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DSP56309 : 24-bit Digital Signal Processor

The DSP56309 device is intended for applications requiring a large amount of on-chip memory, such as wireless infrastructure applications. The DSP56309 offers 100 million multiply-accumulates per second (MMACS) with a 100 MHz clock at 3.0-3.6 V, and it is 5 V I/O tolerant.

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▶ Block Diagram

DSP56309 Features

High performance DSP56300 core

- 100 MMACS with a 100 MHz clock at 3.0 - 3.6 V.
- Object code compatible with the DSP56000 core
- Highly parallel instruction set
- Fully pipelined 24 x 24-bit parallel multiplier-accumulator (MAC)
- 56-bit parallel barrel shifter
- 24-bit or 16-bit arithmetic support under software control
- Position-independent code support
- Addressing modes optimized for DSP applications
- On-chip instruction cache controller
- On-chip memory-expandable hardware stack
- Nested hardware DO loops
- Fast auto-return interrupts
- On-chip concurrent six-channel DMA controller
- On-chip phase-lock loop (PLL) and clock generator
- On-chip emulation (OnCE) module
- JTAG test access port (TAP)
- Address Tracing mode reflects internal accesses at the external port

On-chip memories

- Program RAM, instruction cache, X data RAM, and Y data RAM size is programmable:

Program RAM	Instruction Cache	X Data RAM	Y Data RAM
24576 x 24-bit	0	5120 x 24-bit	5120 x 24-bit
23552 x 24-bit	1024 x 24-bit	5120 x 24-bit	5120 x 24-bit

20480 x 24-bit	0	7168 x 24-bit	7168 x 24-bit
19456 x 24-bit	1024 x 24-bit	7168 x 24-bit	7168 x 24-bit

- 192 x 24-bit bootstrap ROM

Off-chip memory expansion

- Data memory expansion to two 256 K x 24-bit word memory spaces
- Program memory expansion to one 256 K x 24-bit word memory space
- External memory expansion port
- Simultaneous glueless interface to four blocks of either SRAM or DRAM through chip select logic
- Supports interleaved, non-interfering access to both types of memory without losing in-page DRAM access, including DMA-driven access

On-chip peripherals

- 8-bit parallel host interface (HI08) supports a variety of buses (for example, industry standard architecture) and provides glueless connection to a number of industry standard microcomputers, microprocessors, and DSPs
- Two enhanced synchronous serial interfaces (ESSI)
- Serial communications interface (SCI) with baud-rate generator
- Triple timer module
- Up to 34 programmable general-purpose I/O pins (GPIO), depending on which peripherals are enabled

Reduced power dissipation

- Very low-power CMOS design
- Wait and Stop low-power standby modes
- Fully-static logic, operation frequency down to DC
- Optimized power management circuitry

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Sample Availability	External Data Memory (kByte)	External Program Memory (kByte)	External Memory Interfaces	Total DMA Channels	Serial Interface		Number of Timers
					Type	Number of	
Y	1536	768	DRAM, SRAM	6	ESSI, SCI	1, 2	3

Timers				Core Performance DSP (MMACS)	Device Speed (Max) (MHz)	Bus Frequency (Max) (MHz)	Bus Width	
Timer Size (bit)	Timer Channels	Timer Input Captures	Timer Output Compares				Internal Data Bus Width (bit)	External Data Bus Width (bit)
24	3	3	3	100	100	100	24	24

Core Voltage (Spec) (V)	I/O Voltage (Typ) (V)	I/O Ports	Host Port Interfaces Width (bit)	DSP Cores	Other Peripherals	Standby Functions
3.3	3.3	5	8	1	Nested Interrupt, On-Chip Emulation, On-Chip PLL, Peripheral Interrupt, Real-Time Interrupt, Watchdog Timer	STOP












