Product Preview

Low-Voltage CMOS Quad Buffer

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

MC74LCX125

LCX

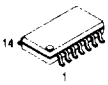
LOW–VOLTAGE CMOS QUAD BUFFER

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 V_I 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.

Current drive capability is 24mA at the outputs. The Output Enable ($\overline{OE}n$) inputs, when HIGH, disable the outputs by placing them in a HIGH Z condition.

- Designed for 2.7 to 3.6V V_{CC} Operation
- 5V Tolerant — Interface Capability With 5V TTL Logic
- Supports Live Insertion and Withdrawal
- I_{OFF} Specification Guarantees High Impedance When V_{CC} = 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

D SUFFIX
PLASTIC SOIC
CASE 751A–03

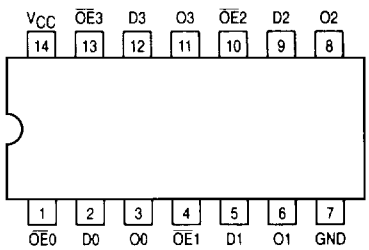


M SUFFIX
PLASTIC SOIC EIAJ
CASE 965–01

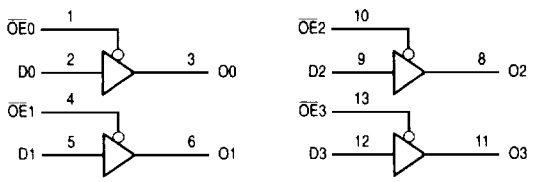
SD SUFFIX
PLASTIC SSOP
CASE 940A–03

DT SUFFIX
PLASTIC TSSOP
CASE 948G–01

Pinout: 14–Lead (Top View)



LOGIC DIAGRAM



PIN NAMES

Pins	Function
$\overline{OE}n$	Output Enable Inputs
Dn	Data Inputs
On	3–State Outputs

FUNCTION TABLE

INPUTS		OUTPUTS
$\overline{OE}n$	Dn	On
L	L	L
L	H	H
H	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

This document contains information on a product under development. Motorola reserves the right to change or discontinue this product without notice.

ABSOLUTE MAXIMUM RATINGS*

Symbol	Parameter	Value	Condition	Unit
V_{CC}	DC Supply Voltage	−0.5 to +7.0		V
V_I	DC Input Voltage	$-0.5 < V_I \leq +7.0$		V
V_O	DC Output Voltage	$-0.5 < V_O \leq +7.0$	Output in 3−State	V
		$-0.5 \leq V_O \leq V_{CC} + 0.5$[1]	Output in HIGH or LOW State	V
I_{IK}	DC Input Diode Current	−50	$V_I < GND$	mA
I_{OK}	DC Output Diode Current	−50	$V_O < GND$	mA
		+50	$V_O > V_{CC}$	mA
I_O	DC Output Source/Sink Current	±50		mA
I_{CC}	DC Supply Current Per Supply Pin	±100		mA
I_{GND}	DC Ground Current Per Ground Pin	±100		mA
T_{STG}	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. I_O absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating Data Retention Only	2.0 1.5	3.3 3.3	3.6 3.6	V
V_I	Input Voltage		0		5.5	V
V_O	Output Voltage	(HIGH or LOW State) (3−State)	0 0		V_{CC} 5.5	V
I_{OH}	HIGH Level Output Current, V_{CC} = 3.0V − 3.6V				−24	mA
I_{OL}	LOW Level Output Current, V_{CC} = 3.0V − 3.6V				24	mA
I_{OH}	HIGH Level Output Current, V_{CC} = 2.7V − 3.0V				−12	mA
I_{OL}	LOW Level Output Current, V_{CC} = 2.7V − 3.0V				12	mA
T_A	Operating Free−Air Temperature		−40		+85	C
$\Delta t/\Delta V$	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

Symbol	Characteristic	Condition	T_A = −40°C to +85°C		Unit
			Min	Max	
V_{IH}	HIGH Level Input Voltage (Note 1)	$2.7V \leq V_{CC} \leq 3.6V$	2.0		V
V_{IL}	LOW Level Input Voltage (Note 1)	$2.7V \leq V_{CC} \leq 3.6V$		0.8	V
V_{OH}	HIGH Level Output Voltage	$2.7V < V_{CC} < 3.6V$; I_{OH} = −100µA	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	$2.7V < V_{CC} < 3.6V$; I_{OL} = 100µA		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	

1. These values of V_I are used to test DC electrical characteristics only. Functional test should use $V_{IH} \geq 2.4V$, $V_{IL} \leq 0.5V$.

