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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, 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 from one to three neural processing units to accelerate machine learning workloads for Generative AI and Edge AI: up to two Ethos-U55 cores and one Ethos-U85 core.

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.

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PRODUCT TABLE

Feature	Available Memory		Processors				High Speed nectivity			Serial Connectivity					Display		Graphics		Camera					Audio		Memory Expansion		Timers					Analog						GPIO		Operation Range	Package Type
	MRAM	SRAM	Cortex-A32	Cortex-M55	Ethos-U55 NPU	Ethos-U85 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	GPU	JPEG Encoder	Parallel	LP-Parallel	MIPI-CSI2 2-Lane	Dual Cam Opt	HW Image Signal (ISP)	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																																										
E8 Series																																										
AE822FA0E5597BS0	5.5 MB	9.75 MB	2x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	6	2	1	1 x up to 24-bit	1	1	Yes	8-16b	8b	1	Yes	Yes	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	136	8	1.7V to 4.8V	WLCSP216
AE822FA0E5597LS0	5.5 MB	9.75 MB	2x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	6	2	1	1 x up to 24-bit	1	1	Yes	8-16b	8b	1	Yes	Yes	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 4.8V	FBGAI94
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	FBGAI94
E6 Series																																										
AE612FA0E5597BS0	5.5 MB	9.75 MB	1x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	6	2	1	1 x up to 24-bit	1	1	Yes	8-16b	8b	1	Yes	Yes	5	2	2	1	12	7	4	1	4	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	136	8	1.7V to 4.8V	WLCSP216
AE612FA0E5597LS0	5.5 MB	9.75 MB	1x 800 MHz	1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	6	2	1	1 x up to 24-bit	1	1	Yes	8-16b	8b	1	Yes	Yes	5	2	2	1	12	7	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 4.8V	FBGAI94
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	FBGAI94
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	FBGAI94
E4 Series																																										
AE402FA0E5597BE0	5.5 MB	9.75 MB		1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	6	2	1	1 x up to 24-bit	1	1	Yes	8-16b	8b	1	Yes	Yes	5	2	2	1	12	7	4	1	2	1	3x, 18 inputs	1x, 4 differential inputs	2x, 2 channels	4x, 16 inputs	1x, 4 inputs	136	8	1.7V to 4.8V	WLCSP216
AE402FA0E5597LE0	5.5 MB	9.75 MB		1x 160 MHz + 1x 400 MHz	1x 46 GOPS + 1x 204 GOPS	1x 204 GOPS	1	1	1	9 (4 w RS-485)	5	6	2	1	1 x up to 24-bit	1	1	Yes	8-16b	8b	1	Yes	Yes	5	2	2	1	12	7	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 4.8V	FBGAI94
E3 Series																																										
AE302F80F55D5AE	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		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		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																																										
AE1C1F4051920PH0	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	68	6	1.7V to 4.8V	FBGAI20
AE1C1F4051920HH0	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	60	6	1.7V to 4.8V	WLCSP120
AE1C1F1041010PH0	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	68	6	1.7V to 4.8V	FBGAI20
AE1C1F1041010HH0	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	60	6	1.7V to 4.8V	WLCSP120
AE1C1F1040505PH0	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	68	6	1.7V to 4.8V	FBGAI20
AE1C1F1040505HH0	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	60	6	1.7V to 4.8V	WLCSP120
The Balletto Family																																										
B1 Series																																										
AB1C1F4M51820PH0	1.8 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	71	6	1.7V to 4.8V	FBGAI20
AB1C1F4M51820HH0	1.8 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 4.8V	WLCSP120
AB1C1F1M41820PH0	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 4.8V	FBGAI20
AB1C1F1M41820HH0	1.8 MB	2.0 MB		1x 160 MHz			1		1	7 (2 w RS-485)	4	3	1		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	36	6	1.7V to 4.8V	WLCSP120
AB1C1F1M41010PH0	1.0 MB	1.0 MB		1x 160 MHz			1		1	7 (2 w RS-485)	4	3	1			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 4.8V	FBGAI20
AB1C1F1M41010HH0t	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 4.8V	WLCSP120

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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, DK-E8) features the superset E7 or E8 series device having two Cortex-M55 CPU cores, two Ethos-U55 neural processors units (NPUs), and two Cortex-A32 MPU cores. The E8 device adds an additional NPU, the Uthos-U85. The MCU in these kits can be configured to operate like other Ensemble MCUs having less cores, allowing you to explore all of the E6, E5, E4, E3, and E1 series devices without the need to purchase multiple kits.

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, Ethos-U55 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. DK-B1 includes the BLE RF path including the antenna.

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, AK-E8-AIML) enables rapid software prototyping and evaluation of endpoint machine learning use cases. Powered by the quad core Alif Ensemble E7 or E8 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, a WVGA color LCD panel, 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 all pins for easy prototyping of your projects. Two microphones are on board, a camera module plus one of any hundreds of available mikroBUS™ click boards may be attached. SK-B1 includes the BLE RF path including the antenna.

LEARN MORE ABOUT ORDERING AN EVALUATION KIT.

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

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