STAR LAKE

HORUS430-X1

GPGPU-Based Radar Subsystem by NVIDIA GTX1080 and Intel i7-9850HE

LAND
SEA
AIR

MIL-STD 461/1275

MIL-STD 810G

- Intel® Core™ i7-9850HE Processor
- NVIDIA MXM Graphic Engine support up to GTX1080 (8GB-GDDR5X, CUDA 2560)
- Extreme Temperature -20~+55 degree
- MIL-STD 461/1275 EMI Filter 18V~36V
- DTL38999 Military Connector

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	
Code Name	Coffee Lake
CPU Cores	6
CPU Threads	12
Frequency	2.70 GHz
Max Turbo Frequency	4.40 GHz
TDP	45 W
Max Memory Size	64 GB
Memory Types	DDR4-2666

With more threads and more cores, 9th 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 ranges from 25W to 65W, form factors can vary without compromising performance.

HORUS430-X1 is installed with graphics card NVIDIA GTX1080 (CUDA 2560,8 GB GDDR5X) , 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 GTX1080 Specification	
GPU Architecture	Pascal
CUDA cores	2560
Memory	8 GB
Memory Type	GDDR5X
Max Power	150W
Core Speed	1566 - 1733 (Boost) MHz
Memory Speed	10000 MHz

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.
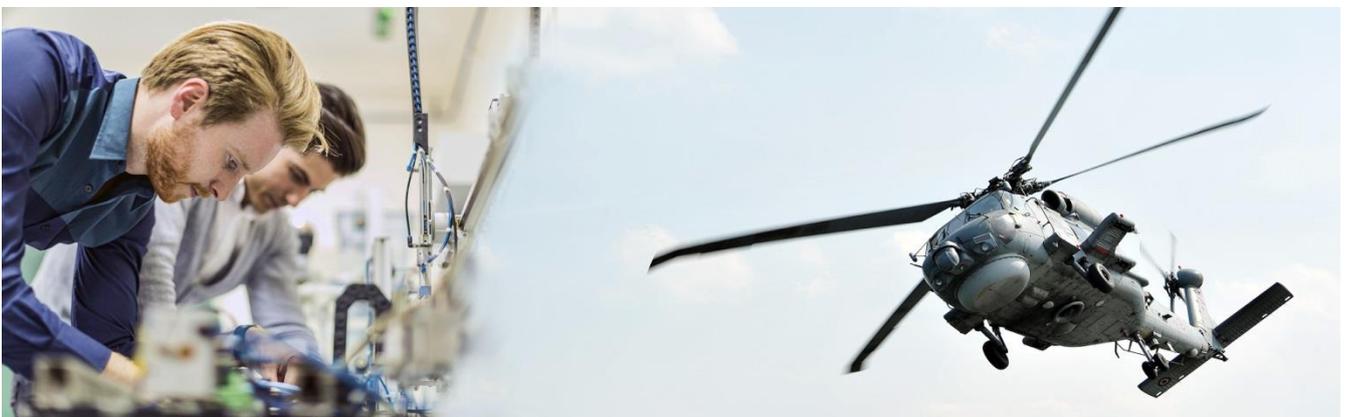

HORUS430-X1, Intel® Core™ i7-9850HE Processor, the 8-Core CPU, supports 1.8 GHz, up to

