



Figure Number	LIST OF FIGURES	Page Number
1-1	MPC555 / MPC556 Block Diagram	1-2
1-2	MPC555 / MPC556 Memory Map	1-6
1-3	MPC555 / MPC556 Internal Memory Map	1-7
2-1	MPC555 / MPC556 Case Dimensions and Packaging	2-2
2-2	MPC555 / MPC556 Pinout Data	2-3
2-3	Type A Interface	2-39
2-4	Type B Interface	2-39
2-5	Type C Interface	2-40
2-6	Type CH Interface	2-40
2-7	Type CNH Interface	2-41
2-8	Type D Interface	2-41
2-9	Type E Interface	2-42
2-10	3-V Type EOH Interface	2-43
2-11	Type F Interface	2-44
2-12	Type G Interface	2-45
2-13	Type H Interface	2-46
2-14	Type I Interface	2-47
2-15	Type IH Interface	2-48
2-16	Type J Interface	2-49
2-17	Type JD Interface	2-50
2-18	EPEE Pad (Type K)	2-51
2-19	Type L Interface	2-52
2-20	Type M Interface	2-52
2-21	Type N Interface	2-53
2-22	Type O Interface	2-54
2-23	Type P Interface	2-55
2-24	Type Q Interface	2-56
2-25	Type R Interface	2-56
2-26	Type S Interface	2-57
3-1	RCPU Block Diagram	3-2
3-2	Sequencer Data Path	3-4
3-3	RCPU Programming Model	3-8
3-4	Basic Instruction Pipeline	3-37
4-1	Burst Buffer Block Diagram	4-2
4-2	Example of Compressed Code	4-5
4-3	Instruction Coding	4-5
4-4	Two Streams Memory Organization — Before Compression	4-6
4-5	Two Streams Memory Organization — After Compression	4-6
4-6	Examples of Compressed Symbols Layout	4-7
4-7	Compressed Address Format	4-8

Figure Number

Page Number



4-8	Examples of Instruction Layout in Memory	4-9
4-9	Generating Compressed Code Address for PowerPC Direct Branches	4-10
4-10	Extracting Direct Branch Target Address in the Decompressor	4-11
4-11	Code Compression Process (Phase A)	4-12
4-12	Bounded Huffman Code Tree	4-13
4-13	Code Decompression Process	4-14
4-14	Exception Table Entries Mapping	4-19
5-1	MPC555 / MPC556 USIU Block Diagram	5-2
6-1	System Configuration and Protection Logic	6-2
6-2	MPC555 / MPC556 Memory Map	6-4
6-3	SGPIO Cell	6-8
6-4	MPC555 / MPC556 Interrupt Structure	6-9
6-5	MPC555 / MPC556 Interrupt Configuration	6-11
6-6	RTC Block Diagram	6-14
6-7	PIT Block Diagram	6-15
6-8	SWT Interrupts and Exceptions	6-16
6-9	SWT Block Diagram	6-17
7-1	Reset Configuration Basic Scheme	7-7
7-2	Reset Configuration Sampling Scheme For "Short" PORESET Assertion, Limp Mode Disabled	7-8
7-3	Reset Configuration Timing for "Short" PORESET Assertion, Limp Mode Enabled	7-9
7-4	Reset Configuration Timing for "Long" PORESET Assertion, Limp Mode Disabled	7-9
7-5	Reset Configuration Sampling Timing Requirements	7-10
8-1	Clock Unit Block Diagram	8-2
8-2	Main System Oscillator (OSCM)	8-3
8-3	System PLL Block Diagram	8-5
8-4	MPC555 / MPC556 Clocks	8-7
8-5	General System Clocks Select	8-10
8-6	Divided System Clocks Timing Diagram	8-11
8-7	Clocks Timing For DFNH = 1 (or DFNL = 0)	8-12
8-8	Clock Source Flow Chart	8-14
8-9	MPC555 / MPC556 Low-Power Modes Flow Diagram	8-19
8-10	Basic Power Supply Configuration	8-22
8-11	External Power Supply Scheme	8-23
8-12	Keep Alive Register Key State Diagram	8-25
8-13	No Standby, No KAPWR, All System Power On/Off	8-27
8-14	Standby and KAPWR, Other Power On/Off	8-28
9-1	Input Sample Window	9-2

