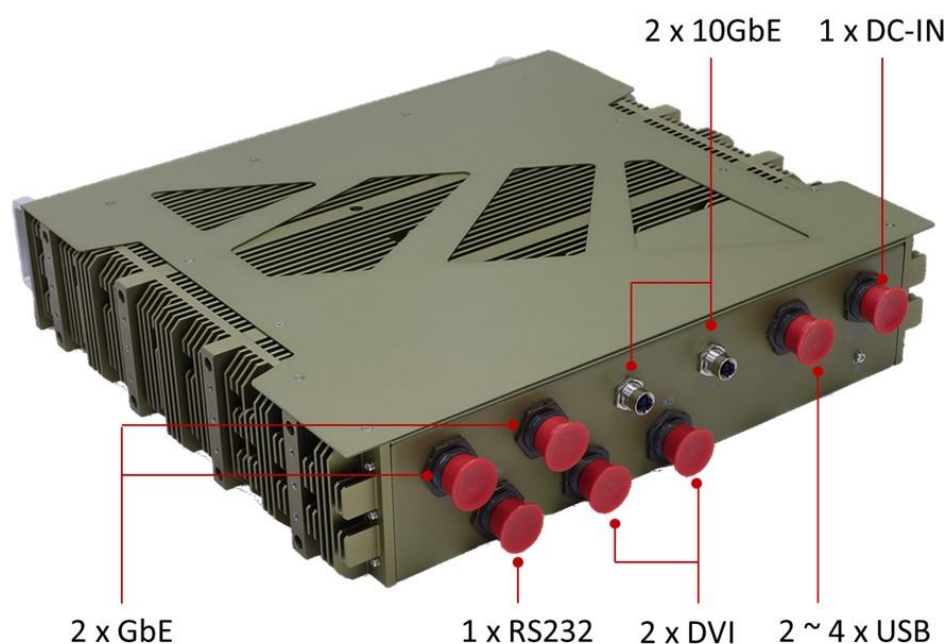
1.4   Rugged D38999 Series connectors

D38999 connectors offer the highest performance capabilities and reliability for both general duty and severe environment applications.

This cylindrical connector family designed for cable-to-panel I/O applications in military, aerospace and other demanding hazardous situations. D38999 connectors are capable of operation within a temperature range -65℃ to 200℃. They are lightweight and can stand up to environmental challenges. Made with removable crimp or fixed hermetic solder contacts, these connectors provide high-vibration characteristics and are suitable for severe wind and moisture problem areas.

1.5   MIL-STD-810G

HORUS430 meets MIL-STD-810G for mechanical shock and vibration, it is designed and tested to withstand extended extended temperature (-40° to +55℃). Combining critical components soldering on board and solid connection, HORUS430 is compliant to MIL-STD 810G standard, can withstand 5g vibration, 100g single shocks and 50g multiple shocks.

1.6   Thermal Solution: Conduction cooling

Aluminum heatsink are an ideal solution for rapidly and evenly distributing high density heat loads. The heat sink is often used to increase heat distribution to additional cold plate surface which directly contact with the heats and improves the overall thermal performance of the system. In addition, 7starlake's unique high thermal conductivity aluminum enclosure is designed with high and low fin plus wave line, creating adequate airflow and increasing the surface area and heat dissipation to reduce thermal resistance in contact with the cooling medium up to 30-40%.

7Starlake ensures that the computer systems we develop remain stable even in high temperature environments. We design to use efficient thermal solutions which can typically keep CPU and GPU module full loading with highly performance during high temperature.
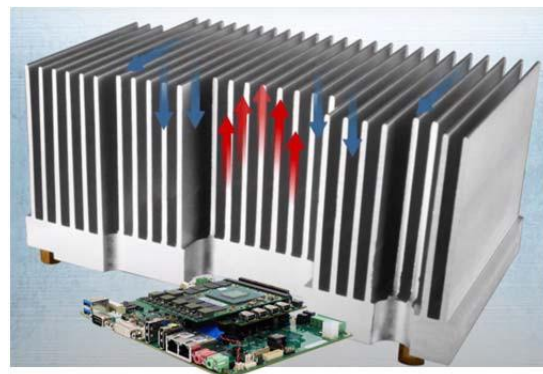
The conduction cooling passive solutions don't require moving components, meaning high reliability, less wear and tear, and low maintenance. It guarantees that our products are made in accordance with your requirements on wide temperature range, compact design, durability, high performance and extended lifecycle. We implement a design principle that uses wide temperature grade components, optimal power circuits, constructed cooling & thermal design, and wideband extended temperature testing.
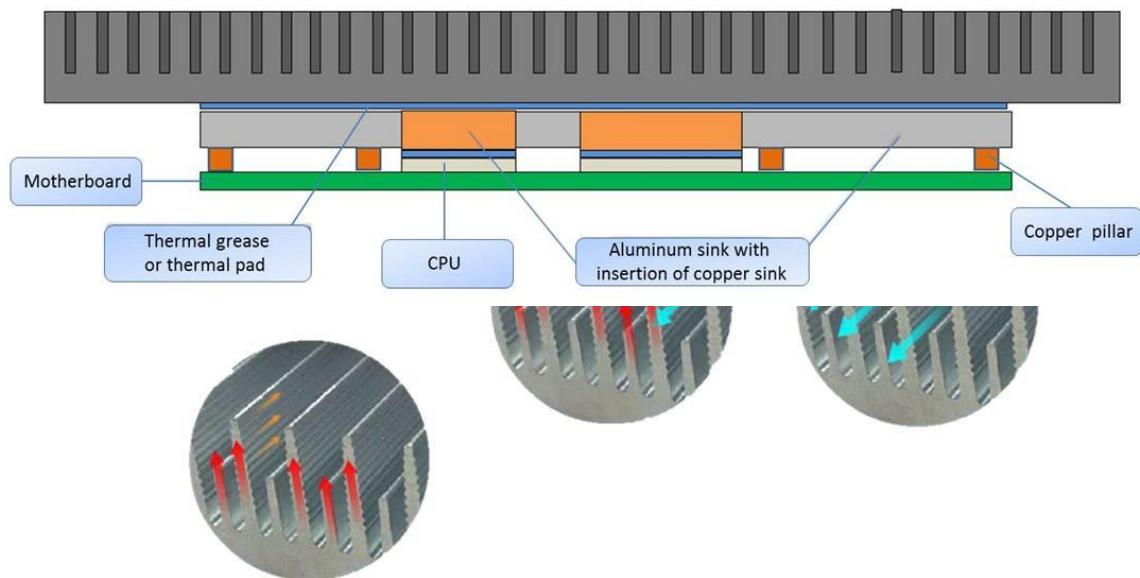
2 Specifications

