Low-Voltage CMOS 16-Bit Transceiver With 5V-Tolerant Inputs and Outputs (3-State, Non-Inverting)

The MC74LCX16245 is a high performance, non-inverting 16-bit transceiver operating from a 2.7 to 3.6V supply. The device is byte controlled. Each byte has separate Output Enable inputs which can be tied together for full 16-bit operation. 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 MC74LCX16245 inputs to be safely driven from 5V devices. The MC74LCX16245 is suitable for memory address driving and all TTL level bus oriented transceiver applications.

4.5ns maximum propagation delays support high performance applications. Current \underline{dr} ive capability is 24mA at both A and B ports. The Transmit/Receive (T/Rn) inputs determine the direction of data flow through the bi–directional transceiver. Transmit (active–HIGH) enables data from A ports to B ports; Receive (\underline{active} –LOW) enables data from B to A ports. The Output Enable inputs (OEn), when HIGH, disable both A and B ports by placing them in a HIGH Z condition.

- Designed for 2.7 to 3.6V VCC Operation
- 4.5ns Maximum t_{pd}
- 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 (20μA) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500mA
- ESD Performance: Human Body Model >2000V; Machine Model >200V

MC74LCX16245



LOW-VOLTAGE
CMOS 16-BIT TRANSCEIVER

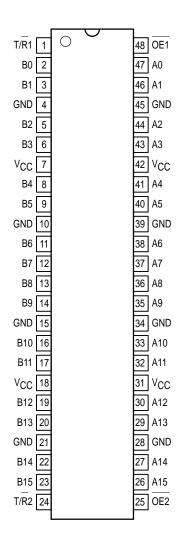


DT SUFFIXPLASTIC TSSOP PACKAGE
CASE 1201–01

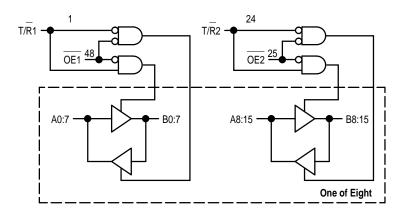
PIN NAMES

Pins	Function
O <u>E</u> n T/Rn	Output Enable Inputs Transmit/Receive Inputs
A0-A15 B0-B15	Side A Inputs or 3–State Outputs Side B Inputs or 3–State Outputs





LOGIC DIAGRAM



Inputs		Outputo	Inp	uts	Outputo
OE1	T/R1	Outputs	OE2	T/R2	Outputs
L	L	Bus B0:7 Data to Bus A0:7	L	L	Bus B8:15 Data to Bus A8:15
L	Н	Bus A0:7 Data to Bus B0:7	L	Н	Bus A8:15 Data to Bus B8:15
Н	Х	High Z State on A0:7, B0:7	Н	Х	High Z State on A8:15, B8:15

 $H = High \ Voltage \ Level; \ L = Low \ Voltage \ Level; \ Z = High \ Impedance \ State; \ X = High \ or \ Low \ Voltage \ Level \ and \ Transitions \ Are \ Acceptable, for I \ I \ reasons, DO \ NOT \ FLOAT \ Inputs$

ABSOLUTE MAXIMUM RATINGS*

Symbol	Parameter	Value	Condition	Unit
Vcc	DC Supply Voltage	-0.5 to +7.0		V
VI	DC Input Voltage	$-0.5 \le V_{I} \le +7.0$		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
lık	DC Input Diode Current	– 50	V _I < GND	mA
loк	DC Output Diode Current	-50	V _O < GND	mA
		+50	VO > VCC	mA
Io	DC Output Source/Sink Current	±50		mA
Icc	DC Supply Current Per Supply Pin	±100		mA
^I GND	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. I_O 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		VCC 5.5	V
IOH	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
^I ОН	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
V _{IH}	HIGH Level Input Voltage (Note 2.)	$2.7V \le V_{CC} \le 3.6V$	2.0		V
V _{IL}	LOW Level Input Voltage (Note 2.)	$2.7V \le V_{CC} \le 3.6V$		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		
VOL	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°C to +85°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}		20	μΑ
		$2.7 \le V_{CC} \le 3.6V$; $3.6 \le V_I$ or $V_O \le 5.5V$		±20	μΑ
ΔlCC	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			
			Тд	=-40°C to +	⊦85°C	
			V _{CC} = 3.0	V 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	4.5 4.5	5.2 5.2	ns
^t PZH ^t PZL	Output Enable Time to High and Low Level	2	1.5 1.5	6.5 6.5	7.2 7.2	ns
^t PHZ ^t PLZ	Output Disable Time From High and Low Level	2	1.5 1.5	6.4 6.4	6.9 6.9	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.

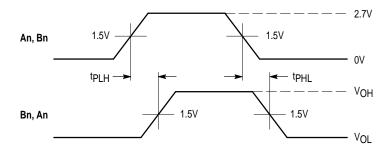
DYNAMIC SWITCHING CHARACTERISTICS

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

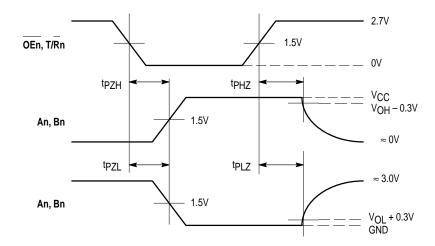
CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C _{IN}	Input Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	7	pF
C _{I/O}	Input/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}	20	pF



WAVEFORM 1 - PROPAGATION DELAYS

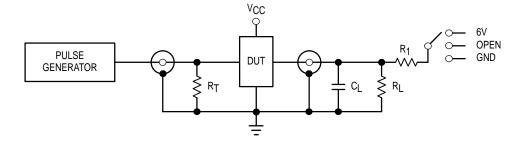
 t_R = t_F = 2.5ns, 10% to 90%; f = 1MHz; t_W = 500ns



WAVEFORM 2 - OUTPUT ENABLE AND DISABLE TIMES

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

Figure 1. AC Waveforms



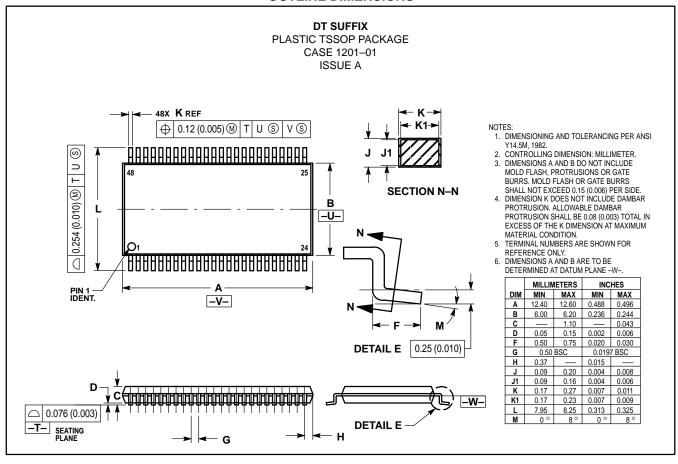
TEST	SWITCH
^t PLH ^{, t} PHL	Open
tPZL, tPLZ	6V
Open Collector/Drain tpLH and tpHL	6V
^t PZH ^{, t} PHZ	GND

 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

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OUTLINE DIMENSIONS



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