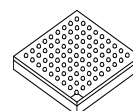


## MCF5253



**Package Information**  
MAPBGA-225

# MCF5253 ColdFire® Microprocessor Data Sheet

Ordering Information: See [Table 1 on page 2](#)

## 1 Introduction

This document provides an overview of the MCF5253 ColdFire processor and general descriptions of the MCF5253 features and modules. Also provided are electrical specifications, pin assignments, and package diagrams for MCF5253 ColdFire® processor. For functional characteristics, refer to the *MCF5253 Reference Manual* (MCF5253RM).

The MCF5253 is a general purpose system controller with over 125 Dhrystone 2.1 MIPS @ 140 MHz performance. The integrated peripherals and EMAC allow the MCF5253 to replace both the microcontroller and the DSP in certain applications. Most peripheral pins can also be remapped as general purpose I/O pins.

Low power features include flexible PLL (with power-down mode) with dynamic clock switching, a hardwired CD ROM decoder, advanced 0.13 µm CMOS process technology, 1.2 V core power supply, and on-chip 128K-byte SRAM.

|     |                                  |    |
|-----|----------------------------------|----|
| 1   | Introduction                     | 1  |
| 1.1 | Orderable Part Numbers           | 2  |
| 1.2 | Block Diagram                    | 3  |
| 2   | Functional Description           | 4  |
| 2.1 | Version 2 ColdFire Core          | 4  |
| 2.2 | Module Inventory                 | 4  |
| 3   | Signal Description               | 6  |
| 4   | Electrical Specifications        | 11 |
| 4.1 | SDRAM Bus Timing                 | 16 |
| 4.2 | SPDIF Timing                     | 17 |
| 4.3 | Serial Audio Interface Timing    | 17 |
| 4.4 | DDATA/PST/PSTCLK Debug Interface | 17 |
| 4.5 | BDM and JTAG Timing              | 18 |
| 5   | Power Consumption                | 19 |
| 6   | Package Information and Pinout   | 19 |
| 6.1 | Pin Assignment                   | 20 |
| 6.2 | Package Drawing                  | 26 |
| 7   | Product Documentation            | 33 |
| 7.1 | Revision History                 | 33 |

# Introduction

For additional information regarding software drivers and applications, refer to <http://www.freescale.com/coldfire>.

## 1.1 Orderable Part Numbers

Table 1 lists the orderable part numbers for the MCF5253 processor.

**Table 1. Orderable Part Numbers**

| Orderable Part Number | Maximum Clock Frequency | Package Type | Operating Temperature Range | Part Status |
|-----------------------|-------------------------|--------------|-----------------------------|-------------|
| MCF5253VM140          | 140 MHz                 | 225 MAPBGA   | -20 to +70°C                | Lead free   |
| MCF5253CVM140         |                         |              | -40 to +85°C                |             |

## 1.2 Block Diagram

Figure 1 illustrates the functional block diagram of the MCF5253 processor.

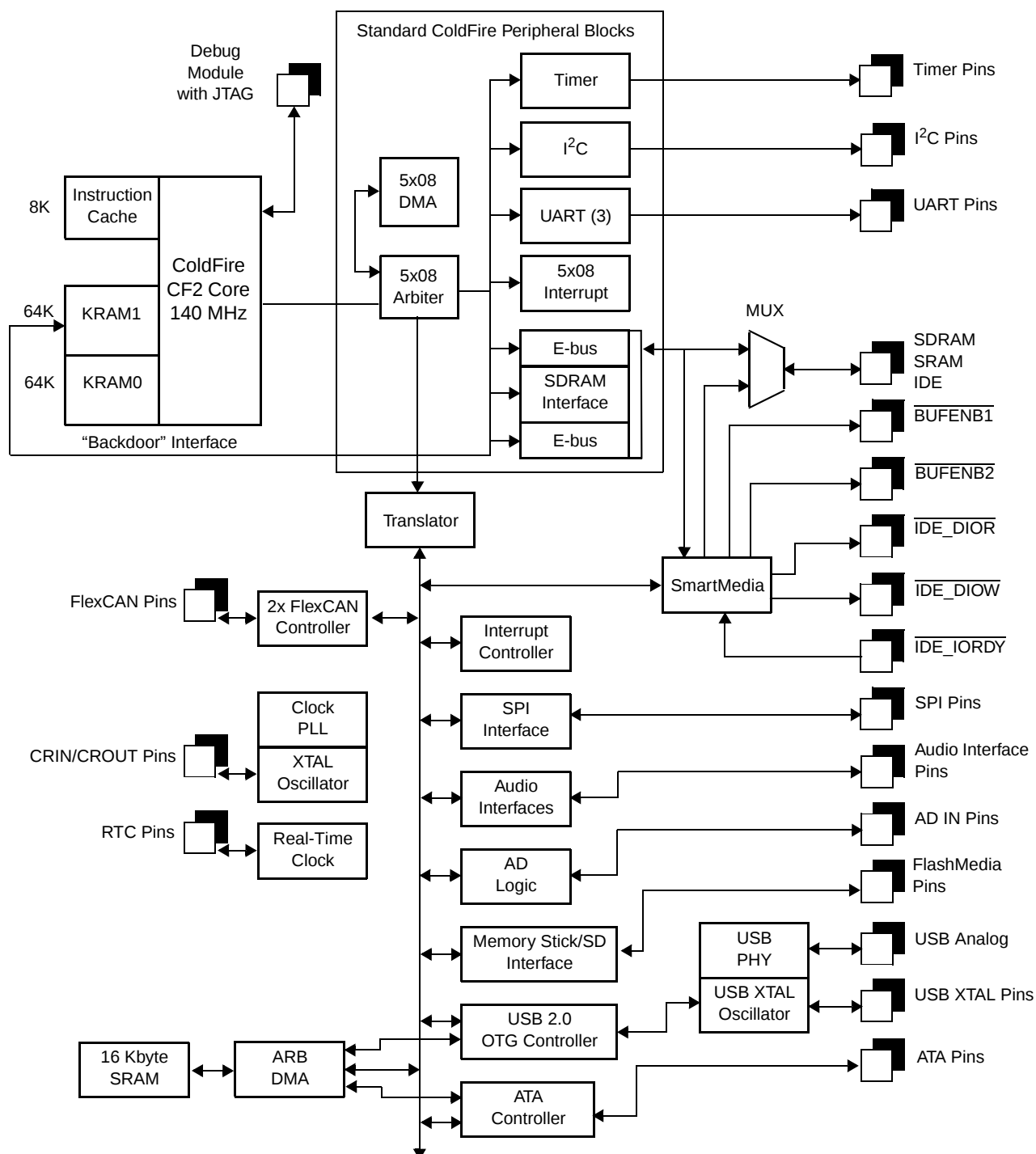


Figure 1. MCF5253 Block Diagram

## 2 Functional Description

### 2.1 Version 2 ColdFire Core

The Version 2 ColdFire (CF2) core consists of two independent, decoupled pipeline structures to maximize performance while minimizing core size. The instruction fetch pipeline (IFP) is a two-stage pipeline for prefetching instructions. The prefetched instruction stream is then gated into the two-stage operand execution pipeline (OEP), which decodes the instruction, fetches the required operands, and then executes the required function.

### 2.2 Module Inventory

Table 2 shows an alphabetical listing of the modules in the processor.

Table 2. Digital and Analog Modules

| Block Mnemonic | Block Name                                           | Functional Grouping         | Brief Description                                                                                                                                                                                                |
|----------------|------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ATA            | Advanced Technology Attachment Controller            | Connectivity Peripheral     | The ATA block is an AT attachment host interface. Its main use is to interface with IDE hard disc drives and ATAPI optical disc drives.                                                                          |
| ADC            | Battery Level/Keypad Analog/Digital Converter        | Analog Input                | The six-channel ADC is based on the Sigma-Delta concept with 12-bit resolution. Both the analog comparator and digital sections are integrated in the MCF5253.                                                   |
| AB             | Audio Bus                                            | Audio Interface             | The audio interfaces connect to an internal bus that carries all audio data. Each receiver places its received data on the audio bus and each transmitter takes data from the audio bus for transmission.        |
| AIM            | Audio Interface                                      | Audio Interface             | The audio interface module provides the necessary input and output features to receive and transmit digital audio signals over serial audio interfaces (IIS/EIAJ) and over digital audio interfaces (IEC958).    |
| BROM           | Bootloader                                           | Boot ROM                    | The MCF5253 incorporates a ROM Bootloader, which enables booting from UART, I2C, SPI, or IDE devices.                                                                                                            |
| FlexCAN        | Twin Controller Area Network 2.0B Communication Unit | Connectivity Peripheral     | The FlexCan module is a full implementation of the Bosch CAN protocol specification 2.0B, which supports both standard and extended message frames.                                                              |
| CSM            | Chip Select Module                                   | Connectivity Peripheral     | Three programmable chip-select outputs ( $\overline{CS0}/\overline{CS4}$ , $\overline{CS1}$ , and $\overline{CS2}$ ) provide signals that enable glueless connection to external memory and peripheral circuits. |
| DMAC           | Direct Memory Access Controller Module               | Connectivity Peripheral     | There are four fully programmable DMA channels for quick data transfer.                                                                                                                                          |
| eMAC           | enhanced Multiply Accumulate Module                  | Core                        | The integrated eMAC unit provides a common set of DSP operations and enhances the integer multiply instructions in the ColdFire architecture.                                                                    |
| MBUS           | Memory Bus Interface                                 | Bus Operation               | The bus interface controller transfers data between the ColdFire core or DMA and memory, peripherals, or other devices on the external bus.                                                                      |
| MMC/SD         | Multimedia Card/Secure Digital Interface             | Flash Memory Card Interface | The interface is Sony® Memory Stick®, SecureDigital, and Multi-Media card compatible.<br><b>Note:</b> The Sony Memory Interface does not support Sony MagicGate™.                                                |

Table 2. Digital and Analog Modules (continued)

| Block Mnemonic   | Block Name                            | Functional Grouping     | Brief Description                                                                                                                                                                                                                                                                                            |
|------------------|---------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GPIO             | General Purpose I/O Interface         | System integration      | GPIO signals are multiplexed with various other signals.                                                                                                                                                                                                                                                     |
| GPT              | General Timer Module                  | Timer peripheral        | The timer module includes two general-purpose timers, each of which contains a free-running 16-bit timer.                                                                                                                                                                                                    |
| IDE              | Integrated Drive Electronics          | Connectivity peripheral | The IDE hardware consists of bus buffers for address and data and are intended to reduce the load on the bus and prevent SDRAM and Flash accesses from propagating to the IDE bus.                                                                                                                           |
| INC              | Instruction Cache                     | Core                    | The instruction cache improves system performance by providing cached instructions to the execution unit in a single clock cycle.                                                                                                                                                                            |
| I <sup>2</sup> C | Inter IC Communication Module         | Connectivity peripheral | The two-wire I <sup>2</sup> C bus interfaces, compliant with the Philips I <sup>2</sup> C bus standard, are bidirectional serial buses that exchange data between devices.                                                                                                                                   |
| SRAM             | Internal 128-KB SRAM                  | Internal memory         | The 128-Kbyte on-chip SRAM is split over two banks, SRAM0 (64K) and SRAM1 (64K). It provides single clock-cycle access for the ColdFire core.                                                                                                                                                                |
| LIN              | Internal Voltage Regulator            | Linear regulator        | An internal 1.2 V regulator is used to supply the CPU and PLL sections of the MCF5253, reducing the number of external components required and allowing operation from a single supply rail, typically 3.3 volts.                                                                                            |
| JTAG             | Joint Test Action Group               | Test and debug          | To help with system diagnostics and manufacturing testing, the MCF5253 includes dedicated user-accessible test logic that complies with the IEEE 1149.1A standard for boundary scan testability, often referred to as Joint Test Action Group, or JTAG.                                                      |
| QSPI             | Queued Serial Peripheral Interface    | Connectivity Interface  | The QSPI module provides a serial peripheral interface with queued transfer capability.                                                                                                                                                                                                                      |
| RTC              | Real-Time Clock                       | Timer Peripheral        | The RTC is a clock that keeps track of the current time even if the clock is turned off.                                                                                                                                                                                                                     |
| BDM              | Background Debug Interface            | Test and debug          | A background-debug mode (BDM) interface provides system debug.                                                                                                                                                                                                                                               |
| SDRAMC           | Synchronous DRAM Memory Controller    | Peripheral Interface    | The SDRAM controller provides a glueless interface for one bank of SDRAM, and can address up to 32MB. The controller supports a 16-bit data bus. The controller operates in page mode, non-page mode, and burst-page mode and supports SDRAMs.                                                               |
| SIM              | System Integration Module             | System Integration      | The SIM provides overall control of the internal and external buses and serves as the interface between the ColdFire core and the internal peripherals or external devices. The SIM is responsible for the two interrupt controllers (setting priorities and levels). And it also configures the GPIO ports. |
| PLL              | System Oscillator and Phase Lock Loop | System Clocking         | The oscillator operates from an external crystal connected across CRIN and CROUT. The circuit can also operate from an external clock connected to CRIN. The on-chip programmable PLL, which generates the processor clock, allows the use of almost any low frequency external clock (5–35 MHz).            |

Table 2. Digital and Analog Modules (continued)

| Block Mnemonic | Block Name                                          | Functional Grouping     | Brief Description                                                                                                                                                                  |
|----------------|-----------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UART           | Universal Asynchronous Receiver /Transmitter Module | Connectivity Peripheral | Three UARTs handle asynchronous serial communication.                                                                                                                              |
| USBOTG         | USB 2.0 High-Speed On-The-Go                        | Connectivity Peripheral | The USB module is used for communication to a PC or communication to slave devices; for example, to download data from a hard disc player to a flash player, and to other devices. |

### 3 Signal Description

This chapter describes the MCF5253 input and output signals. The signal descriptions as shown in [Table 3](#) are grouped according to relevant functionality. For additional signal information, see “Chapter 2, Signal Description” in the MCF5253 reference manual.

