

# HD29413

## Quadruple Differential Line Receivers With 3 State Outputs

REJ03D0306-0200Z  
(Previous ADE-205-582 (Z))  
Rev.2.00  
Jul.16.2004

### Description

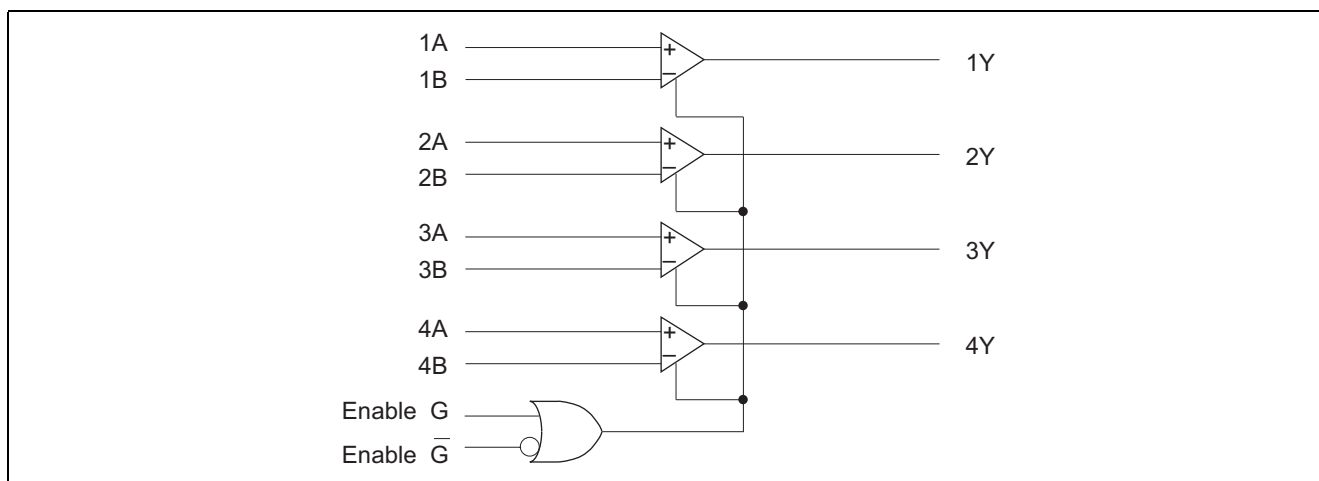
The HD29413 features quadruple differential line receivers designed to meet the spec of EIA RS-422A and RS-423A. The device operates from a single 5 V power supply. The enable function is common to all four receivers and offer a choice of active high or active low inputs. (Complementary output enable input.) Fail safe circuit guarantees the outputs always at the high level when the inputs are open.

### Features

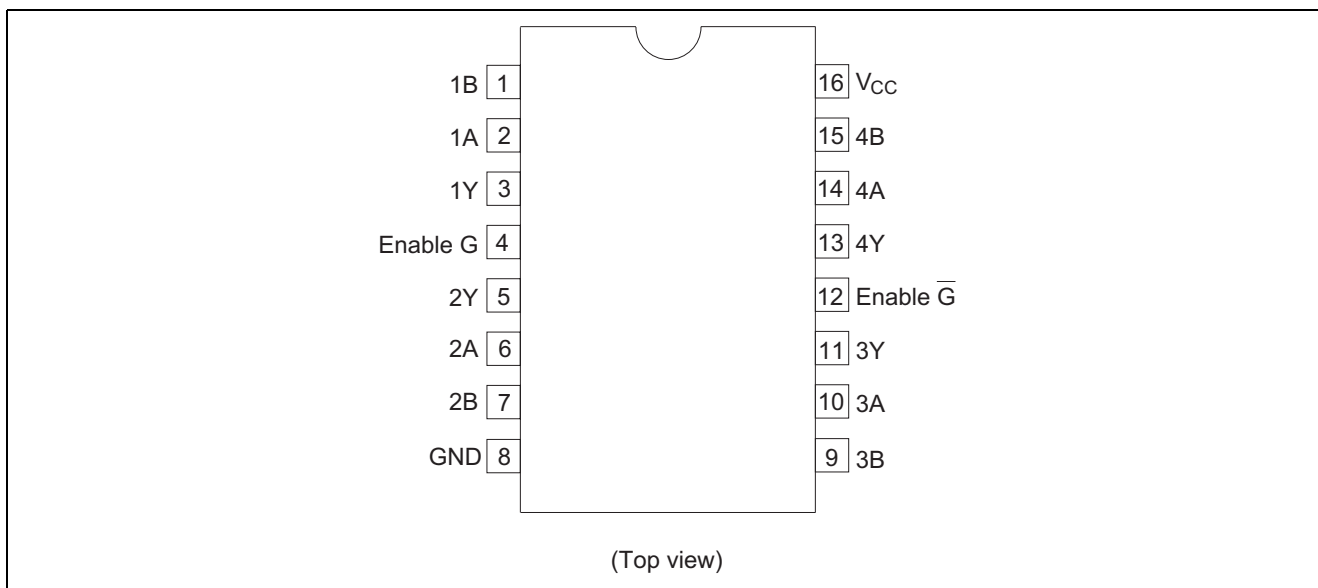
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD29413P	DILP-16 pin	DP-16E, -16FV	P	—

