DSP56303

24-Bit Digital Signal Processor

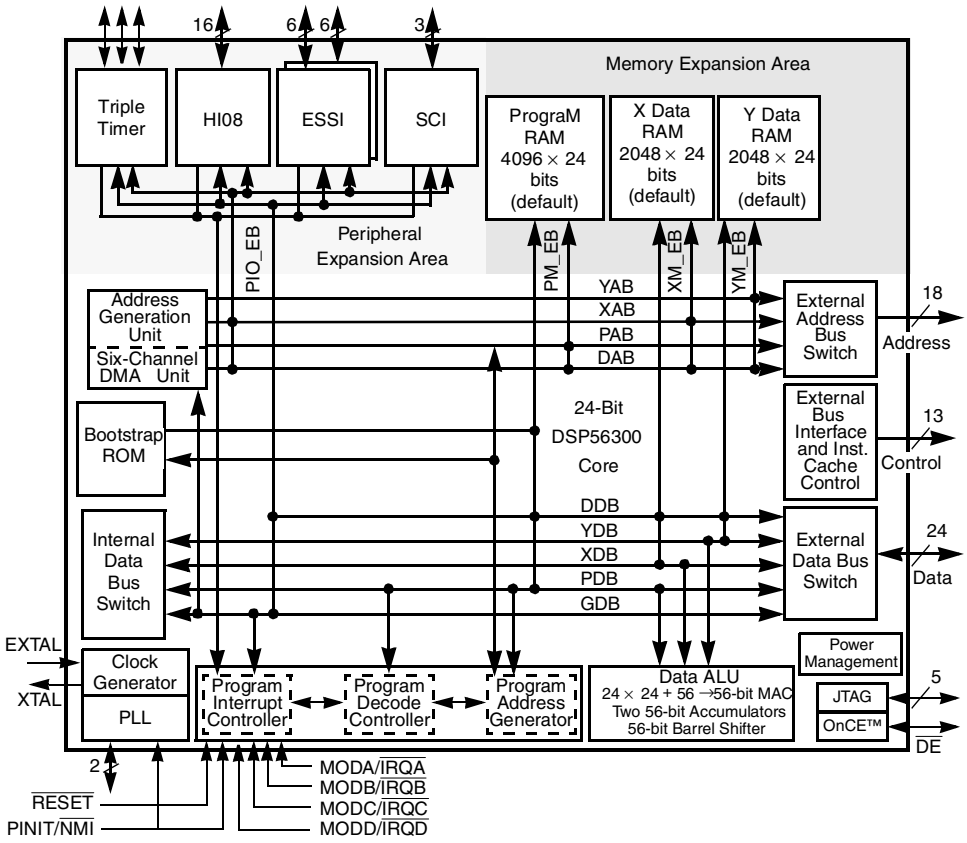

Figure 1. DSP56303 Block Diagram

The DSP56303 is intended for use in telecommunication applications, such as multi-line voice/data/ fax processing, video conferencing, audio applications, control, and general digital signal processing.

The DSP56303 is a member of the DSP56300 core family of programmable CMOS DSPs. Significant architectural features of the DSP56300 core family include a barrel shifter, 24-bit addressing, instruction cache, and DMA. The DSP56303 offers 100 million multiply-accumulates per second (MMACS) using an internal 100 MHz clock at 3.0–3.6 volts. The DSP56300 core family offers a rich instruction set and low power dissipation, as well as increasing levels of speed and power to enable wireless, telecommunications, and multimedia products.

Features

Table 1 lists the features of the DSP56303 device.