Table 3. MCF5253 Signal Index

| Signal Name                       | Mnemonic                     | Function                                                                                                          | Input/ Output | Reset State |
|-----------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------|-------------|
| Address                           | A[24:1]<br>A[23]/GPO54       | 24 address lines—address 23 is multiplexed with GPO54 and address 24 is multiplexed with A20 (SDRAM access only). | Out           | X           |
| Read-write control                | RW                           | Bus write enable—indicates if read or write cycle in progress.                                                    | Out           | H           |
| Output enable                     | $\overline{OE}$              | Output enable for asynchronous memories connected to chip selects                                                 | Out           | negated     |
| Data                              | D[31:16]                     | Data bus used to transfer word data                                                                               | In/Out        | Hi-Z        |
| Synchronous row address strobe    | $\overline{SDRAS}$ /GPIO59   | Row address strobe for external SDRAM                                                                             | Out           | negated     |
| Synchronous column address strobe | $\overline{SDCAS}$ /GPIO39   | Column address strobe for external SDRAM                                                                          | Out           | negated     |
| SDRAM write enable                | $\overline{SDWE}$ /GPIO38    | Write enable for external SDRAM                                                                                   | Out           | negated     |
| SDRAM upper byte enable           | $\overline{SDUDQM}$ /GPO53   | Upper byte enable—indicates during write cycle if high byte is written.                                           | Out           | –           |
| SDRAM lower byte enable           | $\overline{SDLDQM}$ /GPO52   | Lower byte enable—indicates during write cycle if low byte is written.                                            | Out           | –           |
| SDRAM chip selects                | $\overline{SD\_CS0}$ /GPIO60 | SDRAM chip select                                                                                                 | In/Out        | negated     |
| SDRAM clock enable                | BCLKE/GPIO63                 | SDRAM clock enable                                                                                                | Out           | –           |
| System clock                      | BCLK/GPIO40                  | SDRAM clock output                                                                                                | In/Out        | –           |

Table 3. MCF5253 Signal Index (continued)

| Signal Name          | Mnemonic                                                                                                            | Function                                                                                                                             | Input/<br>Output | Reset<br>State |
|----------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------|
| ISA bus read strobe  | $\overline{\text{IDE\_DIOR}}/\text{GPIO31}$<br>(CS2)                                                                | 1 ISA bus read strobe and 1 ISA bus write strobe—allow connection of an independent ISA bus peripheral, such as an IDE slave device. | In/Out           | –              |
| ISA bus write strobe | $\overline{\text{IDE\_DIOW}}/\text{GPIO32}$<br>(CS2)                                                                |                                                                                                                                      | In/Out           | –              |
| ISA bus wait signal  | $\overline{\text{IDE\_IORDY}}/\text{GPIO33}$                                                                        | ISA bus wait line available for both busses                                                                                          | In/Out           | –              |
| Chip Selects[2:0]    | $\overline{\text{CS0}}/\text{CS4}$<br>$\overline{\text{CS1}}/\text{QSPICS3}/\text{GPIO28}$                          | Chip selects bits 2 through 0—enable peripherals at programmed addresses. $\overline{\text{CS0}}$ provides boot ROM selection.       | Out<br>In/Out    | negated        |
| Buffer enable 1      | $\overline{\text{BUFENB1}}/\text{GPIO29}$                                                                           | Two programmable buffer enables—allow seamless steering of external buffers to split data and address bus in sections.               | In/Out           | –              |
| Buffer enable 2      | $\overline{\text{BUFENB2}}/\text{GPIO30}$                                                                           |                                                                                                                                      | In/Out           | –              |
| Transfer acknowledge | $\overline{\text{TA}}/\text{GPIO12}$                                                                                | Transfer Acknowledge signal.                                                                                                         | In/Out           | –              |
| Wake Up              | $\overline{\text{WAKEUP}}/\text{GPIO21}$                                                                            | Wake-up signal input                                                                                                                 | In               | –              |
| Serial Clock Line    | SCL0/SDATA1_BS1/GPIO41<br>SCL1/TXD1/GPIO10                                                                          | Clock signal for Dual I <sup>2</sup> C module operation                                                                              | In/Out           | –              |
| Serial Data Line     | SDA0/SDATA3/GPIO42<br>SDA1/RXD1/GPIO44                                                                              | Serial data port for second I <sup>2</sup> C module operation                                                                        | In/Out           | –              |
| Receive Data         | SDA1/RXD1/GPIO44<br>RXD0/GPIO46<br>EF/RXD2/GPIO6                                                                    | Receive serial data input for UART                                                                                                   | In               | –              |
| Transmit Data        | SCL1/TXD1/GPIO10<br>TXD0/GPIO45<br>XTRIM/TXD2/GPIO0                                                                 | Transmit serial data output for UART                                                                                                 | Out              | –              |
| Request-To-Send      | DDATA3/ $\overline{\text{RTS0}}/\text{GPIO4}$<br>DDATA1/ $\overline{\text{RTS1}}/\text{SDATA2\_BS2}/\text{GPIO2}$   | Signals sent from UART0/1 that it is ready to receive data                                                                           | Out              | –              |
| Clear-To-Send        | DDATA2/ $\overline{\text{CTS0}}/\text{GPIO3}$<br>DDATA0/ $\overline{\text{CTS1}}/\text{SDATA0\_SDIO1}/\text{GPIO1}$ | Signals sent to UART0/1 that data can be transmitted to peripheral                                                                   | In               | –              |
| Timer Output         | SDATA01/TOUT0/GPIO18                                                                                                | Capability of output waveform or pulse generation                                                                                    | Out              | –              |
| IEC958 inputs        | EBUIN1/GPIO36<br>EBUIN2/SCLKOUT/GPIO13<br>EBUIN3/CMD_SDIO2/GPIO14<br>QSPICS0/EBUIN4/GPIO15                          | Audio interfaces to IEC958 inputs                                                                                                    | In               | –              |
| IEC958 outputs       | EBUOUT1/GPIO37<br>QSPICS1/EBUOUT2/GPIO16                                                                            | Audio interfaces to IEC958 outputs                                                                                                   | Out              | –              |
| Serial data in       | SDATA1/GPIO17<br>SDATA3/GPIO8                                                                                       | Audio interfaces to serial data inputs                                                                                               | In               | –              |

Table 3. MCF5253 Signal Index (continued)

| Signal Name                             | Mnemonic                                                | Function                                                                                  | Input/<br>Output | Reset<br>State |
|-----------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------|------------------|----------------|
| Serial data out                         | SDATA01/TOUT0/GPIO18<br>SDATA02/GPIO34                  | Audio interfaces to serial data outputs                                                   | In/Out<br>Out    | —              |
| Word clock                              | LRCK1/GPIO19<br>LRCK2/GPIO23<br>LRCK3/AUDIOCLOCK/GPIO43 | Audio interfaces to serial word clocks                                                    | In/Out           | —              |
| Bit clock                               | SCLK1/GPIO20<br>SCLK2/GPIO22<br>SCLK3/GPIO35            | Audio interfaces to serial bit clocks                                                     | In/Out           | —              |
| Serial input                            | EF/RXD2/GPIO6                                           | Error flag serial in                                                                      | In/Out           | —              |
| Serial input                            | CFLG/GPIO5                                              | C-flag serial in                                                                          | In/Out           | —              |
| Subcode clock                           | RCK/QSPIDIN/QSPIDOUT/<br>GPIO26                         | Audio interfaces to subcode clock                                                         | In/Out           | —              |
| Subcode sync                            | QSPIDOUT/SFSY/GPIO27                                    | Audio interfaces to subcode sync                                                          | In/Out           | —              |
| Subcode data                            | QSPICLK/SUBR/GPIO25                                     | Audio interfaces to subcode data                                                          | In/Out           | —              |
| Clock frequency trim                    | XTRIM/TXD2/GPIO0                                        | Clock trim control                                                                        | Out              | —              |
| Audio clocks out                        | MCLK1/GPIO11<br>QSPICS2/MCLK2/GPIO24                    | DAC output clocks                                                                         | Out              | —              |
| Audio clock in                          | LRCK3/AUDIOCLOCK/GPIO43                                 | Optional audio clock input                                                                |                  | —              |
| MemoryStick/<br>SecureDigital interface | EBUIN3/CMD_SDIO2/GPIO14                                 | Secure Digital command lane—<br>MemoryStick interface 2 data I/O                          | In/Out           | —              |
|                                         | EBUIN2/SCLKOUT/GPIO13                                   | Clock out for both MemoryStick<br>interfaces and for Secure Digital                       | In/Out           | —              |
|                                         | DDATA0/ $\overline{\text{CTS1}}$ /SDATA0_SDIO1/GPIO1    | SecureDigital serial data bit 0—<br>MemoryStick interface 1 data I/O                      | In/Out           | —              |
|                                         | SCL0/SDATA1_BS1/GPIO41                                  | SecureDigital serial data bit 1—<br>MemoryStick interface 1 strobe                        | In/Out           | —              |
|                                         | DDATA1/ $\overline{\text{RTS1}}$ /SDATA2_BS2/GPIO2      | SecureDigital serial data bit 2—<br>MemoryStick interface 2 strobe<br>Reset output signal | In/Out           | —              |
|                                         | SDA0/SDATA3/GPIO42                                      | SecureDigital serial data bit 3                                                           | In/Out           | —              |

Table 3. MCF5253 Signal Index (continued)

| Signal Name                                | Mnemonic                                                                               | Function                                                                            | Input/<br>Output | Reset<br>State |
|--------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------|----------------|
| AT attachment interface<br>(IDE interface) | ATA_DIOW                                                                               | ATA write strobe signal                                                             | Out              | —              |
|                                            | ATA_DIOR                                                                               | ATA read strobe signal                                                              | Out              | —              |
|                                            | ATA_IORDY                                                                              | ATA I/O ready input                                                                 | In               | —              |
|                                            | ATA_DMARQ                                                                              | ATA DMA request                                                                     | In               | —              |
|                                            | ATA_DMACK                                                                              | ATA DMA acknowledge                                                                 | Out              | —              |
|                                            | ATA_INTRQ                                                                              | ATA interrupt request                                                               | In               | —              |
|                                            | ATA_CS0                                                                                | ATA chip select 0                                                                   | Out              | —              |
|                                            | ATA_CS1                                                                                | ATA chip select 1                                                                   | Out              | —              |
|                                            | ATA_A[2:0]                                                                             | 3-bit ATA address bus                                                               | Out              | —              |
|                                            | ATA_D[15:0]                                                                            | 16-bit ATA data bus                                                                 | In/Out           | —              |
| CAN interface                              | CAN0_TX                                                                                | CAN 0 transmit                                                                      | Out              | —              |
|                                            | CAN0_RX                                                                                | CAN 0 receive                                                                       | In               | —              |
|                                            | CAN1_TX                                                                                | CAN 1 transmit                                                                      | Out              | —              |
|                                            | CAN1_RX                                                                                | CAN 1 receive                                                                       | In               | —              |
| USB PHY interface                          | USBVBUS                                                                                | USB Vbus input                                                                      | In               | —              |
|                                            | USBID                                                                                  | USB ID input                                                                        | In               | —              |
|                                            | USBRES                                                                                 | USB current programming resistor pin                                                | Analog           | —              |
|                                            | USBDN                                                                                  | USB DM signalling line                                                              | In/Out           | —              |
|                                            | USBDP                                                                                  | USB DP signalling line                                                              | In/Out           | —              |
| USB oscillator                             | USB_CRIN<br>USB_CROUT                                                                  | Connections for USB oscillator crystal (24 MHz)                                     | In<br>Out        | —              |
| RTC oscillator                             | RTC_CRIN<br>RTCCROUT                                                                   | Connections for real-time clock crystal (32.768 kHz)                                | In<br>Out        | —              |
| AD IN                                      | ADIN0/GPI52<br>ADIN1/GPI53<br>ADIN2/GPI54<br>ADIN3/GPI55<br>ADIN4/GPI56<br>ADIN5/GPI57 | Analog-to-Digital Converter input signals                                           | In               | —              |
| AD OUT                                     | ADREF<br>ADOUT/SCLK4/GPIO58                                                            | Analog-to-Digital Converter output signal—connects to ADREF via integrator network. | In/Out           | —              |
| QSPI clock                                 | QSPICLK/SUBR/GPIO25                                                                    | QSPI clock signal                                                                   | In/Out           | —              |
| QSPI data in                               | RCK/QSPIDIN/QSPIDOUT/GPIO26                                                            | QSPI data input                                                                     | In/Out           | —              |

