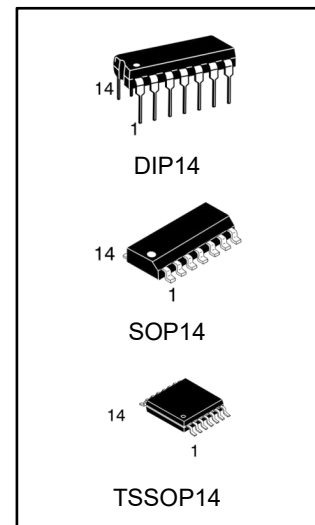


## Features

- Wide supply voltage range from 3V to 15V
- Fully static operation
- 5V, 10V, and 15V parametric ratings
- Standardized symmetrical output characteristics
- Inputs and outputs are protected against electrostatic effects
- Specified from -40°C to +105°C
- Packaging information: DIP14/SOP14/TSSOP14



## Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
CD4068BE	DIP14	CD4068BE	TUBE	1000pcs/Box
CD4068BM/TR	SOP14	CD4068B	REEL	2500pcs/Reel
CD4068BMT/TR	TSSOP14	CD4068B	REEL	2500pcs/Reel

## General Description

The CD4068B is an 8-input And Gate/Nand Gate. The outputs are fully buffered for highest noise immunity and pattern insensitivity to output impedance variations.

It operates over a recommended VDD power supply range of 3V to 15V referenced to VSS (usually ground). Unused inputs must be connected to VDD, VSS, or another input.

**Block Diagram**

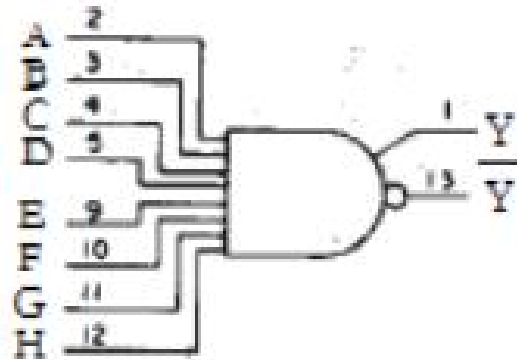


Figure 1. Functional diagram

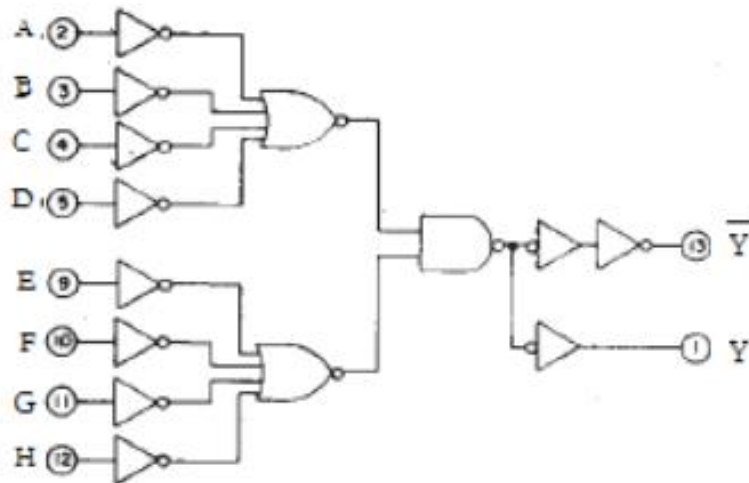
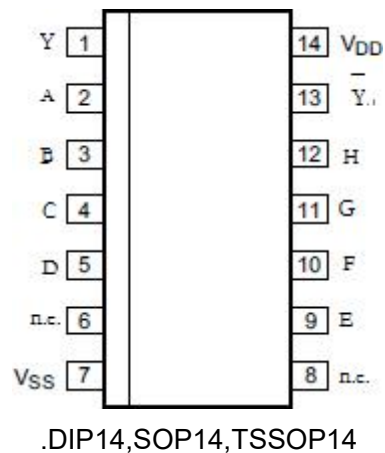


