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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HD74LVC2244A

Octal Buffers / Line Drivers with 3–state Outputs

ADE-205-234A (Z)

2nd. Edition
January 2001

Description

The HD74LVC2244A has eight line drivers with three state outputs in a 20 pin package. This device is a noninverting buffer and has two active low enables ($1\overline{G}$ and $2\overline{G}$). Each enable independently controls four buffers.

All outputs, which are designed to sink up to 12 mA, include equivalent 26 Ω resistors to reduce overshoot and undreshoot.

Low voltage and high speed operation is suitable at battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

Features

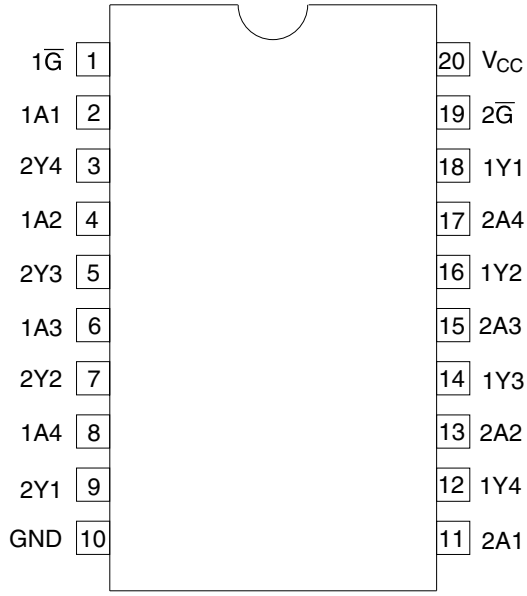
- V_{CC} = 1.65 to 5.5 V
- All inputs V_{IH} (Max) = 5.5 V (@V_{CC} = 0 to 5.5 V)
- All outputs V_O (Max) = 5.5 V (@V_{CC} = 0 V or output off state)
- Typical V_{OL} ground bounce < 0.8 V (@V_{CC} = 3.3 V, Ta = 25°C)
- Typical V_{OH} undershoot > 2.0 V (@V_{CC} = 3.3 V, Ta = 25°C)
- High output current ±12 mA (@V_{CC} = 3.0 to 5.5 V)
- All outputs have equivalent 26 Ω series resistors, so no external resistors are required

Function Table

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

H : High level
L : Low level
X : Immaterial
Z : High impedance

Pin Arrangement



(Top view)

Absolute Maximum Ratings

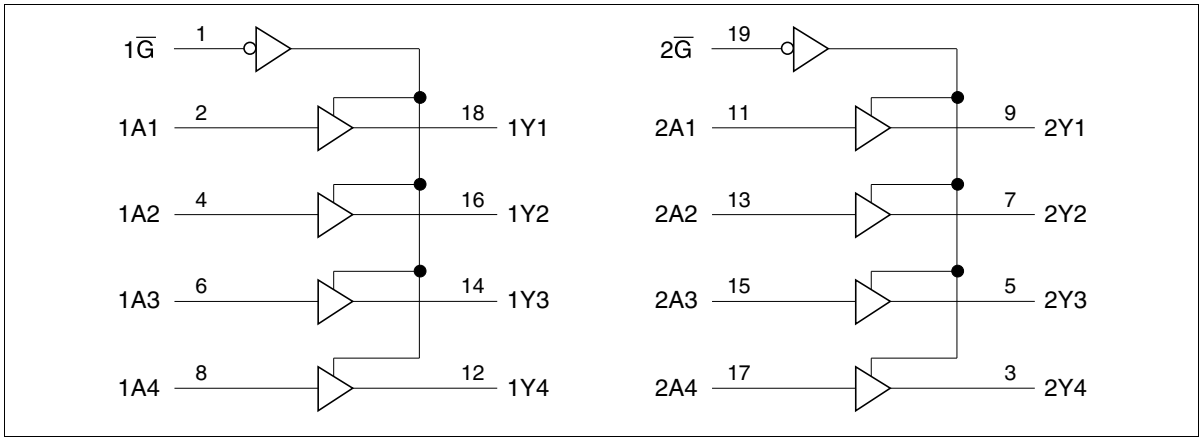
Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	–0.5 to 7.0	V	
Input voltage	V_I	–0.5 to 7.0	V	
Output voltage	V_O	–0.5 to 7.0	V	Output “Z” or V_{CC} : OFF
		–0.5 to V_{CC}+0.5		Output “H” or “L”
Input diode current	I_{IK}	–50	mA	$V_I < 0$
Output diode current	I_{OK}	–50	mA	$V_O < 0$
Output current	I_O	±50	mA	
V_{CC}, GND current	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}	1.65 to 5.5	V	At operation
		1.5 to 5.5		Data retention only
Input voltage	V_I	0 to 5.5	V	
Output voltage	V_O	0 to 5.5	V	Output “Z” or V_{CC} : OFF
		0 to V_{CC}		Output “H” or “L”
Output current	I_{OH}	–2	mA	V_{CC} = 1.65 V
		–4		V_{CC} = 2.3 V
		–8		V_{CC} = 2.7 V
		–12		V_{CC} = 3.0 to 5.5 V
	I_{OL}	2		V_{CC} = 1.65 V
		4		V_{CC} = 2.3 V
		8		V_{CC} = 2.7 V
		12		V_{CC} = 3.0 to 5.5 V
Input rise / fall time	t_r, t_f	0 to 6	ns / V	
Operating temperature	Ta	–40 to +85	°C	