Table 3. MCF5253 Signal Index (continued)

| Signal Name                                      | Mnemonic                                                                                                                                                                                         | Function                                                                                               | Input/<br>Output | Reset<br>State |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------|----------------|
| QSPI data out                                    | RCK/QSPIDIN/QSPIDOUT/GPIO26<br>QSPIDOUT/SFSY/GPIO27                                                                                                                                              | QSPI data out                                                                                          | In/Out           | –              |
| QSPI chip selects                                | QSPICS0/EBUIN4/GPIO15<br>QSPICS1/EBUOUT2/GPIO16<br>QSPICS2/MCLK2/GPIO24<br>CS1/QSPICS3/GPIO28                                                                                                    | QSPI chip selects                                                                                      | In/Out           | –              |
| System oscillator in                             | CRIN                                                                                                                                                                                             | System input                                                                                           | In               | –              |
| System oscillator out                            | CROUT                                                                                                                                                                                            | System output                                                                                          | Out              | –              |
| Reset In                                         | $\overline{\text{RSTI}}$                                                                                                                                                                         | Processor reset input                                                                                  | In               | –              |
| Freescall Test Mode                              | TEST[2:0]                                                                                                                                                                                        | TEST pins.                                                                                             | In               | –              |
| Linear regulator output                          | LINOUT                                                                                                                                                                                           | Output of 1.2 V to supply core                                                                         | Out              | –              |
| Linear regulator input                           | LININ                                                                                                                                                                                            | Input, typically I/O supply (3.3V)                                                                     | In               | –              |
| Linear regulator ground                          | LINGND                                                                                                                                                                                           |                                                                                                        |                  | –              |
| High Impedance                                   | $\text{HI\_Z}$                                                                                                                                                                                   | Assertion tri-states output signal pins                                                                | In               |                |
| Debug Data                                       | DDATA0/ $\overline{\text{CTS1}}$ /SDATA0_SDIO1/GPIO1<br>DDATA1/ $\overline{\text{RTS1}}$ /SDATA2_BS2/GPIO2<br>DDATA2/ $\overline{\text{CTS0}}$ /GPIO3<br>DDATA3/ $\overline{\text{RTS0}}$ /GPIO4 | Display of captured processor data and break-point statuses                                            | In/Out           | Hi-Z           |
| Processor Status                                 | PST0/GPIO50<br>PST1/GPIO49<br>PST2/INTMON2/GPIO48<br>PST3/INTMON1/GPIO47                                                                                                                         | Indication of internal processor status.                                                               | In/Out           | Hi-Z           |
| Processor clock                                  | PSTCLK/GPIO51                                                                                                                                                                                    | Processor clock output                                                                                 | Out              | –              |
| Test Clock                                       | TCK                                                                                                                                                                                              | Clock signal for IEEE 1149.1A JTAG                                                                     | In               | –              |
| Test Reset/<br>Development Serial<br>Clock       | DSCLK/ $\overline{\text{TRST}}$                                                                                                                                                                  | Multiplexed signal that is asynchronous reset for JTAG controller. Also, clock input for debug module. | In               | –              |
| Test Mode Select/Break<br>Point                  | TMS/ $\overline{\text{BKPT}}$                                                                                                                                                                    | Multiplexed signal that is test mode select in JTAG mode and a hardware break-point in debug mode      | In               | –              |
| Test Data Input/<br>Development Serial<br>Input  | TDI/DSI                                                                                                                                                                                          | Multiplexed serial input for the JTAG or background debug module.                                      | In               | –              |
| Test Data<br>Output/Development<br>Serial Output | TDO/DSO                                                                                                                                                                                          | Multiplexed serial output for the JTAG or background debug module                                      | Out              | –              |

## 4 Electrical Specifications

Table 4 through Table 10 provide the electrical characteristics for the MCF5253 processor. The remaining figures and tables in this section provide the timing diagrams and the timing parameters for the MCF5253 processor.

Table 4 provides the maximum rating parameters for the MCF5253 processor.

**Table 4. Maximum Ratings**

| Rating                         | Symbol    | Value        | Units |
|--------------------------------|-----------|--------------|-------|
| Supply Core Voltage            | $V_{CC}$  | -0.5 to +2.5 | V     |
| Maximum Core Operating Voltage | $V_{CC}$  | +1.32        | V     |
| Minimum Core Operating Voltage | $V_{CC}$  | +1.08        | V     |
| Supply I/O Voltage             | $V_{CC}$  | -0.5 to +4.6 | V     |
| Maximum I/O Operating Voltage  | $V_{CC}$  | +3.6         | V     |
| Minimum I/O Operating Voltage  | $V_{CC}$  | +3.0         | V     |
| Input Voltage                  | $V_{in}$  | -0.5 to +6.0 | V     |
| Storage Temperature Range      | $T_{stg}$ | -65 to +150  | °C    |

Table 5 provides the recommended operating temperatures for the MCF5253 processor.

**Table 5. Operating Temperature**

| Characteristic                        | Symbol     | Value            | Units |
|---------------------------------------|------------|------------------|-------|
| Maximum Operating Ambient Temperature | $T_{Amax}$ | +70 <sup>1</sup> | °C    |
| Minimum Operating Ambient Temperature | $T_{Amin}$ | -20              | °C    |

<sup>1</sup> This published maximum operating ambient temperature should be used only as a system design guideline. All device operating parameters are guaranteed only when the junction temperature does not exceed 86.5° C.

Table 6 provides the recommended operating supply voltages for the MCF5253 processor.

**Table 6. Recommended Operating Supply Voltages**

| Pin Name  | Min  | Typ | Max  | Unit |
|-----------|------|-----|------|------|
| COREVDD   | 1.08 | 1.2 | 1.32 | V    |
| PADVDD    | 3.0  | 3.3 | 3.6  | V    |
| ADVDD     | 3.0  | 3.3 | 3.6  | V    |
| ADGND     | —    | GND | —    | V    |
| OSCPADVDD | 3.0  | 3.3 | 3.6  | V    |
| OSCPADGND | —    | GND | —    | V    |
| USBVDD    | —    | 3.3 | —    | V    |
| USBVDDP   | —    | 1.2 | —    | V    |

**Table 6. Recommended Operating Supply Voltages (continued)**

| Pin Name   | Min  | Typ | Max  | Unit |
|------------|------|-----|------|------|
| USBGND     | –    | GND | –    | V    |
| RTCVDDA    | 3.0  | –   | 4.2  | V    |
| RTCVSSA    | –    | GND | –    | V    |
| PLLCOREVDD | 1.08 | 1.2 | 1.32 | V    |
| PLLCOREGND | –    | GND | –    | V    |
| LININ      | 3.0  | 3.3 | 3.6  | V    |
| GND        | –    | GND | –    | V    |

Table 7 provides the operating parameters for the linear regulator.

**Table 7. Linear Regulator Operating Parameters**

| Characteristic                                                 | Symbol           | Min  | Typ | Max  | Units |
|----------------------------------------------------------------|------------------|------|-----|------|-------|
| Input Voltage (LININ)                                          | V <sub>in</sub>  | 3.0  | 3.3 | 3.6  | V     |
| Output Voltage (LINOUT)                                        | V <sub>out</sub> | 1.08 | 1.2 | 1.32 | V     |
| Output Current                                                 | I <sub>out</sub> | –    | 100 | 150  | mA    |
| Power Dissipation                                              | P <sub>d</sub>   | –    | –   | 500  | mW    |
| Load Regulation<br>10% I <sub>out</sub> ≥ 90% I <sub>out</sub> | –                | –    | 50  | 60   | mV    |
| Power Supply Rejection                                         | PSRR             | –    | 40  | –    | dB    |

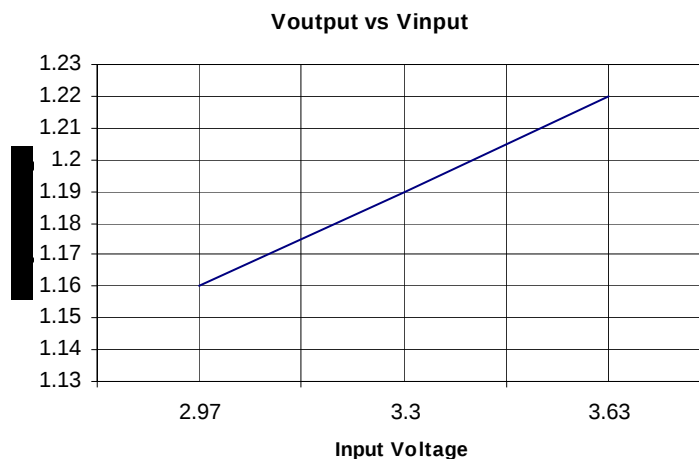
### NOTE

A pmos regulator is used as a current source in this linear regulator, so a 10 µF capacitor (ESR 0... 5 Ohm) is needed on the output pin (LINOUT) to integrate the current. Typically, this requires the use of a tantalum type capacitor.

Table 8 provides the measured parameters related to temperature for the linear regulator.

**Table 8. Linear Regulator—Measured Parameters Related to Temperature**

| Characteristic                                                 | Symbol           | Min          | Typ         | Max          | Units |
|----------------------------------------------------------------|------------------|--------------|-------------|--------------|-------|
| Input Voltage (LININ)                                          | V <sub>in</sub>  | 2.97         | 3.3         | 3.63         | V     |
| Output Voltage (LINOUT)<br>100 mA load                         | V <sub>out</sub> | 125 °C: 1.16 | 25 °C: 1.19 | -40 °C: 1.22 | V     |
| Current Consumption                                            | I <sub>cc</sub>  | -40 °C: 44   | 25 °C: 56   | 125 °C: 68   | mA    |
| Power Dissipation                                              | P <sub>d</sub>   | -40 °C: 131  | 25 °C: 185  | 125 °C: 247  | mW    |
| Load Regulation<br>10% I <sub>out</sub> ≥ 90% I <sub>out</sub> | –                | -40 °C: 46   | 25 °C: 57   | 125 °C: 70   | mV    |



**Figure 2. Linear Regulator—Voutput vs Vinput**

Table 9 provides the operating parameters for the ADC DC electrical characteristics.

**Table 9. Operating Parameters for ADC DC Electrical Characteristics**

| Characteristic                                                                                                                                                                                                                               | Symbol              | Min  | Typ  | Max       | Units |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|------|-----------|-------|
| Operation Voltage Range for ADC                                                                                                                                                                                                              | ADVDD               | 3    | –    | 3.6       | V     |
| Common Mode Rejection                                                                                                                                                                                                                        | CMR                 | 0    | –    | ADVDD–1.1 | v     |
| Reference Voltage (external)                                                                                                                                                                                                                 | ADREF               | 0    | –    | ADVDD–1.1 | v     |
| Input offset voltage                                                                                                                                                                                                                         | V <sub>offset</sub> | –    | 10   | –         | mV    |
| Input Hysteresis (ADINx = ADVDD/2)                                                                                                                                                                                                           | V <sub>hyst</sub>   | 0.73 | 0.78 | 0.85      | mV    |
| ADC Input Linear Operating Range                                                                                                                                                                                                             | ADINx               | 0    | –    | ADVDD–1.1 | V     |
| AD Convertor Error                                                                                                                                                                                                                           |                     | 2    |      |           | LSB   |
| <b>Note:</b> Software and hardware sampling time is dependent on the external RC network used and the internal CPU Frequency and AD Converter clock divider. See Section 12.4.1 in the <i>MCF5253 Reference Manual</i> for more information. |                     |      |      |           |       |

Table 10 provides the DC electrical specifications for the digital pins.

