



MC56F8000 Series

Applications

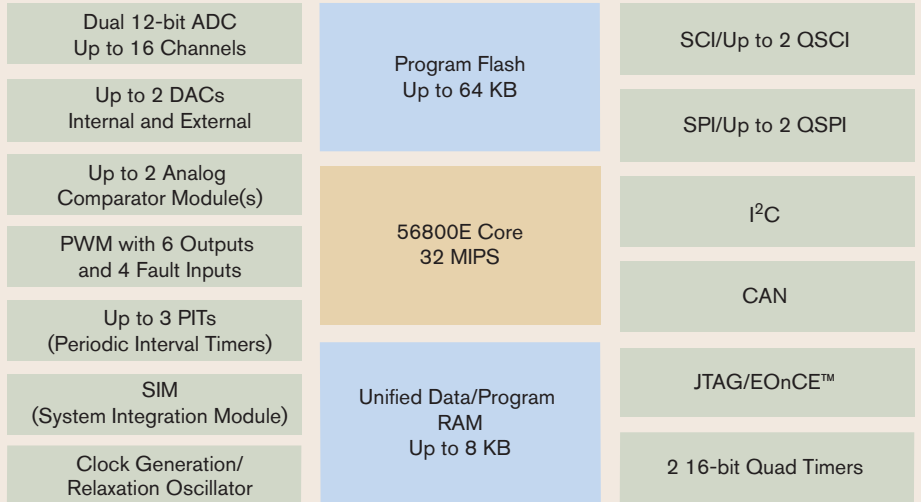
- > Motor control
- > Digital power conversion
- > Advanced lighting control

Overview

Rare Package of Performance, Integration and Value

First developed by Freescale Semiconductor and launched in 2000, a digital signal controller (DSC) is a specialized processor containing a single core capable of performing both microcontroller and digital signal processor functions. On-chip integration and the ease of implementation and programming helps to speed development, lower component count and significantly reduce system costs, enabling a new generation of applications.

Freescale's 56F8000 series is based on the second-generation 56800E DSC core. It complements the higher-end 56F8100 and 56F8300 series by offering software-compatible solutions with higher integration, lower pin count packaging and is exceptionally cost-effective for DSCs. These products are optimized to provide the features, performance and pricing ideal for widespread use in electric motor control, full digital power conversion and advanced lighting control applications.



Key Features

- > High-performance dual Harvard architecture DSC core that is capable of performing complex DSP and MCU algorithms
- > 256 words flash erasable size for EEPROM emulation to eliminate external EEPROM for data storage
- > Integrated 12-bit DACs and high-speed analog comparators to reduce system cost; DACs can be connected internally as inputs to the comparators. Comparators, in conjunction with the DACs, can be used to provide programmable event detections
- > Highly multiplexed functions on each pin to provide a highly functional product in low-cost, small pin-count packages
- > High-performance PWM with 15-bit resolution that can run at 3x system clock (96 MHz) for precise waveform control with cycle-by-cycle control and enhanced features such as independent rising and falling edge delay control and programmable fault interrupts
- > On-chip clock synthesis to reduce system cost with loss of clock to enable safe shut down in the event of a system failure



DIGITAL SIGNAL CONTROLLERS SELECTOR GUIDE

Part Number	Temp. Ranges	Flash	RAM	Features	Package	Speed
56F8011	-40°C to +105°C	12 KB	2 KB	6-ch. PWM, 2 x 3-ch. 12-bit ADC, 4 x 16-bit timers, I ² C, SCI, SPI	32 LQFP	32 MHz
56F8013	-40°C to +105°C -40°C to +125°C	16 KB	4 KB	6-ch. PWM, 2 x 3-ch. 12-bit ADC, 4 x 16-bit timers, I ² C, SCI, SPI	32 LQFP	32 MHz
56F8014	-40°C to +105°C -40°C to +125°C	16 KB	4 KB	5-ch. PWM, 2 x 4-ch. 12-bit ADC, 4 x 16-bit timers, I ² C, SCI, SPI	32 LQFP	32 MHz
56F8023	-40°C to +105°C	32 KB	4 KB	6-ch. PWM, 2 x 3-ch. 12-bit ADCs, 2 x 12-bit DACs, 4 x 16-bit timers, I ² C, QSCI, QSPI, 2 analog comparators	32 LQFP	32 MHz
56F8025	-40°C to +105°C	32 KB	4 KB	6-ch. PWM, 2 x 4-ch. 12-bit ADCs, 2 x 12-bit DACs, 4 x 16-bit timers, I ² C, QSCI, QSPI, 2 analog comparators	44 LQFP	32 MHz
56F8036	-40°C to +105°C	64 KB	8 KB	6-ch. PWM, 2 x 5-ch. 12-bit ADCs, 2 x 12-bit DACs, 4 x 16-bit timers, I ² C, QSCI, QSPI, MSCAN, 2 analog comparators	48 LQFP	32 MHz
56F8037	-40°C to +105°C	64 KB	8 KB	6-ch. PWM, 2 x 8-ch. 12-bit ADCs, 2 x 12-bit external DACs, 8 x 16-bit timers, I ² C, QSCI, QSPI, MSCAN, 2 analog comparators	64 LQFP	32 MHz

