

M8243

MCS-48® INPUT/OUTPUT EXPANDER

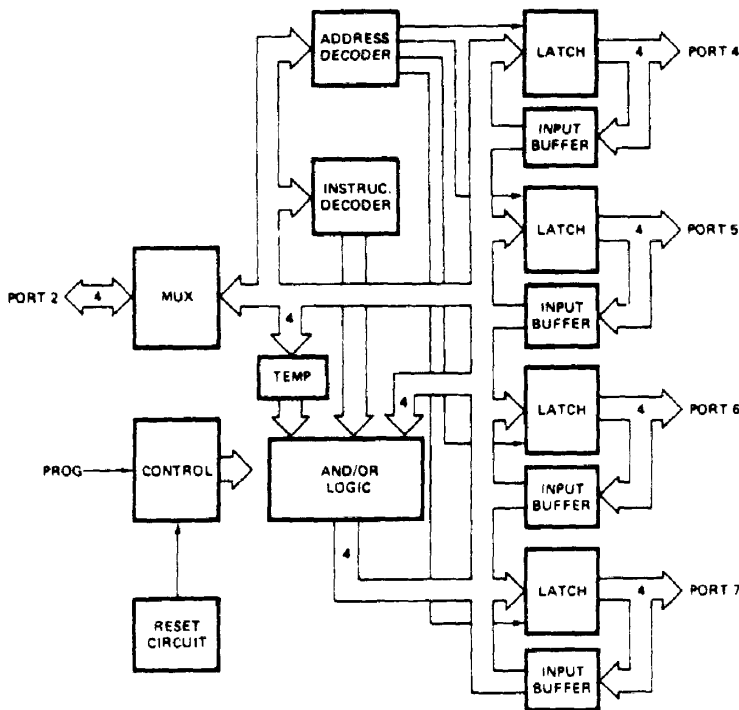
MILITARY

- -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

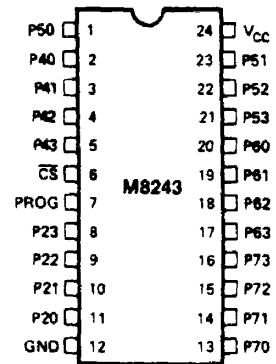
The Intel M8243 is an input/output expander designed specifically to provide a low cost means of I/O expansion for the MCS-48® family of single chip microcomputers. Fabricated in 5 volts NMOS, the M8243 combines low cost, single supply voltage and high drive current capability.

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	2-5	Four (4) bit bi-directional I/O ports.
P50-P53	1, 23-21	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.
P60-P63	20-17	
P70-P73	13-16	
VCC	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		Code	Instruction		
P21	P20		P23	P22	
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 outputted. 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 ($T_A = -55^\circ\text{C}$ to 125°C , $V_{CC} = 5V \pm 10\%$)

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
V _{IL}	Input Low Voltage	-0.5		0.8	V	
V _{IH}	Input High Voltage	2.0		V _{CC} +0.5	V	
V _{OL1}	Output Low Voltage Ports 4-7			0.45	V	I _{OL} = 4.5 mA*
V _{OL2}	Output Low Voltage Port 7			1	V	I _{OL} = 20 mA
V _{OH1}	Output High Voltage Ports 4-7	2.4			V	I _{OH} = 240 μA
I _{IL1}	Input Leakage Ports 4-7	-10		20	μA	V _{in} = V _{CC} to 0V
I _{IL2}	Input Leakage Port 2, CS, PROG	-10		10	μA	V _{in} = V _{CC} to 0V
V _{OL3}	Output Low Voltage Port 2			45	V	I _{OL} = 0.6 mA
I _{CC}	V _{CC} Supply Current		10	20	mA	
V _{OH2}	Output Voltage Port 2	2.4				I _{OH} = 100 μA
I _{OL}	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 ($T_A = -55^\circ\text{C}$ to 125°C , $V_{CC} = 5V \pm 10\%$)

Symbol	Parameter	Min	Max	Units	Test Conditions
t _A	Code Valid Before PROG	100		ns	80 pF Load
t _B	Code Valid After PROG	60		ns	20 pF Load
t _C	Data Valid Before PROG	200		ns	80 pF Load
t _D	Data Valid After PROG	20		ns	20 pF Load
t _H	Floating After PROG	0	150	ns	20 pF Load
t _K	PROG Negative Pulse Width	920		ns	
t _{CS}	CS Valid Before/After PROG	50		ns	
t _{PO}	Ports 4-7 Valid After PROG		700	ns	100 pF Load
t _{LP1}	Ports 4-7 Valid Before/After PROG	120		ns	
t _{ACC}	Port 2 Valid After PROG		700	ns	80 pF Load