**Table 10. DC Electrical Specifications (I/O Vcc = 3.3 Vdc ± 0.3 Vdc)**

| Characteristic                  | Symbol          | Min  | Max | Units |
|---------------------------------|-----------------|------|-----|-------|
| Operation Voltage Range for I/O | V <sub>CC</sub> | 3.0  | 3.6 | V     |
| Input High Voltage              | V <sub>IH</sub> | 2    | 5.5 | V     |
| Input Low Voltage               | V <sub>IL</sub> | -0.3 | 0.8 | V     |
| Reset Threshold Voltage - High  | RtH             | 2.0  | –   | V     |
| Reset Threshold Voltage - Low   | TtL             | –    | 0.8 | V     |
| Reset Input Rise Time           | nS              | 10   | –   | –     |
| Reset Input Fall Time           | nS              | 10   | –   | –     |

**Table 10. DC Electrical Specifications (I/O Vcc = 3.3 Vdc ± 0.3 Vdc) (continued)**

| Characteristic                                                                                                                                                                                                                     | Symbol    | Min  | Max  | Units |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------|------|-------|
| Input Leakage Current @ 0.0 V/3.3 V<br>During Normal Operation                                                                                                                                                                     | $I_{in}$  | –    | ±1   | μA    |
| Hi-Impedance (Three-State) Leakage Current<br>@ 0.0 V/3.3 V During Normal Operation                                                                                                                                                | $I_{TSI}$ | –    | ±1   | μA    |
| Output High Voltage $I_{OH} = 11.9 \text{ mA}^1, 6.3 \text{ mA}^2, 3.1 \text{ mA}^3$                                                                                                                                               | $V_{OH}$  | 2.4  | –    | V     |
| Output Low Voltage $I_{OL} = 7.1 \text{ mA}^1, 3.5 \text{ mA}^2, 1.8 \text{ mA}^3$                                                                                                                                                 | $V_{OL}$  | –    | 0.4  | V     |
| Schmitt Trigger Low to High Threshold Point <sup>4</sup>                                                                                                                                                                           | $V_{T+}$  | 1.67 | 1.79 | V     |
| Schmitt Trigger High to Low Threshold Point <sup>4</sup>                                                                                                                                                                           | $V_{T-}$  | 1.01 | 1.15 | V     |
| Load Capacitance:<br>D[31:16], SCLK[4:1], SCLKOUT, EBUOUT[2:1], LRCK[3:1], SDATA0[2:1], CFLG, EF,<br>IDE_DIOR, IDE_DIOW, IDE_IORDY, MCLK1, MCLK2                                                                                   | $C_L$     | –    | 50   | pF    |
| Load Capacitance:<br>A[24:9], ATA_CS0, ATA_CS1, ATA_A[2:0], ATA_DIOR, ATA_DIOW, ATA_DMACK,<br>ATA_D[15:0], SDATAI[3,1]                                                                                                             | $C_L$     | 15   | 40   | pF    |
| Load Capacitance:<br>A[8:1], ADOUT, ATA_RST<br>BCLK, BCLKE, SDCAS, SDRAS, SDLDQM, SDCS0, SDUDQM, SDWE, BUFENB[2:1],<br>CAN0_TX, CAN1_TX, EBUIN1, RXD[2:0]                                                                          | $C_L$     | –    | 30   | pF    |
| Load Capacitance:<br>SDA0, SDA1, SCL0, SCL1, CMD_SDIO2, SDATA2_BS2, SDATA1_BS1, SDATA0_SDIO1,<br>CS0/CS4, CS1, OE, RW, TA, TXD[2:0], XTRIM, TDO/DSO, RCK, SFSY, SUBR, SDATA3,<br>TOUT0, QSPID_OUT, QSPICS[3:0], QSPICLK, GPIO[6:5] | $C_L$     | –    | 20   | pF    |
| Load Capacitance:<br>DDATA[3:0], PST[3:0], PSTCLK                                                                                                                                                                                  | $C_L$     | –    | 15   | pF    |
| Capacitance <sup>5</sup> , $V_{in} = 0 \text{ V}$ , $f = 1 \text{ MHz}$                                                                                                                                                            | $C_{IN}$  | –    | 6    | pF    |

<sup>1</sup> **8.0 mA:** SCL0, SDA0, SCL1, SDA1, PST[3:0], DDATA[3:0], TDSO, RW, ATA\_RST, MCLK1, QSPICS2\_MCLK2

<sup>2</sup> **4.0 mA:** BUFENB1, BUFENB2, EBUOUT1, SCLKOUT, CMDSDIO, IDE\_DIOR, IDE\_DIOW, TOUT0, RTS[1:0], TXD[1:0],  
SCLK[4:1], LRCK[4:1], SDATA01, SDATA02, QSPICLK, QSPICS0, QSPICS1\_EBUOUT2, QSPICS3, QSPIDOUT, RCK,  
XTRIM, A[8:1], ATA\_CS0, ATA\_CS1, ATA\_A[2:0]

<sup>3</sup> **2.0 mA:** TMS/BKPT, DSI/TDI, TRST/DSCLK

<sup>4</sup> SCLK[4:1], SCL0, SCL1, SDA0, SDA1, ATA\_DMARQ, ATA\_INTRQ, ATA\_IORDY

<sup>5</sup> Capacitance  $C_{IN}$  is periodically sampled rather than 100% tested.

Figure 3 and Table 11 provide the clock timing diagram and timing parameters.

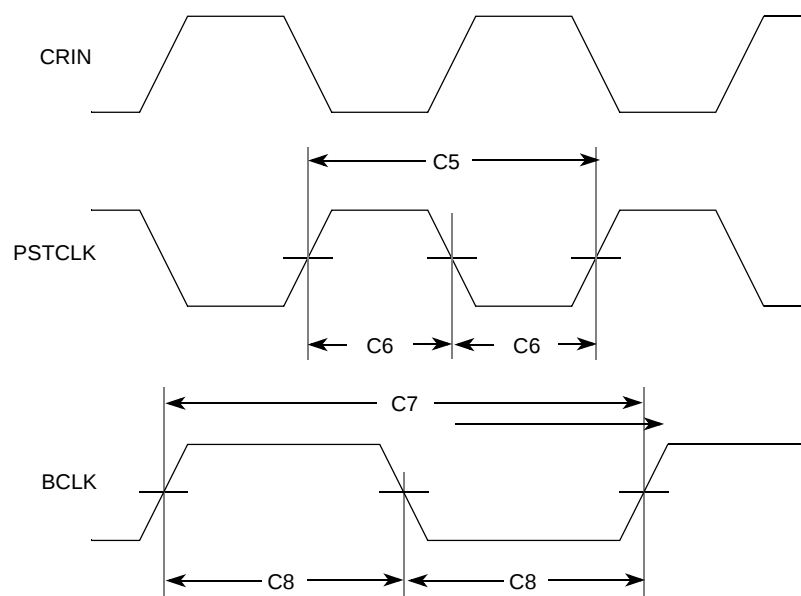


Figure 3. Clock Timing Definition

#### NOTE

Signals shown in Figure 3 are in relation to the SYSCCLK clock. No relationship between signals is implied or intended.

Table 11 shows the clock timing parameters.

Table 11. Clock Timing Parameters

| ID | Characteristic                          | 140 MHz CPU |       | Units |
|----|-----------------------------------------|-------------|-------|-------|
|    |                                         | Min         | Max   |       |
| –  | CRIN Frequency with external oscillator | 5.00        | 33.86 | MHz   |
| –  | CRIN Frequency with internal oscillator | 5           | 16.94 | MHz   |
| C5 | PSTCLK cycle time                       | 7           | –     | ns    |
| C6 | PSTCLK duty cycle                       | 40          | 60    | %     |
| C7 | BCLK cycle time                         | 14.0        | –     | ns    |
| C8 | BCLK duty cycle                         | 35          | 65    | %     |

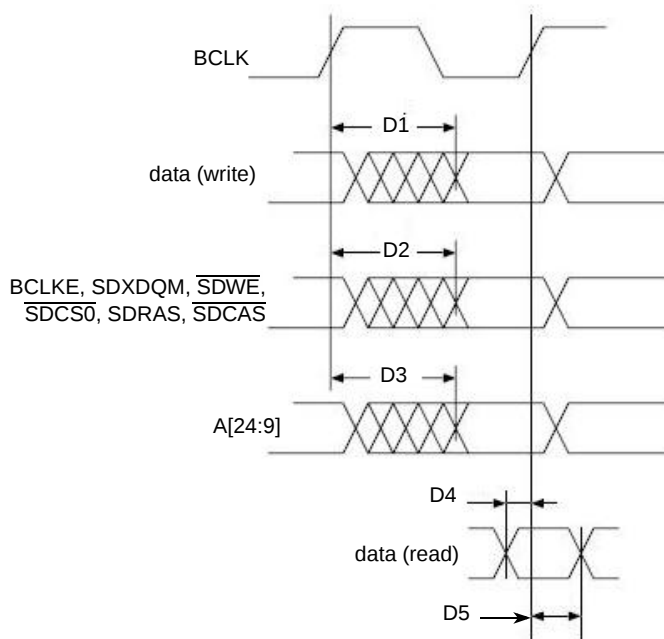
Table 12 shows the CRIN Crystal suggested parameters.

**Table 12. CRIN Crystal Suggested Parameters**

| Parameter                                            | Min | Typ | Max   | Unit |
|------------------------------------------------------|-----|-----|-------|------|
| Frequency                                            | 5   | –   | 16.94 | MHz  |
| Frequency Tolerance                                  | –   | –   | ±50   | ppm  |
| Frequency Stability Over Operating Temperature Range | –   | –   | ±50   | ppm  |
| ESR                                                  | –   | 40  | –     | Ω    |
| Shunt Capacitance                                    | –   | 7   | –     | pF   |
| Load Capacitance                                     | –   | 18  | –     | pF   |

## 4.1 SDRAM Bus Timing

The SDRAM bus is a synchronous bus. Propagation delays, set-up times and hold times with respect to the SDRAM clock BCLK are shown in Figure 4 and the parameters provided in Table 13. When BCLK clock is not active, SDRAM interface is not valid and the external bus cannot be used.



**Figure 4. SDRAM Bus Timing Diagram**

Table 13. SDRAM Bus Timing Parameters

| ID | Characteristic                                                                                                                                                                                                       | Timing to 50% Points Maximum |            |            | Units |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------|------------|-------|
|    |                                                                                                                                                                                                                      | 30 pF Load                   | 40 pF Load | 50 pF Load |       |
| D1 | Propagation delay BCLK rising to data valid                                                                                                                                                                          | 7.88                         | 8.8        | 9.6        | ns    |
| D2 | Propagation delay BCLK rising to BCLKE, $\overline{\text{SDLDQM}}$ , $\overline{\text{SDUDQM}}$ , $\overline{\text{SDWE}}$ , $\overline{\text{SDCS0}}$ , $\overline{\text{SDRAS}}$ , $\overline{\text{SDCAS}}$ valid | 8.7                          | —          | —          | ns    |
| D3 | Propagation delay BCLK rising to A[24:9] valid                                                                                                                                                                       | 8.3                          | 9.2        | —          | ns    |
| D4 | Set-up time data valid to BCLK rising                                                                                                                                                                                | 0                            | 0          | 0          | ns    |
| D5 | Hold time BCLK rising to data valid                                                                                                                                                                                  | 0.7                          | 0.7        | 0.7        | ns    |

## 4.2 SPDIF Timing

The Sony/Philips Digital Interface (SPDIF) timing parameters are provided in Table 14. SPDIF timing is totally asynchronous, therefore there is no need for relationship with the clock. Table 14 shows the differences between high-low and low-high propagation delay which is called the skew.

Table 14. SPDIF Propagation Skew and Transition Parameters

| Characteristic                                                      | Pin Load | Prop Delay Maximum | Skew <sup>1</sup> Maximum | Transition <sup>2</sup> Rise Maximum | Transition Fall Maximum | Units |
|---------------------------------------------------------------------|----------|--------------------|---------------------------|--------------------------------------|-------------------------|-------|
| EBUIN1, EBUIN2, EBUIN3, EBUIN4: asynchronous inputs, no specs apply | —        | —                  | 0.7                       | —                                    | —                       | ns    |
| EBUOUT1, EBUOUT2 output                                             | 40 pF    | —                  | 1.5                       | 24.2                                 | 31.3                    | ns    |
| EBUOUT1, EBUOUT2 output                                             | 20 pF    | —                  | 1.5                       | 13.6                                 | 18.0                    | ns    |

<sup>1</sup> Skew value does not include the skew introduced by different rise and fall times.

<sup>2</sup> Transition times between 10% Vdd and 90% Vdd.

## 4.3 Serial Audio Interface Timing

The Serial Audio Interface fully complies with the Industry standard Philips IIS (InterIC Serial Audio Bus) timings.

## 4.4 DDATA/PST/PSTCLK Debug Interface

Table 15 provides the timing parameters.

Table 15. DDATA/PST/PSTCLK Debug Interface Timing Parameters

| Characteristic                                               | Pin Load | Min  | Max | Units |
|--------------------------------------------------------------|----------|------|-----|-------|
| PSTCLK clock rise edge to DDATA/PSTDATA <sup>1</sup> invalid | 15 pF    | −1.0 | —   | ns    |
| PSTCLK clock rise edge to DDATA/PSTDATA <sup>2</sup> valid   | 15 pF    | —    | 4.0 | ns    |

## Electrical Specifications

- <sup>1</sup> Note that output data may go invalid *before* rising edge of the clock. To clock data in reliably, you need to sample data, for example, 2 ns before rising edge of clock.
- <sup>2</sup> Timing figure given takes 50% margin for noise and uncertainty on pin capacitance. Simulated clock-to-data, not taking noise effects into account is 2.7 ns.

## 4.5 BDM and JTAG Timing

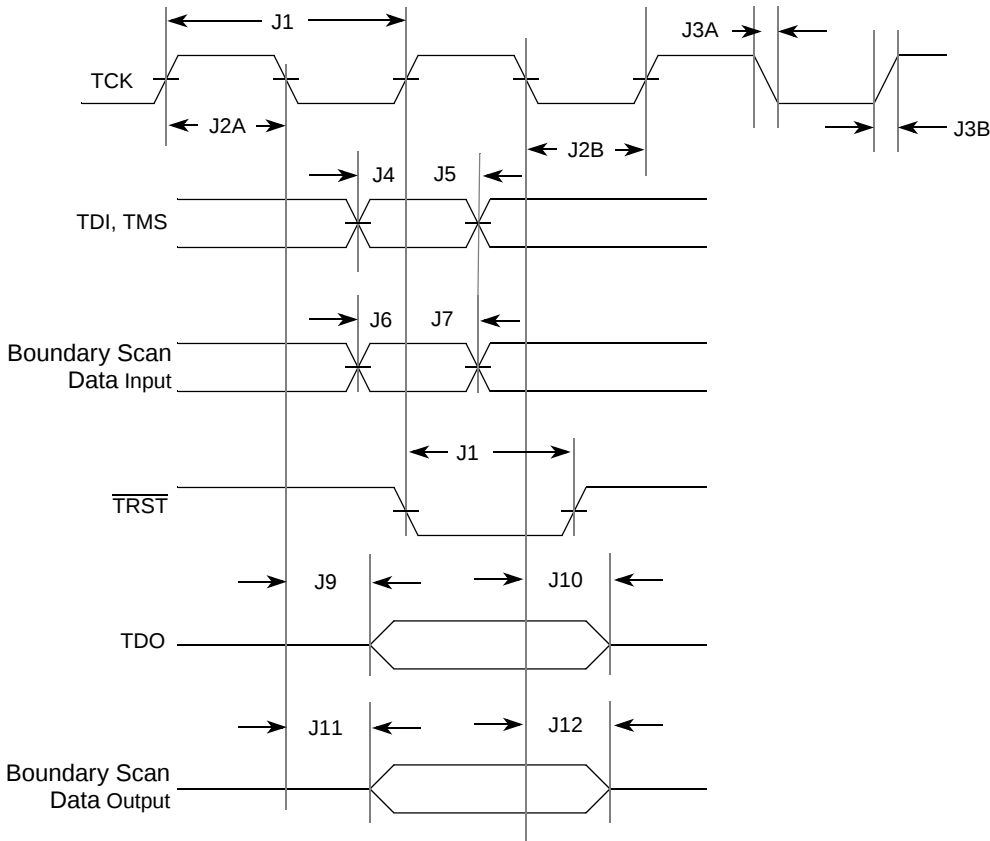
Table 16 provides the BDM timing parameters.

