

# HD74ALVC162835

## 18-bit Universal Bus Driver with 3-state Outputs

REJ03D0055-0700Z  
(Previous ADE-205-201E (Z) )  
Rev.7.00  
Oct.02.2003

### Description

The HD74ALVC162835 is an 18-bit universal bus driver designed for 2.3 V to 3.6 V  $V_{CC}$  operation.

Data flow from A to Y is controlled by the output enable ( $\overline{OE}$ ). The device operates in the transparent mode when the latch enable (LE) is high. When LE is low, the A data is latched if the clock (CLK) input is held at a high or low logic level. If the LE is low, the A data is stored in the latch/flip flop on the low to high transition of CLK. When  $\overline{OE}$  is high, the outputs are in the high impedance state.

To ensure the high impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup register; the minimum value of the register is determined by the current sinking capability of the driver.

All outputs, which are designed to sink up to 12 mA, include 26  $\Omega$  resistors to reduce overshoot and undershoot.

### Features

- Meets "PC SDRAM registered DIMM design support document, Rev. 1.2"
- $V_{CC} = 2.3 \text{ V to } 3.6 \text{ V}$
- 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  $\pm 12 \text{ mA}$  (@  $V_{CC} = 3.0 \text{ V}$ )
- All outputs have equivalent 26  $\Omega$  series resistors, so no external resistors are required

**Function Table**

Inputs				Output Y
$\overline{OE}$	LE	CLK	A	
H	X	X	X	Z
L	H	X	L	L
L	H	X	H	H
L	L	↑	L	L
L	L	↑	H	H
L	L	L or H	X	$Y_0^{*1}$

H : High level

L : Low level

X : Immaterial

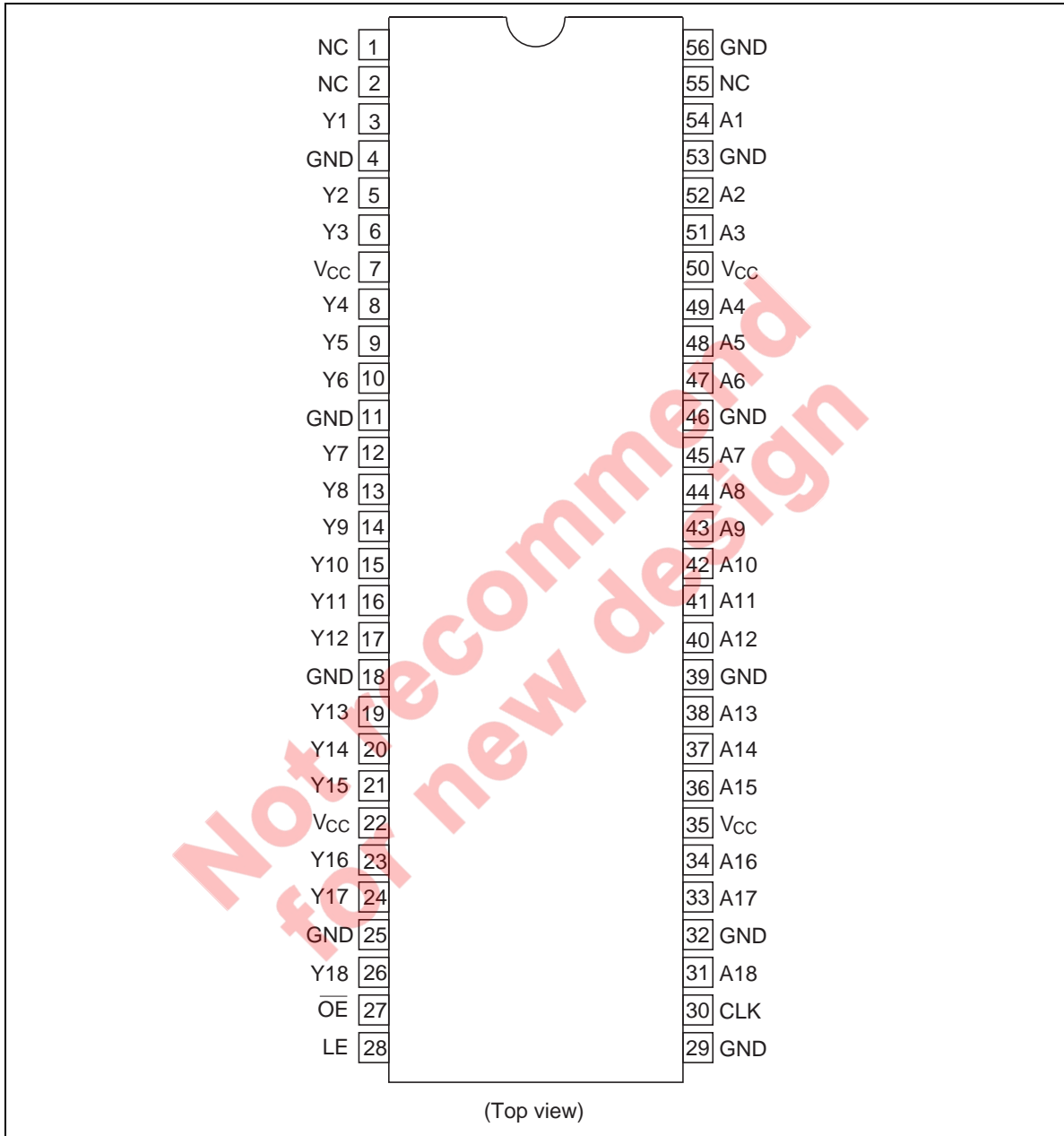
Z : High impedance

↑ : Low to high transition

Note: 1. Output level before the indicated steady-state input conditions were established.

