16-bit bus transceiver with direction pin and 30Ω series termination resistors; (3-State)

74LVCH162245

FEATURES

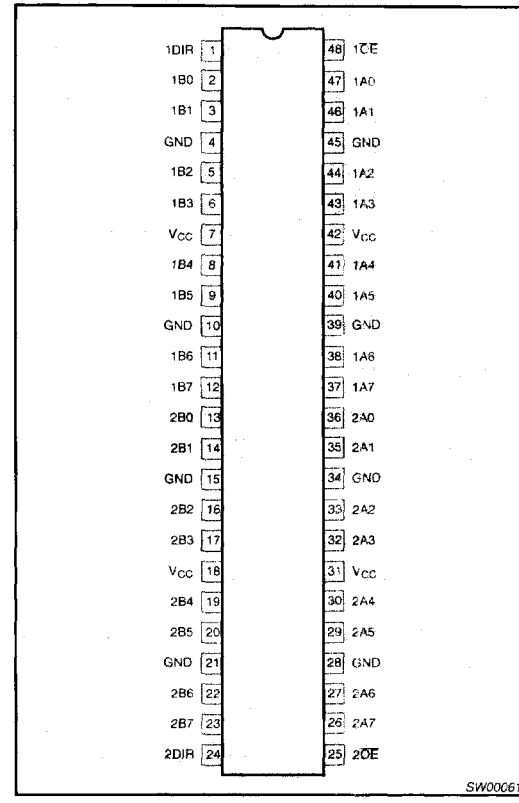
- Wide supply voltage range of 1.2V to 3.6V
- Complies with JEDEC standard no. 8-1A
- CMOS low power consumption
- MULTIBYTE™ flow-through standard pin-out architecture
- Low inductance multiple power and ground pins for minimum noise and ground bounce
- Direct interface with TTL levels
- All data inputs have bushold
- Integrated 30Ω termination resistor

DESCRIPTION

The 74LVCH162245 is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

The 74LVCH16245 is a 16-bit transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions. The 74LVCH162245 features two output enable ($n\overline{OE}$) inputs for easy cascading and two send/receive (nDIR) inputs for direction control. $n\overline{OE}$ controls the outputs so that the buses are effectively isolated. The 74LVCH162245 is designed with 30Ω series resistors in both HIGH and LOW output states. This device can be used as two 8-bit transceivers or one 16-bit transceiver.

PIN CONFIGURATION



ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
48-Pin Plastic SSOP Type III	–40°C to +85°C	74LVCH162245 DL	VCH162245 DL	SOT370-1
48-Pin Plastic TSSOP Type II	–40°C to +85°C	74LVCH162245 DGG	VCH162245 DGG	SOT362-1

QUICK REFERENCE DATA

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

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	Propagation delay An to Bn; Bn to An	C_L = 50pF V_{CC} = 3.3V	2.2	ns
C_I	Input capacitance		5.0	pF
$C_{I/O}$	Input/output capacitance		10	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 the outputs.

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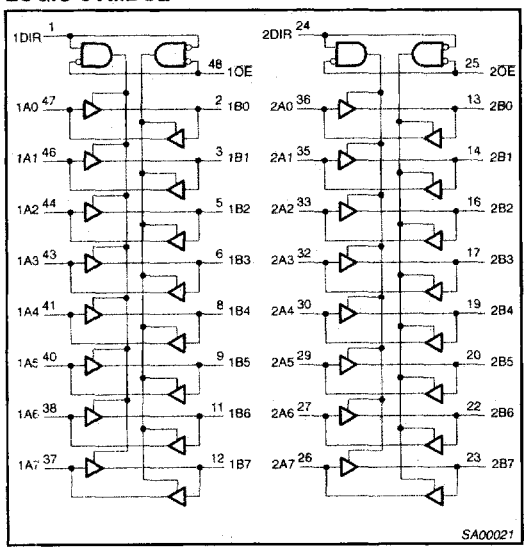
PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	1DIR	Direction control
2, 3, 5, 6, 8, 9, 11, 12	1B0 to 1B7	Data inputs/outputs
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V_{CC}	Positive supply voltage
13, 14, 16, 17, 19, 20, 22, 23	2B0 to 2B7	Data inputs/outputs
24	2DIR	Direction control
25	$2\overline{OE}$	Output enable input (active LOW)
36, 35, 33, 32, 30, 29, 27, 26	2A0 to 2A7	Data inputs/outputs
47, 46, 44, 43, 41, 40, 38, 37	1A0 to 1A7	Data inputs/outputs
48	$1\overline{OE}$	Output enable input (active LOW)

