
HD74LVC16540

16-bit Buffers / Line Drivers with 3-state Outputs

HITACHI

ADE-205-057B(Z)

Rev.2

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Description

The HD74LVC16540 has sixteen inverter drivers with three state outputs in a 48 pin package. When $\overline{G}1$ and $\overline{G}2$ is low level, this drivers set up output is enable. Low voltage and high speed operation is suitable at the battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

Features

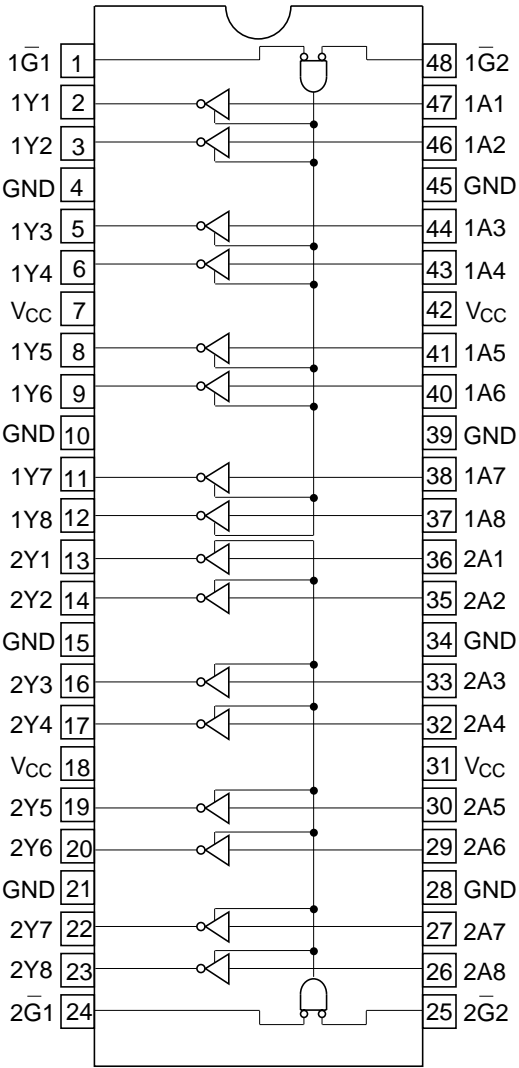
- $V_{CC} = 2.0\text{ V to }5.5\text{ V}$
- All inputs $V_{IH}(\text{Max.}) = 5.5\text{ V} (@V_{CC} = 0\text{ V to }5.5\text{ V})$
- Typical V_{OL} ground bounce $< 0.8\text{ V} (@V_{CC} = 3.3\text{ V}, T_a = 25^\circ\text{C})$
- Typical V_{OH} undershoot $> 2.0\text{ V} (@V_{CC} = 3.3\text{ V}, T_a = 25^\circ\text{C})$
- High output current $\pm 24\text{ mA} (@V_{CC} = 3.0\text{ V to }5.5\text{ V})$

Function Table

Inputs			Output Y
$\overline{G}1$	$\overline{G}2$	A	
L	L	L	H
L	L	H	L
H	X	X	Z
X	H	X	Z

H : High level
L : Low level
X : Immaterial
Z : High impedance

Pin Arrangement



(Top view)

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	-0.5 to 6.0	V	
Input diode current	I_{IK}	-50	mA	$V_I = -0.5\text{ V}$
Input voltage	V_I	-0.5 to 6.0	V	
Output diode current	I_{OK}	-50	mA	$V_O = -0.5\text{ V}$
		50	mA	$V_O = V_{CC} + 0.5\text{ V}$
Output voltage	V_O	-0.5 to $V_{CC} + 0.5$	V	
Output current	I_O	± 50	mA	
V_{CC} , GND current / pin	I_{CC} or I_{GND}	100	mA	
Storage temperature	Tstg	-65 to +150	°C	

Note: The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

Recommended Operating Conditions

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	1.5 to 5.5	V	Data retention
		2.0 to 5.5	V	At operation
Input / output voltage	V_I	0 to 5.5	V	\overline{G} , A
	V_O	0 to V_{CC}	V	Y
Operating temperature	Ta	-40 to 85	°C	
Output current	I_{OH}	-12	mA	$V_{CC} = 2.7\text{ V}$
		-24 ^{*2}	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
	I_{OL}	12	mA	$V_{CC} = 2.7\text{ V}$
		24 ^{*2}	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
Input rise / fall time ^{*1}	t_r, t_f	10	ns/V	

Notes: 1. This item guarantees maximum limit when one input switches.

Waveform : Refer to test circuit of switching characteristics.

