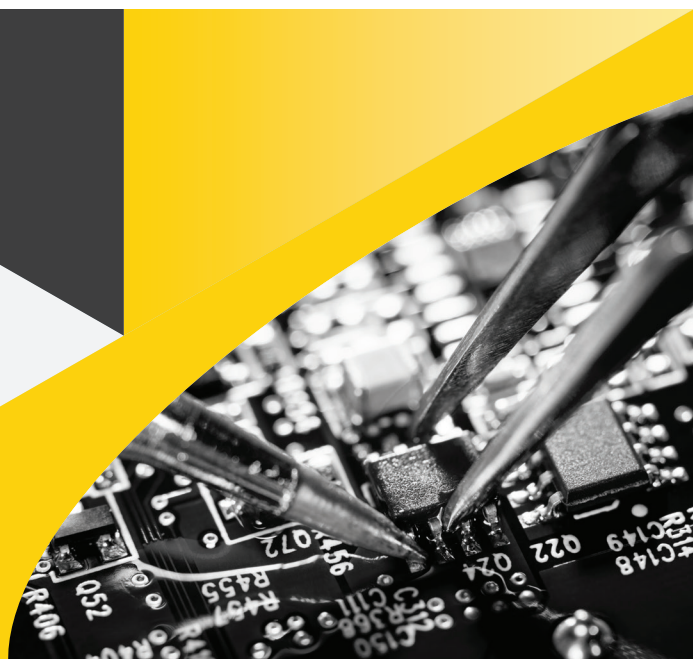# LUMISSIL Microsystems

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8-bit MCUs and Their Continued Adoption in Emerging Applications

8-bit microcontrollers (MCUs) have been widely used in embedded systems for almost 50 years, and they continue to be in high demand for various applications and market segments. According to a report by Fortune Business Insights, the global 8-bit microcontroller market size was USD 29.06 billion in 2020 and is projected to grow at a CAGR of 7.6% during the forecast period of 2021-2028. The growth of the market is attributed to the increasing demand for low power and advanced technology in a wide range of applications and market segments, such as automotive, consumer electronics, industrial, and medical devices.

One of the main drivers for this growth is the emergence of smart devices, such as wearables, occupancy sensors, smart plugs, and smart switches. These applications require low-power consumption and high-performance analog features from an 8-bit MCU. This class of MCUs have evolved from simple compute devices to full-fledged system-on-chip devices that can handle most of today's embedded tasks with ease.

Another factor that boosts the market for 8-bit MCUs is the rising demand for technology in cars. The automotive sector is one of the major end-users of MCUs, as they are used for various functions such as engine control, dashboard display, airbag deployment, and advanced driver assistance systems. In addition to automotive and consumer electronics applications, 8-bit MCUs are also widely used in industrial, healthcare, aerospace, defense, data processing and communication applications. These applications require fast and reliable processing of analog and digital signals, as well as connectivity and security features. In this article, we will explore three common applications where a new class of 8-bit MCUs support these next generation systems.

BATTERY MANAGEMENT, MONITORING, AND OPTIMIZATION

Many embedded systems, especially IoT systems, rely on batteries as their main power source. Therefore, it is crucial to monitor and manage the battery life and health for safe and reliable operation. An MCU with an integrated analog-to-digital converter (ADC) can measure and convert the current and voltage values of the battery to digital data that can be used to estimate the battery's charge and health. The battery's performance can also be reported to external devices through built-in communication interfaces such as UART, SPI, and I2C. Moreover, if battery temperature monitoring is also needed, the MCU's integrated ADC can be used to read an analog temperature sensor for a low power, low-cost system.

EMBEDDED-SYSTEM MANAGEMENT

An example of embedded-system management is motor control. Many applications such as electric vehicles, e-bikes, home appliances, industrial machines, etc., require precise control of motors for speed, torque, positioning, etc. An MCU with an integrated pulse-width modulation (PWM) module can generate variable duty cycles to control the power delivered to the motor. Moreover, an MCU with an integrated analog comparator can compare the input voltage from a sensor to a reference voltage and generate an output signal that can be used to adjust the motor speed or direction.