**Table 16. BDM Interface Timing Parameters**

| Characteristic                                                 | Min  | Max       | Units |
|----------------------------------------------------------------|------|-----------|-------|
| Clock period for DSCLK clock                                   | —    | $5T^1$    | ns    |
| Set-up time DSI, $\overline{\text{BKPT}}$ to DSCLK rising edge | 4.0  | —         | ns    |
| Hold time DSI, $\overline{\text{BKPT}}$ to DSCLK rising edge   | —    | $T + 4.0$ | ns    |
| Propagation delay DSCLK rising edge to TDO/DSO change          | $3T$ | $4T + 32$ | ns    |

<sup>1</sup> T denotes the CPU clock period. E.g. if the CPU is running at 100 MHz,  $T = 10$  ns

Figure 5 provides the JTAG timing diagram and Table 17 provides the JTAG timing parameters.



**Figure 5. JTAG Timing Diagram**

Table 17. JTAG Timing Parameters

| ID  | Characteristic                                                              | Min | Max | Units |
|-----|-----------------------------------------------------------------------------|-----|-----|-------|
| —   | TCK Frequency of Operation                                                  | 0   | 10  | MHz   |
| J1  | TCK Cycle Time                                                              | 100 | —   | ns    |
| J2A | TCK Clock Pulse High Width                                                  | 25  | —   | ns    |
| J2B | TCK Clock Pulse Low Width                                                   | 25  | —   | ns    |
| J3A | TCK Fall Time ( $V_{IH}=2.4$ V to $V_{IL}=0.5$ V)                           | —   | 5   | ns    |
| J3B | TCK Rise Time ( $V_{IL}=0.5$ V to $V_{IH}=2.4$ V)                           | —   | 5   | ns    |
| J4  | TDI, TMS to TCK rising (Input Setup)                                        | 8   | —   | ns    |
| J5  | TCK rising to TDI, TMS Invalid (Hold)                                       | 10  | —   | ns    |
| J6  | Boundary Scan Data Valid to TCK (Setup)                                     | 1   | —   | ns    |
| J7  | TCK to Boundary Scan Data Invalid to rising edge (Hold)                     | 10  | —   | ns    |
| J8  | $\overline{TRST}$ Pulse Width (asynchronous to clock edges)                 | 12  | —   | ns    |
| J9  | TCK falling to TDO Valid (signal from driven or three-state)                | —   | 15  | ns    |
| J10 | TCK falling to TDO High Impedance                                           | 2   | 15  | ns    |
| J11 | TCK falling to Boundary Scan Data Valid (signal from driven or three-state) | —   | 15  | ns    |
| J12 | TCK falling to Boundary Scan. Data High Impedance                           | 1   | 15  | ns    |

## 5 Power Consumption

Table 18 shows maximum power consumption for the MCF5253 device. Typicals will be supplied at a later time.

Table 18. Maximum Power Consumption

| Supply                                                                                               | Maximum Current     |
|------------------------------------------------------------------------------------------------------|---------------------|
| 1.2 V Core                                                                                           | 150 mA              |
| 3.3 V I/O<br>(with core supplied separately)                                                         | 150 mA <sup>1</sup> |
| 3.3 V I/O<br>(with core supplied via internal 1.2 V regulator<br>which is fed from the 3.3 V supply) | 400 mA              |

<sup>1</sup> This does not include the current required for any externally connected 3.3V device (e.g., flash, SDRAM, and other I/O devices).

## 6 Package Information and Pinout

This section includes the pin assignment information, contact connection diagram, and the mechanical package drawing.

The MCF5253 device is available in the following package:

- 225 MAPBGA 13 x 13 mm 0.8 mm pitch package as shown in [Figure 6](#).

## 6.1 Pin Assignment

[Table 19](#) defines all the settings of each pad. See [Figure 7](#) for the ball map of pin locations and [Table 21](#) for the device pin list, sorted by signal identification.

**Table 19. 225 MAPBGA Pin Assignment**

| Name               | Drive Type/<br>Strength | Load<br>(pF) | 1st<br>Function | 2nd<br>Function | Pinconfig<br>Register<br>Bit | GP<br>Pin | Reset | Notes                                                                                |
|--------------------|-------------------------|--------------|-----------------|-----------------|------------------------------|-----------|-------|--------------------------------------------------------------------------------------|
| <b>Address Bus</b> |                         |              |                 |                 |                              |           |       |                                                                                      |
| A1                 | O / 2 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A2                 | O / 2 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A3                 | O / 2 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A4                 | O / 2 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A5                 | O / 2 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A6                 | O / 2 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A7                 | O / 2 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A8                 | O / 2 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A9                 | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A10                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A11                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A12                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A13                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A14                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A15                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A16                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A17                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A18                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A19                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A20/A24            | O / 8 mA                | 30           | A20             | A24             | 31                           | —         | X     | Audio Clock Select: 1-LRCK3 pin;<br>0-CRIN pin                                       |
| A21                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A22                | O / 8 mA                | 30           | —               | —               | —                            | —         | X     | —                                                                                    |
| A23/GPO54          | O / 8 mA                | 30           | A23             | —               | —                            | O54       | X     | Boot Mode Select: 1-Memory<br>connected to $\overline{CS0}$ ; 0-Internal boot<br>rom |
| <b>Data Bus</b>    |                         |              |                 |                 |                              |           |       |                                                                                      |
| D16                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D17                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D18                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D19                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D20                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D21                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D22                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D23                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D24                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D25                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |
| D26                | IO / 8 mA               | 40           | —               | —               | —                            | —         | HI_Z  | —                                                                                    |

Table 19. 225 MAPBGA Pin Assignment (continued)

| Name                            | Drive Type/<br>Strength | Load<br>(pF) | 1st<br>Function         | 2nd<br>Function  | Pinconfig<br>Register<br>Bit | GP<br>Pin | Reset   | Notes                                                       |
|---------------------------------|-------------------------|--------------|-------------------------|------------------|------------------------------|-----------|---------|-------------------------------------------------------------|
| D27                             | IO / 8 mA               | 40           | —                       | —                | —                            | —         | HI_Z    | —                                                           |
| D28                             | IO / 8 mA               | 40           | —                       | —                | —                            | —         | HI_Z    | —                                                           |
| D29                             | IO / 8 mA               | 40           | —                       | —                | —                            | —         | HI_Z    | —                                                           |
| D30                             | IO / 8 mA               | 40           | —                       | —                | —                            | —         | HI_Z    | —                                                           |
| D31                             | IO / 8 mA               | 40           | —                       | —                | —                            | —         | HI_Z    | —                                                           |
| <b>Bus Control</b>              |                         |              |                         |                  |                              |           |         |                                                             |
| $\overline{OE}$                 | O / 4 mA                | 30           | —                       | —                | —                            | —         | Negated | —                                                           |
| RW                              | O / 4 mA                | 30           | —                       | —                | —                            | —         | H       | —                                                           |
| $\overline{TA}/GPIO12$          | IO / 2 mA               | 30           | $\overline{TA}$         | —                | —                            | IO12      | —       | —                                                           |
| $\overline{BUFENB1}/GPIO29$     | IO / 2 mA               | 30           | $\overline{BUFENB1}$    | —                | —                            | IO29      | —       | —                                                           |
| $\overline{BUFENB2}/GPIO30$     | IO / 2 mA               | 30           | $\overline{BUFENB2}$    | —                | —                            | IO30      | —       | —                                                           |
| $\overline{IDE\_DIOR}/GPIO31$   | IO / 2 mA               | 30           | $\overline{IDE\_DIOR}$  | —                | —                            | IO31      | —       | Controlled by $\overline{CS2}$ registers                    |
| $\overline{IDE\_DIOW}/GPIO32$   | IO / 2 mA               | 30           | $\overline{IDE\_DIOW}$  | —                | —                            | IO32      | —       | Controlled by $\overline{CS2}$ registers                    |
| $\overline{IDE\_IORDY}/GPIO33$  | IO / 2 mA               | 30           | $\overline{IDE\_IORDY}$ | —                | —                            | IO33      | —       | —                                                           |
| <b>Chip Selects</b>             |                         |              |                         |                  |                              |           |         |                                                             |
| $\overline{CS0}/\overline{CS4}$ | O / 4 mA                | 30           | $\overline{CS0}$        | $\overline{CS4}$ | —                            | —         | Negated | Boot Mode Select: 1- $\overline{CS0}$ ; 0- $\overline{CS4}$ |
| $\overline{CS1}/QSPICS3/GPIO28$ | IO / 2 mA               | 30           | $\overline{CS1}$        | QSPICS3          | 25                           | IO28      | Negated | —                                                           |
| <b>SDRAM Controller</b>         |                         |              |                         |                  |                              |           |         |                                                             |
| BCLK/GPIO40                     | IO / 8 mA               | 15           | BCLK                    | —                | —                            | IO40      | —       | —                                                           |
| BCLKE/GPIO63                    | IO / 8 mA               | 20           | BCLKE                   | —                | —                            | IO63      | —       | —                                                           |
| $\overline{SDLDQM}/GPO52$       | O / 8 mA                | 20           | $\overline{SDLDQM}$     | —                | —                            | O52       | —       | —                                                           |
| $\overline{SDUDQM}/GPO53$       | O / 8 mA                | 20           | $\overline{SDUDQM}$     | —                | —                            | O53       | —       | —                                                           |
| $\overline{SDWE}/GPIO38$        | IO / 8 mA               | 20           | $\overline{SDWE}$       | —                | —                            | IO38      | Negated | —                                                           |
| $\overline{SDCS0}/GPIO60$       | IO / 8 mA               | 20           | $\overline{SDCS0}$      | —                | —                            | IO60      | Negated | —                                                           |
| $\overline{SDRAS}/GPIO59$       | IO / 8 mA               | 20           | $\overline{SDRAS}$      | —                | —                            | IO59      | Negated | —                                                           |
| $\overline{SDCAS}/GPIO39$       | IO / 8 mA               | 20           | $\overline{SDCAS}$      | —                | —                            | IO39      | Negated | —                                                           |
| <b>ATA Interface</b>            |                         |              |                         |                  |                              |           |         |                                                             |
| ATA_A0                          | O / 2 mA                | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_A1                          | O / 2 mA                | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_A2                          | O / 2 mA                | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D0                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D1                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D2                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D3                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D4                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D5                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D6                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D7                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D8                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D9                          | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D10                         | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D11                         | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D12                         | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D13                         | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |
| ATA_D14                         | IO / 8 mA               | 40           | —                       | —                | —                            | —         | —       | —                                                           |

