# INTRODUCTION

The Z8* Microcomputer family offers the most sophisticated processing capability available on a single chip. As an extension of earlier generations of microcomputers. the Z8 family provides standard on-chip functions, such as :

- 2K. 4K OR 8K BYTES ROM OR EPROM
- 28-PIN AND 40-PIN VERSIONS AVAILABLE
- 144 OR 256 8-BIT REGISTERS
- 32 LINES OF PROGRAMMABLE I/O
- CLOCK OSCILLATOR UP TO 12 MHZ
- AVERAGE INSTRUCTION EXECUTION TIME 1µs (12MHZ)
- TWO COUNTER/TIMERS
- SIX VECTORED INTERRUPTS
- UART FOR SERIAL I/O COMMUNICATIONS
- STACK FUNCTIONS
- POWER-DOWN OPTION
- TTL COMPATIBILITY

The Z8 Microcomputer family is expandable off-chip to provide an additional 62K bytes of program memory and 62K bytes of data memory for the 2K-byte ROM version, an additional 60K bytes of program memory and 60K bytes of data memory for the 4K-byte ROM version and an additional 56K bytes of program memory and 56K bytes of data memory for the 8K-byte ROM version. The interface to external memory is accomplished through one, one and one half, or two of the 8-bit I/O ports, depending on the number of address bits required for the external functions. The Z-BUS* protocol allows easy interface to external functions including peripheral chips.

The Z8 family challenges the "multi-chip solution" design currently implemented by general-purpose microprocessor. Designs based on Z8 Microcomputers family offer a minimum chip-count configuration that can easily be expanded to meet requirements for enhancement options and for future improvements.

## OPTIMIZED INSTRUCTION SET

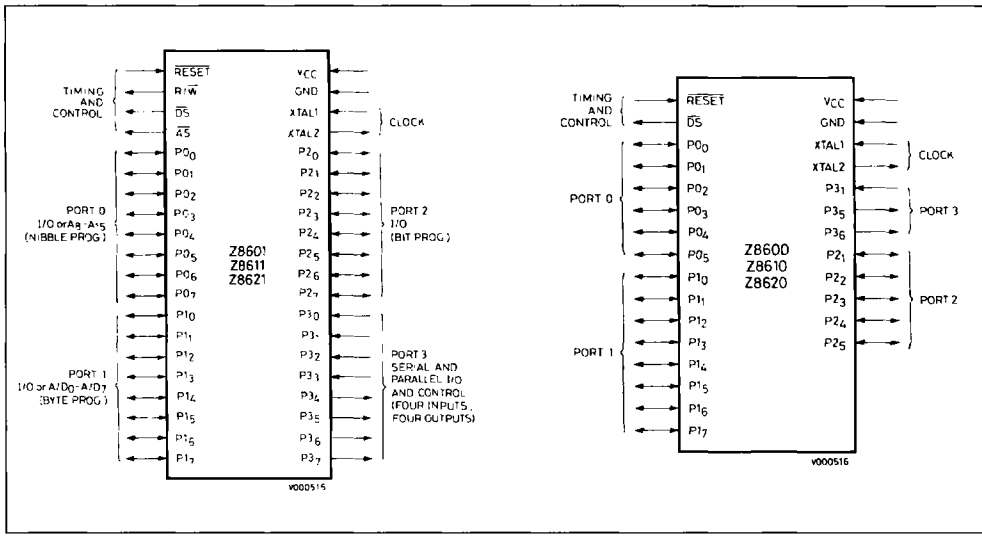
The instruction set of the Z8 family is optimized for high code density and reduced execution time. This feature is supported by a "working register area" concept that uses short (4-bit) register addresses. The general purpose registers can be used as accumulators, as address pointers for indirect addressing. as index registers, or for implementing an on-chip stack.
The 47 instruction types and six addressing modes-together with the ability to operate on bits, 4-bit BCD digits, 8-bit bytes, and 16-bit words, offer unique programming capability and flexibility.

## GROWING FAMILY

The Z8 Microcomputer family is growing to meet the needs of more complex designs. The 8K ROM version Z8621 completed developed by SGS-THOMSON. offers all the features of the Z8 family, plus 8K bytes of on-chip ROM and 256-byte register file. The increased ROM and bytes register file allows the designers to take advantage of the code optimization inherent in the Z8 instruction set when using between 2K and 8K bytes of program memory.
The ROMless Microcomputers provide an alternative for designers seeking to take advantage of the on-chip features of the Z8681 and Z86R91 in applications that require external program memory. The Z8681 ROMless Microcomputer can be used to control a system that addresses up to 128K bytes of external memory. The new Z86R91 ROMless MCU offers in addition 254-byte register file. instead of the 144-byte of the Z8681.

Newly in the Z8 family the 4K and 8K bytes on-chip EPROM Z86E11 and Z86E21, that perform different programming modes. like : EPROM-like, using standard EPROM programmer ; Self-programming, during normal Microcomputer operation and time efficient self-program facility ; and integrated programmable EPROM read-out protection.
For their characteristics the Z86E11 and Z86E21 can be considered as low cost development tools for the Z8 Microcomputer family. OTP versions are available in 4K and 8K bytes EPROM versions.