### Logic Diagram



## Pin Arrangement



## Function Table

Differential Input $V_{IA} - V_{IB}$	Enable		Output Y
	G	$\bar{G}$	
+	H	X	H
	X	L	H
—	H	X	L
—	X	L	L
X	L	H	Z

H : High level

L : Low level

X : Irrelevant

Z : High impedance

## Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply Voltage	$V_{CC}^{*1}$	+7	V
In Phase Input Voltage	$V_{IC}^{*2}$	−25 to +25	V
Differential Input Voltage	$V_{ID}^{*3}$	0 to +25	V
Enable Input Voltage	$V_{IN}$	+7	V
Output Sink Current	$I_O$	+50	mA
Operating Temperature	$T_{opr}$	0 to +70	°C
Storage Temperature	$T_{stg}$	−65 to +150	°C

Notes: 1. All voltage values except for differential input voltage are with respect to ground terminal.

2.  $V_{IC} = 1/2 (V_{IA} + V_{IB})$   $|V_{ID}| = |V_{IA} - V_{IB}|$ 

3. Differential input voltage is measured at the noninverting input with respect to the corresponding inverting input.

4. 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	Min	Typ	Max	Unit
Supply Voltage	$V_{CC}$	4.75	5.0	5.25	V
In Phase Input Voltage	$V_{IC}$	-7	—	+7	V
Differential Input Voltage	$V_{ID}$	+0.3	—	+6.0	V
Output Current	$I_{OH}$	—	—	-440	$\mu A$
	$I_{OL}$	—	—	8	mA
Operating Temperature	Topr	0	—	70	$^{\circ}C$