3.8 GHz clock speed for high-end computing performance. Not only with outstanding CPU performance, HORUS430-X1 has integrated graphics card NVIDIA®Quadro P5000 (CUDA2560, 16GB-GDDR5X) to apply all sort of applications. HORUS430-X1 has provided rich I/O such as 4 x LAN, 4 x USB, 2 x DVI. HORUS430-X1 is highlighting on rugged design and high functionality, the special dual thermal solution allows powerful system to present supreme performance under harsh environment. HORUS430-X1 is design to withstand the most challenging combat requirements with many being MIL-STD 810G certified for extreme environmental conditions. HORUS430-X1 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-X1 is designed to fulfill demands of mission critical applications. Apart from standard I/O interface, HORUS430-X1 equipped with 4 x LAN, 4 x USB, 2 x DisplayPorts. With these rich interfaces, HORUS430-X1 can be easily applied to targeting & acquisition system to link with diversified sensors, such as thermal image camera, scanned array radar..etc.
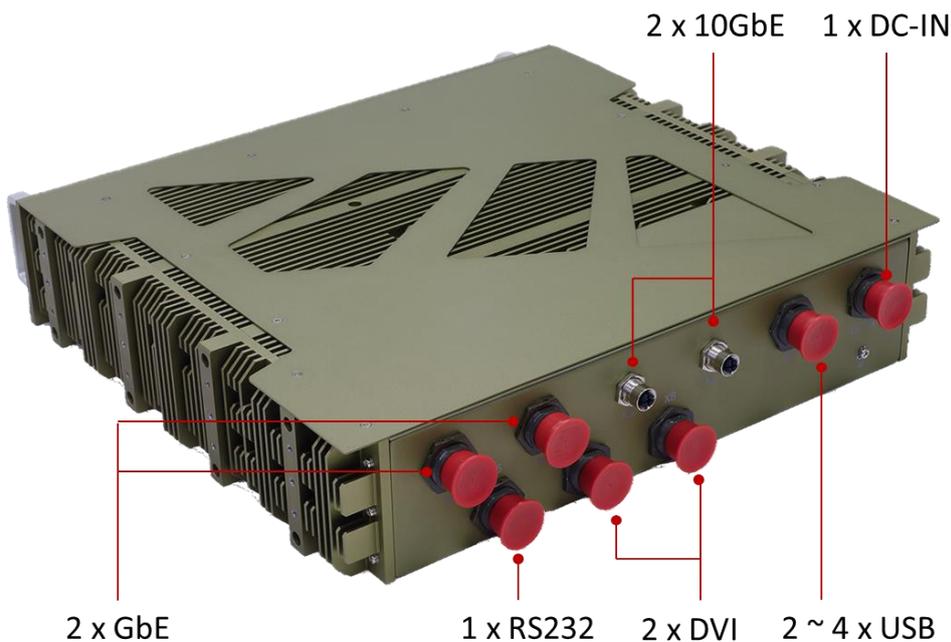
1.4　Rugged D38999 Series connectors

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°C. 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-X1 meets MIL-STD-810G for mechanical shock and vibration, it is designed and tested to withstand extended extended temperature (-20° to +55°C). Combining critical components soldering on board and solid connection, HORUS430-X1 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.
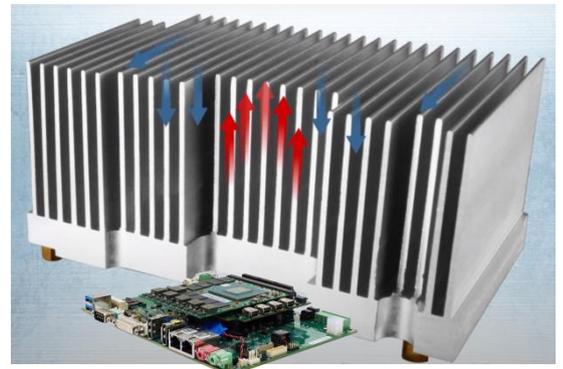
The conduction cooling passive solutions don't require moving components, meaning high reliability, less wear and tear, and low maintenance. It guarantees that our products are made in accordance with your requirements on wide temperature range, compact design, durability, high performance and extended lifecycle. We

implement a design principle that uses wide temperature grade components, optimal power circuits, constructed cooling & thermal design, and wideband extended temperature testing.

