National Semiconductor

ADVANCE INFORMATION

74LVT244
3.3V ABT Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

The LVT244 is an octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus oriented transmitter or receiver which provides improved PC board density.

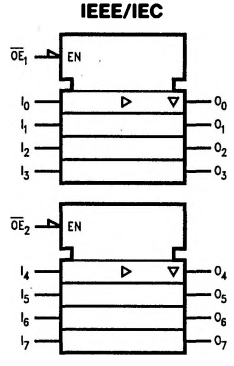
These octal buffers and line drivers are designed for low-voltage (3.3V) V_{CC} applications, but with the capability to provide a TTL interface to a 5V environment. The LVT244 is fabricated with an advanced BiCMOS technology to achieve high speed operation similar to 5V ABT while maintaining a low power dissipation.

Features

- Input and output interface capability to systems at 5V V_{CC}
- Bus-Hold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted
- Power Up/Down high impedance provides glitch-free bus loading
- Outputs source/sink −32 mA/+64 mA
- Available in SOIC JEDEC, SOIC EIAJ and TSSOP
- Functionally compatible with the 74 series 244
- Latch-up performance exceeds 500 mA

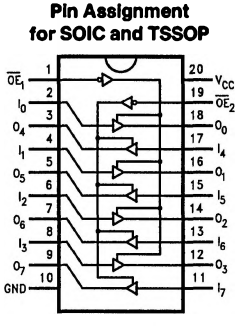
Ordering Code: See Section 11

Logic Symbol



TL/F/12014–1

Connection Diagram



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Truth Tables

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

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

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

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

	SOIC JEDEC	SOIC EIAJ	TSSOP JEDEC
Order Number	74LVT244WM 74LVT244WMX	74LVT244SJ 74LVT244SJX	74LVT244MTCX
See NS Package Number	M20B	M20D	MTC20

Absolute Maximum Ratings (Note)

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	−0.5V to V_{CC}
DC Output Current (I_O)	
Output in LOW State	128 mA
Output in HIGH State, $V_O > V_{CC}$	64 mA
DC Input Diode Current (I_{IK}) $V_I < 0$	−50 mA
DC Output Diode Current (I_{OK}) $V_O < 0$	−50 mA
Storage Temperature Range (T_{STG})	−65°C to +150°C

Note: *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.*

Recommended Operating Conditions

Supply Voltage	
Operating	2.7V to 3.6V
Input Voltage (V_I)	0V to 5.5V
Output Voltage (V_O)	
Output in Active State	0V to V_{CC}
Output in "OFF" State	0V to 5.5V
Minimum Input Edge Rate ($\Delta t/\Delta V$)	
V_{IN} = 0.8V–2.0V, V_{CC} = 3.0V	10 ns/V
Free Air Operating Temperature (T_A)	−40°C to +85°C

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	$T_A = -40°C$ to $+85°C$			Units	Conditions
			Min	Typ (Note 1)	Max		
V_{IK}	Input Clamp Diode Voltage	2.7			−1.2	V	I_I = −18 mA
V_{IH}	Input HIGH Voltage	2.7–3.6	2.0			V	$V_O \le 0.1V$ or $V_O \ge V_{CC} - 0.1V$
V_{IL}	Input LOW Voltage	2.7–3.6			0.8		
V_{OH}	Output HIGH Voltage	2.7–3.6	V_{CC} − 0.2			V	I_{OH} = −100 μA
		2.7	2.4			V	I_{OH} = −8 mA
		3.0	2.0			V	I_{OH} = −32 mA
V_{OL}	Output LOW Voltage	2.7			0.2	V	I_{OL} = 100 μA
		2.7			0.5	V	I_{OL} = 24 mA
		3.0			0.4	V	I_{OL} = 16 mA
		3.0			0.5	V	I_{OL} = 32 mA
		3.0			0.55	V	I_{OL} = 64 mA
$I_{I(HOLD)}$	Bus-Held Input Minimum Drive	3.0	75			μA	V_I = 0.8V
			−75			μA	V_I = 2.0V
$I_{I(OD)}$	Bus-Held Input Over-Drive Current to Change State	3.0	500			μA	(Note 2)
			−500			μA	(Note 3)
I_I	Input Current	0 or 3.6			10	μA	V_I = 5.5V
	Control Pins	3.6			±1	μA	V_I = 0V or V_{CC}
	Data Pins	3.6			−5	μA	V_I = 0V
					1	μA	$V_I = V_{CC}$
I_{IH}^+	Control Pin Input Current	3.6			10	μA	$V_{CC} \le V_I \le 5.5V$
I_{OFF}	Input or Output Current	0			±100	μA	$0V \le V_I$ or $V_O \le 5.5V$
I_{OZL}	TRI-STATE Output Leakage Current	3.6			−5	μA	V_O = 0V

