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April 1st, 2010
Renesas Electronics Corporation

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RD74LVC16245B

16-bit Bus Transceivers with 3-state Outputs

REJ03D0529-0100

Rev.1.00

Apr. 18, 2005

Description

The RD74LVC16245B has sixteen two direction buffers, for the fittest at two direction bus lines with three state outputs. A direction control input, DIR. When DIR is high, data flows from the A inputs to the B outputs. When DIR is low, data flows from the B inputs to the A outputs. When enable inputs (\overline{G}) is high, disables both A and B ports by placing them in a high impedance. 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

- $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$
- All inputs $V_{IH} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V to } 5.5 \text{ V})$
- All outputs $V_{OUT} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V or output off state})$
- 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
 - $\pm 4 \text{ mA} (@V_{CC} = 1.65 \text{ V})$
 - $\pm 8 \text{ mA} (@V_{CC} = 2.3 \text{ V})$
 - $\pm 12 \text{ mA} (@V_{CC} = 2.7 \text{ V})$
 - $\pm 24 \text{ mA} (@V_{CC} = 3.0 \text{ V to } 5.5 \text{ V})$
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
RD74LVC16245BTEL	TSSOP-48 pin	PTSP0048KA-A (TTP-48DBV)	T	EL (1,000 pcs/reel)

Function Table

Inputs		Operation
\overline{G}	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Z

