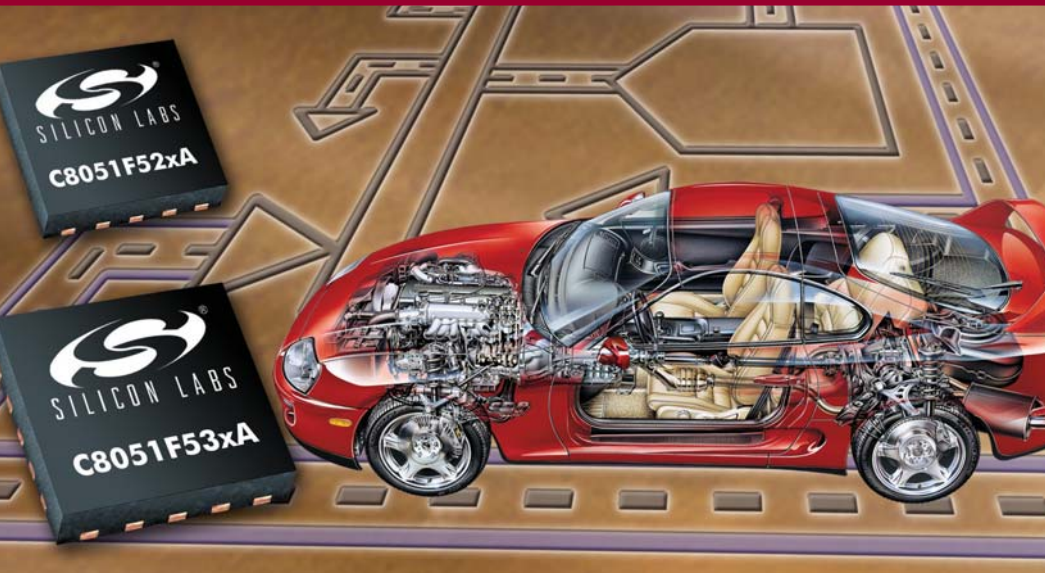


# MCU Solutions for Automotive Systems

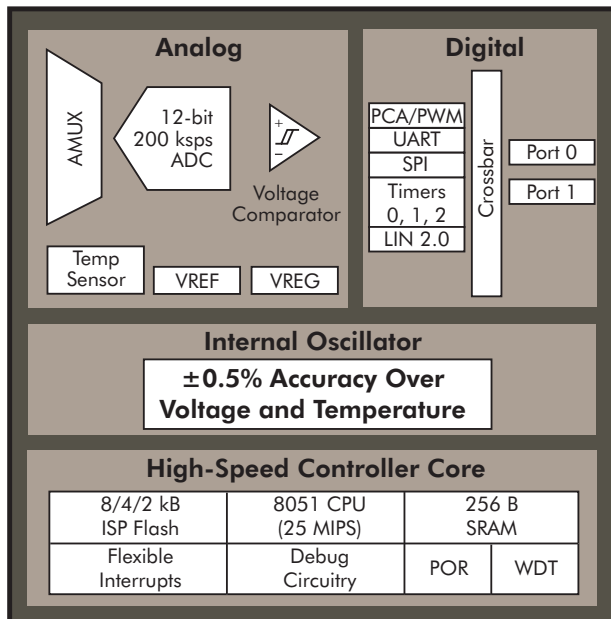
OPTIMIZED FOR POINT-OF-CONTROL  
AND BODY ELECTRONICS APPLICATIONS



## DESCRIPTION

The C8051F53xA and C8051F52xA families of MCUs are the most functionally dense 8-bit automotive qualified (AEC-Q100) MCUs on the market and offer a superior level of integration, performance and features over competing solutions. All devices are designed to operate across the full automotive temperature (-40 to 125 °C) and voltage (1.8 to 5.25 V) range. The C8051F52xA family is the first to combine a  $\pm 0.5\%$  integrated precision internal oscillator with 8 kB Flash, 25 MIPS, 12-bit ADC, dedicated LIN 2.0 controller, 16-bit timers/PWM, SPI, UART and six I/O lines in a small 3 x 3 mm, 10-pin QFN package. The C8051F53xA family has the same feature set, but adds ten additional I/O lines and is offered in 20-pin QFN and TSSOP packages. Both families integrate additional analog features such as a programmable comparator, voltage regulator and on-chip temperature sensor to further reduce design complexity. This highly integrated architecture enables automotive electronics designers to simplify the design process and reduce system cost.

## 8-BIT AUTOMOTIVE MCU BLOCK DIAGRAM



## FEATURES

- 25 MIPS 8051 CPU
- 8 kB Flash memory
- 256 B RAM
- 25 MHz on-board oscillator ( $\pm 0.5\%$ )
- Dedicated LIN hardware engine (both master and slave; V1.2 and V2.0 compatible)
- 12-bit, 200 ksps ADC,  $\pm 1$ LSB INL with integrated precision reference
- Up to 16 analog and digital I/O lines
- 1.8 to 5.25 V input supply
- -40 to 125 °C operating range
- On-chip comparator and temperature sensor
- Packages (Pb-free, RoHS compliant)
  - QFN10 (3 x 3 mm)
  - QFN20 (4 x 4 mm)
  - TSSOP20 (6 x 6 mm)



## APPLICATIONS

- Battery condition monitor
- Climate control (damper, vent and fan control)
- DC-to-AC power inverter
- Door lock actuation
- Electronic parking brake
- Fluid level monitor
- Fuel tank monitor (level, pressure and composition)
- Headlight leveling
- Mirror adjustment (position and dimming)
- Motor control (window, sunroof and door)
- Rain sensor
- Seat position and adjustment
- Sensor interface