Logic Diagram



Electrical Characteristics (Ta = –40 to 85°C)

Item	Symbol	V_{CC} (V)	Min	Typ	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		
		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} = –2 mA
		2.3	1.7	—	—		I_{OH} = –4 mA
		2.7	2.2	—	—		
		3.0	2.4	—	—		I_{OH} = –6 mA
		2.7	2.0	—	—		I_{OH} = –8 mA
		3.0	2.0	—	—		I_{OH} = –12 mA
		4.5	3.6	—	—		
	V_{OL}	1.65 to 5.5	—	—	0.2		I_{OL} = 100 µA
		1.65	—	—	0.45		I_{OL} = 2 mA
		2.3	—	—	0.7		I_{OL} = 4 mA
		2.7	—	—	0.4		
		3.0	—	—	0.55		I_{OL} = 6 mA
		2.7	—	—	0.6		I_{OL} = 8 mA
		3.0	—	—	0.8		I_{OL} = 12 mA
		4.5	—	—	0.8		
Input current	I_{IN}	0 to 5.5	—	—	±5	µA	V_{IN} = 0 to 5.5 V
Off state output current	I_{OZ}	1.65 to 5.5	—	—	±5	µA	V_{OUT} = 0 to 5.5 V
Output leak current	I_{OFF}	0	—	—	±5	µA	V_{IN} or V_O = 5.5 V
Quiescent supply current	I_{CC}	1.65 to 3.6	—	—	10	µA	V_{IN} = 3.6 to 5.5 V [*1], I_O = 0
		1.65 to 5.5	—	—	10		V_{IN} = V_{CC} or GND
	ΔI_{CC}	2.7 to 3.6	—	—	500		V_{IN} = one input at (V_{CC}–0.6)V, other inputs at V_{CC} or GND
Input capacitance	C_{IN}	3.3	—	3.4	—	pF	V_{IN} = V_{CC} or GND
Output capacitance	C_O	3.3	—	9.0	—	pF	V_{OUT} = V_{CC} or GND

Note: 1. This applies in the disabled state only.