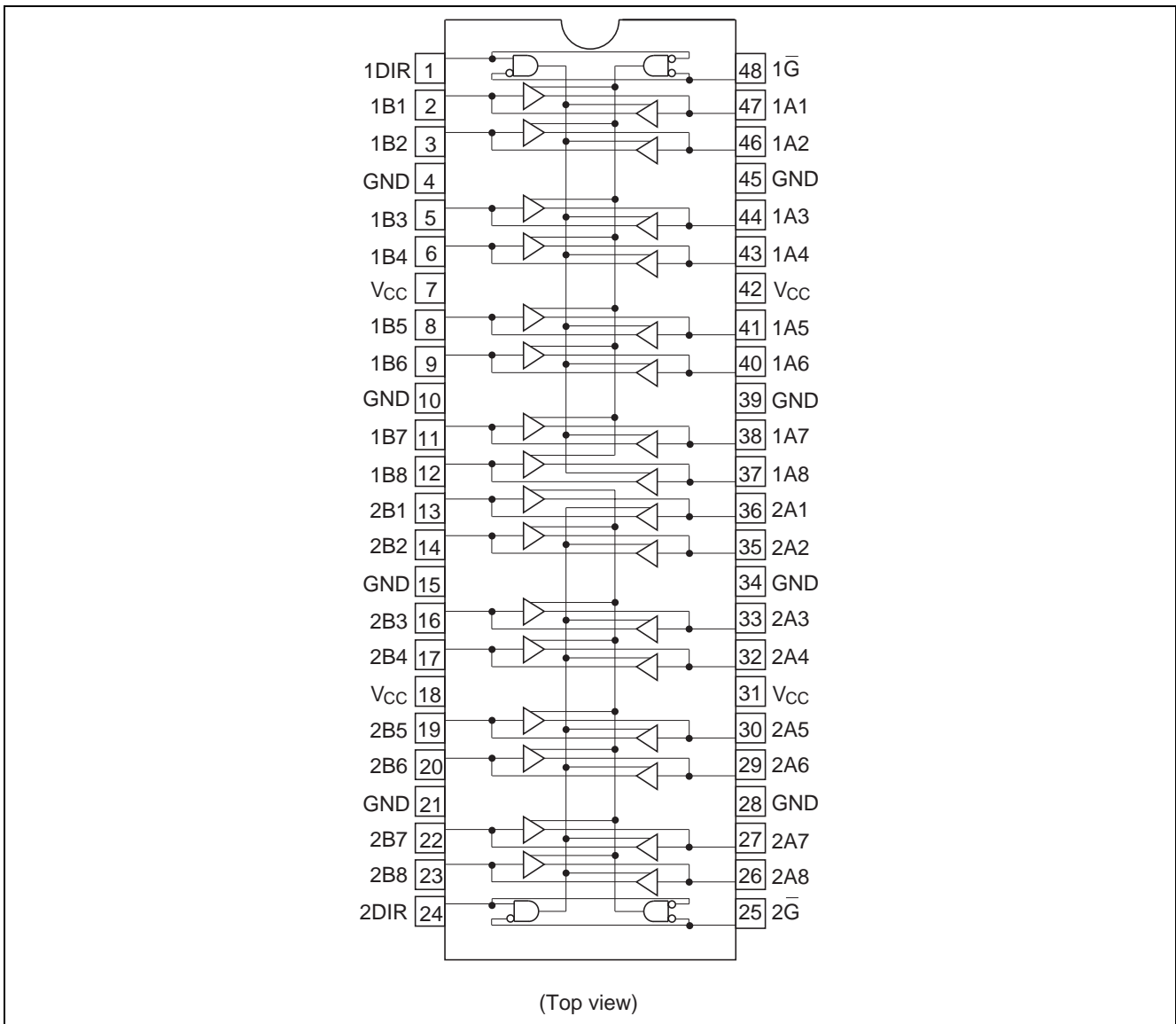
H: High level

L: Low level

X: Immaterial

Z: High impedance

Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	-0.5 to 7.0	V	
Input diode current	I_{IK}	-50	mA	$V_I = -0.5$ V
Input voltage	V_I	-0.5 to 7.0	V	
Output diode current	I_{OK}	-50	mA	$V_O = -0.5$ V
		50		$V_O = V_{CC} + 0.5$ V
Input / output voltage	$V_{I/O}$	-0.5 to $V_{CC} + 0.5$	V	Output "H" or "L"
		-0.5 to 7.0		Output "Z" or V_{CC} :OFF
Output current	I_O	± 50	mA	
V_{CC} , GND current / pin	I_{CC} or I_{GND}	100	mA	
Storage temperature	T_{stg}	-65 to 150	$^{\circ}$ 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 hold
		1.65 to 5.5		At operation
Input / output voltage	V_I	0 to 5.5	V	
	V_O	0 to V_{CC}		Output "H" or "L"
		0 to 5.5		Output "Z" or V_{CC} : OFF
Operating temperature	T_a	-40 to 85	°C	
Output current	I_{OH}	-4	mA	$V_{CC} = 1.65\text{ V}$
		-8		$V_{CC} = 2.3\text{ V}$
		-12		$V_{CC} = 2.7\text{ V}$
		-24		$V_{CC} = 3.0\text{ V to }5.5\text{ V}$
	I_{OL}	4	mA	$V_{CC} = 1.65\text{ V}$
		8		$V_{CC} = 2.3\text{ V}$
		12		$V_{CC} = 2.7\text{ V}$
		24		$V_{CC} = 3.0\text{ V to }5.5\text{ V}$
Input rise / fall time ^{*1}	t_r, t_f	20	ns/V	$V_{CC} = 1.65\text{ V to }2.7\text{ V}$
		10		$V_{CC} = 3.0\text{ V to }5.5\text{ V}$

Notes: 1. This item guarantees maximum limit when one input switches.
Waveform: Refer to test circuit of switching characteristics.

