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SEMICONDUCTOR

The future of intelligent microcontrollers.

Multilayered Security
Hardware Accelerated AI
Unrivaled Battery Life
Scalable Performance
Wireless Connectivity

Everything you need on a single chip

Alif Semiconductor provides scalable, secure, low-power 32-bit microcontrollers and fusion processors with integrated AI-accelerators and wireless connectivity. The foundational Ensemble® and Balletto™ product families redefine what is achievable in terms of processing, machine learning capability, and runtime for battery-operated endpoint devices.

The Ensemble family

Ensemble delivers high-performance, low-power, accelerated on-device AI/ML, imaging & graphics processing, and precise real-time control.

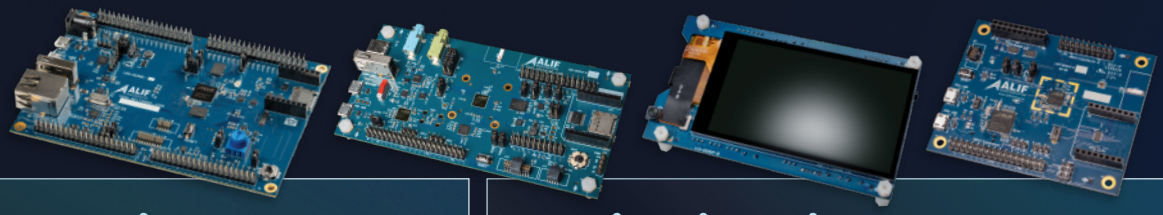
The Ensemble family scales from single and dual core MCUs combining up to two Cortex-M55 MCU cores, on to triple and quad core fusion processors that add up to two Cortex-A32 microprocessor cores capable of running high-level operating systems. Ensemble devices also scale up to include one or two Ethos-U55 microNPUs to accelerate machine learning workloads.

The Balletto family

Balletto is the world's first microcontroller that combines wireless connectivity and hardware accelerated AI/ML processing. Based on the Ensemble E1 series, Balletto extends its capabilities by adding a fully integrated radio subsystem that supports Bluetooth Low Energy 5.3 and 802.15.4 wireless connectivity. The powerful Cortex-M55 CPU plus the Ethos-U55 neural processor makes Balletto an ideal single-chip solution for wearables, hearables, and low-power IoT applications.

