

74LCX244

Low-Voltage Buffer/Line Driver with 5V Tolerant Inputs and Outputs

General Description

The LCX244 contains eight non-inverting buffers with TRI-STATE® outputs. The device may be employed as a memory address driver, clock driver and bus-oriented transmitter/receiver. The LCX244 is designed for low voltage (3.3V) V_{CC} applications with capability of interfacing to a 5V signal environment.

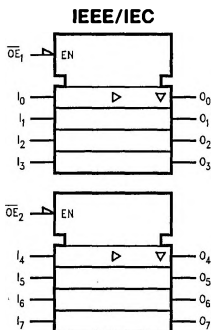
The LCX244 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Features

- 5V tolerant inputs and outputs
- Ideal for low power/low noise 2.7 to 3.6V applications
- Power-down static overvoltage protection on inputs and outputs
- Outputs source/sink 24 mA
- Guaranteed simultaneous switching noise level
- Available in SOIC JEDEC, SOIC EIAJ and TSSOP
- Implements patented Quiet Series noise/EMI reduction circuitry
- Functionally compatible with the 74 series 244
- Latch-up performance exceeds 300 mA
- ESD performance: Human Body Model > 2000V; Machine Model > 250V

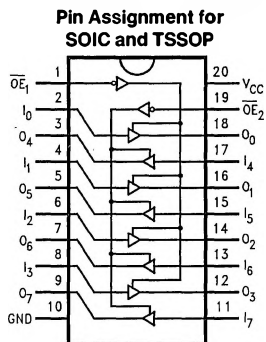
Ordering Code: See Section 11

Logic Symbol



TL/F/11994-1

Connection Diagram



TL/F/11994-2

Pin Names	Description
$\overline{OE}_1, \overline{OE}_2$	TRI-STATE Output Enable Inputs
I_0-I_7	Inputs
O_0-O_7	Outputs

Truth Tables

Inputs		Outputs (Pins 12, 14, 16, 18)
\overline{OE}_1	I_n	
L	L	L
L	H	H
H	X	Z

Inputs		Outputs (Pins 3, 5, 7, 9)
\overline{OE}_2	I_n	
L	L	L
L	H	H
H	X	Z

H = HIGH Voltage Level X = Immaterial L = LOW Voltage Level Z = High Impedance

	SOIC JEDEC	SOIC EIAJ	TSSOP JEDEC
Order Number	74LCX244WM 74LCX244WMX	74LCX244SJ 74LCX244SJX	74LCX244MTCX
See NS Package Number	M20B	M20D	MTC20

Preliminary Data: National Semiconductor reserves the right to make changes at any time without notice.

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V_{CC})	-0.5V to +7.0V
DC Input Voltage (V_I)	-0.5V to +7.0V
Output Voltage (V_O)	
Outputs Tri-Stated	-0.5V to +7.0V
Outputs Active (Note 2)	-0.5V to $V_{CC} + 0.5V$
DC Input Diode Current (I_{IK}) $V_I < 0$	-50 mA
DC Output Diode Current (I_{OK})	
$V_O < 0$	-50 mA
$V_O > V_{CC}$	+50 mA
DC Output Source/Sink Current (I_{OH}/I_{OL})	± 50 mA
DC V_{CC} or Ground Current per Supply Pin (I_{CC} or I_{GND})	± 100 mA
Storage Temperature Range (T_{STG})	-65°C to +150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 2: I_O Absolute Maximum Rating must be observed.

