

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# RD74LVC138B

## 3-to-8-line Decoder / Demultiplexer

REJ03D0502-0200

Rev.2.00

Jan. 14, 2005

### Description

The RD74LVC138B has three binary select inputs in a 16 pin package. If the device is enabled these inputs determine which one of the eight normally high outputs will go low. Two active low and one active high enables are provided to ease the cascading of decoders. 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  $V_{IH} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V to } 5.5 \text{ V})$
- 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	Package Abbreviation	Taping Abbreviation (Quantity)
RD74LVC138BFPEL	SOP-16 pin (JEITA)	FP-16DAV	FP	EL (2,000 pcs/reel)
RD74LVC138BTELL	TSSOP-16 pin	TTP-16DAV	T	ELL (2,000 pcs/reel)

### Function Table

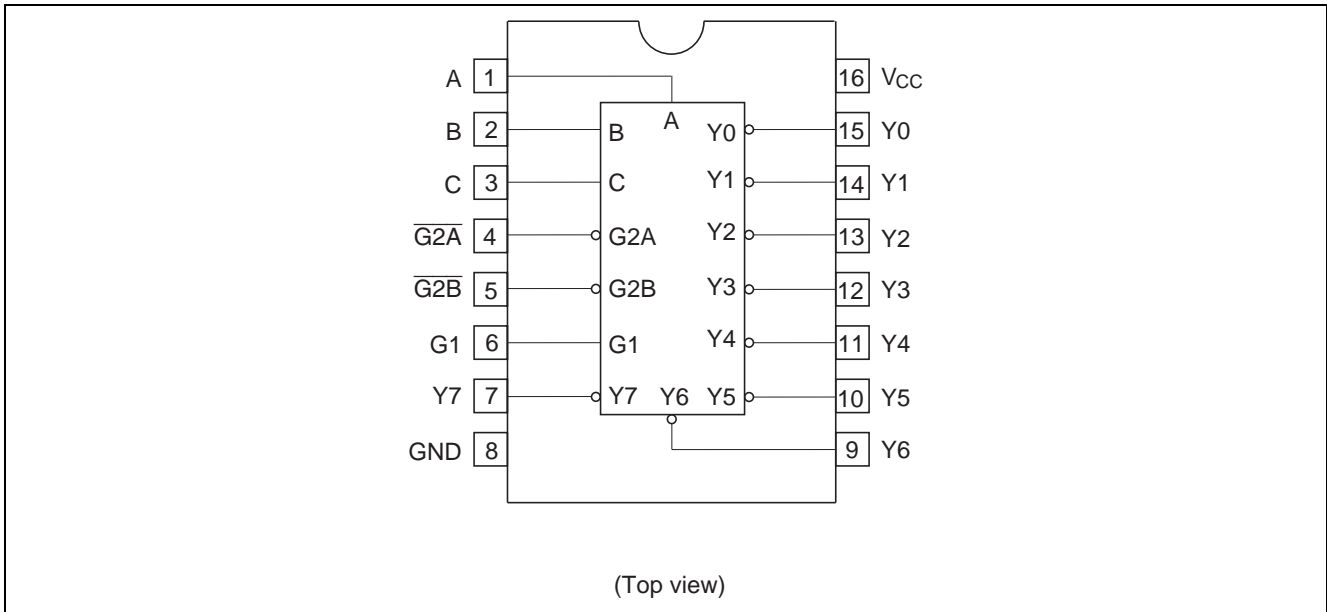
Inputs						Outputs							
Enable			Select										
G1	G2A	G2B	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	X	H	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	L	H	H	H	H	H	L	H	H	H	H
H	L	L	H	L	L	H	H	H	H	L	H	H	H
H	L	L	H	L	H	H	H	H	H	H	L	H	H
H	L	L	H	H	L	H	H	H	H	H	H	L	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L

H: High level

L: Low level

X: Immaterial

## 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	$V_I = -0.5\text{ V}$
Input voltage	$V_I$	-0.5 to 7.0	V	
Output diode current	$I_{OK}$	-50	mA	$V_O = -0.5\text{ V}$
		50		$V_O = V_{CC} + 0.5\text{ V}$
Output voltage	$V_O$	-0.5 to $V_{CC} + 0.5$	V	
Output current	$I_O$	$\pm 50$	mA	
$V_{CC}$ , GND current / pin	$I_{CC}$ or $I_{GND}$	100	mA	
Storage temperature	$T_{stg}$	-65 to +150	$^{\circ}\text{C}$	