## BASIC LOGIC FUNCTIONS




## SELECTION GUIDE

| Part Number | Description | Frequency (MHz) | Packages |
|---|---|---|---|
| Z8600 | 2K ROM, 22 I/O Lines | 8-12 | PDIP-28, PLCC28 |
| Z8601 | 2K ROM, 32 I/O Lines | 8-12 | PDIP-40, PLCC44 |
| Z8610 | 4K ROM, 22 I/0 Lines | 8-12 | PDIP-28, PLCC28 |
| Z8611 | 4K ROM, 32 I/O Lines | 8-12 | PDIP-40, PLCC44 |
| Z8620 | 8K ROM, 22 I/O Lines | 8-12 | PDIP-28, PLCC28 |
| Z8621 | 8K ROM, 32 I/O Lines | 8-12 | PDIP-40, PLCC44 |
| Z8671 | Resident Tiny BASIC | 8 | PDIP-40 |
| Z8681 | ROMless, 143 - Byte Reg. File | 8-12 | PDIP-40, PLCC44 |
| Z86R91 | ROMless, 254 - Byte Reg. File | 8-12 | PDIP-40, PLCC44 |
| Z86E11 | 4K EPROM | 8-12 | DIP-40-W, CLCC44-W |
| Z86E21 | 8K EPROM | 8-12 | DIP-40-W, CLCC44-W |
| Z8611E | 4K OTP EPROM | 8-12 | DIP-40 |
| Z8621E | 8K OTP EPROM | 8-12 | DIP-40 |

