RENESAS

RD74LVC16240B

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

Description

The RD74LVC16240B has sixteen inverter drivers with three state outputs in a 48 pin package. This device is a inverting buffer and has two active low enables ($1\overline{G}$ to $4\overline{G}$). Each enable independently controls four buffers. 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 V to 5.5 V

- All inputs V_{IH} (Max.) = 5.5 V (@V_{CC} = 0 V to 5.5 V)

- All outputs V_{OUT} (Max.) = 5.5 V (@V_{CC} = 0 V or output off state)

- Typical V_{OL} ground bounce < 0.8 V (@V_{CC} = 3.3 V, Ta = 25°C)

- Typical V_{OH} undershoot > 2.0 V (@V_{CC} = 3.3 V, Ta = 25°C)

- High output current   ±4 mA (@V_{CC} = 1.65 V)

    ±8 mA (@V_{CC} = 2.3 V)

    ±12 mA (@V_{CC} = 2.7 V)

    ±24 mA (@V_{CC} = 3.0 V to 5.5 V)

- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
RD74LVC16240BTEL	TSSOP–48 pin	PTSP0048KA–A (TTP–48DBV)	T	EL (1,000 pcs/reel)

Function Table

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

H: High level

L: Low level

X: Immaterial

Z: High impedance

Pin Arrangement

(Top view)
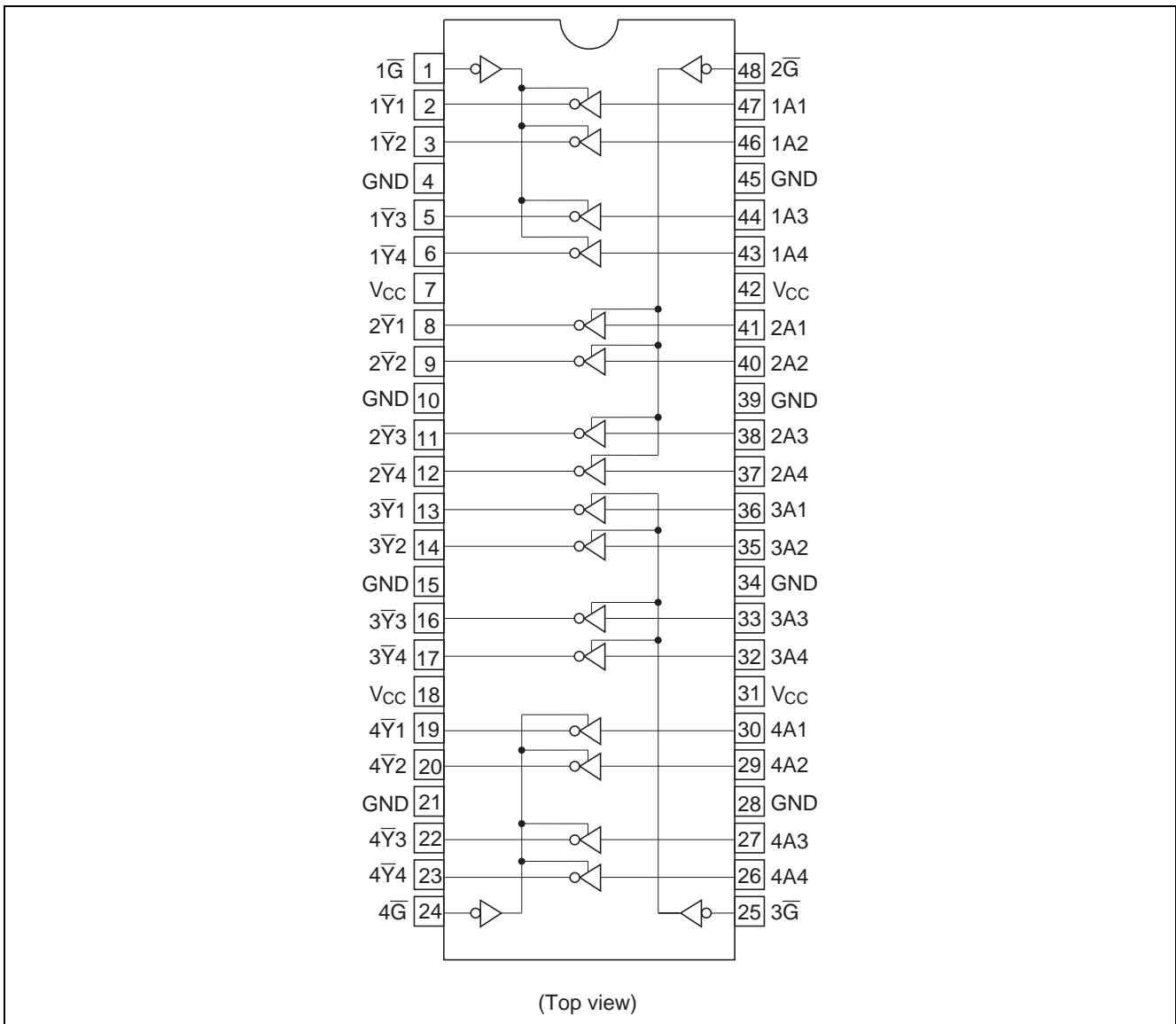
Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	−0.5 to 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
Output voltage	V_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	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.

