RD74LVC74B

Dual D-type Flip Flops with Preset and Clear

REJ03D0324–0100Z
Rev.1.00
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Description

The RD74LVC74B has independent data, preset, clear, and clock inputs Q and $\overline{Q}$ outputs in a 14 pin package. The logic level present at the data input is transferred to the output during the positive going transition of the clock pulse. Preset and clear are independent of the clock and accomplished by a low level at the appropriate input. 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)
- 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

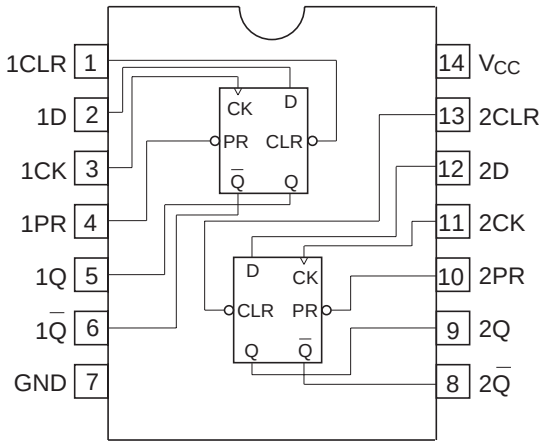
Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
RD74LVC74BFPEL	SOP–14 pin (JEITA)	FP–14DAV	FP	EL (2,000 pcs / reel)
RD74LVC74BTELL	TSSOP–14 pin	TTP–14DV	T	ELL (2,000 pcs / reel)

Function Table

Inputs				Outputs	
PR	CLR	CK	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H[*1]	H[*1]
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q_0	$\overline{Q}_0$
H	H	H	X	Q_0	$\overline{Q}_0$
H	H	↓	X	Q_0	$\overline{Q}_0$

H : High level
L : Low level
X : Immaterial
↓ : High to Low transition
↑ : Low to high transition
Q_0: Level to Q before the indicated steady input conditions were established.
Note: 1. Q and $\overline{Q}$ will remain high as long as preset and clear are low, but Q and $\overline{Q}$ are unpredictable, if preset and clear go high simultaneously.

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 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 retention
		1.65 to 5.5		At operation
Input / output voltage	V_I	0 to 5.5	V	PR, CLR, CK, D
	V_O	0 to V_{CC}		Q, $\overline{Q}$
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
Quiescent supply current	I_{CC}	2.7 to 3.6	—	±5.0	µA	V_{IN} = 3.6 V to 5.5 V
		2.7 to 5.5	—	5.0		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			
Maximum clock frequency	f_{max}	1.8±0.15	—	—	83	MHz		
		2.5±0.2	—	—	83			
		2.7	—	—	150			
		3.3±0.3	—	—	150			
		5.0±0.5	—	—	150			
Propagation delay time	t_{PLH} t_{PHL}	1.8±0.15	1.0	—	13.4	ns	CK	Q
		2.5±0.2	1.0	—	7.1			
		2.7	1.0	—	6.0			
		3.3±0.3	1.0	—	5.2			
		5.0±0.5	1.0	—	4.1			
	t_{PLH} t_{PHL}	1.8±0.15	1.0	—	14.4	ns	CK	$\overline{Q}$
		2.5±0.2	1.0	—	7.7			
		2.7	1.0	—	6.0			
		3.3±0.3	1.0	—	5.2			
		5.0±0.5	1.0	—	4.4			
	t_{PLH} t_{PHL}	1.8±0.15	1.0	—	12.9	ns	PR or CLR	Q, $\overline{Q}$
		2.5±0.2	1.0	—	7.0			
		2.7	1.0	—	6.0			
		3.3±0.3	1.0	—	5.4			
		5.0±0.5	1.0	—	4.1			
Setup time	t_{su}	1.8±0.15	3.6	—	—	ns	Data	
		2.5±0.2	2.3	—	—			
		2.7	3.4	—	—			
		3.3±0.3	3.0	—	—			
		5.0±0.5	3.0	—	—			
	t_{su}	1.8±0.15	2.7	—	—	ns	PR or CLR	
		2.5±0.2	1.9	—	—			
		2.7	2.2	—	—			
		3.3±0.3	2.0	—	—			
		5.0±0.5	2.0	—	—			
Hold time	t_h	1.8±0.15	1.0	—	—	ns		
		2.5±0.2	1.0	—	—			
		2.7	1.0	—	—			
		3.3±0.3	0.0	—	—			
		5.0±0.5	0.0	—	—			
Pulse width	t_w	1.8±0.15	4.1	—	—	ns	CK, PR, CLR	
		2.5±0.2	3.3	—	—			
		2.7	3.3	—	—			
		3.3±0.3	3.3	—	—			
		5.0±0.5	3.3	—	—			
Output skew between pins*[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		

