DFI

DFI's COM Express Mini Powers Advanced Defense Systems

Defense Embedded Systems Market: A Growing Strategic Sector

The Europe defense embedded systems market has witnessed significant growth and is projected to continue expanding over the next 5 to 10 years. In 2023, the market was valued at approximately USD 5.45 billion, and it is expected to reach around USD 9.75 billion by 2030, growing at a Compound Annual Growth Rate (CAGR) of 8.5% during the forecast period. Embedded systems play a crucial role in managing and safeguarding devices, analyzing large data sets, enabling remote control, and protecting against malicious attacks, driving market growth. Key factors driving the market include advancements in electronics, semiconductors, and software, as well as the increasing importance of cybersecurity in connected, data-driven defense systems.

Industry: **Defense**
Application: **Radar system**
Solution: **DFI TGU9A2 , MTU9A2**

TGU9A2

MTU9A2

DFI

The Challenge: Rugged Computing Power for Critical Defense Applications

A leading defense contractor faced significant challenges with their existing defense systems across multiple applications including Detection and Tracking Radar Systems and Field Command Centers. Their legacy computing platforms struggled to process critical battlefield data with the speed and reliability required for modern defense scenarios, potentially compromising mission success and personnel safety. The defense systems required computing solutions that could withstand extreme environmental conditions while delivering superior processing power and long-term availability to ensure mission success in the most demanding battlefield environments.

The Solution: DFI's TGU9A2 COM Express Mini

After rigorous evaluation of multiple options, the defense contractor selected DFI's TGU9A2 COM Express Mini as the ideal solution for their next-generation defense/defense systems. The TGU9A2, featuring the 11th Generation Intel® Processor, offered the perfect combination of high-performance computing, rugged design, and extended lifecycle support critical for defense applications.

The TGU9A2's key specifications addressed all the contractor's requirements:

- **Reliable Performance Foundation:** The 11th Generation Intel® Processor delivered the computing capabilities needed to process complex radar signals and analyze tactical data, and control with split-second precision, while the Single Channel LPDDR4X 4266MHz with Memory Down up to 16GB provided reliable performance for data-intensive defense applications.

- **Compact, Rugged Form Factor:** The COM Express Mini form factor (84mm x 55mm) allowed for integration into space-constrained defense systems while maintaining resilience against shock, vibration, and extreme temperatures encountered in battlefield environments.

- **Enhanced Defense Integration:** TThe TGU9A2's rich I/O capabilities, including 1 Intel® 2.5GbE, 2 USB 3.2, and 8 USB 2.0 ports, offered secure connectivity options for various peripherals and encrypted communication systems, while its multiple expansion capabilities (1 PCIe x4, 2 I2C, 1 SMBus) provided flexibility for integration with specialized sensors, communication systems, and encryption hardware.

Implementation Across Critical Defense Systems

DFI's TGU9A2 Com Express Mini was successfully integrated into these critical defense applications:

1. Detection and Tracking Radar Systems

The TGU9A2's powerful processing capabilities enabled the radar systems to process multiple target acquisition data simultaneously, significantly improving detection ranges and tracking accuracy. The module's reliable performance ensured continuous operation in remote surveillance installations, while its compact size allowed for integration into mobile radar platforms.

2. Field Command Centers

In tactical field Command Centers, the TGU9A2's dual display support provided commanders with comprehensive battlefield visualization, enabling better decision-making in critical situations. The module's energy efficiency extended operational time in field deployments, while its processing power handled encrypted communications and real-time tactical data analysis.

The Results: Enhanced Defense Capabilities and Improved National Security

The integration of DFI's TGU9A2 COM Express Mini into the contractor's defense systems yielded remarkable improvements in radar detection and estimation accuracy through enhanced computational power and real-time target acquisition capabilities, while significantly reducing vulnerability of critical defense facilities to hostile actions and minimizing personnel casualties.
The system's dual-display capabilities enabled more comprehensive situation monitoring in command centers, improving tactical decision-making and response times, while its rugged design maintained performance in extreme temperatures from -40°C to +85°C. Additionally, the expansion capabilities provided flexibility for future technology upgrades without complete system redesigns.

Conclusion: A Strategic Partnership for National Defense

The successful integration of DFI's TGU9A2 COM Express Mini module into critical defense systems exemplifies how the right computing solution can strengthen national security capabilities. By providing a powerful, compact, and long-lifecycle platform, DFI enabled the defense contractor to enhance their systems' performance while meeting the stringent requirements of modern defense applications.

Building on this success, DFI has recently introduced the next-generation MTU9A2 COM Express Mini featuring the Intel® Core™ Ultra Processor (Meteor Lake: U-series). This advanced successor offers significant enhancements over the TGU9A2, including faster Single Channel LPDDR5 7467MHz memory with up to 16GB capacity, improved display capabilities with support for 4K/2K resolution through 1 DDI + 1 LVDS/eDP, expanded connectivity with 1 Intel® 2.5GbE, and enhanced storage options with 2 SATA 3.0 ports. The MTU9A2 also provides greater expansion flexibility with 4 PCIe x1, 1 I2C, 1 SMBus, 1 x LPC/eSPI, and 2 x UART.

