M8243
MCS-48® INPUT/OUTPUT EXPANDER
MILITARY

- **-55°C to +125°C Military Temp.**
- **Simple Interface to M8748/8048/ 8035L Microcomputers**
- **Four 4-Bit I/O Ports**
- **AND and OR Directly to Ports**
- **24-Pin DIP**
- **Single 5V Supply**
- **High Output Drive**
- **Direct Extension of Resident 8048 I/O Ports**

The Intel M8243 is an input/output expander designed specifically to provide a low cost means of I/O expansion for the MCS-48® family of single chip microcomputers. Fabricated in 5 volts NMOS, the M8243 combines low cost, single supply voltage and high drive current capability.

The M8243 consists of four 4-bit bidirectional static I/O ports and one 4-bit port which serves as an interface to the MCS-48 microcomputers. The 4-bit interface requires that only 4 I/O lines of the M8048 be used for I/O expansion, and also allows multiple M8243's to be added to the same bus.

The I/O ports of the M8243 serve as a direct extension of the resident I/O facilities of the MCS-48 microcomputers and are accessed by their own MOV, ANL, and ORL instructions.

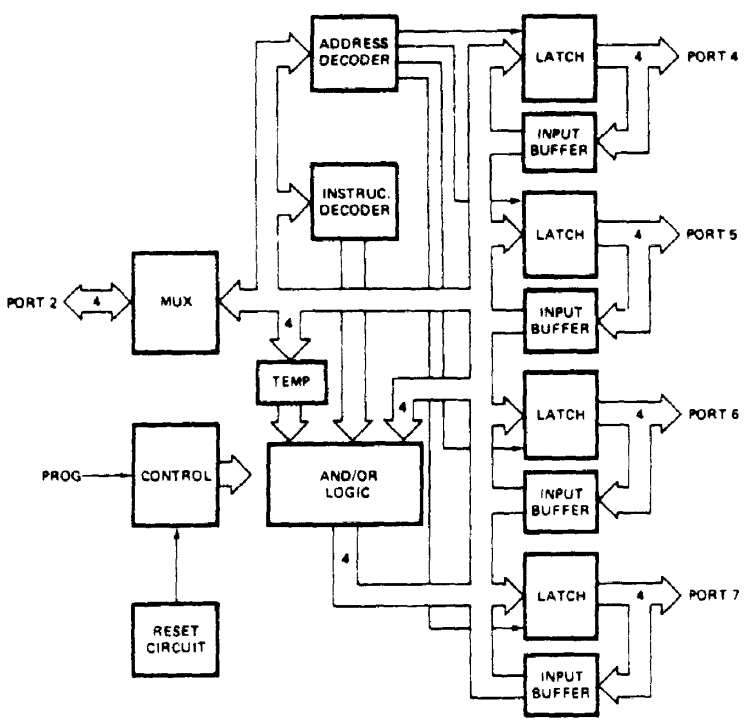

Figure 1. M8243 Block Diagram

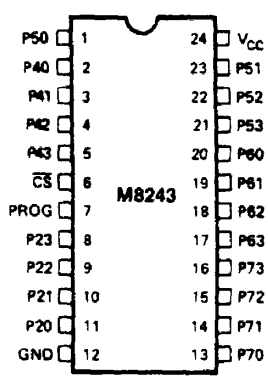

Figure 2. M8243 Pin Configuration

Table 1. Pin Description

Symbol	Pin No.	Function
PROG	7	Clock Input. A high to low transition on PROG signifies that address and control are available on P20-P23, and a low to high transition signifies that data is available on P20-P23.
$\overline{CS}$	6	Chip Select Input. A high on CS inhibits any change of output or internal status.
P20-P23	11-8	Four (4) bit bi-directional port contains the address and control bits on a high to low transition of PROG. During a low to high transition contains the data for a selected output port if a write operation, or the data from a selected port before the low to high transition if a read operation.
GND	12	0 volt supply.
P40-P43 P50-P53 P60-P63 P70-P73	2-5 1, 23-21 20-17 13-16	Four (4) bit bi-directional I/O ports. May be programmed to be input (during read), low impedance latched output (after write), or a tri-state (after read). Data on pins P20-P23 may be directly written, ANDed or ORed with previous data.
V_{CC}	24	+5 volt supply.