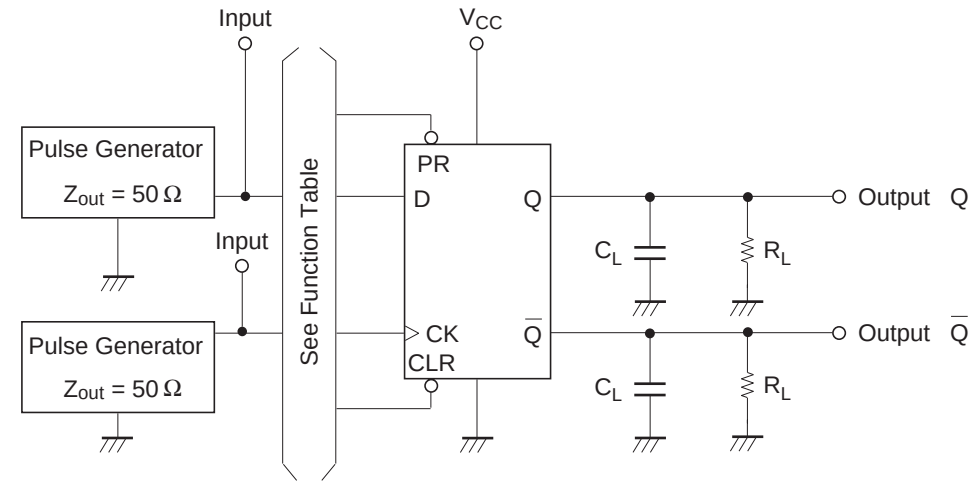
Note: 1. This parameter is characterized but not tested.

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

Operating Characteristics

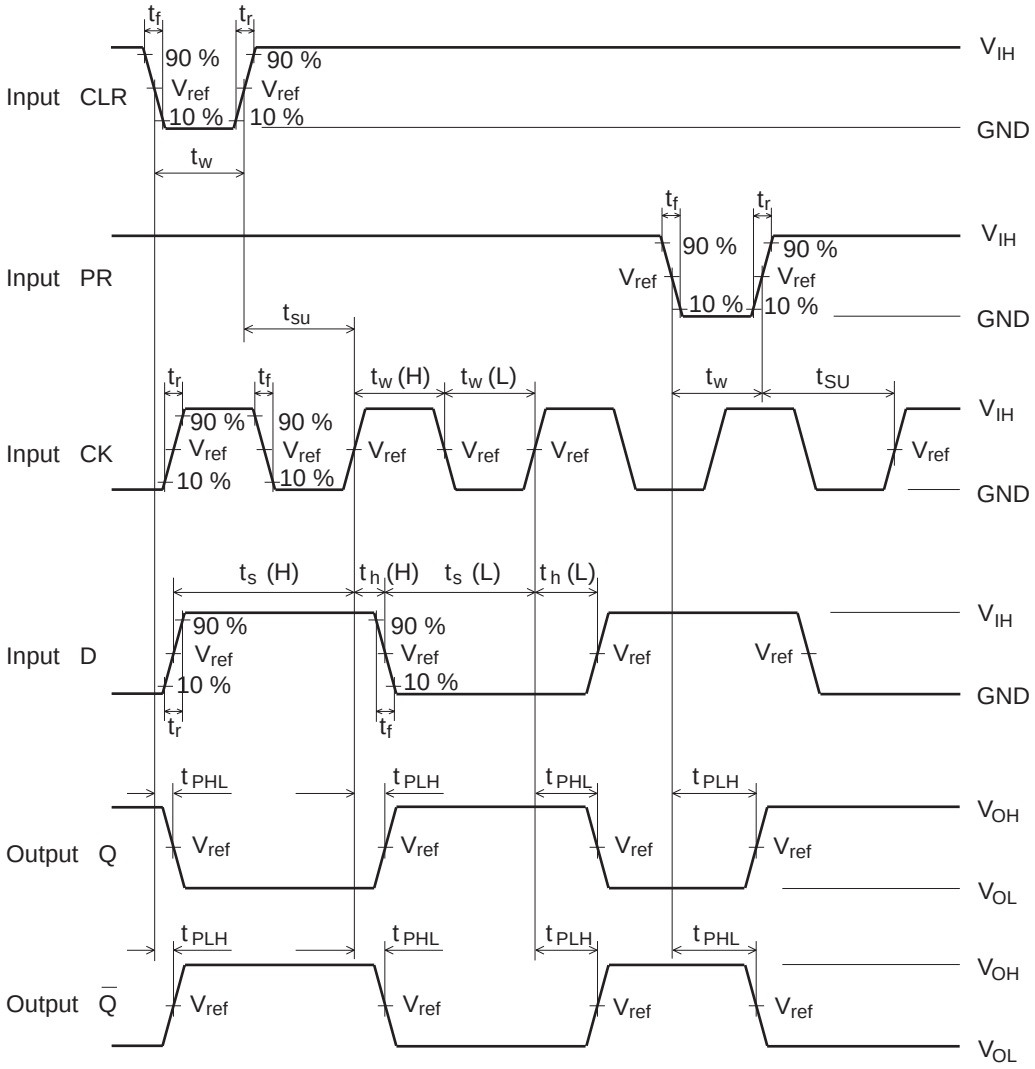
Item	Symbol	V_{CC} = (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C_{PD}	1.8	—	34	—	pF	f = 10 MHz
		2.5	—	34	—		
		3.3	—	36	—		
		5.0	—	40	—		

Test Circuit



Notes: 1. C_L includes probe and jig capacitance.
2. Test is put into the each flip flops.

