RD74LVC16240B

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

REJ03D0526-0100
Rev.1.00
Mar. 14, 2005

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

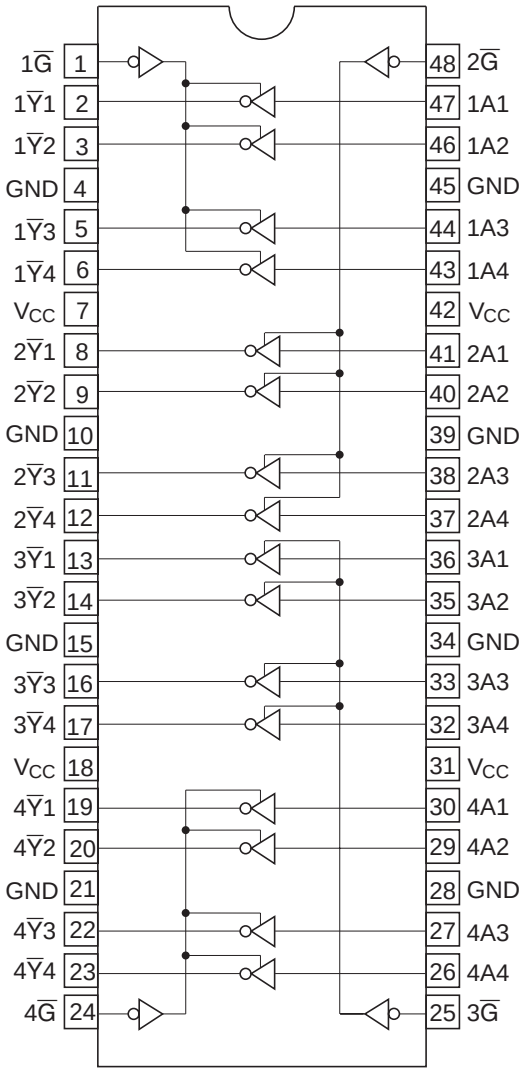
Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
RD74LVC16240BTEL	TSSOP–48 pin	PTSP0048KA–A (TTP–48DBV)	T	EL (1,000 pcs/reel)

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.

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.

Electrical Characteristics

Item	Symbol	V_{CC} (V)	Ta = –40 to 85°C		Unit	Test Conditions
			Min	Max		
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

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		

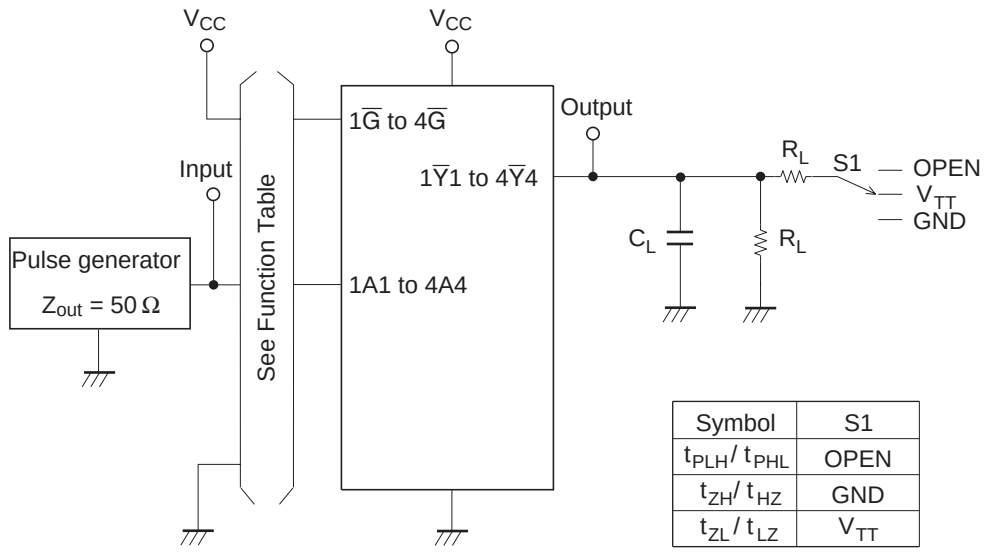
Note: 1. This parameter is characterized but not tested.