Figure Number

Page Number



9-2	MPC555 / MPC556 Bus Signals	9-3
9-3	Basic Transfer Protocol	9-8
9-4	Basic Flow Diagram of a Single Beat Read Cycle	9-9
9-5	Single Beat Read Cycle—Basic Timing—Zero Wait States	9-10
9-6	Single Beat Read Cycle—Basic Timing—One Wait State	9-11
9-7	Basic Flow Diagram of a Single Beat Write Cycle	9-12
9-8	Single Beat Basic Write Cycle Timing, Zero Wait States	9-13
9-9	Single Beat Basic Write Cycle Timing, One Wait State	9-14
9-10	Single Beat 32-Bit Data Write Cycle Timing, 16 Bit-Port Size	9-15
9-11	Basic Flow Diagram Of A Burst Read Cycle	9-18
9-12	Burst-Read Cycle—32-Bit Port Size—Zero Wait State	9-19
9-13	Burst-Read Cycle—32-Bit Port Size—One Wait State	9-20
9-14	Burst-Read Cycle—32-Bit Port Size—Wait States Between Beats	9-21
9-15	Burst-Read Cycle, 16-Bit Port Size	9-22
9-16	Basic Flow Diagram of a Burst Write Cycle	9-23
9-17	Burst-Write Cycle, 32-Bit Port Size, Zero Wait States	9-24
9-18	Burst-Inhibit Cycle, 32-Bit Port Size (Emulated Burst)	9-25
9-19	Non-Wrap Burst with Three Beats	9-26
9-20	Non-Wrap Burst with One Data Beat	9-27
9-21	Internal Operand Representation	9-28
9-22	Interface To Different Port Size Devices	9-29
9-23	Bus Arbitration Flowchart	9-31
9-24	Masters Signals Basic Connection	9-32
9-25	Bus Arbitration Timing Diagram	9-33
9-26	Internal Bus Arbitration State Machine	9-35
9-27	Termination Signals Protocol Basic Connection	9-39
9-28	Termination Signals Protocol Timing Diagram	9-40
9-29	Reservation On Local Bus	9-41
9-30	Reservation On Multilevel Bus Hierarchy	9-42
9-31	Retry Transfer Timing—Internal Arbiter	9-44
9-32	Retry Transfer Timing—External Arbiter	9-45
9-33	Retry On Burst Cycle	9-46
9-34	Basic Flow of an External Master Read Access	9-48
9-35	Basic Flow of an External Master Write Access	9-49
9-36	Peripheral Mode: External Master Reads from MPC555 / MPC556 — Two Wait States	9-50
9-37	Peripheral Mode: External Master Writes to MPC555 / MPC556; Two Wait States	9-51
9-38	Flow of Retry of External Master Read Access	9-53
9-39	Retry of External Master Access (Internal Arbiter)	9-54
9-40	Instruction Show Cycle Transaction	9-55
9-41	Data Show Cycle Transaction	9-56
10-1	Memory Controller Function Within the USIU	10-1
10-2	Memory Controller Block Diagram	10-2

