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S3 Family 8-Bit Microcontrollers

S3F8S39/S3F8S35

Product Specification

PS031405-0118

S3 Microcontrollers

Warning: DO NOT USE THIS PRODUCT IN LIFE SUPPORT SYSTEMS.

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Revision History

Each instance in this document's revision history reflects a change from its previous edition. For more details, refer to the corresponding page(s) or appropriate links furnished in the table below.

Date	Revision Level	Description	Page
Jan 2018	05	Added 32-LQFP package – updated Figures 1-3, 25-2 and Section 27.1; added Package Outline drawing; updated Ordering Information. Corrected TimerB section errors.	1-4, 1-6, 27-2; 25-2, 24-4; 27-1 13-5; 13-6
May 2017	04	Added Zilog Library-based Development Platform and updated to most current 3rd party tools. Added Chapter 27, Ordering Information Changed package type description from ELP to QFN. Removed 'Preliminary' from footer.	CH 26 27-1 Various All
Jan 2015	03	Updated the Third Parties for Development Tools section.	26-12
Apr 2014	02	Updated to include front matter, PDF bookmarks for easier navigation.	All
Aug 2013	01	Original Zilog issue.	All

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1 Product Overview

1.1 S3F8 Series Microcontrollers

Zilog's S3 Family of 8-bit single-chip CMOS microcontrollers offers a fast and efficient CPU, a wide range of integrated peripherals, and various mask-programmable Read only memory (ROM) sizes. Address/data bus architecture and a large number of bit-configurable Input/Output (I/O) ports provide a flexible programming environment for applications with varied memory and I/O requirements. It includes timer/counters with selectable operating modes to support real-time operations.

1.2 S3F8S39/S3F8S35 Microcontrollers

The S3F8S39/S3F8S35 single-chip CMOS microcontrollers are fabricated using the highly advanced CMOS process technology based on Zilog's latest CPU architecture. The S3F8S39/S3F8S35 is a microcontroller with an embedded 32K/16K byte full-flash ROM.

By using a proven modular design approach, Zilog engineers have successfully developed the S3F8S39/S3F8S35 by integrating these peripheral modules with the powerful SAM8 RC core:

- Four configurable I/O ports (26 pin)
- Twenty six interrupt sources and eight interrupt levels
- Eight bit-programmable pins for external interrupts
- One watchdog timer function (Basic Timer)
- One 8-bit basic timer for oscillation stabilization
- Two 8-bit timer/counters and three 16-bit timer/counters with selectable operating modes
- A Stop Wake-Up Timer to wake up CPU from Stop Mode
- Watch timer for real time
- Two asynchronous UART modules
- One SPI module
- One IIC module
- Analog to digital converter with 16 input channels and 10-bit resolution
- One BUZ for programmable frequency output

The S3F8S39/S3F8S35 microcontrollers are ideal for use in a wide range of home applications that requires simple timer/counter, ADC, and so on. They are currently available in 32-pin SOP/SDIP and 32-pin QFN packages.

Comparison	S3F8S39	S3F8S35
Flash Size (Bytes)	32K	16K

1.3 Features

1.3.1 CPU

- SAM8RC CPU core

1.3.2 Memory

Features of internal multi-time program Full-Flash memory are:

- 32K × 8-bit program memory (S3F8S39)
- 16K × 8-bit program memory (S3F8S35)
  - Sector size: 128 Bytes
  - User programmable by "LDC" instruction
  - Sector erase available
  - Fast programming time
  - External serial programming support
  - Endurance: 10,000 erase/program cycles
  - 10 Years data retention

- Data Memory (RAM)
  - 1,040 × 8 bit data memory

1.3.3 Instruction Set

- Seventy eight instructions
- Idle and Stop instructions

1.3.4 26 I/O Pins

- Twenty six normal I/O pins for 32 pin

1.3.5 Interrupts

- Eight interrupt levels and 26 interrupt sources
- Fast interrupt processing feature

1.3.6 Timers and Timer/Counters

- One programmable 8-bit Basic Timer (BT) for oscillation stabilization control or watchdog timer function.
- One 8-bit timer/counter (Timer A) with three operating modes:
  - Interval Mode
  - Capture Mode
  - PWM Mode

- One 16-bit timer/counter (Timer 0) with Interval Mode and PWM Mode.
- Two 16-bit timer/counter (Timer 1/2) with three operating modes:
  - Interval Mode
  - Capture Mode
  - PWM Mode
- One 16-bit Timer B with one-shot-pulse output mode and repeat output mode. It can be triggered by external input or software.
- One Stop Wake-Up Timer with Ring oscillator as its clock source.

