

RD74LVC541B

Octal Buffers / Line Drivers with 3-state Outputs

REJ03D0114-0200

Rev.2.00

Mar. 03, 2005

Description

The RD74LVC541B has eight line drivers with three state outputs in a 20 pin package. When $\overline{G1}$ and $\overline{G2}$ 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

- $V_{CC} = 1.65 \text{ V}$ to 5.5 V
- All inputs $V_{IH} (\text{Max.}) = 5.5 \text{ V}$ ($@V_{CC} = 0 \text{ V}$ to 5.5 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 V)
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
RD74LVC541BFPEL	SOP-20 pin (JEITA)	PRSP0020DD-B (FP-20DAV)	FP	EL (2,000 pcs / Reel)
RD74LVC541BTELL	TSSOP-20 pin	PTSP0020JB-A (TTP-20DAV)	T	ELL (2,000 pcs / Reel)

Function Table

Inputs			Output Y
$\overline{G1}$	$\overline{G2}$	A	
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

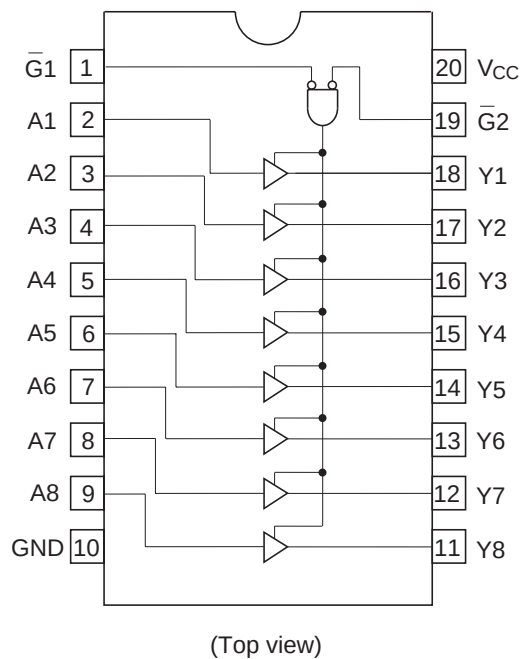
H : High level

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
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	T_{stg}	-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	$\bar{G}1, \bar{G}2, A$
	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)	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		
		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		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 _{OUT} = 5.5 V or GND
Quiescent supply current	I _{CC}	2.7 to 3.6	—	±5.0	µA	V _{IN} = 3.6 to 5.5 V
		2.7 to 5.5	—	5.0	µA	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} t _{PHL}	1.8±0.15	1.0	—	15.7	ns	A	Y
		2.5±0.2	1.0	—	7.8			
		2.7	1.0	—	5.6			
		3.3±0.3	1.5	—	5.1			
		5.0±0.5	1.0	—	4.1			
Output enable time	t _{ZH} t _{ZL}	1.8±0.15	1.0	—	17.5	ns	G1 or G2	Y
		2.5±0.2	1.0	—	10.5			
		2.7	1.0	—	7.5			
		3.3±0.3	1.5	—	7.0			
		5.0±0.5	1.0	—	6.0			
Output disable time	t _{HZ} t _{LZ}	1.8±0.15	1.0	—	16.5	ns	G1 or G2	Y
		2.5±0.2	1.0	—	9.0			
		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} t _{OSHL}	1.8±0.15	—	—	—	ns		
		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		