Figure Number		Page Number
10-3	MPC555 / MPC556 Simple System Configuration	10-3
10-4	Bank Base Address and Match Structure	10-4
10-5	MPC555 / MPC556 GPCM–Memory Devices Interface	10-7
10-6	Memory Devices Interface Basic Timing (ACS = 00,TRLX = 0)	10-8
10-7	Peripheral Devices Interface	10-9
10-8	Peripheral Devices Basic Timing (ACS = 11,TRLX = 0)	10-9
10-9	Relaxed Timing–Read Access (ACS = 11, SCY = 1, TRLX = 1)	10-11
10-10	Relaxed Timing–Write Access (ACS = 10, SCY = 0, CSNT = 0, TRLX = 1)	10-12
10-11	Relaxed Timing–Write Access (ACS = 11, SCY = 0, CSNT = 1, TRLX = 1)	10-13
10-12	Relaxed Timing–Write Access (ACS = 00, SCY = 0, CSNT = 1, TRLX = 1	10-14
10-13	Consecutive Accesses (Write After Read, EHTR = 0)	10-15
10-14	Consecutive Accesses (Write After Read, EHTR = 1)	10-16
10-15	Consecutive Accesses (Read After Read From Different Banks, EHTR = 1)	10-17
10-16	Consecutive Accesses (Read After Read From Same Bank, EHTR = 1)	10-18
10-17	Aliasing Phenomena Illustration	10-23
10-18	Synchronous External Master Configuration For GPCM–Handled Memory Devices	10-25
10-19	Synchronous External Master Basic Access (GPCM controlled)	10-26
11-1	L2U Bus Interface Block Diagram	11-2
11-2	DMP Basic Functional Diagram	11-4
11-3	Region Base Address Example	11-6
12-1	UIMB Interface Module Block Diagram	12-2
12-2	IMB Clock – Full-Speed IMB Bus	12-3
12-3	IMB Clock – Half-Speed IMB Bus	12-3
12-4	Interrupt Synchronizer Signal Flow	12-4
12-5	Time-Multiplexing Protocol for IRQ pins	12-5
12-6	Interrupt Synchronizer Block diagram	12-6
13-1	QADC64 Block Diagram	13-1
13-2	QADC64 Input and Output Signals	13-3
13-3	Example of External Multiplexing	13-10
13-4	QADC64 Module Block Diagram	13-12
13-5	Conversion Timing	13-13
13-6	Bypass Mode Conversion Timing	13-13
13-7	QADC64 Queue Operation with Pause	13-16
13-8	QADC64 Clock Subsystem Functions	13-26



Figure Number

Page Number



13-9	QADC64 Clock Programmability Examples	13-28
13-10	QADC64 Interrupt Flow Diagram	13-30
13-11	Interrupt Levels on IRQ with ILBS	13-31
13-12	QADC64 Conversion Queue Operation	13-44
14-1	QSMCM Block Diagram	14-2
14-2	QSMCM Interrupt Levels	14-6
14-3	QSPI Interrupt Generation	14-7
14-4	QSPI Block Diagram	14-14
14-5	QSPI RAM	14-22
14-6	Flowchart of QSPI Initialization Operation	14-27
14-7	Flowchart of QSPI Master Operation (Part 1)	14-28
14-8	Flowchart of QSPI Master Operation (Part 2)	14-29
14-9	Flowchart of QSPI Master Operation (Part 3)	14-30
14-10	Flowchart of QSPI Slave Operation (Part 1)	14-31
14-11	Flowchart of QSPI Slave Operation (Part 2)	14-32
14-12	SCI Transmitter Block Diagram	14-42
14-13	SCI Receiver Block Diagram	14-43
14-14	Start Search Example	14-56
14-15	Queue Transmitter Block Enhancements	14-62
14-16	Queue Transmit Flow	14-64
14-17	Queue Transmit Software Flow	14-65
14-18	Queue Transmit Example for 17 Data Bytes	14-66
14-19	Queue Transmit Example for 25 Data Frames	14-67
14-20	Queue Receiver Block Enhancements	14-68
14-21	Queue Receive Flow	14-71
14-22	Queue Receive Software Flow	14-72
14-23	Queue Receive Example for 17 Data Bytes	14-73
15-1	MIOS1 Block Diagram	15-5
15-2	MIOS1 Memory Map	15-7
15-3	MCPSM Block Diagram	15-12
15-4	MMCSM Block Diagram	15-15
15-5	MDASM Block Diagram	15-19
15-6	MPWMSM Block Diagram	15-25
15-7	MPIOSM One-Bit Block Diagram	15-30
15-8	MIOS Interrupt Structure	15-32
15-9	MIOS1 Example: Double Capture Pulse Width Measurement	15-39
15-10	MIOS1 Example: Double Capture Period Measurement	15-40
15-11	MIOS1 Example: Double Edge Output Compare	15-41
15-12	MIOS1 Example: Pulse Width Modulation Output	15-43
16-1	TouCAN Block Diagram	16-1
16-2	Typical CAN Network	16-3
16-3	Extended ID Message Buffer Structure	16-4
16-4	Standard ID Message Buffer Structure	16-4

