16-bit buffer/line driver; (3-State)
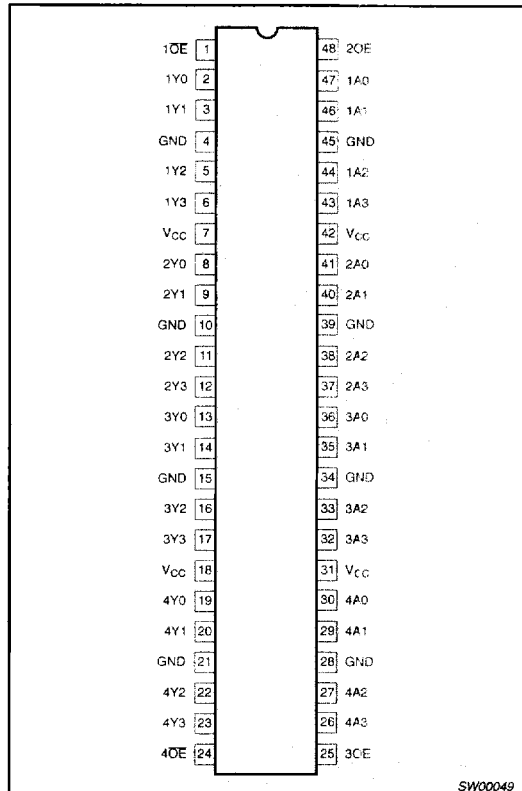
74LVCH16241

FEATURES

- Wide supply voltage range of 1.2V to 3.6V
- Complies with JEDEC standard no. 8-1A
- CMOS low power consumption
- MULTIBYTE™ flow-through standard pin-out architecture
- Low inductance multiple power and ground pins for minimum noise and ground bounce
- Direct interface with TTL levels
- All data inputs have bushold
- Output drive capability 50Ω transmission lines @ 85°C

DESCRIPTION

The 74LVCH16241 is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

The 74LVCH16241 is a 16-bit buffer/line driver with 3-State outputs. The 3-State outputs are controlled by the output enable inputs nOE and nOE. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times. The device can be used as four 4-bit buffers, two 8-bit buffers or one 16-bit buffer.

PIN CONFIGURATION

1OE	1	48	2OE
1Y0	2	47	1A0
1Y1	3	46	1A1
GND	4	45	GND
1Y2	5	44	1A2
1Y3	6	43	1A3
V_{CC}	7	42	V_{CC}
2Y0	8	41	2A0
2Y1	9	40	2A1
GND	10	39	GND
2Y2	11	38	2A2
2Y3	12	37	2A3
3Y0	13	36	3A0
3Y1	14	35	3A1
GND	15	34	GND
3Y2	16	33	3A2
3Y3	17	32	3A3
V_{CC}	18	31	V_{CC}
4Y0	19	30	4A0
4Y1	20	29	4A1
GND	21	28	GND
4Y2	22	27	4A2
4Y3	23	26	4A3
4OE	24	25	3OE

SW00049

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
48-Pin Plastic SSOP Type III	−40°C to +85°C	74LVCH16241 DL	VCH16241 DL	SOT370-1
48-Pin Plastic TSSOP Type II	−40°C to +85°C	74LVCH16241 DGG	VCH16241 DGG	SOT362-1

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °C; t_r = t_f ≤ 2.5 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	Propagation delay nAn to nYn	C_L = 50pF V_{CC} = 3.3V	2.1	ns
C_I	Input capacitance		5.0	pF
C_{PD}	Power dissipation capacitance per buffer	V_I = GND to V_{CC}[1]	30	pF

NOTES:
1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):
   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
   f_i = input frequency in MHz; C_L = output load capacity in pF;
   f_o = output frequency in MHz; V_{CC} = supply voltage in V;
 $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

16-bit buffer/line driver; (3-State)
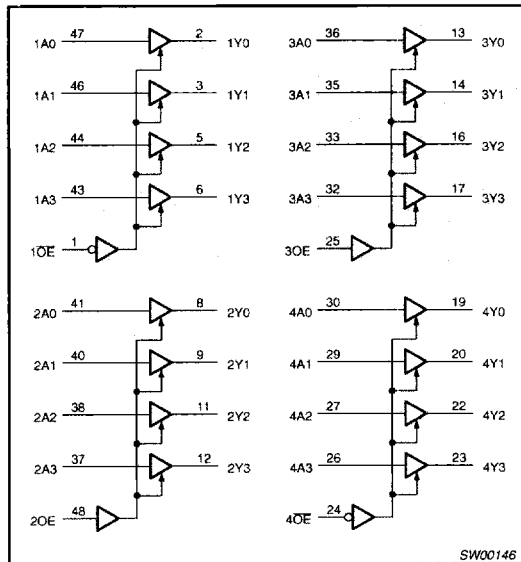
74LVCH16241

PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	1OE	Output enable input (active LOW)
2, 3, 5, 6	1Y0 to 1Y3	Data outputs
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V_{CC}	Positive supply voltage
8, 9, 11, 12	2Y0 to 2Y3	Data outputs
13, 14, 16, 17	3Y0 to 3Y3	Data outputs
19, 20, 22, 23	4Y0 to 4Y3	Data outputs
24	4OE	Output enable input (active LOW)
25	3OE	Output enable input (active LOW)
30, 29, 27, 26	4A0 to 4A3	Data inputs
36, 35, 33, 32	3A0 to 3A3	Data inputs
41, 40, 38, 37	2A0 to 2A3	Data inputs
47, 46, 44, 43	1A0 to 1A3	Data inputs
48	2OE	Output enable input (active LOW)

LOGIC SYMBOL (IEEE/IEC)
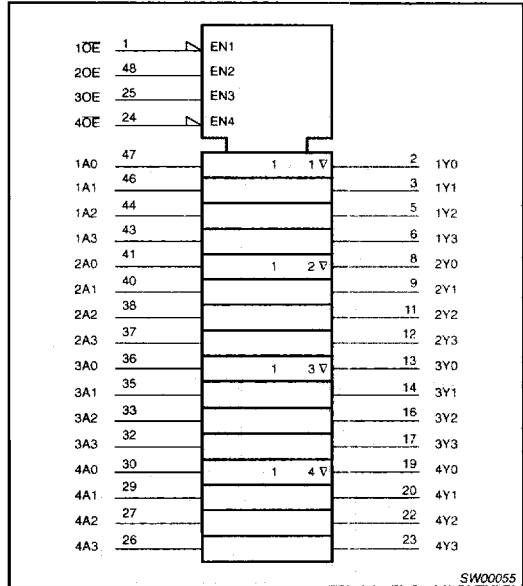
SW00055

LOGIC SYMBOL

SW00146

FUNCTION TABLES

INPUTS		OUTPUT
nOE	1An, 4An	1Yn, 4Yn
L	H	H
L	L	L
H	X	Z

INPUTS		OUTPUT
nOE	2An, 3An	2Yn, 3Yn
H	H	H
H	L	L
L	X	Z

H = HIGH voltage level
L = LOW voltage level
X = don't care
Z = high impedance OFF-state

16-bit buffer/line driver; (3-State)

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BUSHOLD CIRCUIT

SW00044
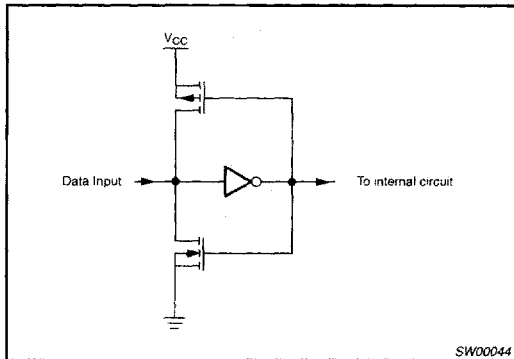
ABSOLUTE MAXIMUM RATINGS[1, 2]

In accordance with the Absolute Maximum Rating System (IEC 134)
Voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		−0.5 to +4.6	V
I_{IK}	DC input diode current	$V_I < 0$	−50	mA
V_I	DC input voltage	For control pins only[3]	−0.5 to +5.5	V
V_I	DC input voltage	For data inputs only[3]	−0.5 to V_{CC} +0.5	V
I_{OK}	DC output diode current	$V_O > V_{CC}$ or $V_O < 0$	±50	mA
V_{OUT}	DC output voltage	Note 3	−0.5 to V_{CC} +0.5	V
I_{OUT}	DC output source or sink current	$V_O = 0$ to V_{CC}	±50	mA
I_{GND}, I_{CC}	DC V_{CC} or GND current		±100	mA
T_{stg}	Storage temperature range		−60 to +150	°C
P_{TOT}	Power dissipation per package −plastic medium-shrink SO (SSOP) −plastic mini-pack (TSSOP)	For temperature range: −40 to +125 °C above +55°C derate linearly with 11.3 mW/K above +55°C derate linearly with 8 mW/K	850 600	mW

