

Product Brief

MPC535PB/D
Rev. 0, 2/2003

MPC535/MPC536
Product Brief



This document provides an overview of the MPC535/MPC536 microcontrollers, including a block diagram showing the major modular components, sections that list the major features, and differences between the MPC535/MPC536 and the MPC555. The MPC535 and MPC536 devices are members of the Motorola MPC500 RISC Microcontroller family. The parts herein will be referred to only as MPC535 unless specific parts need to be referenced.

Table 1. MPC535/MPC536 Features

Device	Flash	Code Compression
MPC535	1 Mbyte	Code compression not supported
MPC536	1 Mbyte	Code compression supported

1 Introduction

The MPC535 device offers the following features:

- PowerPC™ core with a floating point unit (FPU) and a burst buffer controller (BBC)
- Unified system integration unit (USIU), a flexible memory controller, and improved interrupt controller
- 1 Mbyte of Flash memory (UC3F)
 - Typical endurance of 100,000 write/erase cycles @ 25°C
 - Typical data retention of 100 years @ 25°C
- 36 Kbytes of static RAM (two CALRAM modules)
 - 8 Kbytes of normal access or overlay access (sixteen 512-byte regions)
 - 4 Kbytes in CALRAM A, 4 Kbytes in CALRAM B
- A 22-timer channel modular I/O system (MIOS14)
 - Same as MIOS1 plus a real-time clock sub-module (MRTCSM), 4 counter sub-modules (MCSM), and 4 PWM sub-modules (MPWMSM)
- One TouCAN module (TouCAN_B)
- One enhanced queued analog to digital converter (QADC64E A).
- One queued serial multi-channel module (QSMCM A) which contains a queued serial peripheral interface (QSPI) and two serial controller interfaces (SCI/UART)
- -40°C – 85°C ambient temperature

Block Diagram

- Debug features:
 - A Nexus debug port (class 3) – IEEE-ISTO 5001-1999
 - JTAG and background debug mode (BDM)
- Packaging and Electrical

1.1 Block Diagram

Figure 1 is a block diagram of the MPC535.