1.3.7 Watch Timer

- Interval time: 1.995 ms, 0.125s, 0.25s, and 0.5s at 32.768 kHz
- 0.5/1/2/4 kHz buzzer output selectable

1.3.8 Analog to Digital Converter

- 16-channel analog input
- 10-bit conversion resolution

1.3.9 Two Channels UART

- Full-duplex serial I/O interface
- Four programmable operating modes
- Auto generating parity bit

1.3.10 Multi-Master IIC-Bus

- Serial Peripheral Interface
- Serial, 8-bit Data Transfers
- Programmable Clock Prescale

1.3.11 SPI

- Support Master and Slave Mode
- Programmable Clock Prescale

1.3.12 Two Power-Down Modes

- **Idle Mode**: Stops only CPU clock
- **Stop Mode**: Stops system clock and CPU clock

1.3.13 Oscillation Sources

- Main clock frequency: 0.4 MHz-12.0 MHz
- External RC for main clock
- Internal RC: 8 MHz (typ.), 4 MHz (typ.), 1 MHz (typ.), 0.5 MHz (typ.)
- On-chip free running Ring oscillator with 32 kHz frequency for 16-bit Timer 1.

1.3.14 Instruction Execution Time

- 333 ns at fx = 12 MHz (minimum, main clock)

1.3.15 Built-In Reset Circuit (LVR)

- Low-Voltage check to reset system
- V_{LVR} = 1.9/2.3/3.0/3.9 V (by the Smart Option)

1.3.16 Low Voltage Detect Circuit (LVD)

- Flag or Interrupt for voltage drop detection
- Programmable detect voltage: 2.1/2.5/3.2/4.1 V
- Enable/Disable software selectable

1.3.17 Operating Voltage Range

- 1.8 V to 5.5 V at 4 MHz (main clock)
- 2.7 V to 5.5 V at 12 MHz (main clock)

1.3.18 Package Type

- 32-pin SDIP
- 32-pin SOP
- 32-pin QFN
  32-pin LQFP

1.3.19 Operating Temperature Range

- –40°C to +85°C

1.3.20 Smart Option

- ISP-related option selectable (ROM address 3EH)
- Oscillator selection, LVR selection (ROM address 3FH)

1.4 Block Diagram

Figure 1-1 illustrates the block diagram of S3F8S39/S3F8S35.

