HD29413

Quadruple Differential Line Receivers With 3 State Outputs

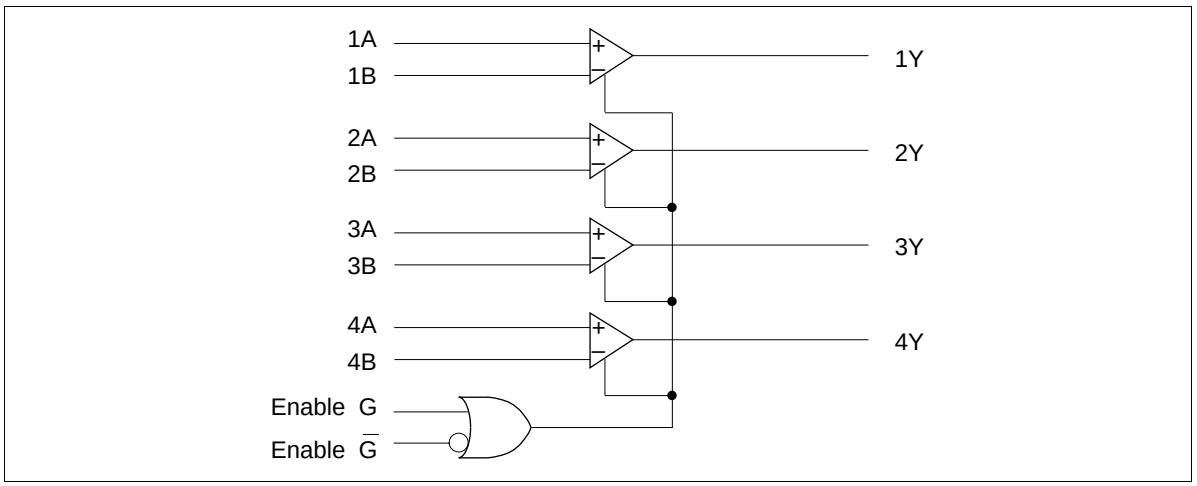
HITACHI

ADE-205-582 (Z)
1st. Edition
Dec. 2000

Description

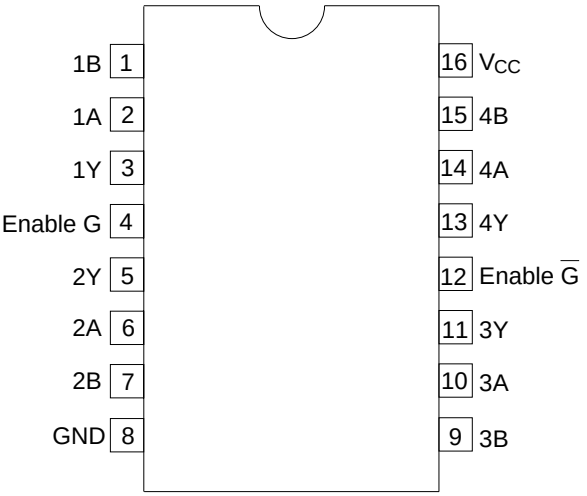
The HD29413 features quadruple differential line receivers designed to meet the spec of EIA RS-422AandRS-423A. The device operates from a single 5 V power supply. The enable function is common to all four receivers and offer a choice of active high or active low inputs. (Complementary output enable input.)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

Logic Diaglam



Hitachi semiconductor

Pin Arrangement



(Top view)

Function Table

Differential Input	Enable		Output
$V_{IA} - V_{IB}$	G	$\overline{G}$	Y
+	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	Topr	0 to +70	°C
Storage Temperature	Tstg	–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	µA
	I_{OL}	—	—	8	mA
Operating Temperature	Topr	0	—	70	°C

Electrical Characteristics (Ta = 0 to + 70°C)