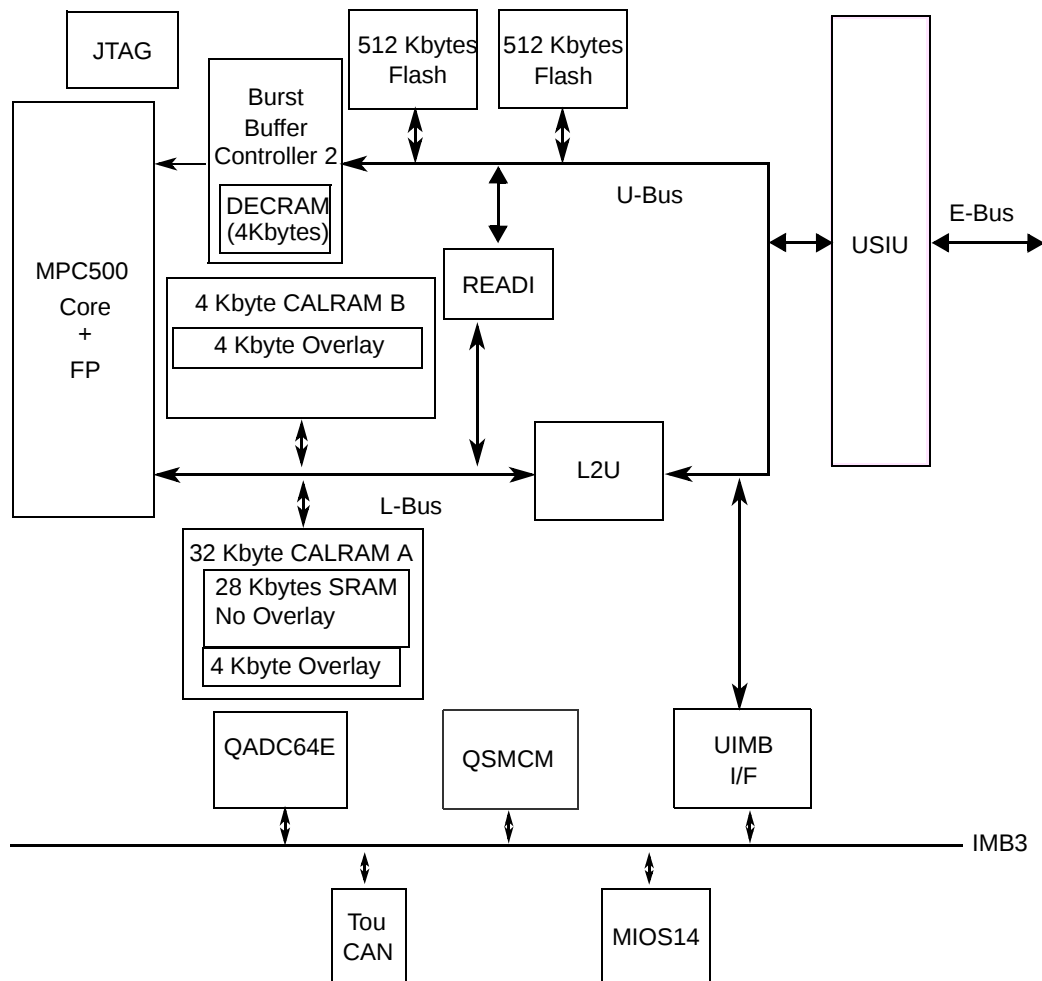


Figure 1. MPC535 Block Diagram

1.2 Detailed Feature List

The MPC535 key features are explained in the following sections.

1.2.1 High Performance CPU System

- Fully static design
- Four major power saving modes
 - On, doze, sleep, deep-sleep and power-down

1.2.2 RISC MCU Central Processing Unit (RCPU)

- High-performance core
 - PowerPC single issue integer core
 - Precise exception model
 - Floating point
 - Code compression (MPC536 only)
 - Compression reduces usage of internal or external Flash memory
 - Compression optimized for automotive (non-cached) applications
 - New compression scheme decreases code size to 40% –50% of source

1.2.3 MPC500 System Interface (USIU)

- MPC500 system interface (USIU, BBC, L2U)
- Periodic interrupt timer, bus monitor, clocks, decremter and time base
- Clock synthesizer, power management, reset controller
- External bus tolerates 5-V inputs, provides 2.6-V outputs
- Enhanced interrupt controller supports a separate interrupt vector for up to eight external and 40 internal interrupts
- IEEE 1149.1 JTAG test access port
- Bus supports multiple master designs
- USIU supports dual-mapping of Flash to move part of internal Flash memory to external bus for development
- External bus, supporting non-wraparound burst for instruction fetches, with up to 8 instructions per memory cycle

1.2.4 Burst Buffer Controller (BBC) Module

- Exception vector table relocation features allow exception table to be relocated to following locations:
 - 0x0000 0000 - 0x0000 1FFF (normal MPC500 exception table location)
 - 0x0001 0000 - 0x0001 1FFF (0 + 64 Kbytes; second page of internal Flash)
 - Second internal Flash module
 - Internal SRAM
 - 0x0FFF_0100 (external memory space; normal MPC500 exception table location)

1.2.5 Flexible Memory Protection Unit

- Flexible memory protection units in BBC (IMPU) and L2U (DMPU)
- Default attributes available in one global entry
- Attribute support for speculative accesses

1.2.6 Memory Controller

- Flexible chip selects via memory controller
- 24-bit address and 32-bit data buses
- 4- to 16-Mbyte (data) or 4-Gbyte (instruction) region size support
- Four-beat transfer bursts, two-clock minimum bus transactions
- Use with SRAM, EPROM, Flash and other peripherals
- Byte selects or write enables
- 32-bit address decodes with bit masks
- Four instruction regions
- Four data regions

1.2.7 1 Mbyte of CDR3 Flash EEPROM Memory (UC3F)

- 1 Mbyte Flash
 - Two UC3F modules, 512 Kbytes each
- Page mode read
- Block (64-Kbyte) erasable
- External 4.75- to 5.25-V VPP program and erase power supply
- Typical endurance of 100,000 write/erase cycles @ 25°C
- Typical data retention of 100 years @ 25°C

1.2.8 36-Kbyte Static RAM (CALRAM)