PRODUCT TABLE

Feature	Available Memory		Processors			High Speed Connectivity			Serial Connectivity					Display		Graphics	Camera			Audio		Memory Expansion		Timers					Analog						GPIO		Operation Range	Package Type
	MRAM	SRAM	Cortex-A32	Cortex-M55	Ethos-U55 NPU	USB 2.0 HS/FS	Ethernet 10/100	SDIO v4.1	UART up to 2.5 Mbps	SPI up to 50 Mbps	I2C up to 3.4 Mbps	MIPI-I3C	CAN-FD up to 10 Mbps	Parallel	MIPI-DSI 2-Lane	2D GPU	Parallel	LP-Parallel	MIPI-CSI2 2-Lane	I2S	PDM 8 mic inputs	OctalSPI	SD v4.2 / eMMC v5.1	32-bit Universal Timer	32-bit Low Power Timer	Quadrature Encoder	RTC	WDT	Temp. Sensor	12-bit ADC	24-bit ΣΔ ADC	12-bit DAC	High-Speed Comparator	Low-Power Comparator	1.8V	Flex, 1.8v to 3.3v	Supply Voltage	
The Ensemble Family																																						
E7 Series																																						
AE722F80F55D5AS	5.5 MB	13.5 MB	2x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	4	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	WLCSP208
AE722F80F55D5LS	5.5 MB	13.5 MB	2x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	4	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	FBGA194
E5 Series																																						
AE512F80F55D5AS	5.5 MB	13.5 MB	1x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	4	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	WLCSP208
AE512F80F55D5LS	5.5 MB	13.5 MB	1x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	4	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	FBGA194
AE512F80F5582AS	5.5 MB	8.25 MB	1x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	4	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	WLCSP208
AE512F80F5582LS	5.5 MB	8.25 MB	1x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	4	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	FBGA194
E3 Series																																						
AE302F80F55D5AS	5.5 MB	13.5 MB		1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	2	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	WLCSP208
AE302F80F55D5LE	5.5 MB	13.5 MB		1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	2	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	FBGAI94
AE302F80F5582AE	5.5 MB	8.25 MB		1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	2	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	WLCSP208
AE302F80F5582LE	5.5 MB	8.25 MB		1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	2	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	FBGAI94
AE302F80C1557LE	1.5 MB	5.75 MB		1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	2	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	FBGAI94
AE302F40C1537LE	1.5 MB	3.75 MB		1x 160 MHz + 1x 400 MHz	1x 46 GOPS	1	1	1	9 (4 w RS-485)	5	5	1	1	1x up to 24-bit	1	1	8-16b	8b	1	5	2	2	1	12	4	4	1	2	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	FBGAI94
E1 Series																																						
AE101F4071542LH	1.5 MB	4.5 MB		1x 160 MHz	1x 46 GOPS	1		1	7 (2 w RS-485)	5	5	1	1	1x up to 24-bit	1	1		8b		3	2	1	1	8	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	120	8	1.7V to 4.2V	FBGAI94
E1C Series																																						
AE1C1F4051920PH	1.9 MB	2.0 MB		1x 160 MHz	1x 46 GOPS	1		1	7 (2 w RS-485)	4	3	1	2	1x up to 24-bit	1	1		8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	71	6	1.7V to 4.5V	FBGAI20
AE1C1F4051920HH	1.9 MB	2.0 MB		1x 160 MHz	1x 46 GOPS	1		1	7 (2 w RS-485)	4	3	1	2		1	1		8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	36	6	1.7V to 4.5V	WLCSP90
AE1C1F40319205H	1.9 MB	2.0 MB		1x 160 MHz	1x 46 GOPS	1		1	7 (2 w RS-485)	4	3	1	2					8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	36	6	1.7V to 4.5V	TQFP64
AE1C1F1041010PH	1.0 MB	1.0 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	71	6	1.7V to 4.5V	FBGAI20
AE1C1F1041010HH	1.0 MB	1.0 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	36	6	1.7V to 4.5V	WLCSP90
AE1C1F1041010SH	1.0 MB	1.0 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	36	6	1.7V to 4.5V	TQFP64
AE1C1F1040505PH	0.5 MB	0.5 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	71	6	1.7V to 4.5V	FBGAI20
AE1C1F1040505HH	0.5 MB	0.5 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	36	6	1.7V to 4.5V	WLCSP90
AE1C1F10405055H	0.5 MB	0.5 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	36	6	1.7V to 4.5V	TQFP64
The Balletto Family																																						
B1 Series																																						
ABIC1F4M51820PH	1.8 MB	2.0 MB		1x 160 MHz	1x 46 GOPS	1		1	7 (2 w RS-485)	4	3	1	2	1x up to 24-bit	1	1		8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	71	6	1.7V to 4.5V	FBGAI20
ABIC1F4M51820HH	1.8 MB	2.0 MB		1x 160 MHz	1x 46 GOPS	1		1	7 (2 w RS-485)	4	3	1	2		1	1		8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	36	6	1.7V to 4.5V	WLCSP90
ABIC1F1M41820PH	1.8 MB	2.0 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	71	6	1.7V to 4.5V	FBGAI20
ABIC1F1M41820HH	1.8 MB	2.0 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	36	6	1.7V to 4.5V	WLCSP90
ABIC1F1M41010PH	1.0 MB	1.0 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	71	6	1.7V to 4.5V	FBGAI20
ABIC1F1M41010HH	1.0 MB	1.0 MB		1x 160 MHz		1		1	7 (2 w RS-485)	4	3	1						8b		3	1	1	1	4	2	4	1	1	1	2x, 12 inputs	1x, 4 differential inputs	1x, 1 channel	2x, 8 inputs	1x, 4 inputs	36	6	1.7V to 4.5V	WLCSP90



Development Kits

Alif DevKits enable rapid evaluation of hardware features by bringing out as many signals as possible to headers for prototyping, performance evaluation and easy test and measurement access. Several pre-built applications are available for all DevKit platforms to help you quickly get started and are available in the following kit selections:

The Ensemble DevKit (DK-E7) features the superset E7 series device having two Cortex-M55 CPU cores, two Ethos-U55 neural network processors cores, and two Cortex-A32 MPU cores. The E7 MCU in this kit can be configured to operate like other Ensemble MCUs having less cores, allowing you to explore the E5, E3, and E1 series devices of the Ensemble family using just one kit.

The Ensemble E1C DevKit (DK-E1C) lets you explore the Compact series of Ensemble devices. Despite its small physical size, E1C packs quite a punch with its Cortex-M55 CPU core, Arm Ethos-U55 micro NPU, and the lowest power consumption across the Ensemble family.

The Balletto DevKit (DK-B1) introduces the Balletto B1 series, the world's first wireless MCU with integrated hardware acceleration for AI/ML workloads. Balletto combines Bluetooth Low Energy 5.3 and 802.15.4 based Thread protocols, an Ethos-U55 microNPU for AI acceleration, and a powerful Cortex-M55 MCU core.

Application Kits

Alif AppKits are application-oriented platforms for rapid software prototyping. They are supported by a software SDK that contains support for all board level peripherals, enabling quick prototyping of diverse use-cases.

The Ensemble AIML AppKit (AK-E7-AIML) enables rapid software prototyping and evaluation of endpoint machine learning use cases. Powered by the quad core Alif Ensemble E7 fusion processor, this kit is ideal for experiencing the performance uplift Alif delivers for Endpoint ML projects over traditional MCUs. On board is a MIPI-CSI camera/image sensor for snapshots or video input, four microphones, and an IMU sensor to capture motion.

Start Kits

Alif StartKits enable a very low cost way to enter the Ensemble and Balletto families with these small but extremely useful kits.

The Ensemble StartKit (SK-E1C) and **The Balletto StartKit (SK-B1)** provide access to pins for easy prototyping of your projects. Two microphones are on board and a camera module may be attached. SK-B1 includes the BLE RF path including the antenna.

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Schedule a meeting with our team to ensure a seamless integration to Alif devices: contact@alifsemi.com