National Semiconductor

74LVQ241
Low Voltage Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

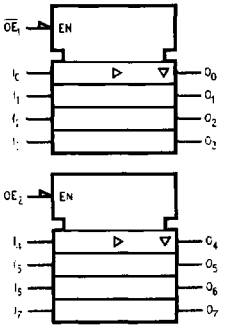
The LVQ241 is an octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus oriented transmitter or receiver which provides improved PC board density.

Features

- Ideal for low power/low noise 3.3V applications
- Implements patented Quiet Series EMI reduction circuitry
- Available in SOIC JEDEC, SOIC EIAJ and QSOP packages
- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Improved latch-up immunity
- Guaranteed incident wave switching into 75Ω
- 4 kV minimum ESD immunity
- MIL-STD-883 54ACQ products are available for Military/Aerospace applications

Logic Symbol

IEEE/IEC



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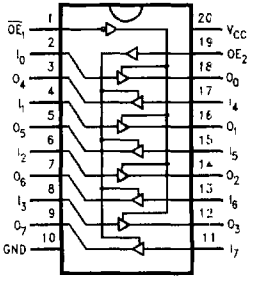
Connection Diagram

Pin Assignment for SOIC and QSOP



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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)
OE_2	I_n	
L	X	Z
H	H	H
H	L	L

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

Pin Names	Description
$\overline{OE}_1$, OE_2	TRI-STATE Output Enable Inputs
I_0–I_7	Inputs
O_0–O_7	Outputs

	SOIC JEDEC	SOIC EIAJ	SSOP JEDEC
Order Number	74LVQ241SC 74LVQ241SCX	74LVQ241SJ 74LVQ241SJX	74LVQ241QSC 74LVQ241QSCX
See NS Package Number	M20B	M20D	MQA20

Absolute Maximum Rating (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 Diode Current (I_{IK})	
V_I = −0.5V	−20 mA
V_I = V_{CC} + 0.5V	+20 mA
DC Input Voltage (V_I)	−0.5V to V_{CC} + 0.5V
DC Output Diode Current (I_{OK})	
V_O = −0.5V	−20 mA
V_O = V_{CC} + 0.5V	+20 mA
DC Output Voltage (V_O)	−0.5V to V_{CC} + 0.5V
DC Output Source or Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current (I_{CC} or I_{GND})	±400 mA
Storage Temperature (T_{STG})	−65°C to +150°C
DC Latch-Up Source or Sink Current	±300 mA

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 (V_{CC})	2.0V to 3.6V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	
74LVQ	−40°C to +85°C
Minimum Input Edge Rate $\Delta V/\Delta t$	
V_{IN} 0.8V to 2.0V	
V_{CC} @ 3.0V	125 mV/ns

DC Characteristics

Symbol	Parameter	V_{CC} (V)	74LVQ241 T_A = +25°C		74LVQ241 T_A = −40°C to +85°C	Units	Conditions
			Typ	Guaranteed Limits			
V_{IH}	Minimum High Level Input Voltage	3.0	1.5	2.0	2.0	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
V_{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.8	0.8	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
V_{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	I_{OUT} = −50 μA
		3.0		2.58	2.48	V	*V_{IN} = V_{IL} or V_{IH} I_{OH} = −12 mA
V_{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	I_{OUT} = 50 μA
		3.0		0.36	0.44	V	*V_{IN} = V_{IL} or V_{IH} I_{OL} = 12 mA
I_{IN}	Maximum Input Leakage Current	3.6		±0.1	±1.0	μA	V_I = V_{CC}, GND

*All outputs loaded; thresholds on input associated with output under test.

DC Characteristics (Continued)

Symbol	Parameter	V_{CC} (V)	74LVQ241 $T_A = +25°C$		74LVQ241 $T_A = -40°C$ to $+85°C$	Units	Conditions
			Typ	Guaranteed Limits			
I_{OLD}	†Minimum Dynamic Output Current	3.6			36	mA	V_{OLD} = 0.8V Max (Note 1)
I_{OHD}		3.6			−25	mA	V_{OHD} = 2.0V Min (Note 1)
I_{CC}	Maximum Quiescent Supply Current	3.6		4.0	40.0	μA	$V_{IN} = V_{CC}$ or GND
I_{OZ}	Maximum TRI-STATE Leakage Current	3.6		±0.25	±2.5	μA	$V_I(OE) = V_{IL}, V_{IH}$ $V_I = V_{CC}$, GND $V_O = V_{CC}$, GND
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	3.3	0.4	0.8		V	(Notes 2, 3)
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	3.3	−0.4	−0.8		V	(Notes 2, 3)
V_{IHD}	Maximum High Level Dynamic Input Voltage	3.3	1.6	2.0		V	(Notes 2, 4)
V_{ILD}	Maximum Low Level Dynamic Input Voltage	3.3	1.6	0.8		V	(Notes 2, 4)

†Maximum test duration 2.0 ms, one output loaded at a time.

Note 1: Incident wave switching on transmission lines with impedances as low as 75Ω for commercial temperature range is guaranteed for 74LVQ.

Note 2: Worst case package.

Note 3: Max number of outputs defined as (n). Data Inputs are driven 0V to 3.3V. One output @ GND.

Note 4: Max number of Data Inputs (n) switching. n − 1 Inputs switching 0V to 3.3V. Input-under-test switching: 3.3V to threshold (V_{ILD}), 0V to threshold (V_{IHD}), f = 1 MHz.

AC Electrical Characteristics: See Section 2 for Test Methodology

Symbol	Parameter	V_{CC} (V)	74LVQ241 $T_A = +25°C$, $C_L = 50$ pF			74LVQ241 $T_A = -40°C$ to $+85°C$, $C_L = 50$ pF		Units
			Min	Typ	Max	Min	Max	
t_{PHL}, t_{PLH}	Propagation Delay Data to Output	2.7	2.0	7.8	12.7	2.0	14.0	ns
		3.3 ±0.3	2.0	6.5	9.0	2.0	9.5	
t_{PZL}, t_{PZH}	Output Enable Time	2.7	2.5	9.6	18.3	2.5	19.0	ns
		3.3 ±0.3	2.5	8.0	13.0	2.5	13.5	
t_{PHZ}, t_{PLZ}	Output Disable Time	2.7	1.0	10.2	20.4	1.0	21.0	ns
		3.3 ±0.3	1.0	8.5	14.5	1.0	15.0	
t_{OSHL}, t_{OSLH}	Output to Output Skew *Data to Output	2.7		1.0	1.5		1.5	ns
		3.3 ±0.3		1.0	1.5		1.5	

*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

Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = Open
C_{PD} (Note 1)	Power Dissipation Capacitance	70	pF	V_{CC} = 3.3V

Note 1: C_{PD} is measured at 10 MHz.