Low-Voltage CMOS Quad Buffer

With 5V-Tolerant Inputs and Outputs (3-State, Non-Inverting)

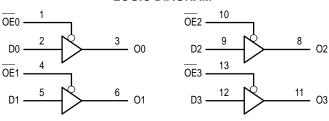
The MC74LCX125 is a high performance, non-inverting quad buffer operating from a 2.7 to 3.6V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A VI specification of 5.5V allows MC74LCX125 inputs to be safely driven from 5V devices. The MC74LCX125 is suitable for memory address driving and all TTL level bus oriented transceiver applications.

 $\underline{\hspace{0.1cm}}$ Current drive capability is 24mA at the outputs. The Output Enable (OEn) inputs, when HIGH, disable the outputs by placing them in a HIGH Z condition.

- Designed for 2.7 to 3.6V VCC Operation
- 5V Tolerant Interface Capability With 5V TTL Logic
- Supports Live Insertion and Withdrawal
- IOFF Specification Guarantees High Impedance When VCC = 0V
- LVTTL Compatible
- LVCMOS Compatible
- 24mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current in All Three Logic States (10μA) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500mA
- ESD Performance: Human Body Model >2000V; Machine Model >200V

Pinout: 14-Lead (Top View) OE3 OE2 13 9 10 8 1 2 3 4 5 6 OE0 D0 00 OE1 D1 01 GND

LOGIC DIAGRAM



MC74LCX125



LOW-VOLTAGE CMOS QUAD BUFFER



D SUFFIX

PLASTIC SOIC CASE 751A-03



M SUFFIX

PLASTIC SOIC EIAJ CASE 965-01



SD SUFFIX

PLASTIC SSOP CASE 940A-03



DT SUFFIX

PLASTIC TSSOP CASE 948G-01

PIN NAMES

Pins	Function
OEn	Output Enable Inputs
Dn	Data Inputs
On	3–State Outputs

FUNCTION TABLE

REV 1

INPL	OUTPUTS	
OEn	Dn	On
L	L	L
L	Н	Н
Н	X	Z

H = High Voltage Level; L = Low Voltage Level; Z = High Impedance State; X = High or Low Voltage Level and Transitions Are Acceptable, for I_{CC} reasons, DO NOT FLOAT Inputs

ABSOLUTE MAXIMUM RATINGS*

Symbol	Parameter	Value	Condition	Unit
VCC	DC Supply Voltage	-0.5 to +7.0		V
VI	DC Input Voltage	$-0.5 \le V_1 \le +7.0$		V
VO	DC Output Voltage	$-0.5 \le V_{O} \le +7.0$	Output in 3–State	V
		$-0.5 \le V_{O} \le V_{CC} + 0.5$	Note 1.	V
Ιικ	DC Input Diode Current	– 50	V _I < GND	mA
loк	DC Output Diode Current	– 50	V _O < GND	mA
		+50	AO > ACC	mA
Io	DC Output Source/Sink Current	±50		mA
Icc	DC Supply Current Per Supply Pin	±100		mA
IGND	DC Ground Current Per Ground Pin	±100		mA
TSTG	Storage Temperature Range	-65 to +150		°C

^{*} Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute–maximum–rated conditions is not implied.

1. Output in HIGH or LOW State. Io absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Тур	Max	Unit
Vcc	Supply Voltage Operating Data Retention Only	2.0 1.5	3.3 3.3	3.6 3.6	V
VI	Input Voltage	0		5.5	V
Vo	Output Voltage (HIGH or LOW State) (3–State)	0 0		V _{CC} 5.5	V
loн	HIGH Level Output Current, V _{CC} = 3.0V – 3.6V			-24	mA
loL	LOW Level Output Current, V _{CC} = 3.0V – 3.6V			24	mA
loн	HIGH Level Output Current, V _{CC} = 2.7V – 3.0V			-12	mA
lOL	LOW Level Output Current, V _{CC} = 2.7V – 3.0V			12	mA
TA	Operating Free-Air Temperature	-40		+85	°C
Δt/ΔV	Input Transition Rise or Fall Rate, V_{IN} from 0.8V to 2.0V, $V_{CC} = 3.0V$	0		10	ns/V