Not recommend  
for new design

**Pin Arrangement**



### Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	$V_{CC}$	-0.5 to 4.6	V	
Input voltage range <sup>*1</sup>	$V_I$	-0.5 to 4.6	V	
Output voltage range <sup>*1, 2</sup>	$V_O$	-0.5 to $V_{CC}+0.5$	V	
Input clamp current	$I_{IK}$	-50	mA	$V_I < 0$
Output clamp current	$I_{OK}$	±50	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	$I_O$	±50	mA	$V_O = 0$ to $V_{CC}$
$V_{CC}$ , GND current / pin	$I_{CC}$ or $I_{GND}$	±100	mA	
Maximum power dissipation at $T_a = 55^\circ\text{C}$ (in still air) <sup>*3</sup>	$P_T$	1	W	TSSOP
Storage temperature range	$T_{stg}$	-65 to 150	°C	

Notes: Stresses beyond those listed under “absolute maximum ratings” 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 condition” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

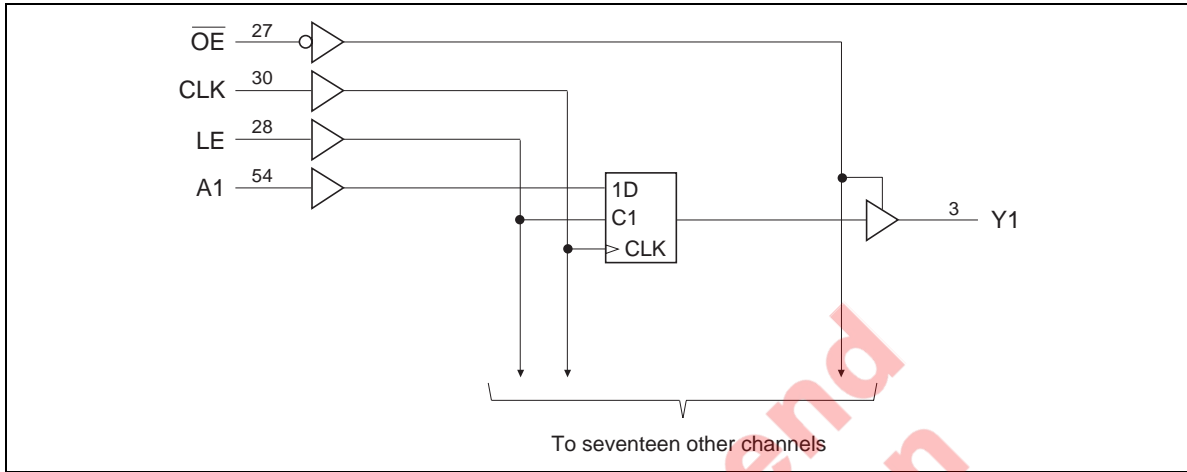
1. The input and output negative-voltage ratings may be exceeded if the input and output clamp current ratings are observed.
2. The input and output positive-voltage ratings may be exceeded up to 4.6 V if the input and output clamp-current ratings are observed.
3. The maximum power dissipation is calculated using a junction temperature of 150°C and board trace length of 750 mils.

### Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage	$V_{CC}$	2.3	3.6	V	
Input voltage	$V_I$	0	$V_{CC}$	V	
Output voltage	$V_O$	0	$V_{CC}$	V	
High-level output current	$I_{OH}$	—	-6	mA	$V_{CC} = 2.3\text{ V}$
		—	-8		$V_{CC} = 2.7\text{ V}$
		—	-12		$V_{CC} = 3.0\text{ V}$
Low-level output current	$I_{OL}$	—	6	mA	$V_{CC} = 2.3\text{ V}$
		—	8		$V_{CC} = 2.7\text{ V}$
		—	12		$V_{CC} = 3.0\text{ V}$
Input transition rise or fall rate	$\Delta t/\Delta v$	0	10	ns/V	
Operating free-air temperature	$T_a$	-40	85	°C	

Note: Unused or floating control pins must be held high or low.