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	A, B, C, G1, $\overline{G2A}$ , $\overline{G2B}$
	$V_O$	0 to $V_{CC}$	V	Y0 to Y7
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 <sup>*1</sup>	$t_r, t_f$	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 <sub>CC</sub> (V)	Ta = -40 to 85°C		Unit	Test Conditions
			Min	Max		
Input voltage	V <sub>IH</sub>	1.65 to 1.95	V <sub>CC</sub> ×0.65	—	V	
		2.3 to 2.7	1.7	—		
		2.7 to 3.6	2.0	—		
		4.5 to 5.5	V <sub>CC</sub> ×0.7	—		
	V <sub>IL</sub>	1.65 to 1.95	—	V <sub>CC</sub> ×0.35	V	
		2.3 to 2.7	—	0.7		
		2.7 to 3.6	—	0.8		
		4.5 to 5.5	—	V <sub>CC</sub> ×0.3		
Output voltage	V <sub>OH</sub>	1.65 to 5.5	V <sub>CC</sub> -0.2	—	V	I <sub>OH</sub> = -100 μA
		1.65	1.2	—		I <sub>OH</sub> = -4 mA
		2.3	1.7	—		I <sub>OH</sub> = -8 mA
		2.7	2.2	—		I <sub>OH</sub> = -12 mA
		3.0	2.4	—		I <sub>OH</sub> = -24 mA
		3.0	2.2	—		
		4.5	3.8	—		
	V <sub>OL</sub>	1.65 to 5.5	—	0.2	V	I <sub>OL</sub> = 100 μA
		1.65	—	0.45		I <sub>OL</sub> = 4 mA
		2.3	—	0.7		I <sub>OL</sub> = 8 mA
		2.7	—	0.4		I <sub>OL</sub> = 12 mA
		3.0	—	0.55		I <sub>OL</sub> = 24 mA
		4.5	—	0.55		
	Input current	I <sub>IN</sub>	0 to 5.5	—	±5.0	μA
Quiescent supply current	I <sub>CC</sub>	2.7 to 3.6	—	±5.0	μA	V <sub>IN</sub> = 3.6 V to 5.5 V
		2.7 to 5.5	—	5.0		V <sub>IN</sub> = V <sub>CC</sub> or GND
	ΔI <sub>CC</sub>	2.7 to 3.6	—	500	μA	V <sub>IN</sub> = one input at (V <sub>CC</sub> -0.6)V, other inputs at V <sub>CC</sub> or GND

## Switching Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)	
			Min	Typ	Max				
Propagation delay time	t <sub>PLH</sub>	1.8±0.15	1.0	—	22.0	ns	A, B, C	Y0 to Y7	
		t <sub>PHL</sub>	2.5±0.2	1.0	—				9.9
			2.7	1.0	—				7.9
			3.3±0.3	1.0	—				6.7
			5.0±0.5	1.0	—				6.0
	t <sub>PLH</sub>	1.8±0.15	1.0	—	21.0	ns	G2A, G2B	Y0 to Y7	
		t <sub>PHL</sub>	2.5±0.2	1.0	—				9.4
			2.7	1.0	—				7.4
			3.3±0.3	1.0	—				6.5
			5.0±0.5	1.0	—				6.0
	t <sub>PLH</sub>	1.8±0.15	1.0	—	20.3	ns	G1	Y0 to Y7	
		t <sub>PHL</sub>	2.5±0.2	1.0	—				8.4
			2.7	1.0	—				6.4
			3.3±0.3	1.0	—				5.8
			5.0±0.5	1.0	—				5.0
Output skew between pins* <sup>1</sup>	t <sub>OSLH</sub>	1.8±0.15	—	—	—	ns			
		t <sub>OSSL</sub>	2.5±0.2	—	—				—
			2.7	—	—				—
			3.3±0.3	—	—				1.0
			5.0±0.5	—	—				1.0
Input capacitance	C <sub>IN</sub>	3.3	—	5.0	—	pF			