Figure 2. Logic diagram

**Function Table**

Input								Output	
A	B	C	D	E	F	G	H	Y	Y
H	H	H	H	H	H	H	H	H	L
L	X	X	X	X	X	X	X	L	H
X	L	X	X	X	X	X	X	L	H
X	X	L	X	X	X	X	X	L	H
X	X	X	L	X	X	X	X	L	H
X	X	X	X	L	X	X	X	L	H
X	X	X	X	X	L	X	X	L	H
X	X	X	X	X	X	L	X	L	H
X	X	X	X	X	X	X	L	L	H

## Pin Configurations



Pin No.	Pin Name	Description
1	Y	data output
2	A	data input
3	B	data output
4	C	data output
5	D	data input
6	n.c.	not connected
7	VSS	ground (0V)
8	n.c.	not connected
9	E	data input
10	F	data output
11	G	data output
12	H	data input
13	$\bar{Y}$	complement output
14	VDD	supply voltage

## Absolute Maximum Ratings

(Voltages are referenced to  $V_{SS}$  (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	VDD	-	-0.5	+18	V
DC input current	I <sub>IK</sub>	any one input	-	±10	mA
input voltage	V <sub>I</sub>	all inputs	-0.5	V <sub>DD</sub> +0.5	V
storage temperature	T <sub>stg</sub>	-	-65	+150	°C
total power dissipation	P <sub>tot</sub>	-	-	500	mW
device dissipation	P	per output transistor	-	100	mW
Soldering temperature	T <sub>L</sub>	10s	250		°C

## Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V <sub>DD</sub>	-	3	-	15	V
ambient temperature	T <sub>amb</sub>	in free air	-40	-	+85	°C

Note:

- (1) For DIP14 packages: above 70°C the value of P<sub>tot</sub> derates linearly with 12mW/K.
- (2) For SOP14 packages: above 70°C the value of P<sub>tot</sub> derates linearly with 8mW/K.
- (3) For (T)SSOP14 packages: above 60°C the value of P<sub>tot</sub> derates linearly with 5.5mW/K.

## Electrical Characteristics

### DC Characteristics 1

(T<sub>amb</sub>=25°C, voltages are referenced to V<sub>SS</sub> (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)			T <sub>amb</sub> =25°C			Unit
		V <sub>O</sub>	V <sub>IN</sub>	V <sub>DD</sub>	Min.	Typ.	Max.	
supply current	I <sub>DD</sub>	-	0, 5	5	-	0.01	0.25	uA
		-	0, 10	10	-	0.01	0.5	uA
		-	0, 15	15	-	0.01	1	uA
LOW-level output current	I <sub>OL</sub>	0.4	0, 5	5	0.51	1	-	mA
		0.5	0, 10	10	1.3	2.6	-	mA
		1.5	0, 15	15	3.4	6.8	-	mA
HIGH-level output current	I <sub>OH</sub>	4.6	0, 5	5	-0.51	-1	-	mA
		2.5	0, 5	5	-1.6	-3.2	-	mA
		9.5	0, 10	10	-1.3	-2.6	-	mA
		13.5	0, 15	15	-3.4	-6.8	-	mA
LOW-level output voltage	V <sub>OL</sub>	-	0, 5	5	-	0	0.05	V
		-	0, 10	10	-	0	0.05	V
		-	0, 15	15	-	0	0.05	V
HIGH-level output voltage	V <sub>OH</sub>	-	0, 5	5	4.95	5	-	V
		-	0, 10	10	9.95	10	-	V
		-	0, 15	15	14.95	15	-	V
LOW-level input voltage	V <sub>IL</sub>	0.5, 4.5	-	5	-	-	1.5	V
		1, 9	-	10	-	-	3	V
		1.5, 13.5	-	15	-	-	4	V
HIGH-level input voltage	V <sub>IH</sub>	0.5, 4.5	-	5	3.5	-	-	V
		1, 9	-	10	7	-	-	V
		1.5, 13.5	-	15	11	-	-	V
input leakage current	I <sub>I</sub>	-	0, 15	15	-	±10-5	±0.1	uA