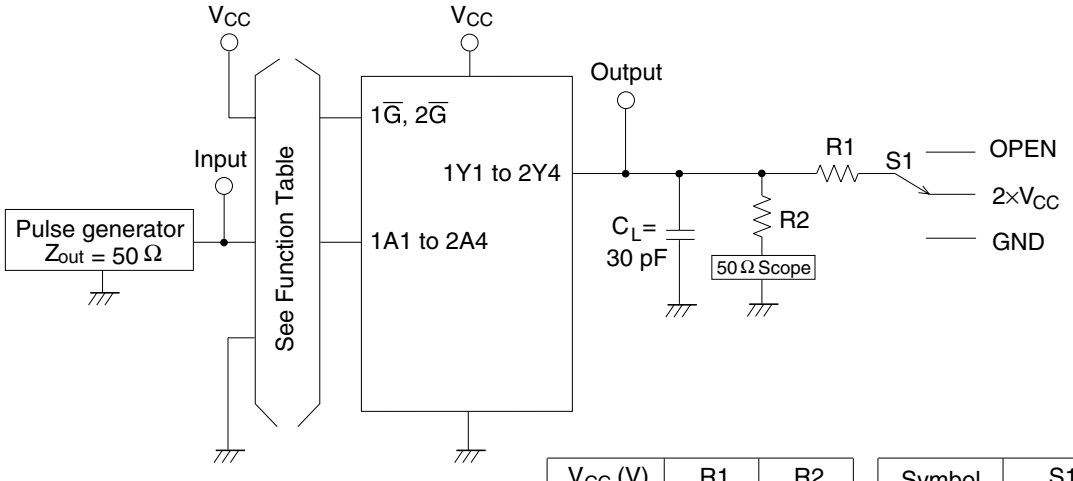
Switching Characteristics (Ta = –40 to 85°C)

Item	Symbol	V_{cc} (V)	Min	Typ	Max	Unit	FROM (Input)	TO (Output)
Propagation delay time	t_{PLH}	1.8±0.15	—	—	10.5	ns	A	Y
	t_{PHL}	2.5±0.2	—	—	7.0			
		2.7	—	—	6.4			
		3.3±0.3	1.5	—	5.5			
		5.0±0.5	—	—	4.1			
Output enable time	t_{ZH}	1.8±0.15	—	—	13.0	ns	$\overline{G}$	Y
	t_{ZL}	2.5±0.2	—	—	9.0			
		2.7	—	—	8.1			
		3.3±0.3	1.0	—	7.1			
		5.0±0.5	—	—	5.6			
Output disable time	t_{HZ}	1.8±0.15	—	—	10.0	ns	$\overline{G}$	Y
	t_{LZ}	2.5±0.2	—	—	8.0			
		2.7	—	—	7.3			
		3.3±0.3	1.5	—	6.8			
		5.0±0.5	—	—	5.7			
Between output pin skew [*1]	t_{OSLH}	1.8±0.15	—	—	2.0	ns		
	t_{OSHL}	2.5±0.2	—	—	2.0			
		2.7	—	—	1.5			
		3.3±0.3	—	—	1.0			
		5.0±0.5	—	—	1.0			

Note : 1. This parameter is characterized but not tested.
$t_{OSLH} = |t_{PLHm} – t_{PLHn}|$, $t_{OSHL} = |t_{PHLm} – t_{PHLn}|$

Test Circuit

(V_{cc} = 1.8±0.15 V, V_{cc} = 2.5±0.2 V)