DC Electrical Characteristics (Continued)

Symbol	Parameter	V_{CC} (V)	$T_A = -40°C$ to $+85°C$			Units	Conditions
			Min	Typ (Note 1)	Max		
I_{OZH}	TRI-STATE Output Leakage Current	3.6			5	μA	$V_O = V_{CC}$
$I_{OZH}+$	TRI-STATE Output Leakage Current	3.6			10	μA	$V_{CC} \le V_O \le 5.5V$
I_{CCH}	Power Supply Current	3.6			0.19	mA	V_I = GND or V_{CC}, Outputs High
I_{CCL}	Power Supply Current	3.6			12	mA	V_I = GND or V_{CC}, Outputs Low
I_{CCZ}	Power Supply Current	3.6			0.19	mA	V_I = GND or V_{CC}, Outputs Disabled
$I_{CCZH}+$	Power Supply Current	3.6			0.19	mA	V_I = GND or V_{CC}, $V_{CC} \le V_O \le 5.5V$, Outputs Disabled
ΔI_{CC}	Increase in Power Supply Current (Note 4)	3.6			0.2	mA	One Input at $V_{CC} - 0.6V$ Other Inputs at V_{CC} or GND

Note 1: All typical values are at $V_{CC} = 3.3V$, $T_A = 25°C$.

Note 2: An external driver must source at least the specified current to switch from LOW to HIGH.

Note 3: An external driver must sink at least the specified current to switch from HIGH to LOW.

Note 4: This is the increase in supply current for each input that is at the specified voltage level rather than V_{CC} or GND.

Dynamic Switching Characteristics: See Section 2 for Test Methodology (Note 1)

Symbol	Parameter	V_{CC} (V)	$T_A = 25°C$			Units	Conditions $C_L = 50$ pF, $R_L = 500\Omega$
			Min	Typ	Max		
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	3.3		0.8		V	(Note 2)
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	3.3		−0.8		V	(Note 2)
V_{IHD}	Minimum High Level Dynamic Input Voltage	3.3				V	(Note 3)
V_{ILD}	Maximum Low Level Dynamic Input Voltage	3.3				V	(Note 3)

Note 1: Characterized in SOIC package. Guaranteed parameter, but not tested.

Note 2: Max number of outputs defined as (n). n−1 data inputs are driven 0V to 3V. Output at LOW.

Note 3: Max number of data inputs (n) switching. n−1 inputs switching 0V to 3V. Input-under-test switching: 3V to threshold (V_{ILD}), 0V to threshold (V_{IHD}).

AC Electrical Characteristics: See Section 2 for Test Methodology

Symbol	Parameter	$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF, $R_L = 500\Omega$					Units
		$V_{CC} = 3.3V \pm 0.3V$			$V_{CC} = 2.7V$		
		Min	Typ (Note 1)	Max	Min	Max	
t_{PLH}	Propagation Delay Data to Output	1.0		4.1	1.0	5.0	ns
t_{PHL}		1.0		4.1	1.0	5.0	
t_{PZH}	Output Enable Time	1.0		5.2	1.0	6.3	ns
t_{PZL}		1.0		5.2	1.0	6.3	
t_{PHZ}	Output Disable Time	1.8		5.1	1.8	5.6	ns
t_{PLZ}		1.8		5.1	1.8	5.6	
t_{OSHL}	Output to Output Skew (Note 2)			1.0			ns
t_{OSLH}							

Note 1: All typical values are at $V_{CC} = 3.3V$, $T_A = 25°C$.

Note 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.

Capacitance (Note 1)

Symbol	Parameter	Min	Typ	Max	Units	Conditions
C_{IN}	Input Capacitance		4		pF	V_{CC} = 0V, V_I = 0V or V_{CC}
C_{OUT}	Output Capacitance		8		pF	V_{CC} = 3.0V, V_O = 0V or V_{CC}

Note 1: Capacitance is measured at frequency f = 1 MHz, per MIL-STD-883B, Method 3012.