DC ELECTRICAL CHARACTERISTICS

			$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$		
Symbol	Characteristic	Condition	Min	Max	Unit
VIH	HIGH Level Input Voltage (Note 2.)	2.7V ≤ V _{CC} ≤ 3.6V	2.0		V
V _{IL}	LOW Level Input Voltage (Note 2.)	2.7V ≤ V _{CC} ≤ 3.6V		0.8	V
Vон	HIGH Level Output Voltage	$2.7V \le V_{CC} \le 3.6V$; $I_{OH} = -100\mu A$	V _{CC} - 0.2		V
		$V_{CC} = 2.7V; I_{OH} = -12mA$	2.2		
		$V_{CC} = 3.0V; I_{OH} = -18mA$	2.4		
		$V_{CC} = 3.0V; I_{OH} = -24mA$	2.2		
V _{OL}	LOW Level Output Voltage	$2.7V \le V_{CC} \le 3.6V; I_{OL} = 100\mu A$		0.2	V
		V _{CC} = 2.7V; I _{OL} = 12mA		0.4	
		V _{CC} = 3.0V; I _{OL} = 16mA		0.4	
		$V_{CC} = 3.0V; I_{OL} = 24mA$		0.55	

^{2.} These values of V_I are used to test DC electrical characteristics only.

DC ELECTRICAL CHARACTERISTICS (continued)

			$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$		
Symbol	Characteristic	Condition	Min	Max	Unit
Ц	Input Leakage Current	$2.7V \le V_{CC} \le 3.6V; \ 0V \le V_{I} \le 5.5V$		±5.0	μΑ
loz	3–State Output Current	$2.7 \le V_{CC} \le 3.6V$; $0V \le V_{O} \le 5.5V$; $V_{I} = V_{IH}$ or V_{IL}		±5.0	μΑ
loff	Power-Off Leakage Current	$V_{CC} = 0V$; V_I or $V_O = 5.5V$		10	μΑ
ICC	Quiescent Supply Current	$2.7 \le V_{CC} \le 3.6V$; $V_I = GND$ or V_{CC}		10	μΑ
		$2.7 \le V_{CC} \le 3.6V$; $3.6 \le V_I$ or $V_O \le 5.5V$		±10	μΑ
∆ICC	Increase in I _{CC} per Input	$2.7 \le V_{CC} \le 3.6V; V_{IH} = V_{CC} - 0.6V$		500	μΑ

AC CHARACTERISTICS ($t_R = t_F = 2.5$ ns; $C_L = 50$ pF; $R_L = 500\Omega$)

				Limits		
		T _A = -40°C to +85°C		1		
			V _{CC} = 3.0	OV to 3.6V	V _{CC} = 2.7V]
Symbol	Parameter	Waveform	Min	Max	Max	Unit
^t PLH ^t PHL	Propagation Delay Input to Output	1	1.5 1.5	6.0 6.0	6.5 6.5	ns
^t PZH ^t PZL	Output Enable Time to High and Low Level	2	1.5 1.5	7.0 7.0	8.0 8.0	ns
^t PHZ ^t PLZ	Output Disable Time From High and Low Level	2	1.5 1.5	6.0 6.0	7.0 7.0	ns
^t OSHL ^t OSLH	Output-to-Output Skew (Note 3.)			1.0 1.0		ns

Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device.
 The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}); parameter guaranteed by design.

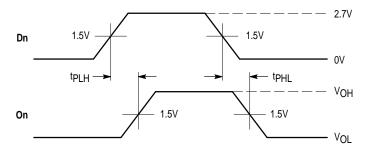
DYNAMIC SWITCHING CHARACTERISTICS

			T _A = +25°C			
Symbol	Characteristic	Condition	Min	Тур	Max	Unit
VOLP	Dynamic LOW Peak Voltage (Note 4.)	V _{CC} = 3.3V, C _L = 50pF, V _{IH} = 3.3V, V _{IL} = 0V		0.8		V
VOLV	Dynamic LOW Valley Voltage (Note 4.)	$V_{CC} = 3.3V$, $C_L = 50pF$, $V_{IH} = 3.3V$, $V_{IL} = 0V$		0.8		V