Figure Number

Page Number



16-5	Interrupt levels on IRQ with ILBS	16-20
16-6	TouCAN Message Buffer Memory Map	16-22
17-1	TPU3 Block Diagram	17-1
17-2	TPU3 Interrupt Levels	17-5
17-3	TCR1 Prescaler Control	17-7
17-4	TCR2 Prescaler Control	17-8
18-1	DPTRAM Configuration	18-2
18-2	DPTRAM Memory Map	18-3
19-1	CMF Array and Control Register Addressing	19-4
19-2	Shadow Information	19-16
19-3	Program State Diagram	19-20
19-4	Erase State Diagram	19-25
19-5	Pulse Status Timing	19-27
19-6	Censorship States and Transitions	19-35
19-7	EPEE Digital Filter and Latch	19-36
19-8	CMF_EPEE Timing Diagram	19-37
19-9	VPP and VDDL Power Switching	19-38
19-10	VPP Conditioning Circuit	19-39
20-1	SRAM Block Diagram	20-1
20-2	SRAM Memory Map	20-2
21-1	Watchpoints and Breakpoint Support in the CPU	21-10
21-2	Partially Supported Watchpoint/Breakpoint Example	21-15
21-3	Instruction Support General Structure	21-17
21-4	Load/Store Support General Structure	21-20
21-5	Functional Diagram of MPC555 / MPC556 Debug Mode Support	21-23
21-6	Debug Mode Logic	21-25
21-7	Debug Mode Reset Configuration	21-27
21-8	Asynchronous Clock Serial Communications	21-35
21-9	Synchronous Self Clock Serial Communication	21-36
21-10	Enabling Clock Mode Following Reset	21-37
21-11	Download Procedure Code Example	21-42
21-12	Slow Download Procedure Loop	21-42
21-13	Fast Download Procedure Loop	21-42
22-1	JTAG Pins	22-1
22-2	Test Logic Block Diagram	22-2
22-3	TAP Controller State Machine	22-4
22-4	Bypass Register	22-6
22-5	Output Pin Cell (O.pin)	22-8
22-6	Observe-Only Input Pin Cell (I.Obs)	22-8
22-7	Output Control Cell (IO.CTL)	22-9



22-8	General Arrangement of Bidirectional Pin Cells	22-9
D-1	TPU3 Memory Map	D-1
D-2	PTA Parameters	D-5
D-3	QOM Parameters	D-7
D-4	TSM Parameters — Master Mode	D-9
D-5	TSM Parameters — Slave Mode	D-10
D-6	FQM Parameters	D-12
D-7	UART Transmitter Parameters	D-14
D-8	UART Receiver Parameters	D-15
D-9	NITC Parameters	D-17
D-10	COMM Parameters (Part 1 of 2)	D-19
D-11	COMM Parameters (Part 2 of 2)	D-20
D-12	HALLD Parameters	D-21
D-13	MCPWM Parameters — Master Mode	D-23
D-14	MCPWM Parameters — Slave Edge-Aligned Mode	D-24
D-15	MCPWM Parameters — Slave Ch A Non-Inverted Center-Aligned Mode	D-25
D-16	MCPWM Parameters — Slave Ch B Non-Inverted Center-Aligned Mode	D-26
D-17	MCPWM Parameters — Slave Ch A Inverted Center-Aligned Mode	D-27
D-18	MCPWM Parameters — Slave Ch B Non-Inverted Center-Aligned Mode	D-28
D-19	FQD Parameters — Primary Channel	D-30
D-20	FQD Parameters — Secondary Channel	D-31
D-21	PPWA Parameters	D-33
D-22	OC Parameters	D-35
D-23	PWM Parameters	D-37
D-24	DIO Parameters	D-39
D-25	SPWM Parameters, Part 1 of 2	D-41
D-26	SPWM Parameters, Part 2 of 2	D-42
D-27	RWTPIN Parameters	D-44
D-28	ID Parameters	D-46
D-29	Two Possible SIOP Configurations	D-47
D-30	SIOP Parameters	D-49
D-31	SIOP Function Data Transition Example	D-53
E-1	MPC555 / MPC556 Family Power Distribution Diagram — 3 V	E-2
E-2	MPC555 / MPC556 Family Power Distribution Diagram — 5 V and Analog ..	E-3
E-3	Crystal Oscillator Circuit	E-4
E-4	RC Filter Example	E-5
E-5	Bypass Capacitors Example (Alternative)	E-6
E-6	RC Filter Example	E-6
E-7	LC Filter Example (Alternative)	E-7
E-8	PLL Off-Chip Capacitor Example	E-7

