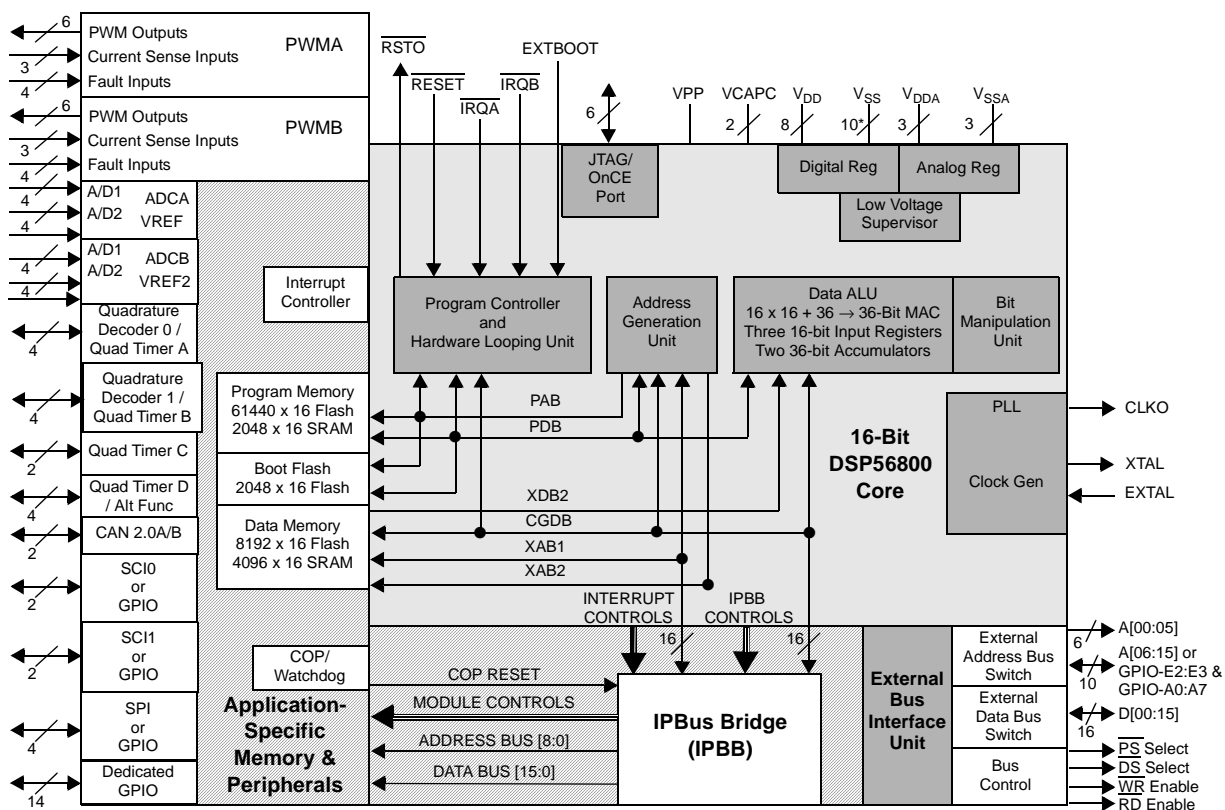


# DSP56F807

## Product Brief

## DSP56F807 16-bit Digital Signal Processor

- Up to 40 MIPS at 80 MHz core frequency
- DSP and MCU functionality in a unified, C-efficient architecture
- Hardware DO and REP loops
- MCU-friendly instruction set supports both DSP and controller functions: MAC, bit manipulation unit, 14 addressing modes
- 60K × 16-bit words Program Flash
- 2K × 16-bit words Program RAM
- 8K × 16-bit words Data Flash
- 4K × 16-bit words Data RAM
- 2K × 16-bit words BootFLASH
- Up to 64K × 16-bit words each of external program and data memory
- Two 6 channel PWM Modules
- Four 4 channel, 12-bit ADCs
- Two Quadrature Decoders
- CAN 2.0 B Module
- Two Serial Communication Interfaces (SCIs)
- Serial Peripheral Interface (SPI)
- Up to four General Purpose Quad Timers
- JTAG/OnCE™ port for debugging
- 14 Dedicated and 18 Shared GPIO lines
- 160-pin LQFP or 160 MAPBGA Packages



\*includes TCS pin which is reserved for factory use and is tied to VSS

**Figure 1. DSP56F807 Block Diagram**

## **DSP56800 Digital Signal Processing Core Features**

- Efficient 16-bit DSP56800 family DSP engine with dual Harvard architecture
- As many as 40 Million Instructions Per Second (MIPS) at 80 MHz core frequency
- Single-cycle  $16 \times 16$ -bit parallel Multiplier-Accumulator (MAC)
- Two 36-bit accumulators including extension bits
- 16-bit bidirectional barrel shifter
- Parallel instruction set with unique DSP addressing modes
- Hardware DO and REP loops
- Three internal address buses and one external address bus
- Four internal data buses and one external data bus
- Instruction set supports both DSP and controller functions
- Controller style addressing modes and instructions for compact code
- Efficient C compiler and local variable support
- Software subroutine and interrupt stack with depth limited only by memory
- JTAG/OnCE debug programming interface

