

## ATHENA IV COM Express PC/104 SBC with integrated Data Acquisition



**Athena IV baseboard with COM installed; heat sink removed for illustration purposes**



**Athena IV with heat sink installed**

### FEATURES

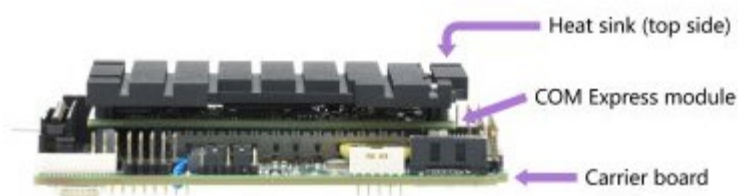
- COM-based architecture for long product life and performance scalability
- Integrated professional quality data acquisition circuit saves space
- Downward stacking PC/104 ISA bus connector supports a wide range of I/O modules for easy system I/O expansion
- M.2 2230 SATA socket supports up to 128GB flashdisk
- Form factor and most connectors backwards compatible with previous generations of Athena for easy product migration
- Heat sink cooling
- 5VDC input voltage
- 4.175 x 4.475" / 106 x 114mm W x H
- 40/+85°C operation fanless
- Windows 10 and Ubuntu Linux OS support

#### **SBC features:**

- Choice of E3845, E3940, or E3950 Atom CPU
- 4-8GB RAM soldered on COM
- Up to 128GB eMMC Flash integrated onto COM
- 2 gigabit Ethernet ports
- VGA + Single-channel 24-bit LVDS
- 1 USB 3.0 port + 4 USB 2.0 ports
- 4 RS-232/422/485 serial ports with dual software/jumper configuration control
- HDA audio (ALC262)
- 7-pin SATA connector plus M.2 2230 socket
- On-board RTC backup battery plus external battery connector

#### **Data acquisition subsystem features:**

- 16 single-ended / 8 differential analog inputs
- 16-bit A/D resolution
- Unipolar and bipolar analog inputs
- Single-ended and differential input configuration
- Programmable gain 1/2/4/8 providing



**A COM-based SBC consists of 3 elements: carrier board, COM, and thermal solution**

input ranges +/-10V / 0-10V down to +/- 1.25V / 0-1.25V

150KHz maximum A/D sample rate, single-channel and multi-channel mode

Internal clock / external clock / software A/D triggering

Single-channel and multi-channel-scan A/D operation

Interrupts with FIFO to support reliable high-speed sampling

4 12-bit single-ended analog outputs +/-10V, +/-5V, 0-10V and 0-5V output ranges

Autocalibration with Universal Driver software maintains accuracy over time and temperature

24 digital I/O, 3.3V logic / 5V tolerant inputs

2 programmable counter/timers for A/D timing and general counting purposes

Athena IV is the fourth generation in the Athena family of rugged, wide-temperature PC/104 SBCs with Integrated data acquisition, extending back to the original Athena in 2004. Athena IV is an excellent choice for:

- Customers using previous generations of Athena seeking to extend the lifetime of their existing product;
- Customers seeking to replace an obsolete PC/104 SBC with a newer generation one to extend their existing product's lifetime; or
- Customers seeking to build a PC/104 system expected to have a long lifetime.