Electrical Characteristics

Item	Symbol	V_{CC} (V)	$T_a = -40\text{ to }85^\circ\text{C}$		Unit	Test Conditions
			Min	Max		
Input voltage	V_{IH}	1.65 to 1.95	$V_{CC} \times 0.65$	—	V	
		2.3 to 2.7	1.7	—		
		2.7 to 3.6	2.0	—		
		4.5 to 5.5	$V_{CC} \times 0.7$	—		
	V_{IL}	1.65 to 1.95	—	$V_{CC} \times 0.35$	V	
		2.3 to 2.7	—	0.7		
		2.7 to 3.6	—	0.8		
		4.5 to 5.5	—	$V_{CC} \times 0.3$		
Output voltage	V_{OH}	1.65 to 5.5	$V_{CC} - 0.2$	—	V	$I_{OH} = -100\ \mu\text{A}$
		1.65	1.2	—		$I_{OH} = -4\ \text{mA}$
		2.3	1.7	—		$I_{OH} = -8\ \text{mA}$
		2.7	2.2	—		$I_{OH} = -12\ \text{mA}$
		3.0	2.4	—		
		3.0	2.2	—		$I_{OH} = -24\ \text{mA}$
		4.5	3.8	—		
	V_{OL}	1.65 to 5.5	—	0.2	V	$I_{OL} = 100\ \mu\text{A}$
		1.65	—	0.45		$I_{OL} = 4\ \text{mA}$
		2.3	—	0.7		$I_{OL} = 8\ \text{mA}$
		2.7	—	0.4		$I_{OL} = 12\ \text{mA}$
		3.0	—	0.55		$I_{OL} = 24\ \text{mA}$
		4.5	—	0.55		
Input current	I_{IN}	0 to 5.5	—	± 5.0	μA	$V_{IN} = 5.5\text{ V or GND}$
Output leak current	I_{OFF}	0	—	± 5.0	μA	$V_{IN} / V_{OUT} = 5.5\text{ V}$
Off state output current	I_{OZ}	2.7 to 5.5	—	± 5.0	μA	$V_{IN} = V_{CC}, \text{GND},$ $V_{OUT} = 5.5\text{ V or GND}$
Quiescent supply current	I_{CC}	2.7 to 3.6	—	± 10	μA	$V_{IN} = 3.6\text{ to }5.5\text{ V}$
		2.7 to 5.5	—	10		$V_{IN} = V_{CC}\text{ or GND}$
	ΔI_{CC}	2.7 to 3.6	—	500	μA	$V_{IN} = \text{one input at } (V_{CC} - 0.6)\text{V},$ other inputs at $V_{CC}\text{ or GND}$

Switching Characteristics

Item	Symbol	V _{CC} (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t _{PLH}	1.8±0.15	1.0	—	12.7	ns	A or B	B or A
	t _{PHL}	2.5±0.2	1.0	—	8.3			
		2.7	1.0	—	5.8			
		3.3±0.3	1.5	—	5.2			
		5.0±0.5	1.0	—	4.5			
Output enable time	t _{ZH}	1.8±0.15	1.0	—	15.3	ns	\bar{G}	A or B
	t _{ZL}	2.5±0.2	1.0	—	10.5			
		2.7	1.0	—	8.0			
		3.3±0.3	1.5	—	7.2			
		5.0±0.5	1.0	—	6.0			
Output disable time	t _{HZ}	1.8±0.15	1.0	—	17.0	ns	\bar{G}	A or B
	t _{LZ}	2.5±0.2	1.0	—	9.5			
		2.7	1.0	—	8.0			
		3.3±0.3	1.5	—	7.2			
		5.0±0.5	1.0	—	6.0			
Between output pins skew *1	t _{OSLH}	1.8±0.15	—	—	—	ns		
	t _{OSHL}	2.5±0.2	—	—	—			
		2.7	—	—	—			
		3.3±0.3	—	—	1.0			
		5.0±0.5	—	—	1.0			
Input capacitance	C _{IN}	3.3	—	4.0	—	pF		
Output capacitance	C _O	3.3	—	8.0	—	pF		