DC ELECTRICAL CHARACTERISTICS (continued)

Symbol	Characteristic	Condition	T_A = –40°C to +85°C		Unit
			Min	Max	
I_I	Input Leakage Current	2.7V ≤ V_{CC} ≤ 3.6V; 0V ≤ V_I ≤ 5.5V		±5.0	μA
I_{OZ}	3–State Output Current	2.7 ≤ V_{CC} ≤ 3.6V; 0V ≤ V_O ≤ 5.5V; V_I = V_{IH} or V_{IL}		±5.0	μA
I_{OFF}	Power–Off Leakage Current	V_{CC} = 0V; V_I or V_O = 5.5V		10	μA
I_{CC}	Quiescent Supply Current	2.7 ≤ V_{CC} ≤ 3.6V; V_I = GND or V_{CC}		10	μA
		2.7 ≤ V_{CC} ≤ 3.6V; 3.6 ≤ V_I or V_O ≤ 5.5V		±10	μA
ΔI_{CC}	Increase in I_{CC} per Input	2.7 ≤ V_{CC} ≤ 3.6V; V_{IH} = V_{CC} – 0.6V		500	μA

AC CHARACTERISTICS[1] (t_R = t_F = 2.5ns; C_L = 50pF; R_L = 500Ω)

Symbol	Parameter	Waveform	Limits			Unit
			T_A = –40°C to +85°C			
			V_{CC} = 3.0V to 3.6V		V_{CC} = 2.7V	
			Min	Max	Max	
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 2)			1.0 1.0		ns

1. These AC parameters are preliminary and may be modified prior to release. The maximum AC limits are design targets. Actual performance will be specified upon completion of characterization.
2. 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.

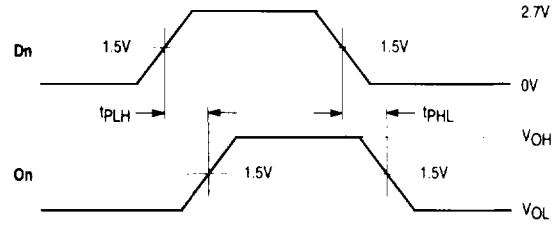
DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Characteristic	Condition	T_A = +25°C			Unit
			Min	Typ	Max	
V_{OLP}	Dynamic LOW Peak Voltage[1]	V_{CC} = 3.3V, C_L = 50pF, V_{IH} = 3.3V, V_{IL} = 0V		0.8		V
V_{OLV}	Dynamic LOW Valley Voltage[1]	V_{CC} = 3.3V, C_L = 50pF, V_{IH} = 3.3V, V_{IL} = 0V		0.8		V

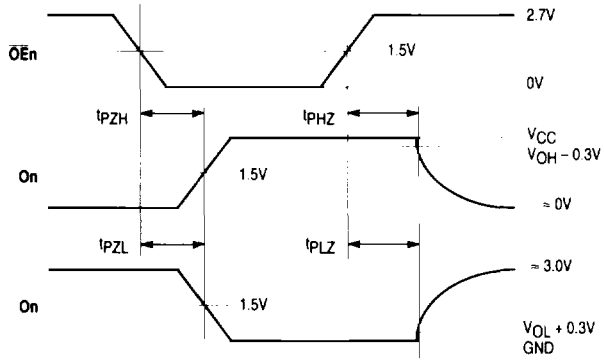
1. Number of outputs defined as "n". Measured with "n–1" outputs switching from HIGH–to–LOW or LOW–to–HIGH. The remaining output is measured in the LOW state.

CAPACITIVE CHARACTERISTICS

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

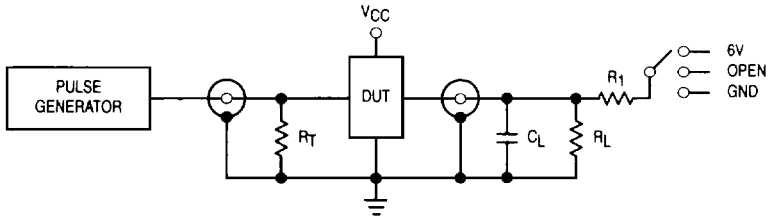


WAVEFORM 1 – PROPAGATION DELAYS
$t_R = t_F$ = 2.5ns, 10% to 90%; f = 1MHz; t_W = 500ns



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
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	6V
Open Collector/Drain t_{PLH} and t_{PHL}	6V
t_{PZH}, t_{PHZ}	GND

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

Figure 2. Test Circuit