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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	$\overline{G}$, A
	V_O	0 to V_{CC}		Output "H" or "L"
		0 to 5.5		Output "Z" or V_{CC}: OFF
Operating temperature	Ta	–40 to 85	°C	
Output current	I_{OH}	–4	mA	V_{CC} = 1.65 V
		–8		V_{CC} = 2.3 V
		–12		V_{CC} = 2.7 V
		–24		V_{CC} = 3.0 V to 5.5 V
	I_{OL}	4	mA	V_{CC} = 1.65 V
		8		V_{CC} = 2.3 V
		12		V_{CC} = 2.7 V
		24		V_{CC} = 3.0 V to 5.5 V
Input rise / fall time[1]	t_r, t_f	20	ns/V	V_{CC} = 1.65 V to 2.7 V
		10		V_{CC} = 3.0 V to 5.5 V

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

Waveform: Refer to test circuit of switching characteristics.

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Electrical Characteristics

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

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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	—	10.9	ns	A	$\overline{Y}$
	t$_{PHL}$	2.5±0.2	1.0	—	7.9			
		2.7	1.0	—	6.2			
		3.3±0.3	1.5	—	5.5			
		5.0±0.5	1.0	—	4.5			
Output enable time	t$_{ZH}$	1.8±0.15	1.0	—	12.6	ns	$\overline{G}$	$\overline{Y}$
	t$_{ZL}$	2.5±0.2	1.0	—	9.6			
		2.7	1.0	—	7.7			
		3.3±0.3	1.5	—	7.0			
		5.0±0.5	1.0	—	6.0			
Output disable time	t$_{HZ}$	1.8±0.15	1.0	—	12.1	ns	$\overline{G}$	$\overline{Y}$
	t$_{LZ}$	2.5±0.2	1.0	—	7.8			
		2.7	1.0	—	7.7			
		3.3±0.3	1.5	—	7.0			
		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	—	25.0	—	pF	f = 10 MHz
		2.5	—	25.0	—		
		3.3	—	27.0	—		
		5.0	—	32.0	—		

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Test Circuit

Note: 1. C_L includes probe and jig capacitance.