Lumissil Microsystems Inc. offers a variety of intelligent analog peripherals, such as ADCs, DACs, quadrature decoder, comparators, and PWMs, that can integrate seamlessly with digital peripherals to deliver greater functionality and flexibility for embedded-system management.

OTHER APPLICATIONS FOR 8-BIT MCUS

Besides the applications mentioned above, 8-bit MCUs can also be used for many other purposes, such as:

IoT control: 8-bit MCUs can provide low-cost and low-power solutions for IoT control applications, such as smart lighting, smart thermostats, smart locks, smart irrigation, etc. These applications require simple and reliable communication protocols, such as Bluetooth Low Energy (BLE), Zigbee, Wi-Fi, etc., that can be supported by 8-bit MCUs with integrated wireless transceiver interface such as SPI or I2C.

Medical devices: 8-bit MCUs can perform various functions in medical devices, such as personal blood pressure monitors, pulse oximeters, heart rate monitors, glucose meters, etc. These devices require accurate and reliable measurement of physiological signals, such as blood pressure, oxygen saturation, heart rate, blood glucose level, etc., that can be achieved by 8-bit MCUs with integrated analog peripherals, such as ADCs, DACs, op amps, comparators, etc.

Consumer electronics: 8-bit MCUs can offer easy ways to handle a variety of tasks in consumer products, such as air conditioners, washing machines, refrigerators, garage door openers, smoke detectors, vacuum cleaners, heat pumps, microwave ovens, TVs, home theater systems, radio-broadcast receivers, sound recording products, etc. These products require user interface features, such as capacitive touch buttons or screens, LCD displays, LED indicators, etc., that can be implemented by 8-bit MCUs with integrated touch controllers and LED drivers.

TODAY'S DEVICES DEMAND LOW POWER

To optimize battery performance and extend system runtimes, the ideal MCU should also offer different power-management modes that can balance performance and power consumption. For example, Lumissil's IS32CS897X MCU family offers features such as IDLE mode that reduces current consumption by up to 90%, SLEEP mode that shuts down all peripherals except for a low-power on-chip oscillator. With an external interrupt source, the chip can be woken up and resumes normal operation from SLEEP mode. Additionally, ADCs, op amps, and digital-to-analog converters (DACs) can also be toggled on or off in software or set to trigger the MCU's core and digital peripherals upon reaching certain thresholds. This provides added flexibility and power savings in battery-powered applications.

CONCLUSION

8-bit MCUs have come a long way from being simple compute devices to becoming sophisticated system-on-chip devices that can handle most of today's embedded tasks. With their low cost, low power consumption, and high-performance analog features, they are ideal for various applications and market segments.

Lumissil Microsystems Inc. offers a wide range of 8-bit MCUs with advanced analog filtering capabilities that support modern systems by increasing system performance and accelerating response to system events. In the next page is a table of our latest generation of MCUs:

Part Number	CS8974	CS8975	CS8976	CS8977	CS8978
Core	1 Cycle 8051				
Speed	16 MHz	32 MHz			
RAM	2KB	1KB	1KB	2KB	2KB
Flash	32KB ECC	16 KB ECC	16KB	64KB	64KB
GPIO	20	12	10	28	20
Interrupts	20	6	6	6	6
I2C	3	2	2	2	1
SPI	1	1	1	1	1
UART	2	2	1	2	2
LIN	1 Controller	1 Controller	Integrated LIN Phy + Controller	1 Controller	Integrated LIN Phy + Controller
Comparators	4	4	2	4	4
Timers	5@16b and 1@24b				
ADC	No	16 ch, 11b SAR	4 ch, 11b SAR	16, 12b SAR	16, 12b SAR
DAC	No	1 ch, 8b			
Temp Sensor	No	Yes			
PWM	6 ch, 8b	6 ch, 12b			
Cap Touch	19 Gen 3	11 Gen 3	9 Gen 3	27 Gen 3	20 Gen 3
Melody Maker	Yes				
Package	TSSOP-24 QFN-24	TSSOP-16 SOP-8	TSSOP-20	TSSOP-20,24,28 LQFP-32	QFN-40
Industrial	-40 to - 85°C				
Automotive	-40 to 125°C				
Auto Qual	AEC-Q100				