

Technical Article



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# Edge Computing Takes the Next Leap Forward

Hexa-core COM Express modules deliver impressive performance for power-constrained applications



## Introduction

As the number of IoT-connected devices continues to explode, there is a growing need for real-time processing throughout the network—from the edge to the cloud. New applications like machine learning are exceeding the capabilities of existing architectures—especially in space-constrained implementations with strict thermal limits.

To handle these emerging demands, it is time for system integrators, ODMs, and OEMs to upgrade to the latest technologies. A prime example is the ADLINK Express-CF/CFE, the first COM Express COM.0, Rev 3.0 Type 6 Module to deliver hexa-core (6-core) performance at the mobile 45 W power envelope.

The Express-CF/CFE is specifically designed for use in tight confines in applications such as image processing and analysis, 4K high speed video encoding and streaming, medical ultra sound, and predictive traffic analysis. With their uncompromising performance and compact package, the modules enable new possibilities for artificial intelligence (AI), workload consolidation, and other intensive computing demands at the edge.

## A Big Boost for High-Performance Computing

At the heart of the Express-CF/CFE is the 8th Generation Intel® Core™ processor family and Intel® Xeon® processor E-2100M (formerly Coffee Lake-H). Manufactured on Intel's latest 14 nm technology, this processor family offers up to 2X the performance of its predecessor at no significant increase in cost.

### Stand-out features and capabilities include:

- More cores (a maximum of 6 compared to 4) and an increased turbo boost of up to 4.4 GHz for uncompromised system performance
- Intel® Generation 9 Low Power Graphics for crisp 4K graphics in industrial automation, medical, and other visual applications
- Thermal design power (TDP) of 45W with 35W configurable TDP down options for a balance of power and performance
- Upgraded I/O, with up to 30 high-speed I/O lanes and integrated USB-C/USB 3.1 Gen2 (10 Gb/s)
- Support for Intel® Optane®, which brings data and programs closer to the processor to improve overall system responsiveness

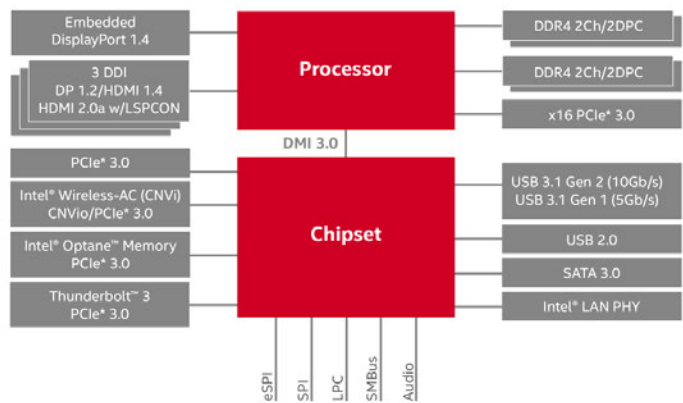


Figure 1: Intel Coffee Lake-H block diagram  
 (source: <https://www.intel.com/content/www/us/en/design/products-and-solutions/processors-and-chipsets/coffee-lake-h/overview.html>)

## New Performance Brings New Opportunities

The Express-CF/CFE delivers unsurpassed performance in a convenient form factor with support for the full range of 8th Gen Intel® Core™ and Intel® Xeon® processor E-2100M processors, giving designers the ability to choose the right mix of performance and features.

Processor	Cores	Base / Turbo Frequency	Cache
Intel® Xeon® E-2176M processor	6	2.7 / 4.4 GHz	12 MB
Intel® Core™ i7-8850H processor	6	2.6 / 4.3 GHz	9 MB
Intel® Core™ i5-8400H processor	4	2.5 / 4.2 GHz	8 MB
Intel® Core™ i3-8100H processor	4	2.5 GHz*	8 MB

Table 1: Intel Coffee Lake-H skus

\*The Intel® Core™ i3-8100H processor does not support turbo boost.

To demonstrate the amazing possibilities enabled by the new modules, ADLINK benchmarked a Express-CF/CFE based on a mainstream four-core Coffee Lake-H processor against a module based on the previous-generation equivalent. The results show impressive gains across a suite of tests.

	Intel® Core™ i3-8100H (Coffee Lake 4 cores)	Intel® Core™ i3-7100E (Kaby Lake 2 cores)	Difference*
<b>LuxMark 3.1 (OpenCL)</b>			
OpenCL on CPU+GPU	2923	2301	27%
<b>SiSoftware Sandra 2012</b>			
Dhrystone Native AVX2	131.26 GIPS	71.52 GIPS	85%
Whetstone Native SSE3	48.43 GFLOPS	39 GFLOPS	24%
Cache/Memory Bandwidth	153 GB/s	83.64 GB/s	85%

Table 2: Performance test result of ADLINK COM Express modules Express-CF with Intel Core i3 and Express-KL with Intel Core i3 processor test  
 \*Note: Benchmarks performed on ADLINK modules; results for other configurations may vary. The performance on these synthetic benchmarks may not be representative of real-world performance. Contact ADLINK for details.