Logic Diagram



Not recommended for new design

**Electrical Characteristics**

Item	Symbol	V <sub>CC</sub> (V)	Ta = -40 to 85°C		Unit	Test Conditions
			Min	Max		
Input voltage	V <sub>IH</sub>	2.3 to 2.7	1.7	—	V	
		2.7 to 3.6	2.0	—		
	V <sub>IL</sub>	2.3 to 2.7	—	0.7	V	
		2.7 to 3.6	—	0.8		
Output voltage	V <sub>OH</sub>	2.3 to 3.6	V <sub>CC</sub> -0.2	—	V	I <sub>OH</sub> = -100 μA
		2.3	1.9	—		I <sub>OH</sub> = -4 mA, V <sub>IH</sub> = 1.7 V
		2.3	1.7	—		I <sub>OH</sub> = -6 mA, V <sub>IH</sub> = 1.7 V
		3.0	2.4	—		I <sub>OH</sub> = -6 mA, V <sub>IH</sub> = 2.0 V
		2.7	2.0	—		I <sub>OH</sub> = -8 mA, V <sub>IH</sub> = 2.0 V
		3.0	2.0	—		I <sub>OH</sub> = -12 mA, V <sub>IH</sub> = 2.0 V
	V <sub>OL</sub>	2.3 to 3.6	—	0.2	V	I <sub>OL</sub> = 100 μA
		2.3	—	0.4		I <sub>OL</sub> = 4 mA, V <sub>IL</sub> = 0.7 V
		2.3	—	0.55		I <sub>OL</sub> = 6 mA, V <sub>IL</sub> = 0.7 V
		3.0	—	0.55		I <sub>OL</sub> = 6 mA, V <sub>IL</sub> = 0.8 V
		2.7	—	0.6		I <sub>OL</sub> = 8 mA, V <sub>IL</sub> = 0.8 V
		3.0	—	0.8		I <sub>OL</sub> = 12 mA, V <sub>IL</sub> = 0.8 V
Input current	I <sub>IN</sub>	3.6	—	±5.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
Off state output current	I <sub>OZ</sub>	3.6	—	±10	μA	V <sub>OUT</sub> = V <sub>CC</sub> or GND
Quiescent supply current	I <sub>CC</sub>	3.6	—	40	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
	ΔI <sub>CC</sub>	3.0 to 3.6	—	750	μA	One input at (V <sub>CC</sub> -0.6)V, other inputs at V <sub>CC</sub> or GND

Switching Characteristics

(Ta = -40 to 85°C)

Item	Symbol	V <sub>CC</sub> (V)	Min	Typ	Max	Unit	From (Input)	To (Output)		
Maximum clock frequency	f <sub>max</sub>	2.5±0.2	150	—	—	MHz				
		2.7	150	—	—					
		3.3±0.3	150	—	—					
Propagation delay time	t <sub>PLH</sub>	2.5±0.2	1.0	—	5.0	ns	A	Y		
		2.7	—	—	5.0					
		3.3±0.3	1.0	—	4.2					
	t <sub>PHL</sub>	2.5±0.2	1.3	—	5.9	ns	LE	Y		
		2.7	—	—	5.8					
		3.3±0.3	1.3	—	5.1					
		2.5±0.2	1.4	—	6.3				CLK	Y
		2.7	—	—	6.1					
		3.3±0.3	1.4	—	5.4					
Output enable time	t <sub>ZH</sub>	2.5±0.2	1.4	—	6.3	ns	OE	Y		
	t <sub>ZL</sub>	2.7	—	—	6.5					
		3.3±0.3	1.1	—	5.5					
Output disable time	t <sub>HZ</sub>	2.5±0.2	1.0	—	4.7	ns	OE	Y		
	t <sub>LZ</sub>	2.7	—	—	4.9					
		3.3±0.3	1.3	—	4.5					
Input capacitance	C <sub>IN</sub>	3.3	3.0	4.5	7.0	pF	Control inputs			
		3.3	3.0	6.0	9.0		Data inputs			
Output capacitance	C <sub>O</sub>	3.3	3.0	7.0	9.0	pF	Y ports			

**Switching Characteristics (cont.)**

(T<sub>a</sub> = -40 to 85°C)

Item	Symbol	V <sub>CC</sub> (V)	Min	Typ	Max	Unit	From (Input)
Setup time	t <sub>su</sub>	2.5±0.2	2.2	—	—	ns	Data before CLK↑
		2.7	2.1	—	—		
		3.3±0.3	1.7	—	—		
		2.5±0.2	1.9	—	—	ns	Data before $\overline{LE}$ ↑ CLK "H"
		2.7	1.6	—	—		
		3.3±0.3	1.5	—	—		
		2.5±0.2	1.3	—	—	ns	Data before $\overline{LE}$ ↑ CLK "L"
		2.7	1.1	—	—		
		3.3±0.3	1.0	—	—		
Hold time	t <sub>h</sub>	2.5±0.2	0.6	—	—	ns	Data after CLK↑
		2.7	0.6	—	—		
		3.3±0.3	0.7	—	—		
		2.5±0.2	1.4	—	—	ns	Data after $\overline{LE}$ ↑ CLK "H" or "L"
		2.7	1.7	—	—		
		3.3±0.3	1.4	—	—		
Pulse width	t <sub>w</sub>	2.5±0.2	3.3	—	—	ns	$\overline{LE}$ "L"
		2.7	3.3	—	—		
		3.3±0.3	3.3	—	—		
		2.5±0.2	3.3	—	—	ns	CLK "H" or "L"
		2.7	3.3	—	—		
		3.3±0.3	3.3	—	—		



**Switching Characteristics (cont.)**

(Ta = 0 to 85°C)

