DSP56F801

Product Brief

DSP56F801 16-bit Digital Signal Processor

- Up to 40 MIPS operation
- DSP and MCU functionality in a unified, C-efficient architecture
- MCU-friendly instruction set supports both DSP and controller functions: MAC, bit manipulation unit, 14 addressing modes
- 8K × 16-bit words Program Flash
- 1K × 16-bit words Program RAM
- 2K × 16-bit words Data Flash
- 1K × 16-bit words Data RAM
- 2K × 16-bit words BootFLASH
- Hardware DO and REP loops
- 6-channel PWM Module
- Two 4-channel, 12-bit ADCs
- Serial Communications Interface (SCI)
- Serial Peripheral Interface (SPI)
- General Purpose Quad Timer
- JTAG/OnCE™ port for debugging
- On-chip relaxation oscillator
- 48-pin LQFP Package
- 11 shared GPIO

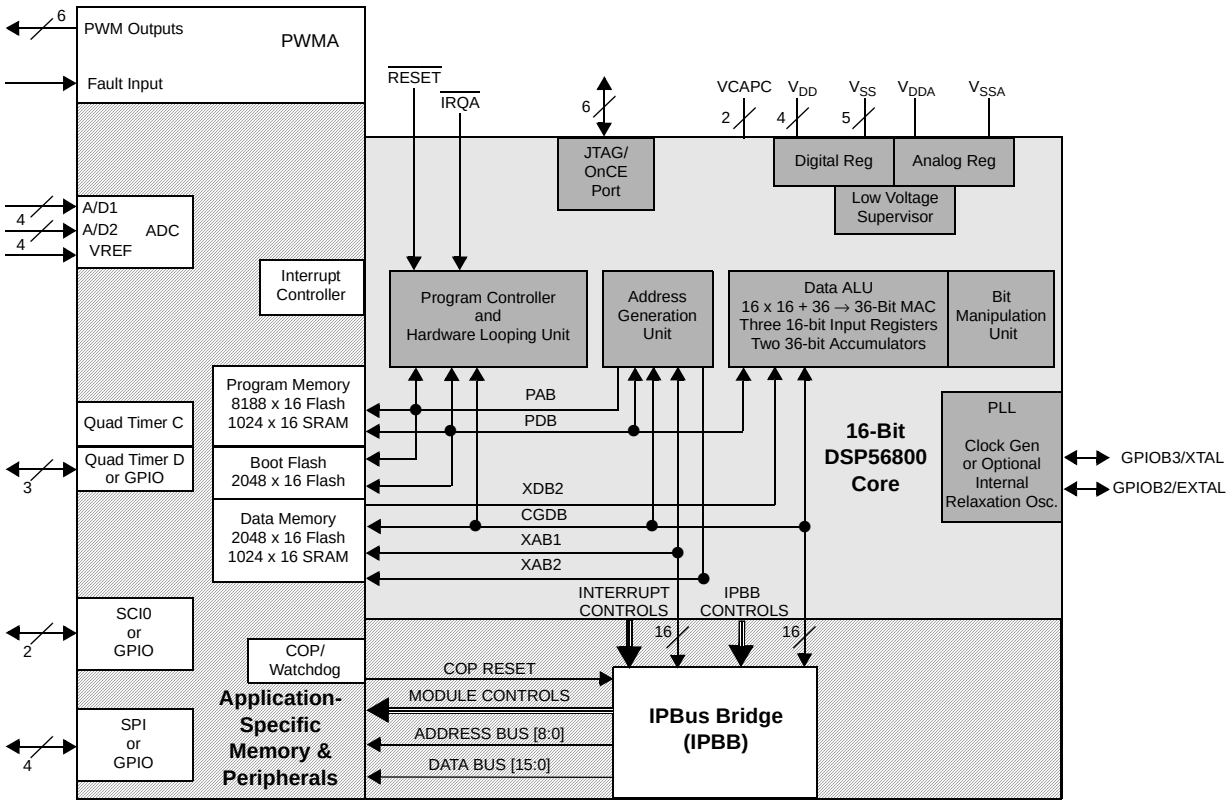

Figure 1. DSP56F801 Block Diagram

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 × 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

DSP56F801 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
  - 8K × 16 bit words of Program Flash
  - 1K × 16-bit words of Program RAM
  - 2K × 16-bit words of Data Flash
  - 1K × 16-bit words of Data RAM
  - 2K × 16-bit words of BootFLASH
- Programmable BootFLASH supports customized boot code and field upgrades of stored code through a variety of interfaces (JTAG, CAN, SPI)

DSP56F801 Peripheral Circuit Features

- Pulse Width Modulator (PWM) with six PWM outputs, two Fault inputs, fault-tolerant design with deadtime insertion; supports both center- and edge-aligned modes
- Two 12-bit, Analog-to-Digital Converters (ADCs), which support two simultaneous conversions with two 4-multiplexed inputs; ADC and PWM modules are in sync
- General Purpose Quad Timer: Timer D with three pins (or three additional GPIO lines)
- Serial Communication Interface (SCI) with two pins (or two additional GPIO lines)
- Serial Peripheral Interface (SPI) with configurable four-pin port (or four additional GPIO lines)
- Eleven multiplexed General Purpose I/O (GPIO) pins
- Computer-Operating Properly (COP) watchdog timer
- Two dedicated external interrupt pins

- External reset pin for hardware 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
- Oscillator flexibility between either an external crystal oscillator or an on-chip relaxation oscillator for lower system cost and two additional GPIO lines

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

DSP56F801 Description

The DSP56F801 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 DSP56F801 is well-suited for many applications. The DSP56F801 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, and 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 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 DSP56F801. Documentation is available from local Motorola distributors, Motorola semiconductor sales offices, Motorola Literature Distribution Centers, or online at www.motorola.com/semiconductors/dsp.

Table 1. DSP56F801 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 DSP56F801, DSP56F803, DSP56F805, and DSP56F807	DSP56F801-7UM/D
DSP56F801 Technical Data Sheet	Electrical and timing specifications, pin descriptions, and package descriptions	DSP56F801/D
DSP56F801 Product Brief	Summary description and block diagram of the DSP56F801 core, memory, peripherals and interfaces (this document)	DSP56F801PB/D

Ordering Information

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

Table 2. DSP56F801 Ordering Information

Part	Supply Voltage	Package Type	Pin Count	Frequency (MHz)	Order Number
DSP56F801	3.0–3.6 V	Plastic Quad Flat Pack (LQFP)	48	80	DSP56F801FA80

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