- 36-Kbyte static calibration RAM
 - Composed of 4-Kbyte and 32-Kbyte CALRAM modules
- Fast access: one clock
- Keep-alive power
- Soft defect detection (SDD)
- 4 Kbyte calibration (overlay) RAM per module (8 Kbytes total)
- Eight 512-byte overlay regions per module (16 regions total)

1.2.9 General Purpose I/O Support (GPIO)

- General-purpose I/O support
- Address (24) and data (32) pins can be used as GPIO in single-chip mode
- 16 GPIO in MIOS14
- Many peripheral pins can be used as GPIO when not used as primary functions
- 5-V outputs with slew rate control

1.2.10 Debug Features

- Extensive system debug support
- On-chip watchpoints and breakpoints
- Program flow tracking
- Background debug mode (BDM)

1.2.10.1 Nexus Debug Port (Class 3)

- Nexus/IEEE – ISTO 5001-1999 debug port (Class 3)
- Nine- or 16-pin interface

1.2.11 Integrated I/O System

- True 5-V I/O

1.2.11.1 22-Channel Modular I/O System (MIOS14)

- 22-channel MIOS timer (MIOS14)
- Six modulus counter submodules (MCSM)
 - Four additional MCSM submodules compared to MIOS1
- 10 double action submodules (DASM).
- 12 dedicated PWM submodules (PWMSM)
 - Four additional PWM submodules compared to MIOS1 (shared with MIOS GPIO pins)
- MIOS real-time clock submodule (MRTCSCM) provides low power clock/counter
 - Requires external 32-KHz crystal
 - Uses four pins: two for 32-KHz crystal, two for power/ground.

1.2.12 One Enhanced Queued Analog-to-Digital Converter Module (QADC64E)

- One enhanced queued analog to digital converter (QADC64E A) with 16 total analog channels.
- 10 bit A/D converter with internal sample/hold
 - Typical conversion time is 4 μ s (250-Kbyte samples/sec)
 - Two conversion command queues of variable length
- Automated queue modes initiated by:
 - External edge trigger/level gate
 - Software command
 - Periodic/interval timer, assignable to both queue 1 and 2
- 64 result registers
 - Output data is right or left justified, signed or unsigned
- Conversions alternate reference (ALTREF) pin. This pin can be connected to a different reference voltage

1.2.13 One CAN 2.0B Controller (TouCAN) Module

- One TouCAN module (TouCAN_B)
- 16 message buffers, programmable I/O mode
- Maskable interrupts
- Programmable loopback for self-test operation
- Independent of the transmission medium (external transceiver is assumed)
- Open network architecture, multimaster concept

Detailed Feature List

- High immunity to EMI
- Short latency time for high-priority messages
- Low power sleep mode, with programmable wake up on bus activity

1.2.14 Queued Serial Multi-Channel Module (QSMCM)

- One queued serial module with one queued-SPI and two SCI (QSMCM_A)
 - QSMCM_A matches full MPC555 QSMCM functionality
- Queued-SPI
 - Provides full-duplex communication port for peripheral expansion or interprocessor communication
 - Up to 32 preprogrammed transfers, reducing overhead
 - Synchronous serial interface with baud rate of up to system clock / 4
 - Four programmable peripheral-select pins support up to 16 devices
 - Special wrap-around mode allows continuous sampling of a serial peripheral for efficient interfacing to serial analog-to-digital (A/D) converters
- SCI
 - UART mode provides NRZ format and half- or full-duplex interface
 - 16 register receive buffer and 16 register transmit buffer on one SCI
 - Advanced error detection, and optional parity generation and detection
 - Word length programmable as 8 or 9 bits
 - Separate transmitter and receiver enable bits, and double buffering of data
 - Wake-up functions allow the CPU to run uninterrupted until either a true idle line is detected, or a new address byte is received

1.2.15 Electrical Specifications and Packaging

- 40 MHz operation
- -40°C – 85°C ambient temperature
- 2.6 V $\pm$ 0.1 V external bus
 - External bus is compatible with external memory devices operating from 2.5 V to 3.4 V.
 - Extended voltage range (2.7 – 3.4 V) degrades data drive timing by 1.1 ns on data writes.
- 2.6 $\pm$ 0.1 V internal logic
- 5-V I/O (5.0 $\pm$ 0.25 V)
- Plastic ball grid array (PBGA) packaging
 - 388 ball PBGA
 - 27 mm x 27 mm body size
- 1.0 mm ball pitch

1.3 MPC535 Optional Features

The following features of the MPC535 are optional features and may not appear in certain configurations:

- 40-MHz operation
- MPC536 supports code compression

2 Differences between the MPC535 and the MPC555

The MPC535 is an enhanced version of the MPC555. Most functional features of the MPC555 are unchanged on the MPC535. Table 2 shows the high level differences.