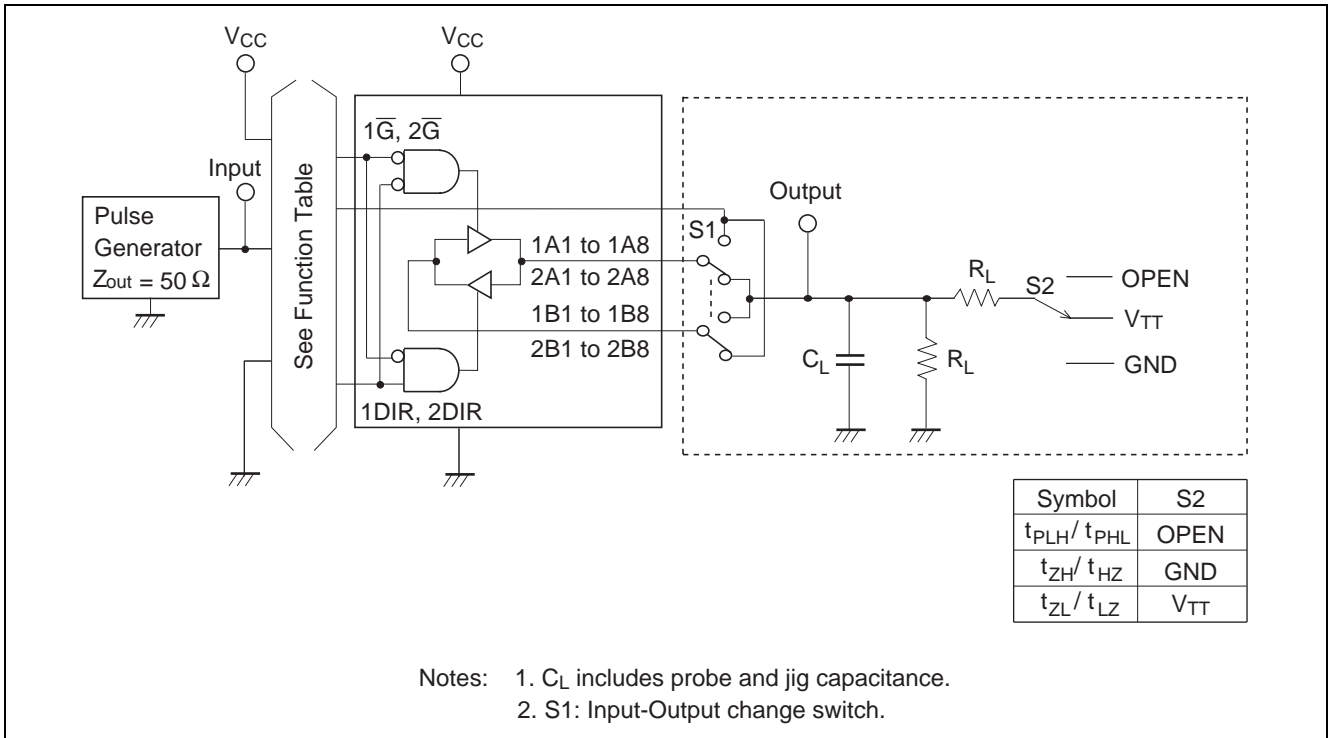
Note: 1. This parameter is characterized but not tested.