## SOLUTIONS GUIDE

**MOST ADVANCED  
8-BIT AUTOMOTIVE MCU**



**SILICON LABS**

An ISO/TS 16949 Registered Company

# MCU Solutions for Automotive Systems

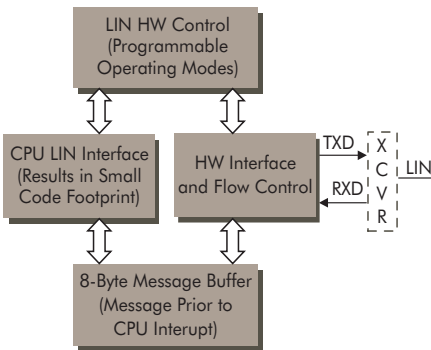
## Quality

All Silicon Labs' automotive MCUs are designed, manufactured and tested to rigorous automotive requirements and are qualified to the AEC-Q100 standard. Silicon Labs as well as our manufacturing partners are all ISO/TS 16949 registered companies.



## Dedicated LIN 2.0 Controller

The LIN hardware implementation offers advantages over competing UART or software implementations. The dedicated message buffer and hardware generated flow control timing results in higher overall system bandwidth. The standard register-based control interface simplifies communication software development and minimizes code size.



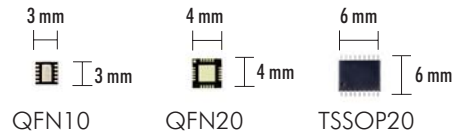
## Ultra-Precision Oscillator ( $\pm 0.5\%$ )

With  $\pm 0.5\%$  tolerance across temperature ( $-40$  to  $125^\circ\text{C}$ ) and voltage (1.8 to 5.25 V), these MCUs offer a fully integrated LIN 2.0 master-mode implementation without any external timing components. The ultra-precision internal oscillator is configured to maximum instruction clock (25 MHz), resulting in no compromise between using an internal oscillator and achieving maximum CPU bandwidth.

## 8-Bit Automotive Microcontroller Product Matrix

Part Number	Flash Memory	MIPS (peak)	RAM (bytes)	Digital Port I/O Pins	Serial Buses	Timers (16-bit)	PCA Chnls	Internal Osc	ADC	Temp Sensor	VREF	Comparator	Other	Package
C8051F530A	8 kB	25	256	16	LIN 2.0, SPI, UART	3	3	$\pm 0.5\%$	12-bit, 16-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN20/TSSOP20
C8051F531A	8 kB	25	256	16	UART, SPI	3	3	$\pm 0.5\%$	12-bit, 16-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN20/TSSOP20
C8051F533A	4 kB	25	256	16	LIN 2.0, SPI, UART	3	3	$\pm 0.5\%$	12-bit, 16-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN20/TSSOP20
C8051F534A	4 kB	25	256	16	UART, SPI	3	3	$\pm 0.5\%$	12-bit, 16-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN20/TSSOP20
C8051F536A	2 kB	25	256	16	LIN 2.0, SPI, UART	3	3	$\pm 0.5\%$	12-bit, 16-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN20/TSSOP20
C8051F537A	2 kB	25	256	16	UART, SPI	3	3	$\pm 0.5\%$	12-bit, 16-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN20/TSSOP20
C8051F520A	8 kB	25	256	6	LIN 2.0, SPI, UART	3	3	$\pm 0.5\%$	12-bit, 16-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN10
C8051F521A	8 kB	25	256	6	UART, SPI	3	3	$\pm 0.5\%$	12-bit, 16-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN10
C8051F523A	4 kB	25	256	6	LIN 2.0, SPI, UART	3	3	$\pm 0.5\%$	12-bit, 6-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN10
C8051F524A	4 kB	25	256	6	UART, SPI	3	3	$\pm 0.5\%$	12-bit, 6-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN10
C8051F526A	2 kB	25	256	6	LIN 2.0, SPI, UART	3	3	$\pm 0.5\%$	12-bit, 6-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN10
C8051F527A	2 kB	25	256	6	UART, SPI	3	3	$\pm 0.5\%$	12-bit, 6-ch., 200 ksp/s	Y	Y	1	VREG, $-40$ to $125^\circ\text{C}$	QFN10

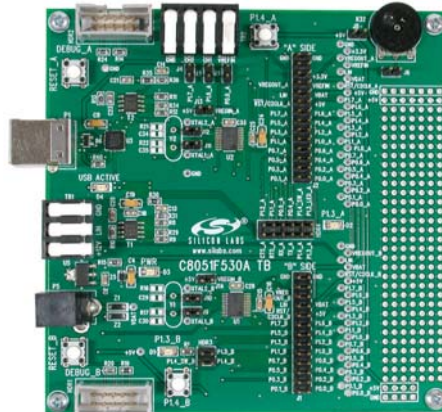
## Actual Sizes



## Comprehensive Development Tools

The easiest way to begin development with the C8051F53xA and C8051F52xA MCU families is with the fully functional "out-of-the-box" C8051F530ADK development kit, which includes all hardware and software required to begin application development. A unique aspect of the target hardware is that it has two C8051F530A devices on a single board. This enables designers to develop a fully functioning LIN 2.0 master/slave network with a single piece of hardware. Furthermore, the external connector and 12 V regulator allows designers to interface to any existing LIN network for maximum design and test flexibility.

## C8051F530ADK Target Board



## Integrated Development Environment