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

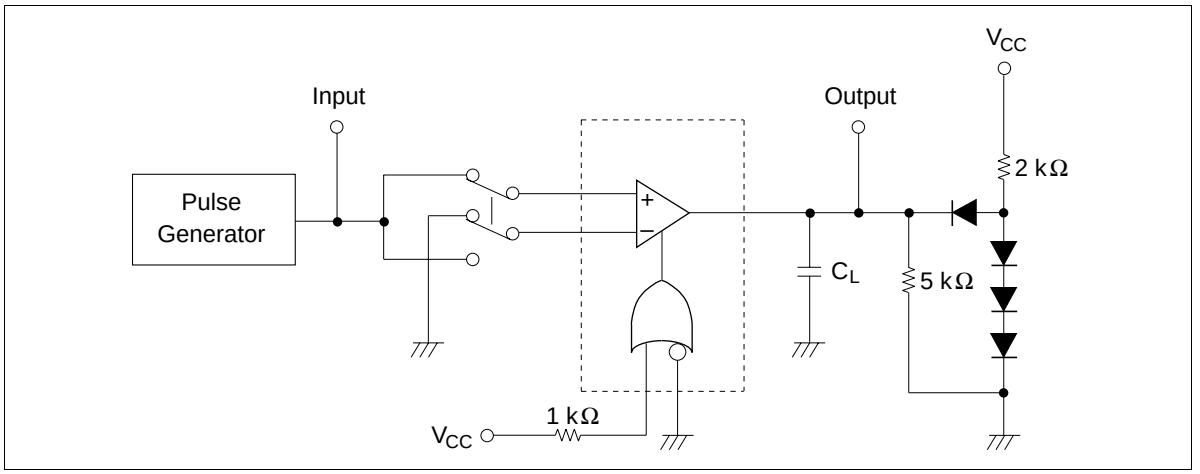
Notes: 1. All typical values are at V_{CC} = 5 V, Ta = 25°C, V_{IC} = 0
2. Not more than one output should be shorted at a time.

Switching Characteristics (V_{CC} = 5 V, Ta = 25°C)

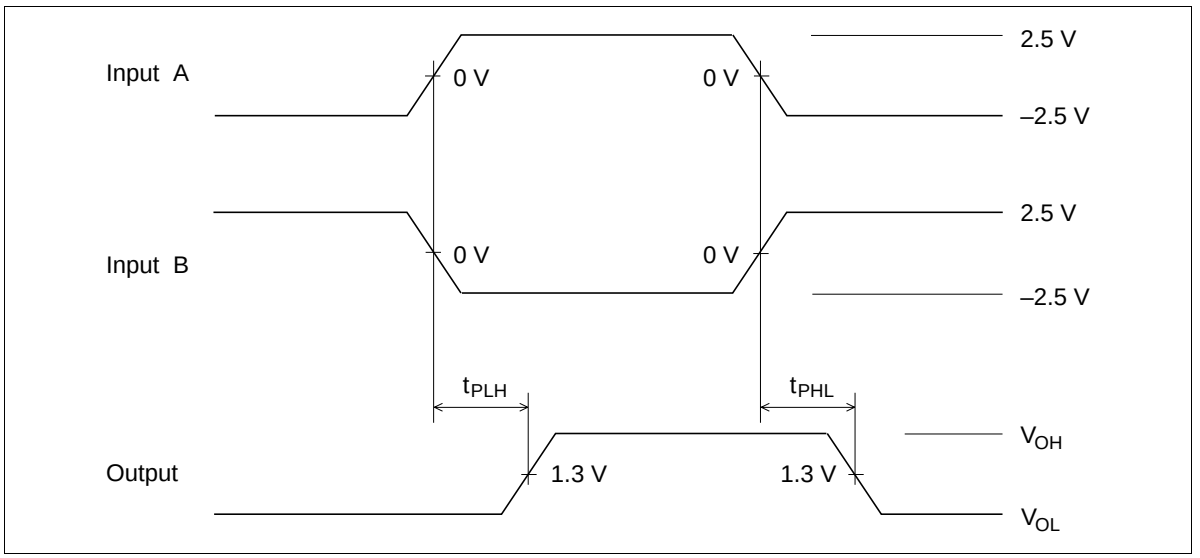
Item	Symbol	Min	Typ	Max	Unit	Conditions
Propagation Delay Time	t_{PLH}, t_{PHL}	—	17	25	ns	C_L = 15 pF
Output Enable Time	t_{ZH}, t_{ZL}	—	15	22	ns	
Output Disable Time	t_{HZ}	—	15	22	ns	C_L = 5 pF
	t_{LZ}	—	20	30	ns	