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

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	—		

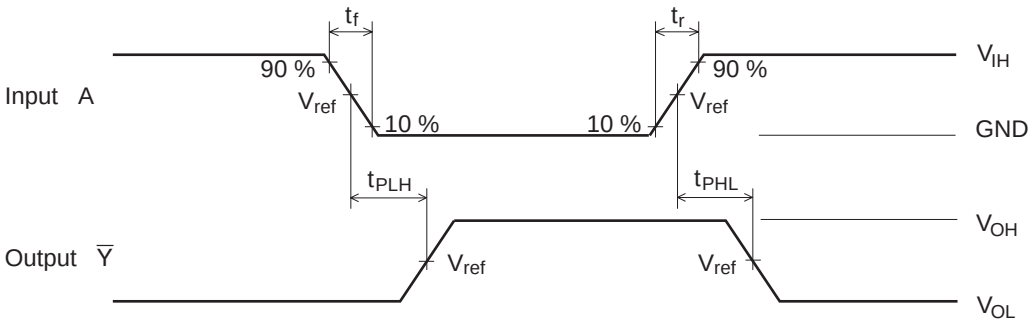
Test Circuit



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

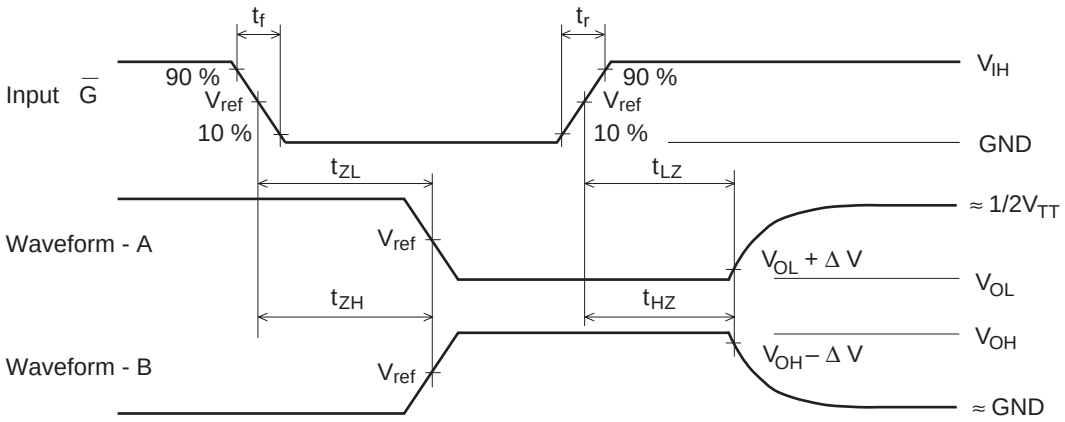
Note: 1. C_L includes probe and jig capacitance.

Waveforms – 1



Notes: 1. Input waveform : PRR = 10 MHz, Z_O = 50 Ω, duty cycle 50%

Waveforms – 2



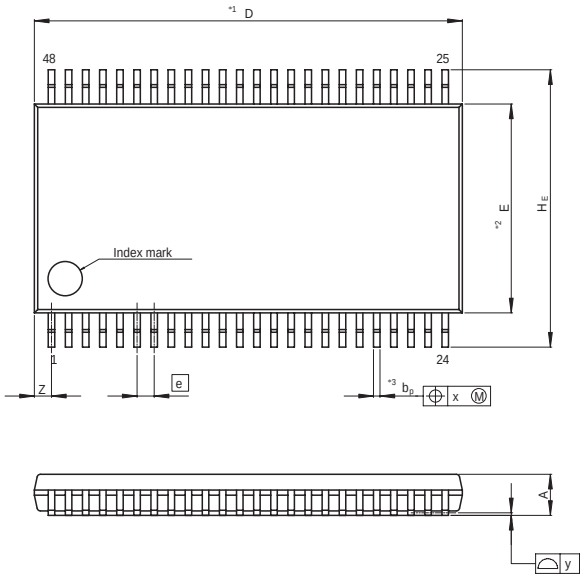
	INPUTS						
Vcc (V)	VI	tr/tf	Vref	VTT	CL	RL	ΔV
Vcc = 1.8±0.15 V	Vcc	≤ 2 ns	1/2 Vcc	2× Vcc	30 pF	1.0 kΩ	0.15 V
Vcc = 2.5±0.2 V	Vcc	≤ 2 ns	1/2 Vcc	2× Vcc	30 pF	500 Ω	0.15 V
Vcc = 2.7 V	2.7 V	≤ 2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
Vcc = 3.3±0.3 V	2.7 V	≤ 2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
Vcc = 5.0±0.5 V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

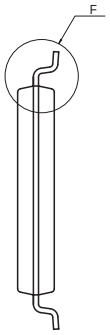
Notes:
1. Input waveform : PRR = 10 MHz, Z_O = 50 Ω, duty cycle 50%
2. Waveform – A shows input conditions such that the output is "L" level when enable by the output control.
3. Waveform – B shows input conditions such that the output is "H" level when enable by the output control.

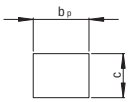
Package Dimensions

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

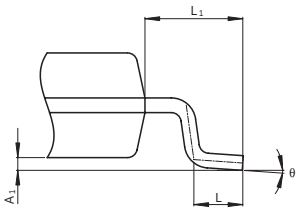
NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2"
   DO NOT INCLUDE MOLD FLASH
2. DIMENSION"*3"DOES NOT
   INCLUDE TRIM OFFSET.







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 Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology (Shanghai) Co., Ltd.
Unit2607 Ruijing Building, No.205 Maoming Road (S), Shanghai 200020, China
Tel: <86> (21) 6472-1001, Fax: <86> (21) 6415-2952

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

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