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DSP56309 Parametrics


DSP56309 Documentation
Documentation

Application Notes







ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
Loading...					Loading...	
AN1751 DSP563xx Port A Programming	FREESCALE	pdf	439	1	5/01/1998	
AN1764 DSP56300 Enhanced Synchronous Serial Interface (ESSI) Programming	FREESCALE	pdf	424	2	7/24/2000	
AN1772 Efficient Compilation of Bit-Exact Applications for DSP563xx	FREESCALE	pdf	348	0	11/13/1998	
AN1781 Bootting DSP563xx Devices through the Serial Communication Interface (SCI)	FREESCALE	pdf	267	0	11/13/1998	
AN1790 Programming the CS4218 CODEC for Use with DSP56300 Devices	FREESCALE	pdf	482	0	2/23/1999	
AN1790SW Programming the CS4218 Codec for Use with DSP56300 Devices Supporting Software	FREESCALE	zip	170	0	10/12/2001	
AN1808 DSP56300 HI08 Host Port Programming	FREESCALE	pdf	287	0	10/03/2001	
AN1834 DSP56300 Using DSP56300 Interactive Timing Diagrams	FREESCALE	pdf	582	0	10/03/2001	
AN1839 DSP56300 Programming the DSP56300 OnCE and JTAG Ports	FREESCALE	pdf	398	0	10/03/2001	
AN2013 DSP56300 Family: Characterizing CMOS DSP Core Current for Low-Power Applications	FREESCALE	pdf	366	0	10/25/2000	
AN2074 DSP56300 JTAG Examples	FREESCALE	pdf	636	0	10/04/2001	
AN2085 DSP56300 Family: ECP Standard Parallel Interface for DSP56300 Devices	FREESCALE	pdf	410	0	11/09/2000	
AN2088 Integrating the DSP563xx in Distributed Computing Environments	FREESCALE	pdf	571	0	3/29/2001	
AN2113 AN2113 Multichannel Voice Coding System on the RTXC Operating System	FREESCALE	pdf	479	0	4/21/2001	
AN2277 Guidelines for Converting DSP56002 Designs to DSP56300 Designs	FREESCALE	pdf	433	0	4/12/2002	
AN2715 Porting Code from the DSP56300 Family of Products to the SC140/SC1400 Core	FREESCALE	pdf	417	1	11/11/2004	

APR1 Digital Sine-Wave Synthesis Using the DSP56001/2	FREESCALE	pdf	393	-	-	
APR20 Application Optimization for the DSP56300/DSP56600 Digital Signal Processors	FREESCALE	pdf	636	0	10/05/2001	
APR22 Application Conversion from the DSP56100 Family to the DSP56300/600 Families	FREESCALE	pdf	526	0	10/05/2001	
APR23 Using the DSP56300 Direct Memory Access Controller	FREESCALE	pdf	426	0	10/05/2001	
APR25 DSP56300 Interfacing Fast SRAM to the DSP56300 Family of Digital Signal Processors	FREESCALE	pdf	850	0	10/05/2001	
APR26 DSP56300 Interfacing Flash Memory with the DSP56300 Family of Digital Signal Processors	FREESCALE	pdf	1128	0	10/05/2001	
APR27 DSP56300 Interfacing EPROM and EEPROM Memory with the DSP56300 Family of Digital Signal Processors	FREESCALE	pdf	768	0	10/05/2001	
APR3 DSP56000 Fractional and Integer Arithmetic using the DSP56000 Family of General-Purpose Digital Signal Processors	FREESCALE	pdf	770	1	1/25/2000	
APR30 DSP56300 Assembly Code Development Using the Freescale Toolsets	FREESCALE	pdf	380	0	10/05/2001	
APR35 DSP56300 Designing the DSP56xxx Software for Nonrealtime Tests File I/O Using SIM56xxx and ADS56xxx	FREESCALE	pdf	337	1	9/28/2001	
APR36 DSP56300 Interfacing the DSP560xx/DSP563xx Families to the Crystal CS4226 Multichannel Codec	FREESCALE	pdf	458	0	10/05/2001	
APR38 DSP56300 Interfacing Serial EEPROM to DSP563xx	FREESCALE	pdf	915	0	10/05/2001	
APR40 DSP56300 Implementing Viterbi Decoders Using the VSL Instruction on DSP Families DSP56300 and DSP56600	FREESCALE	pdf	967	0	10/05/2001	
Brochures						
ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
BRDSP56300 DSP56300 Family Brochure	FREESCALE	pdf	104	-	-	
BRPACKTELEARCH Freescale Semiconductor Packet Telephony Architecture	FREESCALE	pdf	281	1	3/12/2004	

Data Sheets

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56309 DSP56309 24-Bit Digital Signal Processor Data Sheet	FREESCALE	pdf	1903	7	2/17/2005	


Engineering Bulletins

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
Loading...						
EB336 Technical Bulletin: Changes in Process Technologies: Hardware and Software Design Implications for DSP56300 Family Derivatives	FREESCALE	pdf	260	2	6/16/2004	
EB343 Functional Differences Between Masks 5H80G and 0J17D of the DSP56309	FREESCALE	pdf	458	2	4/23/2001	
EB345 Functional Differences Between the 1F90S Mask of the DSP56302 and the 0J17D Mask of the DSP56309	FREESCALE	pdf	572	1	4/23/2001	
EB346 Functional Differences Between the DSP56302 and DSP56309 (Formerly DSP56302A)	FREESCALE	pdf	246	2	4/23/2001	
EB360 DSP56300 Mechanical Differences Between the 196-Pin MAP- BGA and 196-Pin PBGA Packages	FREESCALE	pdf	292	0	6/25/2000	
EB635 Lead-Free BGA Solder Joint Assembly Evaluation	FREESCALE	pdf	116	2	4/20/2005	


Errata - [Click here for important errata information](#)