## Table 19. 225 MAPBGA Pin Assignment (continued)

| Name                               | Drive Type/<br>Strength | Load<br>(pF) | 1st<br>Function | 2nd<br>Function       | Pinconfig<br>Register<br>Bit | GP<br>Pin | Reset | Notes                                   |
|------------------------------------|-------------------------|--------------|-----------------|-----------------------|------------------------------|-----------|-------|-----------------------------------------|
| ATA_D15                            | IO / 8 mA               | 40           | —               | —                     | —                            | —         | —     | —                                       |
| ATA_CS0                            | O / 2 mA                | 40           | —               | —                     | —                            | —         | —     | —                                       |
| ATA_CS1                            | O / 2 mA                | 40           | —               | —                     | —                            | —         | —     | —                                       |
| ATA_DIOR                           | O / 8 mA                | 40           | —               | —                     | —                            | —         | —     | —                                       |
| ATA_DIOW                           | O / 8 mA                | 40           | —               | —                     | —                            | —         | —     | —                                       |
| ATA_IORDY                          | I                       | —            | —               | —                     | —                            | —         | —     | —                                       |
| ATA_INTRQ                          | I                       | —            | —               | —                     | —                            | —         | —     | —                                       |
| ATA_DMARQ                          | I                       | —            | —               | —                     | —                            | —         | —     | —                                       |
| ATA_DMACK                          | O / 8 mA                | 40           | —               | —                     | —                            | —         | —     | —                                       |
| ATA_RST                            | O / 2 mA                | 40           | —               | —                     | —                            | —         | —     | —                                       |
| <b>Clock Generation</b>            |                         |              |                 |                       |                              |           |       |                                         |
| CRIN                               | —                       | —            | —               | —                     | —                            | —         | —     | Main Processor Clock Input              |
| CROUT                              | —                       | —            | —               | —                     | —                            | —         | —     | Main Processor Clock Output             |
| RTC_CRIN                           | A                       | —            | —               | —                     | —                            | —         | —     | Real Time Clock (32.768 kHz) Input      |
| RTCCROUT                           | A                       | —            | —               | —                     | —                            | —         | —     | Real Time Clock (32.768 kHz) Output     |
| USB_CRIN                           | A                       | —            | —               | —                     | —                            | —         | —     | USB Clock (24 MHz) Input                |
| USB_CROUT                          | A                       | —            | —               | —                     | —                            | —         | —     | USB Clock (24 MHz) Output               |
| XTRIM/TXD2/GPIO0                   | IO / 2 mA               | 30           | XTRIM           | TXD2                  | 0                            | IO0       | —     | Interrupt Capable Input                 |
| <b>JTAG/BDM/Test</b>               |                         |              |                 |                       |                              |           |       |                                         |
| TDO/DSO                            | O / 4 mA                | 30           | —               | —                     | —                            | —         | —     | See TEST0 Description                   |
| TDI/DSI                            | I                       | —            | —               | —                     | —                            | —         | —     | See TEST0 Description                   |
| TMS/BKPT                           | I                       | —            | —               | —                     | —                            | —         | —     | See TEST0 Description                   |
| TCK                                | I                       | —            | —               | —                     | —                            | —         | —     | —                                       |
| TRST/DSCLK                         | I                       | —            | —               | —                     | —                            | —         | —     | See TEST0 Description                   |
| HI_Z                               | I                       | —            | —               | —                     | —                            | —         | —     | For Normal Operation Tie This Pin High  |
| PSTCLK/GPIO51                      | IO / 8 mA               | 30           | PSTCLK          | —                     | —                            | IO51      | —     | —                                       |
| PST0/GPIO50                        | IO / 4 mA               | 30           | PST0            | —                     | —                            | IO50      | HI_Z  | —                                       |
| PST1/GPIO49                        | IO / 4 mA               | 30           | PST1            | —                     | —                            | IO49      | HI_Z  | —                                       |
| PST2/INTMON2/<br>GPIO48            | IO / 4 mA               | 30           | PST2            | INTMON2               | 17                           | IO48      | HI_Z  | —                                       |
| PST3/INTMON1/<br>GPIO47            | IO / 4 mA               | 30           | PST3            | INTMON1               | 18                           | IO47      | HI_Z  | —                                       |
| DDATA0/CTS1/<br>SDATA0_SDIO1/GPIO1 | IO / 4 mA               | 30           | DDATA0          | CTS1/SDATA<br>0_SDIO1 | 14,13                        | IO1       | HI_Z  | Interrupt Capable Input                 |
| DDATA1/RTS1/<br>SDATA2_BS2/GPIO2   | IO / 4 mA               | 30           | DDATA1          | RTS1/SDATA<br>2_BS2   | 24,23                        | IO2       | HI_Z  | Interrupt Capable Input                 |
| DDATA2/CTS0/GPIO3                  | IO / 4 mA               | 30           | DDATA2          | CTS0                  | 22                           | IO3       | HI_Z  | Interrupt Capable Input                 |
| DDATA3/RTS0/GPIO4                  | IO / 4 mA               | 30           | DDATA3          | RTS0                  | 21                           | IO4       | HI_Z  | Interrupt Capable Input                 |
| TEST0                              | I                       | —            | —               | —                     | —                            | —         | —     | BDM/JTAG Select: 1-BDM; 0-JTAG          |
| TEST1                              | I                       | —            | —               | —                     | —                            | —         | —     | For normal operation, tie this pin low. |
| TEST2                              | I                       | —            | —               | —                     | —                            | —         | —     | For normal operation, tie this pin low. |
| <b>Reset/Wake-up</b>               |                         |              |                 |                       |                              |           |       |                                         |
| RSTI                               | I                       | —            | —               | —                     | —                            | —         | —     | —                                       |

Table 19. 225 MAPBGA Pin Assignment (continued)

| Name                               | Drive Type/<br>Strength | Load<br>(pF) | 1st<br>Function | 2nd<br>Function | Pinconfig<br>Register<br>Bit | GP<br>Pin | Reset | Notes                   |
|------------------------------------|-------------------------|--------------|-----------------|-----------------|------------------------------|-----------|-------|-------------------------|
| WAKEUP/GPIO21                      | IO / 2 mA               | 30           | WAKEUP          | —               | —                            | IO21      | —     | —                       |
| <b>USB</b>                         |                         |              |                 |                 |                              |           |       |                         |
| USBDN                              | A                       | —            | —               | —               | —                            | —         | —     | —                       |
| USBDP                              | A                       | —            | —               | —               | —                            | —         | —     | —                       |
| USBID                              | I                       | —            | —               | —               | —                            | —         | —     | —                       |
| USBVBUS                            | A                       | —            | —               | —               | —                            | —         | —     | —                       |
| USBRES                             | A                       | —            | —               | —               | —                            | —         | —     | —                       |
| TESTOUT <sup>1</sup>               | O                       | —            | —               | —               | —                            | —         | —     | —                       |
| NC                                 | —                       | —            | —               | —               | —                            | —         | —     | —                       |
| <b>Audio Interface</b>             |                         |              |                 |                 |                              |           |       |                         |
| SDATAI1/GPIO17                     | IO / 2 mA               | 30           | SDATAI1         | —               | —                            | IO17      | —     | —                       |
| SDATAO1/TOUT0/<br>GPIO18           | IO / 2 mA               | 30           | SDATAO1         | TOUT0           | 8                            | IO18      | —     | —                       |
| SCLK1/GPIO20                       | IO / 2 mA               | 30           | SCLK1           | —               | —                            | IO20      | —     | —                       |
| LRCK1/GPIO19                       | IO / 2 mA               | 30           | LRCK1           | —               | —                            | IO19      | —     | —                       |
| SDATAO2/GPIO34                     | IO / 2 mA               | 30           | SDATAO2         | —               | —                            | IO34      | —     | —                       |
| SCLK2/GPIO22                       | IO / 2 mA               | 30           | SCLK2           | —               | —                            | IO22      | —     | —                       |
| LRCK2/GPIO23                       | IO / 2 mA               | 30           | LRCK2           | —               | —                            | IO23      | —     | —                       |
| SDATAI3/GPIO8                      | IO / 2 mA               | 30           | SDATAI3         | —               | —                            | IO8       | —     | —                       |
| SCLK3/GPIO35                       | IO / 2 mA               | 30           | SCLK3           | —               | —                            | IO35      | —     | —                       |
| LRCK3/AUDIOCLK/<br>GPIO43          | IO / 2 mA               | 30           | LRCK3           | AUDIOCLK        | —                            | IO43      | —     | See A20/A24 Description |
| EBUIN1/GPIO36                      | IO / 2 mA               | 30           | EBUIN1          | —               | —                            | IO36      | —     | —                       |
| EBUIN2/SCLKOUT/<br>GPIO13          | IO / 2 mA               | 30           | EBUIN2          | SCLKOUT         | 16                           | IO13      | —     | —                       |
| EBUIN3/<br>CMD_SDIO2/GPIO14        | IO / 2 mA               | 30           | EBUIN3          | CMDSDIO2        | 15                           | IO14      | —     | —                       |
| QSPICS0/EBUIN4/<br>GPIO15          | IO / 2 mA               | 30           | QSPICS0         | EBUIN4          | 30                           | IO15      | —     | —                       |
| EBUOUT1/GPIO37                     | IO / 2 mA               | 30           | EBUOUT1         | —               | —                            | IO37      | —     | —                       |
| QSPICS1/<br>EBUOUT2/GPIO16         | IO / 2 mA               | 30           | QSPICS1         | EBUOUT2         | 29                           | IO16      | —     | —                       |
| CFLG/GPIO5                         | IO / 2 mA               | 30           | CFLG            | —               | —                            | IO5       | —     | Interrupt Capable Input |
| EF/RXD2/GPIO6                      | IO / 2 mA               | 30           | EF              | RXD2            | —                            | IO6       | —     | Interrupt Capable Input |
| MCLK1/GPIO11                       | IO / 4 mA               | 30           | MCLK1           | —               | —                            | IO11      | —     | —                       |
| QSPICS2/MCLK2/<br>GPIO24           | IO / 4 mA               | 30           | QSPICS2         | MCLK2           | 28                           | IO24      | —     | —                       |
| <b>Analog-to-Digital Converter</b> |                         |              |                 |                 |                              |           |       |                         |
| ADIN0/GPI52                        | A                       | —            | ADIN0           | —               | —                            | I52       | —     | —                       |
| ADIN1/GPI53                        | A                       | —            | ADIN1           | —               | —                            | I53       | —     | —                       |
| ADIN2/GPI54                        | A                       | —            | ADIN2           | —               | —                            | I54       | —     | —                       |
| ADIN3/GPI55                        | A                       | —            | ADIN3           | —               | —                            | I55       | —     | —                       |
| ADIN4/GPI56                        | A                       | —            | ADIN4           | —               | —                            | I56       | —     | —                       |
| ADIN5/GPI57                        | A                       | —            | ADIN5           | —               | —                            | I57       | —     | —                       |
| ADREF                              | A                       | —            | —               | —               | —                            | —         | —     | —                       |
| ADOUT/SCLK4/<br>GPIO58             | IO / 2 mA               | 30           | ADOUT           | SCLK4           | 9                            | IO58      | —     | —                       |

## Table 19. 225 MAPBGA Pin Assignment (continued)

| Name                            | Drive Type/<br>Strength | Load<br>(pF) | 1st<br>Function | 2nd<br>Function      | Pinconfig<br>Register<br>Bit | GP<br>Pin | Reset | Notes                                                                 |
|---------------------------------|-------------------------|--------------|-----------------|----------------------|------------------------------|-----------|-------|-----------------------------------------------------------------------|
| <b>FlexCAN</b>                  |                         |              |                 |                      |                              |           |       |                                                                       |
| CAN0_TX                         | O / 8 mA                | 30           | —               | —                    | —                            | —         | —     | —                                                                     |
| CAN0_RX                         | I                       | —            | —               | —                    | —                            | —         | —     | —                                                                     |
| CAN1_TX                         | O / 8 mA                | 30           | —               | —                    | —                            | —         | —     | —                                                                     |
| CAN1_RX                         | I                       | —            | —               | —                    | —                            | —         | —     | —                                                                     |
| <b>QSPI</b>                     |                         |              |                 |                      |                              |           |       |                                                                       |
| QSPICLK/SUBR/<br>GPIO25         | IO / 2 mA               | 30           | QSPICLK         | SUBR                 | 27                           | IO25      | —     | —                                                                     |
| RCK/QSPIDIN/<br>QSPIDOUT/GPIO26 | IO / 2 mA               | 30           | RCK             | QSPIDIN/<br>QSPIDOUT | 26                           | IO26      | —     | —                                                                     |
| QSPIDOUT/SFSY/<br>GPIO27        | IO / 2 mA               | 30           | QSPIDOUT        | SFSY                 | 10                           | IO27      | —     | —                                                                     |
| <b>I<sup>2</sup>C</b>           |                         |              |                 |                      |                              |           |       |                                                                       |
| SDA0/SDATA3/<br>GPIO42          | IO / 4 mA               | 30           | SDA0            | SDATA3               | 11                           | IO42      | —     | —                                                                     |
| SCL0/SDATA1_BS1/<br>GPIO41      | IO / 4 mA               | 30           | SCL0            | SDATA1_BS1           | 12                           | IO41      | —     | —                                                                     |
| SDA1/RXD1/GPIO44                | IO / 4 mA               | 30           | SDA1            | RXD1                 | 19                           | IO44      | —     | —                                                                     |
| SCL1/TXD1/GPIO10                | IO / 4 mA               | 30           | SCL1            | TXD1                 | 20                           | IO10      | —     | —                                                                     |
| <b>UART</b>                     |                         |              |                 |                      |                              |           |       |                                                                       |
| TXD0/GPIO45                     | IO / 2 mA               | 30           | TXD0            | —                    | —                            | IO45      | —     | —                                                                     |
| RXD0/GPIO46                     | IO / 2 mA               | 30           | RXD0            | —                    | —                            | IO46      | —     | —                                                                     |
| <b>Power/Ground Pins</b>        |                         |              |                 |                      |                              |           |       |                                                                       |
| LININ                           | —                       | —            | —               | —                    | —                            | —         | —     | 3.3 Volt Supply Required                                              |
| LINOUT                          | —                       | —            | —               | —                    | —                            | —         | —     | 1.2 Volt Output (Approx 50% Efficient)                                |
| LINGND                          | —                       | —            | —               | —                    | —                            | —         | —     | —                                                                     |
| PLLCOREVDD<br>(3 Balls)         | —                       | —            | —               | —                    | —                            | —         | —     | 1.2 Volt Supply Required (M4, N3, P2)                                 |
| PLLCOREGND<br>(3 Balls)         | —                       | —            | —               | —                    | —                            | —         | —     | N4,P3,R2                                                              |
| USBVDD (2 Balls)                | —                       | —            | —               | —                    | —                            | —         | —     | 3.3 Volt Supply Required (L13, M13)                                   |
| USBVDDP                         | —                       | —            | —               | —                    | —                            | —         | —     | 1.2 Volt Supply Required                                              |
| USBGND (3 Balls)                | —                       | —            | —               | —                    | —                            | —         | —     | K11, L11, M12                                                         |
| OSCPADVDD                       | —                       | —            | —               | —                    | —                            | —         | —     | 3.3 Volt Supply Required                                              |
| OSCPADGND                       | —                       | —            | —               | —                    | —                            | —         | —     | —                                                                     |
| RTC_VDDA                        | —                       | —            | —               | —                    | —                            | —         | —     | 3.3 Volt Supply Required                                              |
| RTCVSSA                         | —                       | —            | —               | —                    | —                            | —         | —     | —                                                                     |
| ADVDD                           | —                       | —            | —               | —                    | —                            | —         | —     | 3.3 Volt Supply Required                                              |
| ADGND                           | —                       | —            | —               | —                    | —                            | —         | —     | —                                                                     |
| PADVDD (10 Balls)               | —                       | —            | —               | —                    | —                            | —         | —     | 3.3 Volt Supply Required (E7, E9, F10, H8, H11, K5, L6, L8, L10, R13) |