## Electrical Characteristics (Ta = 0 to +70 $^{\circ}C$ )

Item	Symbol	Min	Typ*1	Max	Unit	Conditions		
Differential Input High Threshold Voltage	V <sub>TH</sub>	—	—	0.3	V	V <sub>CC</sub> = 5 V ±5 %, V <sub>IC</sub> = −7 to +7 V	V <sub>OH</sub> ≥ 2.7 V, I <sub>OH</sub> = −440 μA	
Differential Input Low Threshold Voltage	V <sub>TL</sub>	—	—	−0.3	V		V <sub>OL</sub> ≤ 0.4 V, I <sub>OL</sub> = 4 mA	
Enable Input Voltage	V <sub>IH</sub>	2.0	—	—	V			
	V <sub>IL</sub>	—	—	0.8	V			
Enable Input Clamp Voltage	V <sub>IK</sub>	—	—	−1.5	V	V <sub>CC</sub> = 4.75 V, I <sub>IN</sub> = −18 mA		
Output Voltage	V <sub>OH</sub>	2.7	—	—	V	V <sub>CC</sub> = 4.75 V	V <sub>ID</sub> = 0.3 to 6 V	I <sub>OH</sub> = −440 μA
	V <sub>OL</sub>	—	—	0.4	V	V <sub>IL</sub> ( $\bar{G}$ ) = 0.8 V	V <sub>ID</sub> = −0.3 to −6 V	I <sub>OL</sub> = 4mA
		—	—	0.45	V	V <sub>IH</sub> (G) = 2 V		I <sub>OL</sub> = 8 mA
Off State (High impedance) Output Current	I <sub>OZ</sub>	—	—	20	μA	V <sub>CC</sub> = 5.25 V		V <sub>O</sub> = 2.4 V
		—	—	−20	μA	V <sub>IL</sub> (G) = 0.8 V, V <sub>IH</sub> ( $\bar{G}$ ) = 2 V		V <sub>O</sub> = 0.4 V
Line Input Current	I <sub>IN</sub>	—	—	2.2	mA	V <sub>CC</sub> = 5.25 V or V <sub>CC</sub> = 0 V		V <sub>I</sub> = −10 V
		0	—	1.0	mA			V <sub>I</sub> = 3 V
		0	—	−1.0	mA			V <sub>I</sub> = −3 V
		—	—	−2.2	mA			V <sub>I</sub> = −10 V
Enable Input Current	I <sub>I(EN)</sub>	—	—	100	μA	V <sub>CC</sub> = 5.25 V		V <sub>I</sub> = 5.5 V
	I <sub>IH</sub>	—	—	20	μA			V <sub>I</sub> = 2.7 V
	I <sub>IL</sub>	—	—	−0.36	mA			V <sub>I</sub> = 0.4 V
Short Circuit Output Current	I <sub>OS</sub> *2	−15	—	−85	mA	V <sub>CC</sub> = 5.25 V, V <sub>O</sub> = 0 V		
Supply Current	I <sub>CC</sub>	—	—	70	mA	V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 0 V (All Output Disable)		

Notes: 1. All typical values are at  $V_{CC} = 5 V$ ,  $T_a = 25^{\circ}C$ ,  $V_{IC} = 0$

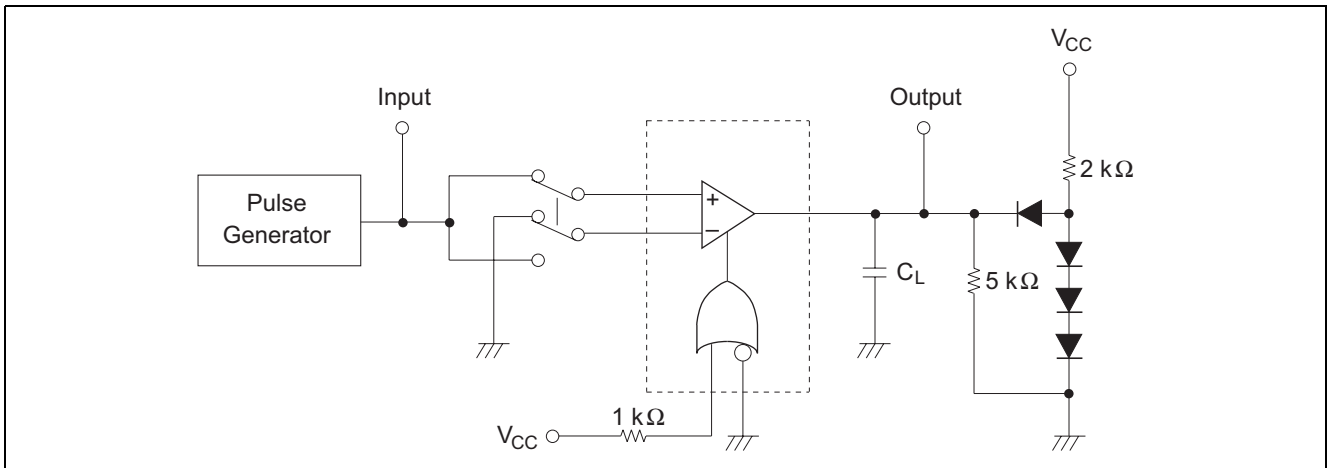
2. Not more than one output should be shorted at a time.