Symbol	S1
t_{PLH}/t_{PHL}	OPEN
t_{ZH}/t_{HZ}	GND
t_{ZL}/t_{LZ}	V_{TT}

Waveforms – 1

Notes: 1. Input waveform : PRR = 10 MHz, Z_O = 50 Ω, duty cycle 50%
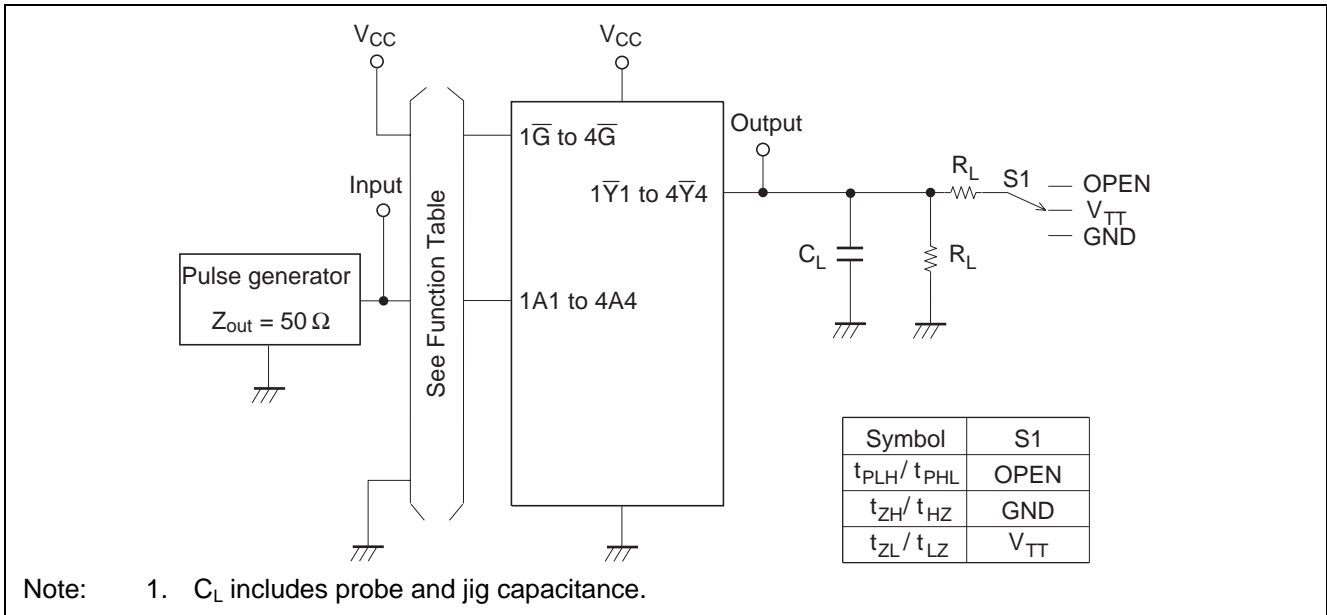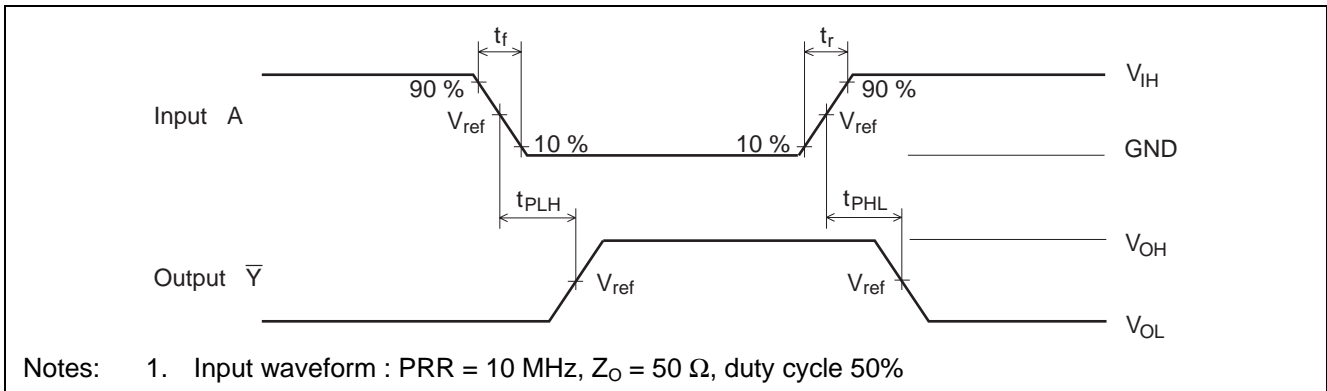
Waveforms – 2
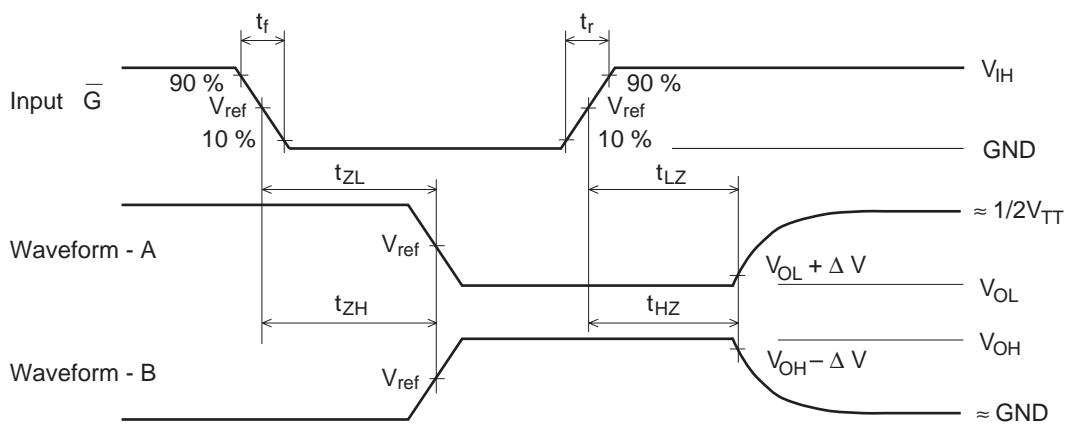
VCC (V)	INPUTS		Vref	VTT	CL	RL	ΔV
	VI	tr/tf					
VCC = 1.8±0.15 V	VCC	≤ 2 ns	1/2 VCC	2× VCC	30 pF	1.0 kΩ	0.15 V
VCC = 2.5±0.2 V	VCC	≤ 2 ns	1/2 VCC	2× VCC	30 pF	500 Ω	0.15 V
VCC = 2.7 V	2.7 V	≤ 2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
VCC = 3.3±0.3 V	2.7 V	≤ 2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
VCC = 5.0±0.5 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 Ω, 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

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-TSSOP48-6.1x12.5-0.50	PTSP0048KA-A	TTP-48DBV	0.2g

NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2"
   DO NOT INCLUDE MOLD FLASH
2. DIMENSION"*3"DOES NOT
   INCLUDE TRIM OFFSET.

Terminal cross section
(Ni/Pd/Au plating)

Detail F

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	——	12.5	12.7
E	——	6.10	——
A_2	——	——	——
A_1	0.08	0.13	0.18
A	——	——	1.20
b_p	0.14	0.19	0.24
b_1	——	——	——
c	0.10	0.15	0.20
c_1	——	——	——
θ	0°	——	8°
H_E	7.90	8.10	8.30
e	——	0.50	——
x	——	——	0.08
y	——	——	0.10
Z	——	——	0.65
L	0.4	0.5	0.6
L_1	——	1.0	——

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RENESAS SALES OFFICES   http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

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