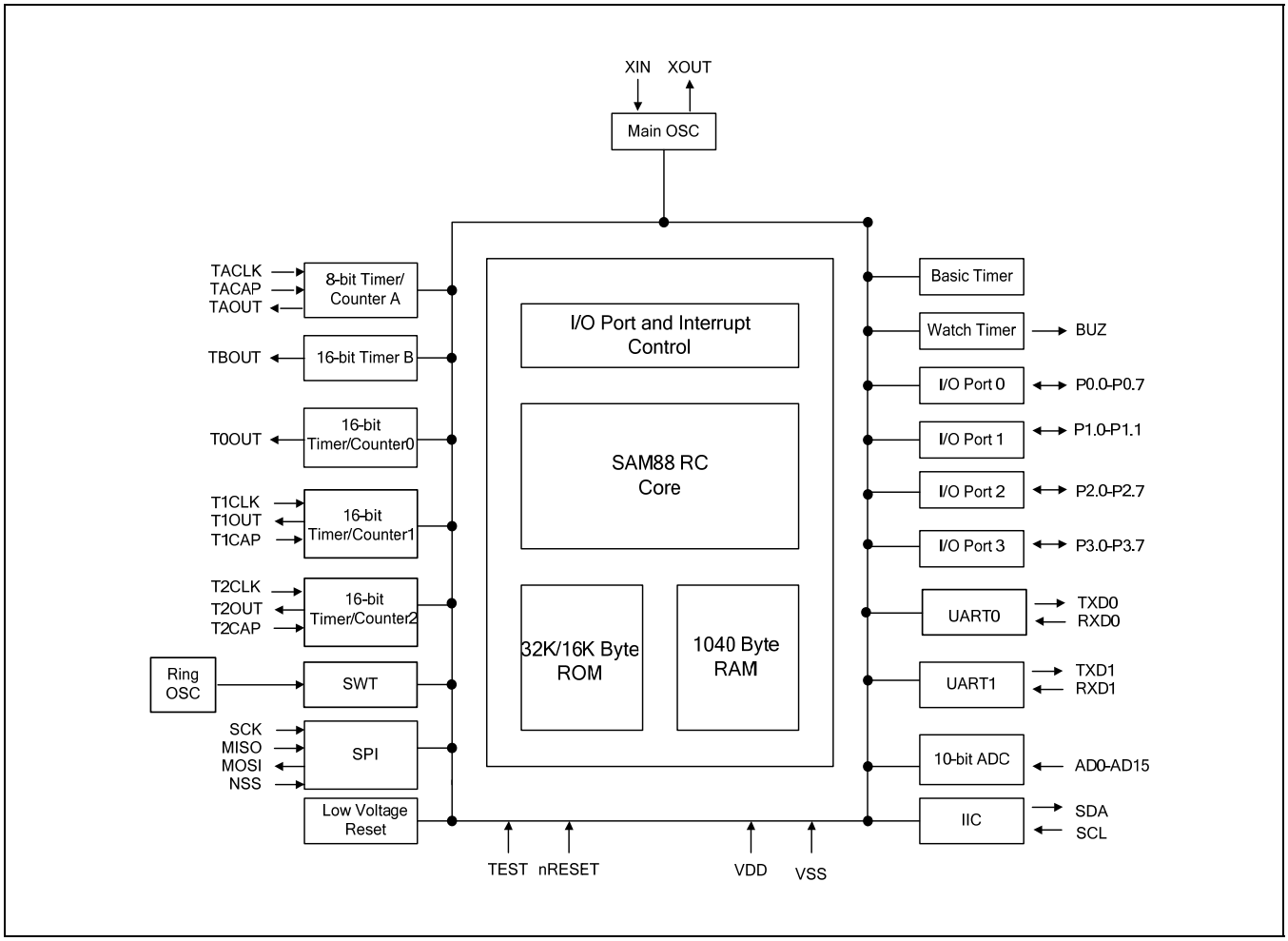

Figure 1-1 S3F8S39/S3F8S35 Block Diagram

1.5 Pin Assignments

Figure 1-2 illustrates the S3F8S39/S3F8S35 pin assignment (32-pin SOP/32-pin SDIP).

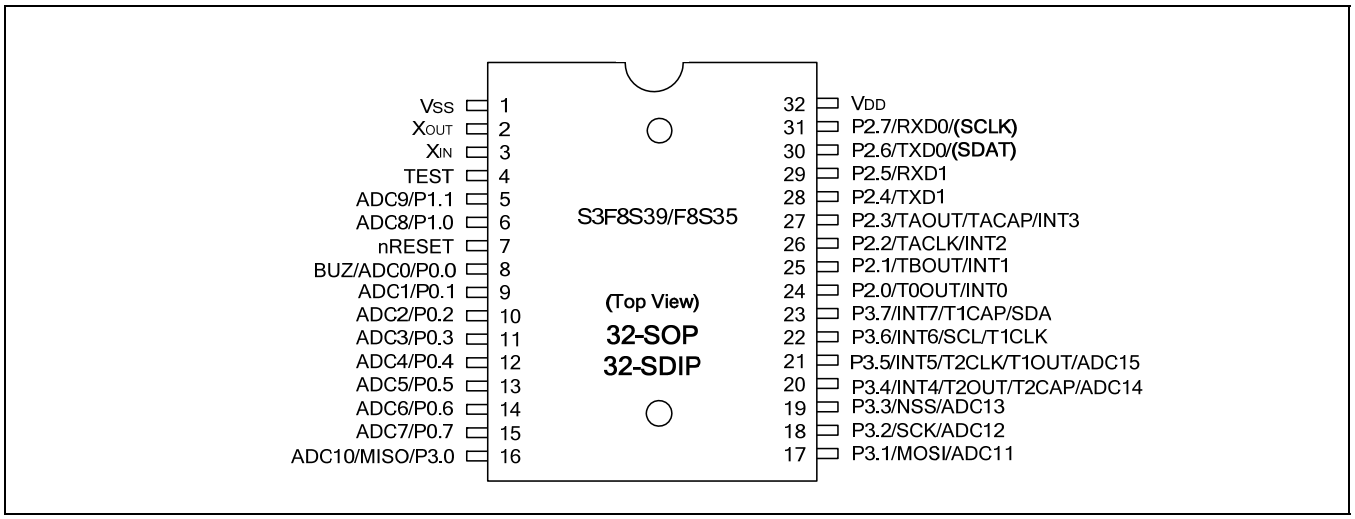

Figure 1-2 S3F8S39/S3F8S35 Pin Assignment (32-SOP/32-SDIP)

