To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

Send any inquiries to http://www.renesas.com/inquiry.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: "Standard", "High Quality", and "Specific". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as "Specific" without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is "Standard" unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.

   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.

   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.

   "Specific": Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

HD74LVC533

Octal D-type Transparent Latches with 3-state Outputs

REJ03D0356–0400Z
(Previous ADE-205-070B (Z))
Rev.4.00
Jul. 27, 2004

Description

The HD74LVC533 has eight D type latches with three state outputs in a 20 pin package. When the latch enable input is high, the Q outputs will follow the D inputs. When the latch enable goes low, data at the D inputs will be retained at the outputs until latch enable returns high again. When a high logic level is applied to the output control input, all outputs go to a high impedance state, regardless of what signals are present at the other inputs and the state of the storage elements. 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} = 2.0 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 ±24 mA (@V_{CC} = 3.0 V to 5.5 V)
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LVC533FPEL	SOP–20 pin (JEITA)	FP–20DAV	FP	EL (2,000 pcs/reel)
HD74LVC533TELL	TSSOP–20 pin	TTP–20DAV	T	ELL (2,000 pcs/reel)

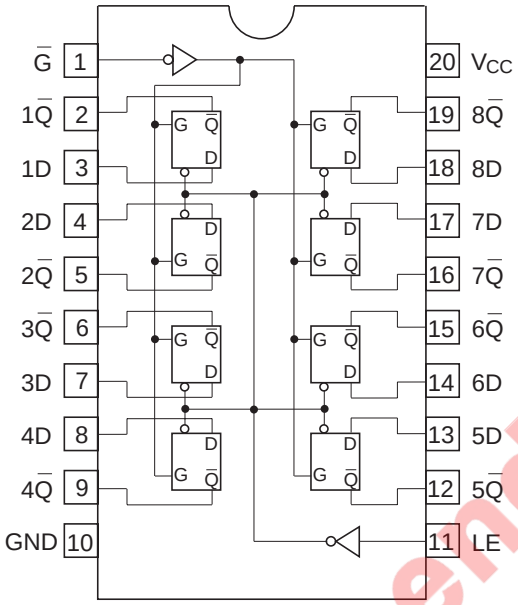
Note: Please consult the sales office for the above package availability.

Function Table

Inputs			
$\overline{G}$	LE	D	Output $\overline{Q}$
H	X	X	Z
L	H	L	H
L	H	H	L
L	L	X	Q_0

H: High level
L: Low level
X: Immaterial
Z: High impedance
Q_0: Level of $\overline{Q}$ before the indicated steady input conditions were established.

Pin Arrangement



(Top view)

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	–0.5 to 6.0	V	
Input diode current	I_{IK}	–50	mA	V_I = –0.5 V
Input voltage	V_I	–0.5 to 6.0	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
		2.0 to 5.5		At operation
Input / output voltage	V_I	0 to 5.5	V	$\overline{G}$, LE, D
	V_O	0 to V_{CC}	V	$\overline{Q}$
Operating temperature	Ta	–40 to 85	°C	
Output current	I_{OH}	–12	mA	V_{CC} = 2.7 V
		–24 *2		V_{CC} = 3.0 V to 5.5 V
	I_{OL}	12	mA	V_{CC} = 2.7 V
		24 *2		V_{CC} = 3.0 V to 5.5 V
Input rise / fall time *1	t_r, t_f	10	ns/V	

Notes: 1. This item guarantees maximum limit when one input switches.
Waveform: Refer to test circuit of switching characteristics.
2. Duty cycle ≤ 50%