## Switching Characteristics ( $V_{CC} = 5 V$ , $T_a = 25^{\circ}C$ )

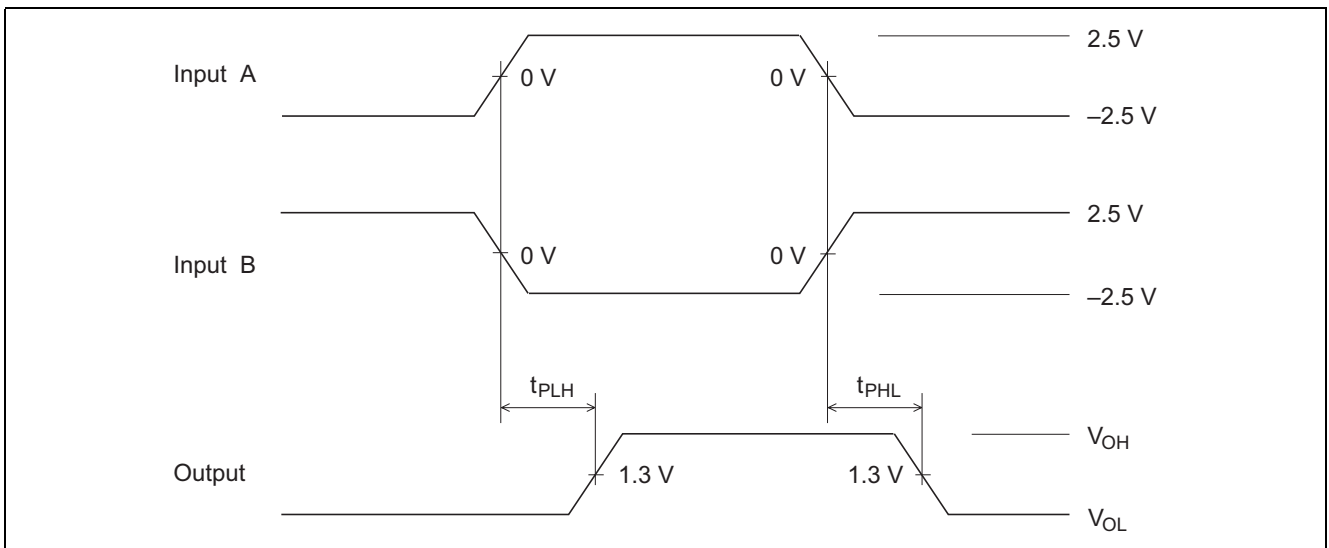
Item	Symbol	Min	Typ	Max	Unit	Conditions
Propagation Delay Time	$t_{PLH}$ , $t_{PHL}$	—	17	25	ns	$C_L = 15 pF$
Output Enable Time	$t_{ZH}$ , $t_{ZL}$	—	15	22	ns	
Output Disable Time	$t_{HZ}$	—	15	22	ns	$C_L = 5 pF$
	$t_{LZ}$	—	20	30	ns	