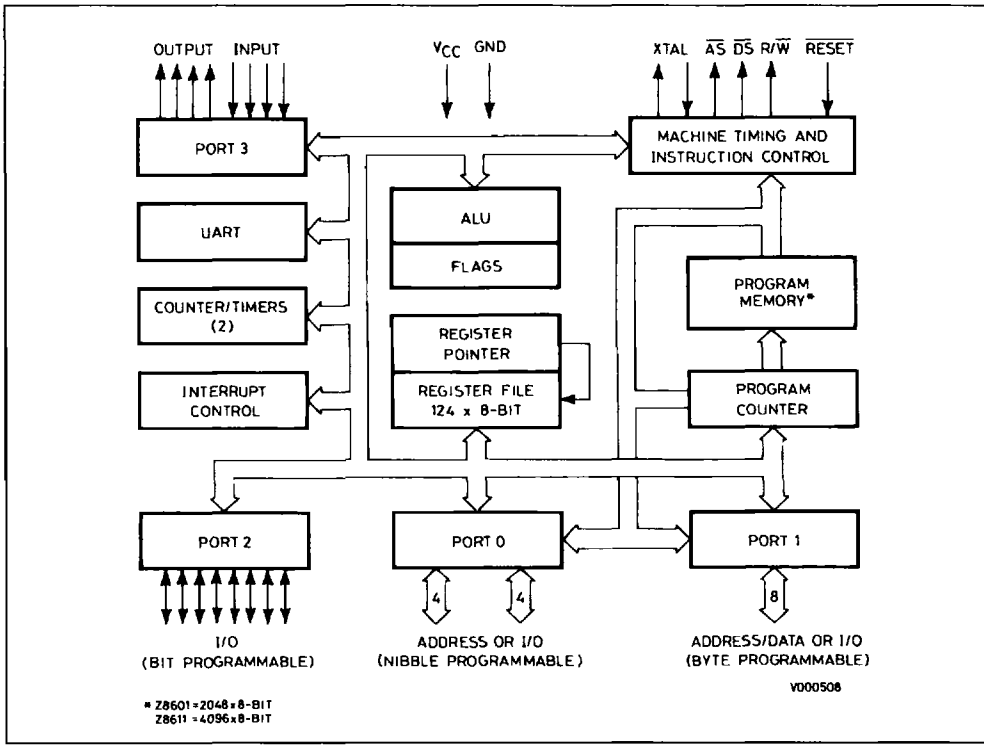
## ORDERING INFORMATION

| Part Number | Description | Speed | Package |
|---|---|---|---|
| Z8600B1 | Z8 MCU W/2K ROM | 8MHz | PDIP-28 |
| Z8600AB1 | Z8 MCU W/2K ROM | 12MHz | PDIP-28 |
| Z8600C1 | Z8 MCU W/2K ROM | 8MHz | PLCC28 |
| Z8600AC1 | Z8 MCU W/2K ROM | 12MHz | PLCC28 |
| Z8601B1 | Z8 MCU W/2K ROM | 8MHz | PDIP-40 |
| Z8601AB1 | Z8 MCU W/2K ROM | 12MHz | PDIP-40 |
| Z8601C1 | Z8 MCU W/2K ROM | 8MHz | PLCC44 |
| Z8601AC1 | Z8 MCU W/2K ROM | 12MHz | PLCC44 |
| Z8610B1 | Z8 MCU W/4K ROM | 8MHz | PDIP-28 |
| Z8610AB1 | Z8 MCU W/4K ROM | 12MHz | PDIP-28 |
| Z8610C1 | Z8 MCU W/4K ROM | 8MHz | PLCC28 |
| Z8610AC1 | Z8 MCU W/4K ROM | 12MHz | PLCC28 |
| Z8611B1 | Z8 MCU W/4K ROM | 8MHz | PDIP-40 |
| Z8611AB1 | Z8 MCU W/4K ROM | 12MHz | PDIP-40 |
| Z8611C1 | Z8 MCU W/4K ROM | 8MHz | PLCC44 |
| Z8611AC1 | Z8 MCU W/4K ROM | 12MHz | PLCC44 |
| Z8620B1 | Z8 MCU W/8K ROM | 8MHz | PDIP-28 |
| Z8620AB1 | Z8 MCU W/8K ROM | 12MHz | PDIP-28 |
| Z8620C1 | Z8 MCU W/8K ROM | 8MHz | PLCC28 |
| Z8620AC1 | Z8 MCU W/8K ROM | 12MHz | PLCC28 |
| Z8621B1 | Z8 MCU W/8K ROM | 8MHz | PDIP-40 |
| Z8621AB1 | Z8 MCU W/8K ROM | 12MHz | PDIP-40 |
| Z8621C1 | Z8 MCU W/8K ROM | 8MHz | PLCC44 |
| Z8621AC1 | Z8 MCU W/8K ROM | 12MHz | PLCC44 |
| Z8671B1 | Z8 MCU W/BASIC | 8MHz | PDIP-40 |
| Z8681B1 | Z8 ROMLESS MCU | 8MHz | PDIP-40 |
| Z8681AB1 | Z8 ROMLESS MCU | 12MHz | PDIP-40 |
| Z8681C1 | Z8 ROMLESS MCU | 8MHz | PLCC44 |
| Z8681AC1 | Z8 ROMLESS MCU | 12MHz | PLCC44 |
| Z86R91B1 | Z8 ROMLESS MCU | 8MHz | PDIP-40 |
| Z86R91AB1 | Z8 ROMLESS MCU | 12MHz | PDIP-40 |
| Z86R91C1 | Z8 ROMLESS MCU | 8MHz | PLCC44 |
| Z86R91AC1 | Z8 ROMLESS MCU | 12MHz | PLCC44 |
| Z86E11F1 | Z8 MCU W/4K EPROM | 8MHz | DIP-40-W |
| Z86E11AF1 | Z8 MCU W/4K EPROM | 12MHz | DIP-40-W |
| Z86E11L1 | Z8 MCU W/4K EPROM | 8MHz | CLCC44-W |
| Z86E21F1 | Z8 MCU W/8K EPROM | 8MHz | DIP-40-W |
| Z86E21AF1 | Z8 MCU W/8K EPROM | 12MHz | DIP-40-W |
| Z86E21L1 | Z8 MCU W/8K EPROM | 8MHz | CLCC-44-W |
| Z8611F1E | Z8 OTP W/4K EPROM | 8MHz | DIP-40 |
| Z8611AF1E | Z8 OTP W/4K EPROM | 12MHz | DIP-40 |
| Z8621F1E | Z8 OTP W/8K EPROM | 8MHz | DIP-40 |
| Z8621AF1E | Z8 OTP W/8K EPROM | 12MHz | DIP-40 |
| Z8E-KIT-BOARD | Z8 EPROM PROGRAMMING BOARD KIT | | |
| EMU-Z8PC8 | Z8 IBM PC BASED IN-CIRCUIT EMULATOR | | |
| TE-Z8 | Z8 IBM PC BASED TOTAL EMULATOR | | |

# 2K AND 4K ROM MICROCOMPUTERS

- COMPLETE MICROCOMPUTER, 2K OR 4K BYTES OF ROM. 128 BYTES OF RAM, 32 I/O LINES, AND UP TO 60K BYTES ADDRESSABLE EXTERNAL SPACE EACH FOR PROGRAM AND DATA MEMORY
- 144-BYTES REGISTER FILE, INCLUDING 124 GENERAL-PURPOSE REGISTERS, FOUR I/O PORT REGISTERS, AND 16 STATUS AND CONTROL REGISTERS
- MINIMUM INSTRUCTION EXECUTION TIME 1µs, AT 12MHz
- VECTORED, PRIORITY INTERRUPTS FOR I/O, COUNTER/TIMERS, AND UART
- FULL-DUPLEX UART AND TWO PROGRAMMABLE 8-BIT COUNTER/TIMERS, EACH WITH A 6-BIT PROGRAMMABLE PRESCALER
- REGISTER POINTER SO THAT SHORT, FAST INSTRUCTIONS CAN ACCESS ANY OF NINE WORKING-REGISTER GROUPS IN 1µs (12MHz)
- ON-CHIP OSCILLATOR WHICH ACCEPTS CRYSTAL OR EXTERNAL CLOCK DRIVE
- AVAILABLE IN 8MHZ AND 12MHz VERSIONS
- SINGLE 5V SUPPLY VOLTAGE
- ALL PINS TTL COMPATIBLE
- 40-PIN DUAL-IN-LINE AND 44-LEAD CHIP CARRIER PACKAGES AVAILABLE