## **DSP56F807 Memory Features**

- Harvard architecture permits as many as three simultaneous accesses to program and data memory
- On-chip memory including a low cost, high volume flash solution
  - $60K \times 16$ -bit words of Program Flash
  - $2K \times 16$ -bit words of Program RAM
  - $8K \times 16$ -bit words of Data Flash
  - $4K \times 16$ -bit words of Data RAM
  - $2K \times 16$ -bit words of BootFLASH
- Off-chip memory expansion capabilities programmable for 0, 4, 8, or 12 wait states
  - As much as  $64K \times 16$  bits of data memory
  - As much as  $64K \times 16$  bits of program memory

## **DSP56F807 Peripheral Circuit Features**

- Two Pulse Width Modulator modules each with six PWM outputs, three Current Sense inputs, and four Fault inputs, fault tolerant design with deadtime insertion, supports both center and edge aligned modes
- Four 12-bit, Analog-to-Digital Converters (ADCs), which support two simultaneous conversions with quad, 4-pin multiplexed inputs; ADC and PWM modules are in sync
- Two Quadrature Decoders each with four inputs or two additional Quad Timers
- Two dedicated General Purpose Quad Timers totaling six pins: Timer C with two pins and Timer D with four pins
- Two Serial Communication Interfaces each with two pins (or four additional GPIO lines)
- CAN 2.0 B Module with 2-pin port for transmit and receive

- Serial Peripheral Interface (SPI) with configurable 4-pin port (or four additional GPIO lines)
- Computer-Operating Properly (COP) Watchdog timer
- Two dedicated external interrupt pins
- 14 dedicated General Purpose I/O (GPIO) pins, 18 multiplexed GPIO pins
- External reset input pin for hardware reset
- External reset output pin for system reset
- JTAG/On-Chip Emulation (OnCE™) for unobtrusive, processor speed-independent debugging
- Software-programmable, Phase Lock Loop-based frequency synthesizer for the DSP core clock

## **Energy Information**

- Fabricated in high-density CMOS with 5V tolerant, TTL-compatible digital inputs
- Uses a single 3.3V power supply
- On-chip regulators for digital and analog circuitry to lower cost and reduce noise
- Wait and Stop modes available

## **DSP56F807 Description**

The DSP56F807 is a member of the DSP56800 core-based family of Digital Signal Processors (DSPs). It combines, on a single chip, the processing power of a DSP and the functionality of a microcontroller with a flexible set of peripherals to create an extremely cost-effective solution. Because of its low cost, configuration flexibility, and compact program code, the DSP56F807 is well-suited for many applications. The DSP56F807 includes many peripherals that are especially useful for applications such as: motion control, smart appliances, steppers, encoders, tachometers, limit switches, power supply and control, automotive control, engine management, noise suppression, remote utility metering, industrial control for power, lighting, automation.

The DSP56800 core is based on a Harvard-style architecture consisting of three execution units operating in parallel, allowing as many as six operations per instruction cycle. The microprocessor-style programming model and optimized instruction set allow straightforward generation of efficient, compact code for both DSP and MCU applications. The instruction set is also highly efficient for C/C++ Compilers to enable rapid development of optimized control applications.

## **“Best in Class” Development Environment**

The SDK (Software Development Kit) provides fully debugged peripheral drivers, libraries and interfaces that allow programmers to create their unique C application code independent of component architecture. The CodeWarrior Integrated Development Environment 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, the SDK, CodeWarrior, and EVMs create a complete, scalable tools solution for easy, fast, and efficient development.

## **Product Documentation**

The four documents listed in Table 1 are required for a complete description and proper design with the DSP56F807. Documentation is available from local Motorola distributors, Motorola semiconductor sales offices, Motorola Literature Distribution Centers, or online at [www.motorola.com/semiconductors/DSP](http://www.motorola.com/semiconductors/DSP).

**Table 1. DSP56F807 Chip Documentation**

Topic	Description	Order Number
DSP56800 Family Manual	Detailed description of the DSP56800 family architecture, and 16-bit DSP core processor and the instruction set	DSP56800FM/D
DSP56F801/803/805/807 User's Manual	Detailed description of memory, peripherals, and interfaces of the DSP56F807, DSP56F803, DSP56F805, and DSP56F807	DSP56F801-7UM/D
DSP56F807 Technical Data Sheet	Electrical and timing specifications, pin descriptions, and package descriptions	DSP56F807/D
DSP56F807 Product Brief	Summary description and block diagram of the DSP56F807 core, memory, peripherals and interfaces (this document)	DSP56F807PB/D

## **Ordering Information**

Consult a Motorola Semiconductor sales office or authorized distributor to order parts.

**Table 2. DSP56F807 Ordering Information**

Part	Supply Voltage	Package Type	Pin Count	Frequency (MHz)	Order Number
DSP56F807	3.0 - 3.6V	Low Profile Quad Flat Pack (LQFP)	160	80	DSP56F807PY80
DSP56F807	3.0 - 3.6V	Plastic Ball Grid Array (PBGA)	160	80	DSP56F807VF80

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and the Stylized M Logo are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

MOTOROLA and the Stylized M Logo are registered in the US Patent & Trademark Office. All other product or service names are the property of their respective owners. © Motorola, Inc. 2002.

### **How to reach us:**

**USA/EUROPE/Locations Not Listed:** Motorola Literature Distribution; P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

**JAPAN:** Motorola Japan Ltd.; SPS, Technical Information Center, 3-20-1, Minami-Azabu. Minato-ku, Tokyo 106-8573 Japan. 81-3-3440-3569

**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre, 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong. 852-26668334

**Technical Information Center: 1-800-521-6274**

**HOME PAGE:** <http://www.motorola.com/semiconductors/>



**MOTOROLA**

DSP56F807PB/D