## DC Characteristics 2

( $T_{amb} = -40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$ , voltages are referenced to  $V_{SS}$  (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)			$T_{amb} = -40^{\circ}\text{C}$		$T_{amb} = +85^{\circ}\text{C}$		$T_{amb} = +105^{\circ}\text{C}$		Unit
		VO	VIN	VDD	Min.	Max.	Min.	Max.	Min.	Max.	
supply current	$I_{DD}$	-	0, 5	5	-	0.25	-	7.5	-	7.5	$\mu\text{A}$
		-	0, 10	10	-	0.5	-	15	-	15	$\mu\text{A}$
		-	0, 15	15	-	1	-	30	-	30	$\mu\text{A}$
LOW-level output current	$I_{OL}$	0.4	0, 5	5	0.61	-	0.42	-	0.36	-	$\text{mA}$
		0.5	0, 10	10	1.5	-	1.1	-	0.9	-	$\text{mA}$
		1.5	0, 15	15	4	-	2.8	-	2.4	-	$\text{mA}$
HIGH-level output current	$I_{OH}$	4.6	0, 5	5	-0.61	-	-0.42	-	-0.36	-	$\text{mA}$
		2.5	0, 5	5	-1.8	-	-1.3	-	-1.15	-	$\text{mA}$
		9.5	0, 10	10	-1.5	-	-1.1	-	-0.9	-	$\text{mA}$
		13.5	0, 15	15	-4	-	-2.8	-	-2.4	-	$\text{mA}$
LOW-level output voltage	$V_{OL}$	-	0, 5	5	-	0.05	-	0.05	-	0.05	V
		-	0, 10	10	-	0.05	-	0.05	-	0.05	V
		-	0, 15	15	-	0.05	-	0.05	-	0.05	V
HIGH-level output voltage	$V_{OH}$	-	0, 5	5	4.95	-	4.95	-	4.95	-	V
		-	0, 10	10	9.95	-	9.95	-	9.95	-	V
		-	0, 15	15	14.95	-	14.95	-	14.95	-	V
LOW-level input voltage	$V_{IL}$	0.5, 4.5	-	5	-	1.5	-	1.5	-	1.5	V
		1, 9	-	10	-	3	-	3	-	3	V
		1.5, 13.5	-	15	-	4	-	4	-	4	V
HIGH-level input voltage	$V_{IH}$	0.5, 4.5	-	5	3.5	-	3.5	-	3.5	-	V
		1, 9	-	10	7	-	7	-	7	-	V
		1.5, 13.5	-	15	11	-	11	-	11	-	V
input leakage current	$I_I$	-	0, 15	15	-	$\pm 0.1$	-	$\pm 1$	-	$\pm 1$	$\mu\text{A}$

## AC Characteristics

( $T_{amb} = 25^{\circ}\text{C}$ ,  $V_{SS} = 0\text{V}$ ,  $t_r, t_f = 20\text{ns}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 200\text{k}\Omega$ , unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
propagation delay time	$t_{PHL}, t_{PLH}$	$V_{DD} = 5\text{V}$	-	150	300	ns
		$V_{DD} = 10\text{V}$	-	75	150	ns
		$V_{DD} = 15\text{V}$	-	55	110	ns
transition time	$t_{THL}, t_{TLH}$	$V_{DD} = 5\text{V}$	-	100	200	ns
		$V_{DD} = 10\text{V}$	-	50	100	ns
		$V_{DD} = 15\text{V}$	-	40	80	ns
input capacitance	CI	any input	-	5	7.5	pF

## AC Testing Circuit

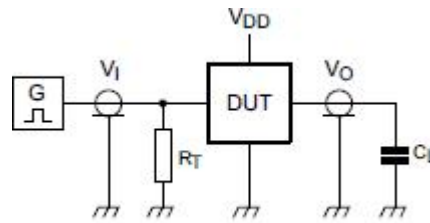


Figure 3. Test circuit for switching times

Definitions for test circuit:

DUT=Device Under Test.

$C_L$ =Load capacitance including jig and probe capacitance.

$R_T$ =Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator.