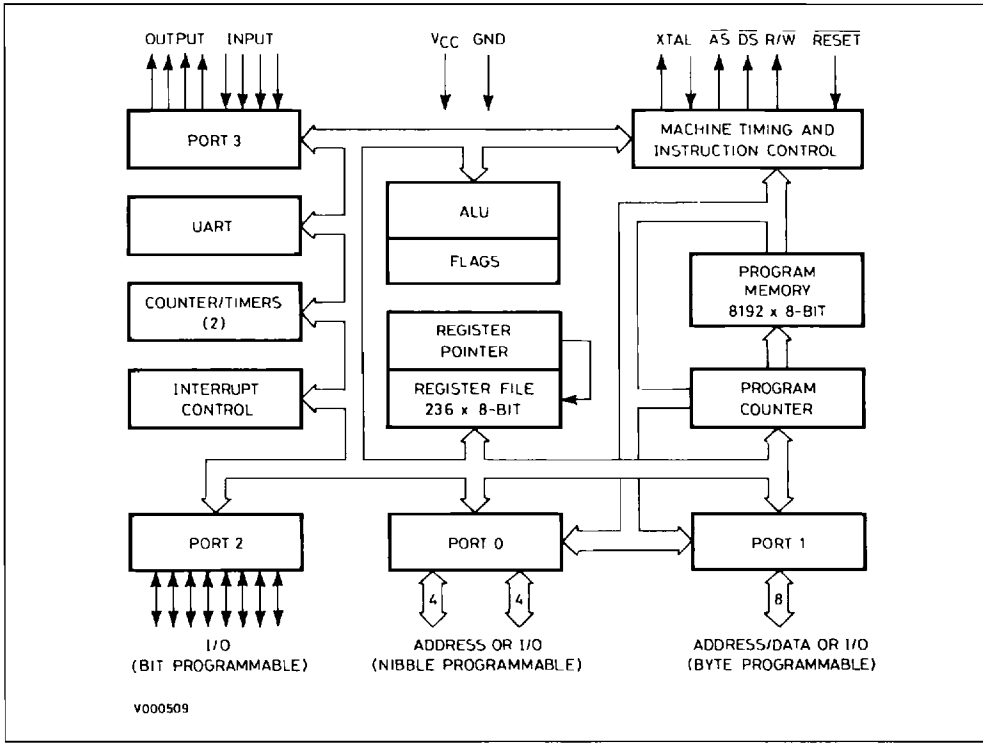
**BLOCK DIAGRAM**



# 8K ROM MICROCOMPUTER

- COMPLETE MICROCOMPUTER, 8K BYTES OF ROM, 240 BYTES OF RAM, 32 I/O LINES, AND UP TO 56K BYTES ADDRESSABLE EXTERNAL SPACE EACH FOR PROGRAM AND DATA MEMORY
- 256-BYTE REGISTER FILE, INCLUDING 236 GENERA-PURPOSE REGISTERS, FOUR I/O PORT REGISTERS, AND 16 STATUS AND CONTROL REGISTERS
- MINIMUM INSTRUCTION EXECUTION TIME 1µs, MAX. 3.6µs, AT 12MHZ
- VECTORED. PRIORITY INTERRUPTS FOR I/O, COUNTER/TIMERS, AND UART
- FULL-DUPLEX UART AND TWO PROGRAMMABLE 8-BIT COUNTER/TIMERS, EACH WITH A 6-BIT PROGRAMMABLE PRESCALER
- REGISTER POINTER SO THAT SHORT, FAST INSTRUCTIONS CAN ACCESS ANY OF NINE WORKING REGISTER GROUPS IN 0.6µs (12MHZ)
- ON-CHIP OSCILLATOR WHICH ACCEPTS CRYSTAL OR EXTERNAL CLOCK DRIVE
- AVAILABLE IN 8MHZ AND 12MHZ VERSIONS.
- SINGLE 5V SUPPLY VOLTAGE
- ALL PINS TTL COMPATIBLE
- 40-PIN DUAL-IN-LINE AND 44-LEAD CHIP CARRIER PACKAGES AVAILABLE