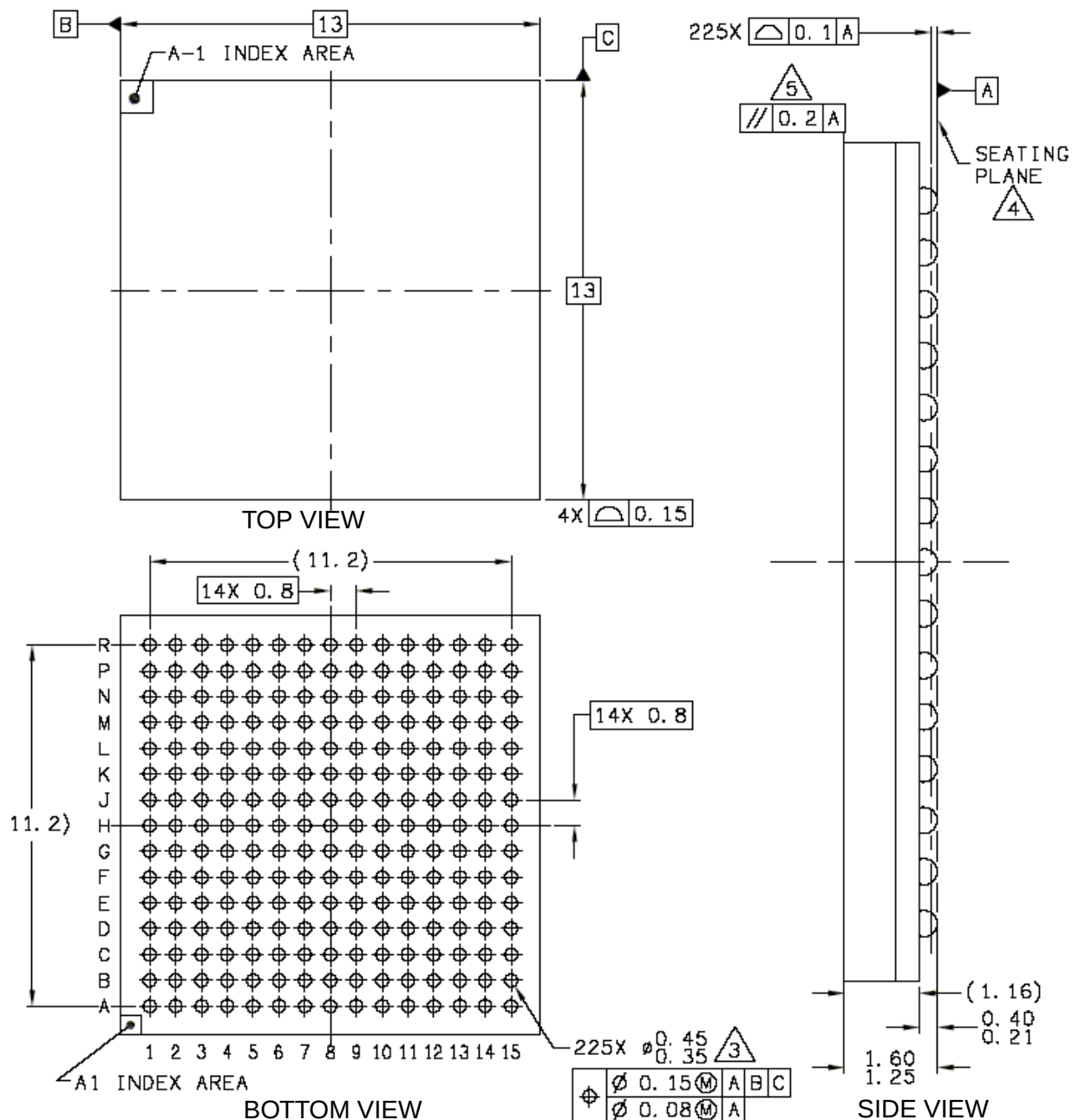
Table 19. 225 MAPBGA Pin Assignment (continued)

| Name                                      | Drive Type/<br>Strength | Load<br>(pF) | 1st<br>Function | 2nd<br>Function | Pinconfig<br>Register<br>Bit | GP<br>Pin | Reset | Notes                                                                              |
|-------------------------------------------|-------------------------|--------------|-----------------|-----------------|------------------------------|-----------|-------|------------------------------------------------------------------------------------|
| COREVDD<br>(4 Balls)                      | —                       | —            | —               | —               | —                            | —         | —     | 1.2 Volt Supply Required (G8, H7,<br>H9, J8)                                       |
| COREVSS/PADVSS<br>(18 Balls) <sup>2</sup> | —                       | —            | —               | —               | —                            | —         | —     | A1, A15, E8, E10, F7, G6, G7, G9,<br>G11, J7, J9, J10, J11, L5, L7, L9,<br>R1, R15 |

<sup>1</sup> For test purposes only. Leave ball as open circuit.  
<sup>2</sup> These pads are listed as “GND” in the ball map and the rest of the tables.

## 6.2 Package Drawing

Figure 6 shows the package outline diagram for the MCF5253 processor.



**Notes:**

1. All dimensions in millimeters.
2. Dimensioning and tolerancing per ASME Y14. 5M-1994.
3. Maximum solder ball diameter measured parallel to datum A.
4. Datum A, the seating plane, is determined by the spherical crown of the solder balls.
5. Parallelism measurement shall exclude any effect of mark on top surface of package.

**Figure 6. MCF5253 Package Drawing**

## 6.2.1 MAPBGA Pinout

Figure 7 shows the MCF5253 ball map of pad locations.

|   | 1               | 2               | 3               | 4                    | 5                          | 6                             | 7                                   | 8                              | 9                            | 10                                         | 11                                      | 12                        | 13                          | 14                          | 15                   |   |
|---|-----------------|-----------------|-----------------|----------------------|----------------------------|-------------------------------|-------------------------------------|--------------------------------|------------------------------|--------------------------------------------|-----------------------------------------|---------------------------|-----------------------------|-----------------------------|----------------------|---|
| A | GND             | D24             | D26             | D30                  | SDUDQM/<br>GPO53           | SDRAS/<br>GPIO59              | ATA_DMAR<br>Q                       | ATA_A0                         | ATA_D1                       | ATA_D6                                     | ATA_D11                                 | ATA_D12                   | ATA_D1OW                    | LININ                       | GND                  | A |
| B | D19             | D23             | D25             | D28                  | BCLK/<br>GPIO40            | SDCS0/<br>GPIO60              | ATA_A1                              | ATA_A2                         | ATA_D0                       | ATA_D4                                     | ATA_D9                                  | ATA_D14                   | HI_Z                        | LINOUT                      | ATA_DIOR             | B |
| C | D16             | D20             | D22             | D27                  | D31                        | SDLDQM/<br>GPO52              | SDWE/<br>GPIO38                     | ATA_RST                        | ATA_CS0                      | ATA_D5                                     | ATA_D10                                 | ATA_DMACK                 | LINGND                      | CAN1_TX                     | CAN0_TX              | C |
| D | A22             | A23/GPO54       | A21             | D21                  | D29                        | SDCAS/<br>GPIO39              | ATA_IORDY                           | ATA_INTRQ                      | ATA_CS1                      | ATA_D7                                     | ATA_D8                                  | ATA_D15                   | CAN0_RX                     | MCLK1/<br>GPIO11            | SDATA02/<br>GPIO34   | D |
| E | A14             | A16             | A18             | D17                  | D18                        | BCLKE/<br>GPIO63              | PADVDD                              | GND                            | PADVDD                       | GND                                        | ATA_D13                                 | CAN1_RX                   | SCLK2/<br>GPIO22            | LRCK2/<br>GPIO23            | RSTI                 | E |
| F | A13             | A10             | A12             | A17                  | A19                        | A20/A24                       | GND                                 | ATA_D2                         | ATA_D3                       | PADVDD                                     | TEST0                                   | TMS/BKPT                  | TCK                         | TRST/<br>DSCLK              | TDI/DSI              | F |
| G | A5              | A7              | A6              | A15                  | A11                        | GND                           | GND                                 | COREVDD                        | GND                          | TEST1                                      | GND                                     | PST1/<br>GPIO49           | TDO/DSO                     | PSTCLK/<br>GPIO51           | PST0/<br>GPIO50      | G |
| H | A3              | A2              | A1              | A8                   | A4                         | A9                            | COREVDD                             | PADVDD                         | COREVDD                      | TEST2                                      | PADVDD                                  | TXD0/<br>GPIO45           | PST3/<br>INTMON1/<br>GPIO47 | PST2/<br>INTMON2/<br>GPIO48 | RXD0/<br>GPIO46      | H |
| J | RTC_CRIN        | RTC_VDDA        | CS0/CS4         | RW                   | ADOUT/<br>SCLK4/<br>GPIO58 | ADIN5/<br>GPI57               | GND                                 | COREVDD                        | GND                          | GND                                        | GND                                     | DDATA3/<br>RTS0/<br>GPIO4 | SCL1/TXD1/<br>GPIO10        | DDATA2/<br>CTS0/<br>GPIO3   | SDA1/RXD1<br>/GPIO44 | J |
| K | RTCVSSA         | RTCCROUT        | ADIN0/<br>GPI52 | ADVDD                | PADVDD                     | BUFENB2/<br>GPIO30            | EBUIN3/CM<br>D_SDIO2/<br>GPIO14     | SCLK1/<br>GPIO20               | SDA0/<br>SDATA3/<br>GPIO42   | DDATA0/<br>CTS1/SDAT<br>A0_SDIO1/<br>GPIO1 | USBGND                                  | N/C                       | N/C                         | N/C                         | N/C                  | K |
| L | ADIN1/<br>GPI53 | ADIN2/<br>GPI54 | ADIN3/<br>GPI55 | ADGND                | GND                        | PADVDD                        | GND                                 | PADVDD                         | GND                          | PADVDD                                     | USBGND                                  | USBVDDP                   | USBVDD                      | USB_CRIN                    | USB_CROUT            | L |
| M | ADIN4/<br>GPI56 | ADREF           | CRIN            | PLLCORE<br>VDD       | IDE_DIOR/<br>GPIO31        | EBUIN2/<br>SCLKOUT/<br>GPIO13 | CS1/<br>QSPICS3/<br>GPIO28          | QSPIDOUT/<br>SFSY/<br>GPIO27   | CFLG/<br>GPIO5               | LRCK3/<br>AUDCLK/<br>GPIO43                | USBID                                   | USBGND                    | USBVDD                      | USBRES                      | USBIDP               | M |
| N | OSCPAD<br>VDD   | CROUT           | PLLCORE<br>VDD  | PLLCORE<br>GND       | TA/GPIO12                  | EBUIN1/<br>GPIO36             | RCK/QSPID<br>IN/QSPIDO<br>UT/GPIO26 | QSPICS1/<br>EBUOUT2/<br>GPIO16 | SDATA1/<br>GPIO17            | SDATAI3/<br>GPIO8                          | N/C                                     | N/C                       | N/C                         | USBVBUS                     | USBDN                | N |
| P | OSCPAD<br>GND   | PLLCORE<br>VDD  | PLLCORE<br>GND  | IDE_D1OW/<br>GPIO32  | BUFENB1/<br>GPIO29         | EBUOUT1/<br>GPIO37            | QSPICLK/<br>SUBR/<br>GPIO25         | LRCK1/<br>GPIO19               | QSPICS2/<br>MCLK2/<br>GPIO24 | SCL0/SDAT<br>A1_BS1/<br>GPIO41             | N/C                                     | N/C                       | TESTOUT                     | N/C                         | N/C                  | P |
| R | GND             | PLLCORE<br>GND  | OE              | IDE_IORDY/<br>GPIO33 | WAKEUP/<br>GPIO21          | XTRIM/<br>TXD2/<br>GPIO0      | QSPICS0/<br>EBUIN4/<br>GPIO15       | SDATA01/<br>TOUT0/<br>GPIO18   | EF/RXD2/<br>GPIO6            | SCLK3/<br>GPIO35                           | DDATA1/RT<br>S1/SDATA2<br>BS2/<br>GPIO2 | N/C                       | PADVDD                      | NC                          | GND                  | R |
|   | 1               | 2               | 3               | 4                    | 5                          | 6                             | 7                                   | 8                              | 9                            | 10                                         | 11                                      | 12                        | 13                          | 14                          | 15                   |   |

Figure 7. MCF5253 Ball Map

Table 20 shows the signal color and signal name legend.