NOTES:
1. Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

16-bit buffer/line driver; (3-State)

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RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN	MAX	
V_{CC}	DC supply voltage (for max. speed performance)		2.7	3.6	V
V_{CC}	DC supply voltage (for low-voltage applications)		1.2	3.6	V
V_I	DC Input voltage range	Data inputs only	0	V_{CC}	V
V_I	DC Input voltage range	Control pins only	0	5.5	V
V_O	DC output voltage range		0	V_{CC}	V
T_{amb}	Operating free-air temperature range		−40	+85	°C
t_r, t_f	Input rise and fall times	V_{CC} = 2.7 to 3.0V V_{CC} = 3.0 to 3.6V	0 0	20 10	ns/V

DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS		LIMITS Temp = −40°C to +85°C			UNIT
				MIN	TYP[1]	MAX	
V_{IH}	HIGH level Input voltage	V_{CC} = 1.2V		V_{CC}			V
		V_{CC} = 2.7 to 3.6V		2.0			
V_{IL}	LOW level Input voltage	V_{CC} = 1.2V				GND	V
		V_{CC} = 2.7 to 3.6V				0.8	
V_{OH}	HIGH level output voltage	V_{CC} = 2.7V; V_I = V_{IH} or V_{IL}; I_O = −12mA		V_{CC}-0.5			V
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = −100µA		V_{CC}-0.2	V_{CC}		
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = −24mA		V_{CC}-1.0			
V_{OL}	LOW level output voltage	V_{CC} = 2.7V; V_I = V_{IH} or V_{IL}; I_O = 12mA				0.4	V
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = 100µA				0.2	
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = 24mA				0.55	
I_I	Input leakage current	V_{CC} = 3.6V; V_I = 5.5V or GND	Control pins		± 0.1	± 5	µA
		V_{CC} = 3.6V; V_I = V_{CC} or GND	Data input pins[2]		± 0.1	± 5	
I_{IHZ}/I_{ILZ}	Input current for common I/O pins	V_{CC} = 3.6V; V_I = V_{CC} or GND			± 0.1	± 15	µA
I_{OZ}	3-State output OFF-state current	V_{CC} = 3.6V; V_I = V_{IH} or V_{IL}; V_O = V_{CC} or GND			0.1	± 10	µA
I_{CC}	Quiescent supply current	V_{CC} = 3.6V; V_I = V_{CC} or GND; I_O = 0			0.2	40	µA
ΔI_{CC}	Additional quiescent supply current per control pin	V_{CC} = 2.7V to 3.6V; V_I = V_{CC} −0.6V; I_O = 0			5	500	µA
ΔI_{CC}	Additional quiescent supply current per data I/O pin	V_{CC} = 2.7V to 3.6V; V_I = V_{CC} −0.6V; I_O = 0			150	750	µA
IBHL	Bushold LOW sustaining current	V_{CC} = 3.0V; V_I = 0.8V[2, 3]		75			µA
IBHH	Bushold HIGH sustaining current	V_{CC} = 3.0V; V_I = 2.0V[2, 3]		−75			µA
IBHLO	Bushold LOW overdrive current	V_{CC} = 3.6V[2, 4]		450			µA
IBHHO	Bushold HIGH overdrive current	V_{CC} = 3.6V[2, 4]		−450			µA

NOTES:
1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.
2. For data inputs only, control inputs do not have a bushold circuit.
3. The specified sustaining current at the data input holds the input below the specified V_I level.
4. The specified overdrive current at the data input forces the data input to the opposite logic input state.

16-bit buffer/line driver; (3-State)

74LVCH16241

AC CHARACTERISTICS

GND = 0V; t_R = t_F = 2.5ns; C_L = 50pF; R_L = 500Ω; T_{amb} = −40°C to +85°C.

