TEXAS INSTRUMENTS

7000

TMS7000 Family Microarchitecture

MICROCOMPUTER SERIES™

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TMS7000 FAMILY MICROARCHITECTURE USER'S GUIDE

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SECTION 1

INTRODUCTION

1.1 GENERAL INFORMATION

The Texas Instruments TMS7000 Family of single-chip microcomputers is based around a microprogrammable Central Processing Unit (CPU), which can be interfaced to combinations of on-chip RAM, ROM, and I/O circuitry to provide a powerful family of single-chip microcomputers. The TMS7000 CPU implements a 64K byte logical address space and interfaces with I/O registers, timer circuit controls, and other useful on-chip functions by referencing certain addresses within the address space.

This document contains a description of the internal architecture of the TMS7000. It describes primarily the operation of CPU; the memory and on-chip I/O circuitry may vary among the TMS7000 family members, and will be described in the documentation for those individual devices. This document is intended to present information regarding the internal architecture of the TMS7000 family necessary for microcoding these devices. A symbolic microinstruction assembler called MICASM is provided for assembling microcode instruction mnemonics. This assembler is described in the TMS7000 Microassembler User's Guide.

Other information relating to the TMS7000 Family of microcomputers is contained in the following documents:

- TMS7000 8-Bit Microcomputer Data Manual (MP #008A)
- TMS7000 Assembly Language Programmer's Guide (MP #916)
- TMS7000 Microassembler User's Guide (MP #457)
- TMS7000 Microcode Development Guide (MP #458)
- TMS7000 Microprogrammer's Reference Card (MP #459)

The standard instruction set executed by the TMS7000 Family is described in the TMS7000 Assembly Language Programmer's Guide. Internally, the TMS7000 is a microprogrammed processor, whose operation is controlled by a sequence of microinstructions. The internal microprogram is stored in the CPU in the Control ROM, or CROM. Each microinstruction in the microprogram has the same format, consisting of bit fields which control the following operations:

- The gating of microregisters onto internal buses
- The operation of the internal Arithmetic Logic Unit (ALU)
- The appropriate shifting of the ALU results
- The gating of ALU results back into microregisters
- The memory controls to on-chip and off-chip memory
- The next microinstruction to be executed.

This format is called a horizontal microinstruction format, because every component of the microarchitecture is controlled by a single microinstruction word. Such an organization permits a high degree of parallelism in the operation of the microarchitecture.

1.2 INITIAL FAMILY MEMBERS

The TMS7000, TMS7020, and TMS7040 are the initial members of the TMS7000 8-bit Microcomputer Family. The TMS7020 provides 128 bytes of RAM, 2K bytes of ROM, and four 8-bit I/O ports. The TMS7040 provides the same 128 bytes of RAM but contains 4K bytes of ROM. The TMS7000 is identical to the TMS7020/7040, but it has no on-chip ROM. Throughout this document, TMS7000 will in general refer to any member of the TMS7000 family, unless explicitly stated otherwise.

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