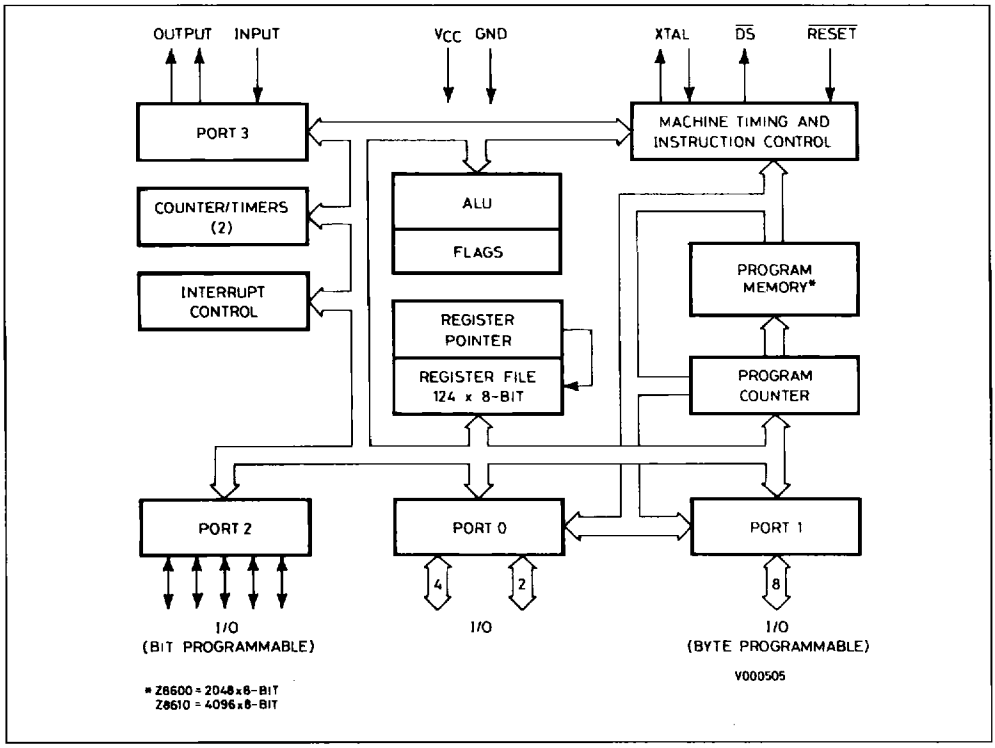
## BLOCK DIAGRAM



# 2K AND 4K ROM MICROCOMPUTERS

- COMPLETE MICROCOMPUTER, 2K OR 4K BYTES OF ROM. 128 BYTES OF RAM AND 22 I/O LINES
- 144-BYTE REGISTER FILE, INCLUDING 124 GENERAL-PURPOSE REGISTERS, FOUR I/O PORT REGISTERS, AND 14 STATUS AND CONTROL REGISTERS
- VECTORED, PRIORITY INTERUPTS FOR I/O AND COUNTER/TIMERS
- TWO PROGRAMMABLE 8-BIT COUNTER/TIMERS, EACH WITH A 6-BIT PROGRAMMABLE PRESCALER
- REGISTER POINTER SO THAT SHORT, FAST INSTRUCTIONS CAN ACCESS ANY ONE OF THE NINE WORKING REGISTER GROUPS
- ON-CHIP OSCILLATOR THAT ACCEPTS CRYSTAL OF EXTERNAL CLOCK DRIVE
- AVAILABLE IN 8MHZ AND 12MHZ VERSIONS.
- SINGLE 5V SUPPLY VOLTAGE
- ALL PINS TTL COMPATIBLE
- 28-PIN DUAL-IN-LINE AND 28-LEAD CHIP-CARRIER PACKAGES AVAILABLE