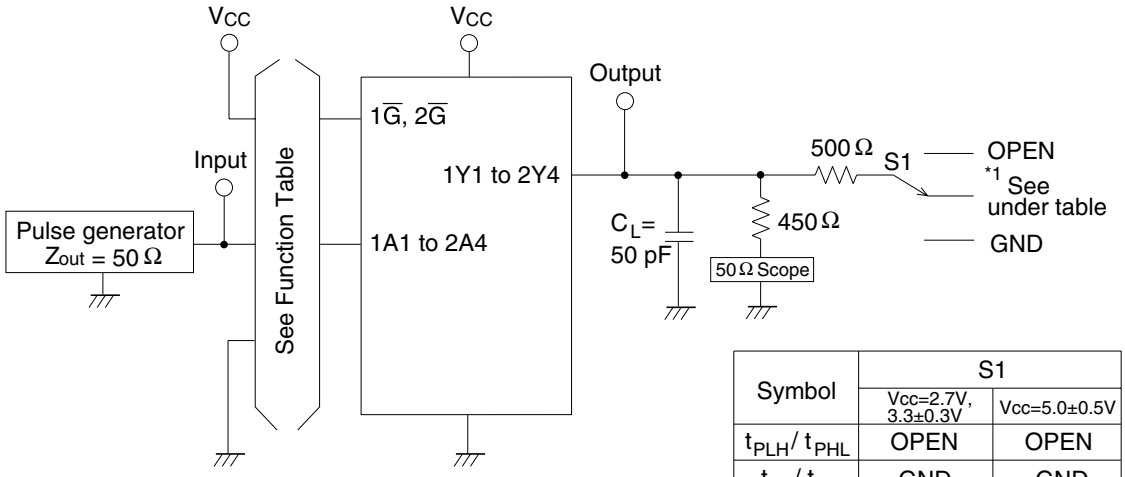


V_{CC} (V)	R1	R2
1.8±0.15	1 kΩ	950 Ω
2.5±0.2	500 Ω	450 Ω

Symbol	S1
t_{PLH}/ t_{PHL}	OPEN
t_{ZH} / t_{HZ}	GND
t_{ZL} / t_{LZ}	2×V_{CC}

Note: 1. C_L includes probe and jig capacitance.

(V_{cc} = 2.7 V, V_{cc} = 3.3±0.3 V, V_{cc} = 5.0±0.5 V)

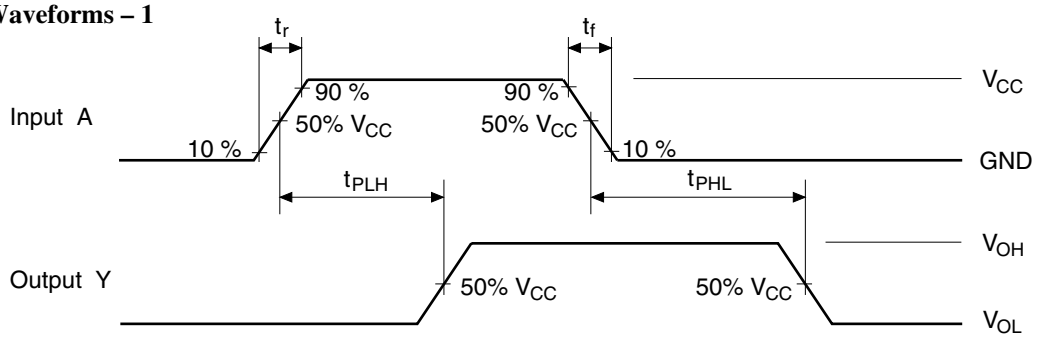


Symbol	S1	
	Vcc=2.7V, 3.3±0.3V	Vcc=5.0±0.5V
t_{PLH}/ t_{PHL}	OPEN	OPEN
t_{ZH}/ t_{HZ}	GND	GND
t_{ZL}/ t_{LZ}	6 V	2×V_{CC}

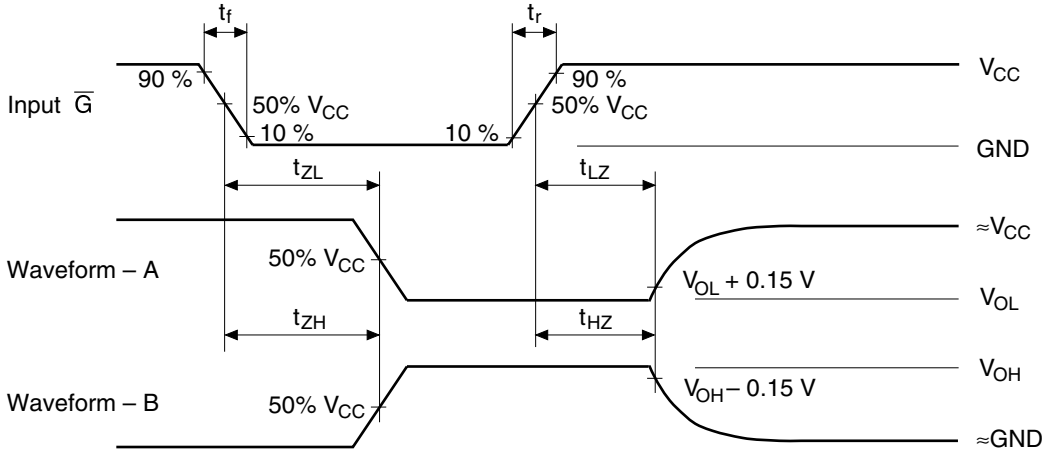
Note: 1. C_L includes probe and jig capacitance.