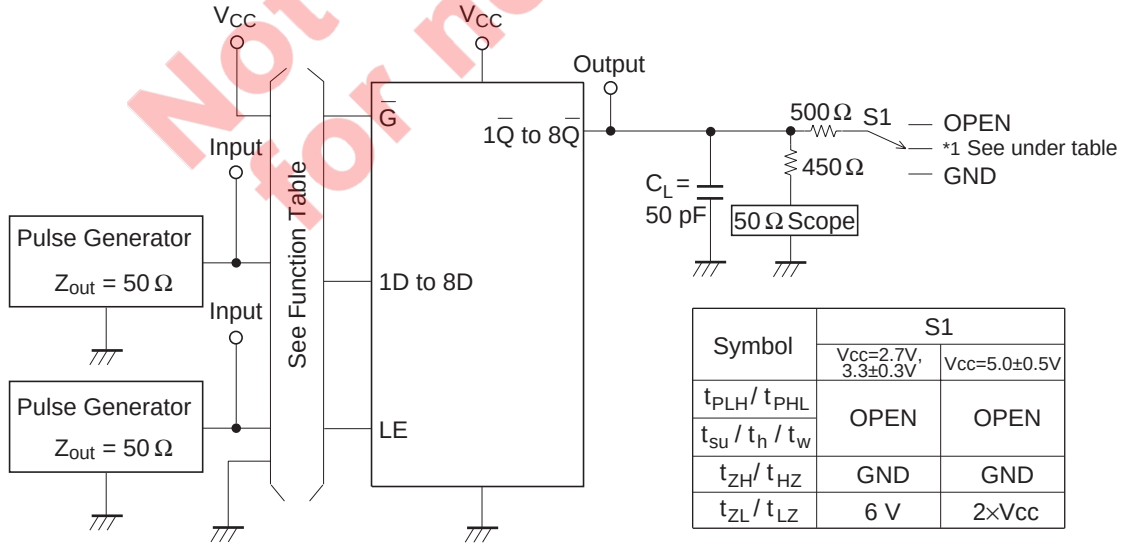
Electrical Characteristics

			Ta = –40 to 85°C			
Item	Symbol	V_{CC} (V)	Min	Max	Unit	Test Conditions
Input voltage	V_{IH}	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	V_{CC}×0.7	—		
	V_{IL}	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	V_{CC}×0.3		
Output voltage	V_{OH}	2.7 to 5.5	V_{CC}–0.2	—	V	I_{OH} = –100 µA
		2.7	2.2	—		I_{OH} = –12 mA
		3.0	2.4	—		
		3.0	2.0	—		I_{OH} = –24 mA
		4.5	3.8	—		
	V_{OL}	2.7 to 5.5	—	0.2	V	I_{OL} = 100 µA
		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
Off state output current	I_{OZ}	5.5	—	±10	µA	V_{IN} = V_{CC}, GND V_{OUT} = V_{CC} or GND
Quiescent supply current	I_{CC}	5.5	—	20	µA	V_{IN} = V_{CC} or GND
	ΔI_{CC}	3.0 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 Min	Typ	Max	Unit	From (Input)	To (Output)
Propagation delay time	t_{PLH}	2.7	—	7.0	9.0	ns	D	$\overline{Q}$
	t_{PHL}	3.3±0.3	1.5	5.0	8.0			
		5.0±0.5	—	4.0	6.5			
	t_{PLH}	2.7	—	7.5	10.5	ns	LE	$\overline{Q}$
	t_{PHL}	3.3±0.3	1.5	5.5	9.5			
		5.0±0.5	—	4.0	8.0			
Output enable time	t_{ZH}	2.7	—	7.5	9.5	ns	$\overline{G}$	$\overline{Q}$
	t_{ZL}	3.3±0.3	1.5	5.5	8.5			
		5.0±0.5	—	4.0	7.0			
Output disable time	t_{HZ}	2.7	—	5.0	8.5	ns	$\overline{G}$	$\overline{Q}$
	t_{LZ}	3.3±0.3	1.5	4.5	7.5			
		5.0±0.5	—	3.5	6.5			
Setup time	t_{su}	2.7	2.0	—	—	ns		
		3.3±0.3	2.0	—	—			
		5.0±0.5	2.0	—	—			
Hold time	t_h	2.7	2.0	—	—	ns		
		3.3±0.3	2.0	—	—			
		5.0±0.5	2.0	—	—			
Pulse width	t_w	2.7	4.0	—	—	ns		
		3.3±0.3	4.0	—	—			
		5.0±0.5	4.0	—	—			
Input capacitance	C_{IN}	2.7	—	3.0	—	pF		
Output capacitance	C_O	2.7	—	15.0	—	pF		