2. duty cycle $\leq 50\%$

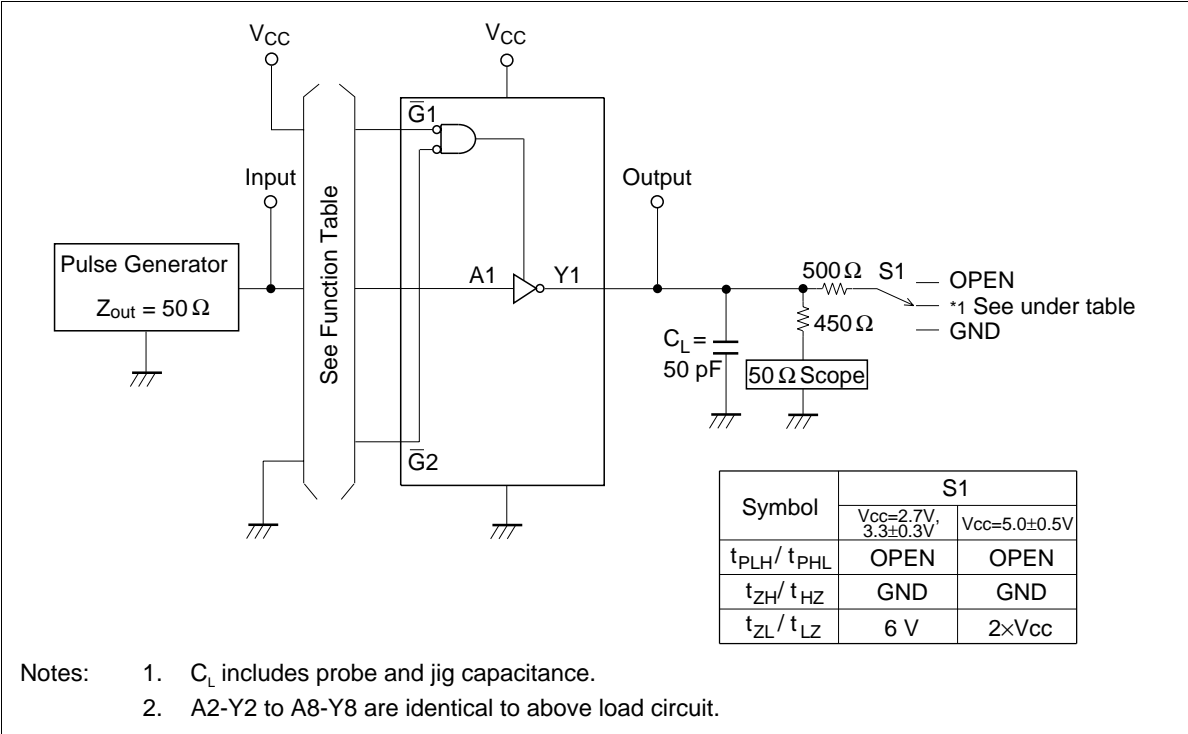
Electrical Characteristics

Item	Symbol	V _{CC} (V)	Ta = -40 to 85°C		Unit	Test Conditions
			Min	Max		
Input voltage	V _{IH}	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	V _{CC} ×0.7	—	V	
	V _{IL}	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	V _{CC} ×0.3	V	
Output voltage	V _{OH}	2.7 to 5.5	V _{CC} -0.2	—	V	I _{OH} = -100 μA
		2.7	2.2	—	V	I _{OH} = -12 mA
		3.0	2.4	—	V	
		3.0	2.0	—	V	I _{OH} = -24 mA
		4.5	3.8	—	V	
	V _{OL}	2.7 to 5.5	—	0.2	V	I _{OL} = 100 μA
		2.7	—	0.4	V	I _{OL} = 12 mA
		3.0	—	0.55	V	I _{OL} = 24 mA
		4.5	—	0.55	V	
Input current	I _{IN}	0 to 5.5	—	±5.0	μA	V _{IN} = 5.5 V or GND
Off state output current	I _{OZ}	5.5	—	±10	μA	V _{IN} = V _{CC} , GND V _{OUT} = V _{CC} or GND
Quiescent supply current	I _{CC}	5.5	—	40	μA	V _{IN} = V _{CC} or GND
	ΔI _{CC}	3.0 to 3.6	—	500	μA	V _{IN} = one input at (V _{CC} -0.6)V, other inputs at V _{CC} or GND