System

CPU	Intel® 9th Coffee-Lake i7-9850HE (2.7 GHz, up to 4.4 GHz, 6-cores, 12 threads) Intel® 11th Tiger-Lake i7-11850HE (2.6 GHz, up to 4.7 GHz, 8-cores, 16 threads)
Memory type	DDR4-2666 Up to 64GB (ECC for Options)

Display

GPU	NVIDIA MXM Graphic Card support up to RTX A2000 (CUDA 2560) NVIDIA MXM Graphic Card support up to RTX A4500 (CUDA 5888)

Storage

Storage	2 x mSATA, up to 1TB

Ethernet

LAN	2 x Intel I350-AM2 Gigabit LAN Interfaces (10/100/1000Mbps)
10GbE	2 x 10GbE supported

Front I/O

X1	1 x USB x 4 MIL-38999 22Pin connector (Amphenol TV07RW-13-S)
X2, X3	2 x 10G LAN M12 8Pin connector (X CODE Cat6)
X4, X5	2 x 1G LAN MIL-38999 10Pin connector (Amphenol TV07RW-13-98S)
X6	1 x RS232 MIL-38999 10Pin connector (Amphenol TV07RW-13-98S)
X7, X8	2 x DVI MIL-38999 22Pin connector (Amphenol TV07RW-13-S)

Power Requirement

Power Input	18V~36V DC-DC 300W

Applications, Operating System

Application	Energy/Smart Grid/Power Plant Management, Intelligent Automation and manufacturing applications
OS	Windows 10 64Bit Ubuntu13.04, Ubuntu13.10, Ubuntu14.04, Fedora 20
EMC	EN 61000-4-2: Air discharge: 8 kV, Contact discharge: 6kV EN 61000-4-3: 10V/m EN 61000-4-4: Signal and DC-Net: 1 kV EN 61000-4-5: Leads vs. ground potential 1kV, Signal und DC-Net: 0.5 kV CE and FCC MIL-STD-461 (Options): CE102 basic curve, 10kHz - 30 MHz RE102-4, (1.5 MHz) -30 MHz - 5 GHz RS103, 1.5 MHz - 5 GHz, 50 V/m equal for all frequencies

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MIL-STD-810	Method 500.5, Procedures I and II (Altitude, Operation): 12,192M, (40,000 ft) for the initial cabin altitude (18.8Kpa or 2.73 Psia) Method 500.5, Procedures III and IV (Altitude, Non-Operation): 15,240, (50,000 ft) for the initial cabin altitude (14.9Kpa or 2.16 Psia) Method 501.5, Procedure I (Storage/High Temperature) Method 501.5, Procedure II (Operation/High Temperature) Method 502.5, Procedure I (Storage/Low Temperature) Method 502.5, Procedure II (Operation/Low Temperature) Method 503.5, Procedure I (Temperature shock) Method 507.5, Procedure II (Temperature & Humidity) Method 514.6, Vibration Category 24/Non-Operating (Category 20 & 24,Vibration) Method 514.6, Vibration Category 20/Operating (Category 20 & 24,Vibration) Method 516.6, Shock-Procedure V Non-Operating (Mechanical Shock) Method 516.6, Shock-Procedure I Operating (Mechanical Shock)
Reliability	Conduction Cooling. Designed & Manufactured using ISO 9001 Certified Quality Program.
MIL-STD-461	CE102 basic curve, 10kHz - 30 MHz RE102-4, (1.5 MHz) -30 MHz - 5 GHz RS103, 200 MHz - 3.2 GHz, 50 V/m equal for all frequencies EN 61000-4-2: Air discharge: 8 kV, Contact discharge: 6kV EN 61000-4-3: 10V/m EN 61000-4-4: Signal and DC-Net: 1 kV EN 61000-4-5: Leads vs. ground potential 1kV, Signal und DC-Net: 0.5 kV CE and FCC
MIL-STD-1275	Steady State – 20V~33V, Surge Low – 18V/500ms, Surge High – 100V/500ms Emitted spikes Injected Voltage surges Emitted voltage surges Voltage ripple (2V) Voltage spikes Starting Operation Reverse polarity

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3 Order Information

HORUS430-X1
GPGPU-based radar subsystem with Intel® 9th Gen Core i7-9850HE, RTXA2000 MXM, IP65 , 18V-36V, support MIL-STD-461, MIL-STD-810G. with MIL-DTL-D38999 Connectors, Operating Temp. -40 to +55℃

HORUS430-X2
GPGPU-based radar subsystem with Intel® 11th Gen Core i7-11850HE, RTXA4500 MXM, IP65 , 18V-36V, support MIL-STD-461, MIL-STD-810G. with MIL-DTL-D38999 Connectors, Operating Temp. -40 to +50℃

4 Dimension