### ◆ Maintaining a legacy for long life applications

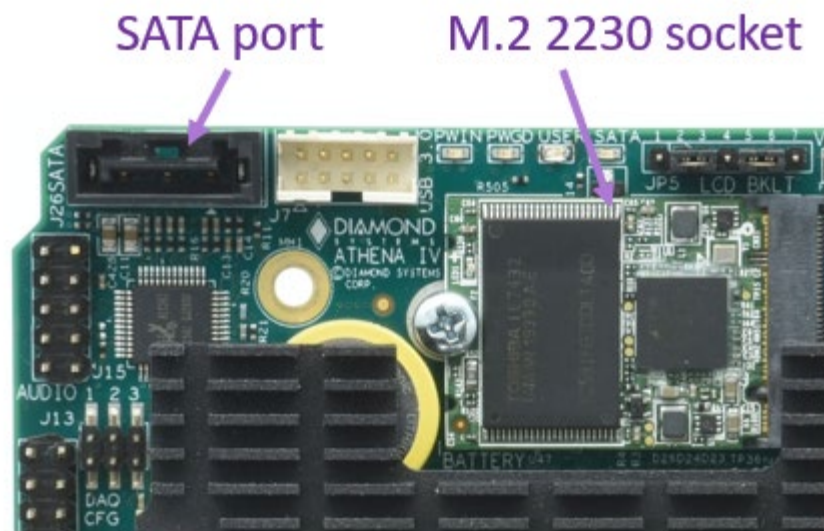
Each generation of Athena maintained the same physical shape and most of the I/O connectors and features of the previous generations, while updating key features to stay current with the state of the art. In this way the Athena platform has maintained a low-impact migration path for customers with extended product lifecycles that outstrip the lifetimes of the CPU. Many customers have been able to maintain their products for up to 16 years as a result.

Click [here](#) to view a comparison chart of the features and differences between Athena II, Athena III, and Athena IV.

### ◆ Mass storage

Athena IV offers two methods for mass storage:

- An M.2 2230 size SATA socket is provided for onboard mass storage. Modules up to 128GB are available. This is the most common choice.
- A standard 7-pin SATA connector is available for connecting a standard 2.5" or other form factor hard drive. This connector can be used when higher capacity storage is needed. Diamond offers accessory board ACC-HDDMOUNT which allows a 2.5" drive to be mounted on the PC/104 stack.



### ◆ PC/104 expansion

Athena IV uses the rugged and widely supported PC/104 ISA bus for I/O expansion. Choose from hundreds of I/O modules from vendors all over the world, including our own extensive selection using the links below. Although the board has both top side and bottom side PC/104 connectors, bottom side mounting of I/O modules is preferred to avoid blocking airflow over the top-side heat sink on Athena.

PC/104 specifications are available [here](#). Learn more about PC/104 [here](#).