^{4.} Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

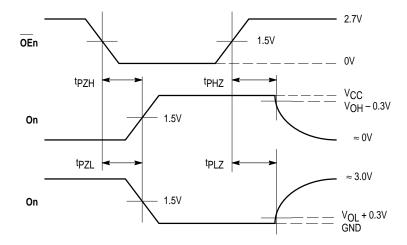
CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C _{IN}	Input Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	7	pF
COUT	Output Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	8	pF
C _{PD}	Power Dissipation Capacitance	10MHz, $V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	25	pF



WAVEFORM 1 - PROPAGATION DELAYS

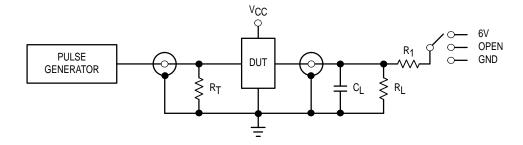
 t_R = t_F = 2.5ns, 10% to 90%; f = 1MHz; t_W = 500ns



WAVEFORM 2 - OUTPUT ENABLE AND DISABLE TIMES

 t_R = t_F = 2.5ns, 10% to 90%; f = 1MHz; t_W = 500ns

Figure 1. AC Waveforms

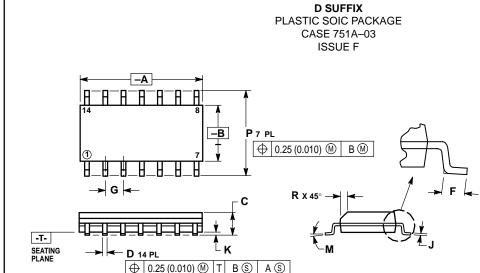


TEST	SWITCH
tPLH, tPHL	Open
tPZL, tPLZ	6V
Open Collector/Drain tpLH and tpHL	6V
tPZH, tPHZ	GND

 C_L = 50pF or equivalent (Includes jig and probe capacitance) R_L = R_1 = 500 Ω or equivalent R_T = Z_{OUT} of pulse generator (typically 50 Ω)

Figure 2. Test Circuit

OUTLINE DIMENSIONS



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- T 14.5WI, 1902.
 CONTROLLING DIMENSION: MILLIMETER.
 DIMENSIONS A AND B DO NOT INCLUDE
 MOLD PROTRUSION.
 MAXIMUM MOLD PROTRUSION 0.15 (0.006)
- PER SIDE.

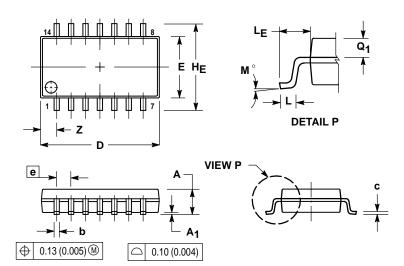
 5. DIMENSION D DOES NOT INCLUDE DAMBAR DIMENSION D DUES NOT INCLUDE DAMBAR
 PROTRUSION. ALLOWABLE DAMBAR
 PROTRUSION SHALL BE 0.127 (0.005) TOTAL
 IN EXCESS OF THE D DIMENSION AT
 MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
Α	8.55	8.75	0.337	0.344
В	3.80	4.00	0.150	0.157
С	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27	BSC	0.050	BSC
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
Р	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

M SUFFIX

PLASTIC SOIC EIAJ PACKAGE CASE 965-01 ISSUE O

5



- NOTES:
 1 DIMENSIONING AND TOLERANCING PER ANSI
- Y14.5M, 1982. 2 CONTROLLING DIMENSION: MILLIMETER.
- 2 DOMENSIONS DAND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE, MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.