Item	Symbol	V <sub>CC</sub> (V)	Min	Typ	Max	Unit	FROM (Input)	TO (Output)
Propagation delay time	C <sub>L</sub> =0pF <sup>*1</sup> t <sub>PLH</sub> , t <sub>PHL</sub>	3.3±0.165	0.9	—	2.0	ns	A	Y
	C <sub>L</sub> =50pF	3.3±0.165	1.0	—	4.5			
	C <sub>L</sub> =0pF <sup>*1</sup>	3.3±0.165	1.4	—	2.9		CLK	Y
	C <sub>L</sub> =50pF	3.3±0.165	1.9	—	4.5			
	C <sub>L</sub> =50pF t <sub>SSO</sub> <sup>*1,2</sup>	3.3±0.165	1.9	—	4.8		CLK, A	Y
Output rise / fall time	C <sub>L</sub> =50pF <sup>*1</sup> t <sub>TLH</sub> , t <sub>THL</sub>	3.3±0.165	1.0	—	2.5	volts/ ns		Y

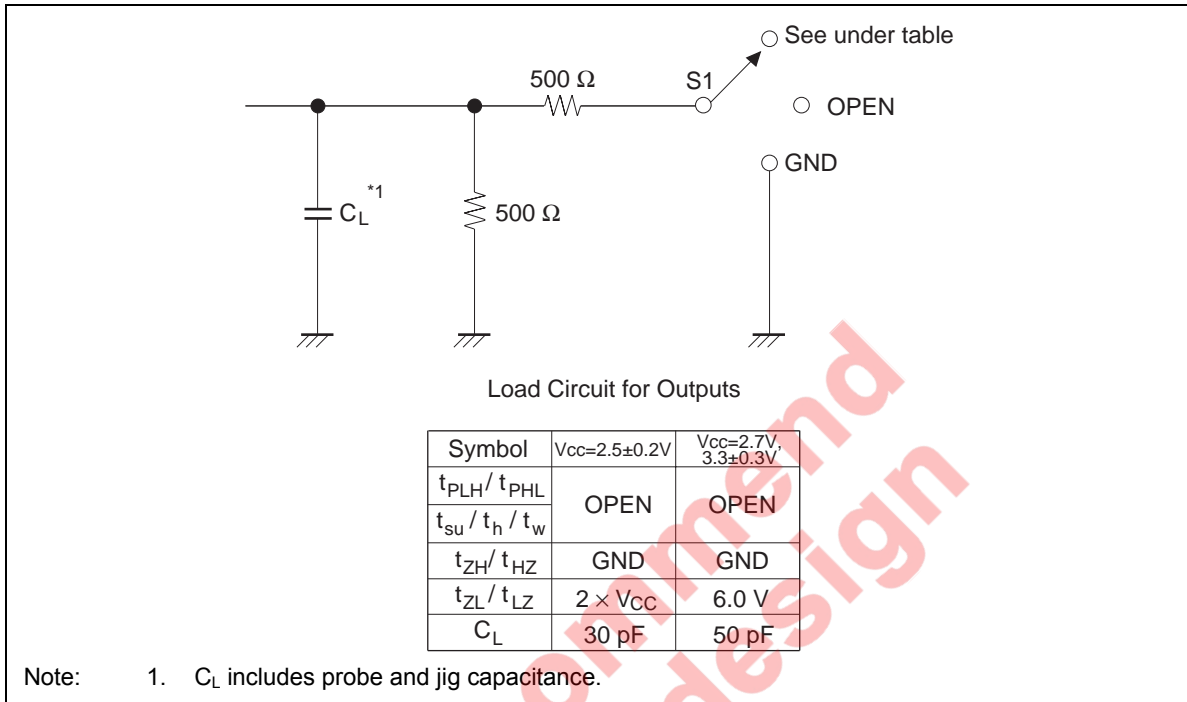
- Notes: 1. This parameter is characterized but not tested.  
 2. t<sub>SSO</sub> : Simultaneous switching output time.

**Operating Characteristics**

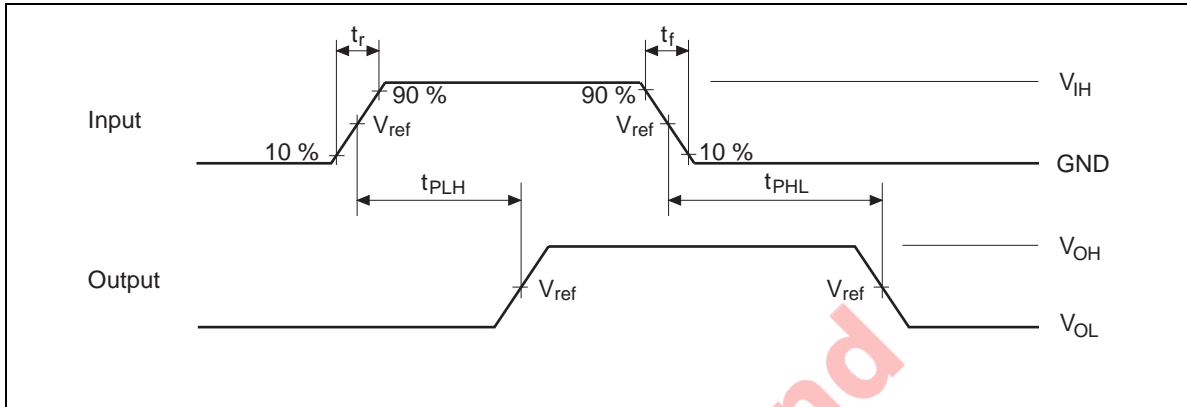
(Ta = 25 °C)