Recommended Operating Conditions

Supply Voltage (V_{CC})	
Operating	2.0V to 3.6V
Data Retention Only	1.5V to 3.6V
Input Voltage (V_I)	0V to 5.5V
Output Voltage (V_O)	
Output in Active State	0.0V to V_{CC}
Output in "OFF" State	0.0V to 5.5V
Output Current I_{OH}/I_{OL}	
$V_{CC} = 3.0V$ to $3.6V$	± 24 mA
$V_{CC} = 2.7V$ to $3.0V$	± 12 mA
Free Air Operating Temperature (T_A)	-40°C to +85°C
Minimum Input Edge Rate ($\Delta t/\Delta V$)	
$V_{IN} = 0.8V$ to $2.0V$, $V_{CC} = 3.0V$	10 ns/V

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units	Conditions
			Min	Max		
V_{IH}	High Level Input Voltage	2.7-3.6	2.0		V	$V_{OUT} \leq 0.1V$ or $\geq V_{CC} - 0.1V$
V_{IL}	Low Level Input Voltage	2.7-3.6		0.8		
V_{OH}	High Level Output Voltage	2.7-3.6 2.7 3.0 3.0	$V_{CC} - 0.2$ 2.2 2.4 2.2		V	$I_{OH} = -100 \mu\text{A}$ $I_{OH} = -12 \text{ mA}$ $I_{OH} = -18 \text{ mA}$ $I_{OH} = -24 \text{ mA}$
V_{OL}	Low Level Output Voltage	2.7-3.6 2.7 3.0		0.2 0.4 0.55	V	$I_{OL} = 100 \mu\text{A}$ $I_{OL} = 12 \text{ mA}$ $I_{OL} = 24 \text{ mA}$
I_I	Input Leakage Current	2.7-3.6		± 5.0	μA	$0 \leq V_I \leq 5.5V$
I_{OZ}	TRI-STATE Output Leakage	2.7-3.6		± 5.0	μA	$0 \leq V_O \leq 5.5V$ $V_I = V_{IH}$ or V_{IL}
I_{OFF}	Power Off Leakage Current	0V		100	μA	V_I or $V_O = 5.5V$
I_{CC}	Quiescent Supply Current	2.7-3.6		10 ± 10	μA	$V_I = V_{CC}$ or GND $3.6 \leq (V_I, V_O) \leq 5.5V$
ΔI_{CC}	Increase in I_{CC} per Input	2.7-3.6		500	μA	$V_{IH} = V_{CC} - 0.6V$

AC Electrical Characteristics: See Section 2 for Test Methodology

Symbol	Parameter	V _{CC} (V)	T _A = -40°C to +85°C, C _L = 50 pF		Units
			Min	Max (Note 2)	
t _{PHL} t _{PLH}	Propagation Delay Data to Output	2.7 3.0-3.6	1.5 1.5	7.5 6.5	ns
t _{PZL} t _{PZH}	Output Enable Time	2.7 3.0-3.6	1.5 1.5	9.0 8.0	ns
t _{PHZ} t _{PLZ}	Output Disable Time	2.7 3.0-3.6	1.5 1.5	8.0 7.0	ns
t _{OSHL} , t _{OSLH}	Output to Output Skew (Note 1)	3.0		1.0	ns

Note 1: 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.

Note 2: The maximum AC limits are design targets. Actual performance will be specified upon completion of characterization.

Dynamic Switching Characteristics: See Section 2 for Test Methodology

Symbol	Parameter	V _{CC} (V)	T _A = 25°C	Units	Conditions
			Typical		
V _{OLP}	Quiet Output Maximum Dynamic V _{OL}	3.3	0.8	V	C _L = 50 pF, V _{IH} = 3.3V, V _{IL} = 0V
V _{OLV}	Quiet Output Minimum Dynamic V _{OL}	3.3	0.8	V	C _L = 50 pF, V _{IH} = 3.3V, V _{IL} = 0V

Capacitance

Symbol	Parameter	Typical	Units	Conditions
C _{IN}	Input Capacitance	7	pF	V _{CC} = Open V _I = 0V or V _{CC}
C _{OUT}	Output Capacitance	8	pF	V _{CC} = 3.3V V _I = 0V or V _{CC}
C _{PD}	Power Dissipation Capacitance	32	pF	V _{CC} = 3.3V V _I = 0V or V _{CC} F = 10 MHz