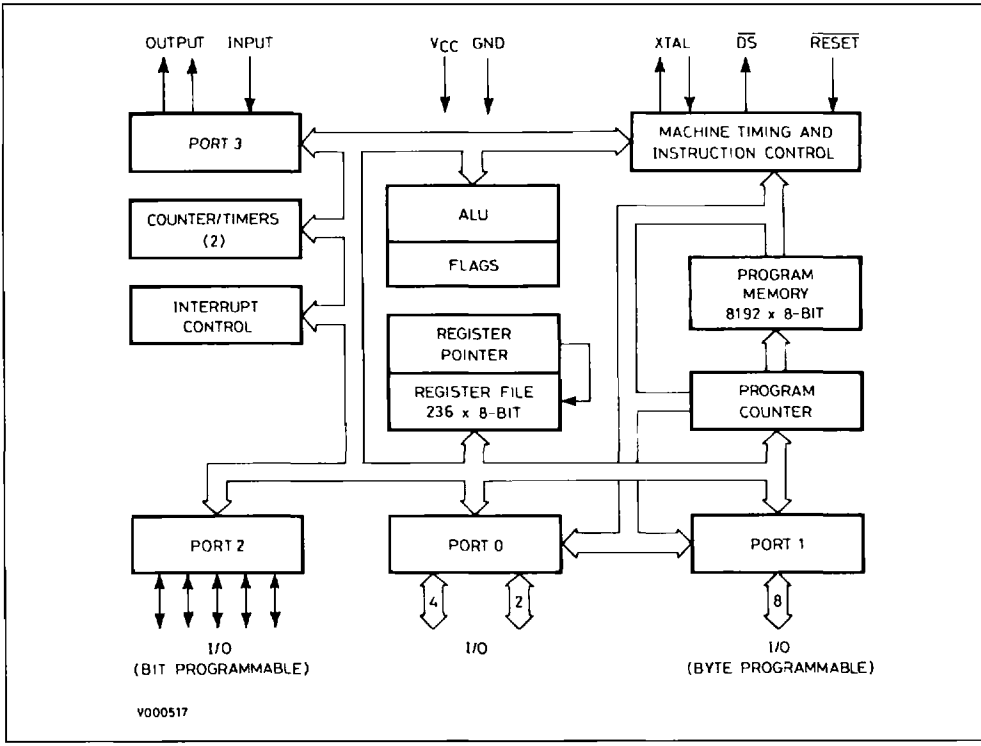
## BLOCK DIAGRAM



# 8K ROM MICROCOMPUTER

- COMPLETE MICROCOMPUTER, 8K BYTES OF ROM, 240 BYTES OF RAM AND 22 I/O LINES
- 256-BYTE REGISTER FILE, INCLUDING 236 GENERAL-PURPOSE REGISTERS, FOUR I/O PORT REGISTERS, AND 14 STATUS AND CONTROL REGISTERS
- VECTORED, PRIORITY INTERUPTS FOR I/O AND COUNTER/TIMERS
- TWO PROGRAMMABLE 8-BIT COUNTER/TIMERS, EACH WITH A 6-BIT PROGRAMMABLE PRESCALER
- REGISTER POINTER SO THAT SHORT, FAST INSTRUCTIONS CAN ACCESS ANY ONE OF THE NINE WORKING REGISTER GROUPS
- ON-CHIP OSCILLATOR THAT ACCEPTS CRYSTAL OF EXTERNAL CLOCK DRIVE
- AVAILABLE IN 8MHZ AND 12MHZ VERSIONS.
- SINGLE 5V SUPPLY VOLTAGE
- ALL PINS TTL COMPATIBLE
- 28-PIN DUAL-IN-LINE AND 28-LEAD CHIP CARRIER PACKAGES AVAILABLE

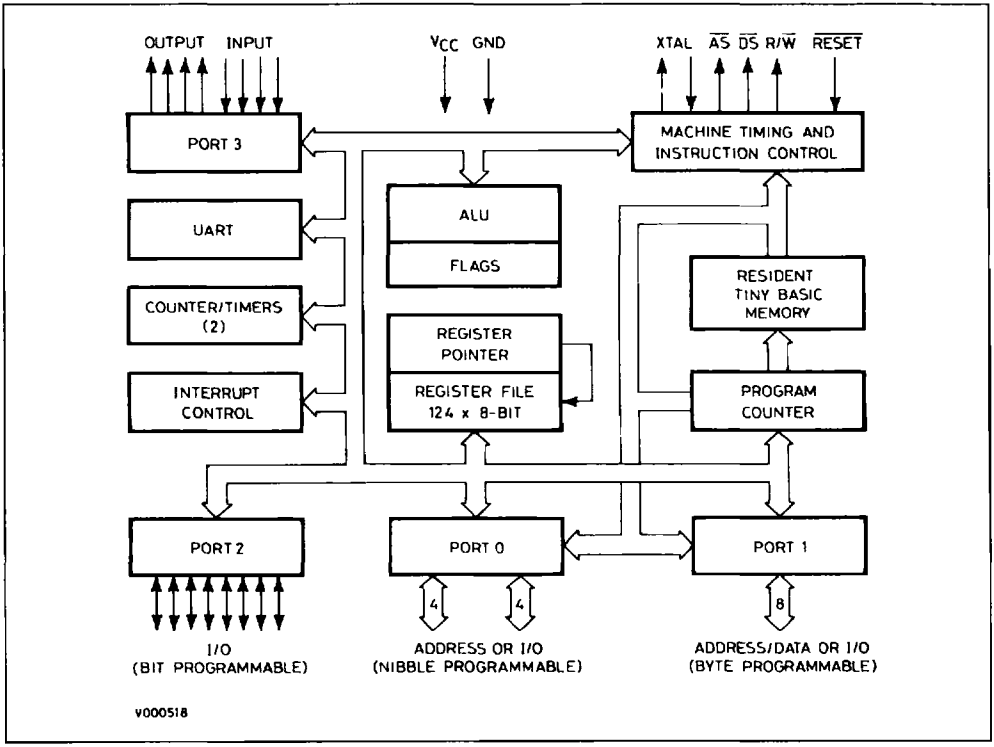
**BLOCK DIAGRAM**



# Z8671 MCU WITH BASIC/DEBUG INTERPRETER

- COMPLETE MICROCOMPUTER PREPROGRAMMED WITH A BASIC/DEBUG INTERPRETER. INTERACTION BETWEEN THE INTERPRETER AND ITS USER IS PROVIDED THROUGH AN ON-BOARD UART
- DIRECTLY ADDRESSES THE Z8671 INTERNAL REGISTERS AND ALL EXTERNAL MEMORY
- PROVIDES QUICK EXAMINATION AND MODIFICATION OF ANY EXTERNAL MEMORY LOCATION OR I/O PORT
- CAN CALL MACHINE LANGUAGE SUBROUTINES TO INCREASE EXECUTION SPEED
- THE Z8671 AUTO START-UP CAPABILITY ALLOWS A PROGRAM TO BE EXECUTED ON POWER-UP OR RESET WITHOUT OPERATOR INTERVENTION
- AVAILABLE IN 8MHZ VERSION
- SINGLE 5V SUPPLY VOLTAGE
- ALL PINS TTL COMPATIBLE
- 40-PIN DUAL-IN-LINE PACKAGE AVAILABLE