Item	Symbol	V <sub>CC</sub> = 2.5±0.2 V	V <sub>CC</sub> = 3.3±0.3 V	Unit	Test Conditions	
		Typ	Typ			
Power dissipation capacitance	Outputs enable	C <sub>pd</sub>	22.0	24.5	pF	C <sub>L</sub> = 0, f = 10 MHz
	Outputs disable		5.0	6.0		

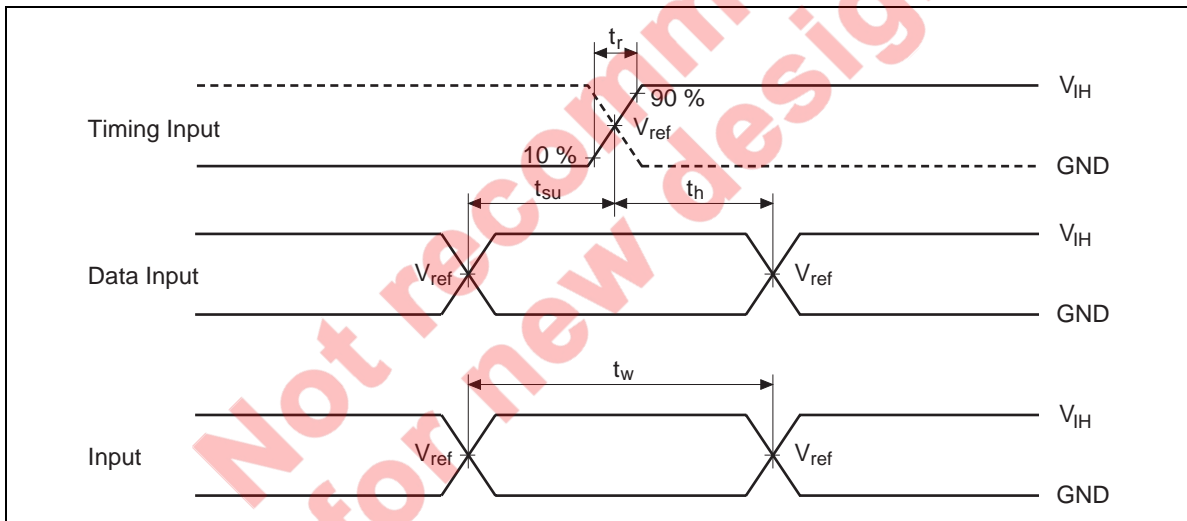
Test Circuit



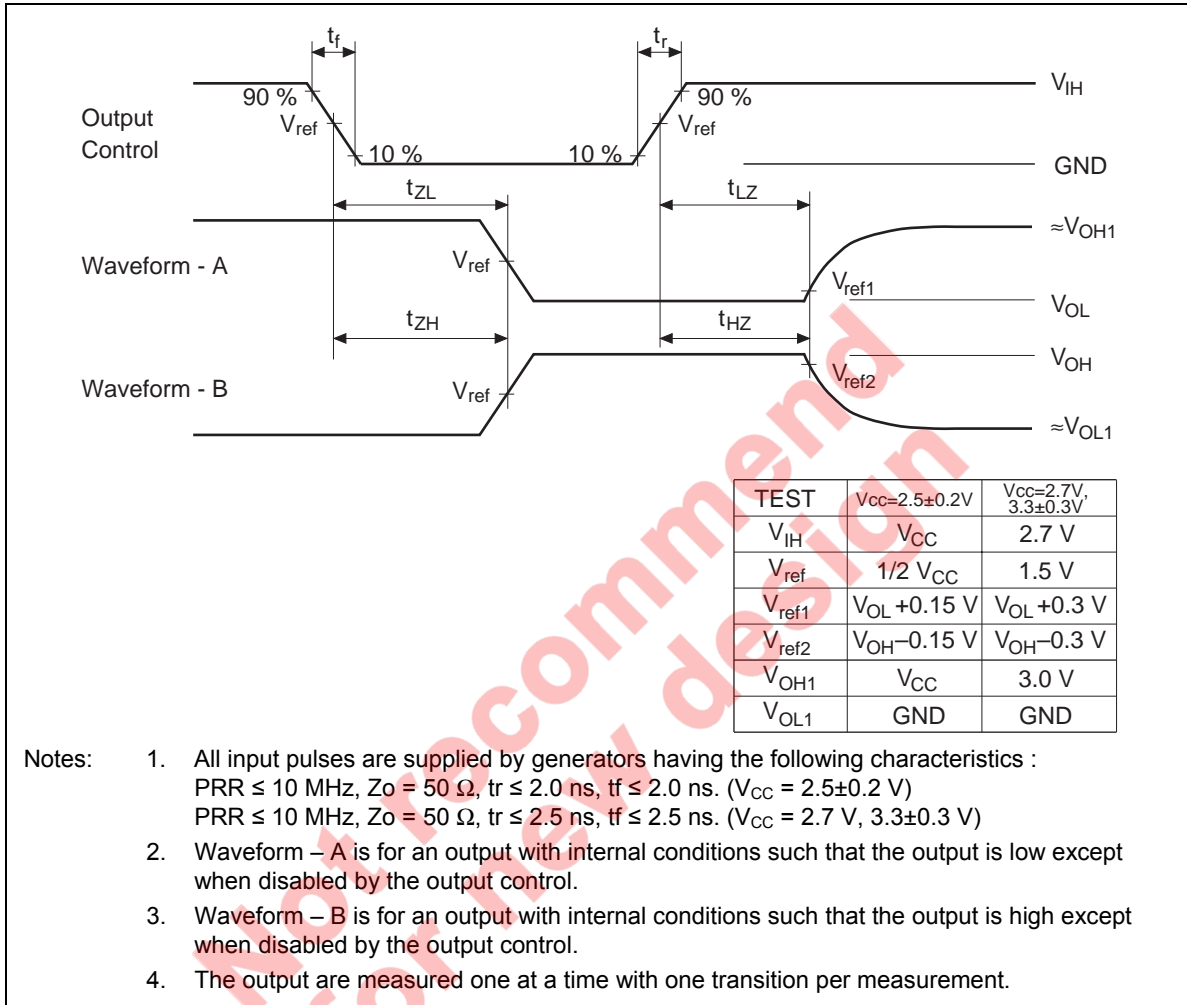
Waveforms - 1



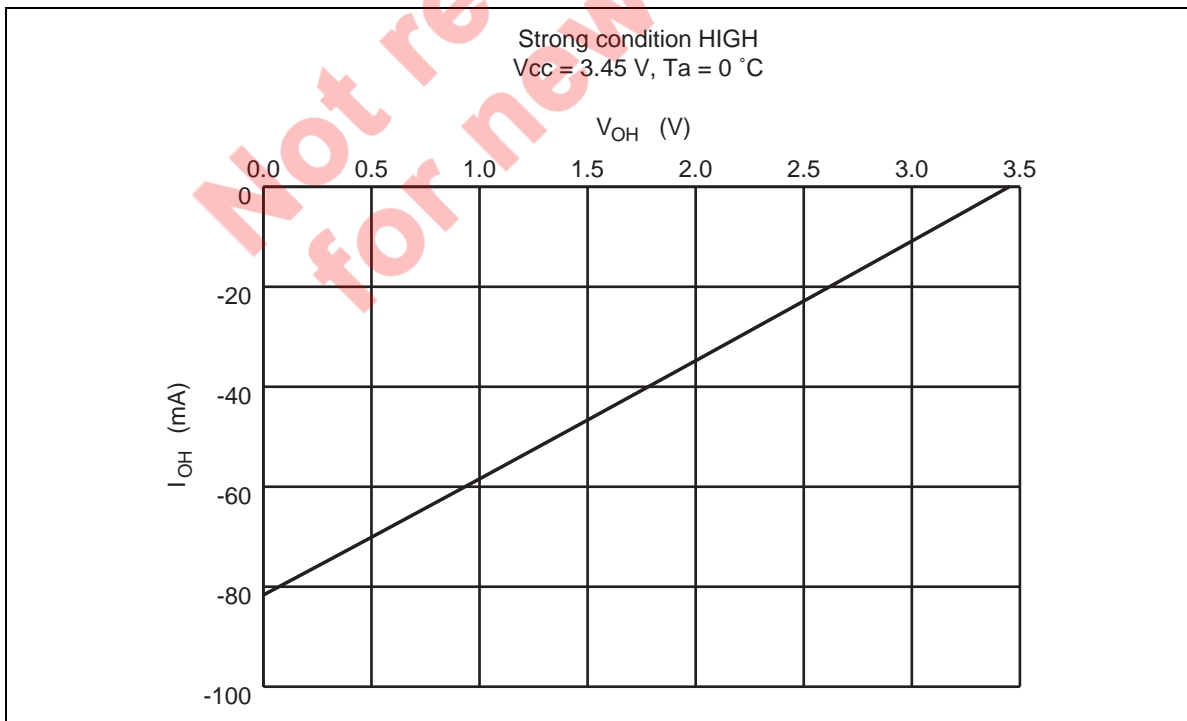
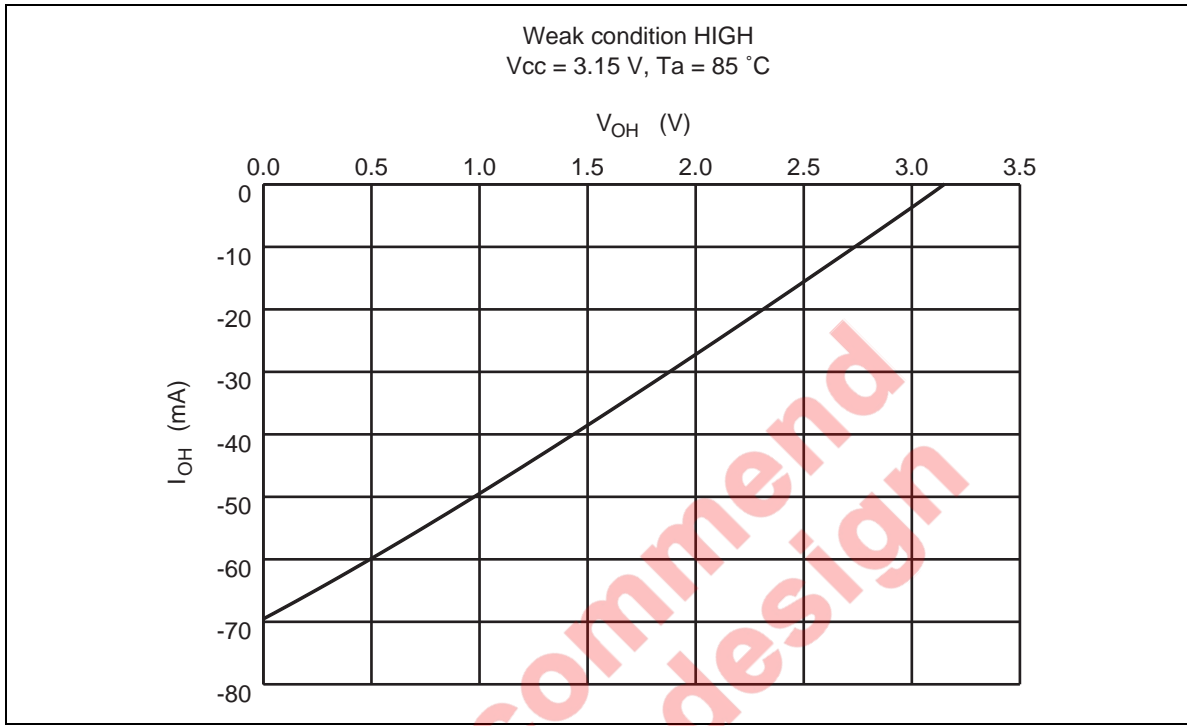
Wave forms - 2