Table 2. Differences Between Modules of the MPC555 and the MPC535

Module	MPC555	MPC535
CPU Core	No Change	
BBC	BBC	BBC with improved code compression ¹
L2U	No Change	
SRAM	26-Kbytes	36-Kbyte CALRAM with overlay features
Flash	448-Kbyte CMF	1-Mbyte UC3F (new programming, etc.)
USIU	USIU	USIU with enhanced interrupt controller
JTAG	No Change	
READI	None	New Module
UIMB	No Change	
QADC64	2 QADC64 (16 channels on each QADC for 32 total channels)	1 QADC64E (16 channels accessible)
QSMCM	(1) No Change (1)	
MIOS	MIOS1	MIOS14: MIOS1 with real-time clock (MRTCSM), 4 more PWMSMs and 4 more MCSMs
TouCAN	(2) No Change (1)	
Power Supplies		
—	40 MHz with two power supplies: nominal 3.3-V to 5.0-V power supplies	40 MHz with two power supplies: 5.0-V I/O, 2.6-V internal logic

¹ Available on some options.

2.1 Additional MPC535 Differences

The following are additional differences between the MPC555 and the MPC535.

- SPI (MISO, MOSI, and SCK) pin drive.
 - MPC535 provides 21-ns rise/fall with 200-pf load using CMOS (20%/70%) levels
- GPIO on MODCK1 pin outputs only 2.6 V
 - MODCK1 pin is in keep-alive power section with no 5-V rail available
 - 5.0-V compatibility modes
 - Input is 5-V friendly
 - 2.6-V output has less slew rate control
 - 2.6-V: V_{OH} = 2.3 V
- Power supplies for external bus pins
 - QVDDL is quiet supply to hold non-switching outputs quiet even when noisy supply (NVDDL) sags
 - QVDDL supplies pre-drive and other pad logic
 - NVDDL only supplies final PMOS driver stage
 - QVDDL and NVDDL shorted on customer board after filtering
- Pull-up and pull-down changes during PORESET and HRESET
 - All 2.6-V/5-V pads (external bus: address/data/control) pull down at reset
 - All 5-V pads pull up at reset
 - Additional control granularity in the PDMCR register
- No pull-ups on QSMCM SCI receive pads
- A_RXD1_QGPI1, A_RXD2_QGPI2 pins do not have weak pull-up during reset or any other time
- CLKOUT has 3 drive strength options
 - Better matches drive to requirements to reduce EMI
 - 25, 50, 100 pf instead of 45 and 90 pf
- Change reset value of ENGCLK to maximum divide (crystal/128)
 - For a 4-MHz crystal, this is 31.25 KHz
 - ENGCLK is selectable between 2.6 V and 5 V
- A daisy chain between UC3F modules allows either module to provide the reset configuration word (RCW)
- Censorship operation
 - A RCW bit controls whether or not the entire UC3F can be erased while censorship is violated
- BBC SPRs (PPC regs) access in two clocks instead of one clock
- CALRAM internal protection block size is 8 Kbytes
 - Instead of 4 Kbytes on MPC555 LRAM
- CALRAM causes machine check exception instead of data storage interrupt (DSI) exception in certain cases
 - For non-overlay CPU core accesses, a DSI exception is taken
 - For overlay accesses and any non-core access (slave mode), a machine check exception is taken

- CALRAM causes DSI exception only if the data relocation (DR) bit in the core machine state register, MSR[DR], is set.
 - L2U on MPC555 already followed this protocol, but the LRAM did not. Now all L-bus peripherals follow this protocol.
 - The MSR[DR] bit is described in the reference manual for more information.
- Four additional PRDS control bits were added to the USIU to allow more granularity of PRDS control on a part
- BBC includes a 4-Kbyte DECRAM that can be used if compression is not used or is not available.