**Table 20. Signal Color/Name Legend**

| Color                                                                             | Name                  |
|-----------------------------------------------------------------------------------|-----------------------|
| None                                                                              | Signal name as listed |
|  | GND                   |
|  | PADVDD                |
|  | COREVDD               |
|  | USBGND                |

Table 21 shows the device pin list, sorted by signal identification.

**Table 21. MCF5253 13 x 13 BGA (225 Signal ID by Pad Grid Location)**

| Signal ID          | Pad Location |
|--------------------|--------------|
| A1                 | H03          |
| A10                | F02          |
| A11                | G05          |
| A12                | F03          |
| A13                | F01          |
| A14                | E01          |
| A15                | G04          |
| A16                | E02          |
| A17                | F04          |
| A18                | E03          |
| A19                | F05          |
| A2                 | H02          |
| A20/A24            | F06          |
| A21                | D03          |
| A22                | D01          |
| A23/GPO54          | D02          |
| A3                 | H01          |
| A4                 | H05          |
| A5                 | G01          |
| A6                 | G03          |
| A7                 | G02          |
| A8                 | H04          |
| A9                 | H06          |
| ADGND              | L04          |
| ADIN0/GPI52        | K03          |
| ADIN1/GPI53        | L01          |
| ADIN2/GPI54        | L02          |
| ADIN3/GPI55        | L03          |
| ADIN4/GPI56        | M01          |
| ADIN5/GPI57        | J06          |
| ADOUT/SCLK4/GPIO58 | J05          |
| ADREF              | M02          |
| ADVDD              | K04          |

Table 21. MCF5253 13 x 13 BGA (225 Signal ID by Pad Grid Location) (continued)

| Signal ID          | Pad Location |
|--------------------|--------------|
| ATA_A0             | A08          |
| ATA_A1             | B07          |
| ATA_A2             | B08          |
| ATA_CS0            | C09          |
| ATA_CS1            | D09          |
| ATA_D0             | B09          |
| ATA_D1             | A09          |
| ATA_D10            | C11          |
| ATA_D11            | A11          |
| ATA_D12            | A12          |
| ATA_D13            | E11          |
| ATA_D14            | B12          |
| ATA_D15            | D12          |
| ATA_D2             | F08          |
| ATA_D3             | F09          |
| ATA_D4             | B10          |
| ATA_D5             | C10          |
| ATA_D6             | A10          |
| ATA_D7             | D10          |
| ATA_D8             | D11          |
| ATA_D9             | B11          |
| ATA_DIOR           | B15          |
| ATA_DIOW           | A13          |
| ATA_DMACK          | C12          |
| ATA_DMARQ          | A07          |
| ATA_INTRQ          | D08          |
| ATA_IORDY          | D07          |
| ATA_RST            | C08          |
| BCLK/GPIO40        | B05          |
| BCLKE/GPIO63       | E06          |
| BUFENB1/GPIO29     | P05          |
| BUFENB2/GPIO30     | K06          |
| CAN0_RX            | D13          |
| CAN0_TX            | C15          |
| CAN1_RX            | E12          |
| CAN1_TX            | C14          |
| CFLG/GPIO5         | M09          |
| COREVDD            | G08          |
| COREVDD            | H07          |
| COREVDD            | H09          |
| COREVDD            | J08          |
| CRIN               | M03          |
| CROUT              | N02          |
| CS0/CS4            | J03          |
| CS1/QSPICS3/GPIO28 | M07          |
| D16                | C01          |

**Table 21. MCF5253 13 x 13 BGA (225 Signal ID by Pad Grid Location) (continued)**

| Signal ID                      | Pad Location |
|--------------------------------|--------------|
| D17                            | E04          |
| D18                            | E05          |
| D19                            | B01          |
| D20                            | C02          |
| D21                            | D04          |
| D22                            | C03          |
| D23                            | B02          |
| D24                            | A02          |
| D25                            | B03          |
| D26                            | A03          |
| D27                            | C04          |
| D28                            | B04          |
| D29                            | D05          |
| D30                            | A04          |
| D31                            | C05          |
| DDATA0/CTS1/SDATA0_SDIO1/GPIO1 | K10          |
| DDATA1/RTS1/SDATA2_BS2/GPIO2   | R11          |
| DDATA2/CTS0/GPIO3              | J14          |
| DDATA3/RTS0/GPIO4              | J12          |
| EBUIN1/GPIO36                  | N06          |
| EBUIN2/SCLKOUT/GPIO13          | M06          |
| EBUIN3/CMD_SDIO2/GPIO14        | K07          |
| EBUOUT1/GPIO37                 | P06          |
| EF/RXD2/GPIO6                  | R09          |
| GND                            | A01          |
| GND                            | A15          |
| GND                            | E08          |
| GND                            | E10          |
| GND                            | F07          |
| GND                            | G06          |
| GND                            | G07          |
| GND                            | G09          |
| GND                            | G11          |
| GND                            | J07          |
| GND                            | J09          |
| GND                            | J10          |
| GND                            | J11          |
| GND                            | L05          |
| GND                            | L07          |
| GND                            | L09          |
| GND                            | R01          |
| GND                            | R15          |
| HI_Z                           | B13          |
| IDE_DI0R/GPIO31                | M05          |
| IDE_DI0W/GPIO32                | P04          |
| IDE_IORDY/GPIO33               | R04          |

Table 21. MCF5253 13 x 13 BGA (225 Signal ID by Pad Grid Location) (continued)

| Signal ID                   | Pad Location |
|-----------------------------|--------------|
| LINGND                      | C13          |
| LININ                       | A14          |
| LINOUT                      | B14          |
| LRCK1/GPIO19                | P08          |
| LRCK2/GPIO23                | E14          |
| LRCK3/AUDIOCLK/GPIO43       | M10          |
| MCLK1/GPIO11                | D14          |
| NC                          | R14          |
| OE                          | R03          |
| OSCPADGND                   | P01          |
| OSCPADVDD                   | N01          |
| PADVDD                      | E07          |
| PADVDD                      | E09          |
| PADVDD                      | F10          |
| PADVDD                      | H08          |
| PADVDD                      | H11          |
| PADVDD                      | K05          |
| PADVDD                      | L06          |
| PADVDD                      | L08          |
| PADVDD                      | L10          |
| PADVDD                      | R13          |
| PLLAVDD                     | M04          |
| PLLCOREGND                  | N04          |
| PLLCOREGND                  | P03          |
| PLLCOREGND                  | R02          |
| PLLCOREVDD                  | N03          |
| PLLCOREVDD                  | P02          |
| PST0/GPIO50                 | G15          |
| PST1/GPIO49                 | G12          |
| PST2/INTMON2/GPIO48         | H14          |
| PST3/INTMON1/GPIO47         | H13          |
| PSTCLK/GPIO51               | G14          |
| QSPICLK/SUBR/GPIO25         | P07          |
| QSPICS0/EBUIN4/GPIO15       | R07          |
| QSPICS1/EBUOUT2/GPIO16      | N08          |
| QSPICS2/MCLK2/GPIO24        | P09          |
| QSPIDOUT/SFSY/GPIO27        | M08          |
| RCK/QSPIDIN/QSPIDOUT/GPIO26 | N07          |
| RSTI                        | E15          |
| RTC_CRIN                    | J01          |
| RTC_VDDA                    | J02          |
| RTCCROUT                    | K02          |
| RTCVSSA                     | K01          |
| RW                          | J04          |
| RXD0/GPIO46                 | H15          |
| SCL0/SDATA1_BS1/GPIO41      | P10          |

**Table 21. MCF5253 13 x 13 BGA (225 Signal ID by Pad Grid Location) (continued)**

| Signal ID                          | Pad Location |
|------------------------------------|--------------|
| SCL1/TXD1/GPIO10                   | J13          |
| SCLK1/GPIO20                       | K08          |
| SCLK2/GPIO22                       | E13          |
| SCLK3/GPIO35                       | R10          |
| SDA0/SDATA3/GPIO42                 | K09          |
| SDA1/RXD1/GPIO44                   | J15          |
| SDATA1/GPIO17                      | N09          |
| SDATA3/GPIO8                       | N10          |
| SDATA01/TOUT0/GPIO18               | R08          |
| SDATA02/GPIO34                     | D15          |
| $\overline{\text{SDCAS}}$ /GPIO39  | D06          |
| $\overline{\text{SDCS0}}$ /GPIO60  | B06          |
| $\overline{\text{SDLDQM}}$ /GPO52  | C06          |
| $\overline{\text{SDRAS}}$ /GPIO59  | A06          |
| $\overline{\text{SDUDQM}}$ /GPO53  | A05          |
| $\overline{\text{SDWE}}$ /GPIO38   | C07          |
| $\overline{\text{TA}}$ /GPIO12     | N05          |
| TCK                                | F13          |
| TDI/DSI                            | F15          |
| TDO/DSO                            | G13          |
| TEST0                              | F11          |
| TEST1                              | G10          |
| TEST2                              | H10          |
| TESTOUT                            | P13          |
| TMS/ $\overline{\text{BKPT}}$      | F12          |
| $\overline{\text{TRST}}$ /DSCLK    | F14          |
| TXD0/GPIO45                        | H12          |
| USB_CRIN                           | L14          |
| USB_CROUT                          | L15          |
| USBDN                              | N15          |
| USBDP                              | M15          |
| USBGND                             | K11          |
| USBGND                             | L11          |
| USBGND                             | M12          |
| USBID                              | M11          |
| USBRES                             | M14          |
| USBVBUS                            | N14          |
| USBVDD                             | L13          |
| USBVDD                             | M13          |
| USBVDDP                            | L12          |
| $\overline{\text{WAKEUP}}$ /GPIO21 | R05          |
| XTRIM/TXD2/GPIO0                   | R06          |

# 7 Product Documentation

This section includes the related product documentation and references to information posted on Freescale’s external web page.

This document is labeled as the type: Data Sheet: Technical Data. Definitions for all Freescale document types are available at: <http://www.freescale.com>.

You can also obtain information on the mechanical characteristics of the MCF5253 integrated microprocessor at <http://www.freescale.com/coldfire>.

The following documents are required for a complete description of the device and are necessary for proper design:

*MCF5253 Reference Manual* (order number: MCF5253RM)

*MCF5253 Product Brief* (order number: MCF5253PB)

## 7.1 Revision History

[Table 22](#) summarizes revisions to this document.

**Table 22. MCF5253DS Revision History**

| Rev. No. | Substantive Change(s)                                    |
|----------|----------------------------------------------------------|
| 2        | First public version.                                    |
| 3        | Added industrial temperature part number, MCF5253CVM140. |
| 4        | Added <a href="#">Section 5</a> , “Power Consumption”    |

#### **How to Reach Us:**

**Home Page:**  
www.freescale.com

**E-mail:**  
support@freescale.com

**USA/Europe or Locations Not Listed:**  
Freescale Semiconductor  
Technical Information Center, CH370  
1300 N. Alma School Road  
Chandler, Arizona 85224  
+1-800-521-6274 or +1-480-768-2130  
support@freescale.com

**Europe, Middle East, and Africa:**  
Freescale Halbleiter Deutschland GmbH  
Technical Information Center  
Schatzbogen 7  
81829 Muenchen, Germany  
+44 1296 380 456 (English)  
+46 8 52200080 (English)  
+49 89 92103 559 (German)  
+33 1 69 35 48 48 (French)  
support@freescale.com

**Japan:**  
Freescale Semiconductor Japan Ltd.  
Headquarters  
ARCO Tower 15F  
1-8-1, Shimo-Meguro, Meguro-ku,  
Tokyo 153-0064, Japan  
0120 191014 or +81 3 5437 9125  
support.japan@freescale.com

**Asia/Pacific:**  
Freescale Semiconductor Hong Kong Ltd.  
Technical Information Center  
2 Dai King Street  
Tai Po Industrial Estate  
Tai Po, N.T., Hong Kong  
+800 2666 8080  
support.asia@freescale.com

**For Literature Requests Only:**  
Freescale Semiconductor Literature Distribution Center  
P.O. Box 5405  
Denver, Colorado 80217  
1-800-521-6274 or 303-675-2140  
Fax: 303-675-2150  
LDCForFreescaleSemiconductor@hibbertgroup.com

Information in this document is provided solely to enable system and software implementers to use Freescale Semiconductor products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits or integrated circuits based on the information in this document.

Freescale Semiconductor reserves the right to make changes without further notice to any products herein. Freescale Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters that may be provided in Freescale Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals", must be validated for each customer application by customer's technical experts. Freescale Semiconductor does not convey any license under its patent rights nor the rights of others. Freescale Semiconductor products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Freescale Semiconductor product could create a situation where personal injury or death may occur. Should Buyer purchase or use Freescale Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold Freescale Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Freescale Semiconductor was negligent regarding the design or manufacture of the part.

Freescale™ and the Freescale logo are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners.

© Freescale Semiconductor, Inc. 2008. All rights reserved.