1. t_{PLH}, t_{PHL}

Test Circuit

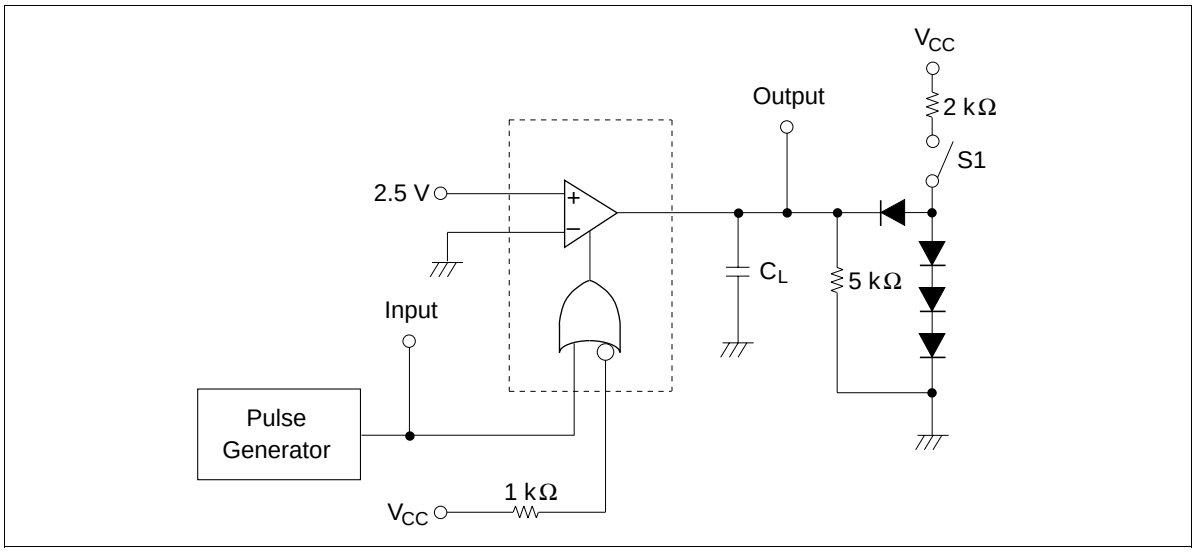


Waveforms

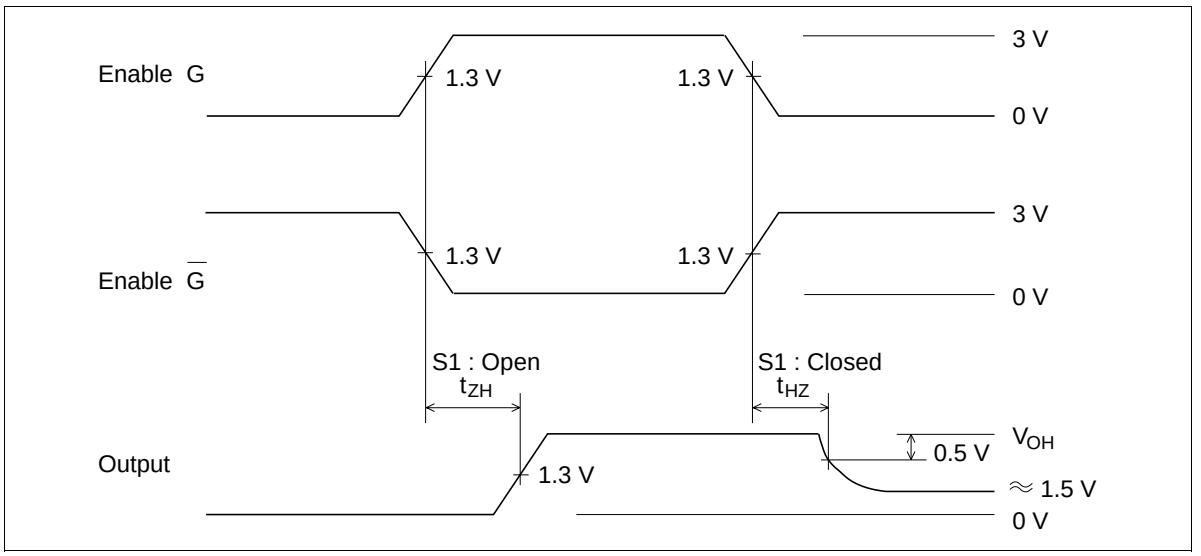


2. t_{HZ}, t_{ZH}

Test Circuit

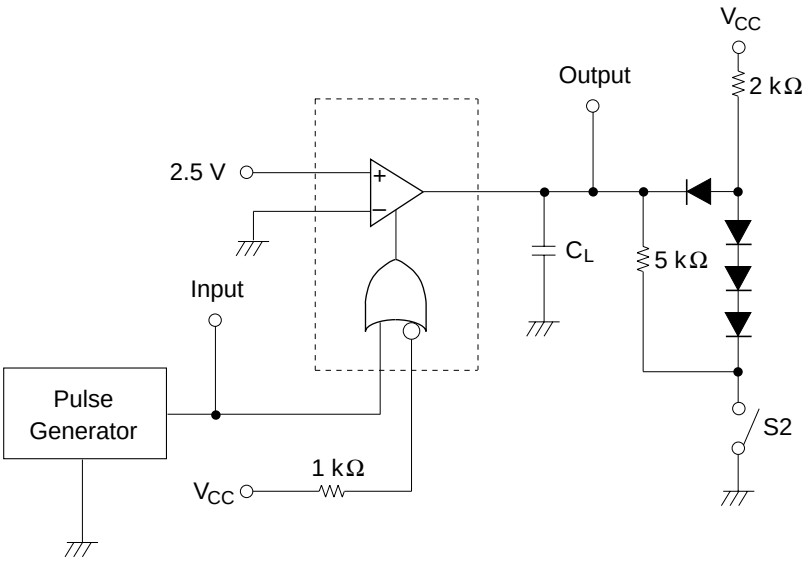


Waveforms

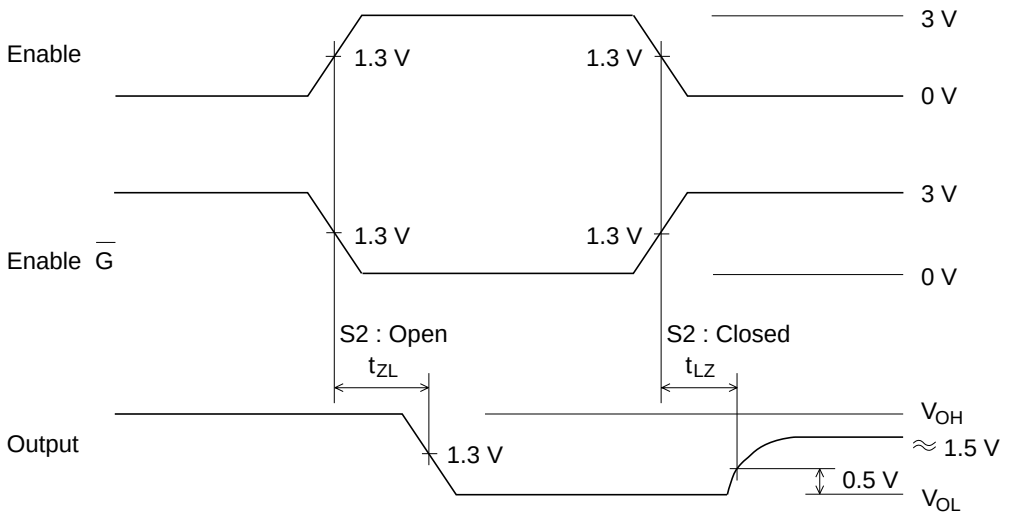


3. t_{LZ}, t_{ZL}

Test Circuit



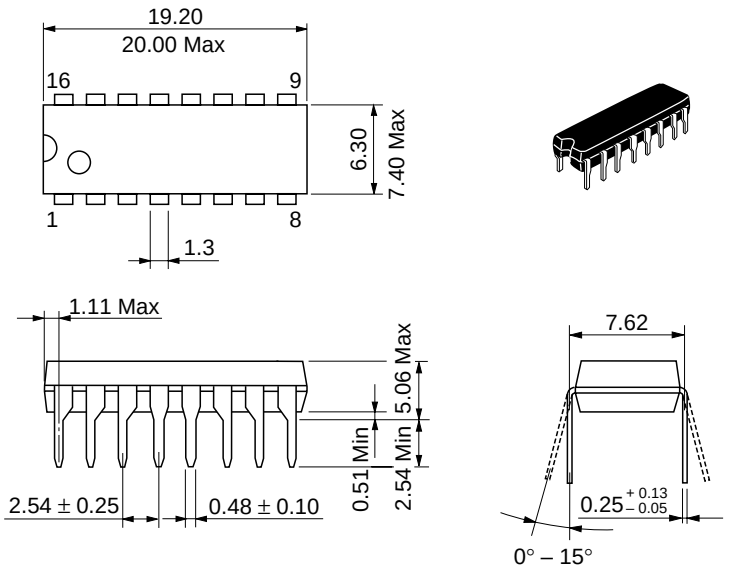
Waveforms



Notes:
1. The pulse generator has the following characteristics: PRR = 1 MHz duty cycle 50%, t_r = ≤ 15 ns, t_f = ≤ 6 ns, Zout = 50 Ω.
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

Unit: mm



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	1.07 g

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