3 SRAM Keep-Alive Power Behavior

The SRAM has three keep-alive power pins (VDDSRAM1, VDDSRAM2, and VDDSRAM3). These pins provide keep-alive power to the SRAM arrays in the CALRAM modules.

The VDDSRAM1 pin powers the 32-Kbyte CALRAM A during keep-alive while power is off to the MPC535 (except for the keep-alive power supplies). CALRAM A keeps all of its 32 Kbytes powered during power down.

The VDDSRAM2 pin powers the 4-Kbyte CALRAM B module. The CALRAM modules only power their arrays from the VDDSRAM pins during keep-alive. During normal operation, they are powered by the normal internal VDD of the part.

The 4-Kbyte DECRAM in the BBC module power its arrays via the VDDSRAM3 pin during keep-alive and are supplied by VDD during normal operation.

4 MPC535 Memory Map

The internal memory map is organized as a single 4-Mbyte block. This is shown in Figure 3. This block can be moved to one of eight different locations. The internal memory space is divided into the following sections:

- Flash memory (1 Mbyte) — U-bus memory
- Static RAM memory (36 Kbytes CALRAM) — L-bus memory
- Control registers and IMB3 modules (64 Kbytes), partitioned as
 - USIU and flash control registers
 - UIMB interface and IMB3 modules
 - CALRAM and READI control registers (L-bus control register space)

The internal memory block can reside in one of eight possible 4-Mbyte memory spaces. These eight locations are the first eight 4-Mbyte memory blocks starting with address 0x0000 0000, as shown in Figure 2. There is a user programmable register in the USIU to configure the internal memory map to one of the eight possible locations. Programmability of internal memory map location allows multiple chip system.

The IMB3 address space block in Figure 3 shows memory allocation for IMB3 modules. It does not show the actual memory space required for individual modules. All modules are mapped to the low address, numerically, of the memory allocated for that module in the IMB3 address space.