1.  $t_{PLH}$ ,  $t_{PHL}$

Test Circuit

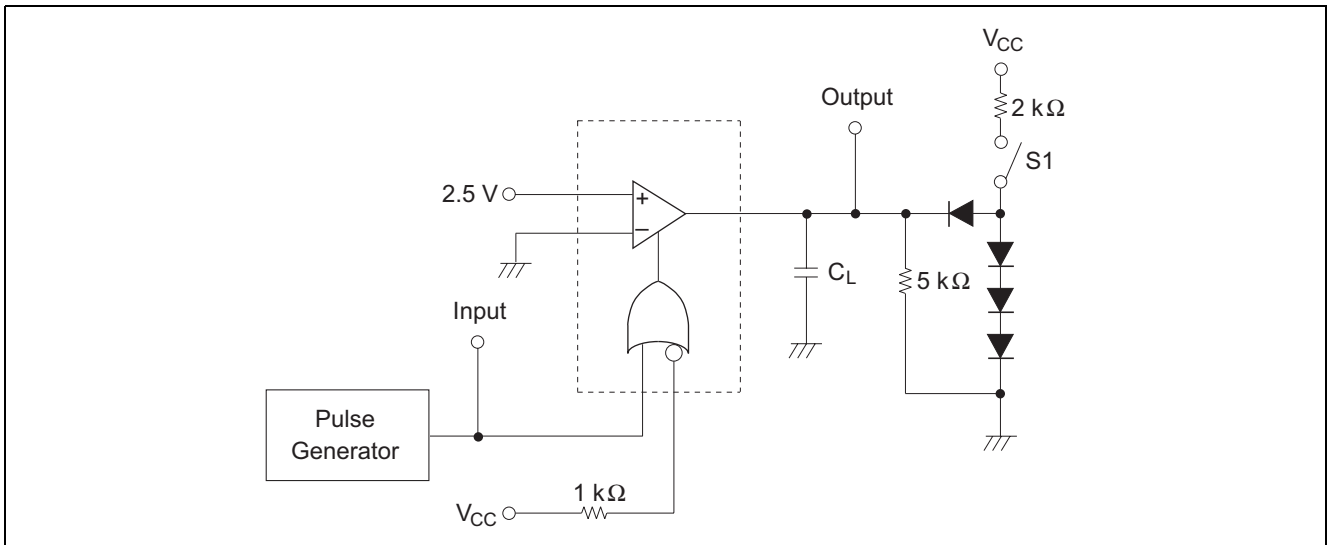


Waveforms

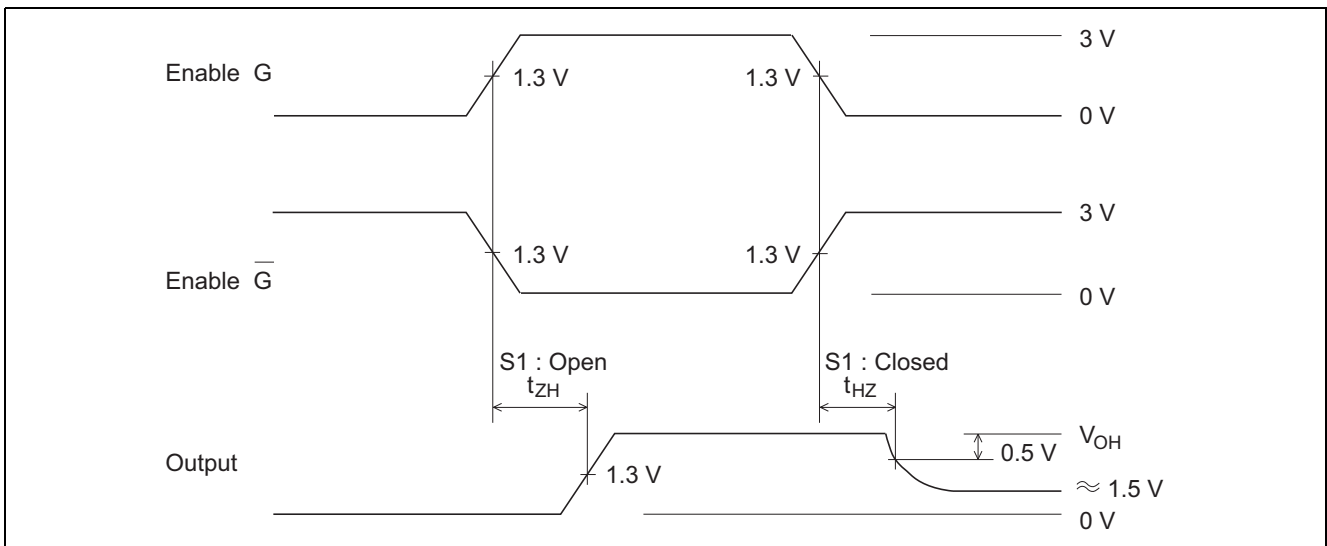


## 2. $t_{HZ}$ , $t_{ZH}$

### Test Circuit

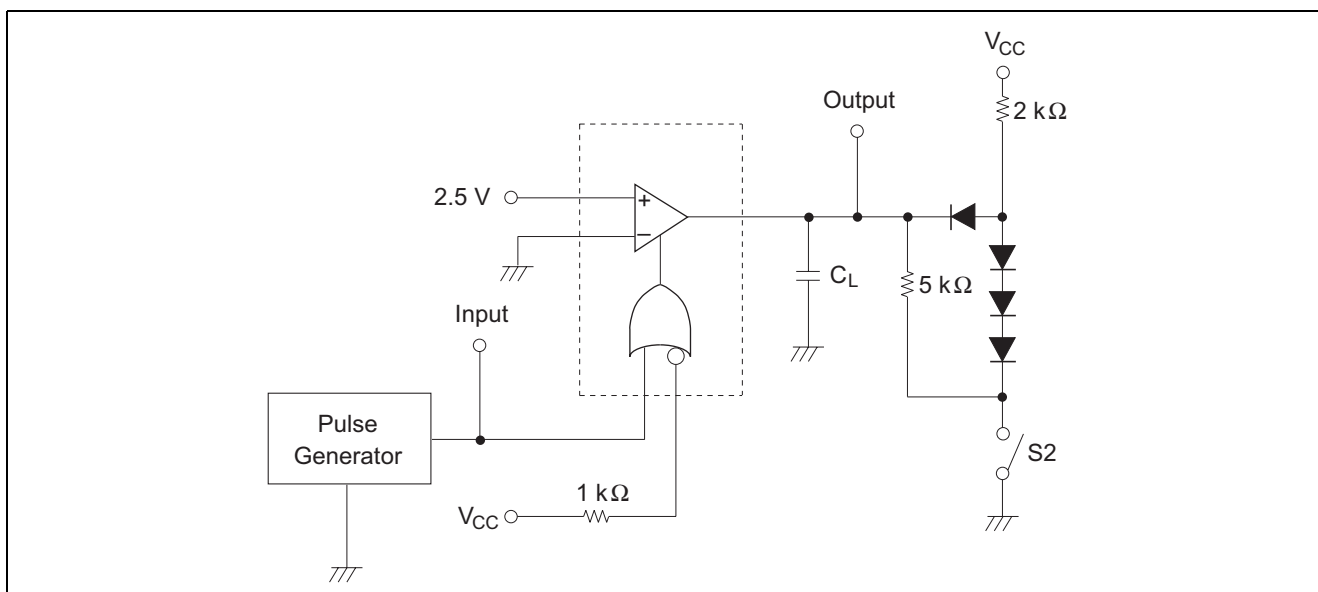


### Waveforms

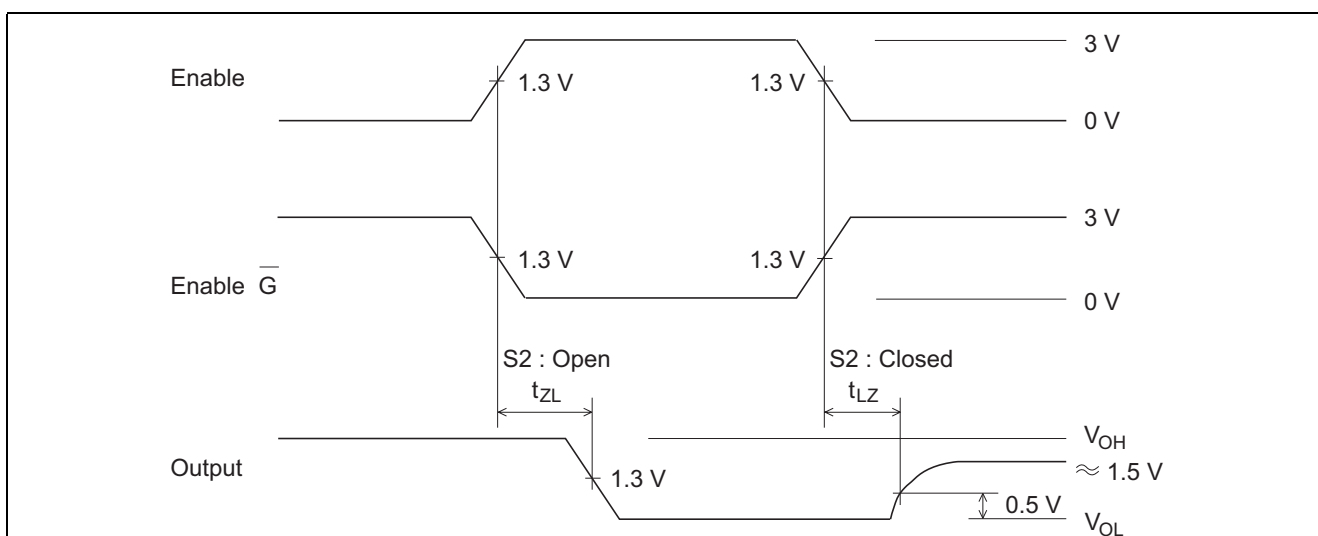


### 3. $t_{LZ}$ , $t_{ZL}$

#### Test Circuit



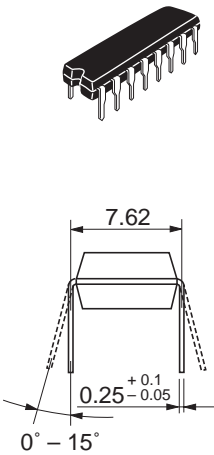