(V_{cc} = 1.8±0.15 V, V_{cc} = 2.5±0.2 V)

• **Waveforms – 1**



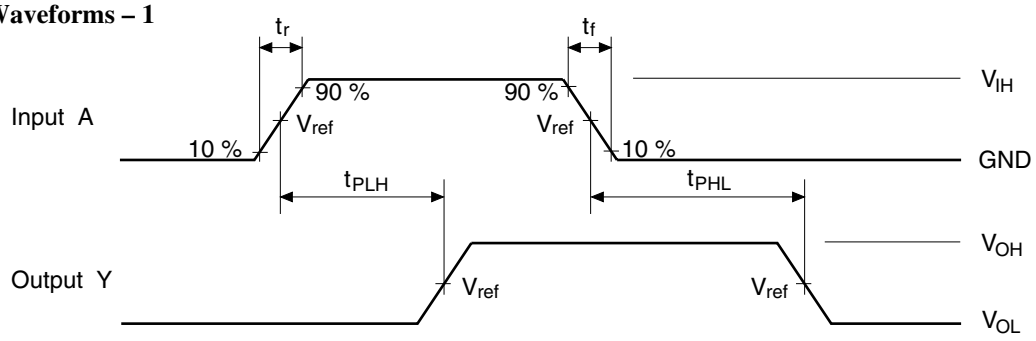
• **Waveforms – 2**



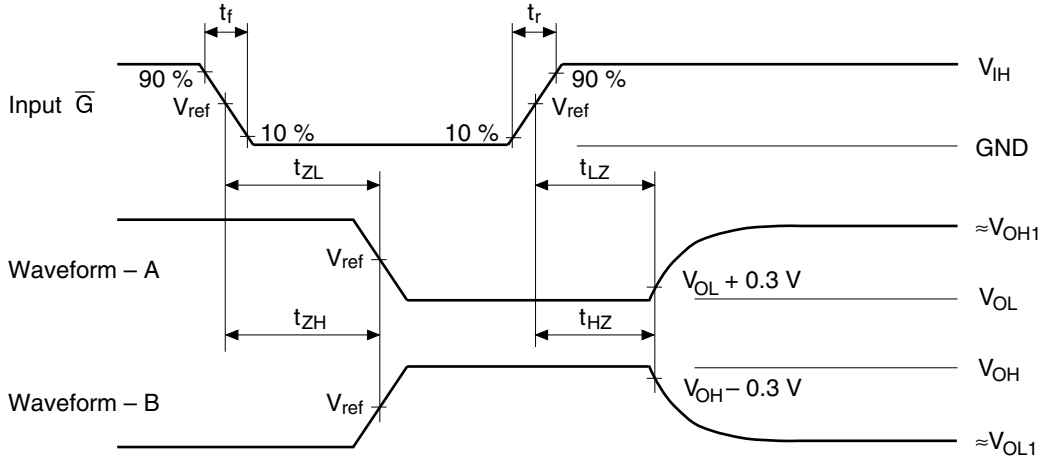
Notes: 1. Input waveform : PRR = 10 MHz, duty cycle 50%, t_r = 2.0 ns, t_f = 2.0 ns
2. Waveform – A shows input conditions such that the output is "L" level when enabled by the output control.
3. Waveform – B shows input conditions such that the output is "H" level when enabled by the output control.