#### [Analog I/O expansion modules](#)

#### [Digital I/O expansion modules](#)

#### [Serial port expansion modules](#)

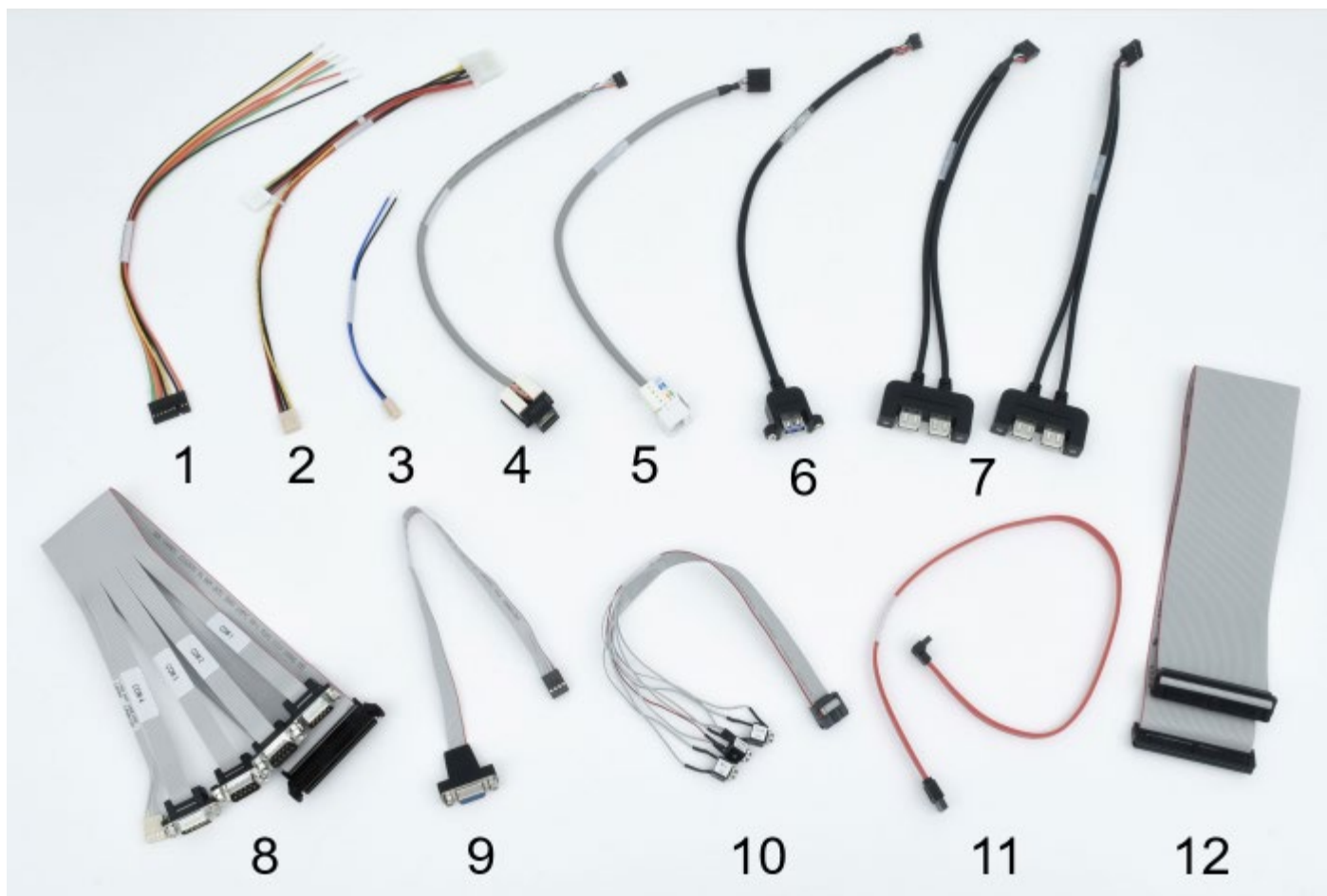
### ◆ Development Kit

Development kits are available to support quick project startup. Each kit includes the Athena SBC, a cable kit, and a programmed 64GB flashdisk with your choice of Windows 10 or Linux operating system, ready to run. Simply plug in the flashdisk, attach the cables, add your keyboard, mouse, and display, and you're ready to boot into a fully functional OS. Configuration files and instructions are provided to rebuild the OS with your application. The Linux kit includes all the tools needed to rebuild the OS. The Windows 10 kit includes a runtime license.

### ◆ Cable Kit

Athena IV is designed to use most of the same cables as previous generations of Athena, along with upgrades for the latest technology. New with Athena IV is a second gigabit Ethernet port which is backwards compatible with the original board's 10/100 connector along with a USB 3.0 cable.

Cables are normally sold as complete kits. Individual cables may be available in some cases or may be ordered with minimum order quantities; contact us for details.



CK-ATH4-01 includes the following cables:

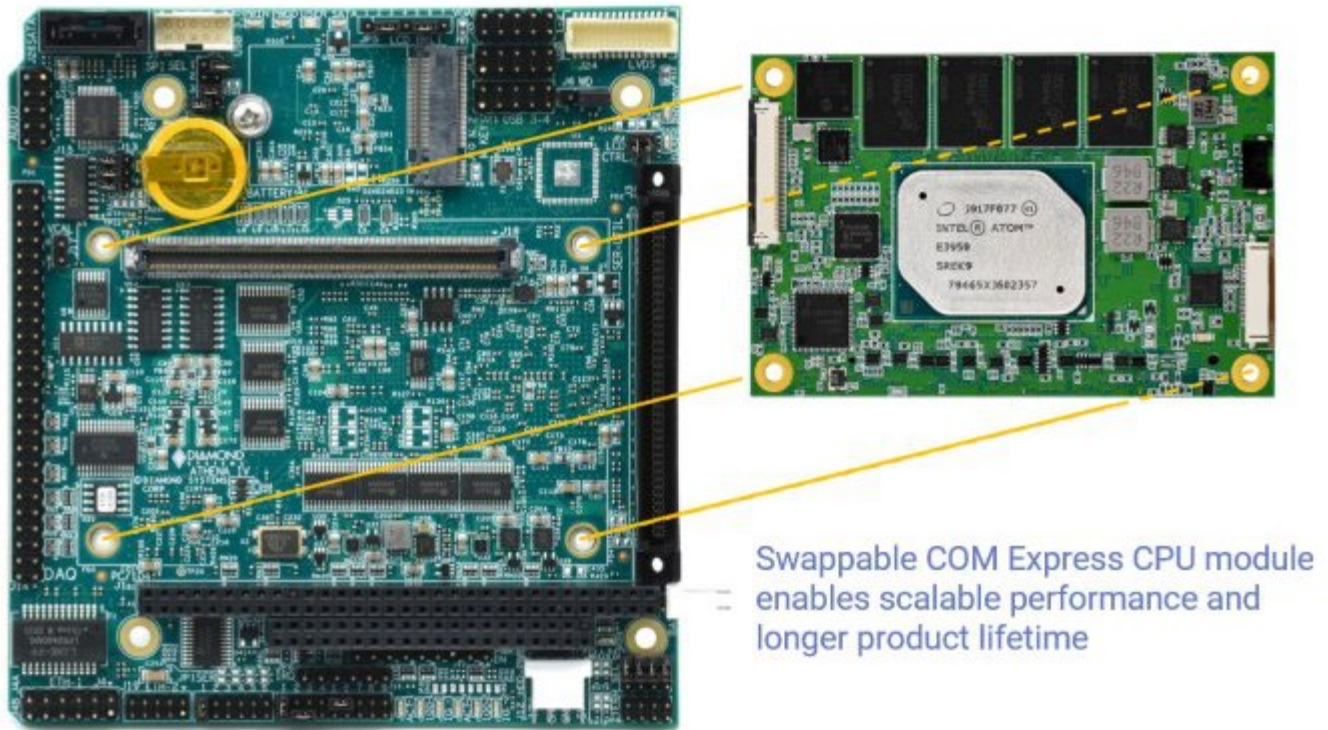
No.	Qty	Cable	Description	Drawing
1	1	6981009	Power I/O cable	<a href="#">Show</a>
2	1	6981006	Output power cable	<a href="#">Show</a>
3	1	6981011	External battery cable	<a href="#">Show</a>
4	1	6981080	Gigabit Ethernet cable, RJ-45 socket, 10 pin board connector	<a href="#">Show</a>
5	1	6981086	Gigabit Ethernet cable, RJ-45 socket, 12 pin board connector	<a href="#">Show</a>
6	1	6980603	Dual USB 3.0 type A, latching	<a href="#">Show</a>
7	1	6981012	Dual USB cable, ports 0 & 1	<a href="#">Show</a>
8	1	6981014	Cable Assy, 80 Pin Socket, 2x20 to 4x Serial DB9M	-
9	1	6981030	VGA cable	<a href="#">Show</a>
10	1	6981031	Audio cable	<a href="#">Show</a>
11	1	6989101	SATA Cable, 7-Pin Data, Straight to Right Angle, 500mm	<a href="#">Show</a>
12	1	C-50-18	50-conductor .1" pitch 18" ribbon cable, Data acquisition Cable	<a href="#">Show</a>