## BLOCK DIAGRAM



# ROMLESS MICROCOMPUTERS

- COMPLETE MICROCOMPUTER, 24 I/O LINES, AND UP TO 64K BYTES OF ADDRESSABLE EXTERNAL SPACE EACH FOR PROGRAM AND DATA MEMORY
- 143-BYTE REGISTER FILE, INCLUDING 124 GENERAL-PURPOSE REGISTERS, THREE I/O PORT REGISTERS, AND 16 STATUS AND CONTROL REGISTERS, FOR THE Z8681
- 254-BYTE REGISTER FILE, INCLUDING 236 GENERAL-PURPOSE REGISTERS, TWO I/O PORT REGISTERS, AND 16 STATUS AND CONTROL REGISTERS, FOR THE Z86R91
- VECTORED, PRIORITY INTERRUPTS FOR I/O, COUNTER/TIMERS, AND UART
- FULL-DUPLEX UART AND TWO PROGRAMMABLE 8-BIT COUNTER/TIMERS, EACH WITH A 6-BIT PROGRAMMABLE PRESCALER
- REGISTER POINTER SO THAT SHORT, FAST INSTRUCTIONS CAN ACCESS ANY ONE OF THE 9 (Z8681) AND 15 (Z86R91) WORKING-REGISTER GROUPS
- ON-CHIP OSCILLATOR THAT ACCEPTS CRYSTAL OR EXTERNAL CLOCK DRIVE
- AVAILABLE IN 8MHZ AND 12MHZ VERSIONS.
- SINGLE 5V SUPPLY VOLTAGE
- ALL PINS TTL COMPATIBLE
- 40-PIN DUAL-IN-LINE AND 44-LEAD CHIP CARRIER PACKAGES AVAILABLE

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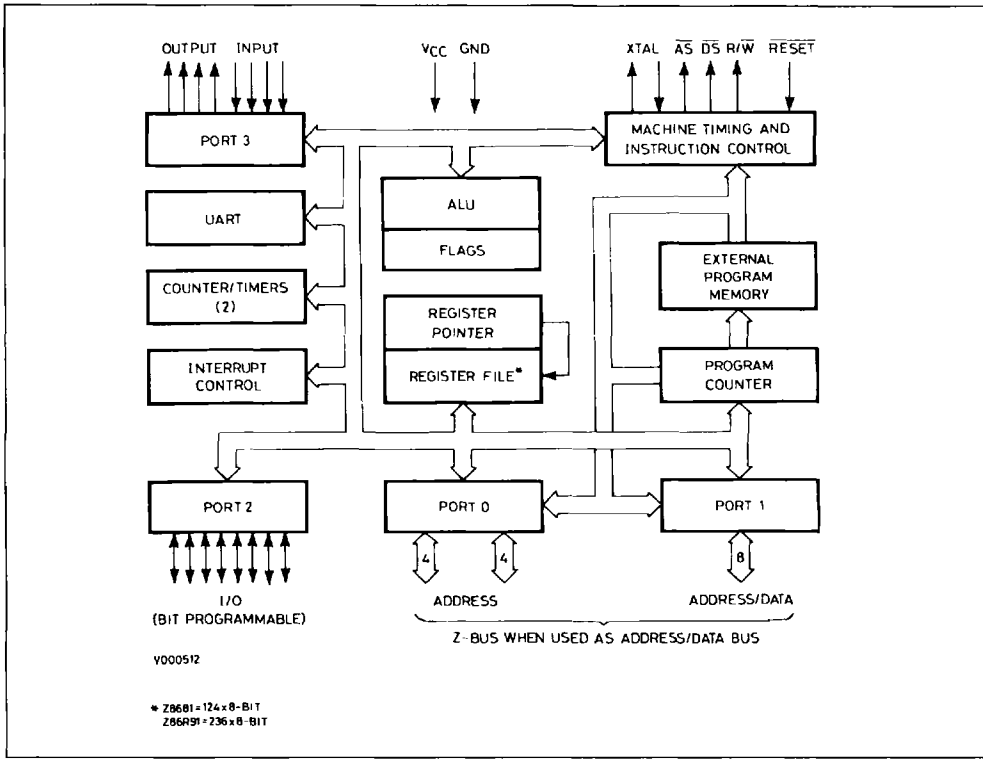
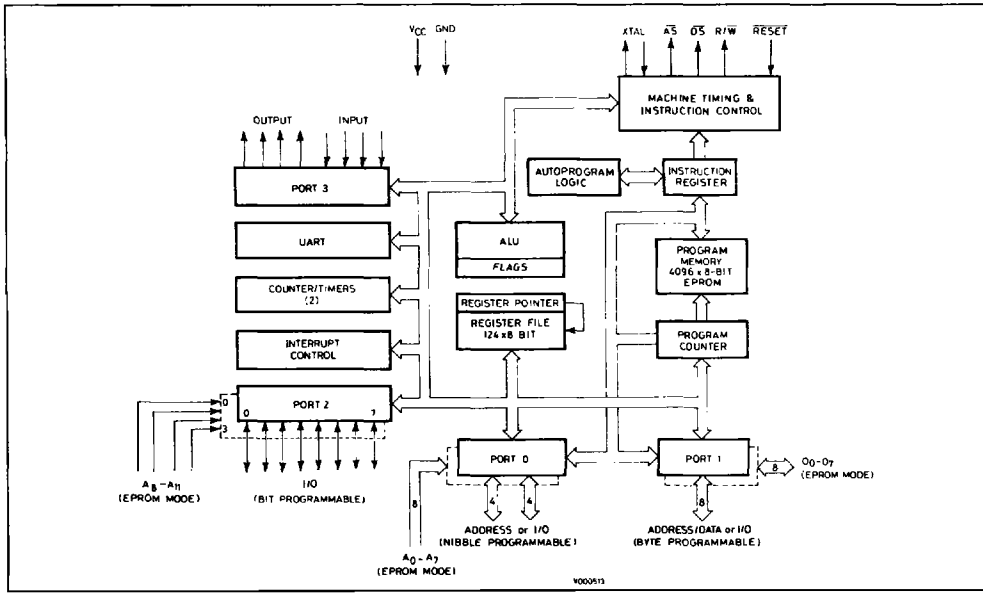