Table 1. DSP56303 Features

<table>
<tr><th>Feature</th><th>Description</th></tr>
<tr><td>High-Performance DSP56300 Core</td><td>
• 100 million multiply-accumulates per second (MMACS) with a 100 MHz clock at 3.3 V nominal
• Object code compatible with the DSP56000 core with highly parallel instruction set
• Data arithmetic logic unit (Data ALU) with fully pipelined 24 × 24-bit parallel multiplier-accumulator (MAC), 56-bit parallel barrel shifter (fast shift and normalization; bit stream generation and parsing), conditional ALU instructions, and 24-bit or 16-bit arithmetic support under software control
• Program control unit (PCU) with position-independent code (PIC) support, addressing modes optimized for DSP applications (including immediate offsets), internal instruction cache controller, internal memory-expandable hardware stack, nested hardware DO loops, and fast auto-return interrupts
• Direct memory access (DMA) with six DMA channels supporting internal and external accesses; one-, two-, and three-dimensional transfers (including circular buffering); end-of-block-transfer interrupts; and triggering from interrupt lines and all peripherals
• Phase-lock loop (PLL) allows change of low-power divide factor (DF) without loss of lock and output clock with skew elimination
• Hardware debugging support including on-chip emulation (OnCE) module, Joint Test Action Group (JTAG) test access port (TAP)
</td></tr>
<tr><td>Internal Peripherals</td><td>
• Enhanced 8-bit parallel host interface (HI08) supports a variety of buses (for example, ISA) and provides glueless connection to a number of industry-standard microcomputers, microprocessors, and DSPs
• Two enhanced synchronous serial interfaces (ESSI), each with one receiver and three transmitters (allows six-channel home theater)
• Serial communications interface (SCI) with baud rate generator
• Triple timer module
• Up to thirty-four programmable general-purpose input/output (GPIO) pins, depending on which peripherals are enabled
</td></tr>
<tr><td>Internal Memories</td><td>
• 192 × 24-bit bootstrap ROM
• 8 K × 24-bit RAM total
• Program RAM, instruction cache, X data RAM, and Y data RAM sizes are programmable:
<table>
<tr><th>Program RAM Size</th><th>Instruction Cache Size</th><th>X Data RAM Size</th><th>Y Data RAM Size</th><th>Instruction Cache</th><th>Switch Mode</th></tr>
<tr><td>4096 × 24-bit</td><td>0</td><td>2048 × 24-bit</td><td>2048 × 24-bit</td><td>disabled</td><td>disabled</td></tr>
<tr><td>3072 × 24-bit</td><td>1024 × 24-bit</td><td>2048 × 24-bit</td><td>2048 × 24-bit</td><td>enabled</td><td>disabled</td></tr>
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</table>
</td></tr>
<tr><td>External Memory Expansion</td><td>
• Data memory expansion to two 256 K × 24-bit word memory spaces using the standard external address lines
• Program memory expansion to one 256 K × 24-bit words memory space using the standard external address lines
• External memory expansion port
• Chip select logic for glueless interface to static random access memory (SRAMs)
• Internal DRAM Controller for glueless interface to dynamic random access memory (DRAMs)
</td></tr>
<tr><td>Power Dissipation</td><td>
• Very low-power CMOS design
• Wait and Stop low-power standby modes
• Fully static design specified to operate down to 0 Hz (dc)
• Optimized power management circuitry (instruction-dependent, peripheral-dependent, and mode-dependent)
</td></tr>
<tr><td>Packaging</td><td>
• 144-pin TQFP package in lead-free or lead-bearing versions
• 196-pin molded array plastic-ball grid array (MAP-BGA) package in lead-free or lead-bearing versions
</td></tr>
</table>

Target Applications

Examples include:

- Multi-line voice/data/fax processing
- Video conferencing
- Audio applications
- Control

Product Documentation

The documents listed in **Table 2** are required for a complete description of the DSP56303 device and are necessary to design properly with the part. Documentation is available from a local Freescale distributor, a Freescale semiconductor sales office, or a Freescale Semiconductor Literature Distribution Center. For documentation updates, visit the Freescale DSP website. See the contact information on the back cover of this document.

Table 2. DSP56303 Documentation

Name	Description	Order Number
DSP56303 Technical Data	Description, features list, and specifications of the DSP56303.	DSP56303
DSP56303 User's Manual	Detailed functional description of the DSP56303 memory configuration, operation, and register programming	DSP56303UM
DSP56300 Family Manual	Detailed description of the DSP56300 family processor core and instruction set	DSP56300FM
Application Notes	Documents describing specific applications or optimized device operation including code examples	See the DSP56303 product website

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