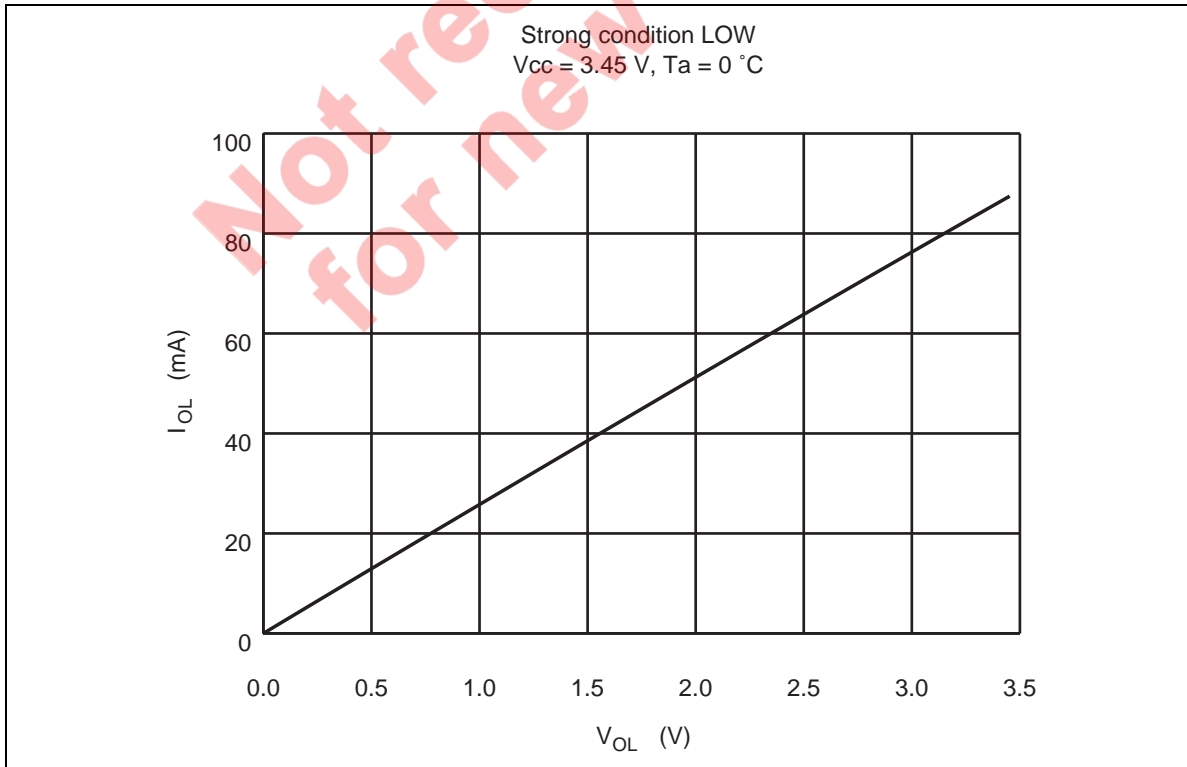
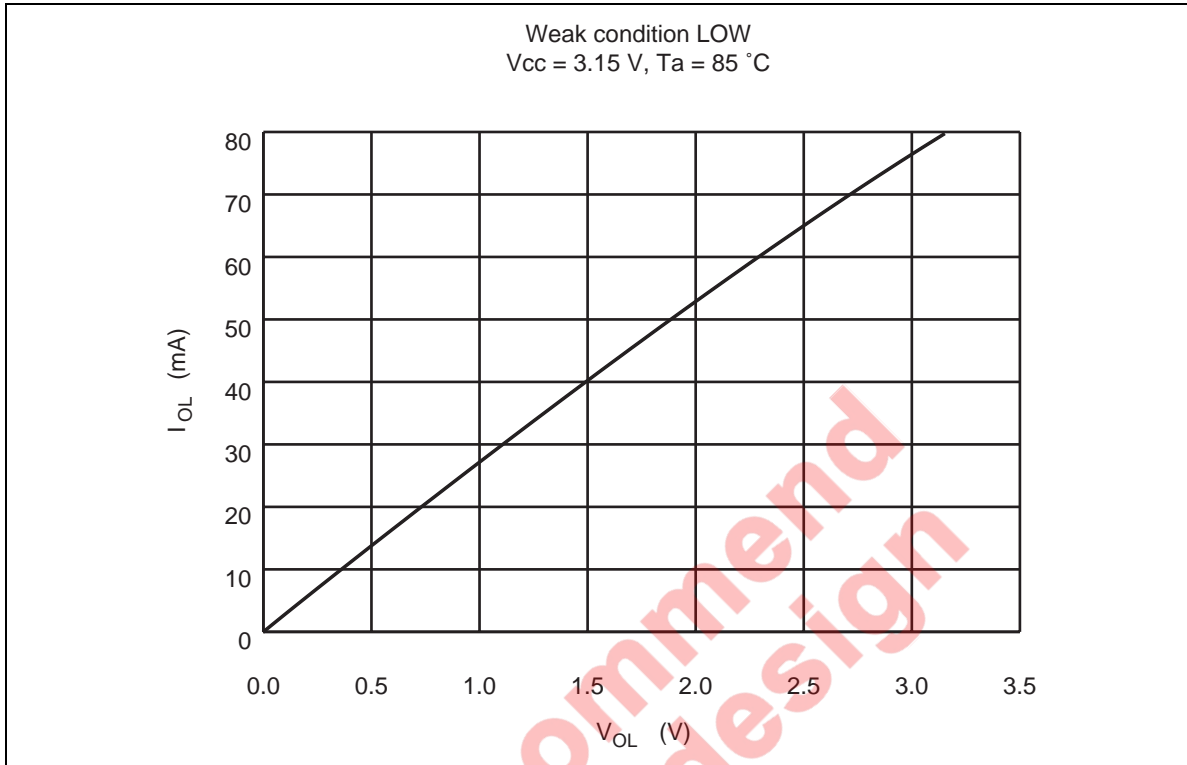