SYMBOL	PARAMETER	WAVEFORM	LIMITS				UNIT
			V_{CC} = 3.3V ±0.3V			V_{CC} = 2.7V	
			MIN	TYP[1]	MAX	MAX	
t_{PHL} t_{PLH}	Propagation delay nAn to nYn; nAn to nYn	1, 4		2.8	5.0	6.0	ns
t_{PZH} t_{PZL}	3-State output enable time 1OE to 1Yn; 4OE to 4Yn	2, 4		3.4	6.0	7.0	ns
t_{PHZ} t_{PLZ}	3-State output disable time 1OE to 1Yn; 4OE to 4Yn	2, 4		3.2	5.5	6.0	ns
t_{PZH} t_{PZL}	3-State output enable time 2OE to 2Yn; 3OE to 3Yn	3, 4		3.4	6.0	7.0	ns
t_{PHZ} t_{PLZ}	3-State output disable time 2OE to 2Yn; 3OE to 3Yn	3, 4		3.2	5.5	6.0	ns

NOTE:
1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.
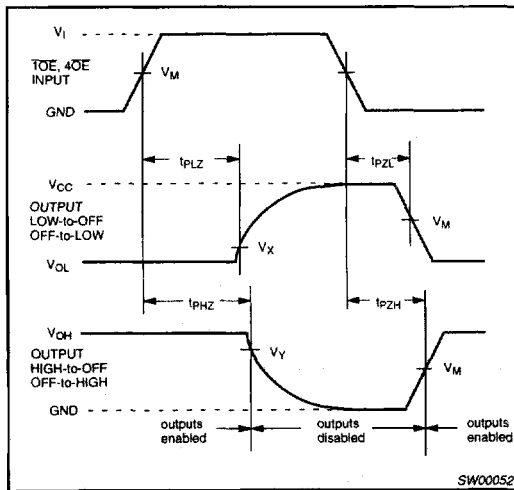
16-bit buffer/line driver; (3-State)

AC WAVEFORMS

$V_M = 1.5V$ at $V_{CC} \geq 2.7V$; $V_M = 0.5\ V_{CC}$ at $V_{CC} < 2.7V$.
V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.
$V_X = V_{OL} + 0.3V$ at $V_{CC} \geq 2.7V$; $V_X = V_{OL} + 0.1\ V_{CC}$ at $V_{CC} < 2.7V$
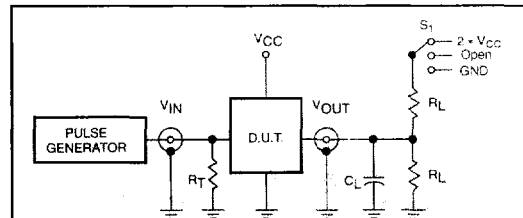$V_Y = V_{OH} -0.3V$ at $V_{CC} \geq 2.7V$; $V_Y = V_{OH} - 0.1\ V_{CC}$ at $V_{CC} < 2.7V$
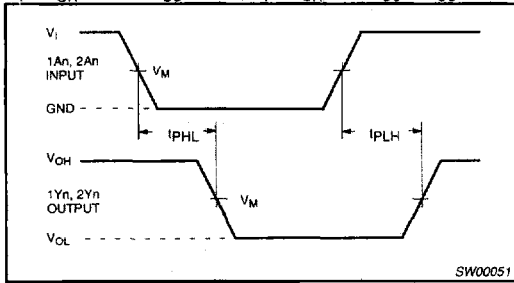
Waveform 1. Waveforms showing the input (nAn) to output (nYn) propagation times

Waveform 2. Waveforms showing the 3-State enable and disable times for the input (1OE, 4OE)
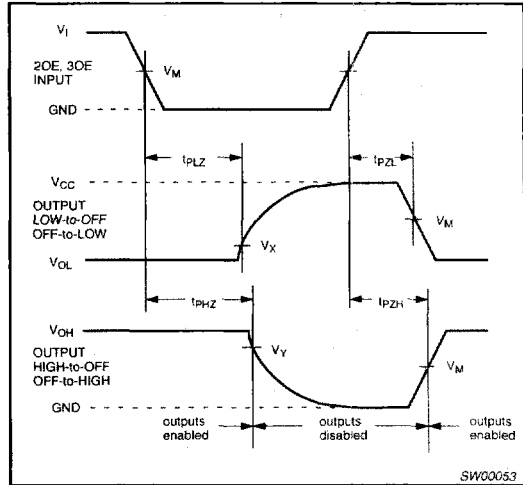
Waveform 3. Waveforms showing the 3-State enable and disable times for the input (2OE, 3OE)

Test Circuit for 3-State Outputs

SWITCH POSITION

TEST	SWITCH
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	2 * V_{CC}
t_{PHZ}/t_{PZH}	GND

V_{CC}	V_I
< 2.7V	V_{CC}
2.7 – 3.6V	2.7V

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.
C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.
R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

Waveform 4. Load circuitry for switching times