Tools and Support

For rapid application development, Freescale offers CodeWarrior® Development Studio with Processor Expert™ technology. Award-winning CodeWarrior tools provide an integrated development environment for creating, compiling, linking and debugging applications. The Processor Expert tool provides access to fully debugged peripheral drivers, software libraries and example applications.

A complimentary CodeWarrior permanent license for up to 16 KB application code (sufficient for the MC56F801x products) is available through simple web-based registration. Freescale also provides training materials, application notes and reference designs to expedite system development with Freescale DSCs.

DOCUMENTATION

Freescale Document Number	Title	Description
WP8000	White Paper: Benefits and Applications Enabled by 56F8000 Digital Signal Controllers	Reviews features and benefits of 56F8000 DSCs and examines a few of the broad range of industrial, consumer and automotive applications enabled by these devices
AN3234	Application Note: Washing Machine 3-Phase AC Induction Motor Drive Based on 56F8013	Explores trend in washing machine design to replace traditional drive systems with modern, electronically controlled, brushless drives
AN1916	Application Note: 3-Phase BLDC Motor Control with Hall Sensors Using 56800/E Digital Signal Controllers	Describes the design of a 3-phase BLDC (Brushless DC) motor drive based on Freescale's 56800/E DSCs
AN3102	Application Note: Unique Features of the 56F801x Family of Digital Signal Controllers	Identifies and explains the differences of the 56F801x family to help designers get the most from the DSCs
5600PWMADCSYNCH	PWM-to-ADC Synchronization for 56F83xx/1xx and 56F801x Digital Signal Controllers	Presentation showing how to use Processor Expert beans to implement target system application
SdT827_BROOKS	Practical Embedded C Programming for Digital Signal Controllers	Provides information and techniques for using CodeWarrior to generate efficient C code for DSCs

Design Challenges

System designers are constantly looking for opportunities to enhance their products and stay ahead of competition. Enhancements can take many forms, including increased performance and features, lower cost, smaller size and better energy efficiency. Frequently, the opportunity to make enhancements is weighed against the ease of implementation and implementation cost which is why many opportunities fail to move forward. Sophisticated control algorithms and high-performance CPUs are often beyond the reach of many high-volume but cost-sensitive applications.

Freescale Solution

Freescale DSCs combine the processing power of a DSP with the functionality of a microcontroller to provide integrated solutions for motor control, digital power conversion, smart sensing, lighting control and instrumentation. The combination of a fully integrated core with high-performance peripherals provide the speed, flexibility and low power consumption essential for industrial and appliance applications. With seven devices to choose from, spanning 12 KB to 64 KB program memory and 32-pin to 64-pin highly multiplexed I/O, this series offers a broad set of options to enhance products.

Potential enhancements attainable with Freescale's 56F8000 series include:

- > Sensorless control of electric motors to reduce system cost and eliminate a potential point of failure
- > The combination of motor control with other system interface and communications requirements into a single device reducing system cost
- > Adaptive closed-loop algorithmic control of electric motors can produce less torque ripple translating to less vibration and noise
- > Reduction of bulky magnetics in power supplies resulting in more efficient power conversion with lower heat generation and smaller size
- > Software configurable power supplies that adapt to system and environmental conditions while providing a platform approach to product design
- > Flexible platform for architectural lighting that can automatically compensate for changes in ambient lighting conditions

Learn More: For more information about Freescale's digital signal controllers, please visit www.freescale.com/dsc.