

16-bit Microcontrollers

# S12XS

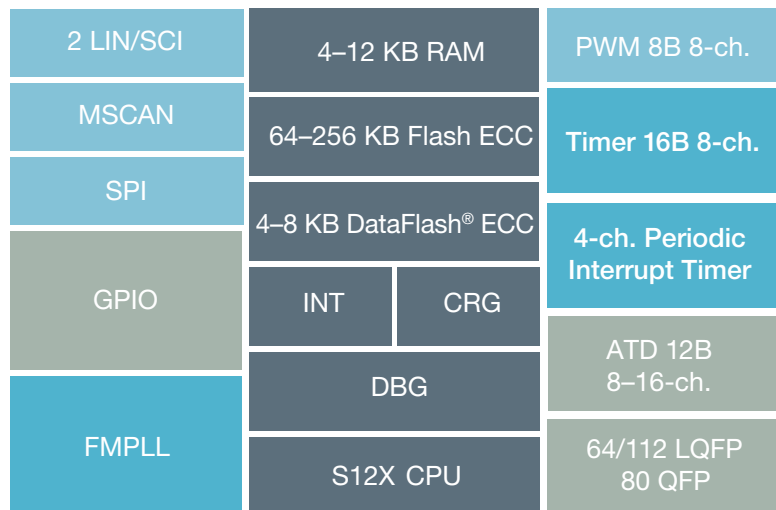
## Family of automotive microcontrollers

### Overview

Addressing the need for design flexibility and platform compatibility, Freescale has developed the S12XS family of 16-bit microcontrollers (MCUs) optimized for a broad range of cost-sensitive automotive body electronics applications. The family includes six devices designed to give you flexibility in choosing different memory, package and cost options to accommodate your application requirements.

The S12XS family provides an economical, compatible extension to the high-performance S12XE family, broadening the overall portfolio by offering you lower cost and smaller package options. The S12XS and S12XE families have complementary memory, peripherals and packages. This flexibility can help you react quickly to market opportunities and reduce the cost of migration if application requirements change during the development cycle. The full range of S12 and S12X products enables scalability, hardware and software reusability, and compatibility across a broad array of automotive electronics platforms.

### S12XS Family Block Diagram



The S12XS family features a streamlined set of on-chip peripheral, memory and package options optimized for automotive body and passenger comfort applications. Compact packaging makes these devices suitable

for space-constrained applications, such as small actuators, sensor modules and column-integrated modules.

| Device    | Flash  | ROM    | RAM   | EE              | XGATE | MPU | EBI | CAN | SCI (LIN) | SPI | IIC | ECT | TIM        | PIT   | PWM       | ATD | Max Speed (MHz) | Package                 |
|-----------|--------|--------|-------|-----------------|-------|-----|-----|-----|-----------|-----|-----|-----|------------|-------|-----------|-----|-----------------|-------------------------|
| 9S12XS256 | 256 KB |        | 12 KB | 8 KB DataFlash® |       |     |     | 1   | 2         | 1   |     |     | 16B, 8-ch. | 4-ch. | 8B, 8-ch. | 16  | 32              | 64 LQFP 80 QFP 112 LQFP |
| 3S12XS256 |        | 256 KB | 12 KB |                 |       |     |     | 1   | 2         | 1   |     |     | 16B, 8-ch. | 4-ch. | 8B, 8-ch. | 16  | 32              | 64 LQFP 80 QFP 112 LQFP |
| 9S12XS128 | 128 KB |        | 8 KB  | 8 KB DataFlash® |       |     |     | 1   | 2         | 1   |     |     | 16B, 8-ch. | 4-ch. | 8B, 8-ch. | 16  | 32              | 64 LQFP 80 QFP 112 LQFP |
| 3S12XS128 |        | 128 KB | 8 KB  |                 |       |     |     | 1   | 2         | 1   |     |     | 16B, 8-ch. | 4-ch. | 8B, 8-ch. | 16  | 32              | 64 LQFP 80 QFP 112 LQFP |
| 9S12XS64  | 64 KB  |        | 4 KB  | 4 KB DataFlash® |       |     |     | 1   | 2         | 1   |     |     | 16B, 8-ch. | 4-ch. | 8B, 8-ch. | 16  | 32              | 64 LQFP 80 QFP 112 LQFP |
| 3S12XS64  |        | 64 KB  | 4 KB  |                 |       |     |     | 1   | 2         | 1   |     |     | 16B, 8-ch. | 4-ch. | 8B, 8-ch. | 16  | 32              | 64 LQFP 80 QFP 112 LQFP |

## Applications

- Seat controllers
- Steering wheel controllers
- Heat ventilation and air conditioning
- Sunroofs
- Door zone modules
- Slave body control modules
- Cost-effective lighting modules
- Cost-effective ABS, EPS

## Key Features

### Memory

- 64 KB to 256 KB of embedded flash memory with error correction coding (ECC)
- 4 KB to 12 KB RAM
- Up to 4 KB to 8 KB of data-flash memory with 256-byte sectors

### System

- 40 MHz 16-bit CPU12X upward compatible with MC9S12 instruction set
- Enhanced interrupt module
- Background debug module (BDM) with single-wire interface
- 3.3V to 5.0V operation
- Temperature range: -40°C to +125°C

## Communications and I/O

- One MSCAN module
- CAN 2.0 A, B software compatible
- One serial peripheral interface (SPI) module
- Two LIN capable serial communication interfaces (SCI)
- Up to 91 general-purpose input/output (GPIO) pins

## Timers and Analog-to-Digital Converter (ADC)

- One ADC with 8/10/12-bit resolution and multiplexer for 16 analog input channels
- 8-channel x 8-bit or 4-channel x 16-bit pulse width modulator
- Timer (TIM) with 8- x 16-bit channels for input capture or output compare

## Clock

- Internally filtered phase-locked-loop (IPLL) —no external components required
- Fast wake up from STOP for power saving and immediate program execution

## Specifications

- Package options
  - 64-pin and 112-pin LQFP
  - 80-pin QFP

## Benefits

**Cost Effectiveness:** Optimizes feature set and packaging for cost-sensitive automotive body applications

**Scalability and Compatibility:** Extends S12X memory range from 64 KB up to 1 MB with the compatible upgrade path to the S12XE family

**Flexibility:** Supports cost-sensitive applications with a balanced set of peripherals; upgrade path to the S12XE family maximizes software and hardware reusability

**Development Support:** Leverages and expands on the extensive suite of hardware and software development tools available today for the S12 and S12X families

## Learn More:

For current information about Freescale products and documentation, please visit [www.freescale.com](http://www.freescale.com).