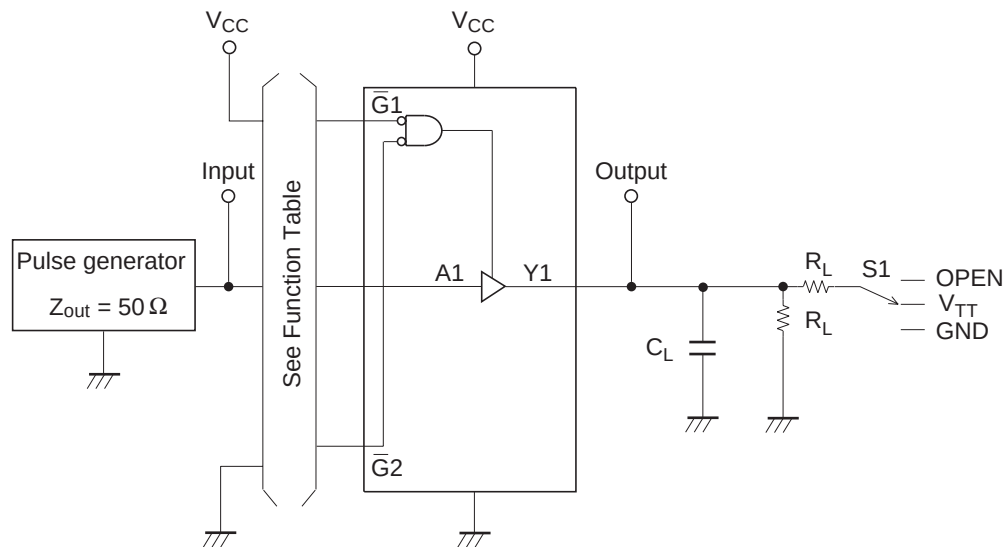
Note: 1. This parameter is characterized but not tested.

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

Operating Characteristics

Item	Symbol	V _{CC} (V)	Ta = 25°C			Unit	Test conditions
			Min	Typ	Max		
Power dissipation C _{PD} Capacitance	C _{PD}	1.8	—	22	—	pF	f = 10 MHz
		2.5	—	25	—		
		3.3	—	25	—		
		5.0	—	30	—		

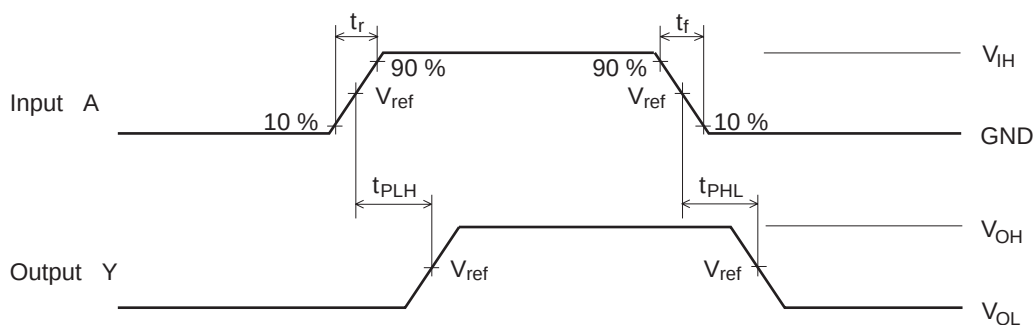
Test Circuit



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

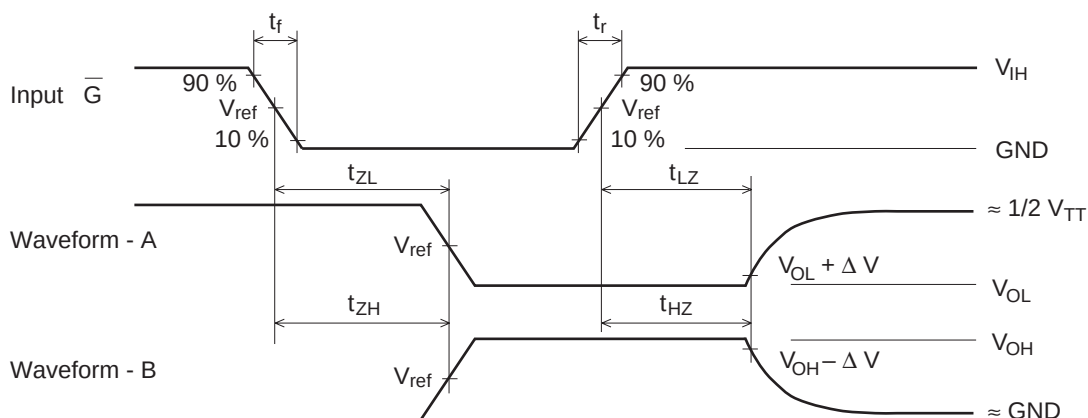
- Notes:
1. C_L includes probe and jig capacitance.
 2. A2-Y2 to A8-Y8 are identical to above load circuit.