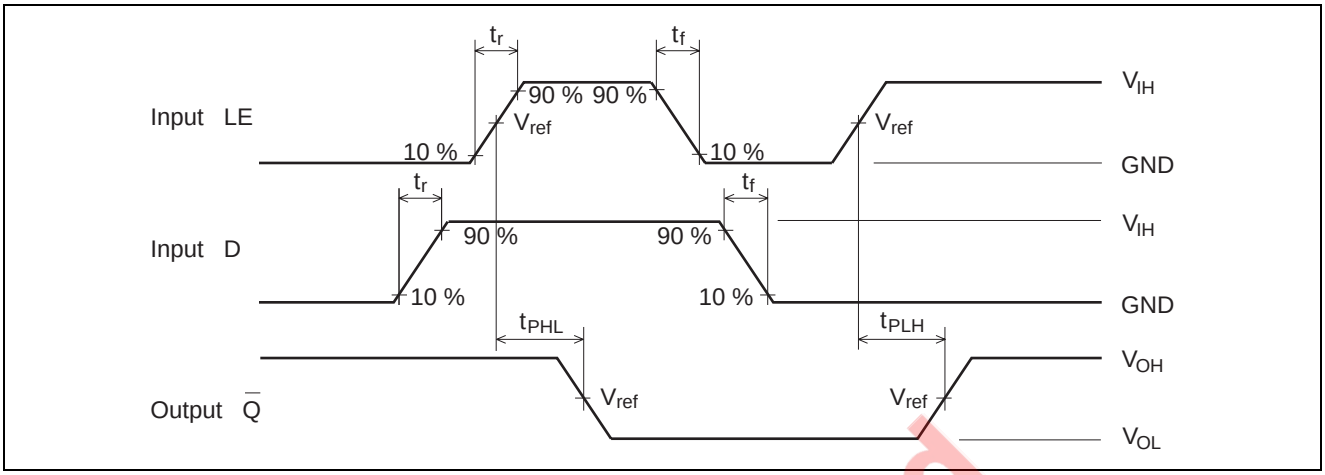
Test Circuit



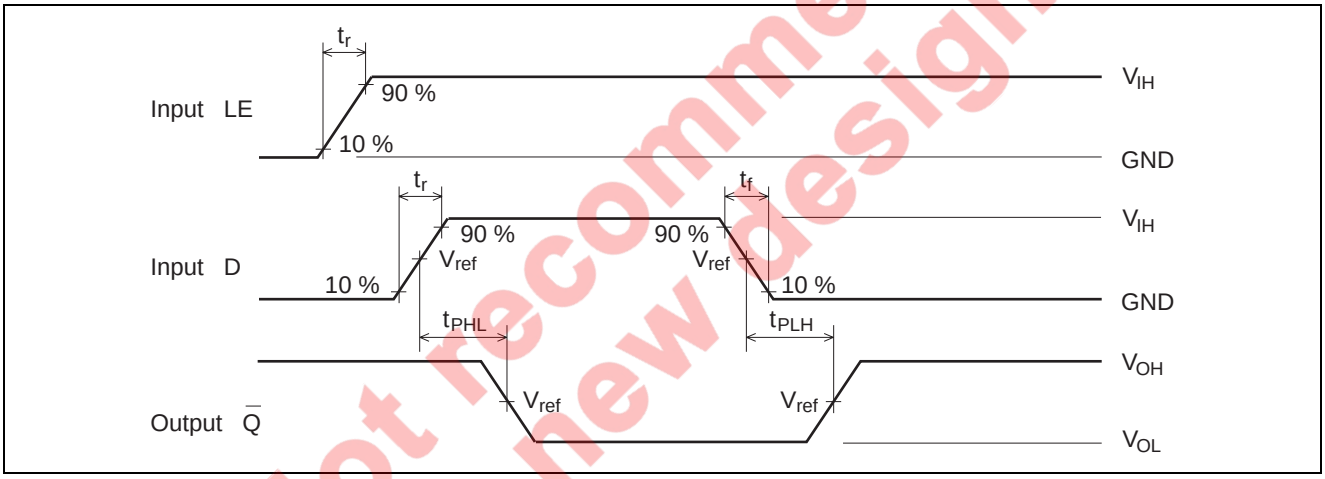
Symbol	S1 Vcc=2.7V, 3.3±0.3V	S1 Vcc=5.0±0.5V
t_{PLH} / t_{PHL}	OPEN	OPEN
t_{su} / t_h / t_w		
t_{ZH} / t_{HZ}	GND	GND
t_{ZL} / t_{LZ}	6 V	2×Vcc

Note: 1. C_L includes probe and jig capacitance.

