CD4011

DATASHEET

Specification Revision History:

Version	Date	Description
V1.0	2022/03	New
V1.1	2023/05	Modify Ordering Information
V1.2	2024/02	Modify Ordering Information
V1.3	2025/03	Add application precautions and overall typesetting.

Description

The CD4011 is a quad 2-input NAND gate.The outputs are fully buffered for the highest noise immunity and pattern insensitivity to output impedance.

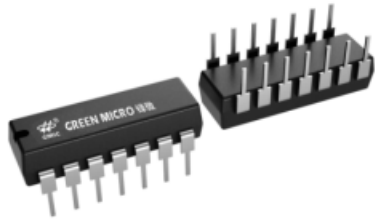
It operates over a recommended V_{DD} power supply range of 3V to 15V referenced to V_{SS}(usually ground).

Unused inputs must be connected to V_{DD} ,V_{SS},or another input.

Features:

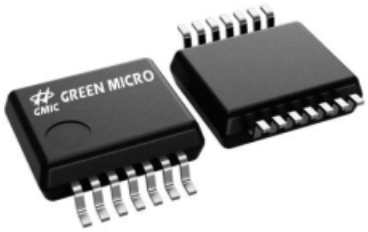
- Wide supply voltage range from 3V to 15V
- Fully static operation
- 5V,10V,and 15V parametric ratings
- Standardized symmetrical output characteristics
- Inputs and outputs are protected against electrostatic effects
- Specified from -40°C to+105°C
- Packaging information:DIP14/SOP14/TSSOP14

产品外观



DIP-14

SOP-14



TSSOP-14

订购信息

名称	封装	丝印	包装	包装数量
CD4011BM	SOP-14	CD4011 108	编带	2500PCS/盘
CD4011BE	DIP-14	CD4011 108	管装	1000PCS/盒
CD4011BPW	TSSOP-14	CD4011 108	编带	2500PCS/盘
CD4011	SOP-14	CD4011 0108	编带	2500PCS/盘
CD4011	DIP-14	CD4011 0108	管装	1000PCS/盒

2 、Block Diagram And Pin Description

2.1 、Block Diagram

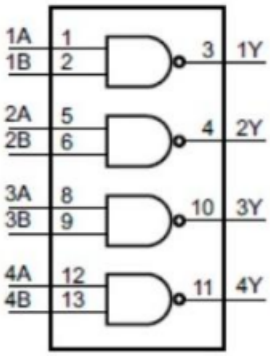


Figure 1.Functional diagram

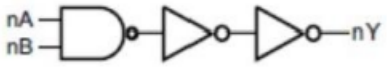
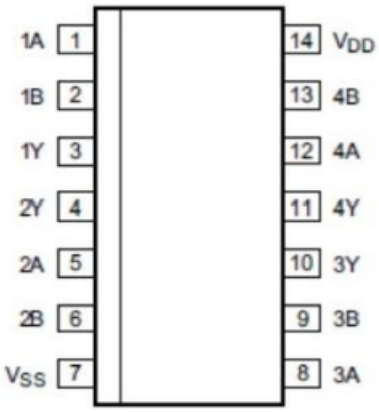


Figure 2.Logic diagram(one gate)

2.2 、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	1A	data input
2	1B	data input
3	1Y	data output
4	2Y	data output
5	2A	data input
6	2B	data input
7	V_{SS}	ground (OV)
8	3A	data input
9	3B	data input
10	3Y	data output
11	4Y	data output
12	4A	data input
13	4B	data input
14	V_{DD}	supply voltage

2.4 、Function Table

Input		Output
nA	nB	nY
L	L	H
L	H	H
H	L	H
H	H	L

Note:H=HIGH voltage level;L=LOW voltage level.

3 、Electrical Parameter

3.1 、Absolute Maximum Ratings

(Voltages are referenced to Vss(ground=0V),unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Max.	Unit
supply voltage	V_{DD}			-0.5	+18	V
DC input current	I_{IK}	any one input		-	±10	mA
input voltage	V_I	all inputs		-0.5	V_{DD}+0.5	V
storage temperature	T_{stg}	-		-65	+150	°C
total power dissipation	P_{tot}	-			500	mW
device dissipation	P	per output transistor		-	100	mW
Soldering temperature	T_L	10s	DIP	245		°C
			SOP	250		

Note:[1]For DIP14 packages:above 70°C the value of P_{tot} derates linearly with 12mW/K.

[2]For SOP14 packages:above 70°C the value of P_{tot} derates linearly with 8mW/K.

[3]For(T)SSOP14 packages:above 60°C the value of P_{tot} derates linearly with 5.5mW/K.

