

Quad 3-State Bus Transceiver

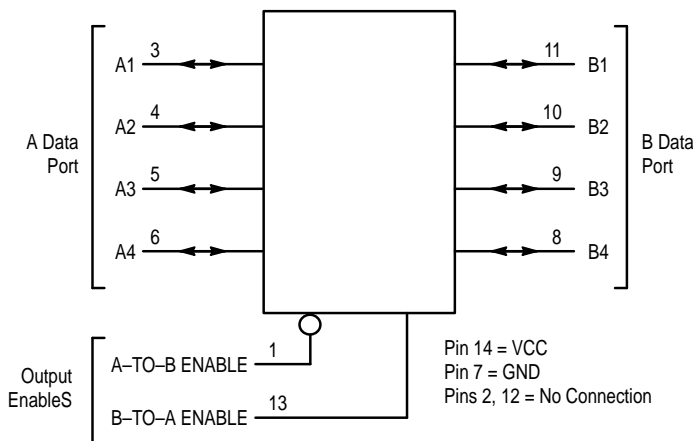
High-Performance Silicon-Gate CMOS

The MC74HC242 is identical in pinout to the LS242. The device inputs are compatible with Standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

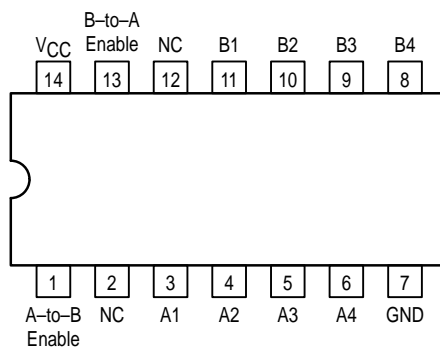
This quad bus transceiver is designed for asynchronous two-way communications between data buses. The states of the Output Enables (A-to-B Enable and B-to-A Enable) determine both the direction of data flow (from A to B or from B to A) and the modes of the Data Ports (input, output, or high-impedance).

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2 to 6V
- Low Input Current: 1µA
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- Chip Complexity: 130 FETs or 32.5 Equivalent Gates

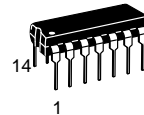
LOGIC DIAGRAM



Pinout: 14-Lead Plastic Package (Top View)



MC74HC242



N SUFFIX
PLASTIC PACKAGE
CASE 646-06

ORDERING INFORMATION

MC74HCXXXN Plastic

FUNCTION TABLE

Control Inputs		Data Port Status	
A-to-B Enable	B-to-A Enable	A	B
H	H	\bar{O}	I
L	H	Z	Z
H	L	Z	\bar{Z}
L	L	I	O

I = Input; O = Output, \bar{O} = Inverting Output
Z = High Impedance



MC74HC242

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	- 0.5 to + 7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	- 1.5 to $V_{CC} + 1.5$	V
$V_{I/O}$	DC Output Voltage (Referenced to GND)	- 0.5 to $V_{CC} + 0.5$	V
I_{in}	DC Input Current, per Pin	± 20	mA
$I_{I/O}$	DC Output Current, per Pin	± 35	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 75	mA
P_D	Power Dissipation in Still Air Plastic DIP†	750	mW
T_{stg}	Storage Temperature	- 65 to + 150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds Plastic DIP Package	260	°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

† Derating — Plastic DIP: - 10 mW/°C from 65° to 125°C

For high frequency or heavy load considerations, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	2.0	6.0	V
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V_{CC}	V
T_A	Operating Temperature Range, All Package Types	- 55	+ 125	°C
t_r, t_f	Input Rise/Fall Time (Figure 1)	$V_{CC} = 2.0 \text{ V}$ $V_{CC} = 4.5 \text{ V}$ $V_{CC} = 6.0 \text{ V}$	0 1000 500 400	ns