$$t_{OSLH} = |t_{PLHm} - t_{PLHn}|, t_{OSHL} = |t_{PHLm} - t_{PHLn}|$$

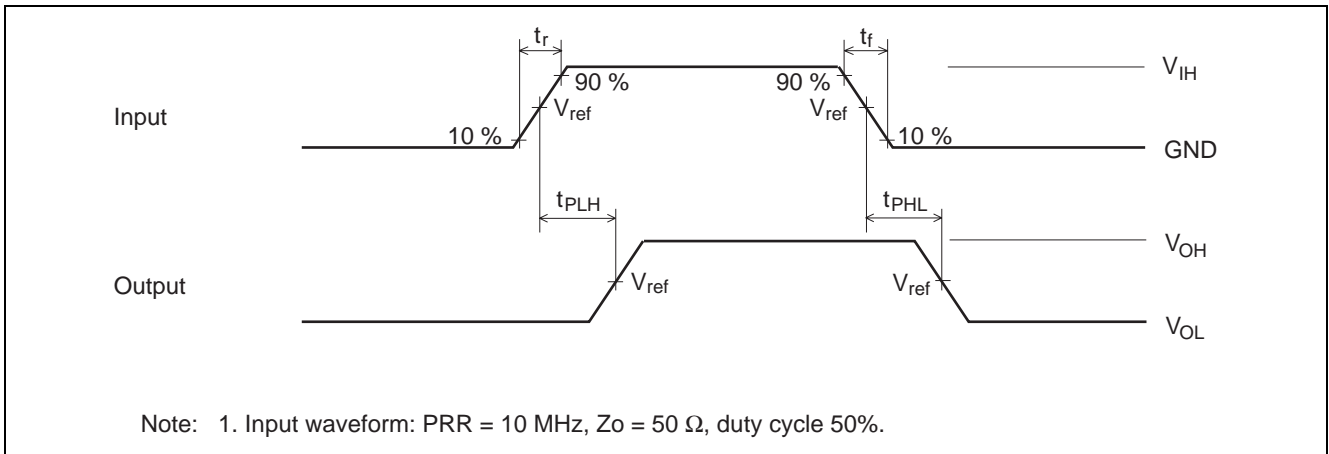
Operating Characteristics

Item	Symbol	V _{CC} (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C _{PD}	1.8	—	42	—	pF	f = 10 MHz
		2.5	—	43	—		
		3.3	—	45	—		
		5.0	—	47	—		