Figure Number

Page Number



G-1	CLKOUT Timing	G-16
G-2	External Clock Timing	G-23
G-3	Synchronous Output Signals Timing	G-24
G-4	Synchronous Active Pull-Up and Open Drain Outputs Signals Timing	G-25
G-5	Synchronous Input Signals Timing	G-26
G-6	Input Data Timing in Normal Case	G-27
G-7	External Bus Read Timing (GPCM Controlled — ACS = '00')	G-28
G-8	External Bus Read Timing (GPCM Controlled — TRLX = '0' ACS = '10') ..	G-29
G-9	External Bus Read Timing (GPCM Controlled — TRLX = '0' ACS = '11') ..	G-30
G-10	External Bus Read Timing (GPCM Controlled — TRLX = '1', ACS = '10', ACS = '11')	G-31
G-11	Address Show Cycle Bus Timing	G-32
G-12	Address and Data Show Cycle Bus Timing	G-33
G-13	External Bus Write Timing (GPCM Controlled — TRLX = '0', CSNT = '0') .	G-34
G-14	External Bus Write Timing (GPCM Controlled — TRLX = '0', CSNT = '1') .	G-35
G-15	External Bus Write Timing (GPCM Controlled — TRLX = '1', CSNT = '1') .	G-36
G-16	External Master Read from Internal Registers Timing	G-37
G-17	External Master Write to Internal Registers Timing	G-38
G-18	Interrupt Detection Timing for External Level Sensitive Lines	G-39
G-19	Interrupt Detection Timing for External Edge Sensitive Lines	G-40
G-20	Debug Port Clock Input Timing	G-41
G-21	Debug Port Timings	G-42
G-22	Reset Timing — Configuration from Data Bus	G-44
G-23	Reset Timing — Data Bus Weak Drive During Configuration	G-45
G-24	Reset Timing — Debug Port Configuration	G-46
G-25	JTAG Test Clock Input Timing	G-48
G-26	JTAG — Test Access Port Timing Diagram	G-49
G-27	JTAG — $\overline{\text{TRST}}$ Timing Diagram	G-50
G-28	Boundary Scan (JTAG) Timing Diagram	G-51
G-29	QSPI Timing — Master, CPHA = 0	G-55
G-30	QSPI Timing — Master, CPHA = 1	G-55
G-31	QSPI Timing — Slave, CPHA = 0	G-56
G-32	QSPI Timing — Slave, CPHA = 1	G-56
G-33	TPU3 Timing	G-58
G-34	MCPSM Enable to vs_pclk Pulse Timing Diagram	G-59
G-35	MPWMSM Minimum Output Pulse Example Timing Diagram	G-60
G-36	MCPSM Enable to MPWMO Output Pin Rising Edge Timing Diagram	G-61
G-37	MPWMSM Enable to MPWMO Output Pin Rising Edge Timing Diagram	G-61
G-38	MPWMSM Interrupt Flag to MPWMO Output Pin Falling Edge Timing Diagram	G-62
G-39	MMCSM Minimum Input Pin (Either Load or Clock) Timing Diagram	G-63
G-40	MMCSM Clock Pin to Counter Bus Increment Timing Diagram	G-63

Figure Number

Page Number



G-41	MMCSM Load Pin to Counter Bus Reload Timing Diagram	G-63
G-42	MMCSM Counter Bus Reload to Interrupt Flag Setting Timing Diagram	G-64
G-43	MMCSM Prescaler Clock Select to Counter Bus Increment Timing Diagram	G-64
G-44	MDASM Minimum Input Pin Timing Diagram	G-65
G-45	MDASM Input Pin to Counter Bus Capture Timing Diagram	G-66
G-46	MDASM Input Pin to MDASM Interrupt Flag Timing Diagram	G-66
G-47	MDASM Minimum Output Pulse Width Timing Diagram	G-66
G-48	Counter Bus to MDASM Output Pin Change Timing Diagram	G-67
G-49	Counter Bus to MDASM Interrupt Flag Setting Timing Diagram	G-67
G-50	MPIO SM Input Pin to MPIO SM_DR (Data Register) Timing Diagram	G-68
H-1	Typical Program Time vs. V_{PP} and Temperature (for CDR1 "Target" Process)	H-2