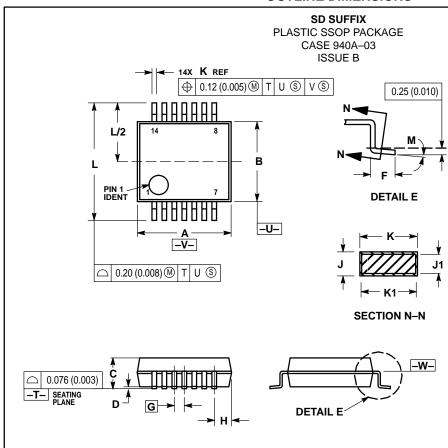
 4 TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

 5 THE LEAD WIDTH DIMENSION (b) DOES NOT

- INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) DANIBAR PROTRUSION SHALL BE 0.08 (0.003)
 TOTAL IN EXCESS OF THE LEAD WIDTH
 DIMENSION AT MAXIMUM MATERIAL CONDITION.
 DAMBAR CANNOT BE LOCATED ON THE LOWER
 RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

	MILLIN	IETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α		2.05		0.081
A ₁	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
С	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
Е	5.10	5.45	0.201	0.215
е	1.27	BSC	0.050) BSC
HE	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
LE	1.10	1.50	0.043	0.059
M	0 °	10°	0 °	10 °
Q_1	0.70	0.90	0.028	0.035
Z		1.42		0.056

OUTLINE DIMENSIONS



- 6 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- 1 14-3M, 1962.

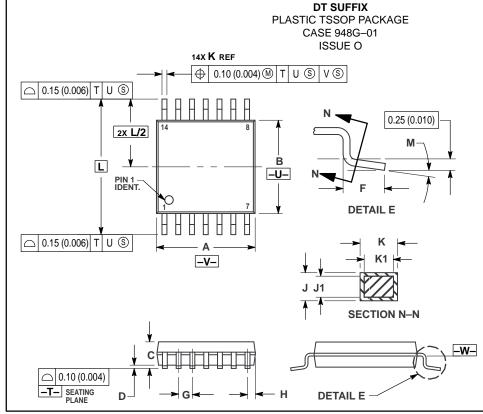
 7 CONTROLLING DIMENSION: MILLIMETER.

 8 DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.

 9 DIMENSION B DOES NOT INCLUDE INTERLEAD
- FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.15 (0.006) PER SIDE.

 10 DIMENSION K DOES NOT INCLUDE DAMBAR
- PROTRUSION/INTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF K DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR INTRUSION SHALL NOT REDUCE DIMENSION K BY MORE THAN 0.07 (0.002) AT LEAST MATERIAL CONDITION.
- TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
- 12 DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE –W–.

	MILLIN	IETERS	INCHES	
DIM	MIN	MAX	MIN	MAX
Α	6.07	6.33	0.238	0.249
В	5.20	5.38	0.205	0.212
С	1.73	1.99	0.068	0.078
D	0.05	0.21	0.002	0.008
F	0.63	0.95	0.024	0.037
G	0.65 BSC		0.026 BSC	
Н	1.08	1.22	0.042	0.048
J	0.09	0.20	0.003	0.008
J1	0.09	0.16	0.003	0.006
K	0.25	0.38	0.010	0.015
K1	0.25	0.33	0.010	0.013
Ĺ	7.65	7.90	0.301	0.311
M	0 °	8 °	0 °	8 °



6

NOTES:

- 1 DIMENSIONING AND TOLERANCING PER ANSI
- Y14.5M, 1982.
 2 CONTROLLING DIMENSION: MILLIMETER.
- 3 DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE
- UNION PER SIDE.

 DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED
- 0.25 (0.010) PER SIDE.

 DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
- 6 TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
- 7 DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE –W–.

	MILLIN	IETERS	INCHES	
DIM	MIN	MAX	MIN	MAX
Α	4.90	5.10	0.193	0.200
В	4.30	4.50	0.169	0.177
С	_	1.20		0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
Н	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
М	0°	8°	0°	8°

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 which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. 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/Locations Not Listed: Motorola Literature Distribution; P.O. Box 5405; Denver, Colorado 80217. 1–800–441–2447

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

JAPAN: Nippon Motorola Ltd.; Tatsumi–SPD–JLDC, 6F Seibu–Butsuryu–Center, 3–14–2 Tatsumi Koto–Ku, Tokyo 135, Japan. 81–3–3521–8315

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park, 51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852–26629298



MC74LCX125/D

Copyright © Each Manufacturing Company.

All Datasheets cannot be modified without permission.

This datasheet has been download from:

www.AllDataSheet.com

100% Free DataSheet Search Site.

Free Download.

No Register.

Fast Search System.

www.AllDataSheet.com