LOGIC SYMBOL

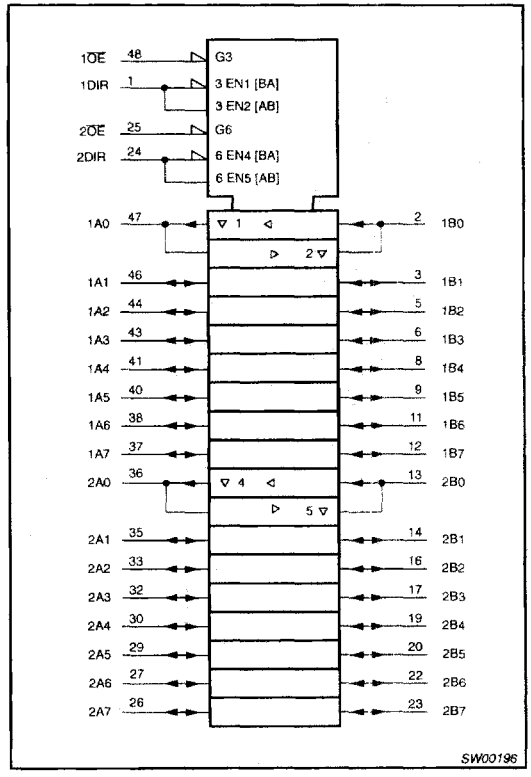


FUNCTION TABLE

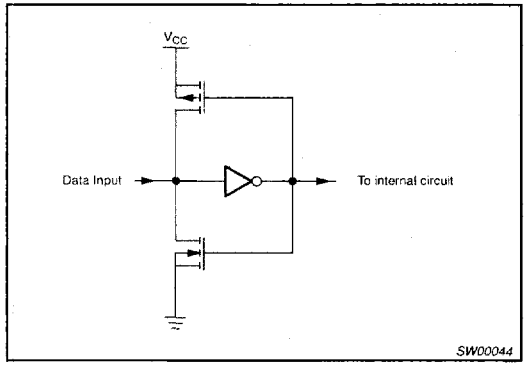
INPUTS		INPUTS/OUTPUT	
nOE	nDIR	nAn	nBn
L	L	A = B	inputs
L	H	inputs	B = A
H	X	Z	Z

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

LOGIC SYMBOL (IEEE/IEC)



BUSHOLD CIRCUIT



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.

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			UNIT
				Temp = −40°C to +85°C			
				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 = −6mA		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 = −12mA		V_{CC}−1.0			
V_{OL}	LOW level output voltage	V_{CC} = 2.7V; V_I = V_{IH} or V_{IL}; I_O = 6mA				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 = 12mA				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.

AC CHARACTERISTICS

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

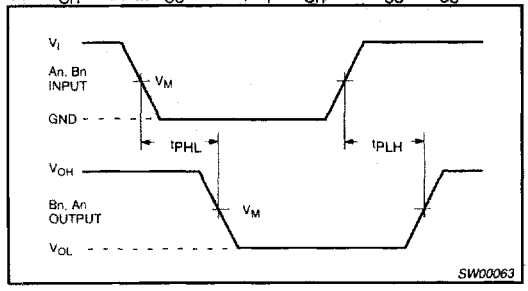
SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			V_{CC} = 3.3V ±0.3V			V_{CC} = 2.7V	V_{CC} = 1.2V	
			MIN	TYP[1]	MAX	MAX	MAX	
t_{PHL} t_{PLH}	Propagation delay nAn to nBn; nBn to nAn	1, 3		3.5	6.0	7.0	16.0	ns
t_{PZH} t_{PZL}	3-State output enable time n$\overline{OE}$ to nAn; n$\overline{OE}$ to nBn	2, 3		4.5	8.0	9.0		ns
t_{PHZ} t_{PLZ}	3-State output disable time n$\overline{OE}$ to nAn; n$\overline{OE}$ to nBn	2, 3		4.2	7.0	7.5		ns

NOTE:

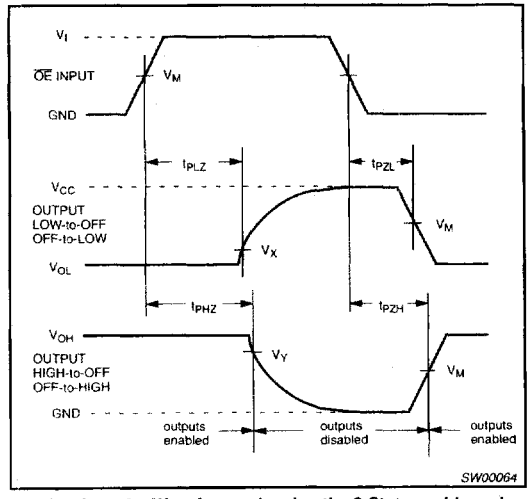
1. *All typical values are at $V_{CC} = 3.3V$ and $T_{amb} = 25°C$.*

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 $V_{CC} < 2.7V$

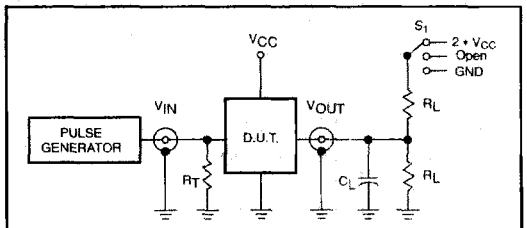


Waveform 1. Waveforms showing the input (nAn, nBn) to output (nBn, nAn) propagation delay times



Waveform 2. Waveforms showing the 3-State enable and disable times

TEST CIRCUIT



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.

SW00047

Waveform 3. Load circuitry for switching times