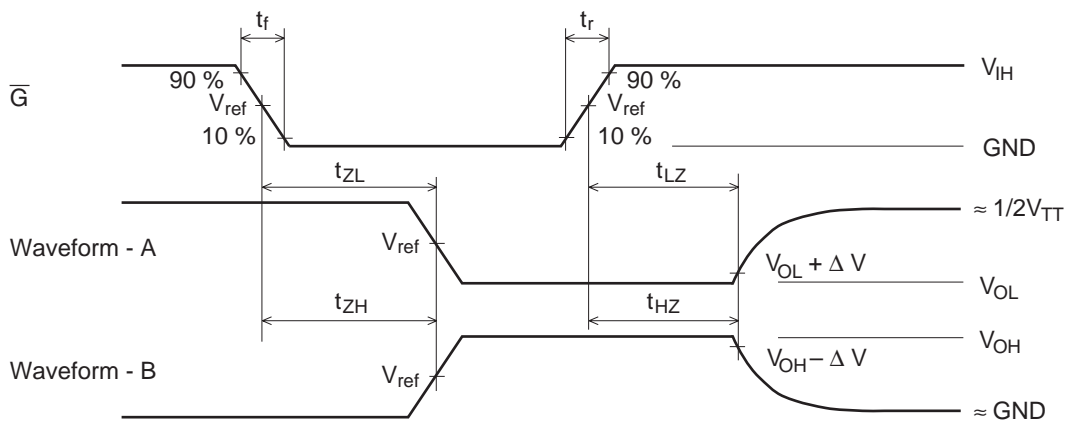
Test Circuit



Waveforms – 1



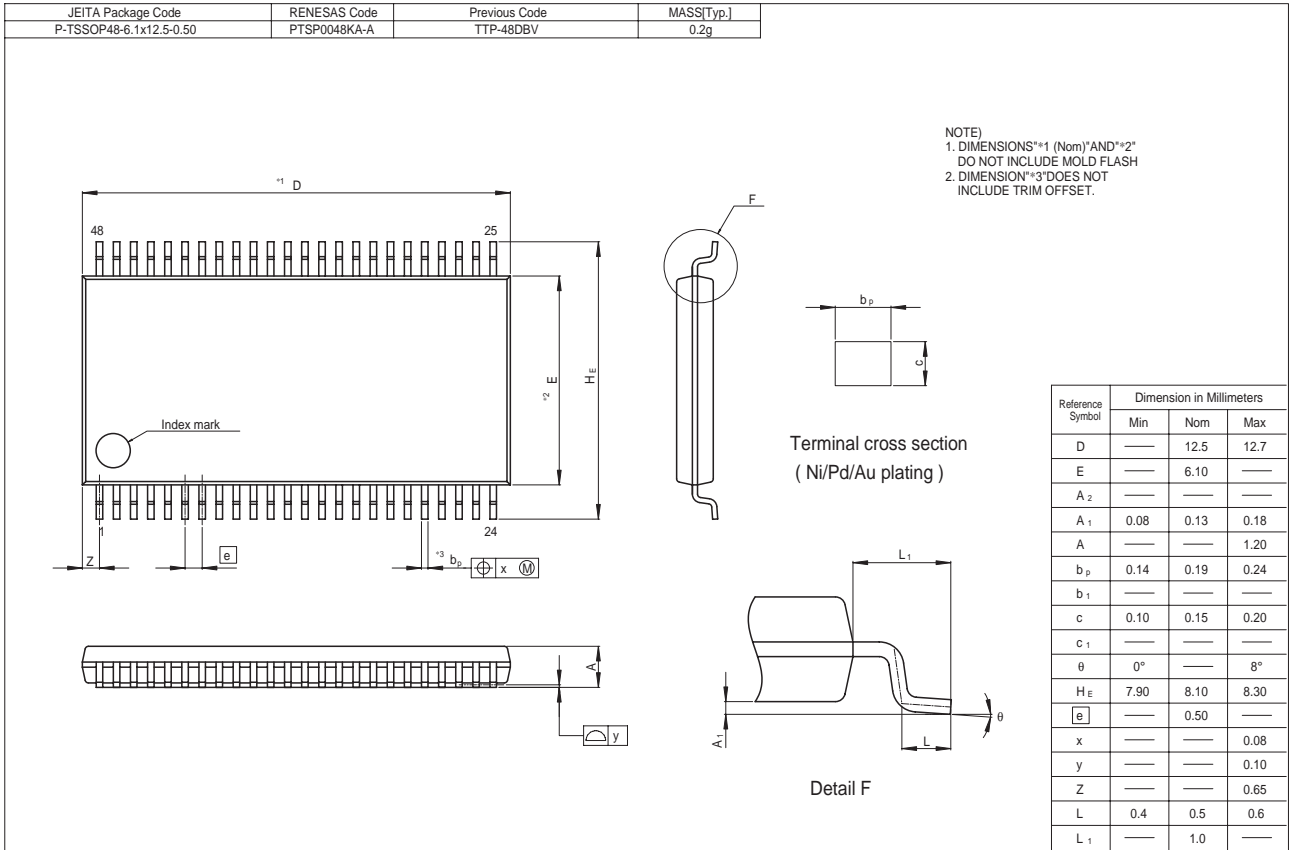
Waveforms – 2



Vcc (V)	INPUTS		Vref	VTT	CL	RL	ΔV
	Vi	tr/tf					
Vcc = 1.8±0.15 V	Vcc	≤ 2 ns	1/2 Vcc	2× Vcc	30 pF	1.0 kΩ	0.15 V
Vcc = 2.5±0.2 V	Vcc	≤ 2 ns	1/2 Vcc	2× Vcc	30 pF	500 Ω	0.15 V
Vcc = 2.7 V	2.7 V	≤ 2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
Vcc = 3.3±0.3 V	2.7 V	≤ 2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
Vcc = 5.0±0.5 V	Vcc	≤ 2.5 ns	1/2 Vcc	2× Vcc	50 pF	500 Ω	0.3 V

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

Package Dimensions



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