Additional MPC535 Differences

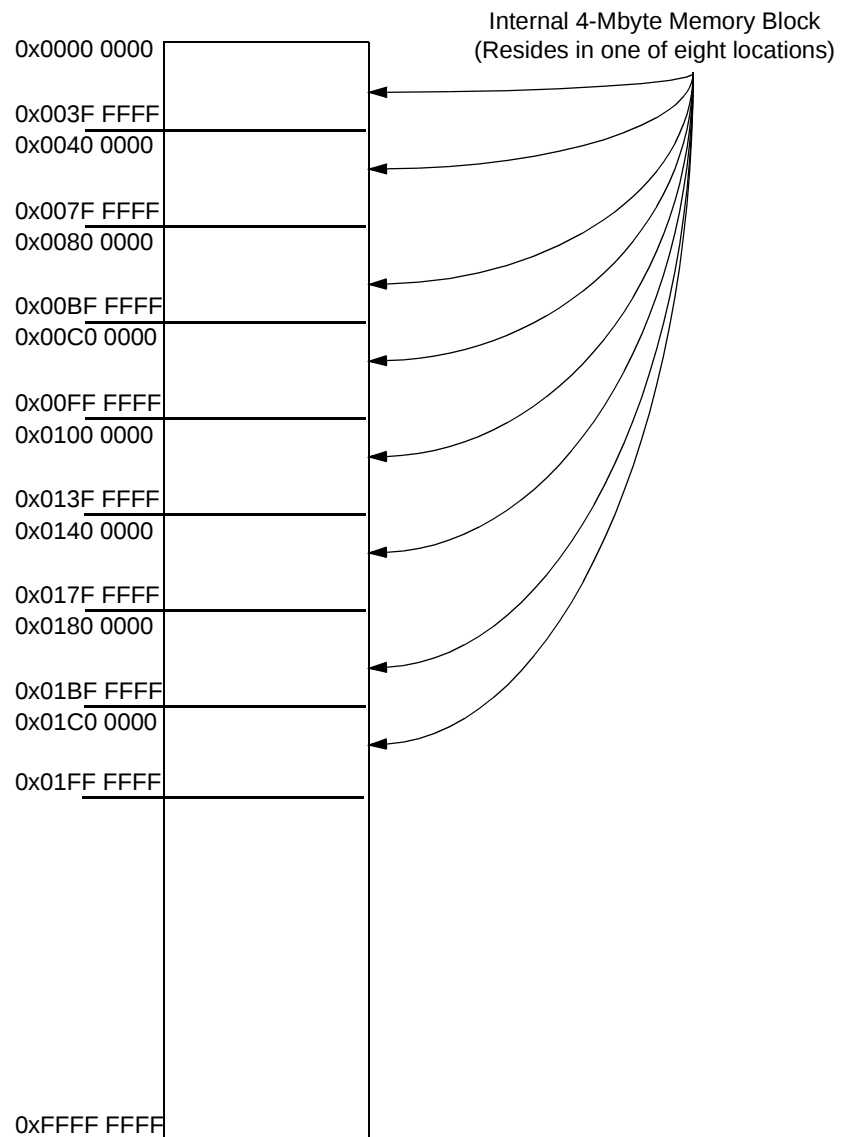


Figure 2. Memory Map

0x00 0000	UC3F_A Flash	USIU Control Registers	0x2F C000
0x07 FFFF	512 Kbytes	UC3F_A Control (64 bytes)	0x2F C800
0x08 0000	UC3F_B Flash	UC3F_B Control (64 bytes)	0x2F C840
0x0F FFFF	512 Kbytes		0x2F C87F
0x10 0000	Reserved for Flash (2,016 Kbytes)		
0x2F 7FFF			0x30 0000
0x2F 8000	DECRAM	Reserved* (144 bytes)	
0x2F 8FFF	4 Kbytes		0x30 0080
0x2F 9000	Reserved		
0x2F 9FFF		Reserved (3952 bytes)	0x30 0090
0x2F A000	BBC Control Registers		
0x2F BFFF	8 Kbytes		
0x2F C000	USIU & Flash Control	Reserved* (10 Kbytes)	0x30 1000
0x2F FFFF	16 Kbytes		0x30 2000
0x30 0000		Reserved (2 Kbytes)	0x30 3800
	UIMB I/F & IMB Modules		
	32 Kbytes	Reserved* (2 Kbytes)	0x30 4000
0x30 7FFF			0x30 4400
0x30 8000	Reserved for IMB	QADC64_A (1 Kbytes)	0x30 4800
0x37 FFFF	480 Kbytes	Reserved* (1 Kbytes)	0x30 4C00
0x38 0000	CALRAM/	QSMCM_A (1 Kbytes)	0x30 5000
	Readi Control	Reserved* (1 Kbytes)	0x30 5400
0x38 00FF	256 bytes	Reserved (1 Kbytes)	0x30 5800
0x38 0100	Reserved (L-bus Control)	Reserved* (1 Kbytes)	0x30 5C00
0x38 3FFF	~32 Kbytes		
0x38 4000		MIOS14 (4 Kbytes)	0x30 6000
	Reserved (L-bus Mem)	Reserved* (1 Kbytes)	0x30 7000
	444 Kbytes	TOUCAN_B (1 Kbytes)	0x30 7400
0x3F 6FFF		Reserved* (1 Kbytes)	0x30 7800
0x3F 7000	All 4-Kbytes can be Overlay Section	Reserved (896 bytes)	0x30 7900
0x3F 7FFF	CALRAM_B (4 Kbyte)	UIMB Control Registers (128 bytes)	0x30 7F80
0x3F 8000			0x30 7FFF
	CALRAM_A (32 Kbyte)		

0x3F FFFF	4-Kbyte Overlay Section		

Note: Reserved, do not write to this space.

