**Overview**

If you find yourself needing a little more memory than what the 56F8165 has to offer, or simply need to interface to other devices in your system in a parallel fashion, then the 56F8166 is the device for you.

Moving to this 144-pin LQFP package allows you to take advantage of its included external memory interface, should you wish to add even more memory to your system. You will still enjoy 544 KB of on-chip Flash memory, pulse-width modulation (PWM) outputs, analog-to-digital converter (ADC) inputs and timer channels, along with the capability of interfacing with other devices in your system.

Whether you are adding performance to your control application, or control capabilities to your signal processing system, you can benefit from the flexibility and compatibility provided by the 56F8165 and 56F8166.

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**Target Applications**

- Polyphase metering
- UPS
- Electric vehicles
- Currency validation
- Industrial control/ connectivity
- Home appliances
- Smart relays
- Fire and security systems
- Medical monitoring

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**56800E Core Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>Up to 40 MIPS at a guaranteed 40 MHz core frequency</td>
<td>Hybrid architecture facilitates implementation of both control and signal processing functions in a single device</td>
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<td>DSP and microcontroller (MCU) functionality in a unified, C-efficient architecture</td>
<td>High-performance, secured Flash memory eliminates the need for external storage devices</td>
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<td>JTAG/enhanced on-chip emulation (EOnCE™) for unobtrusive, real-time debugging</td>
<td>Extended temperature range up to +105°C allows for operation of nonvolatile memory in industrial applications</td>
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<td>Four 36-bit accumulators</td>
<td>Flash memory emulation of EEPROM eliminates the need for external nonvolatile memory</td>
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<td>16- and 32-bit bidirectional barrel shifter</td>
<td>32-bit performance with 16-bit code density</td>
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<td>Parallel instruction set with unique addressing modes</td>
<td>On-chip voltage regulator and power management reduce overall system cost</td>
</tr>
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<td>Hardware DO and REP loops available</td>
<td>Off-chip memory expansion capabilities allow for glueless interfacing with the additional memory of external devices without sacrificing performance</td>
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<td>Three internal address buses</td>
<td>This device boots directly from Flash, providing additional application flexibility</td>
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<tr>
<td>Four internal data buses</td>
<td>High-performance PWM with programmable fault capability simplifies design and promotes compliance with safety regulations</td>
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<tr>
<td>Architectural support for 8-, 16- and 32-bit single-cycle data fetches</td>
<td>PWM and ADC modules are tightly coupled to reduce processing overhead</td>
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<td>MCU-style software stack support</td>
<td>Low-voltage interrupts (LVIs) protect the system from brownout or power failure</td>
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<td>Controller-style addressing modes and instructions</td>
<td>Simple in-application Flash memory programming via EOnCE or serial communication</td>
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<td>Single-cycle 16 x 16-bit parallel multiplier-accumulator (MAC)</td>
<td>Proven to deliver more control functionality with a smaller memory footprint than competing architectures</td>
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**56F8166 Features**

- COP/Watchdog
- Program Memory
- Power Management
- PLL
- 512 KB Flash
- (2) SPI
- 32 KB Boot Flash
- (2) SCI
- 56800E Core
- 40 MIPS
- 40 MHz
- 144 LQFP
- 16-ch., 12-bit ADC
- 32 KB RAM
- External Memory Interface
- JTAG/EOnCE
- Up to 62 GPIO
- 16-bit, 12-bit ADC
- Data Memory
- 6 Channels PWM
- Quadra...
Memory Features

- Architecture permits as many as three simultaneous accesses to program and data memory
- On-chip memory includes high-speed volatile and nonvolatile components
  - 512 KB of Program Flash
  - 32 KB of Data RAM
  - 32 KB of Boot Flash
- All memories operate at 40 MHz (zero wait states) over temperature range (-40°C to +105°C), with no software tricks or hardware accelerators required
- Flash security feature prevents unauthorized accesses to its content
- Off-chip memory expansion capabilities provide a simple method for interfacing additional external memory and/or peripheral devices
  - Access up to 1 MB of external program memory or 1 MB of external data memory
  - External accesses supported at up to 40 MHz (zero wait states)

56F8166 Peripheral Circuit Features

- PWM module with six outputs and four programmable fault inputs
- Two serial peripheral interfaces (SPIs)
- Two serial communications interfaces (SCIs)
- Eight 16-bit timers with input and output compare capability
- Four-input quadrature decoder
- On-chip 3.3V to 2.6V voltage regulator
- Software-programmable Phase-Lock Loop (PLL)
- 12-bit ADCs with 16 inputs, self-calibration and current injection capability
- Up to 62 general-purpose input/output (GPIO) pins
- External reset input pin for hardware reset
- Computer operating properly (COP)
- Integrated power-on reset and LVI module
- I²C communications master mode (emulated)

Award-Winning Development Environment

- Processor Expert™ (PE) technology provides a rapid application design (RAD) tool that combines easy-to-use, component-based software application creation with an expert knowledge system.
- The CodeWarrior™ Integrated Development Environment (IDE) is a sophisticated tool for code navigation, compiling and debugging. A complete set of evaluation modules (EVMs) and development system cards will support concurrent engineering. Together, PE technology, CodeWarrior tools and EVMs create a complete, scalable tools solution for easy, fast and efficient development.

Learn More: For more information about Freescale products, please visit [www.freescale.com](http://www.freescale.com).