For defense contractors looking to upgrade their systems, the MTU9A2's Intel® Meteor Lake CPU delivers approximately 10% better CPU processing performance and 114% improved GPU power compared to the TGU9A2, enabling more sophisticated battlefield analytics and enhanced AI capabilities for target recognition. In addition, the new NPU boasts a 8.2eTOPS that just launched with the Intel® Meteor Lake CPU offers even lower power requirement, ideal for sustained AI workloads and offload for battery life. These improvements make the MTU9A2 an ideal choice for defense applications requiring the ultimate in processing performance, energy efficiency, and advanced connectivity while maintaining the compact form factor and rugged reliability that defense contractors have come to expect from DFI.

Tailored Defense Computing Solutions: DFI's Professional Edge

DFI not only offers a broad portfolio of commercial off-the-shelf embedded products but also takes it a step further by delivering customized SOMs based on both x86 and ARM architectures, as well as carrier boards, to meet the specialized demands of the defense computing market. Each solution is engineered with harsh environmental conditions and stringent security requirements in mind, ensuring it fulfills specific operational needs and complies with defense-grade standards. By leveraging agile edge AI computing, DFI continues to lead the way with comprehensive one-stop services that empower clients to address the rapidly evolving challenges of the defense industry.

DFI's one-stop service begins with the application of Design for Manufacturing principles. Our team collaborates closely with customers from the early design phase to refine product specifications, system architecture, and the bill of materials, while also extending product lifespans to meet rigorous defense standards. Services include prototyping, thorough power and signal validation, performance optimization, and industry certification—ensuring every solution is robust, reliable, and mission-ready.

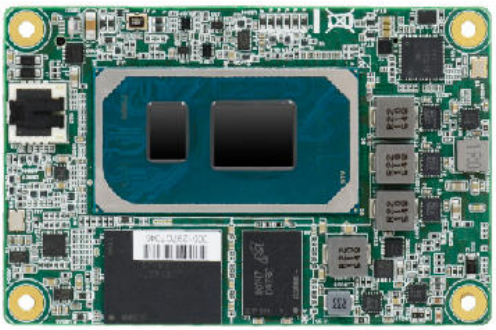
On the technology front, DFI delivers a wide array of value-added capabilities, including software integration (Windows, RTOS, Ubuntu, Android), BIOS and firmware optimization (such as Slim Bootloader, fast resume, and low-power standby at 1W), as well as AI acceleration and Out-of-Band modules tailored for diverse defense applications. All manufacturing processes—from PCB assembly to final testing—are performed entirely in-house by DFI, utilizing key components sourced outside of China to ensure supply chain stability and mitigate risk. We also provide robust post-production support, including long-term availability, repairs, upgrades, re-order fulfillment, and BOM management—ensuring full lifecycle continuity for mission-critical embedded IoT solutions and services in the defense sector.

DFI's TGU9A2 , MTU9A2 – Key Features

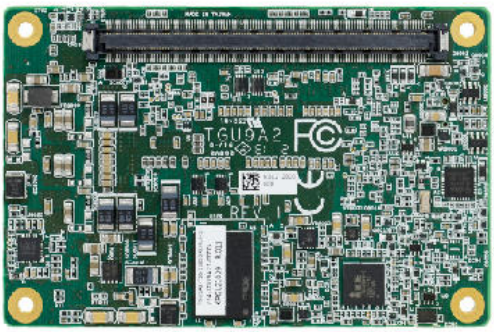
Learn more about DFI's TGU9A2, MTU9A2

TGU9A2

COM Express® Mini



Top View



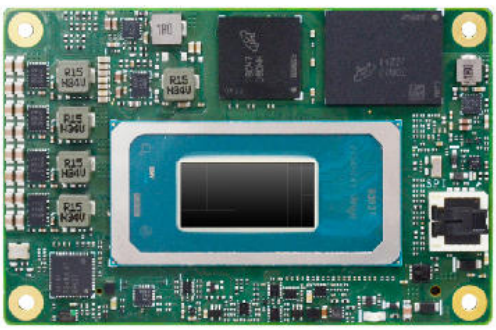
Bottom View

Key Features

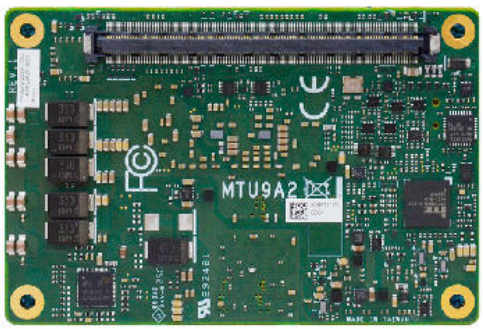
- **LPDDR4** — Single Channel LPDDR4X 4266MHz; Memory Down up to 16GB
- **4K x 2K High Resolution** — DP++ supports 4K x 2K resolution
- **Dual Display** — 1 eDP, 1 DDI (HDMI/DVI/DP++)
- **Multiple Expansion** — 1 PCIe x4, 2 I2C, 1 SMBus
- **Rich I/O** — 2.5GbE, 2 USB 3.2, 8 USB 2.0

MTU9A2

Intel® Core Ultra Processors
COM Express Mini



Top View



Bottom View

Key Features

- **LPDDR5** — LPDDR5-7467 up to 16GB
- **4K High Resolution** — Supports 4K/ 2K resolution
- **High Speed Ethernet** — Supports 100M/1000M/2.5Gbps
- **Multiple Expansion** — 4 PCIe x1, 1 SMBus, 1 I²C, 1 NVMe SSD
- **Rich I/O** — 2 USB 3.2, 8 USB 2.0