Figure 3. Internal Memory Block

5 MPC535 Pinout Diagram

Figure 4 shows the pinout for the MPC535.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
A	VDD	VSS	VRH	VRL	VSS	VSS	AN48 A_PQB4	AN53 A_MA1_PQA1	VDDA	VSSA	VSS	VSS	VSS	VSS	QVDDL	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS
B	VSS	VDD	AN44 ANW A_PQB0	ALTRF	VSS	VSS	AN48 A_PQB5	AN52 A_MA0_PQA0	AN56 A_PQA4	AN58 A_PQA6	VSS	VSS	VSS	VSS	QVDDL	ETRIG2	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VDD
C	VDDRTC	VSS	VDD	AN45 ANX A_PQB1	VSS	VSS	AN46 ANX A_PQB2	AN50 A_PQB6	AN54 A_PQA2	AN57 A_PQA5	VSS	VSS	VSS	VSS	QVDDL	ETRIG1 B_CNRY0	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS
D	EXTAL32	VDDSRAM2	VSS	VDD	VDDH	VSS	AN82 ANZ A_PQB3	AN87 ANZ A_PQB7	AN51 A_PQA3	AN55 A_PQA7	VSS	VSS	VSS	VSS	QVDDL	VDDH	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS
E	XTAL32	B_CNTX0	VDDSRAM1	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	MPWM17
F	VSSRTC	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	MDA13
G	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	MDA29
H	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	MPWM1
J	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	MPWM20 MPO 32B11
K	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	MPO 32B13
L	MDI_0	TDI_DSCK	MDI_1	MCKI	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VFO MPIO 32B0
M	TDI_DS	TDI_DS	TDI_DS	MDI_1	MCKI	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	MPWM4 MPIO 32B5
N	TMS	MDI_4	MDI_6	MDI_5	MDI_0	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VFLS0 MPIO 32B3
P	MDI_7	JCOMP	MCKO	MDI_0	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VFLS1 MPIO 32B4
R	MDI_1	TDI_DS	MDI_2	MDI_1	MDI_0	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS
T	MDI_3	MSEO	MDI_0	MDI_1	MDI_0	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	A_SCK QSPI06 (CFG_CU4)
U	ADDR_SGPIOA16	ADDR_SGPIOA17	ADDR_SGPIOA18	ADDR_SGPIOA19	ADDR_SGPIOA20	ADDR_SGPIOA21	ADDR_SGPIOA22	ADDR_SGPIOA23	ADDR_SGPIOA24	ADDR_SGPIOA25	ADDR_SGPIOA26	ADDR_SGPIOA27	ADDR_SGPIOA28	ADDR_SGPIOA29	ADDR_SGPIOA30	ADDR_SGPIOA31	ADDR_SGPIOA32	ADDR_SGPIOA33	ADDR_SGPIOA34	ADDR_SGPIOA35	ADDR_SGPIOA36	ADDR_SGPIOA37	ADDR_SGPIOA38	ADDR_SGPIOA39	ADDR_SGPIOA40	
V	ADDR_SGPIOA42	ADDR_SGPIOA43	ADDR_SGPIOA44	ADDR_SGPIOA45	ADDR_SGPIOA46	ADDR_SGPIOA47	ADDR_SGPIOA48	ADDR_SGPIOA49	ADDR_SGPIOA50	ADDR_SGPIOA51	ADDR_SGPIOA52	ADDR_SGPIOA53	ADDR_SGPIOA54	ADDR_SGPIOA55	ADDR_SGPIOA56	ADDR_SGPIOA57	ADDR_SGPIOA58	ADDR_SGPIOA59	ADDR_SGPIOA60	ADDR_SGPIOA61	ADDR_SGPIOA62	ADDR_SGPIOA63	ADDR_SGPIOA64	ADDR_SGPIOA65	ADDR_SGPIOA66	