Depending on the benchmark, the new chips show performance gains of up to 85%, which translates to a nearly 2X improvement. Yet the cost and nominal power consumption (TDP) remains virtually unchanged—meaning designers get a massive performance boost with no real tradeoffs.

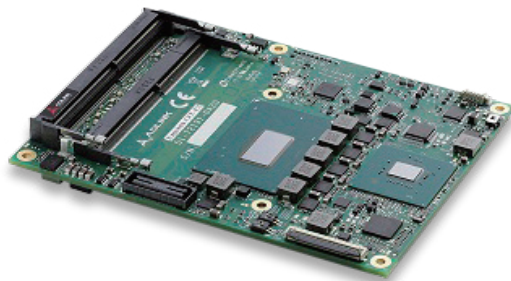


Figure 2: ADLINK Express-CF: COM Express® Basic Size Type 6 Module with Up to Hexacore 8th Gen Intel® Core™ 8000 series and Intel® Xeon® Processors (formerly: Coffee Lake-H)

## Ground-Breaking Graphics

The Express-CF/CFE is specifically designed for customers with high-performance processing graphics requirements who want to outsource the custom core logic of their systems for reduced development time. With its integrated Intel® Generation 9 LP Graphics, the Express-CF/CFE supports up to three independent 4K displays via DisplayPort, HDMI, DVI and LVDS. A multiplexed PCIe x16 graphics bus is also available for discrete graphics expansion and VGA is supported by build option for compatibility with legacy systems.



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## A High-Performance Supporting Cast

To enable extreme performance, the module can accommodate up to 48 GB of 2133/2400 MHz DDR4 in three SO-DIMMs, while fully complying with PICMG COM.0 mechanical specifications. (When configured with an Intel® Xeon® processor, the module supports both ECC and non-ECC memory.) Support for NVMe SSDs through high speed PCIe x4 Gen3 interfaces provides applications with access to the highest speed storage solutions on the market today. Meanwhile, Gigabit Ethernet, SATA 6 Gb/s, and USB 3.1 ensure bottleneck-free access to external resources. All of these features come without a significant cost increase, which enables more competitive solutions, better ROI, and the opportunity for increased profitability.

## Performance You Can Count On

To keep the module running smoothly, the ADLINK Smart Embedded Management Agent (SEMA) board controller offers BIOS failover, voltage/current & temperature monitoring, power sequence control and monitoring, and more. A wide input voltage range of 8.5V to 20V with rapid shutdown further ensures consistent operation in demanding environments.

## Learn More

In response to the high-performance demands of IoT applications markets, ADLINK provides a wide range of products with flexible expansion options. ADLINK strives to be a trusted partner to customers around the globe. The company has a long history of providing custom services and providing prompt support to resolve compatibility problems that may arise during software and hardware integration.

These services include carrier board design services or carrier board design verification as needed. We also provide software, firmware, and BIOS adaptation services to suit your specific requirements. Quality technical support is critical to product development, so ADLINK has created a global network of support centers in all major regions to provide local assistance in high-performance design.

To learn more about the module, visit the ADLINK Express-CF/CFE product page. For more information and to get a quote, contact your sales representative.

## About ADLINK

ADLINK Technology is a global leader in Edge Computing. Our mission is to facilitate the use of advanced technologies to help optimize the business performance of our customers. We provide robust boards, platforms and user interfaces; real-time data connectivity solutions; and application enablement for state-of-the-art industrial computing (e.g., machine learning via AI-at-the-Edge). Together, these also enable innovative end-to-end IoT solutions in support of operational excellence or new revenue streams. ADLINK serves customers in many vertical markets including: manufacturing, networking and communications, healthcare, infotainment, retail, energy, transportation, and government and defense.

ADLINK has an excellent eco-system of technology partners; we are a Premier Member of the Intel® Internet of Things Solutions Alliance, a strategic embedded partner of NVIDIA, and a valued thought-leader and contributor in many standards and interoperability initiatives, including Eclipse, ETSI, OCP, OMG, OpenFog, PICMG, ROS-I and SGeT.

ADLINK's products are available in over 40 countries, either directly or through our worldwide network of value-adding distributors and systems integrators. ADLINK is ISO-9001, ISO-14001, ISO-13485 and TL9000 certified and is publicly-traded on TAIEX (Stock Code: 6166).

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