## AC Testing Waveforms

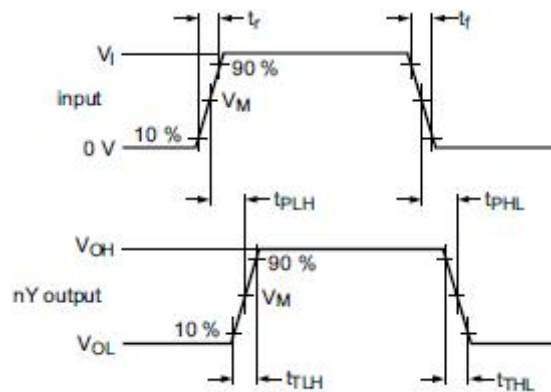


Figure 4. Input to output propagation delay and output transition times

## Measurement Points

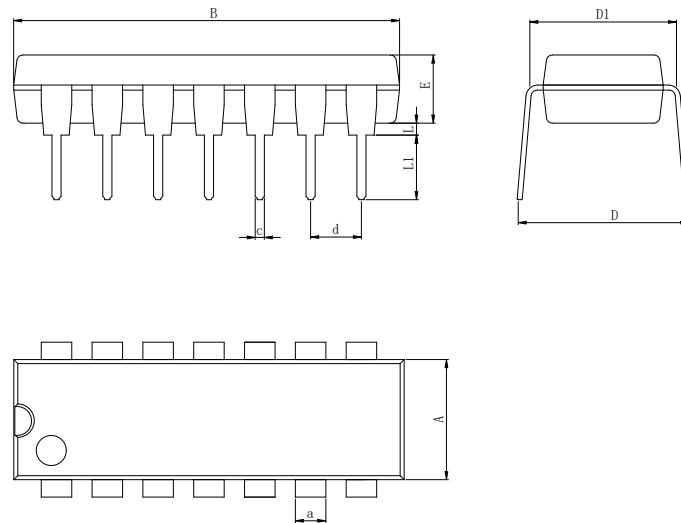
Supply voltage	Input	Output
V <sub>DD</sub>	V <sub>M</sub>	V <sub>M</sub>
5V to 15V	0.5×V <sub>DD</sub>	0.5×V <sub>DD</sub>

## Test Data

Supply voltage	Input		Load
V <sub>DD</sub>	V <sub>I</sub>	tr , tf	C <sub>L</sub>
5V to 15V	V <sub>SS</sub> or V <sub>DD</sub>	≤ 20ns	50pF

## Physical Dimensions

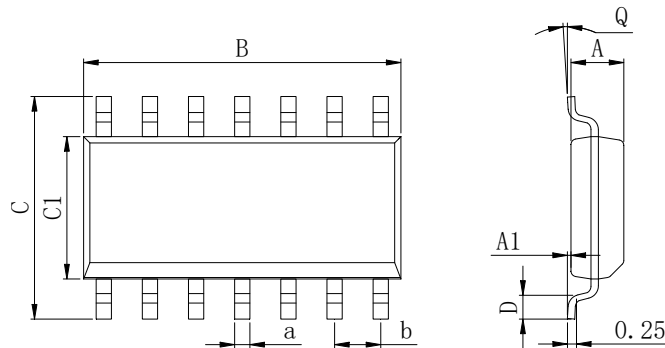
### DIP14



Dimensions In Millimeters(DIP14)

Symbol:	A	B	D	D1	E	L	L1	a	c	d
Min:	6.10	18.94	8.40	7.42	3.10	0.50	3.00	1.50	0.40	2.54 BSC
Max:	6.68	19.56	9.00	7.82	3.55	0.70	3.60	1.55	0.50	

### SOP14

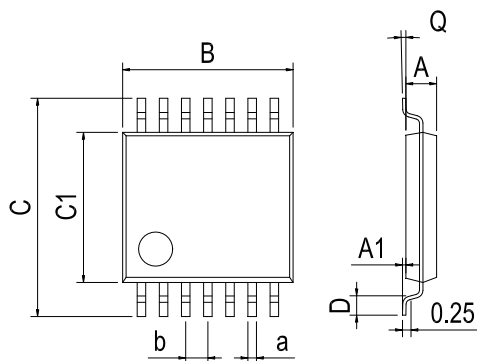


Dimensions In Millimeters(SOP14)

Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	8.55	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	8.75	6.20	4.00	0.80	8°	0.45	

## Physical Dimensions

TSSOP14



Dimensions In Millimeters(TSSOP14)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	



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