### ◆ COM Advantage

### ◆ Advantages of a COM-based architecture

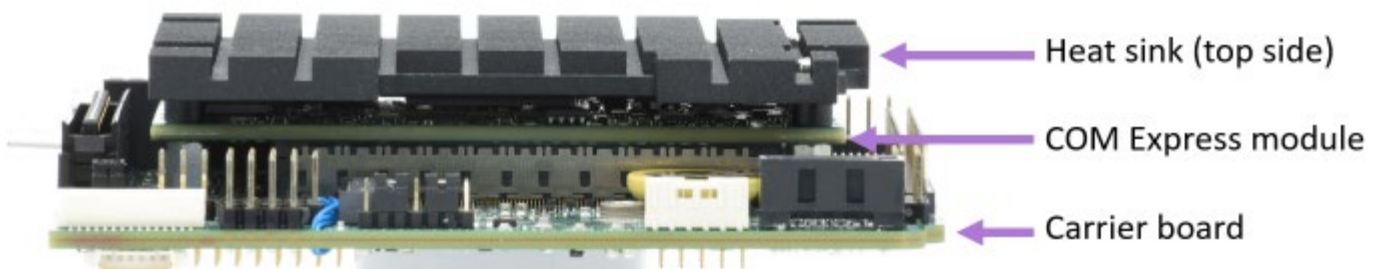
Athena IV uses a COM Express Type 10 "mini" Computer-on-Module (COM) to provide the core CPU functionality, mounted on a carrier board that provides the PC/104 expansion and the remaining I/O circuitry.





The use of a COM instead of a directly soldered CPU circuit provides several key advantages and benefits:

- **Higher feature density:** A 2-board solution provides twice the PCB area in the given footprint, allowing more circuitry and more features to be included.
- **Longer lifetime:** Since all COMs in a given form factor support essentially the same features, if the COM becomes obsolete or unavailable, a newer one can be used in its place, usually with minimal re-engineering.
- **Performance scalability:** COM Express modules are available from a number of suppliers around the world with multiple processor and memory options, allowing a single design to be used for a range of applications. For a lower-end application, choose a low-power, low-performance COM. For a higher end application, choose a higher performance COM. In both cases the rest of the system remains identical, allowing your investment in engineering and product design to be reused multiple times.
- **Earlier access to newest generation CPUs:** Most processors enter the market initially in the form of COMs. By using a COM-based SBC, you can gain access to the latest generation of CPU sooner than waiting for a true SBC with that processor to be available. Again, upgrading is simple since the rest of the system remains unchanged.



