

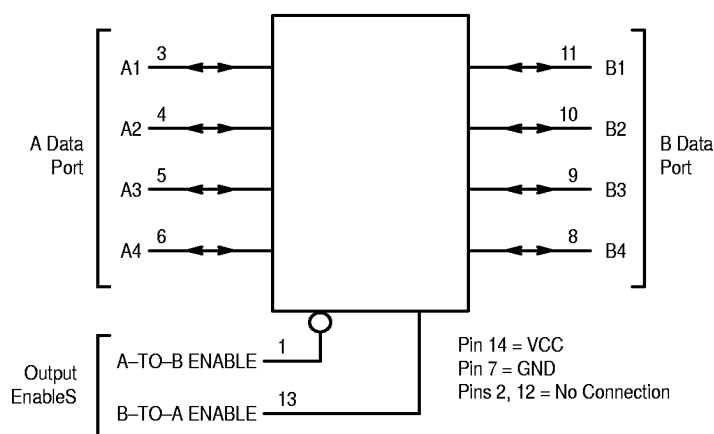
## Quad 3-State Bus Transceiver High-Performance Silicon-Gate CMOS

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.

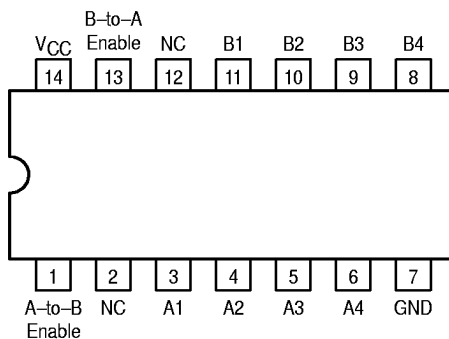
This quad bus transceiver is designed for asynchronous two-way communications between data buses. The states of the Output Enables (A-to-B Enable and B-to-A Enable) determine both the direction of data flow (from A to B or from B to A) and the modes of the Data Ports (input, output, or high-impedance).

- 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

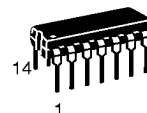
### LOGIC DIAGRAM



### Pinout: 14-Lead Plastic Package (Top View)



## MC74HC242



**N SUFFIX**  
PLASTIC PACKAGE  
CASE 646-06

### ORDERING INFORMATION

MC74HCXXN Plastic

### FUNCTION TABLE

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

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



## 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	$\pm 20$	mA
$I_{I/O}$	DC Output Current, per Pin	$\pm 35$	mA
$I_{CC}$	DC Supply Current, $V_{CC}$ and GND Pins	$\pm 75$	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

\* 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).

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.

## 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 0 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 4.5 6.0	1.50 3.15 4.20	1.50 3.15 4.20	1.50 3.15 4.20	V
$V_{IL}$	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 4.5 6.0	0.3 0.9 1.2	0.3 0.9 1.2	0.3 0.9 1.2	V
$V_{OH}$	Minimum High-Level Output Voltage	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out}  \leq 20 \mu\text{A}$	2.0 4.5 6.0	1.9 4.4 5.9	1.9 4.4 5.9	1.9 4.4 5.9	V
		$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out}  \leq 6.0 \text{ mA}$ $ I_{out}  \leq 7.8 \text{ mA}$	4.5 6.0	3.98 5.48	3.84 5.34	3.70 5.20	
$V_{OL}$	Maximum Low-Level Output Voltage	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out}  \leq 20 \mu\text{A}$	2.0 4.5 6.0	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	V
		$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out}  \leq 6.0 \text{ mA}$ $ I_{out}  \leq 7.8 \text{ mA}$	4.5 6.0	0.26 0.26	0.33 0.33	0.40 0.40	
$I_{in}$	Maximum Input Leakage Current	$V_{in} = V_{CC} \text{ or GND}$	6.0	±0.1	±1.0	±1.0	μA
$I_{OZ}$	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
$I_{CC}$	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

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

**AC CHARACTERISTICS** ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

Symbol	Parameter	V <sub>CC</sub> V	Guaranteed Limit			Unit
			-55 to 25°C	≤85°C	≤125°C	
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, A to B or B to A (Figures 2 and 4)	2.0 4.5 6.0	100 20 17	125 25 21	150 30 26	ns
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Maximum Propagation Delay, Output Enable to Output A or B (Figures 3 and 5)	2.0 4.5 6.0	150 30 26	190 38 33	225 45 38	ns
t <sub>PZL</sub> , t <sub>PZH</sub>	Maximum Propagation Delay, Output Enable to Output A or B (Figures 3 and 5)	2.0 4.5 6.0	150 30 26	190 38 33	225 45 38	ns
t <sub>TLH</sub> , t <sub>THL</sub>	Maximum Output Transition Time, Any Output (Figures 2 and 4)	2.0 4.5 6.0	60 12 10	75 15 13	90 18 15	ns
C <sub>in</sub>	Maximum Input Capacitance		10	10	10	pF
C <sub>out</sub>	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 <sub>PD</sub>	Power Dissipation Capacitance (Per Transceiver)*	Typical @ 25°C, V <sub>CC</sub> = 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.