Figure 1-3 illustrates the S3F8S39/S3F8S35 pin assignment (32-pin QFN/32-pin LQFP).

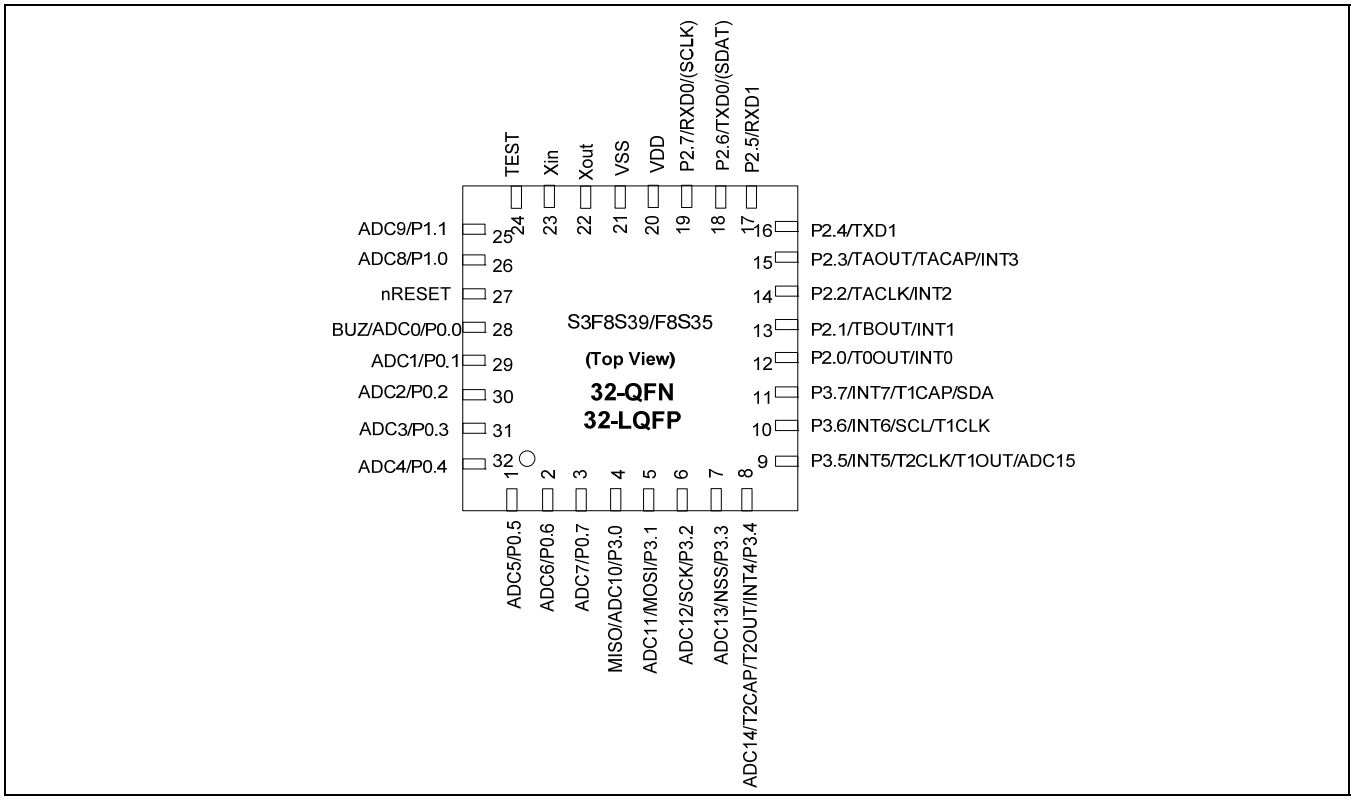

Figure 1-3 S3F8S39/S3F8S35 Pin Assignment (32-QFN/32-LQFP)