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56309CE0J17D DSP56309 Chip Errata Mask 0J17D	FREESCALE	pdf	176	0.4	12/19/2002	-
DSP56309CE4H80G DSP56309 Chip Errata Mask 4H80G	FREESCALE	pdf	305	2.3	12/19/2002	-
DSP56309CE5H80G DSP56309 Chip Errata Mask 5H80G	FREESCALE	pdf	284	2.3	12/19/2002	-




Fact Sheets

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
SUITE56FACT Suite56 DSP Software Development Tools	FREESCALE	pdf	609	0	-	


Product Briefs

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56309PB DSP56309PB/D 24-Bit General-Purpose Digital Signal Processor	FREESCALE	pdf	95	1	2/18/2005	

Reference Manuals

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSP56300FM DSP56300 24-Bit Digital Signal Processor Family Manual	FREESCALE	pdf	12025	5	4/15/2005	
DSP56309UM DSP56309 24-Bit Digital Signal Processor User's Manual	FREESCALE	pdf	4365	0	1/01/1998	
DSP56309UMAD DSP56309 Users Manual Addendum	FREESCALE	pdf	247	1	11/07/2002	


Selector Guides

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
SG1004 SG1004 Digital Signal Processors	FREESCALE	pdf	604	0	5/25/2005	

Training Reference Material

ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
DSPS56TOOLSUM Suite56 DSP Tools User's Manual	FREESCALE	pdf	857	-	-	-

Users Guide



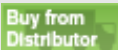



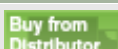
ID and Description	Vendor ID	Format	Size K	Rev #	Date Last Modified	Order Availability
S56CCSERVER Suite56 Command Converter Server User's Guide	FREESCALE	pdf	572	1	10/01/1999	

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DSP56309 Design Tools**Hardware Tools****Analyzers****Logic**

ID and Description	Vendor ID	Format	Size K	Rev #	Order Availability
60063 PI-56303	CORELIS	-	-	-	-

Emulators/Probes/Wigglers

ID and Description	Vendor ID	Format	Size K	Rev #	Order Availability
DSPCOMMAND Universal Command Converter for DSP	FREESCALE	-	-	-	 
DSPCOMMANDPCI PCI Command Converter for DSP	FREESCALE	-	-	-	
DSPCOMMETHERNET Ethernet Command Converter for DSP	FREESCALE	-	-	-	 
DSPCOMMPARALLEL Parallel Port Command Converter for DSP	FREESCALE	-	-	-	 

Evaluation/Development Boards and Systems

ID and Description	Vendor ID	Format	Size K	Rev #	Order Availability
DSP56309EVM DSP56309 Evaluation Module	FREESCALE	-	-	-	-

Models

BSDL

ID and Description	Vendor ID	Format	Size K	Rev #	Order Availability
DSP56309BSDLPBGA196_REV0 DSP56309 BSDL PBGA196 Rev. 0	FREESCALE	txt	14	0	-
DSP56309BSDLPBGA196_REVA DSP56309 BSDL PBGA196 Rev. A	FREESCALE	txt	17	0	-
DSP56309BSDLTQFP144_REV0 DSP56309 BSDL TQFP144 Rev. 0	FREESCALE	txt	14	0	-
DSP56309BSDLTQFP144_REVA DSP56309 BSDL TQFP144 Rev. A	FREESCALE	txt	17	0	-

Software

Operating Systems

ID and Description	Vendor ID	Format	Size K	Rev #	Order Availability
CMX-RTX CMX-RTX	CMX	-	-	-	-

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Orderable Parts Information

Part Number	Package Description	Tape and Reel	Application/ Qualification Tier	Compliance		Status	Budgetary Price QTY 1000+ (\$US)	Info	Order
				Pb-Free	RoHS				

SPAKXC309AG100A	LQFP 144 20*20*1.4P0.5	No	COMMERCIAL, INDUSTRIAL			Available	\$31.36	more	-
SPAKXC309PV100A	LQFP 144 20*20*1.4P0.5	No	-	No	No	Available	-	more	Buy from Distributor
SPAKXC309VF100A	MAPBGA 196 15*15*0.8P1.0	No	-	TBD	TBD	Available	-	more	Buy from Distributor
SPAKXC309VL100A	MAPBGA 196 15*15*0.8P1.0	No	COMMERCIAL, INDUSTRIAL			Available	\$28.73	more	-
XC56309AG100A	LQFP 144 20*20*1.4P0.5	No	COMMERCIAL, INDUSTRIAL			Available	-	more	-
XC56309PV100A	LQFP 144 20*20*1.4P0.5	No	-	No	No	Available	-	more	Order Sample  Buy from Distributor
XC56309VF100A	MAPBGA 196 15*15*0.8P1.0	No	-	TBD	TBD	Available	-	more	Order Sample  Buy from Distributor
XC56309VL100A	MAPBGA 196 15*15*0.8P1.0	No	COMMERCIAL, INDUSTRIAL			Available	-	more	-

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