W	ADDR_SGPIOA69	ADDR_SGPIOA70	ADDR_SGPIOA71	ADDR_SGPIOA72	ADDR_SGPIOA73	ADDR_SGPIOA74	ADDR_SGPIOA75	ADDR_SGPIOA76	ADDR_SGPIOA77	ADDR_SGPIOA78	ADDR_SGPIOA79	ADDR_SGPIOA80	ADDR_SGPIOA81	ADDR_SGPIOA82	ADDR_SGPIOA83	ADDR_SGPIOA84	ADDR_SGPIOA85	ADDR_SGPIOA86	ADDR_SGPIOA87	ADDR_SGPIOA88	ADDR_SGPIOA89	ADDR_SGPIOA90	ADDR_SGPIOA91	ADDR_SGPIOA92	ADDR_SGPIOA93	
Y	ADDR_SGPIOA96	ADDR_SGPIOA97	ADDR_SGPIOA98	ADDR_SGPIOA99	ADDR_SGPIOA100	ADDR_SGPIOA101	ADDR_SGPIOA102	ADDR_SGPIOA103	ADDR_SGPIOA104	ADDR_SGPIOA105	ADDR_SGPIOA106	ADDR_SGPIOA107	ADDR_SGPIOA108	ADDR_SGPIOA109	ADDR_SGPIOA110	ADDR_SGPIOA111	ADDR_SGPIOA112	ADDR_SGPIOA113	ADDR_SGPIOA114	ADDR_SGPIOA115	ADDR_SGPIOA116	ADDR_SGPIOA117	ADDR_SGPIOA118	ADDR_SGPIOA119	ADDR_SGPIOA120	
AA	ADDR_SGPIOA123	ADDR_SGPIOA124	ADDR_SGPIOA125	ADDR_SGPIOA126	ADDR_SGPIOA127	ADDR_SGPIOA128	ADDR_SGPIOA129	ADDR_SGPIOA130	ADDR_SGPIOA131	ADDR_SGPIOA132	ADDR_SGPIOA133	ADDR_SGPIOA134	ADDR_SGPIOA135	ADDR_SGPIOA136	ADDR_SGPIOA137	ADDR_SGPIOA138	ADDR_SGPIOA139	ADDR_SGPIOA140	ADDR_SGPIOA141	ADDR_SGPIOA142	ADDR_SGPIOA143	ADDR_SGPIOA144	ADDR_SGPIOA145	ADDR_SGPIOA146	ADDR_SGPIOA147	
AB	ADDR_SGPIOA150	ADDR_SGPIOA151	ADDR_SGPIOA152	ADDR_SGPIOA153	ADDR_SGPIOA154	ADDR_SGPIOA155	ADDR_SGPIOA156	ADDR_SGPIOA157	ADDR_SGPIOA158	ADDR_SGPIOA159	ADDR_SGPIOA160	ADDR_SGPIOA161	ADDR_SGPIOA162	ADDR_SGPIOA163	ADDR_SGPIOA164	ADDR_SGPIOA165	ADDR_SGPIOA166	ADDR_SGPIOA167	ADDR_SGPIOA168	ADDR_SGPIOA169	ADDR_SGPIOA170	ADDR_SGPIOA171	ADDR_SGPIOA172	ADDR_SGPIOA173	ADDR_SGPIOA174	
AC	ADDR_SGPIOA177	ADDR_SGPIOA178	ADDR_SGPIOA179	ADDR_SGPIOA180	ADDR_SGPIOA181	ADDR_SGPIOA182	ADDR_SGPIOA183	ADDR_SGPIOA184	ADDR_SGPIOA185	ADDR_SGPIOA186	ADDR_SGPIOA187	ADDR_SGPIOA188	ADDR_SGPIOA189	ADDR_SGPIOA190	ADDR_SGPIOA191	ADDR_SGPIOA192	ADDR_SGPIOA193	ADDR_SGPIOA194	ADDR_SGPIOA195	ADDR_SGPIOA196	ADDR_SGPIOA197	ADDR_SGPIOA198	ADDR_SGPIOA199	ADDR_SGPIOA200	ADDR_SGPIOA201	
AD	ADDR_SGPIOA204	ADDR_SGPIOA205	ADDR_SGPIOA206	ADDR_SGPIOA207	ADDR_SGPIOA208	ADDR_SGPIOA209	ADDR_SGPIOA210	ADDR_SGPIOA211	ADDR_SGPIOA212	ADDR_SGPIOA213	ADDR_SGPIOA214	ADDR_SGPIOA215	ADDR_SGPIOA216	ADDR_SGPIOA217	ADDR_SGPIOA218	ADDR_SGPIOA219	ADDR_SGPIOA220	ADDR_SGPIOA221	ADDR_SGPIOA222	ADDR_SGPIOA223	ADDR_SGPIOA224	ADDR_SGPIOA225	ADDR_SGPIOA226	ADDR_SGPIOA227	ADDR_SGPIOA228	
AE	QVDDL	QVDDL	VSS	VDD	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS
AF	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS

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NOTE: This is a top down view of the balls.

Figure 4. MPC535 Pinout Diagram

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