FUNCTIONAL DESCRIPTION

General Operation

The M8243 contains four 4-bit I/O ports which serve as an extension of the on-chip I/O and are addressed as ports 4-7. The following operations may be performed on these ports:

- Transfer Accumulator to Port
- Transfer Port to Accumulator
- AND Accumulator to Port
- OR Accumulator to Port

All communication between the M8048 and the M8243 occurs over Port 2 (P20-P23) with timing provided by an output pulse on the PROG pin of the processor. Each transfer consists of two 4-bit nibbles:

The first containing the "op code" and port address and the second containing the actual 4-bits of data. A high to low transition of the PROG line indicates that address is present while a low to high transition indicates the presence of data. Additional M8243's may be added to the 4-bit bus and chip selected using additional output lines from the M8048/8748/8035L.

Power On Initialization

Initial application of power to the device forces input/output ports 4, 5, 6, and 7 to the tri-state and port 2 to the input mode. The PROG pin may be either high or low when power is applied. The first high to low transition of PROG causes device to exit power on mode. The power on sequence is initiated if VCC drops below 1V.

		Address			Instruction
P21	P20	Code	P23	P22	Code
0	0	Port 4	0	0	Read
0	1	Port 5	0	1	Write
1	0	Port 6	1	0	ORLD
1	1	Port 7	1	1	ANLD

Write Modes

The device has three write modes. MOVD Pi, A directly writes new data into the selected port and old data is lost. ORLD Pi, A takes new data, OR's it with the old data and then writes it to the port. ANLD Pi, A takes new data, AND's it with the old data and then writes it to the port. Operation code and port address are latched from the input port 2 on the high to low transition of the PROG pin. On the low to high transition of PROG data on port 2 is transferred to the logic block of the specified output port.

After the logic manipulation is performed, the data is latched and outputed. The old data remains latched until new valid outputs are entered.

Read Mode

The device has one read mode. The operation code and port address are latched from the input port 2 on the high to low transition of the PROG pin. As soon as the read operation and port address are decoded, the appropriate outputs are tri-stated, and the input buffers switched on. The read operation is terminated by a low to high transition of the PROG pin. The port (4, 5, 6 or 7) that was selected is switched to the tri-stated mode while port 2 is returned to the input mode.

Normally, a port will be in an output (write mode) or input (read mode). If modes are changed during operation, the first read following a write should be ignored; all following reads are valid. This is to allow the external driver on the port to settle after the first read instruction removes the low impedance drive from the M8243 output. A read of any port will leave that port in a high impedance state.

ABSOLUTE MAXIMUM RATINGS*

Ambient Temperature Under Bias ..... -55°C to 125°C
Storage Temperature ..... -65°C to +150°C
Voltage on Any Pin
With Respect to Ground ..... -0.5V to +7V
Power Dissipation ..... 1 Watt

NOTICE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

D.C. CHARACTERISTICS (T_A = -55°C to 125°C, V_{CC} = 5V± 10%)

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
VIL	Input Low Voltage	-0.5		0.8	V	
VIH	Input High Voltage	2.0		VCC+0.5	V	
VOL1	Output Low Voltage Ports 4-7			0.45	V	IOL = 4.5 mA*
VOL2	Output Low Voltage Port 7			1	V	IOL = 20 mA
VOH1	Output High Voltage Ports 4-7	2.4			V	IOH = 240μA
IIL1	Input Leakage Ports 4-7	-10		20	μA	Vin = VCC to OV
IIL2	Input Leakage Port 2, CS, PROG	-10		10	μA	Vin = VCC to OV
VOL3	Output Low Voltage Port 2			45	V	IOL = 0.6 mA
ICC	VCC Supply Current		10	20	mA	
VOH2	Output Voltage Port 2	2.4				IOH = 100μA
IOL	Sum of all I_{OL} from 16 Outputs			72	mA	4.5 mA Each Pin

*See following graph for additional sink current capability

A.C. CHARACTERISTICS (T_A = -55°C to 125°C, V_{CC} = 5V± 10%)

Symbol	Parameter	Min	Max	Units	Test Conditions
tA	Code Valid Before PROG	100		ns	80 pF Load
tB	Code Valid After PROG	60		ns	20 pF Load
tC	Data Valid Before PROG	200		ns	80 pF Load
tD	Data Valid After PROG	20		ns	20 pF Load
tH	Floating After PROG	0	150	ns	20 pF Load
tK	PROG Negative Pulse Width	920		ns	
tCS	CS Valid Before/After PROG	50		ns	
tPO	Ports 4-7 Valid After PROG		700	ns	100 pF Load
tLP1	Ports 4-7 Valid Before/After PROG	120		ns	
tACC	Port 2 Valid After PROG		700	ns	80 pF Load