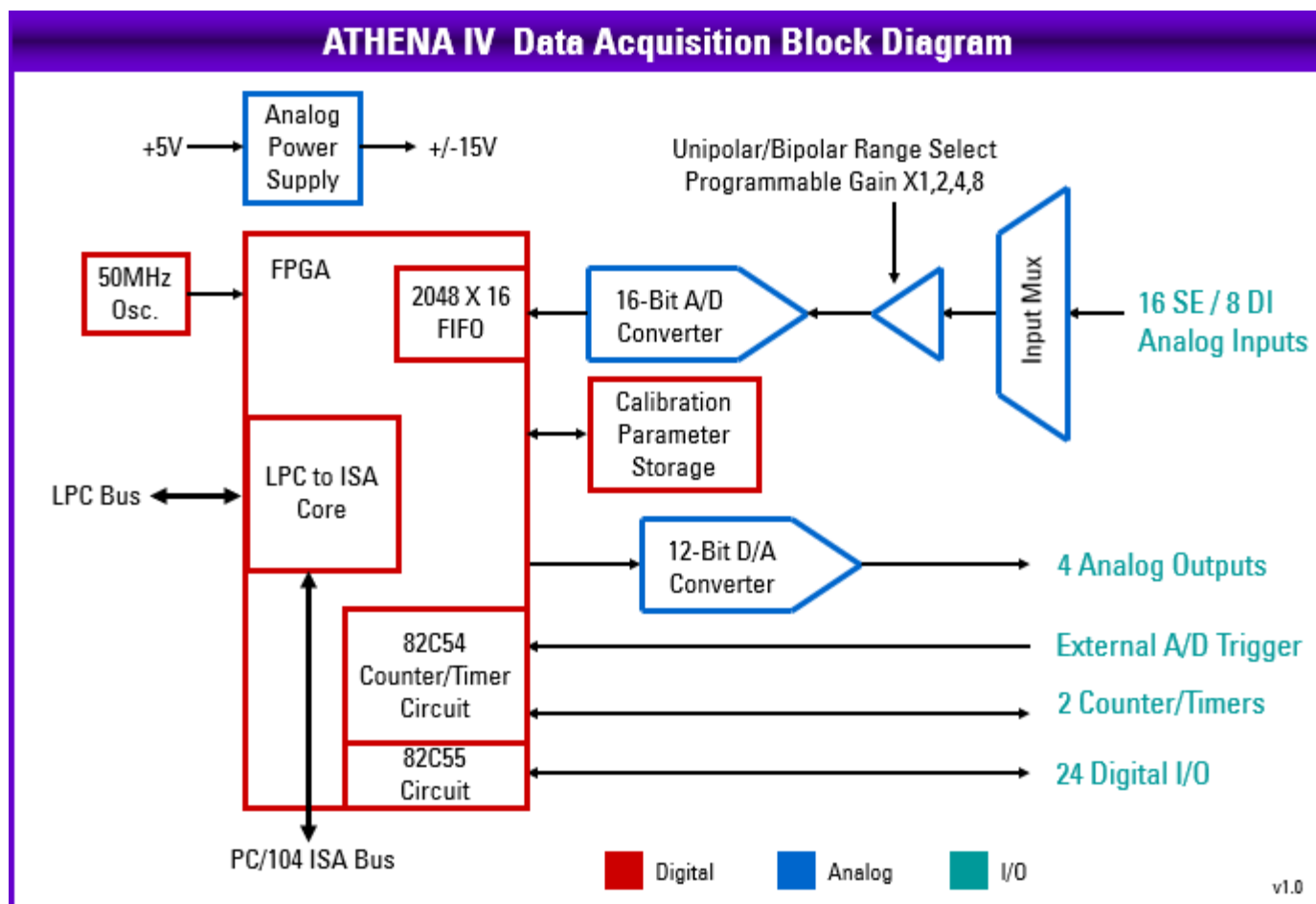
◆ **Data Acquisition**

◆ **Integrated Data Acquisition**

Athena IV is a member of Diamond's 2-in-1 series of SBCs with integrated data acquisition. For applications requiring precision analog I/O, a 2-in-1 SBC is an ideal choice because it reduces the number of boards in the system, resulting in a system that is smaller, lighter, lower cost, and easier to assemble and maintain.

The data acquisition circuit on Athena IV includes 16 channels of 16-bit A/D, 4 channels of 12-bit D/A, and 24 channels of digital I/O. The analog inputs feature single-ended and differential configuration, programmable input ranges, and fault-protected channel multiplexors to protect against overvoltages. The D/A channels feature programmable output ranges and simultaneous update capability. Both A/D and D/A circuits include Diamond's advanced autocalibration technology, enabling the board to be quickly calibrated in software without the use of trim pots that are subject to tampering, mis-adjustment, or shock and vibration. The A/D and D/A circuits feature lower noise, higher bandwidth, and more configuration flexibility than competing analog I/O circuits.

All Diamond's analog and digital I/O circuits are supported by our Universal Driver programming library for Windows and Linux. This software package includes a suite of demo programs in source and executable form. A convenient GUI program supports quick and convenient operation of all I/O features and can be used for rapid prototyping as well as system debugging.