Wave forms – 3

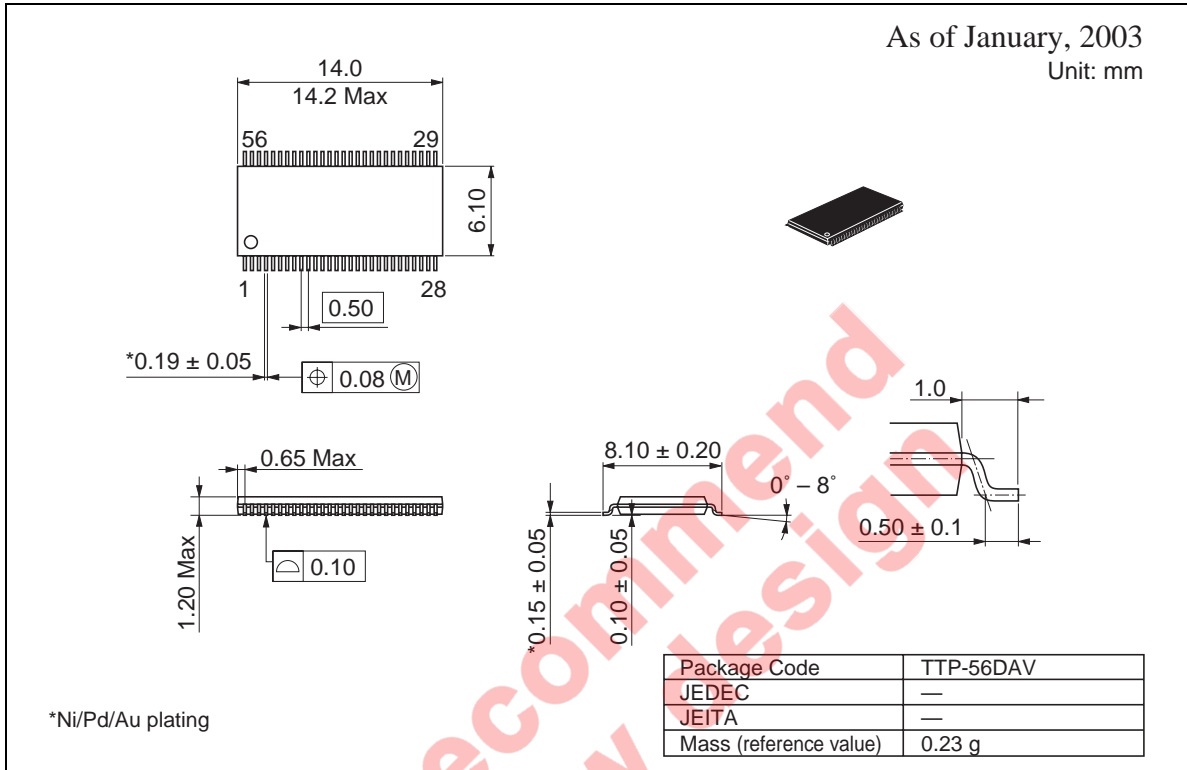


IV Characteristics for Register Output (Measured value)





Package Dimensions



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