DC CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Condition	V_{CC} V	Guaranteed Limit			Unit
				-55 to 25°C	≤85°C	≤125°C	
V_{IH}	Minimum High-Level Input Voltage	$V_{out} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V}$ $ I_{out} \leq 20 \mu\text{A}$	2.0	1.50	1.50	1.50	V
			4.5	3.15	3.15	3.15	
			6.0	4.20	4.20	4.20	
V_{IL}	Maximum Low-Level Input Voltage	$V_{out} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V}$ $ I_{out} \leq 20 \mu\text{A}$	2.0	0.3	0.3	0.3	V
			4.5	0.9	0.9	0.9	
			6.0	1.2	1.2	1.2	
V_{OH}	Minimum High-Level Output Voltage	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 20 \mu\text{A}$	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	
			6.0	5.9	5.9	5.9	
V_{OL}	Maximum Low-Level Output Voltage	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 20 \mu\text{A}$	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
			6.0	0.1	0.1	0.1	
$V_{in} = V_{IH} \text{ or } V_{IL}$	$ I_{out} \leq 6.0 \text{ mA}$ $ I_{out} \leq 7.8 \text{ mA}$	4.5	3.98	3.84	3.70		
		6.0	5.48	5.34	5.20		
		6.0	0.26	0.33	0.40		
I_{in}	Maximum Input Leakage Current	$V_{in} = V_{CC} \text{ or } GND$	6.0	±0.1	±1.0	±1.0	μA
			6.0	±0.5	±5.0	±10.0	
			6.0	8	80	160	
I_{OZ}	Maximum Three-State Leakage Current	Output in High-Impedance State $V_{in} = V_{IL} \text{ or } V_{IH}$ $V_{out} = V_{CC} \text{ or } GND$	6.0	±0.5	±5.0	±10.0	μA
			6.0	8	80	160	
			6.0	8	80	160	
I_{CC}	Maximum Quiescent Supply Current (per Package)	$V_{in} = V_{CC} \text{ or } GND$ $I_{out} = 0 \mu\text{A}$	6.0	8	80	160	μA
			6.0	8	80	160	
			6.0	8	80	160	

NOTE: Information on typical parametric values can be found in Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

AC CHARACTERISTICS ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns)

Symbol	Parameter	V _{CC} V	Guaranteed Limit			Unit
			-55 to 25°C	≤85°C	≤125°C	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, A to B or B to A (Figures 2 and 4)	2.0	100	125	150	ns
		4.5	20	25	30	
		6.0	17	21	26	
t _{PLZ} , t _{PHZ}	Maximum Propagation Delay, Output Enable to Output A or B (Figures 3 and 5)	2.0	150	190	225	ns
		4.5	30	38	45	
		6.0	26	33	38	
t _{PZL} , t _{PZH}	Maximum Propagation Delay, Output Enable to Output A or B (Figures 3 and 5)	2.0	150	190	225	ns
		4.5	30	38	45	
		6.0	26	33	38	
t _{TLH} , t _{THL}	Maximum Output Transition Time, Any Output (Figures 2 and 4)	2.0	60	75	90	ns
		4.5	12	15	18	
		6.0	10	13	15	
C _{in}	Maximum Input Capacitance		10	10	10	pF
C _{out}	Maximum Three-State Output Capacitance (Output in High Impedance State)		15	15	15	pF

NOTE: For propagation delays with loads other than 50 pF, and information on typical parametric values, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

C _{PD}	Power Dissipation Capacitance (Per Transceiver)*	Typical @ 25°C, V _{CC} = 5.0 V		pF
		31		

* Used to determine the no-load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$. For load considerations, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

PIN DESCRIPTIONS**DATA PORTS****A1–A4 (Pins 3,4,5,6) and B1–B4 (Pins 11,10,9,8)**

Data on these pins may be transferred between data buses. Depending upon the states of the Output Enables, these pins may be inputs, outputs or open circuits (high-impedance).

CONTROL INPUTS**A-to-B Enable (Pin 1) and B-to-A Enable (Pin 13)**

Data on these Output Enables determine both the direction of the data flow (from A to B or from B to A) and the states of the outputs (standard or high impedance), according to the Function Table.