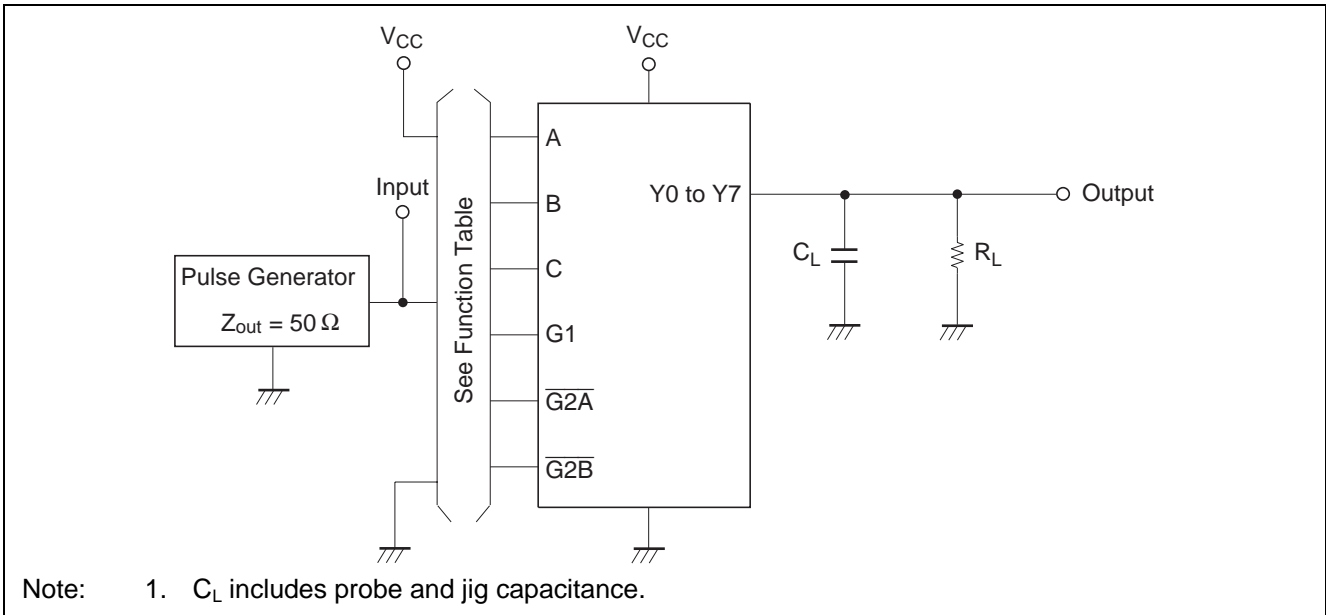
Note: 1. This parameter is characterized but not tested.