Waveforms – 1



Note: Input waveform : PRR = 10 MHz, duty cycle 50%

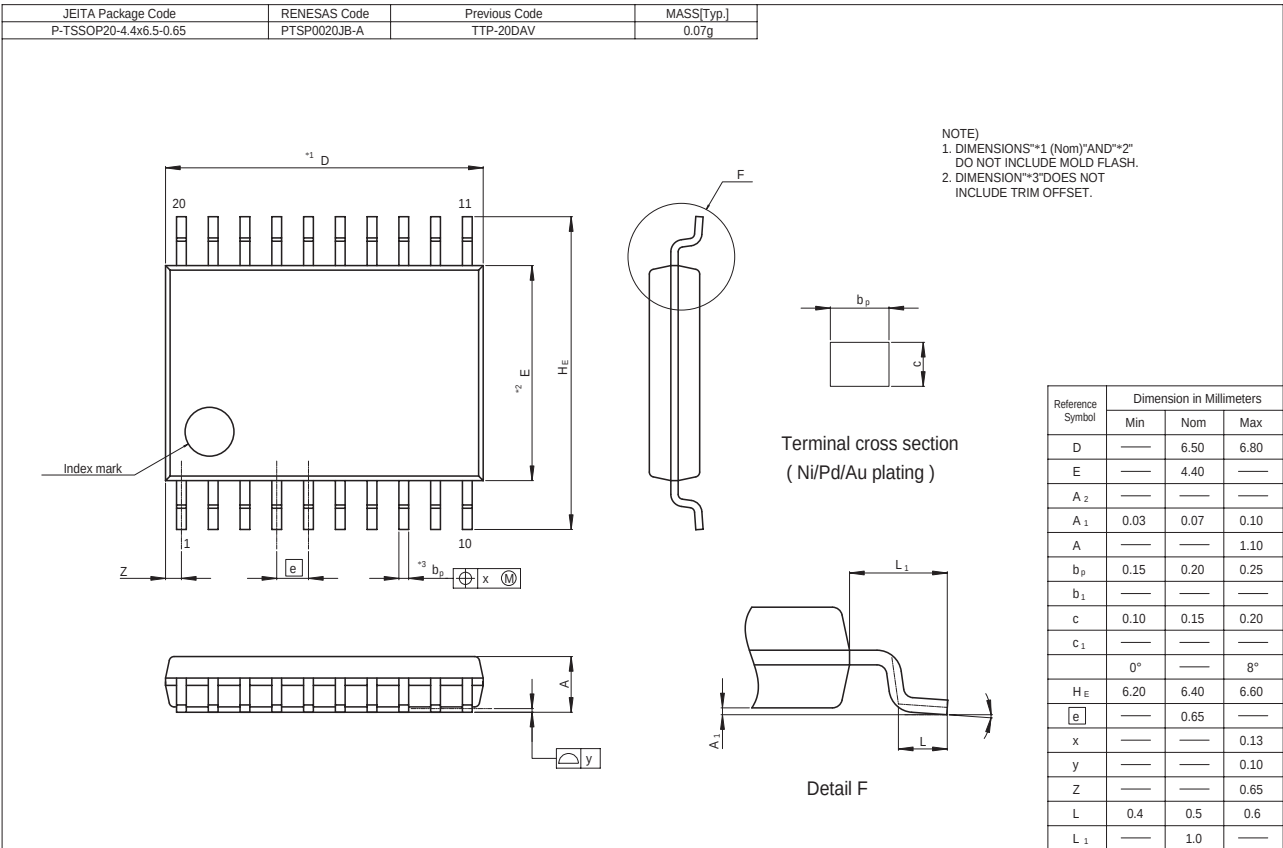
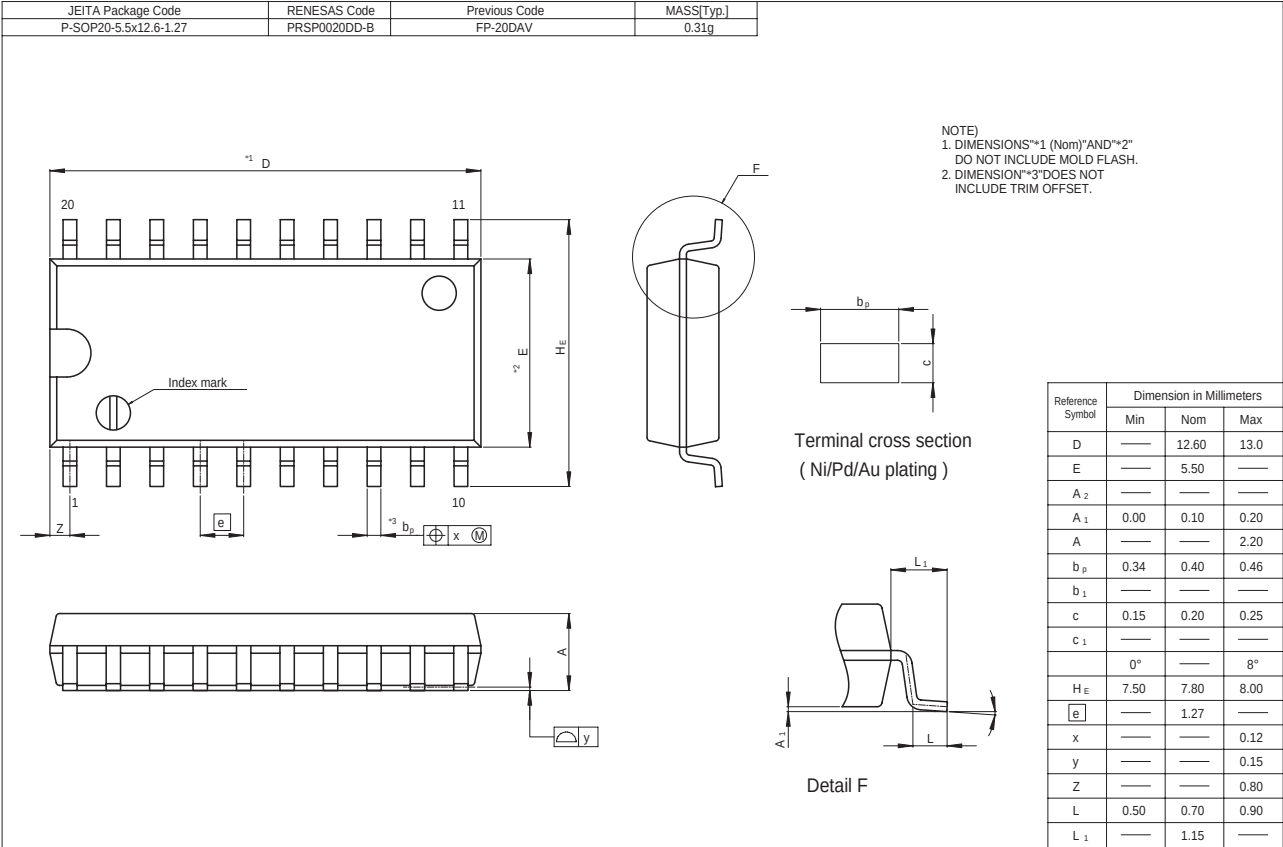
Waveforms – 2



V_{CC} (V)	INPUTS		V_{ref}	V_{TT}	C_L	R_L	ΔV
	V_I	t_r / t_f					
$V_{CC} = 1.8 \pm 0.15$ V	V_{CC}	≤ 2 ns	$1/2 V_{CC}$	$2 \times V_{CC}$	30 pF	1.0 k Ω	0.15 V
$V_{CC} = 2.5 \pm 0.2$ V	V_{CC}	≤ 2 ns	$1/2 V_{CC}$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
$V_{CC} = 2.7$ V	2.7 V	≤ 2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
$V_{CC} = 3.3 \pm 0.3$ V	2.7 V	≤ 2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
$V_{CC} = 5.0 \pm 0.5$ V	V_{CC}	≤ 2.5 ns	$1/2 V_{CC}$	$2 \times V_{CC}$	50 pF	500 Ω	0.3 V

- Notes:
1. Input waveform : PRR = 10 MHz, 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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Renesas Technology America, Inc.

450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology Hong Kong Ltd.

7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

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