(V_{CC} = 2.7 V, V_{CC} = 3.3±0.3 V, V_{CC} = 5.0±0.5 V)

• **Waveforms – 1**



• **Waveforms – 2**

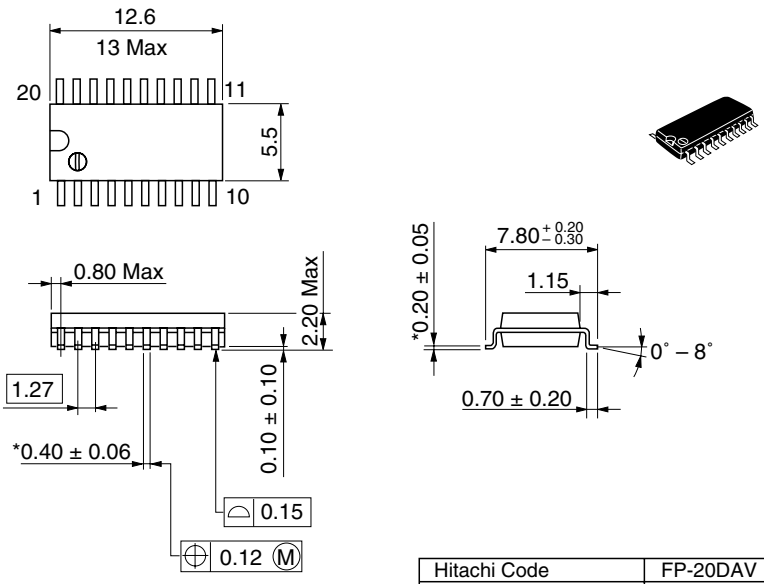


TEST	Vcc=2.7V, 3.3±0.3V	Vcc=5.0±0.5V
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	50%V_{CC}
V_{OH1}	3 V	V_{CC}
V_{OL1}	GND	GND

Notes: 1. Input waveform : PRR = 10 MHz, duty cycle 50%, t_r = 2.5 ns, t_f = 2.5 ns
2. Waveform – A shows input conditions such that the output is "L" level when enabled by the output control.
3. Waveform – B shows input conditions such that the output is "H" level when enabled by the output control.

Package Dimensions

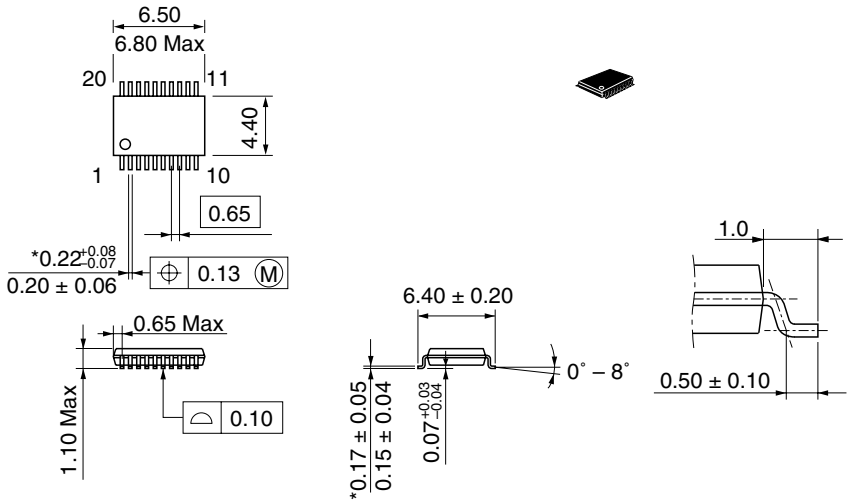
As of July, 2001
Unit: mm



Hitachi Code	FP-20DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.31 g

*Pd plating

As of July, 2001
Unit: mm



Hitachi Code	TTP-20DA
JEDEC	—
JEITA	—
Mass (reference value)	0.07 g

*Dimension including the plating thickness
Base material dimension

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