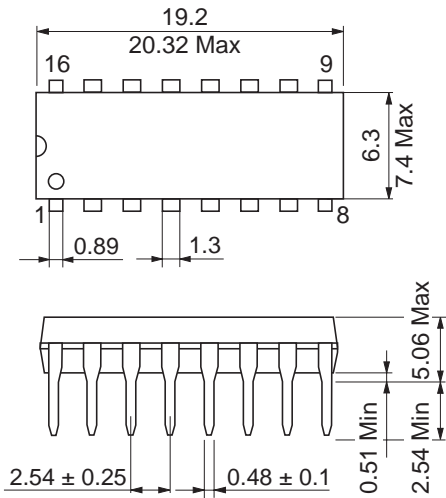
#### Waveforms



- Notes:
1. The pulse generator has the following characteristics: PRR = 1 MHz duty cycle 50%,  $t_r \leq 15$  ns,  $t_f \leq 6$  ns,  $Z_{out} = 50 \Omega$ .
  2.  $C_L$  include probe and jig capacitance.
  3. All diodes are 1S2074(H)
  4. To test G input, ground G input and apply an inverted input waveform.

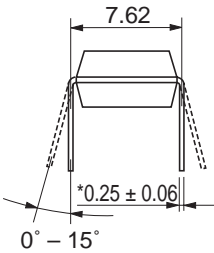
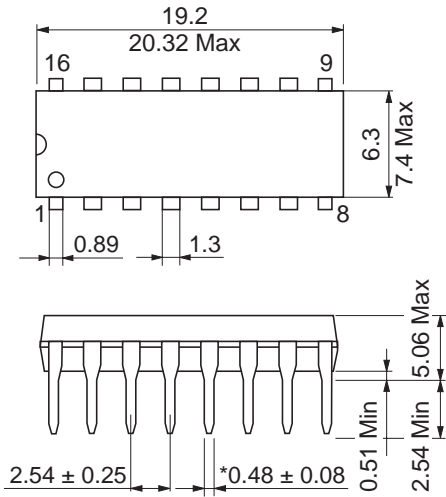
Package Dimensions

As of January, 2003  
Unit: mm



Package Code	DP-16E
JEDEC	Conforms
JEITA	Conforms
Mass (reference value)	1.05 g

Unit: mm



Package Code	DP-16FV
JEDEC	Conforms
JEITA	Conforms
Mass (reference value)	1.05 g

\*Ni/Pd/AU Plating

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