Motherboard

Thermal grease or thermal pad

CPU

Aluminum sink with insertion of copper sink

Copper pillar
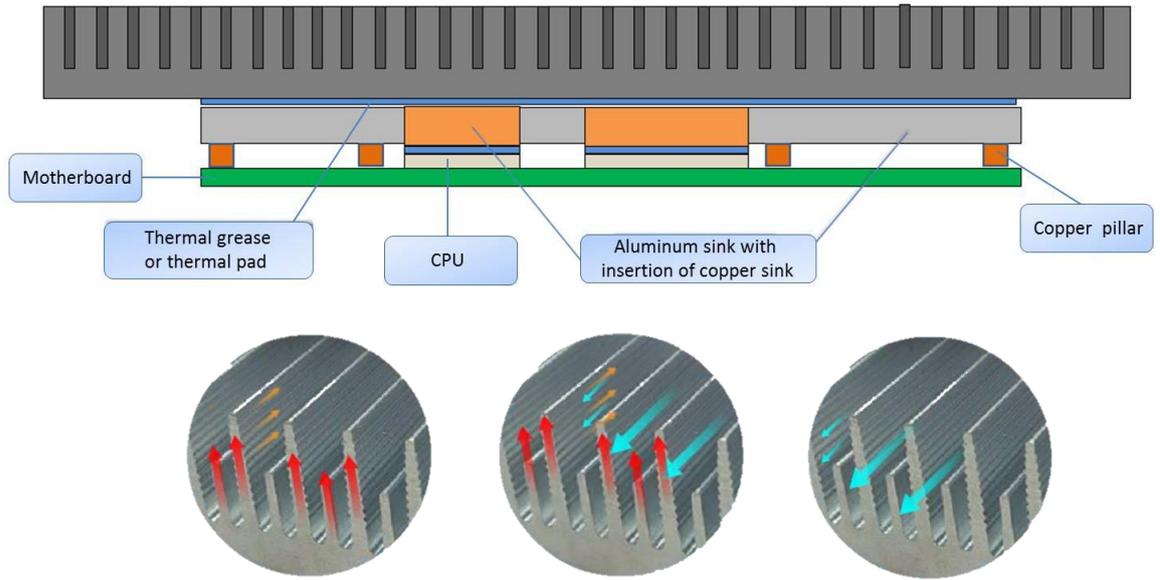
2 Specifications

System

CPU	Intel® 9th Coffee-Lake i7-9850HE (2.7 GHz, up to 4.4 GHz, 6-cores, 12 threads)
Memory type	DDR4-2666 Up to 64GB (ECC for Options)
GPU	NVIDIA MXM Graphic Card support up to GTX1080 (8GB-GDDR5X, CUDA 2560)

Display

Display Port	4 x DisplayPort 1.4 digital video outputs (DP++), 1 x HDMI, 2 x DVI, 1x eDP

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

Applications	Energy/Smart Grid/Power Plant Management, Intelligent Automation and manufacturing applications
OS	Windows 10 64Bit Ubuntu13.04, Ubuntu13.10, Ubuntu14.04, Fedora 20

MIL-STD-810 Specifications (Operating)

Method 502.5 Procedure 2	Low Temperature	-20℃, 4 hours, ±3℃
Method 501.5 Procedure 2	High Temperature	+55℃, 4 hours, ±3℃
Method 507.5	Humidity	85%-95% RH without condensation, 24 hours/cycle, conduct 10 cycles.
Method 514.6	Vibration	5-500Hz, Vertical 2.20Grms, 40mins x 3axis.
Method 516.6	Shock	6 Grms, 11ms, 3 axes.

MIL-STD-810 Specifications (None-Operating)

Method 502.5	Low Temperature	-33℃, 4 hours, change rate:≦20℃/ Hour
	Storage	-15℃, 72hours (By request)
Method 501.5	High Temperature	+71℃, 4 hours, change rate:≦20℃/ Hour
Procedure 1	Storage	+63℃, 240 hours (By request)
Method 514.6	Vibration	5-500Hz, Vertical 2.20Grms, 40mins x 3axis.
Method 516.6	Shock	6 Grms, 11ms, 3 axes.

MIL-STD-461 Specifications (EMC)

Conducted Emissions Power Leads	CE102 basic curve	10kHz - 30 MHz
Conducted Emissions Electric Field	RE102-4	1.5 MHz -30 MHz - 5 GHz
Radiated Susceptibility Electric Field	RS103	1.5 MHz - 3 GHz, 50 V/m equal for all frequencies 2 MHz – 80 MHz 50V/m equal for all frequencies 80 MHz – 3 GHz 50V/m equal for all frequencies 3 GHz - 5 GHz, 50 V/m equal for all frequencies
Electrostatic Discharge	EN 61000-4-2	Air discharge: 8 kV, Contact discharge: 6kV

lectromagnetic compatibility	N 61000-4-4	ignal and DC-Net: 1 kV
lectromagnetic compatibility	EN 61000-4-5	eads vs. ground potential 1kV, ignal und DC-Net: 0.5 kV
adio disturbance	EN 55022	lass A
lectromagnetic compatibility	EN 61000-4-3	0V/m
lectromagnetic compatibility	EN 61000-4-5	eads vs. ground potential 1kV, ignal und DC-Net: 0.5 kV

Conducted Susceptibility ——————— *Power Leads*	**CS101*	*30HZ~150KHZ*
Conducted Susceptibility ——————— *Bulk Cable Injection*	**CS114*	*10kHz~200MHz*
Conducted Susceptibility ——————— *Bulk Cable Injection*	**CS115*	*50v/m*
Conducted Susceptibility ——————— *Damped Sinusoidal Transients*	**CS116*	*50v/m*
Radiated Susceptibility ——————— *Magnetic Field*	**RS101*	*30 Hz~ 100 kHz*
Radiated Susceptibility ——————— *Electric Field*	**RS103*	*5 GHz - 18 GHz, 50 V/m equal for all frequencies*
Radiated Emissions ——————— *Antenna Spurious and Harmonic Outputs*	**RE103*	*10 kHz~ 40 GHz*
Conducted Emissions ——————— *Antenna Terminal*	**CE106*	*10 kHz~ 40 GHz*

*   *Option Test item : CS101/CS114/CS115/CS116/RS101/RS103/RE103/CE106*

*   *Test item for Antenna system : RE103/CE106*

MIL-STD-1275 Specifications

Steady State	Steady State	20V~33V
Surge Low	Surge Low	20V~33V
Surge High	Surge High	18V/500ms

3   Dimension