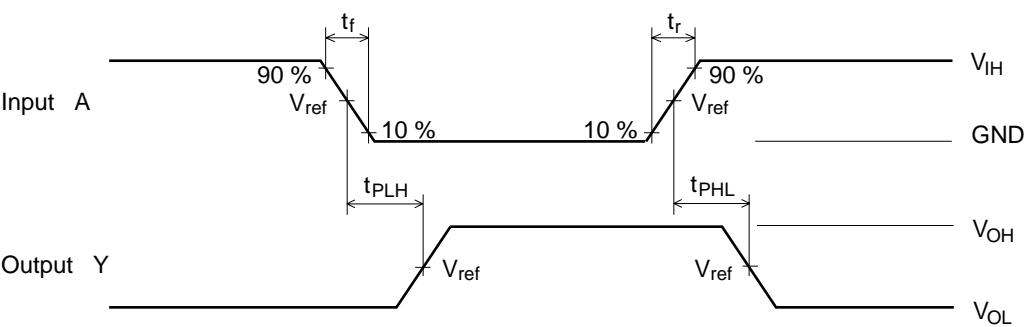
Switching Characteristics

Item	Symbol	V _{cc} (V)	Ta = -40 to 85°C				From (Input)	To (Output)
			Min	Typ	Max	Unit		
Propagation delay time	t _{PLH}	2.7	—	4.5	7.5	ns	A	Y
	t _{PHL}	3.3±0.3	1.5	3.5	6.5	ns		
		5.0±0.5	—	2.5	5.5	ns		
Output enable time	t _{ZH}	2.7	—	5.5	9.0	ns	\overline{G}	Y
	t _{ZL}	3.3±0.3	1.5	4.0	8.0	ns		
		5.0±0.5	—	3.0	6.5	ns		
Output disable time	t _{HZ}	2.7	—	4.0	8.5	ns	\overline{G}	Y
	t _{LZ}	3.3±0.3	1.5	3.5	7.5	ns		
		5.0±0.5	—	2.5	6.0	ns		
Input capacitance	C _{IN}	2.7	—	3.0	—	pF		
Output capacitance	C _O	2.7	—	15.0	—	pF		

Test Circuit

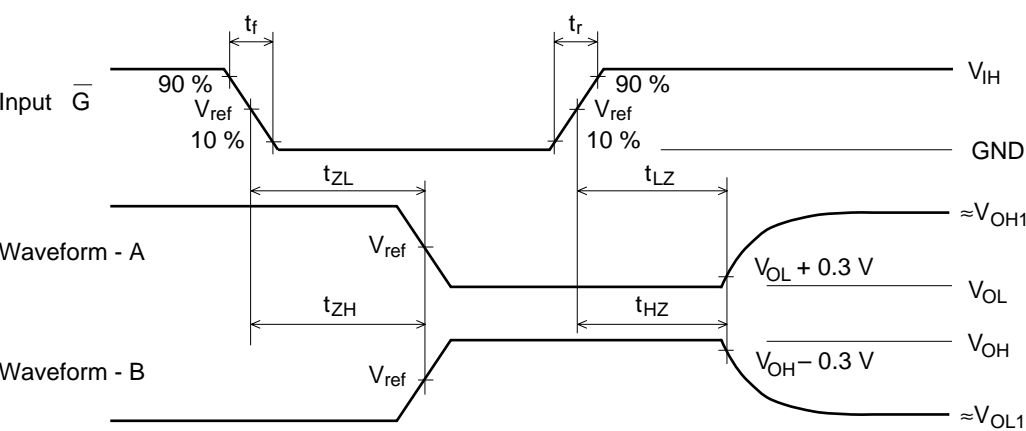


Waveforms – 1



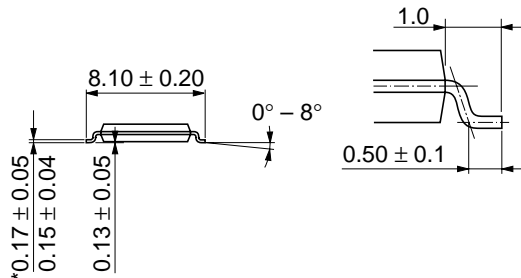
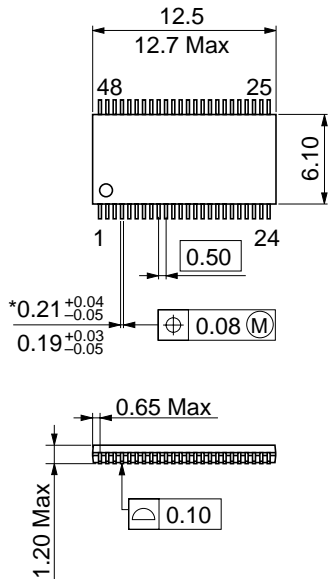
- Notes:
- 1. $t_r = 2.5\text{ ns}$, $t_f = 2.5\text{ ns}$
 - 2. Input waveform : PRR = 10 MHz, duty cycle 50%

Waveforms – 2



TEST	$V_{CC}=2.7\text{ V}$, $3.3\pm0.3\text{ V}$	$V_{CC}=5.0\pm0.5\text{ V}$
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	50% V_{CC}
V_{OH1}	3 V	V_{CC}
V_{OL1}	GND	GND

- Notes:
- 1. $t_r = 2.5\text{ ns}$, $t_f = 2.5\text{ ns}$
 - 2. Input waveform : PRR = 10 MHz, duty cycle 50%
 - 3. Waveform – A shows input conditions such that the output is "L" level when enable by the output control.
 - 4. Waveform – B shows input conditions such that the output is "H" level when enable by the output control.



*Dimension including the plating thickness
Base material dimension

Hitachi Code	TTP-48DB
JEDEC	—
EIAJ	—
Weight (reference value)	0.20 g

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