Waveforms



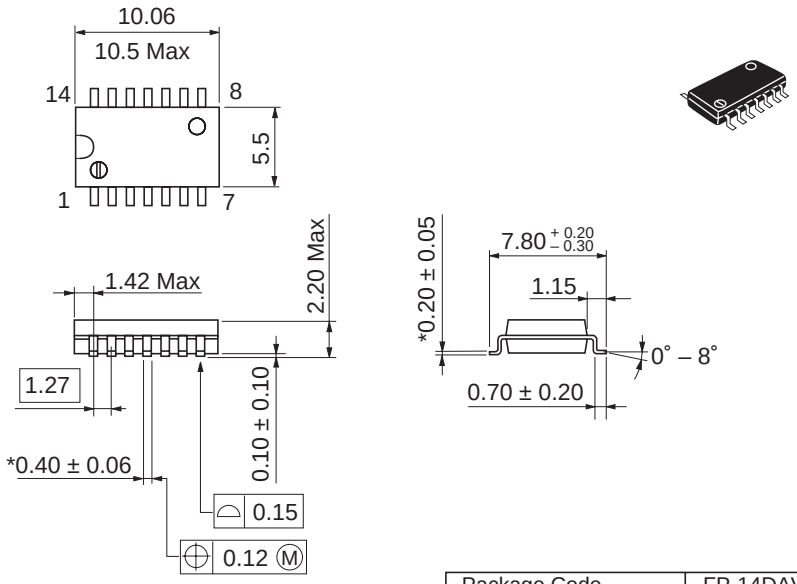
Vcc (V)	INPUTS		Vref	C_L	R_L
	V_{IH}	t_r / t_f			
Vcc = 1.8±0.15 V	Vcc	≤ 2 ns	1/2 Vcc	30 pF	1.0 kΩ
Vcc = 2.5±0.2 V	Vcc	≤ 2 ns	1/2 Vcc	30 pF	500 Ω
Vcc = 2.7 V	2.7 V	≤ 2.5 ns	1.5 V	50 pF	500 Ω
Vcc = 3.3±0.3 V	2.7 V	≤ 2.5 ns	1.5 V	50 pF	500 Ω
Vcc = 5.0±0.5 V	Vcc	≤ 2.5 ns	1/2 Vcc	50 pF	500 Ω

Notes: 1. Clock pulse Input waveform: PRR = 10 MHz, duty cycle 50%.
2. Data input waveform: PRR = 5 MHz, duty cycle 50%.

Package Dimensions

As of January, 2003

Unit: mm

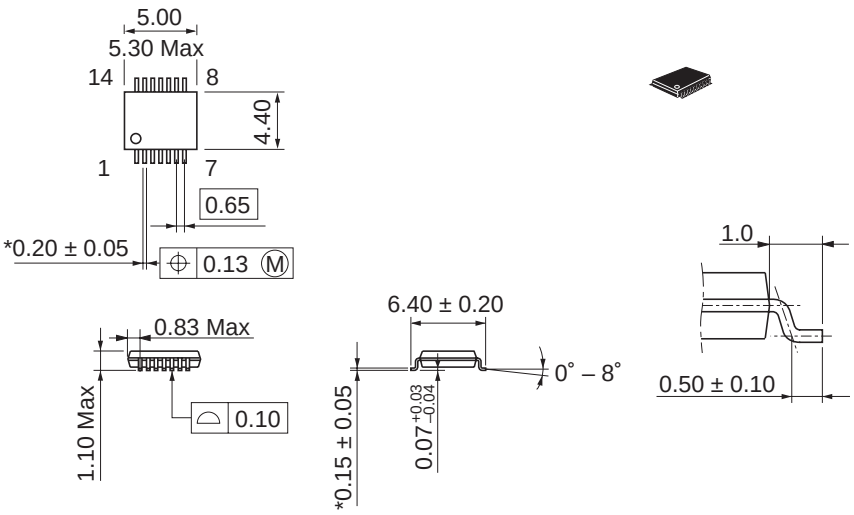


*Ni/Pd/Au plating

Package Code	FP-14DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.23 g

As of January, 2003

Unit: mm



*Ni/Pd/Au plating

Package Code	TTP-14DV
JEDEC	—
JEITA	—
Mass (reference value)	0.05 g

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