3.2 、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{DD}	-	3	-	15	V
ambient temperature	T_{amb}	in free air	-40	-	+105	°C

3.3 、Electrical Characteristics

3.3.1 、DC Characteristics 1

(Tamb=25°C,voltages are referenced to Vss(ground=0V),unless otherwise specified.)

Parameter	Symbol	Conditions(V)			T_{amb}=25°C			Unit
		Vo	VIN	VDD	Min.	Typ.	Max.	
supply current	I_{DD}	-	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_{OL}	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_{OH}	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_{OL}	-	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_{OH}	-	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_{IL}	4.5	-	5	-	-	1.5	V
		9	-	10	-	-	3	V
		13.5	-	15	-	-	4	V
HIGH-level input voltage	V_{IH}	0.5,4.5	-	5	3.5	-	-	V
		1,9	-	10	7	-	-	V
		1.5,13.5	-	15	11	-	-	V
input leakage current	I_I	-	0,15	15	-	$\pm 10^{-5}$	$\pm$0.1	uA

3.3.2、DC Characteristics 2

(Tamb=-40°C to+105°C,voltages are referenced to Vss(ground=0V),unless otherwise specified.)

Parameter	Symbol	Conditions(V)			T_{amb}=40°C		T_{amb}=+85°C		T_{amb}=+105°C		Unit
		Vo	VIn	VDD	Min.	Max.	Min.	Max.	Min.	Max.	
supply current	I_{DD}	-	0,5	5	-	0.25	-	7.5	-	7.5	uA
		-	0,10	10	-	0.5	-	15	-	15	uA
		-	0,15	15	-	1	-	30	-	30	uA
LOW-level output current	I_{OL}	0.4	0,5	5	0.61	-	0.42	-	0.36	-	mA
		0.5	0,10	10	1.5	-	1.1	-	0.9	-	mA
		1.5	0,15	15	4	-	2.8	-	2.4	-	mA
HIGH-level output current	I_{OH}	4.6	0,5	5	-0.61	-	-0.42	-	-0.36	-	mA
		2.5	0,5	5	-1.8	-	-1.3	-	-1.15	-	mA
		9.5	0,10	10	-1.5	-	-1.1	-	-0.9	-	mA
		13.5	0,15	15	-4	-	-2.8	-	-2.4	-	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}	4.5	-	5	-	1.5	-	1.5	-	1.5	V
		9	-	10	-	3	-	3	-	3	V
		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	-	±0.1	-	±1	-	±1	uA

3.3.3、AC Characteristics

(Tamb=25°C,Vss=0V,t,t=20ns,CL=50pF,RL=200kΩ,unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
propagation delay time	t_{PHL},t_{PLH}	see Figure 4	VDD=5V	-	125	250	ns
			VDD=10V	-	60	120	ns
			VDD=15V	-	45	90	ns
transition time	t_{THL},t_{TLH}	see Figure 4	VDD=5V	-	100	200	ns
			VDD=10V	-	50	100	ns
			VDD=15V	-	40	80	ns
input capacitance	C_I	any input		-	5	7.5	pF

4 、Testing Circuit

4.1 、AC Testing Circuit

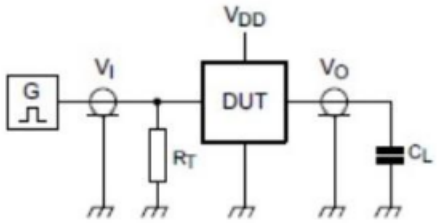


Figure 3.Test circuit for switching times

Definitions for test circuit:

DUT=Device Under Test.

CL=Load capacitance including jig and probe capacitance.

Rr=Termination resistance should be equal to the output impedance Z 。of the pulse generator.

4.2 、AC Testing Waveforms

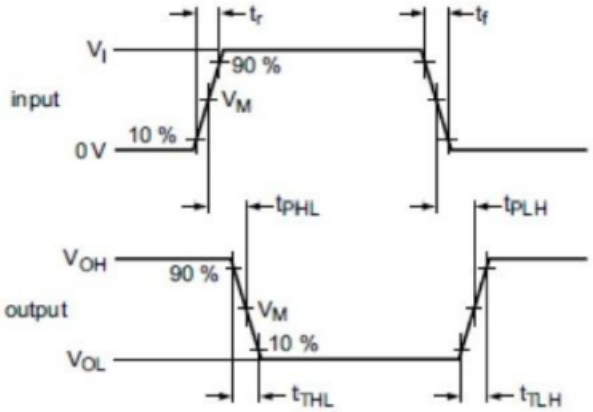


Figure 4.Propagation delay,output transition time

4.3、Measurement Points

Supply voltage	Input	Output
V_{DD}	V_M	V_M
5V to 15V	$0.5\times V_{DD}$	$0.5\times V_{DD}$