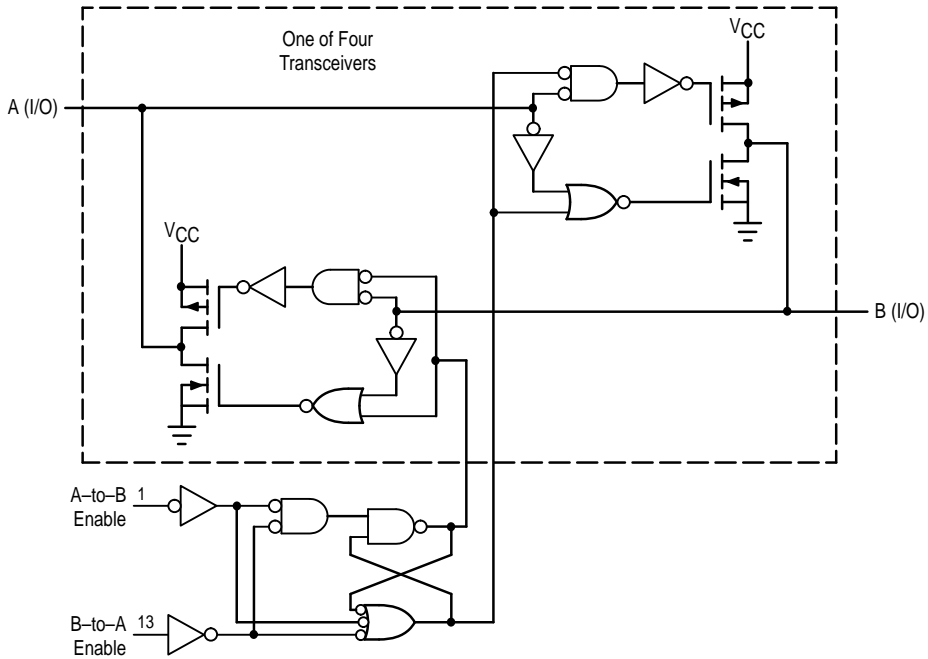


Figure 1. Expanded Logic Diagram

SWITCHING WAVEFORMS

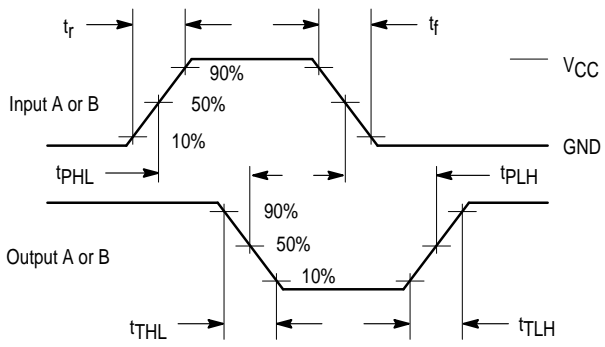


Figure 2.

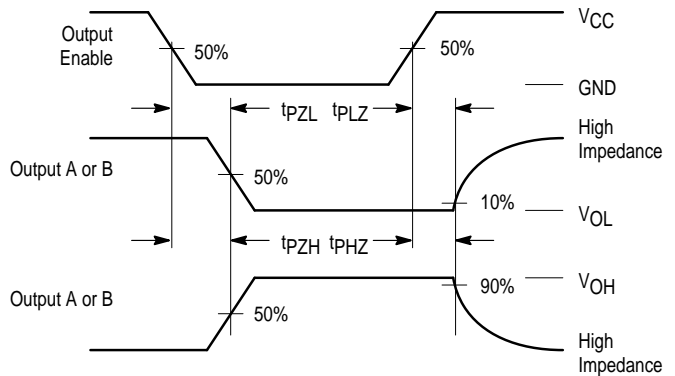
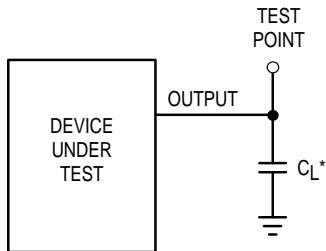


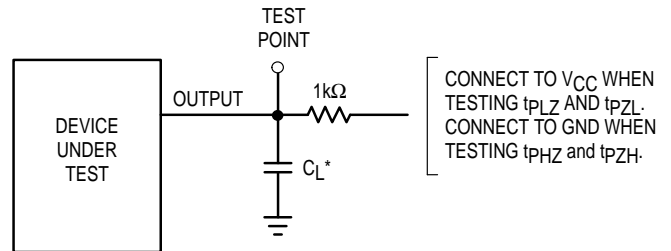
Figure 3.

TEST CIRCUITS



*Includes all probe and jig capacitance

Figure 4.

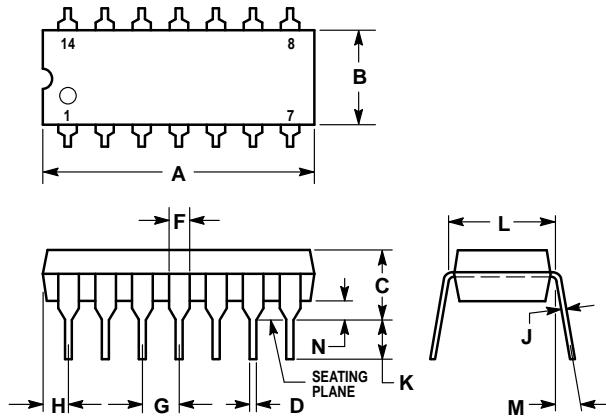


*Includes all probe and jig capacitance

Figure 5.

OUTLINE DIMENSIONS

N SUFFIX
PLASTIC DIP PACKAGE
CASE 646-06
ISSUE L



- NOTES:
- LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
 - DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 - DIMENSION B DOES NOT INCLUDE MOLD FLASH.
 - ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.300 BSC		7.62 BSC	
M	0°	10°	0°	10°
N	0.015	0.039	0.39	1.01

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P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

MFAX: RMFAX0@email.sps.mot.com -TOUCHTONE (602) 244-6609
INTERNET: http://Design-NET.com

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