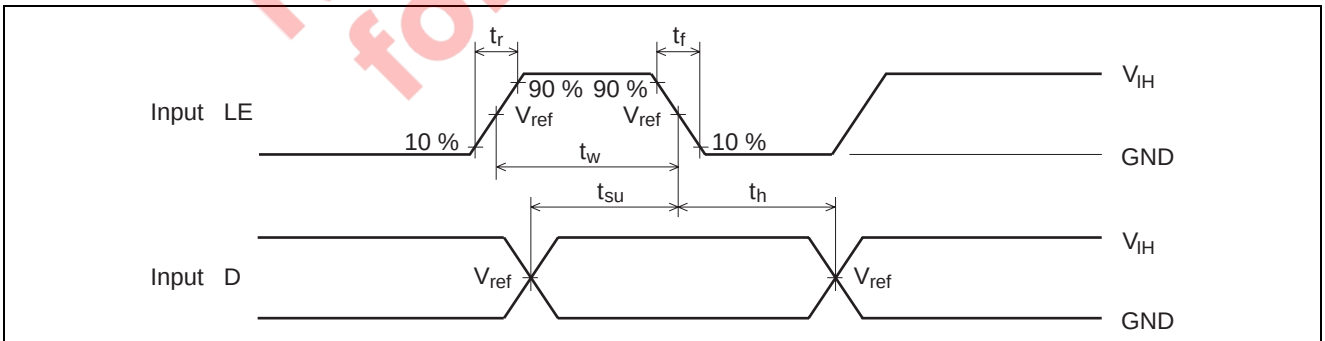
Waveforms – 1



Waveforms – 2

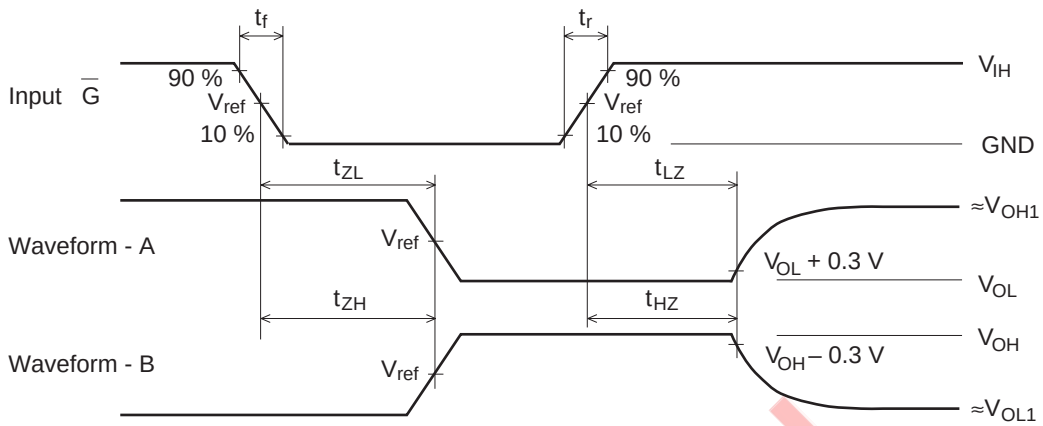


Waveforms – 3



Notes: 1. t_r = 2.5 ns, t_f = 2.5 ns
2. Input waveform : PRR = 10 MHz, duty cycle 50%