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

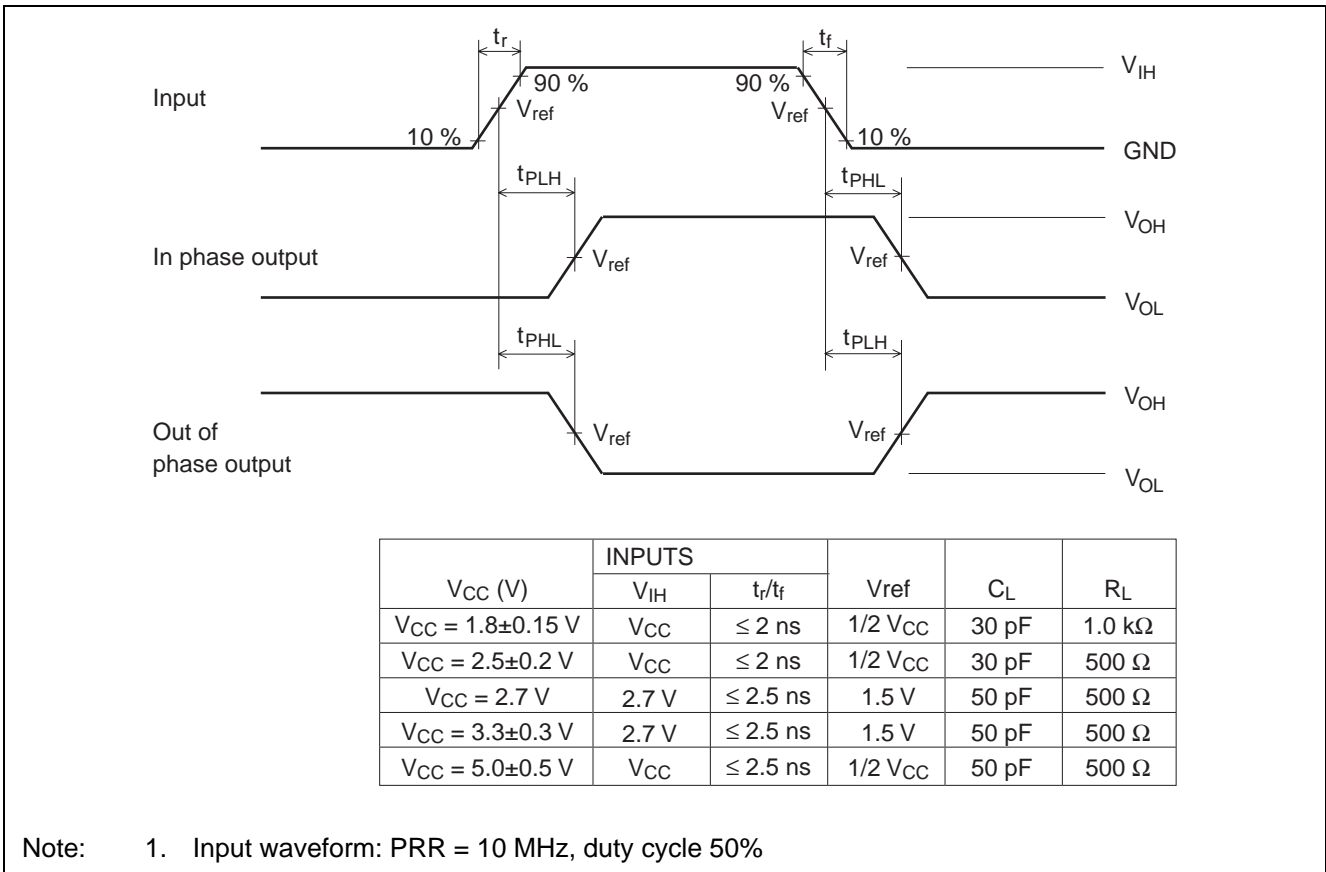
## Operating Characteristics

Item	Symbol	V <sub>CC</sub> = (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C <sub>PD</sub>	1.8	—	25	—	pF	f = 10 MHz
		2.5	—	26	—		
		3.3	—	27	—		
		5.0	—	30	—		

Test Circuit



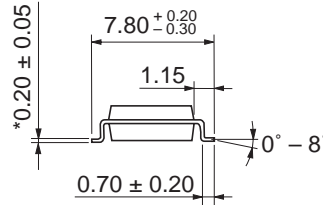
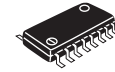
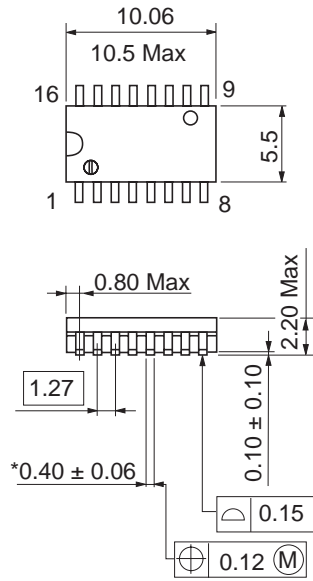
Waveforms





Package Dimensions

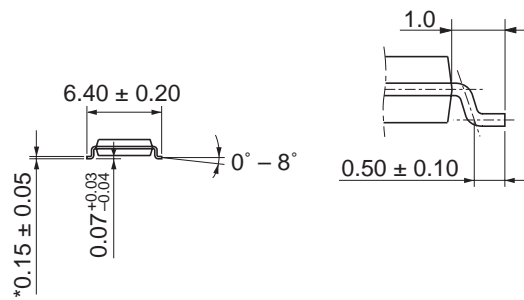
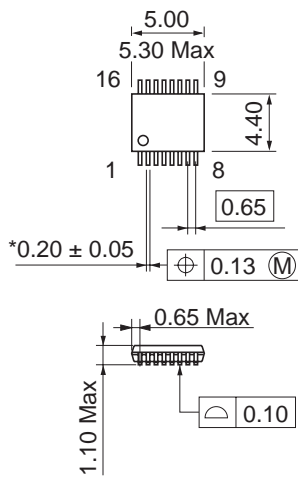
As of January, 2003  
Unit: mm



\*Ni/Pd/Au plating

Package Code	FP-16DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.24 g

As of January, 2003  
Unit: mm



\*Ni/Pd/Au plating

Package Code	TTP-16DAV
JEDEC	—
JEITA	—
Mass (reference value)	0.05 g

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