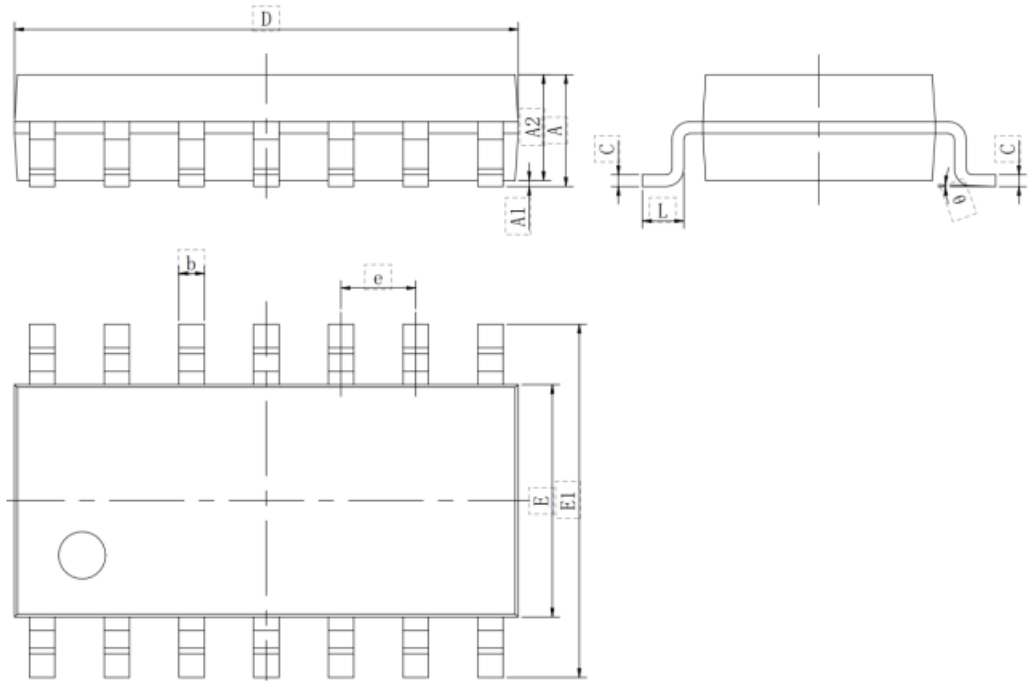
4.4、Test Data

Supply voltage	Input		Load
V_{DD}	V_I	t_r,t_f	C_L
5V to 15V	V_{SS} or V_{DD}	≤20ns	50pF

Outline Dimensions

SOP-14

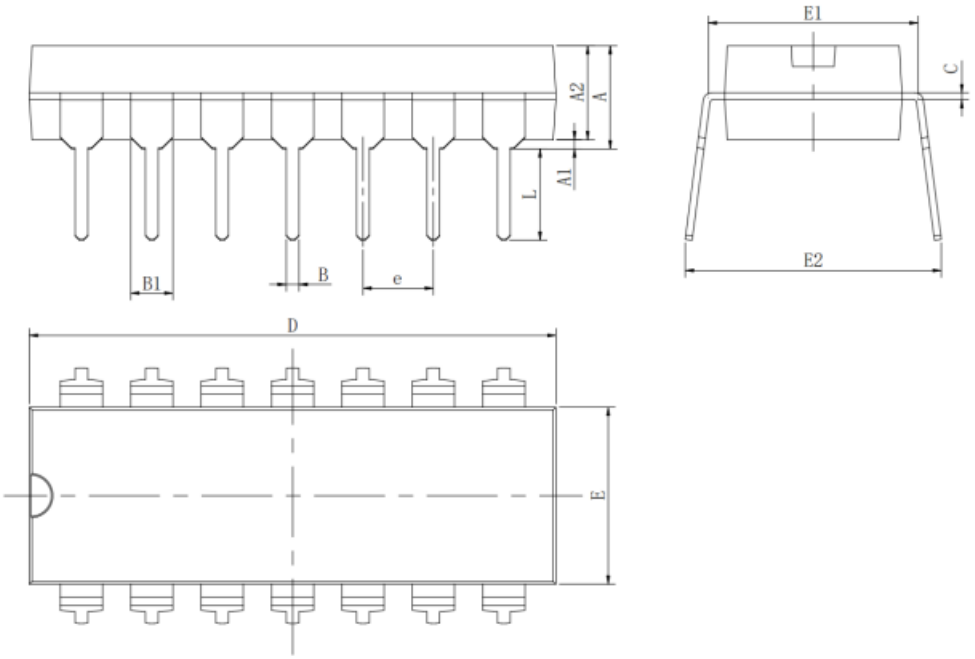
Unit: mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	8.360	8.760	0.329	0.345
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

DIP-14

Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540(BSC)		0.100(BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

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