Waveforms – 4

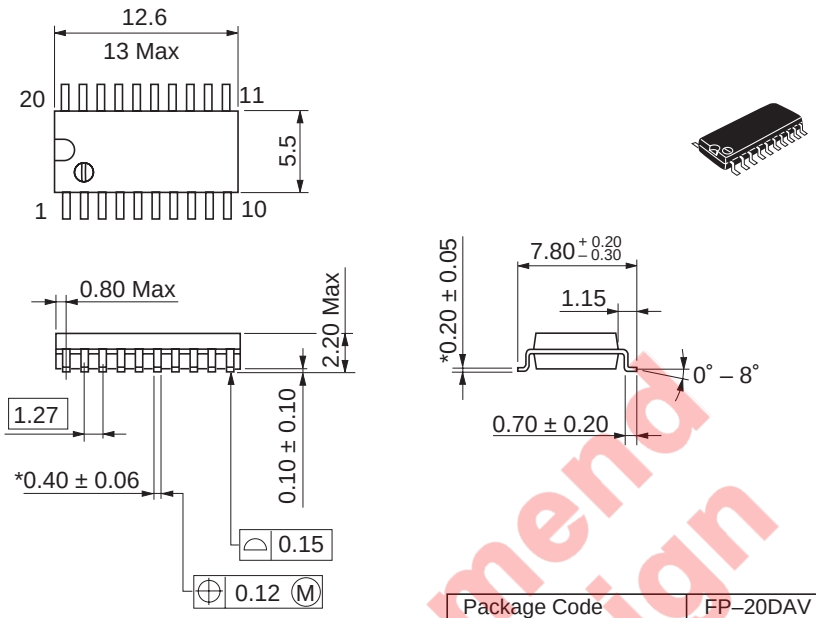


TEST	Vcc=2.7V, 3.3±0.3V	Vcc=5.0±0.5V
V_{IH}	2.7 V	Vcc
V_{ref}	1.5 V	50%Vcc
V_{OH1}	3 V	Vcc
V_{OL1}	GND	GND

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

Package Dimensions

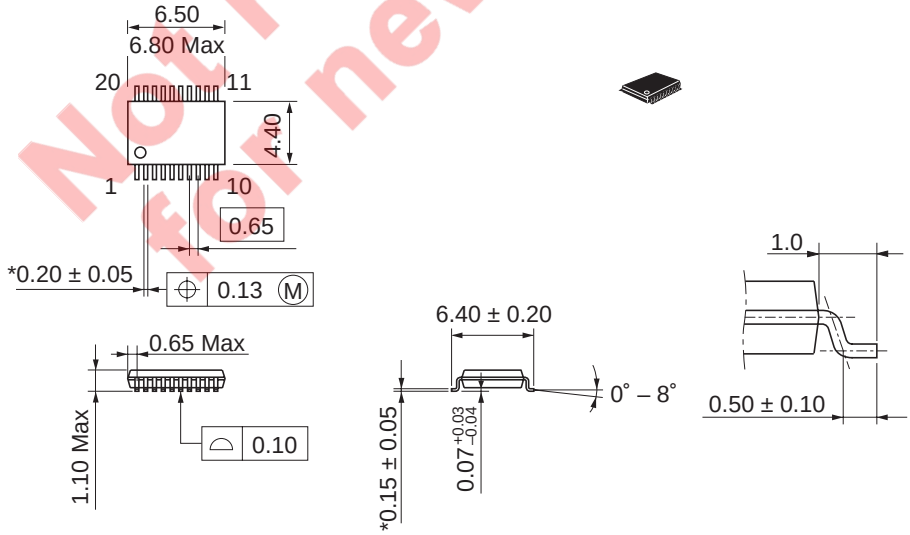
As of January, 2002
Unit: mm



Package Code	FP–20DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.31 g

*Pd plating

As of January, 2002
Unit: mm



Package Code	TTP–20DAV
JEDEC	—
JEITA	—
Mass (reference value)	0.07 g

*Pd plating

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

RENESAS SALES OFFICES

http://www.renesas.com

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, United Kingdom
Tel: <44> (1628) 585 100, Fax: <44> (1628) 585 900

Renesas Technology Europe GmbH
Dornacher Str. 3, D-85622 Feldkirchen, Germany
Tel: <49> (89) 380 70 0, Fax: <49> (89) 929 30 11

Renesas Technology Hong Kong Ltd.
7/F., North Tower, World Finance Centre, Harbour City, Canton Road, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2375-6836

Renesas Technology Taiwan Co., Ltd.
FL 10, #99, Fu-Hsing N. Rd., Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology (Shanghai) Co., Ltd.
26/F., Ruijin 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

Colophon .1.0