# 4K EPROM MICROCOMPUTER

- COMPLETE MICROCOMPUTER, 4K BYTES OF EPROM, 128 BYTES OF RAM 32 I/O LINES, AND UP TO 60K BYTES ADDRESSABLE EXTERNAL SPACE EACH FOR PROGRAM AND DATA MEMORY. FULLY COMPATIBLE WITH STANDARD ROM VERSION
- 144-BYTE REGISTER FILE, INCLUDING 124 GENERAL PURPOSE REGISTERS, FOUR I/O PORT REGISTERS, AND 16 STATUS AND CONTROL REGISTERS
- MINIMUM INSTRUCTION EXECUTION TIME 1µs, AT 12MHZ
- VECTORED PRIORITY INTERRUPTS FOR I/O, COUNTER/TIMERS, AND UART
- FULL-DUPLEX UART AND TWO PROGRAMMABLE 8-BIT COUNTER/TIMERS, EACH WITH A 6-BIT PROGRAMMABLE PRESCALER
- REGISTER POINTER SO THAT SHORT, FAST INSTRUCTIONS CAN ACCESS ANY OF NINE WORKING-REGISTER GROUPS IN 1.5µs (8MHZ)
- ON-CHIP OSCILLATOR WHICH ACCEPTS CRYSTAL OR EXTERNAL CLOCK DRIVE
- THREE EPROM PROGRAMMING MODES :
  - Eprom-like, using a standard EPROM programmer.
  - Self-programming during normal program execution.
  - An off-chip EPROM provides a program/verify facility to allow a simple and time-efficient autoloading operation.
- INTEGRATED PROGRAMMABLE PROTECTIONS AVOID EPROM CONTENT READOUT
- AVAILABLE IN 8MHZ AND 12MHZ VERSIONS
- SINGLE 5V SUPPLY VOLTAGE
- ALL PINS TTL COMPATIBLE
- 40-PIN DUAL-IN-LINE WINDOW AND 44-LEAD CERAMIC LEADED WINDOW CHIP CARRIER PACKAGES AVAILABLE
- THE DEVICE IS ALSO AVAILABLE AS ONE TIME PROGRAMMABLE (OTP) VERSION

**BLOCK DIAGRAM**



# 8K EPROM MICROCOMPUTERS

- COMPLETE MICROCOMPUTER, 8K BYTES OF EPROM 240 BYTES OF RAM 32 I/O LINES, AND UP TO 56K BYTES ADDRESSABLE EXTERNAL SPACE EACH FOR PROGRAM AND DATA MEMORY. FULLY COMPATIBLE WITH STANDARD ROM VERSION
- 256-BYTE REGISTER FILE, INCLUDING 236 GENERAL-PURPOSE REGISTERS, FOUR I/O PORT REGISTERS, AND 16 STATUS AND CONTROL REGISTERS
- MINIMUM INSTRUCTION EXECUTION TIME 1µs AT 12MHz
- VECTORED PRIORITY INTERRUPTS FOR I/O, COUNTER/TIMERS, AND UART
- FULL-DUPLEX UART AND TWO PROGRAMMABLE 8-BIT COUNTER/TIMERS, EACH WITH A 6-BIT PROGRAMMABLE PRESCALER
- REGISTER POINTER SO THAT SHORT, FAST INSTRUCTIONS CAN ACCESS ANY OF SIXTEEN WORKING-REGISTER GROUPS IN 1.5µs (8MHZ)
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