### Ordering Information

### Models and Accessories

Athena IV		
available models:		
ATH4-E3845-4GA	Athena IV SBC, E3845 1.91GHz CPU, 4GB RAM, With DAQ	Available
ATH4-E3845-4GN	Athena IV SBC, E3845 1.91GHz CPU, 4GB RAM, No DAQ (minimum order quantity applies)	Min Order Quantity
ATH4-E3940-8G064A	Athena IV SBC, E3940 1.6GHz Quad Core CPU, 4GB RAM, With DAQ	Available

ATH4-E3940-8G064N	Athena IV SBC, E3940 CPU, 8GB RAM, 64GB eMMC, With DIO	Min Order Quantity
ATH4-E3950-8G128A	Athena IV SBC, E3950 CPU, 8GB RAM, 128GB eMMC, With DAQ	Available
ATH4-E3950-8G128N	Athena IV SBC, E3950 CPU, 8GB RAM, 128GB eMMC, With DIO	Min Order Quantity
ATH4-BB01A	Athena IV Baseboard, with DAQ, requires engineering consultation	Available
ATH4-BB01N	Athena IV Baseboard, without DAQ, requires engineering consultation (minimum order quantity applies)	Min Order Quantity
DK-ATH4-E3845A-LNX64	Development Kit, Athena IV SBC, E3845 CPU, with DAQ, Linux 64-Bit BSP	Available
DK-ATH4-E3845A-WE1064	Development Kit, Athena IV SBC, E3845 CPU, with DAQ, Windows 10 64-Bit BSP	Available
DK-ATH4-E3940-8G064A-LNX64	Dev Kit, Athena IV SBC, E3940 CPU, 64GB eMMC, Linux 64-bit OS	Available
DK-ATH4-E3940-8G064A-WE1064	Dev Kit, Athena IV SBC, E3940 CPU, 64GB eMMC, Windows 10 64-bit OS	Available
DK-ATH4-E3950-8G128A-LNX64	Dev Kit, Athena IV SBC, E3950 CPU, 64GB eMMC, Linux 64-bit OS	Available
DK-ATH4-E3950-8G128A-WE1064	Dev Kit, Athena IV SBC, E3950 CPU, 64GB eMMC, Windows 10 64-bit OS	Available
SDK-ATH4-E3845A-LNX64	Software Development Kit, Athena IV SBC with DAQ, Linux 64-bit OS	Available
SDK-ATH4-E3845A-WE1064	Software Development Kit, Athena IV SBC with DAQ, Windows 10 64-bit OS	Available
SDK-ATH4-E3940-8G064A-LNX64	Software Dev Kit, Athena IV SBC, E3940 CPU, 64GB eMMC, Linux 64-bit OS	Available
SDK-ATH4-E3940-8G064A-WE1064	Software Dev Kit, Athena IV SBC, E3940 CPU, 64GB eMMC, Windows 10 64-bit OS	Available
SDK-ATH4-E3950-8G128A-LNX64	Software Dev Kit, Athena IV SBC, E3950 CPU, 64GB eMMC, Linux 64-bit OS	Available
SDK-ATH4-E3950-8G128A-WE1064	Software Dev Kit, Athena IV SBC, E3950 CPU, 64GB eMMC, Windows 10 64-bit OS	Available

Please [login](#) or [signup](#) for an online quote request.

## Cables and accessories

available models:

<b>CK-ATH4-01</b>	CK-ATH4-01 cable kit
<b>6981009</b>	Power I/O cable
<b>6981006</b>	Output power cable
<b>6981011</b>	External battery cable
<b>6981080</b>	Gigabit Ethernet cable, RJ-45 socket, 10 pin board connector
<b>6981086</b>	Gigabit Ethernet cable, RJ-45 socket, 12 pin board connector
<b>6980603</b>	Dual USB 3.0 type A, latching
<b>6981012</b>	Dual USB cable, ports 0 & 1
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<b>6981030</b>	VGA cable
<b>6981031</b>	Audio cable
<b>6989101</b>	SATA Cable, 7-Pin Data, Straight to Right Angle, 500mm
<b>C-50-18</b>	50-conductor .1" pitch 18" ribbon cable

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