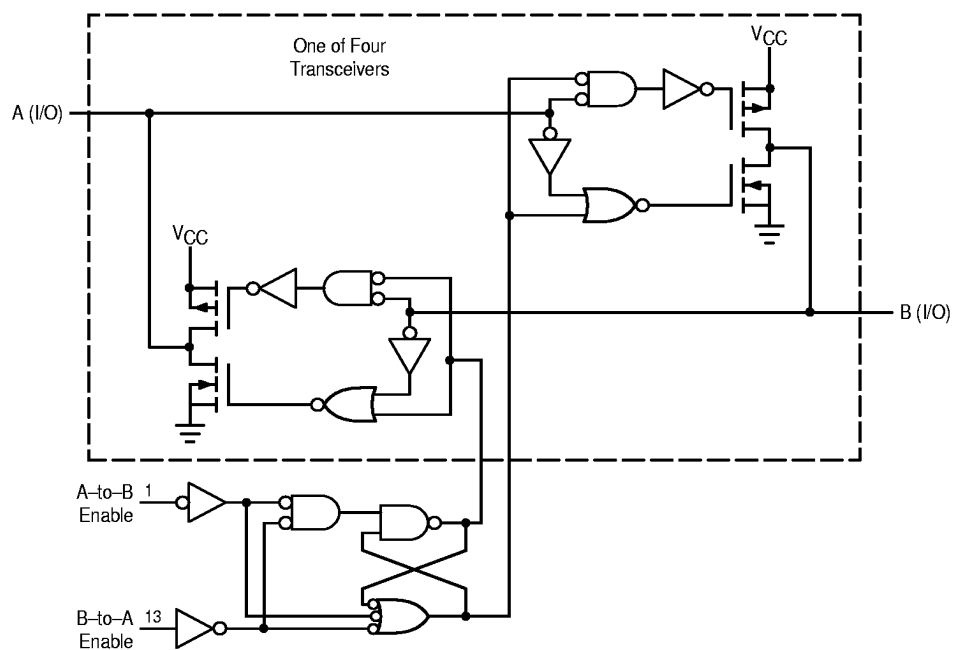


Figure 1. Expanded Logic Diagram

## SWITCHING WAVEFORMS

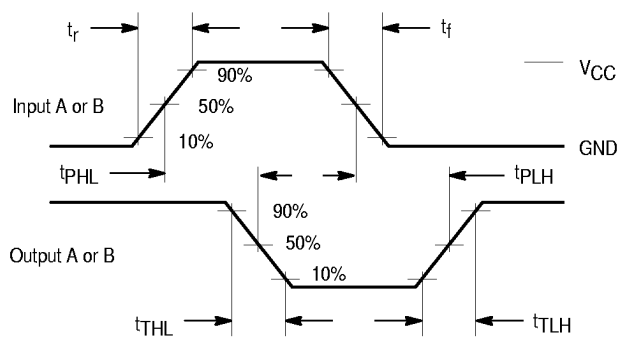


Figure 2.

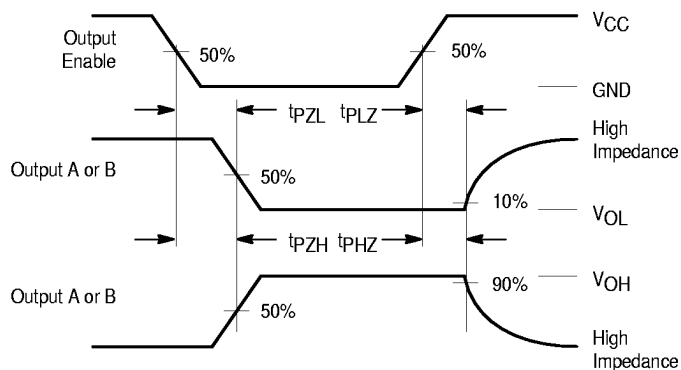
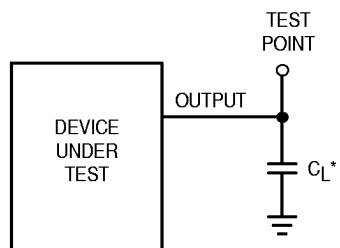


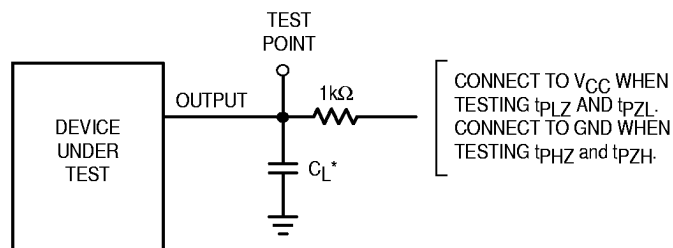
Figure 3.

## TEST CIRCUITS



\*Includes all probe and jig capacitance

Figure 4.

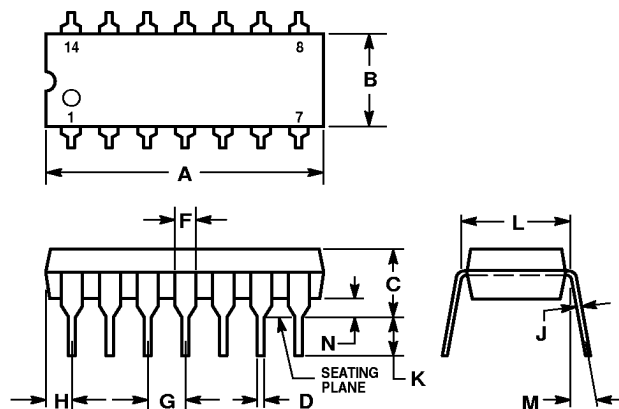


\*Includes all probe and jig capacitance

Figure 5.

## OUTLINE DIMENSIONS


**N SUFFIX**  
**PLASTIC DIP PACKAGE**  
**CASE 646-06**  
**ISSUE L**



## NOTES:

1. LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
3. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
4. 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

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

## How to reach us:

**USA/EUROPE:** Motorola Literature Distribution;  
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

**HONG KONG:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298



**MOTOROLA**

 CODELINE

MC74HC242/D

